

Proceeding of the First International Conference on Oceanography for West Asia

Organized by: Iranian National Institute for Oceanography and Atmospheric Science & UNESCO Regional Education and Research Center on Oceanography for West Asia (UNESCO-RCOWA)

30 - 31 October 2017, IRAN- Tehran





Proceeding of the First International Conference on Oceanography for West Asia



Editors:

Dr. Fatemeh Hajivalie Dr. Babak Moradi Dr. Mohajer Ghazi Mir Saeed Maryam Parsi

Layout:

Mohammad Mahdi Pourvohid Fatemeh Salehi

In the name of God

The message of the conference Chair

Oceans and seas have fundamental roles in the life of the creatures on earth and are the main source for providing food for more than half of the population of the world. Islamic Republic of Iran, which is adjacent to the 3 major valuable water bodies; the Persian Gulf, the Caspian Sea and the Gulf of Oman and has thousands kilometers of coastal line, is a marine country. Utilization of the seas and protecting them is one of our duties as human. The effort of the Iranian marine organizations for a national movement for paying more attention to the seas and oceans is a national necessity that can gather all Iranians together for sustainable management of the country's seas. Therefore, benefiting from national and international capacities as well as the cooperation of all marine organizations and institutes can enhance the marine culture of the Iranian people. In this regard, the Iranian National Institute for Oceanography and Atmospheric Science, the Regional Education and Research Center on Oceanography for West Asia (RCOWA) and the Society of Marine Science and Technology of IR. Iran have the honor of hosting the "First International Conference on Oceanography for West Asia" in 2017. The aim of the Conference is "enhancing the knowledge of Oceanography". Therefore, in its sessions, the importance of oceanography will be presented.

We invite the interested experts and scientists to participate in the "First International Conference on Oceanography for West Asia" which is scheduled to be held on 30-31 October 2017 in Olympic Hotel in Tehran, Islamic Republic of Iran.

We hope with the help of Almighty Allah and the participation of the experts, this conference can be beneficial for better understanding of the importance of the marine environment and for consolidation of the regional and international oceanographic position of I.R. of Iran.

Dr. Nasser Hadjizadeh Zaker

Director of Iranian National Institute for Oceanography and Atmospheric Science Director of Regional Education Research Centre on OCeanography for West Asia



Conference Themes

1.Marine Meteorology

- - Atmosphere-ocean modeling
- - Air-sea interaction
- - Air-sea dynamics and thermodynamics
- - Effect of aerosols on tropical clouds and precipitation

2.Climate Change

- Climatic modeling
- Atmosphere /ocean teleconnection
- Ocean and global warming
- -Climate monitoring and prediction

3.Physical Oceanography

- Observations and modeling of ocean physical processes
- Ocean and sea dynamics and circulation
- Internal waves
- Estuaries and bays hydrodynamics

4. Biological Oceanography

- Biodiversity, ecosystem functioning, stability and restoration
- Human impacts on marine ecosystem
- Marine bio-resources
- Marine biotechnology

5.Ocean Biogeochemistry

- Biogeochemical cycles
- Chemical oceanography
- Global change and climate change

- - Coastal biogeochemistry
- -Marine natural products

6.Fisheries and Aquaculture

- Fisheries biology and ecology
- Fish diseases and health
- New technologies in fisheries
- Future of fisheries due to climate change

7.Marine Geology

- Sedimentation and sedimentary processes in sea
- Hydrocarbon resources in the seas and oceans
- Geomorphology of sea floor and coastal area
- Mineral resources in the seas and oceans
- Offshore geophysical and geotechnical investigation

8.Marine Pollution

- Ocean acidification
- Nutrients pollution and eutrophication
- Waste water, Marine debris and sea dumping pollution
- Noise and thermal pollution
- Oil pollution
- Artificial Islands

9.Marine law and policy

- The rule of law in the oceans
- Law and Policy in Marine Scientific Research
- Ocean Policy and Ocean Governance



- Dispute Settlements in Law of the Sea
- Law and Policy of Marine Environmental
- Protection
- Human Rights/Humanitarian Law and Law of
- the Sea
- Coastal Zones Management
- -Recent Developments in the Law of the Sea
- and Ocean Policy
- Law and Policy in the Southern Ocean and

Antarctica

• Marine economy

10.Marine Hazards

- Marine biohazards
- Tsunami and Tropical storms
- Climate change and marine hazards
- Coastal hazards
- Coastal erosion

11.Marine Engineering and Technology

- Coastal engineering
- Coastal processes
- Coastal sediment transport
- Coastal and offshore structures
- New marine technologies
- Marine Renewable Energy
- · Satellite oceanography and remote sensing



Conference sponsors

شورای عالی صنائع درمانی





جهان اسلام

CIVILICA



معاونت علمی و فناور ی



ODINCINDIO

Ocean Data and Information Network for the Central Indian Ocean region







سازمان بنا در و دریانوردی



























INOC

سازمان شيلات ايران



















دانشگاه مازندران







(پلی تکنیک تهران)





(امکا)







IOE-2

































اتحاديه مالكان كشتى ايران













سازمان حفاظت محيط زيست



سازمان صنايع دريايي



Κ



Scientific committee

1	Dr.Akbarpour Mahmoud	National Institute of Oceanography and Atmospheric Science
2	Dr.Alizadeh Hamid	National Institute of Oceanography and Atmospheric Science
3	Eng. Allahyar Mohammad Reza	Ports and Maritime Organization of Iran
4	Dr.Amini Farhad	University of Tehran
5	Eng. Ardakani Hossein	Iran Meteorological Organization
6	Dr.Badiei Peyman	University of Tehran
7	Dr.Bahari Mohammad Reza	University of Tehran
8	Dr.Banijamali Babak	Darya-Bandar Consulting Engineers
9	Dr.Bannazadeh Mohammad Reza	Iranian Society of Marine Science and Technology
10	Dr.Bavarsad Parviz	Persian Gulf University
11	Prof.Bidokhti Abbas Ali	Iranian Seismological Center
12	Dr. D'ADAMO Nick	UNESCO-IOC Perth Regional Programme Office
13	Dr.Chegini Vahid	Iran Fisheries Organization
14	Dr.Esmaili Sari Abbas	Tarbiat Modares University
15	prof.Etemad Shahidi Amir	Griffith University
16	Dr.Farshchi Parvin	Department Of Environmnet
17	Dr.Gazani Mahin	United Nations Educational, Scientific and Cultural Organization
18	Dr.Ghaffarian Parvin	National Institute of Oceanography and Atmospheric Science
19	Dr.Gheyassi Mahmoud	Amirkabir University of Technology
20	Dr.Goleshani Asghar	Islamic Azad University Central Tehran Branch
21	Dr.Haghshenas Hadi	Ports and Maritime Organization of Iran
22	Dr.Hajivalie Fatemeh	National Institute of Oceanography and Atmospheric Science
23	Dr.Hajizadeh Zaker Naser	Iranian National Institut for Oceanography and Atmospheric Science
24	Dr.Hasanzadeh Esmaiel	Isfahan University
25	Dr. Hassan Zadeh Mohammad Ali	Ports and Maritime Organization of Iran
26	Dr.Jamili Shahla	Research Center of Fisheries Science
27	Dr.Jamshidi Seyamak	National Institute of Oceanography and Atmospheric Science
28	Dr.Javid Amir Hossein	Islamic Azad University, Science and Research Branch, Tehran
29	Dr.Kalbasi Masjed Shahi Mohammad Reza	Tarbiat Modares University
30	Dr.Kamalian Reza	Qom University of Technology
31	Dr.Kazeminzhad Mohammad Hossein	National Institute of Oceanography and Atmospheric Science
32	Dr.Ketabdari Mohammad Javad	Amirkabir University of Technology
33	Dr.Khajeh-pour Lotfollah	khorramshahr University of Marine Science and Technology
34	Prof. Khalili Arzhang	Max-Planck-Instituts für Marine Mikrobiologie
35	Dr.Lak Razieh	Geological Survey & Mineral Explorations of Iran
36	Dr.Lashteh Neshaei Mir Ahmad	University of Guilan



37	Dr.Lotfollahi Mohammad Ali	University of Tabriz
38	Dr.Malek Mohammadi Bahram	University of Tehran
39	Dr.Mazaheri Saied	National Institute of Oceanography and Atmospheric Science
40	Dr.Mehdinia Ali	National Institute of Oceanography and Atmospheric Science
41	Dr.Mir-Abbasi Seyyed Bagher	University of Tehran
42	Dr.Mobasheri Mohammad Reza	K. N. Toosi University of Technology
43	Dr.Mokhtari Mohammad	International Institute of Earthquake Engineering and Seismology
44	Dr.Montazeri Namin Masoud	University of Tehran
45	Dr.Moradi Masoud	National Institute of Oceanography and Atmospheric Science
46	Dr.Naderloo Reza	University of Tehran
47	Prof.Nasiri Gheydari Saadollah	United Nations Educational, Scientific and Cultural Organization
48	Dr.Nasiri Mahmoud	Chabahar Maritime and Marine University
49	Dr.Negarestan Hossein	National Institute of Oceanography and Atmospheric Science
50	Dr.Nobakhti Abbas	National Institute of Oceanography and Atmospheric Science
51	Prof.Oryan Shahrbanoo	Kharazmi University
52	Prof.Riahi Bakhtiary Alireza	Faculty of Tarbiat Modares Marine Sciences and Natural Resources
53	Dr.Sadri-Nasab Masoud	University of Tehran
54	Dr.Saeedi Mohsen	Iran University of Science and Technology
55	Dr.Saleh Abolfazl	National Institute of Oceanography and Atmospheric Science
56	Dr.Saravi Nasrollah	Caspian Sea Eqological Research Center
57	Prof.Sari Alireza	University of Tehran
58	Dr.Savari Ahmad	khorramshahr University of Marine Science and Technology
59	Dr.Sedigh Mortazavi Mohammad	Persian Gulf Eqological Research Center
60	Prof.Seif Mohammad Saieed	Sharif University
61	Dr.Shafiee far Mohammad	Tarbiat Modares University
62	Dr.Shokri Mohammad Reza	Shahid Beheshti University
63	Dr.Siadat-mousavi Seyed Mostafa	Iran University of Science and Technology
64	Dr.Soltanpoor Mohsen	K. N. Toosi University of Technology
65	Professor Tomczak Matthias	Flinders University
66	Dr.Valinasab Touraj	Research Center of Fisheries Science
67	Dr.Yeganeh-Bakhtiary Abbas	Iran University of Science and Technology
68	Dr.Yousef-zadi Morteza	Hormozgan University
69	Dr.Zamanian Moammad Taghi	Atmospheric Science & Meteorogical Research Center
70	Dr.Zare Maivan Hassan	Tarbiat Modares University
71	Dr.Zeinaddini Mostafa	K. N. Toosi University of Technology
72	Dr.Zoljoudi Mojtaba	National Institute of Oceanography and Atmospheric Science



Referee committee

1	Dr.Gharavloo Marvam	Iranian Seismological Center
2	Dr.Ghavour hassan Ali	Isfahan University
3	Dr.Ghorbani Rasool	Gorgan University
4	Dr.Gorgin Saeid	Gorgan University
5	Dr.Hamzeh Mohammad Ali	National Institute of Oceanography and Atmospheric Science
6	Dr.Hedayati seyed Ali Akbar	Gorgan University
7	Dr.Kabiri Keyvan	National Institute of Oceanography and Atmospheric Science
8	Dr.Keshavarz	Research Institute of Petroleum Industry
9	Dr.Keshavarz Moosa	Hormozgan University
10	Dr.Khaledi Hoda	National Institute of Oceanography and Atmospheric Science
11	Dr.KhoshKholgh Ali	National Institute of Oceanography and Atmospheric Science
12	Dr.Madani Seyed Zia Aldin	National Institute of Oceanography and Atmospheric Science
13	Dr.Maghsoodloo Abdolvahhab	National Institute of Oceanography and Atmospheric Science
14	Dr.Manboohi Ahmad	National Institute of Oceanography and Atmospheric Science
15	Dr.Mahmoodof masoud	National Institute of Oceanography and Atmospheric Science
16	Dr.Mobarak Hosn Elham	Islamic Azad University Ahvaz Branch
17	Dr.Mohammad mehdizadeh Mahdi	Hormozgan University
18	Dr.Naderi AbdolMajid	National Institute of Oceanography and Atmospheric Science
19	Dr.Nikpoor Yadallah	khorramshahr University of Marine Science and Technology
20	Dr.Pegah Far Nafiseh	National Institute of Oceanography and Atmospheric Science
21	Dr.Rezaei Marnani Hamid	
22	Dr.Rezazadeh Maryam	Hormozgan University
23	Dr.Savari Sharareh	
24	Dr.Seyed Hashtroodi Mehri	National Institute of Oceanography and Atmospheric Science
25	Dr.Seyouf Jahromi Maryam	Hormozgan University
26	Dr.Shahrbaf Darvazeh Noei Akbar	National Institute of Oceanography and Atmospheric Science
27	Dr.tajbakhsh sahar	Atmospheric Science & Meteorogical Research Center
28	Dr.Zahed Mohammad Ali	Kharazmi University



Board of Chair



Dr. Naser Hadjizadeh Zaker

Chair of the Conference and Director of the Iranian National Institute for Oceanography and Atmospheric Science



Dr. Abbas Nobakhty

Deputy Chair of the conference and project manager of the Oceanic Research Floating Project (Exploration of the Persian Gulf)

Dr Fatemeh Hajivalie

Scientific Chair of the Conference and Director of Scientific Research and Scientific Cooperation of the Iranian National Institute for Oceanography and Atmospheric Science



Ehsan Abedi

Executive Chair of the Conference and Deputy Director for Development and Support of the Iranian National Institute for Oceanography and Atmospheric Science



Dr. Babak Moradi

Deputy Executive Chair of the Conference and Head of Public Relations at the Iranian National Institute for Oceanography and Atmospheric Science





Conference Executive Committee

		Dr. Hemira Agah	Mr. Mehdi Tajik	
		Mr. Majid Salmani	Ms. Fahime Foroughi	
	1	Mr. Faramarz Ebadi	Mr. Farhad Heidari	
	Mr. Mo	ohamad Mahdi Pourvahid	Ms. Marzieh Mazinani	
	Mr. N	lanouchehr Mohammadi	Ms. Maryam Parsi	
Ms. Nasrin Kha	n Ahmadi	Mr. Mohammad Reza Shadi	Dr. Mozhgan Ghazi Mirsaed	Mr. Hamid Reza Khadem Biqam
Ms. Leyla Na	srollahi	Ms. Zohreh Ahmadian		
		Menrgoo	Mr. Mohammad Khalesi Nejad	Dr. Maryam Hakim Elahi
Mr. Abbas G	olpaee	Ms. Sara Davoodi	Ms. Tayyebe Soori	Ms. Masoumeh Vafaie
	1			
ivir. Abbas Ali S	epenri Kia	ivir. iviostafa Shadab	Ms. Parichehr Mazaheri	IVIr. Farrokh Alavian ghavanini
Ms. Zahra Neja	ad Fallah	Ms. Saeedeh Feshki	Dr. Sharare Savari	Ms. Masoome Dalwand



List

Number

Marine Pollution
• Separating Toxic Chromium Ion (VI) from Contaminated Marine Water Using a New
Nano-Adsorbent String GZ-BAKI-TAC-Cr-88 Made by Beshel Activated Carbon5
• Nested Environmental Status Assessment Tool (Neat) To Assess Environmental Status
In Bathing Waters Of The Southern Caspian Sea13
• Evaluation Of Physico-Chemical Parameters, Chlorophyll A And Nutrients In The
Mangrove Ecosystem Of Nayband, Northern Coast Of Persian Gulf
• Heavy Metals In Blood Of Green Sea Turtles (Chelonia Mydas) From Nesting Colo-
nies Of The Northern Coast Of The Sea Of Oman23
• Assessment of Pb, Cd, Cu and Fe Accumulation in Sediments of Chabahar Bay29
Biological Oceanography
• Marine-derived Actinobacteria of Iran ecosystems as a source for neuropathic disease
drug discovery
• Qualitative and Quantitative Study of Zooplankton in Surface Offshore Waters of the
South Caspian Sea41
• An Investigation On Heavy Metals (Zn, Pb, Cu, Ni, Cd, Cr, And Hg) In Chabahar
Sediments (Gulf Of Oman, Iran)45
• Effects Of Methylmercury On The Brain Of Orange Spotted Grouper In Mahshahr
Creeks Of Persian Gulf And Waterborne Fish49
• The Role Of The Sediment Conditions In Shaping Meiofauna Spatial Distribution In
The Shallow Water Of The South Caspian Sea55
• Spatiotemporal Variations In Macrofauna Community In The South Caspian Sea61
• Abu Musa Island As A Biodiversity Hotspot In The Persian Gulf, Iran67
Physical Oceanography71
• Observation of Across-Channel Flow in the Khuran Channel, Persian Gulf, Iran73
Designing a Three-Dimensional Oceanic Model for Study of Monsoon Wind Induced
Currents in the West of Northern Indian Ocean79
• Interannual Variations of the Water Surface Layer: An Arctic Ocean Field Experi-
ence
• Numerical Modeling of Barotropic Response to Shamal Wind in the Persian Gulf91
Ocean Biogeochemistry97
• A Study On Seasonal Changes Of Physicochemical Parameters In Makoran Coastal
Waters
Climate Change102
• A Numerical Modeling Approach to Forecast the Effect of Climate Change on Surface
Temperature of the Gulf of Oman103



Assessment of CORDEX Wind Field in the Persian Gulf	
Marine Geology	115
• Subseafloor engineering geology of Iranian oil and gas fields in Pers	ian Gulf117
Sedimentology and Mechanism of Formation of Sand Dunes in Coa	asts of Oman Sea
	121
Fisheries and Aquaculture	127
Assessment of Species and Proximate Composition of some important	rtant Fish in the
Trawl by-catch and Discard of Khuzestan, North-West Coast of Persian	Gulf129
• State of Phytoplankton, Chlorophyll-a and Nutrient variations in t	he Southwestern
Caspian Sea	
Spatial Distribution and Abundance of Ichthyoplankton in the Nort	heastern Persian
Gulf of Iran	139
Marine Engineering and Technology	145
• Enaluation Of Different Measures To Reduce Shaling Process In Ne	ka Port147
• Determination of Mass Center of a Jacket type Platform by a New M	ethod Associated
with Added Mass Concept	151
MarineHazards	
Toxic Dinoflagellate Resting Cysts Distribution in the Surface Sedime	ents of the North-
east of the Persian Gulf in Ralation with Environmental Parameters a	nd Their Role in
Bloom Formation	161
Marine Meteorology	
• Analysis of an Axisymmetric Tropical Cyclone Model; A Case Study	Example171
Abstracts	

Theme Marine Pollution

Proceeding of the First International Conference on Oceanography for West Asia

30-31 October 2017 IRAN - Tehran



Separating Toxic Chromium Ion (VI) from Contaminated Marine Water Using a New Nano-Adsorbent String GZ-BAKI-TAC-Cr-88 Made by Beshel Activated Carbon

Hanieh.Zargarlellahi*¹, Hossein.Ghafourian²

1*-Young Researchers and Elites Club, North Tehran Branch, Islamic Azad University, Tehran, Iran & Expert of Geological Survey of Iran, haniehzargar62@yahoo.com

2-Department of Marine Science and Technology, North Tehran Branch, Islamic Azad

University

ghaforian25@yahoo.com

Abstract:

Chromium is a relatively common element, naturally occurring in rocks, soil, plants, animals, and in volcanic dust and gases. Oil and coal contain traces of chromium (III). Chromium is Mainly found as the chromium (III) form in nature and rarely as chromium (VI) compounds.

Chromium (VI) is very toxic and all released from industries. Breathing high levels of chromium (VI) can cause irritation to the nose, such as runny nose, nosebleeds, and ulcers and holes in the nasal septum. Ingesting large amounts of chromium (VI) can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. In this project were studied the separation of ion heavy metal chromium (VI) Using new filamentary adsorber for removal of contaminants in environmental. The purpose of this research work is to build a new nano-absorber, GZ-BAKI-TAC-Cr-88, for the adsorption of water soluble chromium ions in polluted water. The sorbent for separation are made by using sodium alginate, Calcium chloride and Beshel Tire activated carbon with nano-holes. The filamentary length of adsorber was 10 cm and 300 µm in diameter in wet state. The tests were done in discontinuous system. The adsorption capacity and the kinetic of maximum percent by metal concentrations in 50,100,15 0and 200 ppm were studied. The amount of chromium uptake was 75.928 ,134.416, 168.667, and 240.05 respectively. For kinetic reaction times, 10, 20, 30,40,50,60 and 120 minutes were selected. The maximum adsorption of chromium (VI) achieved(q) 240.05 in 120 minutes with 200ppm primary concentration of chromium.

Results indicate that the new adsorber calcium alginate filamentary containing activated carbon with nano-holes has good adsorbing character for removal of chromium (VI) in polluted effluent .With increasing of activated carbon in sodium alginate increased the amount of chromium (VI).

Keywords: Alginate - Chromium (VI) - Isolation - Heavy metal

1. Introduction

Chromium (Cr) compounds are widely used in industry such as electroplating, metal finishing, leather tanning, pigments, etc. The predominant use of chromium in industry unfortunately introduces an environmental concern. Cr exists almost exclusively in the Cr(III) oxidation state or in the Cr(VI) oxidation state. In the environment Cr(III) is typically not a problem, its relative toxicity is low. In contrast, Cr(VI) compounds are toxic chemicals and genotoxic carcinogens [1]. A family of chemically activated carbon materials has been developed by a new approach in our



laboratory [12]. This new method provides the carbon materials with relatively low-cost, high surface area, high mesoporous volumes, and some unusual pore surface chemistries [13–17]. Therefore, the novel activated carbon materials with tailored porosity and surface chemistry are expected to have great potential as highly effective adsorbents for removal of Cr(VI) from water .The presence of metal ions in natural or industrial wastewater and their potential impact has been a subject of research in environmental science for a long time. To solve this problem, bio sorption can be part of the solution. Bio sorption of heavy metals by biomass of bacteria, fungi or alga and agricultural waste have been recognized as a potential alternative to the existing technologies such as pre-capitation, ion exchange, solvent extraction and liquid membrane for removal of heavy metals from industrial wastewater, because these processes have the limitations of technical and/or economical viability [23-27].

K₂Cr₂O₇ was used to prepare a stock solution with a concentration of 1000 ppm Cr(VI) which was diluted for preparation of standard and test solutions. Standard solutions were prepared at concentrations of: 50,100,150 & 200 ppm. The adsorption of Cr(VI) was carried out in a shaking machine at room temperature. Activated carbon products can be characterized by physical and activity properties. Both kinds of properties become important factors in the specification of commercial carbons. These tests include the adsorption of a single standard reference adsorbate, and help to distinguish activity characteristics in different carbons. This parameter is related to the macro- and mesopore capacity of activated carbon [28]. Unfortunately, there is no standardized testing procedure to assess or compare the adsorptive capacity of granular activated carbons (GACs), although two general methods are described in the literature.



Molecular structures of alginic acid (a) and Eudragit E 100



Schematic image for preparation of hybrid material by polymerization of 2-aminoethyl methacrylate hydrochloride in the presence of sodium alginate



2. Materials and Methods

All solution for the metal sorption experiments were prepared using K₂Cr₂O₇purchased from Merck. Sodium Alginate (NaC₆H₇O₆) and Calcium Chloride CaCl₂ with 99% purity made by Merck. The activated carbon was prepared Beshel with diameter about 0.125 nm .All solutions were made by using distilled water.



Fig1.filaments of GZ-BAKI-TAC-Cr-88



A:Before Adsorber B:After Adsorber

3.Conclusion

3-1.Effect of pH

The pH of the metal solutions usually plays an important role in the bio sorption of metals. Preliminary studies of GZ-Cr-88 and GZ-BAKI-TAC-Cr-88 on the base of Chromium revealed that highest Cr uptake was observed at pH= 7. Further increase or decrease in pH resulted in decrease Cr uptake. This may be due to nature of binding sites in alginate beads. Also hydrogen ion competition at low pH and solution of chemistry of metal are other important factors responsible for variation of metal uptake at different pH values.

Adsorbant	pН	Ci(ppm)	Ce(ppm)	q	у
	4	50	39.294	13.382	21.412
G7-Cr-88	5	50	38.327	14.591	61.673
02-01-00	6	50	38.025	14.968	74.65
	7	50	35.851	17.686	82.074
	4	50	38.591	19.007	22.818
GZ-BAKI-TAC-Cr-88	5	50	39.26	17.892	60.74
	6	50	38.864	18.552	74.09
	7	50	37.195	21.333	81.402

Table1- Compare between GZ-Cr-88 & GZ-BAKI-TAC-Cr-88



	GZ-BAKI-1 Cr-88; 4 19.007	OT PH Ac-GZ-BAKI-1 1; Cr-88; 5 	AC- GZ-BAKI-T 5; Cr-88; (18.552	Cr-88; FAC- 21.33 5;
8				
	GZ-Cr-88 13.382	4; GZ-Cr-88 14.591	;5; GZ-Cr-88 14.968	GZ-Cr-& ; 6; 17.6
- - -	GZ-Cr-88 13.382 4	GZ-Cr-88 14.591	5; GZ-Cr-88 14.968	GZ-Cr-8 ; 6; 17.6 3
	GZ-Cr-88 13.382 4 19.007	4; GZ-Cr-88 14.591 5 17.892	6 18.552	GZ-Cr-8 ; 6; 17.6 3 7 21.333



3-2. Effect of retention time

The results of the different experiments showed that by increasing retention time, the remained concentration of heavy metals in the solution was reduced. 120 minutes retention time for removing the metal was enough. However increase in retention time from 10 min to 120 min resulted in decrease the remained concentration of heavy metal. kinetic studies (at pH 7) showed that about 240.05 of the total metal ions adsorption occurred within 120 min.

Also by increasing initial concentration, the metal uptake was increased. the maximum uptake for Cr with initial concentration 200 ppm and pH=7 with using GZ-Cr-88 were obtained 33.528 at 120 min and with using GZ-BAKI-TAC-Cr-88 were obtained 240.05 at 120 min.





Fig3.Effect of time

References

[1] D. Blowes, Tracking hexavalent Cr in groundwater, Science 295 (2002) 2024A–2025A.

[2] R.R. Leonard, Lauwerys, carcinogenicity and muta genicity of chromium, Mut. Res. 76 (1980) 227 239.

[3] S.D. Flora, M. Bagnasco, D. Serra, P. Zanacchi, Geno toxicity of chromium compounds .A review, Mut. Res. 238 (1990) 99–172.

[4] U.S. Environmental Protection Agency. National Primary Drinking Water Standards,2003. http://www.epa.gov/safewater/consumer/pdf/mcl.pdf.

[5] C.S. Brooks, Metal Recovery from Industrial Waste, Lewis, Michigan, USA, 1991.

[6] B. Deng, L. Lan, K. Houston, P. Brady, Effects of clay minerals on Cr(Vi) reduction by organic compounds, Environ. Monitor. Assess. 84 (2003) 5–18.

[7] S.J. Park, Y.S. Jang, Pore structure and surface properties of chemically modified activated carbons for adsorption mechanism and rate of Cr(VI), J. Colloid Interface Sci. 249 (2002) 458–463.



[8] N. Zhao, N. Wei, J. Li, Z. Qiao, J. Cui, F. He, Surface properties of chemically modified activated carbons for adsorption rate of Cr (VI), Chem. Eng. J. 115 (1–2) (2005) 133–138.

[9] D.D. Dharani, M. Ranjit, P. Jyotsnamayee, N.D. Surendra, S.T. Ravindra, Removal of Cr(VI) from aqueous solution using activated cow dung carbon, J. Colloid Interface Sci. 232 (2000) 235–240.

[10] P.C. Manuel, M.M. Jose, T.M. Rosa, Chromium(VI) removal with activated carbons, Water Res. 29 (1995) 2174–2180.

[11] A. Diksha, G. Meenakshi, R.C. Bansal, Adsorption of chromium by activated carbon from aqueous solution, Carbon 37 (1999) 1989–1997.

[12] J. Economy, C.L. Mangun, Z. Yue, Activated organic coatings on fiber substrates ,US Patent 6,517,906 (2001).

[13] Z. Yue, C.L. Mangun, J. Economy, Preparation of fibrous porous materials by chemical activation 1. ZnCl2 activation of polymer coated fibers, Carbon 40(2002) 1181–1191.

[14] Z. Yue, J. Economy, G. Bordson, Preparation and characterization of NaOH activated carbons from phenolic resin, J. Mater. Chem. 26 (2006) 1456–1461.

[15] Z. Yue, J. Economy, Synthesis of highly mesoporous carbon pellets from carbon black and polymer binder by chemical activation, Micropor. Mesopor. Mater.96 (2006) 314–320.

[16] Z. Yue, C.L. Mangun, J. Economy, Characterization of surface chemistry and pore structure of H3PO4-activated poly(vinyl alcohol) coated fiberglass, Carbon 42(2004) 1973–1982.

[17] Z. Yue, J. Economy, K. Rajagopalan, G. Bordson, M. Piwoni, L. Ding, V.L. Snoeyink, B.J.Marinas, Chemically activated carbon on a fiberglass substrate for removal of trace atrazine from

water, J. Mater. Chem. 16 (2006) 3375-3380.

[18] L. Ding, V.L. Snoeyink, B.J. Marinas, Z. Yue, J. Economy, Effects of powdered activated carbon pore size distribution on the competitive adsorption of aqueous atrazine and natural organic matter, Environ. Sci. Technol. 42 (2008) 1227–1231.

[19] Z.Yue, J.Economy, Nanoparticle and nano porous carbon adsorbents for removal of trace organic contaminants from water, J. Nano part. Res. 7 (2005) 477–487.

[20] Z. Yue, C.L. Mangun, J. Economy, P. Kemme, D. Cropek, S. Maloney, Removal of chemical contaminants fromwater to belowUSEPAMCL using activated carbon fiber filter, Environ. Sci. Technol. 35 (2001) 2844–2848.

[21] Dionex, Technical Note 26, Determination of Cr(VI) in water, waste water, and solid waste extracts, 1996. http://www1.dionex.com/enus/webdocs/4428 TN26 16May07 LPN034398-02.pdf.



[22] S. Morales-Mu[°]noz, J.L. Luque-Garc *c*, M.D. Luque de Castro, A continuous approach for the determination of Cr(VI) in sediment and soil based on the coupling of microwave-assistedwater extraction, preconcentration, derivatization and photometric detection, Anal. Chim. Acta 515 (2004) 343–348.

[23] B. Volesky, Z.R. Holan, Biosorption of heavy metals, Biotechnol. Prog. 11 (1995)235–250.

[24] B. Volesky, Detoxification of metal-bearing effluents: biosorption for the next century, Hydrometallurgy 59 (2001) 203–216.

[25] R.H.S.F. Viera, B. Volesky, Biosorption: a solution to pollution? Int. Microbiol. 3 (2000) 17–24.

[26] N. Ahalya, T.V. Ramachandra, R.D. Kanamadi, Biosorption of heavy metals review paper: research, J. Chem. Environ. 7 (2003) 71–79.

[27] K.K. Singh, M. Talat, S.H. Hasan, Removal of lead from aqueous solutions by agricultural waste maize bran, Bioresour. Technol. 97 (2006) 2124–2130.

[28] M.G. Lussier, J.C. Shull, D.J. Miller, Activated carbon from cherry stones, Carbon 32 (8) (1994) 1493–1498.

[29] Calgon Carbon Corporation, Determination of the Methylene Blue Number of Activated Carbon (TM 11), Calgon Carbon Corporation, USA, 1971.

[30] European Council of Chemical Manufacturers' Federation (CEFIC), TestMethods for Activated Carbon, European Council of Chemical Manufacturers' Federation

(CEFIC), Belgium, 1986.

[31] B.H. Hameed, A.L. Ahmad, K.N.A. Latiff, Adsorption of basic dye (methylene blue) onto activated carbon prepared from rattan sawdust, Dyes Pigments 75(2007) 143–149.

[32] B.H. Hameed, A.T.M. Din, A.L. Ahmad, Adsorption of methylene blue onto bamboo-based activated carbon: kinetics and equilibrium studies, J. Hazard. Mater. 141 (2007) 819–825.

[33] I.A.W. Tan, A.L. Ahmad, B.H. Hameed, Adsorption of basic dye using activated carbon prepared from oil palm shell: batch and fixed bed studies, Desalination 225 (2008) 13–28.

Proceeding of the First International Conference on Oceanography for West Asia 30-31 October 2017 IRAN - Tehran



Nested Environmental Status Assessment Tool (Neat) To Assess Environmental Status In Bathing Waters Of The Southern Caspian Sea

Haniyeh Nemati¹*, Mohammad Reza Shokri¹, Gholam Hossein Ebrahimi Pour¹, Zohreh Ramezanpour², Ángel Borja³

1-Faculty of Life Sciences and Technology, Shahid Beheshti University, G.C., Evin, Tehran, Islamic Republic of Iran

2- International Sturgeon Research Institute, Agricultural, Research, Education & Extension Organization (AREEO), Rasht, Islamic Republic of Iran

3- AZTI. Marine Research Division, Herrera Kaia Portualdea s/n, 20110 Pasaia, Spain Email: haniyeh.nemati@gmail.com

Abstract

In last decades the Caspian Sea has been impacted by anthropogenic activities. One of the anthropogenic impacts is recreation at bathing areas. The high numbers of swimmers have induced extra pressure in the south of the Caspian Sea. Investigating impacts of human activities and its results on environmental status in bathing areas, by using adequate methods is necessary to implement management measures. In this study, we applied Nested Environmental status Assessment Tool (NEAT) to assess environmental status in bathing waters. We combined multiple indicators from different ecosystem components. NEAT determined that the Caspian Sea is not in good status, in summer, the number of beach users with a significant correlation affected on impacted bathing areas. Accordingly, management measures should be taken into account in the bathing areas of southern Caspian Sea to improve the environmental status of coastal waters.

Keywords: Water quality, NEAT, Caspian Sea, Iran

1. Introduction

The use of seas for recreation, including sunbathing, water sports and bathing is becoming more and more popular. Ecosystem services such as clean bathing waters are required to reach to the qualified recreation activities [1]. The quality of bathing waters should be monitored to determining the opening or closing of the bathing waters; because it is vital for the maintenance of human health in this areas. Recently, methods that able to include multiple ecosystem components in an integration evaluation are available [2]. The Nested Environmental status Assessment Tool (NEAT) is one of those useful methods. NEAT; freely available at: (www.devotes-project.eu/neat), developed to assess aggregation of multiple indicators at multiple temporal and spatial scales [3,4]. NEAT was previously applied to all European Regional Seas [5] to assess the environmental status. The assessment has been undertaken within



the European Marine Strategy Framework Directive (MSFD; 2008/56/EC, European Commission, 2008). The Caspian Sea as a landlocked water body that has suffered decades of anthropogenic activities is a good candidate for applying NEAT in a new biogeographic region. In the coastal areas of the Caspian Sea qualified monitoring of bathing waters based on increasing bathing activities is absent. The objective of this study was applying NEAT to assess the status of a sub-region of the Caspian Sea, comparing impacted and non-impacted beaches by bathing activities.

2. Methodology

The study area is located on the southwest coast of Caspian Sea, in Gilan Province (Iran). Sampling was carried out at 10 sites: five sites were at recreational bathing areas (Impacted Sites 1-5), and five sites were not affected by bathing (Non-Impacted Sites 1-5) (Figure 1). The sampling was undertaken in February 2015 (non-bathing period), and once a month from July to September 2015 (bathing period). The variables analysed include: temperature, salinity, pH, oxygen saturation, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), phosphate, nitrate, nitrite, Total Suspended Solids (TSS), turbidity, Total Coliforms, Faecal Coliforms, *Escherichia coli, Staphylococcus aureus*, phytoplankton, zooplankton, grain size, organic matter and macroinvertebrate composition. For field and laboratory methods see Nemati et al. (2017)[6].



Figure 1. Study area within the Caspian Sea.

NEAT software considers all available ecosystem components in the assessment. For Spatial Assessment Units (SAU), sub-SAUs, habitats, indicators, reference conditions and targets used in this study see Nemati et al. (2017)[6]. In this investigation the status in winter and summer seasons have assessed by combining multiple indicators from different ecosystem components (8 physicochemical, 4 bacteria, 2 plankton, and 1 benthos indicators).



NEAT translate the worst and best indicator values to a scale ranging from 0 (worst possible status) to 1 (best possible status). The target values for each indicator are standardized to a value of 0.6 (the boundary between good (\geq 0.6) and not good (< 0.6) status) such as the Water Framework Directive (WFD, 2000/60/EC). NEAT also allows users to set boundaries representing high-good status (value of 0.8), moderate-poor status (value of 0.4), and poor-bad status (value of 0.2) [4].

3.Conclusion

Based on NEAT results the Caspian Seas is not in good status. Impacted sites are, in general, in poor or moderate status, both in winter and summer (except Impacted Site3 in summer, which is in good status). In turn, non-impacted sites are in poor status in winter (except Site 5, which is in good status) and in good to high status in summer. Also, there are differences between impacted and non-impacted bathing areas, with a significant correlation with the number of beach users. Hence, depending on the high number of recreational water areas on the Iranian coast of the Caspian Sea, management measures should be taken in the southern Caspian Sea to improve environmental status of the bathing area in this region.

References

[1] Ghermandi, A., Nunes, P.A.L.D., Portela, R., Rao, N., Teelucksingh, S.S., 2012. Recreational cultural and aesthetic services from estuarine and coastal ecosystems. In: In: van den Belt, M., Costanza, R., Wolanski, E., McLusky, D. (Eds.), Ecological Economics of Estuaries and Coasts. Treatise on Estuarine and Coastal Science Volume 12. Academic Press, Waltham, MA, pp. 217–237 (Chapter 11).

[2] Borja, A., Ranasinghe, A., Weisberg, S.B., 2009. Assessing ecological integrity in marine waters, using multiple indices and ecosystem components: challenges for the future. Mar. Pollut. Bull. 59, 1–4.

[3] Andersen, J.H., Dahl, K., Göke, C., Hartvig, M., Murray, C., Rindorf, A., Skov, H., Vinther, M., Korpinen, S., 2014. Integrated assessment of marine biodiversity status using a prototype indicator-based assessment tool. Front. Mar. Sci. 1. http://dx.doi.org/10. 3389/fmars.2014.00055.

[4] Borja, A., Elliott, M., Andersen, J.H., Berg, T., Carstensen, J., Halpern, B.S., Heiskanen, A. S., Korpinen, S., Lowndes, J.S.S., Martin, G., Rodriguez-Ezpeleta, N., 2016. Overview of integrative assessment of marine systems: the Ecosystem Approach in practice. Front. Mar. Sci. 3. http://dx.doi.org/10.3389/fmars.2016.00020.

[5] Uusitalo, L., Blanchet, H., Andersen, J., Beauchard, O., Berg, T., Bianchelli, S., Cantafaro, A., Carstensen, J., Carugati, L., Cochrane, S., Danovaro, R., Heiskanen, A.-S., Karvinen, V., Moncheva, S., Murray, C., Neto, J., Nygård, H., Pantazi, M., Papadopoulou, N., Simboura, N.,



Srébaliené, G., Uyarra, M.C., Borja, A., 2016. Indicator-based assessment of marine biological diversity ?lessons from 10 case stu- dies across the European Seas. Front. Mar. Sci. 3. http://dx.doi.org/10.3389/fmars. 2016.00159.

[6] Nemati, H., M..R. Shokri, Z. Ramezanpour, G.H.E. Pour, I. Muxika, Á. Borja, 2017. Using multiple indicators to assess the environmental status in impacted and non-impacted bathing waters in the Iranian Caspian Sea. Ecological Indicators, 82: 175-182.
Proceeding of the First International Conference on Oceanography for West Asia

30-31 October 2017 IRAN - Tehran



EVALUATION OF PHYSICO-CHEMICAL PARAMETERS, CHLOROPHYLL A AND NUTRIENTS IN THE MANGROVE ECOSYSTEM OF NAYBAND, NORTHERN COAST OF PERSIAN GULF

Ghaemi, Maryam^{*1}, Gholamipoor, Sara²

 Marine Living Science Group, Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran, mghaemi@inio.ac.ir
 Marine Living Science Group, Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran, saragholamipoor@inio.ac.ir

Keywords: Persian Gulf, Mangrove, Nayband, nutrient, chlorophyll a.

1- Introduction

Productive wetlands, which support biodiversity and ecosystems, are essential parts of the environment. The wetlands also regulate water quality, quantity, nutrient cycling and act as a buffer between terrestrial and aquatic systems [1]. Mangrove ecosystems are productive wetlands found in tropical and subtropical regions which provide suitable shelter for both marine and terrestrial organisms [2]. Human interferences with the landscape have widespread influences on wetlands [3] and global warming [4]. Consequently, water temperature [5] and instream biogeochemical processes are altered [6]. The healthy aquatic ecosystem depends on the physico-chemical and biological characteristics [7]. Therefore, several studies have been conducted to evaluate the health status of mangroves ecosystems by measuring physicochemical parameters [8-12].

The Nayband, the largest mangrove forest located in the Bushehr province, is largely affected by oil and gas activities and their pollution, land reclamation, agricultural and aquaculture activity, over using natural resources, and changing landuse. Road construction has been led to hydrological changes and subsequent decline of mangrove forests of east Nayband Bay. Therefore, in order to assess the environmental health of these ecosystems, and identifying the negative factors affecting the health of these forests, as well as providing solutions for reducing pollution in these environments or improving the condition of these ecosystems, we investigated the Nayband mangrove ecosystem. To achieve these goals, physicochemical parameters such as



salinity, electrical conductivity, dissolved oxygen, pH, chlorophyll *a* and nutrients (nitrate, nitrite, ammonium, phosphate, and silicate) were investigated.

2-Material and Methods

2-1 Study Area

The Mangrove forests of Nayband, are the widest mangrove communities in above 27 degrees latitude in the northern coast of the Persian Gulf, and the last dense and extensive complex of these ecosystems in the north-west Indian Ocean and has an area of about 390 hectares. Water samples were collected from six stations distributed throughout the mangrove forest and three stations in the coastal water of the Persian Gulf as a reference (Figure 1). Sampling was carried out during summer (September 2016) and winter (February 2017) seasons. From each station three replicate samples were taken.



Figure 1. Sampling stations

2-2 Analytical Method

Concentration of nutrients and chlorophyll *a* were measured by colorimetric (MOOPAM) and spectrophotometric method, respectively. Dissolved oxygen and pH was measured using Hack multi meter (HQ40d). Conductivity and salinity were measured using a WTW 3210 portable meter.

2-3 Statistical Analysis

For Statistical analysis, the SPSS software version 22 was used. To obtain the distribution of data the Klomogrov-Smirnov test was used. The statistical differences were determined by Mann-Whitney U test. Spearman test was used to determine the correlation between the parameters.

3-Result and Discussions

In mangrove ecosystem, nutrients are considered as the most important parameters that influence growth, reproduction and metabolic activities of biotic components. The distribution of nutrients is mainly based on season, tidal conditions and fresh water influx from land [13]. Average



concentration of nitrate, nitrite, and ammonium at mangrove stations were significantly more in winter season (p < 0.05). This might be due to heavy rainfall in winter. Similar finding has been reported by other researcher [10, 12]. Anbazhagan [14] suggested that the addition of nitrogenous nutrients mainly through freshwater and terrestrial runoff in the lagoon definitely increased the level of nitrogenous nutrients. Also, average concentration of nitrite, ammonium, phosphate and silicate at mangrove stations were significantly more than marine stations. Lower concentration of nutrients was recorded at marine stations might be due to utilization of these nutrients by benthic algae and phytoplankton [10]. Furthermore, with regard to high industrial activities related to oil and natural gas industries, it seems that these industries could be another reason for this increase of nutrients at mangrove stations. Nayband mangrove also receives high quantity of human source sewages from industrial establishments of the biggest world natural gas field (South Pars in Iran). Table 1 shows the measured physicochemical parameters of surface water in the sea and near the mangrove trees. In summer, the average pH varied from 7.12 to 7.24 at mangrove and marine stations, respectively and between 8.52 and 8.43 at mangrove and marine stations in winter. Generally fluctuations in pH values during different seasons of the year is attributed to factors like removal of CO₂ in photosynthesis, through bicarbonate degradation, dilution of seawater by freshwater influx, reduction of salinity, temperature and decomposition of organic matter [13, 15].

Season	Region	Physicochemical Parameter	Mean ±Standard Error
		Dissolved Oxygen (mg/l)	0.85±10.30
		pH	0.07±7.12
	Mangrove	Temperature (°C)	0.46±36.95
		Salinity (psu)	0.33±39.95
me		Electrical Conductivity (ms/cm)	0.44±58.82
Sum		Dissolved Oxygen (mg/l)	0.01±7.68
		pH	0.01±7.24
	Marine	Temperature (°C)	0.07±34.73
		Salinity (psu)	0.03±37.10
		Electrical Conductivity (ms/cm)	0.03±55.23
		Dissolved Oxygen (mg/l)	0.41±11.63
		pH	0.05±8.52
	Mangrove	Temperature (°C)	0.34±25.93
		Salinity (psu)	1.74±27.20
ter		Electrical Conductivity (ms/cm)	2.49±42.13
Win		Dissolved Oxygen (mg/l)	0.02±9.31
F		pH	0.01 ± 8.43
	Marine	Temperature (°C)	0.07±22.73
		Salinity (psu)	0.12±36.07
		Electrical Conductivity (ms/cm)	0.15 ± 54.70

Table 1. Physicochemical parameter of surface water



3-Conclusion

The present study was carried out to determine the physicochemical characteristics of water in Nayband mangrove ecosystem. The study revealed that the physicochemical parameters like water temperature, pH, electrical conductivity, salinity, dissolved oxygen, nitrite, nitrate, ammonium, phosphate, and silicate exhibited considerable seasonal and spatial variations.

4-References

[1] Islam, M. S. N., and Gnauck, A., "Threats to the Sundarbans mangrove wetland ecosystems from transboundary water allocation in the Ganges basin: A preliminary problem analysis", *International Journal of Ecological Economics & Statistics*, 13, March 2009, pp. 64-78.

[2] Gopal, B., Chauhan, M., "Biodiversity and its conservation in the Sundarban Mangrove Ecosystem", *Aquatic Sciences-research across boundaries*, 68, 3, October 2006, pp. 338-354.

[3] Chang, H., "Comparative streamflow characteristics in urbanizing basins in the Portland Metropolitan Area", *Hydrological Processes*, 21, 2, January 2007, pp. 211-222.

[4] Oke, T. R., Boundary Layer Climates, Methuen, New York, 1987.

[5] Nelson, K. C., and Palmer, M. A., "Stream temperature surges under urbanization and climate change: data, models, and responses", *JAWRA Journal of the American Water Resources Association*, 43, 2, 2007, pp. 440-452.

[6] Baker, A., Land use and water quality, Encyclopedia of Hydrological Sciences, 2005.

[7] Venkatesharaju, K., et al. "Physico-chemical and bacteriological investigation on the river Cauvery of Kollegal stretch in Karnataka", *Kathmandu University Journal of Science, Engineering and Technology*, 6, 1 2010, pp. 50-59.

[8] Srilatha, G., Thilagavathi, B., and Varadharajan, D., "Studies on the physico-chemical status of muthupettai mangrove, south east coast of India", *Advances in Applied Science Research*, 3, 1, 2012, pp.201-207.

[9] Rahman, M. M., Rahman, M. T., Rahaman, M. S., Rahman, F., Ahmad, J. U., Shakera, B., Halim, M. A., "Water quality of the world's largest mangrove forest", *Canadian Chemical Transactions*, 1, 2, 2013, pp. 141-156.

[10] Srilatha, G., Varadharajan, D., Chamundeeswari, K., and Mayavu, P., "Study on physicochemical parameters in different mangrove regions, southeast coast of india", *Journal of Environmental Analytical Toxicology*, 3, 2013, pp. 182.

[11] Rahaman, S. M., Sarder, L., Rahaman, M. S., Ghosh, A. K., Biswas, S. K., Siraj, S. S., Huq, K. A., Hasanuzzaman, A. F., Islam, S. S., "Nutrient dynamics in the Sundarbans mangrove estuarine system of Bangladesh under different weather and tidal cycles", *Ecological Processes*.
2, 1, Dec 2013, pp. 29.



[12] Arumugam, A., and Kumar, S. P., "Evaluation of physico-chemical parameters and nutrients in the Mangrove ecosystem of Manakudy Estuary, Southwest coast of India", *International Journal of Latest Research in Science and Technology*, 3, 6, 2014, pp. 205-209.

[13] Saravanakumar, A., Rajkumar, M., SeshSerebiahs, J., and Trivakaran, G.A., "Seasonal variations in physico-chemical characteristics of water, sediment and soil texture in avid zone mangroves of Kachchh-Gujarat", *Journal of Environmental Biology*, 29, 5, 2008, pp. 725-732.

[14] Anbazhagan, P., Hydrobiology and benthic ecology of Kodiyakarai coastal sanctuary (South east coast of India). Annamalai University, India, 1988.

[15] Rajasegar, M., "Physico-chemical characteristics of the Vellar estuary in relation to shrimp farming" *Journal of Environmental Biology*, 24, 2003, pp. 95-101.



Heavy Metals In Blood Of Green Sea Turtles (Chelonia Mydas) From Nesting Colonies Of The Northern Coast Of The Sea Of Oman

Mahmood Sinaei¹, Mehdi Bolouki², Mohammad Talebi matin²

1- Department of fisheries, Chabahar branch, Islamic Azad University, Chabahar, Iran,
 2- Department of Environmental, P.O. Box 14155-7383, Tehran, Iran,
 oceanography.sina@gmail.com

Abstract

The green sea turtle (*Chelonia mydas*) has been a species of global concern for decades. In this study, heavy metals (Hg; Cd; Pb; Cu and Zn) were measured in blood of green sea turtles nesting on the northern coast of Sea of Oman. Heavy metals concentrations in blood ranged between 0.16-36.78, $\mu g/g$ (ww). Pb concentrations in blood samples significantly increased in later clutches (p<0.05), while Cu concentrations in blood samples exhibit a declining trend (p<0.05). Results of this study suggest that heavy metals could be one of the factors influencing reductions in fertilization and hatching success. Results also indicate that green sea turtle on the northern coast of Sea of Oman have high capacity in rapid response and detoxification of heavy metals and/or from the low exposure levels of these turtles to the heavy metals. *Key words: Chelonia mydas, heavy metals, Sea of Oman,Iran*

1- Introduction:

Populations of green sea turtles (*Chelonia mydas*) are distributed through the world's tropical and subtropical marine habitat, facing serious anthropogenic threats including poaching, fisheries impacts, pollution and habitat loss [1,2].Female sea turtles drink considerable amounts of water to decrease their body temperature during the nesting season and egg production [3]. This phenomenon cause to increases concentrations of heavy metals in their blood. Studying blood provides more comprehensive information about toxicokinetics of metals in turtles' bodies. The development of non-lethal methods such as collecting blood samples from live sea turtles has been considered as an appropriate tool to evaluate health status and level of pollution [4].Heavy metals discharged into the marine ecosystem of the Sea of Oman have the potential to negatively impact the hatching success of this population. Overall, there is a clear need to improve knowledge of green turtles in Iranian territorial waters of the Sea of Oman. In line with these trends of research, this study was conducted to assess the variations and relationships among trace metal concentrations in blood and to evaluate the effect of heavy metals on hatching success of the green sea turtle.



2. Materials and Methods

For this study, five areas along the northern coast of the Sea of Oman were chosen, which are frequented by turtles (Fig. 1). Blood was collected from the interdigital vein of the hind flipper via a dorsal approach with the use of an 18-gauge, 3.7-cm needle and a 15-ml syringe.Blood tubes were kept on wet ice in a cooler during the remaining time researchers were on the beach collecting samples (range 20 min to 2 hr). A total of 12 blood samples were used in this study. For the extraction and purification of heavy metals the method proposed by Moody and Lindstrom [5] was adopted; however, this was done by implementing some slight modifications based on the context of the present research. Total mercury levels were determined using cold vapor analysis technique.Hatching success were determined following the methodology described by Miller [6].Statistical analyses of the data were conducted by using Statistical Package for Social Sciences (SPSS) software, version 20. All data are reported as mean \pm standard deviation. The data possessed the homogeneity of variance and were normally distributed. One-way analysis of variance (ANOVA) was run followed by a Tukey's test to compare the means (p < 0.05).



Fig.1. Location of all sampling sites.

3. Results

Concentrations of heavy metals (Hg,Cd, Pb, Cu and Zn) determined in blood samples of green sea turtles from the northern coast of the Sea of Oman are presented in Table *y*.

Table.1. Mean and standard deviation	values (µg/g of w.w) of Heav	y metals (Cd, Cu,Zn, Pb and Hg)	in blood of C.mydas.
			-

%CV	Pb	%CV	Zn	%CV	Cu	%CV	Cd	%CV	Hg	Samples
10,9	•,*• •,**	٨,٧	±٣,٢. ٣9,٧٨	11,44	•,17 7,•1±	۵,۴	•,•* •,***±	70	۰,۰۴ ۰,۱۶±	Blood

coefficient value : CV

Results showed that there are higher quantities of essential heavy metals (Cu, Zn) in blood of turtles compared to non-essential heavy metals (Cd, Hg, Pb). Hatching success (%) determined in the green sea turtle (*C*.*Mydas*) clutches laid are showed in Table 2. When comparing hatchling success among beaches, there were no significant differences between them (P > 0.05).

Nest No	Hatchling Success%	Nest No	Hatchling Success%	Nest No	Hatchling Success%
T1	38.3	R3	38.5	L4	35.8
T2	37.3	L1	41.1	L5	37.1
R1	40.2	L2	39	K1	33.3
R2	32.4	L3	37.1	K2	32.9

Table.2. Summary of hatching success (%) for green turtle (C.Mydas) clutches laid.

T: Tang; R: Ramin; L:Lipar; K: Kacho

4. Discussion

The results showed no significant differences between Concentrations of Cd, Zn and Hg in the different clutches. The results achieved in the present study could be explained by the low concentrations of these metals in the environment or from the short duration of time that these turtles were present in the region during the nesting season [7]. Results indicated that an increased in the number of clutches laid in a nesting season will reduce the Cu concentration in the blood. This can be due to lower entry of contaminants through food because turtles feed little or not at all during the nesting season. Moreover, it could be caused by shortage of stored Cu in the liver and kidney tissues of the turtle [8]. Contrary to Cu concentration, the results represented that concentration of Pb increases with an increase in the number of clutches laid in a nesting season. A possible justification for our findings might be due to the replacement of calcium (Ca) during egg formation [9]. Calcium is an important element in formation of the bones and shells of baby turtles. Female turtles absorb Ca ions and store them in yolks and shells of the eggs [9]. In vertebrates, Ca needs are satisfied by absorbing it from food, but female turtles obtain it from Ca reserves such as bones because they do not feed during the nesting season. Since Pb and Ca have similar kinetics, Pb can be transferred to blood together with Ca [10]. As a result of replacement of the Ca required for more than 300 eggs during the nesting season, considerable quantities of Pb enter the blood.



5. Conclusion

The present study provides useful initial information concerning concentrations of heavy metals (Cd, Cu,Zn, Pb and Hg) in green sea turtles of the northern coasts of the Sea of Oman. The studied heavy metals had low concentrations, yet they could be detected in blood. The low concentrations of heavy metals in green sea turtles may be due to their diet, because they consume large quantities of algae and plants from the low levels of the food chain. Results of this study indicate that heavy metals could be one of the factors influencing reductions in fertilization of turtle eggs and in their hatching success. However, more research concerning the effects of heavy metals on fetal development in turtles and on their hatch rates is required and greater attention than any time before, must be paid to environmental evaluation of industrial and development projects, especially on sea turtle nesting beaches.

Acknowledgments

Financial support for this study was obtained from the Iranian Department of the Environment. Special thanks to First Initial Hosseini, First initial Arbabi, and First initial soltanpour, who were important in the data collection process.

References:

[1]- IUCN, (2003), IUCN red list of threatened species. Gland, Switzerland:http://www.redlist.org.

[2]- Ehsanpour, M., Afkhami, M., Khoshnood, R., Reich, K.J. (2014), Determination and Maternal Transfer of Heavy Metals (Cd, Cu Zn, Pb and Hg) in the Hawksbill Sea Turtle (*Eretmochelys imbricata*) from a Nesting Colony of Qeshm Island, Iran. Bull Environ Contam Toxicol. DOI 10.1007/s00128-014-1244-3.

[3]- Kenyon, L.O., Landry, A.M., Gill, G.A. (2001), Trace metal concentrations in blood of the kemp's ridley sea turtle (*Lepidochelys kempii*).Chelonian Conserv Biol 4:128–135

[4]- Van de Merwe, J.P., Hodge, M., Olszowy, H.A., Whittier, J.M., Lee, S.Y. (2010), Using blood samples to estimate persistent organic pollutants and metals in green sea turtles (*Chelonia mydas*). Mar Pollut Bull 60:579–588

[5]- Moody, J.R., Lindstrom, R.N. (1977), Selection and cleaning of plastic containers for storage of trace element samples. Anal Chem 49:2264–2267.

[6]- Miller, J.D. (1999), Determining clutch size and hatching success. In: Research and management techniques for the conservation of sea turtles., Eckert KL, Bjorndal KA, and Abreu-Grobois FA (Eds.), IUCN/SSC Marine Turtle Specialist Group Publication No 4, pp. 124-129.



[7]- Guirlet, E., Das, K., Girondot, M. (2008), Maternal transfer of trace elements in leatherback turtles (*Dermochelys coriacea*) of French Guiana. Aquatic Toxicology 88: 267–276 [8]- Andreani, G., Santoro, M., Cottignoli, S., Fabbri, M., Carpene, E., Isani, G. (2008), Metal distribution and metallothionein in loggerhead (*Caretta caretta*) and grenn (*Chelonia mydas*) sea turtles. Sci Total Environ 390: 287–294.

[9]- Bilinski, J.J., Reina, R.D., Spotila, J.R., Paladino, F.V. (2001), The effects of nest environment on calcium mobilization by leatherback turtle embryos (*Dermochelys coriacea*) during development. Comp. Biochem. Physiol. A Mol Integr Physiol 130: 151–162.

[10]- Fossette, S., Ferraroli, S., Tanaka, H., Ropert-Coudert, Y., Arai, N., Sato, K., Naito, Y., Le Maho, Y., Georges, J.Y. (2007), Dispersal and dive patterns in gravid leatherback turtles during the nesting season in French Guiana. Mar Ecol Prog Ser 338: 233–247.

Assessment of Pb, Cd, Cu and Fe Accumulation in Sediments of Chabahar Bay

Majid Yousefi¹, Homira Agah²*, Lobat Taghavi¹

 1- Islamic Azad University, Science and Research Branch, Environmental Pollution department.
 2- Iranian National Institute for Oceanography and Atmospheric Sciences (INIOAS), No. 3, Etemadzadeh St., Fatemi Ave., 1411813389 Tehran, Iran aaagah_hom@yahoo.com

Keywords: Heavy metals, Sediment, Chabahar Bay, Oman Sea, ICP-MS.

1-Introduction

Heavy metal pollution in the marine environment is determined by measuring its concentrations in water, sediments and living organisms [1]. Sediment analyses plays a crucial role in assessing the degree of heavy metal pollution and resulting health risk associated with the food chain. Toxic heavy metals are regarded as being serious pollutants of aquatic ecosystems because of their environmental persistence, toxicity and ability to negatively effect on various organisms [2]. Their concentrations in the global environment are significantly increasing and reaching levels of potential (lethal and sub lethal) toxicity for many living organisms [3].

Oman Sea is input path of fresh water flows to the Persian Gulf via Arabian Sea and Indian Ocean; also it is an important (*and vital*) shipping route for the oil-producing countries in the ROPME Sea area. Chabahar Bay, which is situated on the Makran Coastline in Sistan and Baluchestan Province, Southeast of Iran, is a free port and industrial zone on the coast of the Gulf of Oman.

Chabahar Bay at southeastern Iran was suspected to heavy metals contamination due to natural processes and human activity. The main goals of this study were to investigate Pb, Cd, Cu and Fe distribution in sediments and detect pollution source(s).

30 sediments (Table 1) were collected from 10 stations (Tiss, Konarak, Desalination plant, Entrance of Chabahar Bay, posm and Ramin) by Van Veen grab (Figure 1). Sediment samples were lyophilized, sieved and the fraction smaller than 63µm were transferred in pre-cleaned dark glass labeled bottles and kept frozen (at -20 °C) prior to chemical analyses [4]. The elements analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS and OES scans) after digestion method (SGS ISM 90 A). The analytical results of the quality control



samples showed good agreement with the certified values (recoveries ranged from 93 to105 %). The limits of detection were set as three times of the standard deviation on the procedural blanks. Sediment samples were exposed to wet sieving and Lazer Particle Sizing (HORIBA-LA950, France and Japan) determination and combusted in an oven at 530±20°C for 8 hours to determine Total Organic Matter (TOM) [5]. Organic matter varied from 1.5 (deeper parts of Tiss and desalination plant, with more than 70% sand fraction) to 3.7% (deeper parts of Konarak) (Table 1, Figure 2). Statistical analyses of the data including were carried out by using SPSS V19 and Excel.



Figure 1: The location of the sampling site.



Figure 2: Distribution of sediments Total Organic Matter

2- Results and discussion

In this study average concentrations of Fe, Cu, Pb and Cd in triplicate samples per station were as 1.96±0.6%, 12.7±3.5, 10.6±4.2 and 1.37±0.68 ppm, respectively (Tables 1).

According to the Figures 3, metal contents were observed in the order of: Fe>Cu>Pb>Cd.



Table 1: Geographical situation, Element concentrations, grain size distributions, organic matter content of the sediments and corresponding
water depths.

Stations	Fe %	Cu ug. g ⁻¹	Pb ug. g ⁻¹	Cd ug. g ⁻¹	Depth (m)	Geographical locations	Sand	Silt %	Clay %	TOM %
Posm 1	2.4±0.05	16.8±0.6	12.7±0.7	2.2±0.1	4.8	25°19'58'' N 60°15'44'' E	64.5	11.8	23.7	2.2±0.4
Posm 2	2.3±0.1	16.4±0.9	7.1±0.6	1.4±0.06	10.6	25°22'54'' N 60°15'21'' E	44.7	36.8	18.5	1.7±0.1
Konarak 1	2.0±0.1	11.2±0.7	13.8±0.6	1.4±0.04	4.6	25°19'58'' N 60°15'44'' E	15.1	21.2	63.7	2±0.1
Konarak 2	3.2±0.2	18.5±0.6	9.8±0.8	2.8±0.1	10	25°22'23'' N 60°28'30'' E	11.8	2.4	85.8	3.7±0.8
Desalination plant	1.7±0.04	9.8±0.6	4.7±0.2	1.3±0.07	4.7	25°26'3'' N 60°30'14'' E	70.3	21.4	8.3	1.5±0.3
Tiss 1	1.6±0.06	12.9±0.6	9.8±0.3	0.9±0.06	3.1	25°21'46'' N 60°35'40'' E	87	3.25	9.75	2±0.1
Tiss 2	1.2±0.07	8.6±0.5	9.9±0.6	0.6±0.01	8.2	25°22'50'' N 60°33'59'' E	72	4.3	23.7	1.5±0.3
Entrance of the Chabahar Bay	2.0±0.09	11.7±0.4	10.2±0.7	1.3±0.01	14.3	25°17'44'' N 60°32'12'' E	34.6	43.6	21.8	2.5±0.2
Ramin 1	1.5±0.08	8.3±0.4	20.0±0.6	0.7±0.04	4.5	25°15'33'' N 60°46'14'' E	78.3	9.6	12.1	2.5±0.2
Ramin 2	1.9±0.07	12.4±0.5	7.6±0.4	1.1±0.05	13.3	25°15'42'' N 60°46'18'' E				1.6±0.2
Average	1.6±0.3	10.8±2.2	11.5±4.9	0.9±0.3						









3- Conclusion

Deeper parts of Konarak with highest organic matter and highest clay fraction (86%) had significantly higher cadmium level than that in the other stations. High elements level in sediments of Konarak could be due to local harbor, dock, boat repair stations and also desalination plant activities. Due to the high percentage of clay in Konarak, transferring Pollution of desalination plants by water flow can be considered a threat in the future. Coastal parts of Ramin had significantly higher lead pollution than that in other stations.

The results of this study revealed that cadmium, lead, copper and Iron levels in the sampling area were lower than sediment guidelines [6,7] (Table 2), thus no pollution risk for these elements exist.

Elements	Cu	Pb	Cd	shows the interim marine sediment quality guidelines:
Average	10.8	11.5	0.9	PEL: probable effect level
ERL	34	46.7	7.7	SQG: Sediment Quality Guidelines
ERM	270	218	9.6	ERL: Effects Range Low, ERM: Effects Range Medium
TEL	18.7	30.2	0.68	TEL: Threshold Effect Level
PEL	108	112		
ISQG-L0w	60	50	1.5	
ISQG-High	270	220	10	

Table 2: Comparing the element levels (μg . g^{-1}) with those of international guidelines (BSQGs)

References

[1] Abouhend A. S., El-Moselhy Kh. M., 2015. Spatial and Seasonal Variations of Heavy Metals in Water and Sediments at the Northern Red Sea Coast. American Journal of water resource <u>Vol.</u> <u>3, No. 3</u>, 2015, pp 73-85. doi: 10.12691.

[2]Arcadi, F. A.; De Luca, R.; Trimarchi, G. R.; Costa, G.; Rapisarda, A.; Williamson, R. B.; Van Dam, L. F.; Bell, R. G.; Green, M. O.; Kim, J. P. 1996. Heavy metal and suspended sediments fluxes from a contaminated intertidal inlet (Manukau Harbour, New Zealand). Mar. Poll. Bull., 32(11): 812-822.

[3]<u>Wagemann et al., 2000</u>. R. Wagemann, E. Trebacz, G. Boila, W.L. Lockhart. Mercury species in the liver of ringed seals Sci. Total Environ., 261 (2000), pp. 21–32.

[4]Wolf-Welling, T.C.W., Moerz, T., Hillenbrand, C.-D., Pudsey, C.J., and Cowan, E.A., 2001. Data report: bulk sediment parameters (CaCO₃, TOC, and >63 μm) of Sites 1095, 1096, and 1101, and coarse fraction analysis of Site 1095 (ODP Leg 178, western Antarctic Peninsula). *In* Barker, P.F., Camerlenghi, A., Acton, G.D., and Ramsay, A.T.S. (Eds.), *Proc. ODP, Sci. Results,* 178: College Station, TX (Ocean Drilling Program), 1–19. <u>doi:10.2973/odp.proc.sr.178.223.</u>

[5]Agah, H. Rahmanpour, Sh. Sheijooni Fumani N. 2014. Organic carbon and organic matter contents in sediments of the Strait of Hormoz, the Persian Gulf. Journal of the Persian Gulf. Vol. 4. No. 13.



[6]U.S. Environmental Protection Agency. 1994. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. EPA 600/R 94/024, Duluth, MN.

[7]U.S. Environmental Protection Agency. 2001. Method for Assessing the Chronic Toxicity of Marine and Estuarine Sediment- associated Contaminants with the Amphipod *Leptocheirus plumulosus*. EPA 600/R-01/020 March 2001. First Edition

Biological Oceanography

Theme



Marine-derived Actinobacteria of Iran ecosystems as a source for neuropathic disease drug discovery

Faezeh Almasi¹, Fatemeh Mohammadipanah¹, Hamid-Reza Adhami²*, Javad Hamedi¹

1-Microbial Biotechnology Laboratory, Department of Microbiology, School of Biology and Center of Excellence in Phylogeny of Living Organisms, College of Science, University of Tehran, 14155-6455, Tehran, Iran,

2-Department of Pharmacognosy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran,

hr-adhami@tums.ac.ir

Abstract

Unearthing new marine bioactive compounds from the oceans as the largest habitat of the earth have increased significantly over the last decades.

Marine microorganisms especially *Actinobacteria* have received mounting attention in biodiscoveries due to their exclusive physicochemical characteristics acquired as an adaptation to prevailing marine conditions capable of producing novel metabolites of pharmaceutical importance like Acetylcholinesterase inhibitors (AChEIs). AChEIs are critical strategy currently approved for effective management of Alzheimer's disease as the most common cause of dementia. Considering the intact nature of Iran, in the present study, AChE inhibitory activities of the isolated marine *Actinobacteria* were evaluated using qualitative and quantitative assays.

Out of 220 isolates obtained from different geographical locations of the Caspian Sea and the Persian Gulf, 34 *Actinobacteria* extracts were fermented and tested for the presence of AChE inhibitors. We found that 29.4% of extracts had inhibition percent more than 15% at the concentration of 100μ g/ml. Based on chemotaxonomic and molecular characterization; five strains showing the higher percent of inhibition were related to *Streptomyces* sp., *Nocardia* sp. and *Promicromonospora* sp. with the least cytotoxicity according to MTT assay. Our search for natural Anti-acetylcholinesterase metabolites from marine *Actinobacteria* yielded isolation of strains with potent Anti-AChE activity reported for the first time. The result of the present study highlights the potency of indigenous *Actinobacteria* in our ecosystems.

Keywords: Marine drug discovery, Marine Actinobacteria, Pharmaceutically active secondary metabolites, Anti-cholinesterase activity, Alzheimer's disease

1- Introduction

Since ancient times, natural compounds have been searched for a wide variety of Human challenges and medical problems. As estimated, at least 50% of the existing drugs that are used to treat human illnesses are derived from natural products. In the focus of searching for new drug leads, repeated re-isolation of already known metabolites emphasis shifting the search to less investigated organisms from unique habitats like marine ecosystems [1-3].



The marine biotope occupying almost 75% of the surface of our planet, harbors most ancient and diverse forms of organisms serving as an excellent source of natural bioactive compounds used in biomedical research and drug development, either directly as drugs or as lead structures for chemical drug synthesis.

The marine environment with extremely different conditions from terrestrial has become an attractive resource in search and discovery for novel natural products and marine *Actinobacteria*, turn out to be important contributors with varied metabolic pathways producing novel chemical scaffolds[4-6]. More than 1,000 new marine origin compounds are discovered annually added to about 30,000 known marine compounds [7]. The number of new marine natural products (MNPs) reported each year has steadily grown from 332 in 1984 to 1378 in 2014 [8].

Associations between micro- and macroorganisms are a prominent feature of marine ecosystems resulting in the biosynthesis of an array of secondary metabolites. Recently, it has been realized that many compounds previously isolated from marine macro-organisms, such as sponges, corals, invertebrate, and tunicates, are in fact, metabolic products of associated microorganisms [9].

As scientific interest has been sparked in marine microorganisms, Actinobacteria with their exciting secondary metabolites have begun to be untapped for their potent biological activities in the past few decades. These bacteria form stable, persistent populations in various marine ecosystems. Although a number of genera are reported from marine ecosystems, general including Aeromicrobium, Dietzia, Rhodococcus, Salinibacterium, Salinispora, Sciscionella and Serinicoccus are considered as indigenous marine genera[10]. Actinobactria are considered as prolific producers of wide variety of biologically active secondary metabolites encompassing a variety of distinct structural classes including antibiotics, enzyme inhibitors, anti-malarial, anti-oxidant, anti-inflammatory, anti-tumor, anti-algal, plant growth promoters, etc. Till 2013, there were seven FDA-approved and 10 marine or marine-derived drugs in clinical trial phase II and III [11]. It is assumed that marine Actinobacteria have evolved with higher genomic and metabolic diversity and therefore, might produce different types of bioactive compound.

Since population aging has become a worldwide phenomenon, the prevalence of the age-related neurodegenerative diseases is expected to increase dramatically and is projected to nearly double every 20 years. Among Neurodegenerative disease, Alzheimer's disease (AD) is the leading cause of dementia worldwide, affecting more than half of the overall number of demented individuals [12,13]. The number of people worldwide living with this progressive and irreversible neurodegenerative disease is projected to increase to more than 130 million meaning one new



(AChEIs) and memantine are the only critical strategy currently approved for its control and all available drug of Alzheimer's Disease (AD) show limited ability to modify the disease [15]. Given the past 30 years success of marine metabolites in drug discovery area and enormous possibilities of discovering novel chemical structures, exploring new lead anti-cholinesterase compounds may result in discovering novel compounds with potency in treating AD.

Two marine habitats of Iran with completely different climates are unique ecological systems with rich natural resources and bio-diversity. These semi-enclosed ecosystems have not yet been affected by human factors, so are expected to be intact providing favorable conditions for the habitat of numerous marine micro and macro organisms. Considering potent compounds obtained from marine bacteria and the enormous diversity of marine microorganisms especially *Actinobacteria* as virtually unlimited sources of novel bioactive compounds and less explored habitats of Iran, in the present study, an effort was made to screen different marine habitats of Iran to find resources of new acetylcholinesterase inhibitors. AChE inhibitory potential of *Actinobacteria* from marine habitats of Iran has hitherto not been reported. In this context, this work evaluated the AChE inhibitory activities of fermentation broth extracts of the marine *Actinobacteria* isolated from the Caspian Sea and the Persian Gulf by quantitative and qualitative methods.

2- Procedure and Result of research

For this purpose, Forty-five samples (marine sediment and organisms including Sea Urchins, Sponges and Bivalvia) were aseptically collected from marine habitats of Iran (Caspian Sea and Persian Gulf) at the depths of 5-40 m during September 2013 till August 2014. All samples were dried at room temperature in dark condition. Different physical and chemical pretreatment methods such as dry heat, UV radiation and adding marine salt applied in order to facilitate the isolation of actinomycetes. The stock solution was prepared by diluting 3 g of dry-heated (100° C, 20min) samples in 27 ml of sterile 0.9 % saline water and 300µl of stock solution inoculated on isolation media. The plates were incubated at 28°C in a dark humidified chamber and checked for the growth of Actinobacterial colonies for 2-12 weeks. The purified strains were maintained in University of Tehran Microorganism Collection (UTMC) using freezing. More than 200 isolates were obtained during isolation. In addition to morphological and chemotaxonomic characterization (di-aminopimelic acid isoform determination according to the method of Staneck and Roberts[16]) of all isolates, preliminary screening for anti-bacterial activity against Methicillin-resistant Staphylococcus aureus (MRSA) UTMC 1401 using top agar method was performed. More than 60% of isolates had meso-DAP in their cell wall indicating the high nrevalence of rare Actinohactoria in marine habitate According to anti-hacterial results 11 37%



of isolates with inhibition zone more than 10mm considered as isolates with potent anti-bacterial activity.

After preliminary dereplication of 220 isolates, 34 isolates were selected for further work. Distribution of isolates obtained from the Caspian Sea and the Persian Gulf is shown (Fig. 1).



Fig. 1)Distribution of isolated Actinobacteria from Caspian Sea (A) and Persian Gulf (B)

Genus *Micromonospora, Streptomyces, Promicromonospora* and *Nocardia* with 26.6%, 14%13.3% and 11% were the most frequent isolates, respectively. *Nocardioides, Oeskovia, Pseudonocardia* and *Amycolatopsis* were among isolates.

Production and extraction of bioactive compounds from all selected isolates was performed. Ethyl acetate extracts of strains were screened for toxicity with larvae of *Artemia salina* (). The primary brine shrimp lethality assay show that out of 34 extracts, extract of UTMC 2423 with 52.14% and UTMC 2433 with 39.38% mortality had the most lethality at the concentration of 100 μ g/ml. The minority (17.6%) of texted extracts had mortality ranged from 7 to 10%. Three extracts had 5% mortality and 67.64% of extracts had no mortality after 24h. Compounds with LC50values higher than or equal to 1000 μ g/ml were reported as non-toxic for *Artemia salina*.

Anti-cholinesterase preliminarily screening was performed using the TLC bioautographic method [17]. 52.9% of the tested extracts were active showing white spots on a purple background the same or more intense than that of 0.5µg physostigmine as a control. Microplate Assay as confirmatory test performed for active extracts at the concentration of 100μ g/ml. The IC₅₀ value for Physostigmine hemisulfate was determined as $0.94 \pm 0.1\mu$ g/ml ($2.92\pm0.42 \mu$ M). The most five efficient extracts with inhibition percent of 20-40% at the concentration of 100μ g/ml were tested for cytotoxic activity against HUVEC cell lines using MTT assay. Viability percent at the concentration of 100μ g/ml for five efficient extracts was 60-100% confirming *Artemia salina* assay based on no toxicity of the extracts. These promising extracts were related to *Streptomyces* sp., *Nocardia* sp. and *Promicromonospora* sp. The inhibition percent and MTT assay results for these five selected isolates are indicated (Table 1). To the best of our knowledge there was no report on the AChE inhibitory potential of the genus *Promicromonospora*.

Table 1) Compariso	Table 1) Comparison of the Acetylcholinesterase inhibitory, in vitro cytotoxicity and Anti-bacterial activity of the selected extracts									
UTMC Accession	Actionobacterial Genera	AChE inhibition %	Viability in MTT assay	Anti-MRSA						
Number		(100µg/ml extract)	%	(+/++)*						
			(100µg/ml extract)							
UTMC 1334	Streptomyces sp.	38.4	73.2	+						
UTMC 1332	Streptomyces sp.	28.2	66.4	+						
UTMC 2433	Streptomyces sp.	18.1	90.7	+						
UTMC 2434	Nocardia sp.	23.7	100	++						
UTMC 1343	Promicromonospora sp.	19.8	69.1	+						

*Inhibition zone less than 5 mm: + and more than 5mm:++

Thin layer chromatography of five extracts with highest inhibition percent examined by TLC on silica plates by use of DCM-MeOH- EtOAC (90:4:1) solvent system. White spots showing enzyme inhibition appeared sharply for UTMC 1323 and UTMC 1334. No inhibition zone was observed by the extract of the culture medium. According to obtained results, TLC bands and anisaldehyde-sulfuric acid reagent strain UTMC 1334 was chosen for large scale fermentation.

Extraction of ninety liters of UTMC 1334 fermentation broth was performed by liquid-liquid extraction method using equal amount of ethyl acetate. The crude extract was applied to silica gel (230-400 mM mesh size) column (90 \times 5 cm) using the solvent gradient (DCM-MeOH) to yield 12 fractions at a flow rate of 0.5 ml/min. The most efficient fractions based on AChE inhibition was further fractionated using Sephadex resins (LH-20), silica gel and Diol column. acetylcholinesterase inhibition assay was performed for obtained fractions. Semi-purified obtained fractions had inhibition percent of 30-60%. The most active fraction will be further purified and structure elucidation will be determined using LC-Mass spectroscopy methods.

2-Conclusion

Beside Streptomyces, rare actinobacteria specially the genus Micromonospora are wildly distributed in marine habitats of Iran. Overall, focusing on the natural compounds, our search for natural Anti-acetylcholinesterase metabolites from marine Actinobacteria yielded the isolation of stains like *Promicromonospora* sp. with potent Anti-AChE activity reported for the first.

3- References

[1]. Newman, D., Cragg, G., (2012), Natural Products as Sources of New Drugs over the 30 Years from 1981 to 2010, Journal of Natural Products, Vol. 75, No. 3, 311-335. [2]. Dias, D., Urban, S., Roessner, U., (2012), A Historical Overview of Natural Products in Drug Discovery, Metabolites, Vol. 2, No. 2, 303-306 [3]. Montaser, R., Leusch, H., (2011), Marine natural products: a new wave of drugs?, Future Medicinal Chemistry, Vol. 3.No. 12, 1475-1489. [4]. Hassan, SS., Shaikh, AL., (2017), Marine actinobacteria as a drug treasure house, Biomedicine & Pharmacotheranv. Vol. 87. 46-57



[5]. Manivasagan, P., Venkatesan, J., Sivakumar, K., Kim, S., (2013), Marine actinobacterial metabolites: Current status and future perspectives, *Microbiological Research*, Vol. 168, 311-338.

[6]. Subramani, R., Aalbersberg, W., (2012), Marine actinomycetes: An ongoing source of novel bioactive metabolites, *Microbiological Research*, Vol. 167, 571-580.

[7]. Lindequist, U., (2016), Marine-Derived Pharmaceuticals – Challenges and Opportunities, *Biomolecules and Therapeutics*, Vol. 24, No. 6, 561–571.

[8]. Blunt J.W., Copp B.R., Keyzers R.A., Munro M.H.G., Prinsep M.R., (2014), Marine natural products, *Natural Product Reports*, Vol. 31, 160–258.

[9]. Konig, G., Kehraus, S., Seibert, S., Abdel-Lateff, A., Muller, D., (2006), Natural Products from Marine Organisms and Their Associated Microbes, *ChemBioChem*, Vol. 7, 229 – 238.

[10]. Goodfellow, M., Fiedler, H.P.,(2010), A guide to successful bioprospecting: informed by actinobacterial systematic, *Antonie Van Leeuwenhoek*, Vol.98, 119–142.

[11]. <u>Martins, A., Vieira, H., Gaspar, H., Santos, S.</u>,(2014), Marketed marine natural products in the pharmaceutical and cosmeceutical industries: tips for success, *Marine Drugs*, Vol. 2, No. 2, 1066–1101

[12]. Schliebs R., Arendt T., (2011), The cholinergic system in aging and neuronal degeneration, *Behavioural brain research*, Vol. 221, 555-563.

[13]. Prince, MJ., (2015), World Alzheimer Report 2015: the global impact of dementia: an analysis of prevalence, incidence, cost and trends. Alzheimer's Disease International.

[14]. Alzheimer's Association (2017), 2017 Alzheimer's disease facts and figures. Alzheimer's & Dementia Vol. 13, 325-373.

[15]. Bishara, D., Sauer J., Taylor D., (2015), The pharmacological management of Alzheimer's disease, *Progress in Neurology and Psychiatry*, Vol. 19, 9-16.

[16]. Staneck, JL., Roberts, GD., (1974), Simplified approach to identification of aerobic actinomycetes by thin-layer chromatography, *Applied microbiology*, Vol. 28, 226-231.

[17]. <u>Marston, A., Kissling, J.</u>, Hostettmann, K., (2002), A rapid TLC bioautographic method for the detection of acetylcholinesterase and butyrylcholinesterase inhibitors in plants, *phytochemical analysis*, Vol. 13, No. 1, 51-54.



Qualitative and Quantitative Study of Zooplankton in Surface Offshore Waters of the South Caspian Sea

Reza Rahnama*, Ali Hamzehpour, Hossein Bagheri, Kazem Darvish Bastami

Iranian National Institute for Oceanography and Atmospheric Science (INIOAS). No. 3, Etemadzadeh St., Fatemi Ave., Tehran, 1411813389, IR Iran.

* Corresponding author,

Email: reza.rah@inio.ac.ir,

Abstract:

In this study diversity and abundance of zooplankton in south Caspian Sea offshore waters were investigated. During the first season of oceanographic cruise in winter 2014 at southern part of Caspian Sea, 8 stations at offshore waters of south Caspian Sea were selected. Totally, 4 Holopelankton and 6 meroplankton were identified. Among the identified zooplanktonic groups, Copepods were the main zooplanktonic group that constituted about 53% of total abundance and 65% of total biomass. They were dominant in all stations. Predominant species of copepods was *Acartiatonsa*. Its abundance was between $(106\pm42 \text{ ind.m}^{-3})$ and $(1545\pm181 \text{ ind.m}^{-3})$. After *A.tonsa*, lamellibranch larvae had the highest abundance in all stations (18%) and fish larvae was at second place in terms of biomass (27%). Results showed after invasion of *M. leidyi*, composition and abundance of zooplankton in south Caspian Sea waters greatly changed.

Keywords: Plankton; Cladocera; Copepod; Diversity; Abundance.

1- Introduction:

Caspian Sea is the biggest land-locked saltwater lake in the world with a catchment area of 3.5 million km²[1]. It is located between 36° N and 62°N.The basin of Caspian Sea is divided into three distinct physical regions: Northern, Middle, and Southern Caspian. The northern Caspian that only include the Caspian shelf is very shallowand accounts less than 1% of the total water volume. The middle Caspian accounts 33% of the total water volume. The southern Caspian is the deepest with oceanic depths of over 1000 m and accounts 66% of the total water volume [2-3]. Environmental conditions in the Caspian Sea significantly changed under the impact of human activities. The faunal composition of Caspian Sea has changed totally during last decades (since 1970) because of its water level fluctuations, human manipulation and the entrance of an alien invasive species of a Ctenophore jellyfish. During 80s *Mnemiopsisleidyi* (originated from the north Atlantic waters) transferred to the Black Sea Azof Marmara and east Mediterranean Seas and then toCaspian Sea [4-5-6-



7].Zooplankton are recognized among the best indicators to be particularly useful to investigate and document environmental changes[8]. Major zooplankton taxa have short life cycle and the community structure is able to reflect real-time scenario as it is less enforced by the stability of individuals from previous years[9]. Zooplankton community structure serves as a critical trophic link between the lower and higher trophic levels.

2- Material and Methods:

The study was carried out in offshore water of south Caspian Sea. One transect with 8 stations were selected. The distance among sampling stations was 30 km. Sampling was conducted in winter season (April 2014). Samples collected in both day and night [7 stations at day and in 1 station (S_5) at night].

Samples were collected by zooplankton net (100 μ m mesh with a 0.36 m mouth diameter) by vertical hauling from10m depth. After collecting, specimens were preserved in a 4% formaldehyde seawater solution.In the laboratory samples were studied in a Bogarov tray contained 0.5 ml of each sample [10]. Biomass of zooplankton was estimated from the shape of each species[11] and an invert microscope was used for identifyingthem.

3- Results:

The range of salinity was from $(12.52g, \text{Kg}^{-1})$ at station 1 to $(12.87 g, \text{Kg}^{-1})$ at station 3. Maximum temperature was $(13.80^{\circ}C)$ at station 4 and minimum was $(11.70^{\circ}C)$ at station 3. Station 7 had the highest value of pH (8.67) and the lowest was found at station 4 (8.60). DO values were found maximum and minimum (10.54 and 9.97 mg. L⁻¹) at stations 7 and 4 respectively. The highest concentration of nitrate was found at station 3 (42.05 μ g.L⁻¹) and the lowest was at station 1 (4.28 μ g.L⁻¹). In this study atotal number 4 Holopelankton and 6 meroplankton were identified, including: (Acartia tonsa and Nauplius of A. tonsa;Copepoda-Asplanchnapriodonta;Rotifera -Podonpolyphemoides;Cladocera Larvae of Nereisdiversicolor;Nereididae nauplius Cypris, and cirrus stages of _ Balanusimprovises; Cirripedia - Lamellibranch larvae; bivalvia and Fish larvae).

4- Conclusion:

During the last 30 years, environmental conditions in the Caspian Sea significantly degraded under the impact of various pressures, among which sea level changes and pollution from multiple sources [12-13]. Additionally, a novel type of anthropogenic impact that became widespread across the world in recent years, started to affect the Caspian Sea, viz. invasions by undesirable alien species of animals and plants [14]. *Mnemiopsisleidyi* a highly fecund



composition and abundance of zooplankton in south Caspian Sea waters greatly changed. Some of the species have been vanished from ecosystem and some others have been dominant. Generally, invasive ctenophore deeply affected on planktonic community and ultimately on total food chain of Caspian Sea. Due to the high importance of zooplankton in the food chain, studying the abundance and diversity of them in southern part of Caspian Seais useful for better management of fish stocks and other aspects of the sea.

References:

[1] Mamaev, V., "The Caspian Sea-enclosed and with many endemic species", European *Environment Agency (EEA)*,2002, pp: 1-26.

[2] Kosarev, A., Yablonskaya, E.A., "The Caspian Sea", In *The Haque*, Academic publishing, 1994.

[3] Aladin, N.V., Plotnikov, I.S., *The Caspian Sea. Lake Basin management initiative*, Moscow, Russia, Thematic Paper, 2004.

[4] Shiganova, T. A. (1993). Ctenophore Mnemiopsis leidyi and ichthyoplankton in the Sea of Marmara in October of 1992. *Oceanology*, 33, 900-903.

[5] Dumont, H. J., 1995. Ecocide in the Caspian. Nature, 673-674.

[6] Shiganova, T., Mirzoyan, Z., Studenikina, E., Volovik, S., Siokou-Frangou, I., Zervoudaki, S., Christou, E., Skirta, A., Dumont, H., 2001. Population development of the invader ctenophore *Mnemiopsis leidyi*, in the Black Sea and in other seas of the Mediterranean basin. *Marine Biology*, 139, 431–445.

[7] Fuentes, V. L., Angel, D. L., Bayha, K. M., Atienza, D., Edelist, D., Bordehore, C., Gili, J. M., Purcell, J. E., 2010. Blooms of the invasive ctenophore, *Mnemiopsis leidyi*, span the Mediterranean Sea in 2009. *Hydrobiologia*, 645(1), 23-37.

[8] Sipkay, C., Kiss, K.T., Vadadi-Fülöp, C., Hufnagel, L., 2009. Trends in research on the possible effects of climate change concerning aquatic ecosystems with special emphasis on the modeling approach. *Applied Ecology and Environmental Research*, 17(2), 171–198.

[9] Richardson, A.J., 2008. In hot water: zooplankton and climate change. *ICES Journal of Marine Science*, 65(3), 279–295.

[10] Postel, L., Fock, H., Hagen, W., "Biomass and abundance". In *Harris, R., Wiebe, P., Lenz, J., Skjoldal, H. R. and Huntley, M. (Eds.), ICES Zooplankton Methodology Manual,* Academic Press, London, 2000, pp. 83-192.

[11] Petipa, T. S., 1957. On average weight of the main zooplankton forms in the Black Sea. Proc. Sevastopol. *Biological Station*, *9*, 39-57.



[12] Ivanov, P.I., Kamakin. A., Ushivtzev. V., Shiganova, T., Zhukova, O., Aladin, N., Wilson, S., Harbison, G., Dumont, H., 2000. Invasion of Caspian Sea by the comb jelly fish *Mnemiopsisleidyi* (Ctenophora). *Biological Invasions*, 2,255–258.

[13] Salmanov M.A., *Ecology and Biological Productivity of the Caspian Sea*, Institute of Zoology, Baku, Azerbaijan, 1999.

[14] Shiganova, T.A., Dumont, H.J., Sokolsky, A.F., Kamakin, A.M., Tinenkova, D., Kurasheva, E.K., "Population dynamics of *Mnemiopsisleidyi* in the Caspian Sea, and effects on the Caspian ecosystem", In *Dumont, H., Shiganova, T.A., Niermann, U* (*Eds.*), *Aquatic Invasions in the Black, Caspian, and Mediterranean Seas*, Kluwer, Dordrecht, 2004, 35, 71-111.

[15] Kideys, A.E., Roohi, A., Eker, E., Melin, F., Beare, D., 2008. Increased chlorophyll a levels in the southern Caspian Sea, following an invasion of jellyfish. *Research Letters in Ecology*, 1–4.

Proceeding of the First International Conference on Oceanography for West Asia

30-31 October 2017 IRAN - Tehran



An Investigation On Heavy Metals (Zn, Pb, Cu, Ni, Cd, Cr, And Hg) In Chabahar Sediments (Gulf Of Oman, Iran)

Negarestan Hossein.¹ Fallahi Asghar.², Parizi Saeed.³

1-Fisheries Department, Islamic Azad University, North Tehran Branch, Tehran, Iran, hosseinnegarestan@yahoo.com

2-Ports and Maritime Organization (PMO), Tehran, Iran, asgharfallahi@gmail.com 3- Ports and Maritime Organization (PMO), Tehran, Iran, parizi@pmo.ir

1. Introduction

Chabahar is located in north of Gulf of Oman with coarse sediment [1]. Chabahar Port is placed in Chabahar Bay with a 320 Km2 area in north east of Gulf of Oman, Sistan and Baluchistan Province, Iran. Chabahar Bay has an average depth of 6 m with a maximum depth of 19 m. Gulf of Oman has a narrow continental shelf and rapidly deepens up to 3700 meters [2]. Chabahar area is recipient of a great amount of nutrients from summer monsoon currents which causes the region to be highly productive for the phytoplankton [3].

There are two origins for sediments of the region; local and importing materials [4-5]. A number of pollution studies showed that although Chabahar coastal area is not polluting the region, but there is some pollution in the sediments that could be originated from outside the region [6-7]. Heavy metals in the sediments can be released back into the water column by dredging operation. Since dredging is a normal practice in port operation. The present study aimed to investigate effects of Chabahar port operation on the presence of heavy metal contaminants.

2. Materials and Methods

Sediment samples were collected from 4 sites in 12-13 November 2012. Sites include inside port, dumping site and two control sites, all outside port. Sampling performed using a Van Veen Grab sampler. Collected samples were placed in containers, tagged and placed in cold storage and transferred to laboratory. In laboratory, samples were prepared and a GC-MS Aglent 7890 spectrometer was used to analyze and detect concentrations of heavy metals. Geoaccumulation Index (Igeo) was calculated. For Contamination Factor (CF) and Contamination Degree (Cd) in the present study Concentration background for Zn, Pb, Cu, Ni, Cd, Cr, and Hg was 119, 20.1, 50, 70, 2.14, 90, and 0.4 μ g/g dry weight respectively [7]. Additional evaluation of pollution was done comparing concentrations with US standards of



TEL, ERL, PEL, ERM, and AET [8] and the Netherlands standards for sediment pollution of Target and Intervention [9].

3. Results

Igeo for Ni, Cu, and Pb was more than 2 for all sites suggesting a moderate pollution. Zn was also moderately polluted, according to Igeo, in all sites except the dumping site that sowed an Igeo of 3.03 slightly over 3 suggesting a highly polluted site (Table 1)

			(8)	-,	F	-	
Site	Zn	Pb	Cu	Ni	Cd	Cr	Hg
In Port	2.73	2.07	2.67	2.10	-0.74	0.85	-0.80
Dumping	3.03	2.24	2.33	2.44	-0.54	1.03	-1.21
Control 1	2.81	2.06	2.51	2.38	-0.70	0.90	-0.68
Control 2	2.88	2.20	2.47	2.41	-0.58	0.98	-1.51

Table 1. Geoaccumulation index (Igeo) for sediment samples of Chabahar.

Looking at results in Table 2, mercury levels in control 2 site with CF of 1.38 and Dumping site with CF of 2.75 were considered moderately polluted but other sites with CF of more than 6 were classified as highly polluted. Contamination degree (CD) shown in Table 5 indicates that Site control 2 is slightly polluted with a CD of 6.75, but other sites with CD more than 7 and less than 14 were moderately polluted.

Table 2. Contamination Factor (CF), and Contamination Degree (CD) of Chabahar sediments.

Site	Zn	Pb	Cu	Ni	Cd	Cr	Hg	CD
In Port	0.13	0.63	0.43	0.06	1.26	0.31	7.00	9.82
Dumping	0.27	0.93	0.20	0.13	2.01	0.47	2.75	6.75
Control 1	0.16	0.62	0.29	0.11	1.40	0.35	9.25	12.18
Control 2	0.19	0.84	0.27	0.12	1.85	0.42	1.38	5.06

As it is evident from Table 3, the two heavy metals Cd and Hg are of concern when compared to US and Netherlands standards. Cd concentration in all sites of Chabahar was smaller than the desirable "Target" standard of Netherlands, however, it exceeded some US standards, such as ERL, PEL, and AET. Hg was in high enough concentration that it was more than all US and Netherlands standards, but it did not exceed "intervention" standard of the Netherlands of 10 μ g/g dry weight; meaning it is not in a level that action is needed for remediation.

Table 3. Concentration of Heavy metals in sediment samples compared to standards of US and Netherlands.

Heavy Metal		Chabahar Po	rt Concentrat	tion	US Standards [18]						Netherlands Standard [19]		
(ppm)	Port	Dumping	Control1	Control2	TEL ₁	ERL ₂	PEL ₃	ERM ₄	AET ₅	Target ₆	Inter-		
											vention ₇		
Zn	16.05	31.70	19.00	22.40	124	150	271	410	410 (Infauna)	16	350		
Pb	12.50	18.50	12.30	16.85	30.2	46.7	112	218	400 (Bivalve)	55	530		
Cu	21.50	9.75	14.55	13.45	18.7	34	108	270	390 (Microt.)	3.4	96		
Ni	4.05	8.90	7.85	8.25	15.9	20.9	42.8	51.6	110 Echino.)	0.26	100		
Cd	2.70	4.30	3.00	3.95	0.68	1.2	4.21	9.6	3 (Neanthes)	8.00	12		
Cr	28.10	41.95	31.35	37.70	52.3	81	160	370	62 (Neanth.)	0.38	220		
Hg	2.80	1.10	3.70	0.55	0.13	0.15	0.7	0.71	0.41 (Micro.)	0.30	10		



4. References

[1] Khakbaft Consulting Engineers, Sezepardazi Consulting engineers and Royal Haskoning, 2005. Shahid Beheshti Port Development Plan, Hydrodynamics and sediment report, second volume (AFC), Port and Shipping Organization, Tehran, Iran (In Persian).

[2] Barazandeh M., Torkamani Bojdani H., Safarkhanlu L., and Negarestan H., 2009. Oceans and Seas of the World. Comprehensive Encyclopedia of Ports and Seas, Vol. 4, pp 67-112. Ports and Maritime Organization (PMO), Tehran, Iran (In Persian).

[3] Negarestan H., 2014. Environmental Impact Assessment of Dumping Dredged Materials (Maintenance Dredging) into the sea in the Amirabad and Chabahar Ports, research report 291p. Ports and Maritime Organization (PMO), Tehran, Iran (In Persian).

[4] Negarestan H., Asghari M., Torkamani Bojdani H. and Safarkhanlu L., 2009. Sediments of the Seabed. Comprehensive Encyclopedia of Ports and Seas, Vol. 4, pp 154-172. Ports and Maritime Organization (PMO), Tehran, Iran (In Persian).

[5] Negarestan H., 2016. Environmental Impact Assessment of Dumping Dredged Materials.Case study: Maintenance Dredging of Amirabad and Chabahar Ports, 444p, ISBN 9786008422013. Ports and Maritime Organization (PMO), Tehran, Iran (In Persian).

[6] Sadatipour S. M. t., Raghavan B. R., Karimkhani Bahador A., and Deepthi T., 2010. Heavy Metal Scenario in the Gulf of Chabahar-Oman Sea. International Journal of Earth Sciences and Engineering, 3: 316-322.

[7] Mortazavi M. S., Mohebi Nozar S. L., Pourang N., Akbarzadeh G., Aghajeri N., Kamali I. and Khodami S., 2012. Investigating environmental pollutants (heavy metals and petroleum hydrocarbons) in Iranian area of Gulf of Oman. Research report, Iranian Fisheries Research Organization (IFRO), Tehran, Iran (In Persian).

[8] Buchman M. F., 2008. NOAA Screening Quick Reference Tables. NOAA Ofice of Response and Restoration Division (OR and R), Report 08-1. National Oceanic and Atmospheric Administration, Seattle, USA.

[9] Verbruggen E. M. J., Posthumus R., and van Wezel A. P., 2001. Ecotoxicological Serious Risk Concentrations for Soil, Sediment and Water. Updated proposals for first series of compounds RIVM, Bilthover. RIVM Report 711701020, National Institute of Public Health and the Environment (RIVM), Bilthoven, the Netherlands.



Effects Of Methylmercury On The Brain Of Orange Spotted Grouper In Mahshahr Creeks Of Persian Gulf And Waterborne Fish

Savari, Sharareh

Business incubator (Markaz Roshd), Khorramshahr Marine Science and Technology University, Khorramshahr, Iran, srsavari@yahoo.com

Abstract

The histopathological defects of Methylmercury (MeHg) were studied on Epinephelus coioides brain in the laboratory and compared to the defects seen in Mahshahr Creeks (Zangi, Marymous, Ghanam, Petrochemical creeks) in fish brain to seek the bioavailability of methylmercury in fish brain in Persian Gulf. At first the median lethal concentration (LC_{50.96h}) of MeHg was measured and beyond and above the maximum tolerable concentration of MeH fish $(1/10^{th} \text{ of } LC_{50-96h})$ were calculated using Probit Analysis. Fish were adapted to the tanks and exposed to 10, 20, 40 and 80 µg/L of methylmercury chloride in the Fisheries Center of Zangi Creek. The brains were collected at days 7, 14 and 30 of exposure and the depuration studies were performed for 7 and 14 days. The brains were dissected and sectioned for haemotoxylin and eosin staining and monitored under microscope. The defects pertained hyperanemia and hemorrhage, karvolysis and necrosis, nuclear dust, endothelium hypertrophy, hydropic degeneration, vacuolation, cloudy swelling and edema. These defects were seen in different parts of the brain such as olfactory bulb, cereberum, optic lobe, cerebellum, diencephalon and medulla. The histopathological alteration index was assessed and showed severe defects and no rescue of phenotype after 14 days of depuration was seen. Zangi and Marymous Creeks fell between the control group and the lowest MeHg concentration as safe sites while Ghanam and Petrochemical creeks are introduced as very polluted sites to methylmercury.

Key words: Histopathology, Methylmercury, Epinephelus coioides, brain, Mahshahr Creeks.

1-Introduction

Histopathological studies reflects the overall health of a community in an ecosystem. Histopathological biomarkers can be good indicators of a specific xenobiotic in the environment level^{1,2}. The Neuroanatomy of *Epinephelus coioides* has recently been studied through transverse sectioning³, but the histology of the brain and the effect of pollutants on this tissue have not been studied. Mercury is a hazardous waste coming from petrochemical, industrial and agricultural organizations as well as portal communications. Methylmercury, its organic derivative, is even more dangerous and harmful than mercury itself. Methylmerucry is highly hydrophobic and due to its lipophilicity, it penetrates through the blood brain barrier and targets the brain more than the other tissues. In addition the



accumulation of methylmercury in brain is more than other tissues, therefore studying its effect on such a tissue is more important. In Iran *Epinephalus coioides* lives in the Persian Gulf and is also cultivated in Bandar Emam Khomeini fisheries center. The fish that were studied were cultivated fish from Mahshahr Creeks (Zangi Creek).

2- Procedure of the Research

The fish were cultivated in Emam Khomeini Fisheries Center beside the Zangi creek. Tanks were exposed to 0, 10, 20, 40 and 80 μ g/L of methylmercury chloride. The brains were collected and placed in Bouin's solution fixative. The dehydration step was followed by sectioning using a microtome and the sections were subjected to Haemotoxylin- Eosin staining.

3- Results

In general all the concentrations showed hyperanemia, some extent of hemorrhage, karyolysis, necrosis, nuclear dust, hyper chromatin, vacuolation, endothelium hypertrophy, cloudy swelling, hydropic degeneration and ectopic granular accumulation.

In the figures 1, 2 and 3 pictures of cerebellum, optic lobe and medulla are shown at a magnitude of 750X at concentration of 80 μ g/L at day 30.



Fig. 1. Hemorrhage in cerebellum after 30 days of exposure to 80 μg/L of methylmercury (magnitude: 750×). Long arrow: Hemorrhage, short arrow: Endothelium hypertrophy, star: hydrobic degeneration and vaculation.



Fig. 2. Vaculaiton and hyperanemia in optic lobe after 30 days of exposure to 80 µg/L of methylmercury (magnitude: 750×). Line:





Fig.3. Vaculaiton and hydrobic degeneration of medulla after 30 days of exposure to 80 µg/L of methylmercury (magnitude: 750×). Line: vaculation, star: hydrobic degeneration, short arrow: endothelium hypertrophy.

Figure 4 shows metencephalon, the cerebellum, the most defected part among all parts of brain in orange spotted grouper. Cerebellum shows severe hemorrhage of valvula cerebelli, Nuclear dust of necrosis and karyolysis of purkinje cells and stellate cells, hyperanemia of granular layer, karyolysis of purkinje cells and vacuolation and cloudy swelling of molecular layer. Edema and swelling of depuration durations are seen in this part of brain. No rescue of phenotype was observed after depuration of 14 days (day 44). Similar defects are seen in olfactory bulb, cerebrum and mesencephalon (figures not shown).



Fig. 4. Histopathology of cerebellum of orange spotted grouper brain at different concentrations and days of exposure to methylmercury



In order to see where the amount of pollution fits with the methylmercury exposure contamination a graph of histopathological alteration index has been drawn in figure 5 and it shows that Zangi creek falls below the lowest concentration and is closer to the control fish while Petrochemical creek has the highest pollution falling after the 80 μ g/L concenteration. This index indicates that the histopathological defects of methylmercury on fish brain are severe and non-returnable (no rescure of phenotype is shown).



Fig. 5. Histopatholagical Alteration Index of waterborne fish compared to Mahshahr Creek fish.

4- Conclusion

In general methylmercury showed to have a deteriorate effect on all parts of the brain. It was apparent that with rise in concentration and the duration of the exposure, the defects brought about by the pollutant increases. Moreover the depuration experiments not only did not show any rescue and release of the defected phenotype yet as a conclusion showed more flaws due to more time to inhale the defect, such as more rates of hemorrhage in these experiments; meaning that the defect was not washed out but became more settled. Hemorrhage is more severe in depuration studies rather than the exposures; perhaps there was more time to take up the defect in these experiments. Zangi Creek falls between the lowest concentration and the control, showing still some hopes meaning that the area is not as polluted and can be considered a safe creek.

4- References

[1]- Velkova-Jordanoska, L. (2002). Histopatological and molecular-diagnostical study of the hepatic capillary in black barbel (*Barbus meridionalis petenyi* Heck.) in Lake Ohrid. *MSc Thesis, Univ. St. Cyril and Methodius, Skopje, R. Macedonia (in Macedonia)*


[2]- Roganovic-Zafirova, D., Jordanova, M., Panov, S., Velkova-Jordanoska, L. (2003). Hepatic capillariasis in the Mediterranean barbell (*Barbus meridionalis petenyi* Heck.) from Lake Ohrid. *Folia Veterinaria*, 47(1), 35–37.

[3]- <u>Nagarajan</u>, G., <u>Aruna</u>, A. and <u>Chang</u>, C.F. (2012).Neurosteroidogenic enzymes and their regulation in the early brain of the protogynous grouper *Epinephelus coioides* during gonadal sex differentiation, <u>*General and Comparative Endocrinology*</u>.

Proceeding of the First International Conference on Oceanography for West Asia

30-31 October 2017 IRAN - Tehran



The Role Of The Sediment Conditions In Shaping Meiofauna Spatial Distribution In The Shallow Water Of The South Caspian Sea

Taheri, Mehrshad¹*, Darvish Bastami, Kazem¹, Yazdani Foshtomi, Maryam¹ 1- Iranian National Institute for Oceanography and Atmospheric Science (INIOAS), 9, Etemadzadeh Avenue, West Fatemi Street, Tehran, Iran.

* mehrshadtaheri@yahoo.com

Absrtact

The spatial distribution of meiofauna and their relationship with environmental factors were investigated in four stations different sediment types (coarse silt, fine, medium and coarse sand) in the southern Caspian Sea in November 2013. The maximum meiofauna densities were observed in fine and coarse sand stations while the minimum density was observed in coarse silt station. In total twenty nine species were identified and nematodes with fifteen species was the dominant in term of density and species number. The highest species number and Shannon diversity were obtained in medium sand station while coarse silt station showed the lowest values. There was a significant difference in meiofaunal community composition in all stations and the genus *Daptonema* were the most dominant group. Total meiofauna density, species number, Shannon and evenness showed a significant relationship with sediment grain size and total organic matter content. *Keywords meiofauna, sediment grain size, density, community structure, brackish water, Caspian Sea*.

1- Introduction

Meiofauna are a very diverse animals inhabiting in a wide range of environmental gradients from intertidal zone to hydrothermal deep-sea sediments. Their abundance, diversity and distribution are controlled by several environmental factors, including temperature, oxygen, salinity, organic matter and sediment grain size [1]. It is known that spatial variation of meiofauna community related to sediment conditions while temporal variation mostly related to temperature and salinity [2]. Sediment grain size is a key factor influencing sediment poor water oxygen concentration, food availability and pH value which directly control distribution of benthic meiofauna [1].

Although the ecology and biodiversity of meiofauna have been studied in many parts of the world [2], a few studies have described them in the south Caspian Sea in Iranian borders [i.e. 3]. The aim of the present study was to investigate the possible relationship between the meiofauna community characteristics in term of density, diversity indices and nematode community composition with the measured environmental variables.



2- Materials and Methods

Sampling was conducted in Mazandaran Province (Nowshahr), in the south coast of the Caspian Sea. Samples were taken from four shallow water stations with different sediment types; Coarse silt (CSi, median grain size=29), Fine sand (FSa, median grain size=148), Medium sand (MSa, median grain size=382) and Coarse sand (CSa, median grain size=504) in November 2013. At each station, six replicate sediment cores were collected to a depth of 4 cm for meiofaunal community analyses (three) and the rest for measuring the percentage of the total organic matter (TOM) and the sediment grain size. All cores for meiofaunal community analyses were preserved in 4% buffered formaldehyde. Physicochemical parameters including depth, salinity, temperature, pH and dissolved oxygen of the overlying bottom water were measured using a CTD.

In the laboratory, meiofaunal samples were washed over a 1 mm and a 38 μ m meshes. The fraction remaining on last sieve was centrifuged three times with Ludox to separate organisms from sediments. Then animals were stained with Rose Bengal, counted and identified according to [4] and NeMys online identification system. For nematode analysis, the first 120 nematodes individuals (or all nematodes if a lower number was observed) were hand-picked up [5,6] from each sediment replicate, transferred to pure glycerine and mounted on slides for identification to species level. Total organic matter was determined by loss weight on ignition and grain size analysis was performed using a Particle Size Analyser.

For every replicate, the number of species (S) was recorded. Shannon diversity (H', log e) and evenness (Pielou's, J) were calculated in PRIMER v6 with PERMANOVA+ add-on .Differences in total nematode density, species number, Shannon diversity and evenness in different stations were tested using One-way Analysis of Variance (ANOVA) and a Tukey HSD test. The correlation of density and indices with environmental conditions were determined using the Spearman rank correlation coefficient. One-way permutational ANOVA (Permanova) based on a Bray-Curtis based resemblance matrices were used to determine differences in meiofauna community composition among stations. A one-way SIMPER analysis (Cut of level=90%) was used to identify the meiofauna species having important contributions to within group similarity among stations [7].

3- Results

3-1 Environmental variables

Environmental variables are shown in table 1. The lowest and highest depth was obtained at coarse sand and coarse silt stations, respectively. The variations of pH and salinity were a



fine and station while the highest was observed at medium sand station. The highest temperature and dissolved oxygen were recorded at coarse silt and medium sand stations, respectively. The lowest organic matter and mud content (%) was observed at coarse sand station while the highest was obtained at coarse silt stations.

Table 1) Physicochemical parameters measured at sampling station.TOM: Total organic matter, CSi: Course silt, FSa: Fine sand, MSa: Medium sand and CSa: Coarse sand.

	Depth	pН	Oxygen	Salinity	Temperature	Sand	Mud	ТОМ
CSi	14	8.39	8.39	12.73	20.00	1.65±0.17	98.35±0.17	7.00±0.14
FSa	12	8.41	8.41	12.53	19.50	64.50±1.44	35.50±1.44	4.72±0.05
MSa	9	8.80	8.66	12.50	20.00	91.00±0.29	9.00±0.29	2.60±0.08
CSa	7	8.59	7.85	12.34	20.40	91.84±0.32	8.16±0.32	1.92±0.03

3-2- Meiofauna distribution pattern

In total 29 species belonging to 23 genera were identified. Besides, crustacean Napli, Turbellaria and Acari were recorded in some stations. Permanent meiofauna species was the most part of community in both density and species number. Polychaeta larvae were the main temporary meiofauna group. Nematoda were the most dominant group followed by Foraminifera and Copepoda. Among the nematode species, the genus Daptonema with five species was the numerically dominant group (Table 2).

Table) Distribution of meiofauna in different stations. Scientific names are written alphabetically. CSi: Coarse silt, FSa: Fine sand, MSa: Medium sand and CSa: Coarse sand.

	CSi	FSa	MSa	CSa	CSi FSa MSa	CSa		
Nematoda					Copepoda			
Adoncholaimus araelensis	+	-	-	-	Schizopera neglecta - + +	+		
Antomicron elegans	-	-	+	+	Schizopera rybnikovi +	-		
Axonolaimus spinosus	-	-	+	-	<u>Bradya Sp1</u> + - +	+		
Chromadorita Sp.	-	+	+	+	<u>Bradya Sp2</u>	+		
Daptonema curticauda	+	+	+	+	Ostracoda			
Daptonema karabugasensis	-	+	+	+	<i>Cyprideis litoralis</i> +	-		
Daptonema robustus	+	+	+	+	<i>Cytheromorpha fuscata</i> +	-		
Daptonema setosum	-	+	-	+	<i>Leptocythere longa</i> +	-		
Daptonema tenuispiculum	+	+	+	+	Polychaeta			
Halalaimus minusculus	-	-	+	-	<u>Hypania invalida</u> - + +	+		
Hofmaenneria brachystoma	-	+	+	-	Streblospio gynobranchiata - + +	+		
Microlaimus naidinae	-	+	+	+	<i>Nereis</i> Sp. + + -	+		
Sphaerolaimus cuneatus	-	-	-	+	Others			
Theristus flevensis	-	+	+	-	Napli - + +	-		
Tripyloides marinus	-	+	+	+	Turbellaria + - +	-		
Foraminifera					Acari - + +	-		
Ammonia beccarii	-	-	+	-				
Elphidium gunteri	-	-	+	-				
Elphidium shochinae	-	-	+	-				
Mayerella brotzkajae	-	-	+	-				

The maximum densities values were obtained at fine and coarse sand stations while the minimum was observed at coarse silt station. The lowest species number was obtained in coarse silt, while highest was observed in medium sand station. The highest and lowest diversity were calculated in medium sand and coarse silt stations, respectively. In contrast,



highest evenness was observed in coarse silt but no significant differences were detected other stations (Fig. 1).



Figure. 1. Total density, species number (*S*), Shannon diversity (*H'*) and evenness (*J*) measured at sampling stations. Different letters (superscripted) indicate significant differences (p < 0.05).

3-3- Meiofauna community composition

The result of one-way Permanova showed a significant difference in meiofaunal community composition (Table 3). In all stations except coarse silt the most abundant taxa were *Daptonem (D. curticauda* and *D. tenuispiculum)*. Total meiofauna density, species number, Shannon and evenness showed a significant relationship with sediment grain size and total organic matter content (p < 0.05).

4-Conclusion

In conclusion, spatial distribution of meiofauna showed a significant relationship with median grain size and total organic matter content. Variations in the sediment grain size, mud content and organic matter content [1] are known to influence the meiofaunal distribution and community characteristics. This is an indirect effect due to changes in a biochemical environment in different sediment type. Biogeochemical characteristics of sediments are influenced by the sediment permeability that in turn correlated with sediment grain size. In general, the permeability is higher in the coarser sediments [9]. In permeable sediment, advective pore-water flows can pump oxygenated water until the upper 4 cm of sandy sediment which can increase the mineralization rate of the organic matter and ventilate the sediment [9]. Non-permeable sediment (fine) tends to have lower oxygen penetration depth together with high organic matter content. The higher organic matter content in finer



accumulation of the reduced chemical products (toxic components like H_2S) because of anaerobic mineralization processes [10]. In this situation, after a long period of time, the chances of survival of many nematode species can reduce and nematode community may displace by some well-adapted genera or species with low diversity [present study and 11]. The similar results were observed in nematode density, species number and Shannon diversity in three contrasting sediment types in the North Sea [5].

5- References

[1] Giere, O. (2009), Meiobenthology: the Microscopic Motile Fauna of Aquatic Sediments.2nd edition. Springer-Verlag: Berlin, Heidelberg.

[2] Maria, T.F., Paiva, P., Vanreusel, A., Esteves, A.M. (2013). The relationship between sandy beach nematodes and environmental characteristics in two Brazilian sandy beaches (Guanabara Bay, Rio de Janeiro). Anais da Academia Brasileira de Ciências, Vol. 85, No. 1, 257–270.

[3] Bastami, K.D., Taheri, M., Yazdani Foshtomi, M., Haghparast, S., Bagheri, H., Hamzehpoor, A., Esmaeilzadeh, M., Molamohyeddin, N. (2017). Nematode community structure in relation to metals in the southern of Caspian Sea. Acta Oceanologica Sinica. Vol. 36, No. 10, 1–8.

[4] Birshtein, Y.A., Vinogradov, L.G., Kondakov, N.N., Astakhova, M.S., Romanova, N.N. (1968). Atlas of invertebrates of the Caspian Sea. Moscow: Pishchevaya Promyshlennost.

[5] Taheri, M., Braeckman, U., Vincx, M., Vanaverbeke, J. (2014). Effect of short-term hypoxia on marine nematode community structure and vertical distribution pattern in three different sediment types of the North Sea. Marine Environmental Research, Vol. 99, 149–159.

[6] Taheri, M., Grego, M., Riedel, B., Vincx, M., Vanaverbeke, J. (2015). Patterns in nematode community during and after experimentally induced anoxia in the northern Adriatic Sea. Marine Environmental Research, Vol. 110, 110–123.

[7] Anderson, M.J., Gorley, R.N., Clarke, K.R. (2008). *PERMANOVA+for PRIMER: Guide* to Software and Statistical Methods, PRIMER-E Ltd, Plymouth.

[8] Wilson, A.M., Huettel, M., Klein, S., 2008. Grain size and depositional environment as predictors of permeability in coastal marine sands. *Estuarine, Coastal and Shelf Science*, Vol 80, No. 1, 193–199.



[9] Rusch, A., Huettel, M., Wild, C., Reimers, C.E. (2006). Benthic oxygen consumption and organic matter turnover in organic-poor, permeable shelf sands. *Aquatic Geochemistry*, Vol. 12, No.1, 1–19.

[10] Rabalais, N.N., Díaz, R.J., Levin, L.A., Turner, R.E., Gilbert, D., Zhang, J. (2010). Dynamics and distribution of natural and human-caused hypoxia. *Biogeosciences*, Vol. 7, 585–619.

[11] Vidaković, J., Bogut, I. (2004). Aquatic nematodes of Sakadaš Lake (Kopački rit Nature Park, Croatia). Biologia Bratislava, Vol. 59, No. 5, 567–575.



Spatiotemporal Variations In Macrofauna Community In The South Caspian Sea

Ghasemi, Amir Faraz^{1and2}, Savari, Ahmad¹, Nabavi, Mohammad Bagher¹, Doostshenas, Babak¹, Taheri, Mehrshad^{1*}, Yazdani Foshtomi, Maryam³

1- Department of Marine Biology, Faculty of Marine Science and Oceanography, Khorramshahr University of Marine Science and Technology, , Khorramshahr, Khozestan, Iran.

2- Iranian National Institute for Oceanography, 9, Etemadzadeh Avenue, West Fatemi Street,

Tehran, Iran.

mehrshadtaheri@yahoo.com

Abstract

Spatiotemporal variation in the south Caspian Sea macrofauna community and biodiversity were studied in different seasons and depths between Sisanganand Nowshahrin 2010. A total of 29 species belonging to different macrofauna groups were observed. Annelida were the numerically dominant group of macrofauna but Crustacean had the highest species number. *Streblospio gynobranchiata* and *Potamothrix vejdovskyi* were the most aboundant species in the study sites. Neither Percentage of Total Organic Matter nor sediment grain sizes were significantly affected by seasons and depths. However, a significant differences in density and diversity indices were observed among depths and seasons.

Key wordsSpatiotemporal, macrofauna, community composition, biodiversity, south Caspian Sea

1-Introduction

Macrofauna are the main food items for the Caspian Sea bentivorous fishes such as sturgeons [1]. Study on sturgeon juveniles (<40 cm length) in shallow water showed that annelida and amphipoda were the main food items in their digestive system [2]. Among the teleost bentivorous fishes, *Rutilusfrisii* and *Cyprinuscarpio* are the main commercial species (more than 50% of catch) in the south Caspian Sea[3] which also feed mainly on macrofauna[4].[5] showed a positive relationship between fish catches values and macrofauna biomass in many regions of the Guilan province (Iran) which emphasis on importance of macrofauna.

With regard to thelow number of macrofauna species in the south Caspian Sea shallow water [6-9] and increasing rural and agricultural waste water [10], local loss or changein species richness may negatively effect on density, community community and benthic functional diversity[i.e. 11] which in turn may negatively impact on bentivorous fishes populations, benthic-pelagic coupling and biogeochemical cycling [i.e. 12].The main objective of this study was investigation of the seasonal change in density anddiversity of macrofauna community in



community does notaffect by seasons and depths. These results can give us good backgroundinformation for the purposes of rebuilding stock of bentivorous fishes.

2- Material and Methods

Macrofauna samplings were carried out in early of March, June, September and November between Sisanganand Nowshahrin 2010. In each season, four transects was supposed and along each transect four stations in 2, 5, 9 and 14 meter depths were sampled. For biological study, three replicate sediments were collected using Van Veen grab (300 cm⁻²) in each station (12 samples in each depth) followed by [6,8]. In the laboratory, sediments were gently sieved by 0.5 mm mesh and the retained materials fixed in 4% buffered formalin and stained with Rose Bengal. Macrofauna were identified and counted under stereomicroscope. The World Register of Marine Species (WORMS) was used to harmonize species names.Total organic matter was determined by loss weight on ignition (4 hours at 550 °C) after drying (24 hours at 90 °C) to constant weight. Grain size analysis was performed using a particle size analyzer.

Macrofaunacommunity was described based on the following parameters: total density, community composition, diversity (as Shannon-wiener's), evenness (as Pielou's) and species number. All the data from the four stations at each depth were considered as a line (4 lines) and lines from different seasons were compared [6, 8]. Two-way Permanova with twofixed factors (depth and season) were applied to test differences between percentage of TOM, fine sand, silt–clay, all mentioned univariate parameters and community composition (multivariate). A Euclidean distance and Bray-Curtis based resemblance matrix was used for univariate and multivariate data, respectively. Due to the restricted number of possible permutations in pairwise tests, p-values were obtained from Monte Carlo test[13]. Variation in macrofauna community composition was visualized using Principal Coordinates Analysis (PCO) based on log (X+1) transformed data. All analyses and calculations were done in PRIMER v6 with PERMANOVA+ add-on. The relationship between the density, species number, diversity and eveness with percentage of TOM, fine sand and silt-clay was estimated using a Spearman's rank correlation coefficient.

3- Results

Environmental conditions and the sediment characteristics at the sampling station have already described in [8]. In the present study, we focused on sediment grain size and total organic matter content. Neither Percentage of total organic matter nor sediment grain sizeswere significantly affected by seasons and depths.



4- Macrofauna community

A total of 29 species belonging to different macrofauna groups were observed. Annelida were the numerically dominant group of macrofauna but Crustacean had the highest species number (Table 1). Three decapods are categorized asbethicepifuana (*Palaemonadspersus, P. elegans*and*Rhythropanopeusharrisii*).

Table 1: Dominance list of macrofauna species in all seasons and depths. In each of the column, the species with highest density are arranged in the top of the other and bold species (five species) name only observed in one line in one season.

Polychaeta	Oligochaeta	Cumacea	Amphipoda	
Streblospiogynobranchiata	Potamothrixvejdovskyi	Stenocumalaevis	Pontogammarussarsi	
Hypaniainvalida	Tubificoidesfraseri	S. gracilis	P. maeoticus	
Alittasuccinea	Limnodrilus Sp.	Petrocumapectinata	Niphargoideseaquimanus	
Hedistediversicolor	Paranaislitoralis	S. diastyloides	N. motasi	
	Isochaetidesmichaelseni	S. cercarioides	Pontogammarus Sp.	
		S. tenuicauda	P. rubustoides	
			Cardiofilusbaeri	
Decapods	Mollusca	Insect		
Palaemonadspersus	Cerastodermalamarcki	Chironomusalbidus		
P. elegans	Mytilasterlineatus			
Rhythropanopeusharrisii	<i>Pyrgola</i> Sp.			

Total macrofauna density was statistically different among stations and seasons. Maximum and minimum densities were obtained in Winter and Spring, respectively. There were generally an incerase in density with depth in all seasons (Table 2).

Table 2. Mean number of species recorded (per m⁻²) in each season during this study.

	Total density							
	Line 1	Line 2	Line 3	Line 4				
Winter	460.00±371.10 ^A	636.67±327.49 ^A	660.00±629.34 ^A	1220.00±1049.54 ^A				
Spring	22.17±38.47 ^C	55.50±70.06 [°]	24.92±32.18 ^B	24.92±32.18 ^B				
Summer	163.83±453.40 ^{AB}	386.00±301.02 ^{AB}	838.92±864.22 ^A	1252.67±1080.39 ^A				
Autumn	277.75±307.37 ^A	214.00±98.99 ^в	408.25±205.68 ^A	769.50±649.68 ^A				

Species number, shannon diversity and evenness were considerably different among stations and seasons. Maximum and minimum values of the mentioned indices were observed in Winter and Spring, respectively (Fig. 1). There was just a weak significant correlation between density of macrofauna with sediment grain size. Species number, diversity and eveness were not affected by sediment factores.







Nematode community structure were significantly different among stations and seasons (Pseudo-F= 3.72, P= 0.043). These differences were considerable between Spring in all depthes with the other seasons. The PCO plots revealed These differences (Fig. 2). The results of the SIMPER analysis showed that *Streblospio gynobranchiata* and *Potamothrix vejdovskyi* contributed most to the similarity within each season.



Figure 2) Visualizion of macrofauna community by Principal Coordinates Analysis (PCO) in different seasons and depths.

5-Conclusion

Salinity is a key factor controlling macroauna biodiversity in the south Caspian Sea [7]. In comparison to other seas and open oceans, the Caspian Sea low salinity (maximum 13 ppt) is too high for true freshwater species and too low for marineorigin species. Therefore, these conditions arejust favourable for brackish water species [14]. In the present study, 29 species of macrofauna were identified which is rather higher than the othe studies. In the Noor coast, Mazandaran province, 6species was reported [6] while in the Gorgan bay 10 species was reported [7]. Besides, 16 species were reported by [15]. Although sediment grain size and TOM were reported as the most importantfactores controlling macroaunadispersal in the South Caspian Sea [6], no significant relationships between macrofauna density and diversity indices with weresediment factores indicating that other factors are probablycontrolling macrofauna assemblages. The reproductive season for manybenthivore fish species and macrofauna in the south Caspian Sea starts from latewinter to late spring [4,16]. Meanwhile incerasing in water temprature would led to an increase in metabolic rate and feeding intensity predators viceversa. Therfore, seasonal change in macrofauna community probabley related to combine effect of their reproduction activity, predatorpressure and temprature [17,18].



3- References

[1] Haddadi Moghadam, K., Parandavar, H., Pajand, Z., Chubian, F. (2005) Feeding habits of sturgeon fishes in shallow coastal waters of Guilan Province, southern Caspian Sea. Iranian Sci Fish J Vol.14, No. 3, 37–48.

[2] Hashemyan A, Khoshbavar Rostamani, HA, Taleshian, H A., comparative analysis of feeding habitats of sturgeon fish in shallow coastal waters of Mazandaran and Golestan provinces, south Caspian Sea. Iranian Sci. Fish J. 2005., 14: 157-165.

[3] Fazli, H., Kor, D., Daryanabard, G., 2014. Spatial and temporal distribution of Kutum (Rutilus frisii kutum, Kamensky 1901) in Iranian waters of the Caspian Sea. Iranian Scientific fisheries Journal Vol. 23, No. 1. 63-75.

[4] Abdoli A. (1999) The inland water fishes of Iran, 1st edn. Naghsh Mana.

[5] Mirzajani. A. .2005. Determination of benthos organisms' biomass and their distribution on south part of the Caspian Sea (from Astara till Chalus waters). Pajouhesh & Sazandegi. 10(4), 128–132.

[6] Taheri M, Yazdani Foshtomi M (2011) Community structure and biodiversity of shallow water macrobenthic fauna at Noor coast, South Caspian Sea, Iran. J Mar Biol Ass UK 91(3):607-613

[7] Taheri, M., Yazdani, M., Noranian, M., Mira, S.S., 2012. Spatial distribution and biodiversity of macrofauna in the southeast of the Caspian Sea, Gorgan Bay in relation to environmental conditions. Oceanol. Sci. J. 47, 113–122.

[8] Ghasemi A F, Clement J C, Taheri M, et al. 2014. Changes in the quantitative distribution of Caspian Sea polychaetes: prolific fauna formed by non-indigenous species. Journal of Great Lakes Research, 40(3): 692–698.

[9]Ghasemi, A.M., Taheri, M., Yazdani Foshtomi, M., Noranian, M., Mira, S.S., Jam, A., 2016. Gorgan Bay: a microcosm for study on macrobenthos species-environment relationships in the southeastern Caspian Sea. Acta Oceanologica Sinica. 35(4), 82–88.

[10] Shahryari A, Kabir MJ, Golfirozy K (2009) Evaluation of microbial pollution of Caspian Sea at the Gorgan Gulf. J Gorgan Uni Med Sci 10(2):69-73.

[11] Belley R and Snelgrove PVR (2016) Relative Contributions of Biodiversity and Environment to Benthic Ecosystem Functioning. Frontiers in Marine Science. 3: 242.

[12]Yazdani Foshtomi M, Braeckman U,Derycke S, Sapp M, Van Gansbeke D, Sabbe K, etal.(2015) The Link between Microbial Diversity andNitrogen Cycling in Marine Sediments IsModulatedby Macrofaunal Bioturbation. PLoS ONE 10(6):e0130116.



[13]Anderson, M.J., Gorley, R.N., Clarke, K.R. (2008). PERMANOVA+for PRIMER: Guide to Software and Statistical Methods, PRIMER-E Ltd, Plymouth.

[14] Karpinsky MG (2005) The Caspian Sea Environment. In: Kostianoy A, Kosarev A (eds) Biodiversity: The Handbook of Environmental Chemistry. Springer-Verleg, pp 159-173.

[15]Roohi A, Kideys AE, Sajjadi A, Hashemian A, Pourgholam R,Fazli H, Ganjian Khanari A, Eker-Develi E (2010) Changesin biodiversity of phytoplankton, zooplankton, fishes andmacrobenthos in the Southern Caspian Sea after the invasionof the ctenophore Mnemiopsis Leidyi. Biological Invasions 12:2343-2361.

[16]Taheri, M., Seyfabadi, J., Abtahi, B., Yazdani, M., 2009. Population changes and reproduction of an alien spionid polychaete, Streblospio gynobranchiata, in shallow waters of the south Caspian Sea. JMBA2 Marine BiodiversityRecord. 2, 1–5.

[16]Mistri M., Fano E.A., Ghion F. and Rossi R. (2002) Disturbance and community pattern of Polychaetes inhabiting Valle Magnavacca(Valli di Comacchio, northern Adriatic Sea, Italy). Marine Ecology23, 31–49.

[17]Kevrekidis T. (2005) Population dynamics, reproductive biology and productivity of Streblospio shrubsolii (Polychaeta: Spionidae) in differentsediment and salinities. In Mediterranean Lagoon (MonolimniLagoon, northern Aegean). International Review of Hydrobiology 90,100–121.



Abu Musa Island As A Biodiversity Hotspot In The Persian Gulf, Iran

Naderloo, Reza*¹ Abdollahi, Rashed²Ebrahimnezhad, Saeed³

Department of Zoology, School of Biology, College of Science, University of Tehran, Tehran, Iran rnaderloo@ut.ac.ir

1. Introduction

The Iranian islands in the Persian Gulf, especially those far from the mainland, have been inadequately studied. The current study, which is the main results of a national-funded biodiversity project, presents the first comprehensive marine biodiversity recording from Abu Musa Island (long. 55° 01.670' E, lat. 25° 53.459' N), an Iranian offshore island in the eastern part of the Persian Gulf (Figure 1). The importance of the Island location is related to vicinity of the Strait of Hormuz (as a crucial shipping lane in the global oil trade), depth of surroundings, suitable for petroleum tankers and big ships passage, and also existence of oilfield (Moubarak oilfield) in nearby that turns Abu Musa to one of the most strategic points in the Persian Gulf. The geological origin of Abu-Musa, similar to other neighboring islands in the eastern and southeastern part of the Persian Gulf, is rooted at the diapiric movement of Infra-Cambrian to Cambrian salt and is strongly linked to Hormuz Formation (Kent, 1979; Salah, 1996).

2. Material And Method

Abu Musa Island is roughly triangular and covers an area of almost 13 km². The Island is not particularly diverse regarding the intertidal ecosystems and generally comprise just two types of shores, sandy and rocky. The tidal pattern in Abu Musa is "predominately semi-diurnal" (Jones, 1986) and the maximum range of tides can reach to about two meters. Samplings were performed in eight stations (Figure 1) around the Island in four field surveys from 2014 to 2016. In each sampling, specimens were collected in low tide mainly by hand and different-size scoop nets. The rocks were broken into parts of 3-5 cm in order to find shrimps, polychaetes and other within-rocks-living species. Sediments were sieved using a metal sieve with 1 mm mesh size. Specimens with high mobility such as crabs and fishes were caught using middle sized fish net. At the same time, subtidal habitats to the depth of <4 m were sampled by snorkeling. In some cases, scuba diving was used for sampling in depths less than six meters. Although we just had a qualitative approach but sampling in several times from each station, provided the material for a general comparison between the stations using PRIMER software (ver. 6.1.6) (Clarke and



Gorley, 2006). The specimens were sorted into major animal groups, fixed in 75% ethanol and then transported to the laboratory for identifying up to species level as possible. The specimens were deposited in the Zoological Museum of Tehran University (ZUT).

3. Result

In total, 355 species in 13 phyla, from algae to fishes are recorded in which 24 species belong to previous studies. The order of phyla based on species diversity were as following: Arthropoda (127 species in 42 families), Mollusca (96 species in 47 families), Annelida (29 species in 16 families), Cnidaria (19 species in 11 families), Rhodophyta (15 species in 7 families), Echinodermata (10 species in 6 families), Chlorophyta (9 species in 7 families), Ochrophyta (8 species in 4 families), Chordata (7 species in 7 families), Porifera (6 species in 6 families), Platyhelminthes (3 species, in 2 families), Nemertea (1 species) and Sipuncula (1 species) (Figure 2). Arthropods and mollusks, altogether comprising more than 65% of total species diversity, make the most diverse taxa in all surveyed stations around the Island. Nearly all of the presented species (97.6%) are new records for the Island, and 32 species (9.7%) are new records for the Persian Gulf. Based on the collected materials during this study a total of 10 new species were presented from different taxa; one amphipod, two crabs, six Alpheid shrimps (three *Alpheus* and three *Synalpheus*) and one polychaete worm. A clustering analysis based on the occurrence (presence/absence) of specimens among stations is presented in Figure 3.

4. Discussion

A high species diversity of different habitats in Abu Musa Island reflects the suitability and potentials for different species to emerge. The important point is that these statistics are just related to the specimens collected by naked eye and many other species can be added to this list by studying smaller sized taxa in the area. Two separate studies on the Qeshm Island (in the entrance of the Persian Gulf) and Tarut island (in west part of the Persian Gulf) have reported 39 and 30 species of Gastropoda respectively while the number for Abu Musa is 72 (51 just from AB-2). Abu Musa covers 114 species of Mollusca in just two type of habitats which counts about 20% of all reported Mollusca (about 600 species) in the Persian Gulf and also includes 127 crustacean species while the number for whole the Persian Gulf is about 500 (the same taxa studied in Abu Musa). Among all the stations in the island, AB-2 had the highest number of species and 72.5% of all founded species belong to this station. With a far distance, the next station in order of species number was AB-1 with 38% of the species. Besides the unique situation of this station at the northern point of the Island, the structure of the shore also has great impact on the diversity. In this station a coastal shelf is extended into the sea as far as about 250 meters with a maximum depth of 3 meters at farthest point from the shore. Then there is a break



in sea floor and the depth suddenly reaches to over 15 meters. This shelf with a solid substrate allows sessile animals (such as hard corals and anemones) to settle in the coastal area. The settlement of these biotic structures increases the microhabitats in the area and leads to a higher diversity mostly for those species living within live or dead corals and crevices of rocks. The partly short range of tides in Abu Musa also plays an important role in providing a subtidal region with less environmental stresses.

The high number of recorded species from Abu Musa reflects the real potential of diversity in the Persian Gulf. Getting farther from the mainland, it is speculated that decreasing pollution in the Persian Gulf leads to a better condition for life to get diverse.



Figure 2 Pie-chart showing phyla diversity in intertidal and shallow subtidal of Abu Musa, the numbers within parenthesis infer to number of species and families in that phyla, respectively. Percent numbers refer to percent of phyla among all other phyla.





Figure 3 Dendrogram of surveyed stations in Abu Musa based on presence/absence of species

References

[1] Kent, P. 1979. The emergent Hormuz salt plugs of southern Iran. Journal of petroleum geology 2: 117-144.

[2] Salah, M. 1996. Geology and hydrocarbon potential of Dalma Island, offshore Abu Dhabi. Journal of petroleum Geology 19: 215-226.

Physical Oceanography

Theme

Observation of Across-Channel Flow in the Khuran Channel, Persian Gulf, Iran

Khosravi, M.¹, Siadatmousavi, S.M.², Chegini, V.¹, Vennell, R.³

1.Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran, mazyar.khosravi@inio.ac.ir

2.School of Civil Engineering, Iran University of Science and Technology, Tehran, Iran, siadatmousavi@iust.ac.ir

Department of Marine Science, University of Otago, Dunedin, New Zealand, ross.vennell@otago.ac.nz

Abstract

The Khuran Channel, Southern Iran (26°45'N), is an open channel at both ends. Because of its particular shape and geometry, this narrow channel is subjected to strong tidal currents. Spatial distributions of the mean and tidal flows were obtained over a semidiurnal tidal cycle where the highest tidal velocity in the third day of the secondary spring tide exceeded 140 cm/s. A 614.4 kHz Teledyne RDI Workhorse Broadband ADCP was employed to observe the current profiles over 13 repetitions of a cross-channel transect. The 3.1 km long transect ran north/south across the channel. Contrary to the previous surveys in this channel, which concluded a westward mean flow for the whole channel, the current study showed a westward mean flow in the deep parts of the channel and an eastward mean flow over the shallow slopes, with the maximum magnitudes (15-20cm/s) near the surface in the north side.

Keywords: Khuran Channel, Tidal flow, Vessel Mounted ADCP measurements

1- Introduction

The Khuran Channel (KCh) in the Strait of Hormuz located at 26°45'N and 55°40'E with ~110 km length and the minimum width of 3.2 km at the port of Pol (Figure 1).The KCh is a topographically complex channel which open at both ends. Owning to its particular geometry, this narrow channel is subjected to strong tidal currents. In narrow channels like the KCh, the structure of across-channel flow is often highly variable, with changes occurring on spatial scales on the order of hundreds of meters and temporal scales of minutes.Spatial and temporal variations of the cross-channel flow are highly considerable due to the interaction among lateral bathymetric changes, tidally-driven currents, gravitational circulation, and wind-driven currents[1]. There are several studies which emphasize the importance of across-channel flow in estuarine environments and channel systems [e.g. 2, 3-11]. The vessel mounted-ADCP measurements presented in this study have provided the first description of the spatial variability of the mean and tidal flows along a cross-channel transect within the KCh at the secondary spring tide.





Fig. 1 Map of study area. The across-channel transect in this study was located at the right side of the narrowest section of KCh. The mooring location is shown at the narrowest section.

2- Materials and Methods

A vessel mounted 614.4 kHz Teledyne RDI Workhorse Broadband ADCP and a Garmin GPSMAP 521s interfaced to a laptop computer were used to obtain detailed profilesof the mean and tidal flows in the KCh over 13 repetitions of a cross-channel transect during one semidiurnal tidal cycle, on 10 October 2014, the third day of secondary spring tidein the area. The 3.1 km long transectwhich located on longitudes of 55.787°E, ran north/south across the channel(in the sense used by Cáceres, Valle-Levinson [5]). Observation of the currentalong the mentionedtransect is part of a more detailed study on observation of tidal currents in the KCh. The ADCP was deployed in downward position along the starboard side of a small vessel ~3 m long, which was moved at the maximum speed of ~2.5 m/s. The depth of the ADCP transducers was set to be ~0.83 m below the water surface. Considering that the blanking distance for a Workhorse 600 kHz is equal to 1m, the first bin was ~1.83 m below the water surface. Additionally, the mention ADCP was capable of bottom tracking and the vertical bin height has been set to 1 m. Velocity profiles were averaged over ensembles for both the velocity and the bottom tracking data every 40s.

The KCh is almost along the east-west axis; however, the direction of the strongest shear variability of tidal currents and of the weakest across-channel tidal flows was -4 degrees. Thus the data were rotated 4 degrees clockwise to the east-west(x-direction, u-component)and north-south(y-direction, v-component). The ADCP's compass was calibrated, as explained in Joyce [12]. After rotation of the axes, the instantaneous data were adjusted into uniform grids of 1 m depth and 100 m length aligned with tracks and the harmonic analysis was performed independently on the time series generated at each grid point.

3- Results and Discussion

3.1Vessel Mounted-ADCP Surveys

3.1.1 Mean Flow

Fig. 2 shows the main characteristic of across-channel distribution of the u-mean flow over the period of observations. Study of [13] concluded that there is a westward residual current in the KCh and hence any



pollutant in the industrial eastern part of this channel would move westward. Contrary to their results, the vessel mounted ADCP measurements of the current study indicated that the u-mean flow was influenced significantly by bathymetry as inflows (negative values) observed in the deep part of the channel and outflows (positive values) over the shallow slopes, more evident in the north side of the channel. As a result, the pollutants would move westward in the deep part of the channel and eastward motion of pollutant will occur over shallow slopes.

The mean flow was resembled to that inferred from theoretical results in a weakly stratified coastal plain estuary in Delaware Bay[2]. The same results also observed at Yeomha Channel, Gyeonggi bay, South Korea[11]. The along-channel mean flow showed the greatest magnitudes (15-20 cm/s) near the surface in the northern side. The magnitude of the u-mean flow was in a fair agreement to those residual current observed at moored current meter location of [13], with the maximum magnitude of 23.1 cm/s in the secondary spring tide. In the deep part of the channel, outflows occurred over the entire water column. The along-channel mean u flow exhibited a mean absolute magnitude of 7.9 cm/s in the section.



Fig. 2 Across-channel distribution of the along-channel mean flow (looking toward the ocean, the left side of the plot is South and the right side is North).

3.2.2Tidal flow

The across-channel distribution of the semidiurnal tidal current amplitudes is shown in Fig. 3. The maximum amplitude exceeded140cm/sand occurred near the surface. Clearly, the tidal velocity contours followed the bathymetry which emphasize on the relative domination of frictional force in dynamical terms. In other words, the semidiurnal tidal current amplitudes reduced in the deep part of water column and the smallest tidal amplitude was observed near the bottom which indicated the importance of the bottom friction [1, 4, 5, 14-18]. This was also evident inrelative energetic peak at quarter-diurnal tide (e.g., M_4) in the rotary spectra (Fig. 3) that implies the effect of bottom friction through the nonlinear overtide M_4 (not plotted here). The results obtained here were consistent with those observed by Valle-Levinson and Atkinson [1] and Valle-Levinson and Lwiza [3]. Tidal current with the highest magnitude of ~111 cm/s at the mooring location in the spring tide was comparable to those across-channel distributions of the semidiurnal tidal current amplitudes that ranged 100-150 cm/s.





Fig. 3 Across-channel tidal amplitude distributions for the M2 constituent

4- Conclusions

This study through vessel-mounted ADCP surveys gives the first detailed description of mean and tidal flow on small spatial and temporal resolution in this channel. The spectral characteristics of the moored current meter in the KCh confirmed that the tidal and inertial oscillations were the main components of current in this channel. Diurnal and semidiurnal tidal constitutes showed the largest energy in which M_2 tidal constituent was almost one order of magnitude more energetic than K1 tidal constituent (not plotted here). The study of flow in this topographically complex channel revealed that the mean flow is flooddominated over the slope in shallow areas, mostly in the north side of the channel. It is also ebbdominated through the water column in the deep part of the channel, which resembled to that concluded from theoretical results by Wong [2] and also observed by [11]. Contrary to the results by [13], the current study indicated that the pollutants would move westward in the deep part of the channel and also eastward motion of pollutant will occur over shallow slopes. The highest mean flow in the KCh (15-20 cm/s) was near the surface in the northern side. The maximum amplitude of semidiurnal tidal current exceeded to 140 cm/s which occurred near the surface and gradually reduced with depth. The semidiurnal tidal current contours followed the bathymetry which indicates the predominant of frictional forces in the dynamical terms. Particularly, the minimum tidal amplitude was measured near the bed, again due to effects of the bottom friction. These results were in a fair agreement with those observed by [1, 3, 5, 19]

References

[1] Valle-Levinson, A. and L.P. Atkinson, Spatial gradients in the flow over an estuarine channel. Estuaries, 1999. **22**(2): p. 179-193.

[2] Wong, K.C., On the nature of transverse variability in a coastal plain estuary. Journal of Geophysical Research: Oceans, 1994. **99**(C7): p. 14209-14222.

[3] Valle-Levinson, A. and K.M. Lwiza, The effects of channels and shoals on exchange between the Chesapeake Bay and the adjacent ocean. Journal of Geophysical Research: Oceans, 1995. **100**(C9): p. 18551-18563.

[4] Valle-Levinson, A., K.C. Wong, and K.M. Lwiza, Fortnightly variability in the transverse dynamics of a coastal plain estuary. Journal of Geophysical Research: Oceans, 2000. **105**(C2): p. 3413-3424.



an energetic tidal channel. Journal of Geophysical Research: Oceans, 2003. 108(C4).

[6] Doyle, B.E. and R.E. Wilson, Lateral dynamic balance in the Sandy Hook to Rockaway Point transect. Estuarine and Coastal Marine Science, 1978. **6**(2): p. 165-174.

[7] Chant, R.J. and R.E. Wilson, *Secondary circulation in a highly stratified estuary*. Journal of Geophysical Research: Oceans, 1997. **102**(C10): p. 23207-23215.

[8] Hughes, F. and M. Rattray, *Salt flux and mixing in the Columbia River Estuary*. Estuarine and Coastal Marine Science, 1980. **10**(5): p. 479-493.

[9] Dyer, K., Estuaries: a physical introductionWiley. New York, 1997.

[10] Cameron, W., *On the transverse forces in a British Columbia inlet*. Transactions of the Royal Society of Canada, 1951. **45**: p. 1-9.

[11] Lee, D. and S. Woo, *Characteristics of cross-channel momentum balance at Yeomha Channel, Gyeonggi bay, South Korea.* JOURNAL OF COASTAL RESEARCH, 2011: p. 1515-1519.

[12] Joyce, T.M., *On in situ "calibration" of shipboard ADCPs*. Journal of Atmospheric and Oceanic Technology, 1989. **6**(1): p. 169-172.

[13] Zaker, N., et al., *Dynamics of the Currents in the Strait of Khuran in the Persian Gulf*. Journal of Shipping and Ocean Engineering, 2011. **1**(2).

[14] Parker, B.B., Tidal hydrodynamics. 1991: John Wiley & Sons.

[15] Friedrichs, C.T. and O.S. Madsen, *Nonlinear diffusion of the tidal signal in frictionally dominated embayments*. Journal of Geophysical Research: Oceans, 1992. **97**(C4): p. 5637-5650.

[16] Walters, R.A. and F.E. Werner, *Nonlinear generation of overtides, compound tides, and residuals.* Tidal hydrodynamics, 1991: p. 297-320.

[17] Valle-Levinson, A. and K.M. Lwiza, *Bathymetric influences on the lower Chesapeake Bay hydrography*. Journal of Marine Systems, 1997. **12**(1): p. 221-236.

[18] Valle-Levinson, A., W.C. Boicourt, and M.R. Roman, *On the linkages among density, flow, and bathymetry gradients at the entrance to the Chesapeake Bay.* Estuaries, 2003. **26**(6): p. 1437-1449.

[19] Valle-Levinson, A., C. Reyes, and R. Sanay, *Effects of bathymetry, friction, and rotation on estuaryocean exchange*. Journal of Physical Oceanography, 2003. **33**(11): p. 2375-2393.

30-31 October 2017 IRAN - Tehran



Designing a Three-Dimensional Oceanic Model for Study of Monsoon Wind Induced Currents in the West of Northern Indian Ocean

Farhady, Ardeshir¹*, Zamanian, M.T.², Rashidy, A.³

1- PhD student, Physical Oceanography, Atmospheric Sciences and Meteorological Research Center (ASMERC IRAN);

2- Assistant Professor, Physical Oceanography, Atmospheric Sciences and Meteorological Research Center (ASMERC IRAN)

> 3- Assistant Professor, Physical Oceanography, Tarbiat Modares University ardeshir.farhady@yahoo.com

Abstract

We have designed a three-dimensional finite difference hydrodynamic oceanic model using baroclinic primitive equations based on the earth's spherical coordinates modified by vertical sigma coordinate with eleven levels equivalent to five layers to study the monsoon wind induced currents in the west of northern Indian Ocean. In this model, which we named it as ASMERC-1, the horizontal finite difference scheme is staggered and, the model uses a modified Arakawa C grid with the two-step Lax-Wendroff scheme and DuFort-Frankel scheme to simulate the advection terms and diffusion terms, respectively. The ASMERC-1 model is forced by monsoon wind that data obtained from the European Center for Medium range Weather Forecasting (ECMWF) model as a series of 3-hour intervals in the summer between June 15 to July 15, 2006 to investigate monsoon wind induced currents by procedure of simulation. The results of this model, which have good agreements with the measurements and previous findings, show that the monsoon wind induced currents flows northeastward during the period of monsoon and extended over the entire basin, from the Somali coasts to the eastern Bay of Bengal. The Ekman drift and Ekman suction are the most important processes for the currents in the central northern Indian Ocean and upwelling in western and northern parts of the northwest Indian Ocean.

Keywords: Three-dimensional Modeling, ASMERC-1 Model, Monsoon Wind Induced Current, West of Northern Indian Ocean

1.Introduction

The phenomenon of monsoon in Indian Ocean can be considered as interesting phenomenon in the region. Recently, the development of the atmosphere-sea dynamics models has provided important advances in the prediction of monsoon in Indian Ocean [1]. The direction of winds over the north of Indian Ocean change twice a year. Indian Ocean climatological winds, generally blow from the northeast during winter (November–February) and from the southwest during the monsoon season (May–September), (Fig. 1) [2]. These seasonally reversing monsoon winds over the north Indian Ocean force a seasonally reversing circulation in the upper ocean, (Fig. 2) [2].



In 1991, Jensen studied the seasonal changes in the Somali Current system using a four-layer model where the lowest layer is at rest [3][4]. Whereas the currents in various layers of the Indian Ocean is a topic that has been less addressed in the literature and articles. In this paper, by applying the force of monsoon wind to the 3D numerical model (ASMERC-1 Oceanic Model), we predict the currents of five layers at the west of northern Indian Ocean. Shetye, et al (199 4) speculated that the flow of bottom water (deeper than about 3500m) in the Arabian Sea moves northward and upwells into the layer of North Indian Deep Water (approximately 1500-3500m) [5].

2. Materials and Methods

In ASMERC model (Atmospheric Sciences & MEteorological Research Center), we consider the west of northern Indian Ocean, which is located between 0° to 27° N and 43° to 80° E with topography obtained from ETOPO-1 (1 arc-minute global relief model of Earth's surface). The governing equations are momentum equation and continuity equation [6][7]:

$$\frac{D\mathbf{U}}{Dt} = -2\mathbf{\Omega} \times \mathbf{U} - \nabla\Phi - \frac{1}{\rho}\nabla p + \frac{1}{\rho}[(\nabla \cdot \mathbf{A} \cdot \nabla)\mathbf{U}]$$
(1)

In which, the first, second, third and fourth terms are, Coriolis force, gradients of geopotential, gradient of pressure, and friction at right hand side, respectively.

$$\frac{D\alpha}{Dt} = \alpha \nabla \cdot \mathbf{U} \tag{2}$$

in which, α is the specific volume.

The definition of the σ -sigma vertical coordinate is $\sigma = \frac{p - p_A}{p_b - p_A}$, $0 \le \sigma \le 1$. In which, (at the sea surface) $p = p_A \rightarrow \sigma = 0$ and (at the bottom) $p = p_b \rightarrow \sigma = 1$

According to the definition of sigma, vertical coordinate of this model is divided to five layers (11 levels). In the steady wind condition, there is a transferring of momentum continually from surface to the bottom due to viscosity of ocean water. Different flows between layers caused producing various friction therefore; to obtain flow velocity in different layers we need to know layers' tensions and frictional forces these are created in these layers



$$\vec{F} = \frac{-g}{p_b - p_A} \frac{\partial \vec{\tau}}{\partial \sigma}$$
(3)

In which vectors τ and *F* are shear stress and friction force at each layer, respectively. The model uses modified Arakawa C grid. The horizontal distance between gird points is 0.5 degree in the northward and southward. The vertical distance between the levels is 0.1, according to the σ -vertical coordinate. In this model, the horizontal finite difference scheme for discretization of the differential equations is staggered and, the model uses the two-step Lax-Wendroff scheme and DuFort-Frankel scheme to simulate the advection terms and diffusion terms, respectively. By using the C.F.L condition, the time step is 120 s. In this study, we suppose that the boundaries are rigid and no-slip condition is governed. Therefore, the tangential and normal components of velocity are zero at rigid boundaries and no current can penetrate the rigid boundaries as well as bottom. At the open boundaries, also the kinematic and dynamic boundary conditions are used, and the currents cannot pass through the surface and bottom.

3- Results

This model is forced with monsoon wind that its wind data was obtained with intervals of three hours using the ECMWF model for one month from June 15 to July 15, 2006. After running the model on June 15, and continuing to forecast until July 15, 2006 for a month, we obtained many current field that some of them depicted in Fig. 2. The wind field and five layer current fields are shown in Fig. 2. Furthermore, in this article, we just focus on current induced by monsoon wind using ECMWF wind data.





Figure (2) :15 July 2006, Wind Field(A), and predicted Current Fields in five layers (B, C, D, E, F)



Figure (3): Contours of vertical velocity component predicted in July 15, 2006 to demonstrate the upwelling zones (red color and positive values) in upper layers (A, B) and lower layers, (C, D)



The wind field shows a southwest wind of monsoon on July 15th. In higher latitudes, the wind field is stronger. In the two first layer (upper layers), the wind stress is stronger than other forces, and the water flows in the wind direction, with a slight deviation to the right in the northern hemisphere (due to the Coriolis force) and the speed intensity of the current field decreases with depth, due to the friction term. In the lower layers (third to fifth layers), the horizontal pressure gradient is more important than wind stress. As a result, the flow of water moves in the opposite direction of the higher layers to compensate the outgoing surface water. The current field of two first layers (upper layers) in Figure (2), have good agreements with field currents of surface layer in Figure (1), and the flow field currents in lower layers (layers of 3, 4 and 5) have good agreements with field currents of what that were speculated for deep and the bottom water circulation by Shetye, et al (1994) [5]. In Figure (3), upwelling occurs at the western and northern boundaries at the upper layers in the ocean, and the occasion is reverse at the lower layers. The Ekman drift and Ekman suction are the most important mechanisms for the currents in the central and upwelling in western and northern parts of the west of northern Indian Ocean.

References

[1] H. S. Chaudhari, S. Pokhrel, A. Kulkarni, A. Hazra, and S. K. Saha, "Clouds-SST relationship and interannual variability modes of Indian summer monsoon in the context of clouds and SSTs: observational and modelling aspects," *Int. J. Climatol.*, vol. 36, no. 15, pp. 4723–4740, Dec. 2016.

[2] D. Shankar, P. N. Vinayachandran, and A. S. Unnikrishnan, "The monsoon currents in the north Indian Ocean," *Prog. Oceanogr.*, vol. 52, no. 1, pp. 63–120, 2002.

[3] T. G. Jensen, "A Numerical Study of the Seasonal Variability of the Somali Current," 1990.

[4] T. G. Jensen, "Modeling the seasonal undercurrents in the Somali Current system," *J. Geophys. Res.*, vol. 96, no. C12, p. 22,151-22,167, Dec. 1991.

[5] S. R. Shetye, A. D. Gouveia, and S. S. C. Shenoi, "Circulation and water masses of the Arabian Sea," *Indian Acad. Sci. (Earth Planet. Sci.)*, vol. 103, no. 2, pp. 107–123, 1994.

[6] A. Farhady and M. T. Zamanian, "Development of a three dimensional numerical modeling to study the thermodynamics of wind-driven currents - in press," *J. Mar. Scinces Technol.*

[7] J. R. Apel, *Principles of Ocean Physics*, vol. 38, no. 5. London Academic Press, 1999.

Proceeding of the First International Conference on Oceanography for West Asia 30-31 October 2017 IRAN - Tehran

Interannual Variations of the Water Surface Layer: An Arctic Ocean Field Experience

Nahavandian, Somayeh^{*1}; Gratton, Yves²

 Assistant professor of Department of Marine Physics, Faculty of Natural Resources and Marine Sciences, Tarbiat Modares University, Noor, Mazandaran, Iran,
Professor of Institut National de la Recherche Scientifique (Université du Ouébec). Centre Eau Terre

Environnement, Quebec City (QC), Canada

s.nahavandian@modares.ac.ir

Abstract

The climate change has already affected our planet. It has had significant effects on the physical characteristics of oceans and seas, including water level, rainfall and retreat of sea ice especially in the Arctic. The Arctic Ocean plays an important role in the global climate and the climate change in this region is the most pronounced. Since the sea ice reflects more sunlight toward the space than the water, thereby it plays an important role to keep water temperature enough cold to maintain polar ice balance. The present report is a brief overview of the current scientific programs that study the impacts of climate change in the Canadian Arctic. The analysis of the surface salinity and mixed layer depth using the data collected during different programs, shows that during 2007-2008 MLDs are significantly deeper than in 2003-2004 with the exception of June and July where they were similar. This difference is due to a strong upwelling in fall 2007 which mixed completely water column and leads increasing the water column salinity and its effects maintained as late as the spring of 2008.

Keywords: Climate change, Arctic Ocean, CASES, CFL, ArcticNet, Mixed Layer Depth

1-Introduction

Observations confirm that the Arctic Ocean and its marginal seas are already warming and the areal extent of the bottom Atlantic warm layer has increased [1]. On the other hand, the Arctic sea ice has gradually decreased since the 1980s [2]. The total sea ice distribution (areal and thickness) in the Arctic Ocean has declined over the past several decades. The absolute minimum Arctic ice pack extent was observed in August 2012 (National Snow and Ice Data Center (NSIDC) September 19, 2012), after previous minimums in 2005 and 2007 [3]. Ice extent shrunk to its eight lowest minimum extents on September 13th, 2017 (NSIDC). These changes over the recent years directly affected the physics, ecosystems and communities in Arctic and subarctic [4, 5]. Since the presence of sea ice is crucial for some mammals such as polar bears and walruses, the health of Arctic ecosystems is directly affected by the sea ice changes (United State Environmental Protection Agency report). Despite the Arctic and Antarctic are both Polar Regions, they are quite different. One notable difference is that the Arctic is a closed ocean and is completely surrounded by land while the Antarctic is an open ocean. That is the

Although the reduction of sea ice extent has many negative consequences, it has provided some commercial and scientific opportunities. For instance, decreasing the amount of Arctic ice opens shipping lanes and gives the researchers unprecedented access to the Arctic Ocean.

As a result, a comprehensive study on the mixed layer in the Canadian Arctic has been accomplished by the author based on a number of recent and unique data sets gathered in the southern Beaufort Sea. The data includes the winters of 2003-2004 and 2007-2008, as well as summers and falls of 2002 to 2009 [7]. The mixed layer is an oceanic surface layer, in which the salinity, density, and temperature are almost uniform due to the high mixing initiated by the air-sea exchange. The interannual variation of the MLD is analyzed in this paper.

2- Methodes and Materials

As it was mentioned previously, the scarcity of data in the Arctic is due to the difficult access and inhospitable climate. The Canadian Arctic Shelf Exchange Study (CASES) was the first program in the Canadian Arctic Ocean during which the sampling was carried out in the Mackenzie Shelf and Amundsen Gulf. The expeditions were carried out aboard the Canadian Coast Guard Ship CCGS Amundsen. The International Polar Year Circumpolar Flaw Lead (IPY-CFL) was an international project which was accomplished in 2007-2008 polar year and was initiated by Canada. Another scientific program that has brought together more than 145 scientists from all over the world in different fields of science is ArcticNet (2004-2018). The author was involved and participated in sampling during summer 2011. It worth mentioning that the only other ship which overwintered in the Arctic was the CCGS Des Groseilliers during the winter of 1998 in the American SHEBA (Surface Heat Budget of the Arctic Ocean) program [8]. The study region that this paper is focused on is shown in Figure 1.



Fig. 1. Map of the study region including the Beaufort Sea and the Amudnsen Gulf.



3- Results

The interannual comparison of the MLDs is performed using data from 2002, 2003-2004, 2005, 2006, 2007-2008 and 2009. Two complete years of CTD profiles are available: 2003-2004 (CASES) and 2007-2008 (CFL). The profiles during fall 2002 and 2006, and during summer 2005 and 2009 are also available. Figure 2 shows the MLD monthly variability in the Amundsen Gulf and Beaufort Sea during different years. The values are colour-coded to show the yearly variability. This figure clearly shows that the MLD is generally larger in 2007-2008 especially during winter and spring. In the beginning of the fall and in the summer, the MLD is comparable in all years.



Fig. 2. MLDs during fall 2002, all of 2003-2004 and 2007-2008, summer 2005, fall 2006 and summer 2009.

In order to analyze the interannual variability of the MLD during two complete years 2003-2004 and 2007-2008, we performed a set of monthly Student t-test comparisons between these two years (not shown). The monthly averages of the two series are significantly different during the fall, winter and spring while the MLD mean values are very similar during the summer.

Figure 3 shows salinity contour with the MLD isolines in fall 2003 and 2007. As it is obvious in the figure the salinity is significantly higher and also MLD is much deeper in 2007 compared with 2003. This difference is due to different wind events as well as to the freshwater and seasonal ice distributions that vary even within each region. The event of the fall of 2007 was the strongest event observed in the region since the sampling began, and its effects were felt as late as the spring of 2008 [9]. The strong easterly winds blowing parallel to the coast in fall 2007 are responsible for the upwelling event as well as for delaying ice formation by as much as six weeks.





Fig. 3. Salinity at 5 m in the fall of 2003 (left) and in the fall of 2007 (right) with the MLD isolines. The estimation was performed using ordinary Kriging.

4- Conclusion

Despite the fact that the Arctic is an isolated Ocean, it plays a very important role in Earth's climate regulation. The climate change in the Arctic is faster and more severe than in most of the rest of the world. The extent of area of summer sea ice and the age of the Arctic ices are important indicators of the Arctic conditions, which are shrinking very fast during recent decades. In this paper, the interannual variability of the MLD was assessed based on data measured between 2002 and 2009. The comparison between two-year complete data (2003-2004 and 2007-2008) established that the mean monthly MLDs during 2007-2008 were significantly deeper in fall, winter and spring while in summer they are comparable. The comparison of the MLDs in falls of 2002, 2003, 2006 and 2007, revealed that the mean MLDs were significantly larger in the fall of 2007 compared with the other years. The deep MLD between fall 2007 and spring 2008 is related to a strong upwelling that occurred in fall 2007 which brought salty and warm deep waters to the surface and mixed the water column.

Through the analysis of the salinity mixed layer depth with the data collected during the CASES and CFL programs; confirms that partial absence of sea ice (here in 2007-2008) has significant effects on physical parameters such as salinity and the MLD. The loss of ice cover is what actually taking place now in the Arctic due to the global warming with numerous known and unknown consequences.

References:

Serreze, M. C., Walsh, J. E., Chapin, F. S., Osterkamp, T., Dyurgerov, M., Romanovsky, V., Oechel,
W. C., Morison, J., Zhang, T., and Barry, R. G. (2000). Observational evidence of recent change in the northern high-latitude environment. Climatic Change, 46(1):159207.

[2] Comiso, J. C., Parkinson, C. L., Gersten, R., and Stock, L. (2008): Accelerated decline in the Arctic sea ice cover, Geophys. Res. Lett., 35, L01703, doi:10.1029/2007GL031972.


[3] Wang, J., Zhang, J., Watanabe, E., Ikeda, M., Mizobata, K., Walsh, J. E., Bai, X., and Wu, B. (2009). Is the Dipole Anomaly a major driver to record lows in Arctic summer sea ice extent? Geophysical Research Letters, 36(5):L05706.

[4] Ford, J. D., Pearce, T., Gilligan, J., Smit, B., & Oakes, J. (2008). Climate change and hazards associated with ice use in northern Canada. Arctic, Antarctic, and Alpine Research, 40(4), 647-659.

[5] Forest A., Coupel P., Else B., Nahavandian S., Lansard B., Raimbault P.,Papakyriakou, T., Gratton, Y., Fortier L., Tremblay J.-É., and Babin, M. (2014). Synoptic evaluation of carbon cycling in the Beaufort Sea during summer: contrasting river inputs, ecosystem metabolism and air-sea CO2 fluxes. Biogeosciences, 11(10), 2827-2856.

[6] Kraus, E. B. and Turner, J. S. (1967). A one-dimensional model of the seasonal thermocline II. the general theory and its consequences. Tellus, 19(1):98.

[7] Nahavandian Esfahani, S. (2014). Temporal and spatial evolution of the mixed layer in the southern Beaufort sea and the Amundsen Gulf. PhD thesis, Université du Québec, Institut national de la recherche scientifique.

[8] Macdonald, R. W., McLaughlin, F. A., and Carmack, E. C. (2002). Fresh water and its sources during the SHEBA drift in the Canada Basin of the Arctic Ocean. Deep-Sea Research Part I: Oceanographic Research Papers, 49(10):17691785.

[9] Tremblay, J. É., Bélanger, S., Barber, D. G., Asplin, M., Martin, J., Darnis, G., Fortier, L., Gratton, Y., Link, H., Archambault, P., et al. (2011). Climate forcing multiplies biological productivity in the coastal Arctic Ocean. Geophysical Research Letters, 38(18):L18604.

Numerical Modeling of Barotropic Response to Shamal Wind in the Persian Gulf

Sezavar, Alireza^{1*}, Hirose, Naoki²

1. Research Institute for Applied Mechanics, Kyushu university, Kyushu, Japan, 2. Research Institute for Applied Mechanics, Kyushu University, 6-1 Kasuga-kouen, Kasuga 816-8580,

Japan

ali.r.sezavar@gmail.com

Abstract

The Persian Gulf is a semi-enclosed sea, located in the Middle-East region and is connected to the Gulf of Oman through the Strait of Hormuz. The water depth in the Persian Gulf is quite shallow with an average depth of about 35 m. In the Persian Gulf, one of the most important forcing is Shamal wind. The Shamal wind is a strong northerly or northwesterly wind. It mainly occurred during November to March and is associated with mid-latitude disturbances traveling from west to east. According to Perrone's studies, Winter Shamal can be divided into two types [1]: (a) those, which last 24 to 36 hours, and (b) those, which last 3 to 5 days (Monsoon). Several modeling studies have been done on circulation and water mass formation in the Persian Gulf. The oceanic response to a wintertime short-term atmospheric forcing on the circulation and heat budget has been studied in Persian Gulf [2]. However, none of the above studies has examined the response of the short-term Shamal winds (a, b) on the external mode as geophysical hydrodynamics of the Persian Gulf. The purpose of this study is evaluation of the short-term phenomena such as Kelvin wave, gravity wave and geostrophic adjustment associated with Shamal forcing (a, b) in the Persian Gulf.

Keywords: Barotropic, Kelvin wave, Coriolis force, Shamal wind, Numerical modeling, Persian Gulf

1.Introduction

According to available information, previous studies on Shamal specifications are so limited [1,2]. One of these mentioned study focused on effect of Shamal in wintertime and another one mentioned that summer Shamal is not as important as the one in winter from a storm surge point of view. It seems that more analysis is necessary to clarify the Shamal characteristics. In this way some studies by using of wind data set performed. In addition, JRA data agreement with Thoppil's [3] results checked for The Persian Gulf region. By using the spatial data of sea surface wind speed, which obtained from Japanese Reanalysis (JRA), we examined the data during 16 years from 1991-2007 to find out more stronger Shamal. As a result, strong Shamal was occurred at point (26.5_N, 52_E) in three cases. Case (A) in 24 Dec. 2004, case (B) in 11 Jan. 2005 and case (C) in 24 Jul. 2006 happened, respectively. As a result, it found that the summer Shamal is important as well as winter time, also the strongest magnitude of wind speed occurred



in the summer time (case (C)) on the contrary of Perrone [1]. On the other hand, The JRA data show good agreement with Thopil [3].

2.Methodes and Materials

This study is based on a linear 2D shallow water equations (1-3) model with grid resolution 3.7 km in both longitude and latitude directions which used at the Persian Gulf and developed by Kim and Yoon (1996).

$$\frac{\partial u}{\partial t} - fv = -g \frac{\partial \eta}{\partial x} + v_h \left(\frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 v}{\delta y^2} \right) - \frac{ru}{h} + \frac{\tau_x}{\rho h}$$
(1)

$$\frac{\partial v}{\partial t} + fu = -g \frac{\partial \eta}{\partial y} + v_h \left(\frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 v}{\delta y^2} \right) - \frac{rv}{h} + \frac{\tau_y}{\rho h}$$
(2)

$$\frac{\partial \eta}{\partial t} + h \left(\frac{\delta u}{\delta x} + \frac{\delta v}{\delta y} \right) = 0 \tag{3}$$

where

Variables (u, v): velocity components (ms ⁻¹);	<i>f</i> : Coriolis	parameter	(s^{-1}));
--	---------------------	-----------	------------	----

- g: gravity acceleration (ms⁻²); v_h : viscosity (m²s⁻¹);r: bottom drag coefficient (ms⁻¹);h: depth (m); τ : wind stress (Nm⁻²); ρ : density (kg m⁻³);
- η : Stream lines for the steady geostrophic flow.

The model has run for one layer in closed boundary at 57_E. The Persian Gulf topography is so complicated, therefore in order to better understanding of oceanic response for the short-term wind forcing, at first the simple model made. The model contains rectangular coastal lines (24_N-27.4_N, 47.8_E-57_E) and flat bottom with depths of 30 m used by 2D shallow water equation with 3721 m horizontal resolution. Three types of experiments are examined in this study. Some parts of them are explained as follows; Type 1: Gaussian function used for generating sea level changes. Plain waves were set on two different types: small initial scale (Exp.1) and large initial scale (Exp.2). These experiments performed in order to observe of external waves such as gravity waves, Poincare waves and also the waves near the lateral boundaries such as Kelvin wave. Type 2: Constant northerly (Exp.3) and westerly (Exp.4) winds with an e-folding scale 90 km at different blowing times as 24 hours and 16 hours, respectively. Also northwesterly (Exp.5) wind was blown across the region for 48 hours and then stopped but all of models still were run for two weeks. Type 3: In this experiments (Exp. 6 and 7), the realistic topography examined by using ETOPO2 response to JRA data set cases (A-C) but in Exp. 8, the bottom friction coefficient effect on this region in realistic mode has been studied. All above descriptions are summarized within table 1 to 3.



Experiments			Initial distribution	Width (km)	Gaussian scale (km)
		а	small initial scale	100	100
		b	small initial scale	100	200
		с	small initial scale	100	360
		d	small initial scale	200	100
	Exp.1	е	small initial scale	200	200
		f	small initial scale	200	360
		g	small initial scale	360	100
		h	small initial scale	360	200
Type 1		i	small initial scale	360	360
		а	large initial scale	100	100
		b	large initial scale	100	200
		С	large initial scale	100	360
		d	large initial scale	200	100
	Exp.2	е	large initial scale	200	200
		f	large initial scale	200	360
		g	large initial scale	360	100
		h	large initial scale	360	200
		i	large initial scale	360	360

Table 1) Descriptions of experiments 1 and 2 as type 1.

Table 2) Descriptions of experiments 3, 4 and 5 as type 2.

Experiments		Forcing	Direction	Boundary
	Exp.3	Constant wind	N	Rectangular
Туре 2	Exp.4	Constant wind	W	Rectangular
	Exp.5	Constant wind	NW	Rectangular

Table 3) Descriptions of experiment 6, 7 and 8 as type 3.

Experiments			Forcing Boundary	Boundary	etc.
		а	JRA Wind data (case A)	ETOPO2	winter time
	Exp.6	b	JRA Wind data (case B)	ETOPO2	winter time
Type. 3		с	JRA Wind data (case C)	ETOPO2	summer time
	Exp.7	а	JRA Wind data (case A)	-	Flat bottom
	Exp.8	а	JRA Wind data (case A)	ETOPO2	bottom friction coefficient



3.Conclusion

In this study numerical modeling of barotropic response to Shamal was evaluated. Our evaluation contains two parts of experiments. In first part, all experiments were done in simple model (Rectangular boundary) which included types 1 and 2 whereas at the second part the realistic model was run.

In Type 1, the results of experiments 1a-i (small initial scale) showed that the propagation of Kelvin wave occurred near coastal lines. In Experiments 2a-i (Large initial scale) Kelvin wave propagated near boundaries. The examination was done by reducing the width of boundary from 367 km to 100 km comparing to Rossby Radius of deformation (260 km). The results show that generated current is similar to non-rotating current. Also, it found that by increasing of the Gaussian scale, the signal of Kelvin wave becomes stronger.



Fig. 1) Top row shows sea level (m) differences (A-B) between Coriolis force (A) parameter and without it (B) in northern boundary. Bottom row shows sea level (m) differences (C-D) between Coriolis force (C) parameter and without it (D) in southern boundary (Exp. 3). Shaded color is sea level (m). (A-B) is inertial gravity, (C-D) is Kelvin wave.

In type 2, the results of experiments 2a-i (large initial scale) showed that the propagation of Kelvin wave occurred near boundaries. Furthermore, in experiments of 1 and 2, the speed of Kelvin obtained 17.14 m/s and time arriving of Kelvin wave near the western boundary was about 36 hours after initial propagation. Additionally, by making differences between results which obtained from Coriolis force and without Coriolis force experiments, the inertial gravity wave occurred. The obtained result is shown in Fig. 1.

Type 3 is related to realistic experiments used by ETOPO2 and JRA wind data set. At first for validation of JRA wind data set for Persian Gulf region, the obtained results were compared with results by Thoppil and Hogan [3] in November and December of 2004. These results show that good agreement as well (Fig. 2).





Figure 2) Comparison of cross-calibrated, multi-platform (CCMP, Atlas et al 2009) (black) and NOGAPS

0.5 (grey) wind-stress (N/m2) and wind-speed (m/s) at (27 N 51 E) (Thoppil and Hogan, 2010).

Then analyzing of JRA wind data set from 1996-2006, was done in order to finding the strongest and specifications of Shamal. Three cases which are November 2004 (Exp.6a, Fig. 3), January 2005 (Exp. 6b), July 2006 (Exp. 6c) were found.



Figure 3) The model was run Exp. 6a by JRA wind data (grey) wind speed m/s in which at peak velocity 16m/s found within late-November and early-December 2004.

Also, some specifications of Shamal are: 1. over 10 m/s speed, 2. before onset of Shamal southerly or southeasterly wind occurred, 3. Shamal wind also happened in winter time as well as summer (case C). In all cases, the results showed that after onset of Shamal, the southeastward current flows occurred near southern boundary and then it propagated to eastern boundary (northwesterly) and after that the strongest current (southeasterly) occurred in near northern boundary. The total time of establishment of current is about 2-3.5 days and then the current decays. Additionally, with considering of a flat bottom topography in experiment 7A, the Kelvin wave occurred with speed of 6.1 m/s. Moreover, the effect of bottom topography in all experiment 8A in three ranges 0.05, 0.005, 0.0005 m/s was evaluated. Results showed that in in the strong cases, the current has slow motion southeastward without any establishments of circulation or northwestward current near the northern boundary. It means that the bottom friction has a great effect on circulation and its survival time.

References

[1] Perrone, T.J., 1979. Winter Shamal in the Persian Gulf, Naval Env. Prediction Res. Facility,

Technical Report, 79-06, Monterey, 180pp.



[2] Thoppil, P.G. and Hogan, P.J., 2010, A Modeling Study of Circulation and Eddies in the Persian Gulf, Journal of Physical Oceanography, Volume 40,2122-2134.

[3] Thoppil, P.G. and Hogan, P.J., 2010, Persian Gulf response to a wintertime Shamal wind event, Deep-Sea Research I, 57 (2010), 946955.

Theme

Ocean Biogeochemistry



A Study On Seasonal Changes Of Physicochemical Parameters In Makoran Coastal Waters

Ershadifar, Hamid; Ghazilou, Amir; Kor, Kamalodin; Koochaknejad, Emad; Negarestan, Hossein

Chabahar Oceanography Center, Iranian National Institute for Oceanography and Atmospheric Sciences (INIOAS), Chabahar, Iran; hamid.ershadifar@inio.ac.ir

Keywords: Seasonal changes; Physicochemical parameters; Makoran coastal waters; Monsoon; Nutrient

1-Introduction

Makoran coastal environments are generally of economic importance and are significantly involved in interaction with open ocean. It plays a vital role in a people's economy by virtue of its resources, productive habitats and rich biodiversity. In recent years, coastal areas have been assuming greater importance, owing to their increasing human population, urbanization and accelerated developmental activities. The strength of the physical forcing and biological response vary seasonally. The boundary and open ocean processes of the region is influenced by upwelling during summer and cooling in winter which bring a great amount of nutrients into the upper ocean, enhancing primary productivity and ultimately the fisheries [1]. The reversal in surface circulation during the monsoon, seasonality in the nutrient distribution, and light intensities has important effects on primary production in this region.

2-Materials and Methods

The sampling was done within 7 stations around Chabahar Port in pre-monsoon (May 17, 2017) and monsoon (August 21, 2017) seasons. The location of each station is given in Fig. 1. The sampling was carried out from two depths. Samples were taken from surface (0.5 meter beneath the surface, depth 1) and from the bottom (1.0 meter above the bottom, depth 2). In order to determine nutrient content, 100 ml of seawater was filtered using syringe filter (0.45 μ m), transferred to the laboratory and stored at -20 ^oC in the Lab until the analysis. The concentrations of nitrite (NO₂-N), silicate (SiO₃-Si) and phosphorus (PO₄-P) were determined using spectrophotometric methods [2]. Measurements were performed in triplicates. The data were first assessed for normality and homogeneity of variance assumptions using Shapiro–Wilk and



physicochemical parameters and nutrient concentrations between two months. Accordingly, univariate ANOVAs were applied to examine the spatial changes. Finally, a PCA was performed to assess the intrinsic variation in environmental data.

3-Results and Discussions

Table 1 summarizes the maximum and minimum values for physicochemical parameters. For surface water samples a significant (p<0.05) effects of time was detected for all examined data except nitrite concentration. In terms of spatial variation were significant differences in silicate concentrations and pH values among stations. For the bottom layer, the effects of time were significant on all examined parameters except pH and salinity while there were also no significant differences in mean nitrite concentration among selected stations.

TABLE 1) The maximum and minimum **amount of different physicochemical** parameters.

Parameter	Max	Min
	(Month:Station:Depth)	(Month:Station:Depth)
Salinity	37.2 (2:6:2)	36.1 (1:3:1)
pH	8.34 (1:5:1)	7.95 (2:2:2)
DO (mg/L)	6.48 (2:2:1)	2.08 (2:3:2)
Temperature (°C)	31.5 (1:2:2)	24.1 (2:7:1)
Nitrite (ppb)	75.2 (2:7:2)	0.0 (1:7:1)
Silicate (ppb)	421.4 (1:4:2)	0.0 (2:2:1)
Phosphate(ppb)	150.0 (2:3:2)	0.0 (2:5:1)

Fig. 1) Map showing the study site



The first two PCs explained 82.5 % of the overall variations. The results indicated moderate





spatio-temporal changes in environmental conditions as demonstrated in Fig 2. Temperature, salinity, pH, DO as well as nitrate concentration were considered as the main responsible data for the observed variations.

4- References

[1] Rai, S. V., Rajashekhar, M. (2014), seasonal assessment of hydrographic variables and phytoplankton community in the arabian sea waters of kerala, southwest coast of india, *Brazilian journal of oceanography*, Vol. 62, 279-293.

[2] MOOPAM, Manual of oceanographic observation and pollutant analyses methods. (ROPME, 2010, Kuvait City, Kuwait).

Theme Climate Change



A Numerical Modeling Approach to Forecast the Effect of Climate Change on Surface Temperature of the Gulf of Oman

Farkhani Shirin* ' Hadjizadeh Zaker Nasser

Graduate Faculty of Environment, University of Tehran, Tehran, Iran s_farkhani @ut.ac.ir

Abstract

In accordance with accomplished climatology predictions by global models along with measurements, the ocean's temperature is increasing. Regarding the important role which water temperature plays in aquatic ecosystems, the impact evaluation of climate change on water temperature seems to be essential. In terms of biological variety and fishery resources, the Gulf of Oman is considered as one of the most significant water bodies in the world. It is also one of the most important waterways in the world. This paper presents the assessment of effect of climate change on surface temperature of the Gulf of Oman, using MIKE three-dimensional numerical model. Parameters such air temperature, relative humidity, wind speed, precipitation rate and the sky clearness have been used for hydrodynamics simulation of the region. For this purpose, time series of mentioned parameters downloaded from ECMWF, were used as the model's input for the control period (1980 – 2000) simulation. CORDEX projections under RCP 2.6, RCP4.5 and 8.5 were used as future (2080-2100) input data. The effect of the climate change on the surface temperature was evaluated by studying the differences between the patterns in three scenarios and the control period. The results indicated that surface water temperature in future, for three scenarios, will have an increasing trend. This increment becomes smaller towards the East because of higher depth of that region. In addition; the temperatures in RCP 8.5 contain the most variation in the future in comparison with the past condition. The highest variations will occur in summer with the value of 3.475 $^{\circ}$ c.

Keywords: Climate change, Global warming, Sea surface temperature, Gulf of Oman

1. Introduction

Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer) [1]. As climate change has warmed the Earth, oceans and seas have responded more slowly than land environments. But scientific research is finding that marine ecosystems can be far more sensitive to even the most modest temperature change [2].

The effect of climate change on sea surface temperature has been assessed in many regions such as Baltic Sea [3], Mediterranean Sea [4], Irish Sea [5] and the Persian Gulf [6].



Oman Sea with tropical weather condition, water current and diverse habitats is one of the most diverse areas. Existence of habitats like Mangrove forest, Coral Reef, Tidal Mud Flat, Rocky Shores, Sandy Shores, and Kelp Bed provides safe and diverse place for feeding, breeding, and living grounds for aquatic animals as fishes [7].

This paper presents the assessment of effect of climate change on surface temperature of the Gulf of Oman, using MIKE three-dimensional numerical model.Parameters such as water temperature data in open boundary, mean salinity for water column, air temperature, relative humidity, wind speed components, precipitation rate and the sky transparency have been utilized for hydrodynamics simulation of the region. ECMWF data in the Gulf of Oman for the period of (1980-2000) and downscaled CORDEX data in three scenarios (RCP 2.6, RCP 4.5 and RCP 8.5) for the period of (2080-2100), has been implemented to model. Finally Oman sea temperature for two cases has been compared.

2. Methodes

2-1. Modeling Domain

The Gulf of Oman, as an extension of Indian Ocean, connects the Persian Gulf to the Arabian Sea and Indian Ocean. In addition, because of its natural geographic location, northern coasts of Gulf of Oman are potential hubs for marine transport.

The modeling domain, the computational mesh and bathymetry for hydrodynamics simulation has been shown in Figure. 1.



2-2. Simulation Duration

The modeling has been carried out for two sets of periods, (1980-2000) and (2080-2100). A time step of 60 second was required to satisfy the Courant–Friedrich –Lewis (CFL) criterion and avoid divergence.



2-3. MODEL INPUT

Hydrodynamic model was forced by considering: water surface changes at open sea boundary (Chabahar port), wind field [8], relative humidity, precipitation rate, the sky transparency and bottom friction. Climatological data was obtained from ECMWF data sets and CORDEX project for current and future climate.

The number of horizontal cells was 6727. The boundary condition information including surface elevation, mean temperature and salinity put into the model. Various sensitivity tests were carried out to analyze the effect of variations of different parameters on the results including bed resistance and eddy viscosity. After Calibration which is the comparisons of measured and simulated surface elevation time series at a point located near the Jask port, a very good agreement has been observed. (Figure. 2)



3. Results

In order to evaluate the impact of climate change on the Oman Sea's Temperature, a comparison is made between the temperature resulted from numerical modeling, for the periods of (1980-2000) and (2080-2100).The results of comparison of mean sea surface temperature for Spring , Summer , Autumn and winter are presented in Figure. 3, Figure. 4, Figure. 5 and Figure.6 respectively.

The results demonstrate that surface temperature in future, will increase in all seasons. This increasing becomes smaller towards the East because of higher depth of this region. The amount of mean temperature increment until year 2100 is shown in Table 1.

Based on conducted numerical modeling results, it is predicted that the temperature in future climate, will have the highest increment in projections of RCP 8.5 in all seasons. The forecasted temperature in summer had the highest variation with the value of 3.475°C in comparison with other seasons in future.





Fig. 3)Temperature comparison between(a) current climate and Future climate (b)RCP 2.6, (c) RCP 4.5, (d) RCP 8.5 in spring



Fig. 4)Temperature comparison between(a) current climate and Future climate (b)RCP 2.6, (c) RCP 4.5, (d) RCP 8.5 in summer



Fig. 5)Temperature comparison between(a) current climate and Future climate (b)RCP 2.6, (c) RCP 4.5, (d) RCP 8.5 in autumn





Fig. 5)Temperature comparison between(a) current climate and Future climate (b)RCP 2.6, (c) RCP 4.5, (d) RCP 8.5 in winter

season	RCP 2.6	RCP4.5	RCP8.5
Spring	2.215	2.453	3.335
Summer	2.103	2.773	3.475
Autumn	2.016	1.79	3.121
Winter	1.821	2.134	2.79

Table1) Mean Temperature difference between current and future climate (°c)

4 – Conclusion

In this study, the impact of climate change on temperature of the Oman Sea was estimated, using Mike 3.

This model was forced by ECMWF and CORDEX derived climatological data.

By comparison of simulation results in current and future climate, it is seen that the surface temperature of the Oman Sea will rise in all seasons of the year, in future. This increment becomes smaller towards the East because of higher depth of that region. It is also predicted that the temperature in future climate, will have the highest increment in projections of RCP 8.5 in all seasons. The highest variations will occur in summer with the value of 3.475° c.

Refrences

[1] https://www.ipcc.ch/ipccreports/tar/wg1/518.htm

[2] http://www.nationalgeographic.com/environment/oceans/critical-issues-sea-temperature-rise

[3] Hordoir, R. and Meier, H.E.M., (2012), Effect of climate change on the thermal stratification of the Baltic Sea: a sensitivity experiment, *Climate Dynamics*, *38*(9-10), pp.1703-1713.

[4] Lejeusne, C., Chevaldonne, P., Pergent-Martini, C., Boudouresque, C.F. and Perez, T., (2010), Climate change effects on a miniature ocean: the highly diverse, highly impacted Mediterranean Sea, *Trends in ecology & evolution*, *25*(4), pp.250-260.

[5] Olbert, A.I., Dabrowski, T., Nash, S. and Hartnett, M., (2012), Regional modeling of the 21st century climate changes in the Irish Sea, *Continental Shelf Research*, *41*, pp.48-60.



[7] Amini, M., Nazemroaya, S., Madadi, H., Nekooei, A., (2009), Fish biodiversity of Iranian Coast of Oman Sea.

[8]Farkhani, S., Hajizadeh zaker, N., (2017), Assessment of the impact of climate change on wind field in the Gulf of Oman, International Conference on Contemporary Iran on Civil Engineering Architecture and Urban Development. 30-31 October 2017 IRAN - Tehran



Assessment of CORDEX Wind Field in the Persian Gulf

Alinejhad-Tabrizi, Tahereh^{1*}, Hadjizadeh-Zaker, Nasser¹, Kamranzad, Bahareh³

Graduate Faculty of Environment, University of Tehran, Tehran, Iran, Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran, t.alinejhad@ut.ac.ir

Abstract

Increasing the greenhouse gases emission causes the climate changes. Climate variability can change the wind and consequently wave pattern. Due to the importance of beaches and ports and the significant impact of waves on these areas, assessment of the potential effect of climate change on the wind regime is important. in this paper wind characteristics obtained from CORDEX was used for assessing the effect of climate change on wind regime in the Persian Gulf. For this purpose, CORDEX results were compared with those of ECMWF at three points and the results showed that CORDEX wind speeds are overestimated for average, maximum and minimum values. Dominate wind directions represented by two wind fields are nearly similar. The variations of the annual wind speed in this area were also investigated until 2100. For this purpose, time series of annual averages of the wind speeds were plotted in three points for the period of 1981 to 2100. Results indicated a decreasing trend in all points of the domain for all RCPs.

Keywords: Climate change, ECMWF, CORDEX, Persian Gulf

1. Introduction

Climate change is an issue of major concern nowadays. Its impact on the natural and human environment is studied intensively, as the expected shift in climate will be significant in the next few decades. Recent experience shows that the effects will be critical in coastal areas which are a focus for growing populations and economies [1], resulting in erosion and sedimentation phenomena worldwide [2]. Climate variability can change the wind pattern and consequently its magnitude and frequency of occurrence. Knowledge of extreme winds and waves is required for marine industries. In addition, the increasing demand for renewable energy sources in the coming decades requires that we have a clear understanding of the susceptibility of wind resources to climate change. Therefore, assessment of the potential effect of climate change on variation of the wind regime is essential.

In the last decade, some studies have assessed the effect of climate change on wind patterns such as Geil et al. (2013) [3], Kamranzad et al. (2013) [4] and Davy et al. (2017) [5], using different global or regional climate models in different areas in the world. Global Climate Models (GCMs) can provide prediction information on scales of around 1000 by 1000km covering what could be a vastly differing landscape



(from very mountainous to flat coastal plains for example). Regional Climate Models (RCMs) and Empirical Statistical Downscaling (ESD), applied over a limited area and driven by GCMs can provide information on much smaller scales supporting more detailed impact and adaptation assessment and planning. The impacts of a changing climate, and the adaptation strategies required to deal with them, will occur on regional and national scales. This is where Regional Climate Downscaling (RCD) has an important role to play by providing projections with much greater detail and more accurate representation of localized extreme events. The Coordinated Regional Climate Downscaling Experiment (CORDEX) has served as a catalyst to achieve this goal.

In the context of climate change, this study assesses the impact on the wind field along the Persian Gulf. For this purpose, wind characteristics obtained based on CORDEX (a project for World Climate Research Program) are used for assessing the effect of climate change on wind regime. Since there were no evaluation on this data on the study area, its results were controlled by comparing them with a local model. The local model selected for this purpose was ECMWF which has showed acceptable consistency with the measured values and produced accurate wave field [6].

2. Methods

2-1. Study Area

Assessment of the effect of climate change on wind pattern was carried out in the Persian Gulf (Fig. 1). The Persian Gulf is an extension of the Indian Ocean through the Strait of Hormuz and lies between Iran to the northeast and the Arabian Peninsula to the southwest. It has many fishing grounds, extensive coral reefs, and abundant pearl oysters, and also it is important for the oilfields on its shore. Its strategic location has made it an ideal place for human development over time. Therefore, specifying the wind field variation caused by the climate change seems to be necessary in this area.



Fig. 1)Study Area.



2-2-Data Resources

The Coordinated Regional Climate Downscaling Experiment (CORDEX) wind data developed by Max Planck Institute for the new Earth system model (MPI-ESM) based on context of the CMIP5 process (Coupled Models Intercomparison Project Phase 5) was used to produce the data for the historical period from 1981 to 2005 and also for the future (from 2006 to 2100) in three Representative Concentration Pathways (RCPs), Containing RCP 2.6, RCP4.5 and RCP8.5, based on the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). The spatial and temporal resolutions were about 0.5 degree in latitude and longitude and daily average, respectively [7].

Local wind field was obtained from the European Centre for Medium-Range Weather Forecasts (ECMWF). This wind contains the wind vector in 10 meters from the sea level with 0.125 degree and 6-hourly spatial and temporal resolutions, respectively. This model is used widely for wave modeling and produces acceptable results [6].

3-Results

3-1- Evaluation of CORDEX in the Persian Gulf

In order to evaluate the CORDEX results in the Persian Gulf, it was compared with ECMWF wind field. This comparison was carried out in three points in the Persian Gulf (Fig. 1). These points were selected based on the spatial resolution of models. Two wind fields were compared quantitatively in these points from 1981 to 2005. The annual averages, maximums and minimums of wind speed were obtained and shown in table 1. According to this table, in comparison to ECMWF, CORDEX wind speeds are mostly overestimated in average, maximum and minimum values, except for the point 3, which located in Strait of Hormoz, near the coastal areas where numerical models have limited ability to produce the reliable data due to complicated orography. Therefore, CORDEX wind speeds require modification before using them as an input for wave modeling or any usage of the wind field in this area.

	Table 1) Wind speed statistics of two models (1981-2005)				
Р	oint	Statistical Index (m/s)	ECMWF	CORDEX	
		Max	15.30	19.50	
	1	Min	0.02	0.08	
		Ave	4.98	5.39	
		Max	15.05	21.74	
	2	Min	0.01	0.07	
		Ave	4.54	5.34	
		Max	14.79	24.19	
	3	Min	0.01	0.04	



For assessing the quality of the CORDEX, wind directions of the two sources were compared using wind roses. Wind roses are shown in Figure 2. This figure indicates that the dominant wind directions represented by two wind fields (CORDEX and ECMWF) are similar.



3-2- Impacts of climate change on the wind field in the Persian Gulf

Variations of the annual wind speed was also evaluated from 1981 to 2100 in the Persian Gulf using historical wind speeds and RCP2.6, RCP4.5 and RCP8.5 obtained from CORDEX wind field. For this purpose, annual averages of CORDEX wind speeds were calculated and the variation was assessed using time series. The trendlines shown in Figure 3 have been fitted to wind speeds derived from RCP8.5. Time series of annual averages of the wind speeds (Fig. 3) indicate a global decreasing trend in all three points of the domain for all the future Representative Concentration Pathways.





4. Conclusion

Wind characteristics obtained from CORDEX was used for assessing the effect of climate change on wind regime in the Persian Gulf. For this purpose, CORDEX results were compared with those of ECMWF at three points and the results showed that CORDEX wind speeds are overestimated for average, maximum and minimum values. Directional analysis using wind roses indicated a similar dominant direction for two wind sources. The variations of the annual wind speed were also investigated until the year 2100 in the area. For this purpose, time series of annual averages of the wind speeds were plotted. Results indicated a decreasing trend in all points of the domain for all RCPs.

References

[1] Casas-Prat, M., L. McInnes, K., A. Hemer M. and P. Sierra J., (2016), Future wave-driven coastal sediment transport along the Catalan coast, Regional Environmental Change, Vol. 16, 1739-1750.

[2] Nicholls, R. J. and Kebede, A. S., (2012), Indirect impacts of coastal climate change and sea-level rise: the UK example, Climate policy, Vol 12, S28-S52.

[3] Geil, L. K., Serra Y. L. and Zeng X., (2013), Assessment of CMIP5 model simulations of the North American Monsoon system. American Meteorological Society, Vol 26, 8787-8801.



3.1 wind field in the Persian Gulf, Journal of Coastal Research, Special Issue No.65, 249-253.

[5] Davy, R., Gnatiuk, N., Pettersson, L. and Bobylev, L., (2017), Climate change impacts on wind energy potential in the European domain with a focus on the Black Sea, Renewable and Sustainable Energy Reviews, https://doi.org/10.1016/j.rser.2017.05.253.

[6] Moeini, M.H., Etemad-Shahidi, A., Chegini, V. and Rahmani, I., (2012), Wave data assimilation using a hybrid approach in the Persian Gulf. *Ocean Dynamics*, Vol 62, 785-797.

https://esgf-index1.ceda.ac.uk/projects/cordex-ced

Theme Marine Geology



Subseafloor engineering geology of Iranian oil and gas fields in Persian Gulf

Fattahi Bandpey, Maryam¹, Hafezi Moghaddas, Naser², Ghafoori, Mohammad³, Moussavi Harami, Reza⁴, Kazem Shiroodi, Sadjad⁵ 1- Geology Department, Ferdowsi University of Mashhad, Mashhad, Iran, fattahi.maryam.b@gmail.com

2- Geology Department, Ferdowsi University of Mashhad, Mashhad, Iran, nhafezi@um.ac.ir

3- Geology Department, Ferdowsi University of Mashhad, Mashhad, Iran, Ghafoori@um.ac.ir

4-Geology Department, Ferdowsi University of Mashhad, Mashhad, Iran, Harami@um.ac.ir

5- Iranian offshore oil company IOOC, Tehran, Iran, sshiroodi@iooc.co.ir

Keywords: Marine geology, Engineering geology, Shallow sedimentology, Offshore geotechnics, Persian Gulf

1-Introduction

Geological and geotechnical conditions of the seabed and subseabed are one of the important and necessary information for design and operation of offshore structures [5]. The geological study discussed the history of sedimentation on the site and geological substitution process that affects the deposits. This data could be used for construction a geological engineering model that show the spatial uniformity of seabed properties across the region [4]. Geological information help engineers to make an accurate interpretation of the result of engineering tests and analysis. The purpose of this research is to understand sedimentological and geological engineering conditions of subseabed around the oil and gas fields in Iranian part of Persian Gulf for geotechnical aspects.

2- Study area

The Persian Gulf Basin is a marginal, epicontinental sea with a length of about 1000 and width of 200 to 300 km, covering an area of approximately 226,000 km2. The average water depth is about 35 m [3]. In general, the northern part of the Persian Gulf is deeper than the southern part. Iranian coastline, northern part, consists of the steeply dipping anticlines trending NW-SE. In the southern part, the Arabian marine shelf is wider and gentler, with less water depth than the Iranian shelf [6]. The Persian Gulf is surrounded by Arabian platform in the south and Zagros mountain range in the north and is structurally a part of the Zagros simply folded belt [1]. This basin can be separated into two major sedimentary basins: a northern, Iranian part, which is strongly influenced by fluviatile sedimentation, and a southern, Arabian part, carbonate domain



3- Methods

One of the main parts of this investigation is to provide a geotechnical database that carry out using data that we had gathered from geotechnical and oil companies (Iranian offshore oil company (IOOC)) in Iran. The depth of the study ranges between 5 to 100 meters below seabed with an average of 30 m that can effect on stability of marine structures like jack-up rigs. Because of limited geotechnical information in some regions of study area we have used sedimentology information to complete interpretation of some place with low density of geotechnical data. Also, supplementary information and maps that have used in this research include of bathymetry data (IOOC), sedimentological surface map, a restricted amounts of geophysical data (IOOC) and satellite images (Google earth). Finally, the geological model and cross sections of study area have prepared and engineering geology conditions of study area have interpred.

4- Results

In this section, subseabed geology and sediments texture near oil industrial structures in Persian Gulf are presented based on the geotechnical database have prepared in this study. Fig.1 shows the location of cross sections and also shows some of geological sections that have drawn and interpreted in this research.



Fig. 1) Location of cross sections and boreholes in study area and some of geological cross sections that have prepared in this research

5- Conclusion

In this research, geological engineering conditions of subseabed in the Persian Gulf, that includes many oil and gas fields and marine structures, have investigated. The depth of study have limited to about 100 meters below seabed that is necessary for design and stability analysis of marine



structures like jack-up rigs. Results indicated that abundance of interbeded and lenses of coarse grain layers near Iranian coastline are more than another parts of the study area. In addition, the frequency and thickness of coarse layers increased from Iranian part towards Arabian part.

Based on the engineering properties data, in general three horizon can be separated. Horizon a. includes alternating of fine and coarse layers. The engineering properties of this horizon is very varied toward the coastal line. This horizon is loose and inhomogeneous and comprises many lenses and interlayers of coarse grain sediments (mainly in western basin). The second horizon are more compacted and more strength but still shows the high heterogeneity. The third layers includes of hard limy clay and limited compacted calcareous sand that are relatively homogenous.

6- References

Alavi, M., (2007). Structures of the Zagros fold-thrust belt in Iran. Am. J. Sci. 307 (9), 1064-1095

Diester-Haas, L., (1973). Holocene climate in the Persian Gulf as deduced from grain-size andpteropod distribution. Mar Geol 14, 207–223.

Purser, BH., Seibold, E., (1973). The principle environmental factors influencing Holocene sedimentation and diagenesis in the Persian Gulf. In: Purser BH (ed) The Persian Gulf: Holocene carbonate sedimentation and diagenesis in a shallow epicontinental sea. Springer, New York, pp 1–10

Randolph, M.F., Gourvenec, S., (2011). Offshore Geotechnical Engineering, Spon Press, UK Rocker, K., Thompson, D., Jung, B., Briaud, J.L., Lin, S., (2011). Handbook for marine geotechnical engineering. SP-2209-OCN. Naval Facilities Engineering command.

Kassler, P., 1973. The structural and geomorphic evolution of the Persian Gulf. In: Purser BH (ed) The Persian Gulf: Holocene carbonate sedimentation and diagenesis in a shallow epicontinental sea. Springer, New York, pp 11–32.



Sedimentology and Mechanism of Formation of Sand Dunes in Coasts of Oman Sea

Ahrari-roudi, Mohyeddin¹, Afarin, Mohammad² Oceanography Department, Chabahar Maritime University, Chabahar, Iran Research Expert, Chabahar Oceanographic Center (Oman Sea and Indian Ocean) Afarin.m@inio.ac.ir

Keywords: Sedimentology, Sand Dune, Morphodynamic, Chabahar, Konarak.

1-Introduction

Iran's quaternary deposits are mainly flood-plain rivers that form young alluvial zones. Nevertheless, in the Oman Sea Basin and the margin, quaternary deposits are marine. In addition, in some parts of Iran Quaternary rock type basaltic flows, marine terraces, deposits and deposits desert wind [1]. The northern coasts of the Oman Sea are typical of uplifting beaches and are located in the Makran subduction zone, which has an inclination of 4 centimeters annually. Quaternary deposits in coastal Makran are post-Pliocene sediments that in the stratigraphic column should normally be located on the Pliocene conglomerate, but in the study area there are low coastal areas (Low terraces). The sediments are mostly localized, but those that share in all regions share similar characteristics. These deposits include coastal terraces and old and young cones, wind deposits (including hills and sandy areas), river sediments (alluvial and flood plains sediments) and coastal deposits of subtidal, intertidal and supratidal zone as well as sediments of the estuaries [1]. The mechanism of the formation of sand dunes (Duns) is that moving particles with obstacles on their way such as plants, rock fragments or other natural effects, which reduces wind speed as a result of depositions of loads Bed and suspended [2]. These particles accumulate around these obstacles and gradually increase their amount. Eventually, the accumulation of these particles of sand causes the formation of sand dunes. Of course, as these barriers are larger, it is possible for the masses to appear as larger hills. Most wind activities and migrations of sand dunes have increased and intensified during the Pleistocene [3]. The variation of the size of the particle is a suitable application for transport and sedimentation [4]. The way of aggregating sand is controlled by factors such as origin, gravity, direction and wind power, and the surface condition in which the sand continues to move [5]. Sand dunes do not stack in their place after they are formed, but they move in the direction of wind blowing With winds blowing the and in the windward direction they are driven unwerde



and then climb up to the top of the hill to the top of the hill [6]. The objectives of this research include comparing the sand dunes of the mentioned area in terms of statistical and sedimentological parameters (such as mean, mode, median, sorting, kurtosis, skewness, sphericity, roundness and grain size) as well as morphometric studies and their extension in the northern coast of the Oman Sea.

2- Geological setting and Material and methods

The study area, the coastal zone of the north of the Oman Sea at 143 km, is the borderline between the eastern border of Chabahar and Konarak on the coastal strip of the north of the Oman Sea from Gwadar Bay to the station of the radio transmitter. The 3000 m deep Oman Abyssal Plain is part of the Arabian Plate and is bounded in the north by the Makran accretionary prism and subduction zone. In the south and southwest the Oman Abyssal Plain is bounded by the Little Murray Ridge/Murray Ridge and by the Oman continental margin and the Owen Basin, respectively. To the east the abyssal plain narrows due to convergence of the Murray Ridge and the Makran accretionary wedge and disappears at about 65 30' E. Despite the northward subduction of the Arabian Plate below the Eurasian Plate at a convergence rate increasing eastward from 3.6 to 4.1 cm/yr there is no expression of a deep sea trench. This presumably is due to high sedimentary input from the Pakistan and Oman coasts and due to the small dip of the subducting plate of about 2-3 [8]. Geographical coordinates of the studied area include latitude and longitude N 25° 45^{\prime} $53^{"}$ and E 60° 51^{\prime} $20^{"}$ in the radio receiver area in the west of the Konarak to the geographical location N 25° 09['] 47["] and E 60° 10['] 29["] In the Brice area in the east of Chabahar (Fig. 1). This subduction is associated with an accretionary wedge of sediments which has developed since the Cenozoic [7]. To the west, the Makran Trench is connected by the Minab Fault system to the Zagros fold and thrust belt [8]. The study area, the coastal zone of the north of the Oman Sea at 143 km, is the borderline between the eastern border of Chabahar and Konarak on the coastal strip of the north of the Oman Sea from Gwadar Bay to the station of the radio transmitter [9]. Sediment accretion and underplating of sediments caused the uplift of the Makran coast of about 1.5 mm/yr and a seaward migration of the shoreline (Fig. 1). Methods of work in this research included the first phase of library studies, documentation, review of resources and collecting regional information and Subsequent field studies included photographing, sampling of sediment samples and measuring the morphometric components of sand dunes such as peak length, windward and backward winds, long axes, short axes and elevations. Regarding the area of sand dunes, the samples were completely randomized. So that from each point of sampling 3 directions were taken to one of the upstream slopes, one from the back to the wind and another from the hilltop. After mixing them, one sample of 2 kg was taken and transferred to the laboratory. After field studies, the samples were analyzed in a laboratory



using Salk and Shaker at intervals of 0.5Ø. This means that for estimation of transportation distance in order to achieve morphometric indices after preparation of the samples, including crushing the husk, 250 grams were randomly selected. After grains sizing, drying was carried out for 15 minutes based on standard grains sizing (ASTM). In this method, the segregation of sand components from 63, 125, 250, 500, 1000, and 2000 microns was used for the 1Ø range. For this purpose, Folk method [10] was used to determine the graining properties of sand samples. Excel 2013 software was used to plot the desired graphs such as cumulative curves and histograms. Finally, the data and information were combined and conclusions were made.

3- Discussion and Discussion

The study area consists of highlands and hills in various forms and includes a vast plain called Plain Washman that has emerged from the erosion of the marl unit of the region. Dunes on the coastline and in other places are frequent. The mechanism of formation of dunes in the studied area is the effect of wind processes that vary according to wind power and particle size. With wind currents, the sand moves from the slope toward the wind (low slope) to the hill, and when the angle increases, it falls to the bottom of the slope with a high slope of the hill and gradually, wind drops are formed. In the region, due to winds in India (wind direction in the summer is more than the south), sometimes the advent of low pressure centers and tropical fronts from the Indian Ocean to the Oman Sea causes severe storms, especially in this sea and on the coast. Also, the presence of low pressure in the south of Iran causes winds in the northwest in the afternoon. In addition to the above-mentioned winds, in the months of July and August winds from the Indian subcontinent called the Monsoon Winds Which are of particular importance in the region. These winds erode on the rocky cliffs around the Oman Sea and increase the altitude of the waves generated. In order to study the winds of these area in 2008, the area of the rose has been studied (Fig. 2).



Figure2) Wind rose plot in Chabahar

In the study area, sand dunes, which are indicative of a sedimentary environment, are expanded both stabilized and unstable in regions (Fig. 3). The stabilized sand dunes include older wind dunes that have weak cementation, and shrubs and desert plants have grown on these units and



have established these hills as low altitude hills. Unsaturated types have loose and distinct winds of sand, and have ripple mark that form low-lying sand dunes. These sands have a brighter color than the stabilized windmills that are easily displaced during extreme winds and storms. The geographic location and weight of the sedimentary samples taken from the sandy hills spread in the Brise, Pasabandar, Ramin, the Big Sea and the Radio Station are shown in Table 1. Below the graphs (Figure 4) a sedimentary sample is presented in coastal areas of the radio station. The histogram of sand gravel sediments in the coastal area of the radio receiver shows that the precipitates are mainly sandy, due to local winds, and the presence of loose and low-resistant marl bodies and transporting them to these coastal areas. The highest percentage of fossil particles is Fine Sand, and according to Folk [10], the sedimentary type is Sand (Fig. 5).



Figure 3) Sand dunes stabilized (A) and non-stabilized in coastal Oman Sea, view to the westward

Table 1) Geographic location of sand dunes in coastal Oman Sea

Latitude	Longitude	weight	Location
N 25 45 ['] 53 ^{'''}	E 60 51 ['] 20 ^{'''}	500 gr	The Radio Station
N 25 [°] 16 [°] 39 ^{°′′}	E 60 45 ['] 2 ^{'''}	500 gr	Great Sea
N 25 [□] 16 [°] 10 ^{°′}	E 60 [□] 40 [′] 19 ^{′′′}	500 gr	Ramin
N 25 04 ⁻ 25	E 60 24 ['] 23 ^{''}	500 gr	Pasabandar
N 25 [°] 09 [°] 47 ^{′′′}	E 60 10 ⁻ 29	500 gr	Brise



Figure 4) Histogram weight percentage of wind (dune) sediments in Oman Sea.




Figure 5) Coastal zone sediments of Oman Sea under the binocular microscope.

4- Conclusion

In Makran, identified Dune consolidated and unconsolidated hits. In order to investigate correlation between morphometric parameters of sand dunes during the summit, the windward and leeward, were measured along the axis of long, short, and its height. In laboratory studies, samples are calculated grain size analysis and statistical parameters. The mean diameter of grains of sand dunes between 2 and 3Ø and types of sediments of sand with sorting solid $(0.5\emptyset)$, positive skewness and kurtosis is Leptokurtic. In the study area, sand dunes, which are indicative of a sedimentary environment, are expanded both stabilized and unstable in regions. The stabilized sand dunes include older wind dunes that have weak cementation, and shrubs and desert plants have grown on these units and have established these hills as low altitude hills. Unsaturated types have loose and distinct winds of sand, and have ripple mark that form lowlying sand dunes. These sands have a brighter color than the stabilized windmills that are easily displaced during extreme winds and storms. The mechanism of forming these sand dunes in coasts Oman Sea can be described as follows that The coastal organization affected by the tectonics from the Makran subduction zone (subduction of the Indian Ocean crust under the Makran and uplift of the beaches) along with weathering processes and water and wind erosion and sediments are transported to the upstream beaches of the sea and deposited Sediments and Finally, they create wind dunes on the coast. With wind currents, the sand moves from the slope toward the wind (low slope) to the hill, and when the angle increases, it falls to the bottom of the slope with a high slope of the hill and gradually, wind drops are formed. In the region, due to winds in India (wind direction in the summer is more than the south), sometimes the advent of low pressure centers and tropical fronts from the Indian Ocean to the Oman Sea causes severe storms, especially in this sea and on the coast. Also, the presence of low pressure in the south of Iran causes winds in the northwest in the afternoon. In addition to the above-mentioned winds, in the months of July and August winds from the Indian subcontinent called the Monsoon Winds Which are of particular importance in the region. These winds erode on the rocky cliffs around the Oman Sea and increase the altitude of the waves generated and change the geomorphology of the area.



5- References

[1] Dolati, A. (2010), Stratigraphy, Structural geology and low-temperature termochronology across the Makran accretionary wedge in Iran, Swiss Institute of Technology Zurich, Diss ETH, No. 19151, 165 P.

[2] Moghimi, H., Arian, M. and Sorbi, A. (2015), Fault Movement Potential of Marzanabad Area, North Alborz, Iran. Open Journal of Geology, 5, 126-135.

[3]Hamdan, M.A., Refaat, A.A., Abu Anwar, E. and Shallaly, N.A. (2014), Source of the aeolian dune sand of Toshka area, southeastern Western Desert, Egypt. Aeolian Research, in press.

[4] Amini, A., Moussavi-Harami, R., Lahijani, H. and Mahboubi, A. (2010), Morphometry and Sedimentology of Miankaleh's Nebkha in southeast of the Caspian Sea, the second national conference of wind erosion and dust storms, Yazd University.

[5] Livingstone, I., Wiggs, G.F.S. and Weaver, C.M. (2007), Geomorphology of Desert Sand Dunes: a Review of Recent Progress, Earth-Science Reviews, 80(3-4): 239-257.

[6] Negahban, S., Yamani, M., Maghsoudi, M. and Azizi, Gh. (2013), Accumulation, geomorphology and zoning Nebkhas in western of Lut and the effects of vegetation on their morphology, Quantitative geomorphological researches, 4: 17-42.

[7] Poor Khosravani, M., Vali, A. and Mo'ayyeri, Gh. (2010), Plant morphology Nebkhas relationships with morphometric characteristics of Tamarix mascatensis in Kheirabad of Sirjan, Journal of Geography and Planning (University of Tabriz), 15(32): 219-237.

[8] Regard, V.; Hatzfeld, D.; Molinaro, M.; Aubourg, C.; Bayer, R.; Bellier, O.; Yamini-Fard, F.; Peyret, M.; Abbassi, M. (2010), The transition between Makran subduction and the Zagros collision: recent advances in its structure and active deformation. Geological Society, London, Special Publications 330 (1): 43–64.

[9] Kopp, C.; Fruehn, E.; Flueh, E.; Reichert, C.; Kukowski, N; Bialas, J.; Klaeschen, D. (2001), Structure of the Makran subduction zone from wide-angle and reflection seismic data. Tectonophysics. 329: 171–191.

[10] Folk, R.L. (1974): Petrology of Sedimentary Rocks: Hemphill Publishing co., Austin, Texas, 182 pp.

Theme

Fisheries and Aquaculture

Proceeding of the First International Conference on Oceanography for West Asia

30-31 October 2017 IRAN - Tehran



Assessment of Species and Proximate Composition of some important Fish in the Trawl by-catch and Discard of Khuzestan, North-West Coast of Persian Gulf

Hoveizavi, Shafa,¹* Doustshenas, Babak,¹ Eskandari, Gholamreza, ²Savari, Ahmad, ¹ Mohammadasgari₁ Hossein, ³Chenari, Farideh¹

1. Department of Marine Biology, Faculty of Marine and Oceanic Sciences, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran

2South Aquaculture Research Center, Ahvaz, Iran

3Department of Environment, Faculty of Natural Resources, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran

shafa2004@gmail.com

Abstract

The protein, lipids and ash contents of 27 species of fish classified under 13 families collected from the trawl by catch and discards of Khuzestan, North-west coast of Persian Gulf were estimated. Carangidae that presented the largest number of species. According to the result of body biochemical, the highest and lowest content of protein in Parastromateus niger (75.27 \pm 0.359) and Pomadasys stridens (49.36 \pm 0.04), Lipid in Pomadasys stridens(32.66 \pm 0.355) and Johnius borneensis (3.48 \pm 0.444), Ash in Acanthocephola ehaviore (28.14 \pm 0.377) and Parapercis robinsoni (1.82 \pm 0.003), respectively observed.

Key words: Trawl fishery, protein, total Lipids, biochemical composition

1- Introduction

The depletion of fishery resources from the oceans around the world, coupled with growing malnutrition in developing countries, underscore the need for better utilization of available fishery resources as human food [6]. Fish received increased attention as a potential source of animal protein and essential nutrients for human diets [4,10,13].One of the major challenges facing the mangers of modern multispecies marine fisheries is the problem of bycatch of incidental species taken along with target species of commercial importance. FAO fisheries glossary, as a proportion of discard organic materials of animal origin in the catch, which for whatever reason discarded or dumped into the sea has been described [5]. Discard catch as "a proportion of the Catch returned to the sea" is defined [12]. Today, discard catch is one of the most important problems of fishing around the world. Discard practices has a direct impact on fish stocks and the marine environment, and indirect effect on people, society and ecosystem are still largely unknown [8].



2- Material and methods

Implementation of the project during one year in the waters of Khuzestan province. Monthly samples from 3 station with trawl were (Choebdeh, Arvand Kenar and Hendijan) collected. From all of the tissue of the fishes samples were prepared and these were completely homogeneous to obtain the final sample.

The percentage proximate composition was determined chemically according to the method of analysis described by the Association of Official Analytical Chemists [3]. The dried samples were homogenized to determine the crude protein (CP) by micro Kjeldahl method (N 9 6.25), crude lipid (CF) by ether-extraction method using a Soxtec system, ash by combustion in a muffle oven at 550°C for 12 h obtained.

3- Results and Discussion

Family	Species	Protein %	Fat %	Ash %
LEIOGNATHIDAE	Photopectoralis bindus	56.10±0.057	20.56±0.532	17.45±0.389
	Diagramma pictum	66.77±0.015	13.28±0.523	6.11±0.19
HAEMULIDAE	Pomadasys stridens	49.36±0.04	32.66±0.355	11.86±0.952
	Upeneus sulphureus	51.63±1/644	19.69±0.22	16.12±0.55
MULLIDAE	Upeneus sundaicus	60.42±1.287	23.43±0.925	3.83±0.011
SCIAENIDAE	Johnius borneensis	72.5±0.213	3.48±0.44	19.48±0.742
	Johnius belongeri	59.06±0.926	13.2±0.137	11.3±0.296
ENGRAULIDAE	Thryssa hamiltonii	65.4±0.734	13.49±0.202	14.32±0.503
PRISTIGASTERIDAE	Ilisha megaloptera	69.44±0.228	13.54±0.129	12.46±0.383
SYANODONTIDAE	Saurida tumbil	69.7±1.22	6.33±0.451	19.03±0.145
Family	Species	Protein %	Fat %	Ash %
RACHYCENTRIDAE	Rachycentron canadum	66.66±0.799	21.97±0.05	21.16±0.022
CEPOLIDAE	Acanthocephola ehaviore	61.86±0.555	5.98±1.982	28.14±0.377
PINGUIPEDIDAE	Parapercis robinsoni	60.51±0.569	12.01±0.836	1.82±0.003
TERAPONIDAE	Terapon theraps	52.57±3.86	15.23±0.908	2.09±0.243
	Terapon puta	58.31±1.145	14.44±0.21	22.81±1.325
SCIAENIDAE	Johnius borneensis	72.5±0.213	3.48±0.444	19.48±0.742
	Johnius belongeri	59.06±0.926	13.2±0.137	11.3±0.296
	Otolithes ruber	72.53±0.43	6.42±0.547	15.91±0.412
	Protonibea diacantha	69.03±0.77	8.52±0.221	17.53±0.682
	Atule mate	66.4±0.204	19.61±0.478	9.96±0.24
	Scomberoides commersonnianus	60.82±0.877	15.03±0.322	15.02±0.146
	Alepes kleinii	64.34±1.459	8.5±0.175	21.53±0.162
	Megalaspis cordyla	67.6±0.003	8.41±0.003	20.20±0.073
CARANGIDAE	Alepes djedaba	65.01±1.425	16.3±0.262	16.13±0.409
	Selaroides leptolepis	65.88±1.823	27.3±0.138	3.12±0.041
	Alectis indica	68.16±0.777	11.45±1.455	16.54±489
	Parastromateus niger	75.27±0.359	15.56±0.364	3.66±0.081

Table 1. Biochemical composition of perciformes the coast of Khuzestan.





Figure 1. Percentage of the number species of bony fish registered by family, during the study.

The subtropical and tropical zones, such as the Persian Gulf, are the most diverse ecosystems. Sciaenidae and Carangidae were the families that presented the largest number of species (Fig. 1), representing together 44.43% of the overall total. The composition of the bycatch is specific for each kind of fishing and trawling for shrimp is undoubtedly the most damaging. Of the bony fishes registered during the study, the majority was demersal, common in areas like the study herein. The predominance of Sciaenidae and Carangidae in number of species as well as in weight corroborated [21] and [22] statements, which attributed importance to this family, for other geographical regions with similar beds. This, thus, confirmed the dominance of this family in tropical estuary regions and warmer temperate regions, having been observed by [18] for the area sampled here. According to the result of body biochemical, the highest and lowest content of protein in *Parastromateus niger* (75.27 \pm 0.359) and *Pomadasys stridens* (49.36 \pm 0.04), Lipid in Pomadasys stridens(32.66 \pm 0.355) and *Johnius borneensis* (3.48 \pm 0.444), Ash in *Acanthocephola ehaviore* (28.14 \pm 0.377) and *Parapercis robinsoni* (1.82 \pm 0.003), respectively observed (Table.1).

Due to the minimal amount of protein measured in the study, can be said that the minimum protein content is a suitable source for human consumption and fish feed produce. The knowledge on biochemical composition of any edible organisms is extremely important since the nutritive value is reflected in its biochemical contents. The demand for protein rich food is increasing, especially in developing countries, stimulating the exploration of unexploited or nontraditional resources. Fish has been consumed throughout the world because of its several health benefits. Its flesh has high quality protein that can easily be digested as compared to other sources of animal proteins [15]. Moreover, its intake reduces fats particularly triacylglycerides in the blood [7] and also important in reducing



cardiovascular disorders [1] however, it is important to analyze body proximate composition of fish prior to its consumption [10].Fish has long been recognized as a valuable source of high quality protein in the human diet. It is an important source of PUFAs, vitamin D, iodine and selenium [19]. In recent years, fish lipids have also assumed great nutritional significance owing to their protective role against the development of cardiovascular disease and rheumatoid arthritis [2, 14]. Hence, consumption of fish is therefore being encouraged. According to the results the therefore discarded fish have great potential in fulfilling nutritional requirements as fresh food (minimally processed) and with nutritional additives in forms of fish powder and fish oil and it can play an effective role in aquaculture development in the region. Further studies in this area are needed to reduce fishing discard.

4- Conclusion

Discarded fish have great potential in fulfilling nutritional requirements as fresh food (minimally processed) and with nutritional additives in forms of fish powder and fish oil and it can play an effective role in aquaculture development in the region.

References

[1] Ahmed, I. (2011), Effect of dietary niacin on growth and body composition of two Indian major carps, rohu, Labeo rohita and mrigal, Cirrhinus mrigala fingerlings based on dose-response study. Aquaculture International journal, Vol. 19, No. 2, 567-584.

[2] Ajayabhaskar, D. (2002), Nutritional evaluation of molluscan sea food. Ph. D., Thesis, Annamalai University, India, 129.

[3] AOAC. (2000), Association of Official Analytical Chemists Official.

[4] Arts, M.T., Ackman, R.G., Holub, B.J. (2001), Essential fatty acids in aquatic ecosystems: a crucial link between diet and human health and evolution. Ca. J. Fisheries Aquatic Science, Vol. 58, No. 5, 122–137.

[5] Bellido, J.M., Begonasantos, M, Graziapennino, M., Valeiras X., Pierse, G.J. (2011), Fisherydiscards and By-catch: solutions for an ecosystemapproach to fisheries management. Hydrobiologia, Vol. 670, No. 3, 317-333.

[6] Bijukumar, A., Deepthi, G.R., Padmakumaran Nair, K.G. (2013), Proximate Composition of fish in the trawl by-catch and discard of Kerala, South-west Coast of India. Journal of Aquatic Biology and Fisheris, Vol. 1, No. 1 & 2, 106-116.

[7] Boberg, M. (1990), Clinical effects of fish oil. Narings one word forsking, Vol. 34, No. 1, 133-134.

[8] Cetinic, P., Škeljo F., Ferri. J. (2011), Discards of the commercial boat seine fisheries on Posidonia



[9] De Silva, S. S., Anderson, T. A. (1995), Fish nutrition in aquaculture, Vol. 1, No. 1, 384.

[10] Fawole, O.O., Ogundiran, M.A., Ayandiran, T.A., Olagunju, O.F. (2007), Mineral Composition in some selected fresh water fishes in Nigeria. J. Food Safety, Vol. 9, No. 9, 52-55.

[11] Hasan, M. R., Halwart, M. (2009), Fish as feed inputs for aquaculture: practices, sustainability and implications. FAO fisheries and aquaculture technical paper. Vol. 32, No. 518, Rome, 407pp.

[12] Kelleher, K. (2005), Discards in the world's marine fisheries. Anupdate.FAO Fisheries Technical Paper, Vol. 23, No. 470. FAO, Rome, 131pp.

[13] Kromhout, D., Feskens, E.J., Bowles, C.H. (1995), The protective effect of a small amount of fish on coronary heart disease mortality in an elderly population, Intenational. Journal of Epidemiology, Vol. 24, No. 1, 340-345.

[14] Kumaran, R., Ravi, V., Gunalan, B., Murugan, S., Sundramanickam, A. (2012), Estimation of proximate, amino acids, fatty acids and mineral composition of mullet (Mugil cephalus) of Parangipettai, Southeast Coast of India. Advances in Applied Science Research, Vol. 3, No. 4, 2015-2019

[15] Louka, N., Juhel, F., Fazilleau, V., Loonis, P. (2004), A novel colorimetry analysis used to compare different drying fish processes. Food Control, Vol. 15, No. 5, 327-334.

Methods of Analysis. (17th Ed.). W. Hortuntzed (Ed), Washington.

[16] Reynolds, R.M. (1993), Physical oceanography of the Persian Gulf, Strait of Hormuz, and the Gulf of Oman: results from the Mitchell Expedition. Marine Pollution Bulletin, Vol. 27, No.16, 35-60.

[17] Rocha, G.R., Rossi-Wongtschowski, C.L.D.B. (1998), Demersal fish community on the inner shelf of Ubatuba, southeastern Brazil. Rev. bras. Oceanographic, Vol. 46, No. 2, 93-109.

[18] Swedish National Food Administration. (1994), Food habits in Sweden 1989- method- and result analyses.Uppsala: Statens livsmedelsverk. Venugopal and Shahidi,1996

[19] Taiwo, I.O. (2013), Discards and fishing debris of the Tuna fisheries in the South West Pacific and Indian Oceans, Science Journal of Environment. Engineering. 1-5.

[20] Vazzoler, A.E.A.M. (1962), Sobre a primeira maturação sexual e destruição de peixes imaturos. Bolm. Institute. Oceanography, Vol. 12, No. 2, 5-38.

[21] Vianna, M., Almeida, T. (2005), Bony fish bycatch in the southern Brazil pink shrimp (Farfantepenaeus brasiliensis and F. paulensis) fishery. Brazilian Archives of Biology and Technology, Vol. 48, No. 4, 611-623.

State of Phytoplankton, Chlorophyll-a and Nutrient variations in the Southwestern Caspian Sea

Bagheri, Siamak¹, Makaremi, Marzieh², Dadai Ghandi, Azemat²

 Iranian Fisheries Sciences Research Institute
 Inland Waters Aquaculture Research Center siamakbp@gmail.com

Abstract

This study focuses on distribution, species composition of phytoplankton, and nutrient variations in the south-western Caspian Sea between July 2009 and March 2010. Samples were collected from 12 stations along three transects: Lisar, Anzali and Sefidrood. Among 44 identified phytoplankton species, diatoms (70.2%) and cyanophytes (25.0%) were dominant. The average phytoplankton abundance was calculated as $1.085E \pm 05$ cells l-1. Among the phytoplankton groups, diatom density was higher (70.2%) than two out of three of total abundance in density of $1.085E \pm 05$ cells 1-1. Diatoms Dactyliosolen fragilissimus and Skeletonema costatum and cyanophyte Oscillatoria sp. numerically dominated in the system. There were major changes in phytoplankton composition and average phytoplankton density was higher than those documented in 1996-1997 and 2005. The average concentrations of dissolved inorganic nitrogen (DIN), dissolved inorganic phosphorus (DIP) and dissolved inorganic silicate (DIS) were 5.10 ± 3.98 , 1.14 \pm 0.44 and 14.5 \pm 6.32 μ M respectively, and these concentrations were strikingly high. Increases in DIN and DIP concentrations were more than twofold compared to recorded values during the last 2 decades due to the eutrophication. Fluctuations in nutrients played an important role in the variation of phytoplankton composition and abundance. Chlorophyll-a concentrations varied between 3.22 and 16.1 μ g l⁻¹ and there was a significant increase in chlorophylla as compared with previously studies.

Keywords: Phytoplankton, abundance, chlorophyll-a, nutrient, Caspian Sea

1.Introduction

Phytoplankton are an important water quality indicator because of their sensitivity to environmental changes, and short life span. Phytoplankton is also a useful indicator of high nutrient concentrations in water because of its propensity to multiply rapidly. Under the right conditions, phytoplankton can undergo rapid population growth, or blooms [1]. In an early study, the total number of phytoplankton between 1962 and 1974 was reported to be 449 in the Caspian Sea [2]. Recently, Kideys et al. [3] reported that there was a significant increase in phytoplankton density, particularly in harmful ones in the Caspian Sea. Moreover, Nasrollahzadeh et al. [4] observed 2–4 fold increases in phytoplankton



abundance in 2003–2004 and 2005 compared to previous years. According to Bagheri et al. [5] cyanophyte *Nodularia* sp. and dinoflagellate *Heterocapsa* sp. produced two anomalous algal blooms for the first time in the south-western Caspian Sea in September 2005 and October 2006, respectively. Increases in nutrient levels in the south-western Caspian Sea led to higher primary productivity reflected by high chlorophyll-a levels ($2.71-35.3 \text{ mg } 1^{-1}$) in 2006, whereas chlorophyll-a levels in 1994 were between 0.56 and 1.34 mg 1^{-1} [6, 7]. This study, in the period 2009 to 2010, intends to uncover the temporal distributions of phytoplankton population density and nutrient variations in the south-western Caspian Sea. In addition, to discuss eutrophication processes in the system the findings of the present study were also compared with those of previous years.

2. Materials and Methods

Phytoplankton density and species composition were evaluated by using surface samples collected from 12 stations along three transects (Lisar, Anzali and Sefidrood) on the western Iranian coast of the Caspian Sea during July 2009 to March 2010. Each sampling station is located in different depths from shore to offshore (stations at 5 m, 10 m, 20 m and 50 m). The sampling of the all station grids was performed in three days and each transect was sampled in one day using a speedboat.

Phytoplankton samples were collected using a 1.70 l Nansen water sampler (Hydro- Bios, Germany, TPN Series). The samples were kept in 500 ml bottles and preserved in buffered formaldehyde 4.00%. Phytoplankton taxonomic classification was performed based on, Tiffany & Britton [8], Vinyard [9]. Water samples were collected using a 1.70 l Nansen water sampler (Hydro-Bios, Germany, TPN; Transparent Plastic Nansen water sampler, No: 436201). The further treatment of the hydro-chemical and chlorophyll-a samples evaluation were the same as described by Bagheri et al. [7].

3.Results and Discussion

The annual average surface water temperature ($16.4 \pm 7.748C$) was between July 2009 and March 2010. The surface salinity in the south-western Caspian Sea varied between 9.17 and 12.3 psu during the study. There was a decreasing trend in the average salinity values of the surface water from summer to winter. Average dissolved inorganic nitrogen (DIN: $2.26-10.5\mu$ M), dissolved inorganic phosphor (DIP: $0.73-1.60 \mu$ M) and dissolved inorganic silicate concentrations (DIS: $6.40-20.5 \mu$ M) revealed very important temporal variations due to the fluctuations of river inflows rich in nutrients. The nutrient findings indicated higher levels of nutrients, especially in DIN and DIP concentrations during the last two decades. The results showed that average increases in DIN and DIP concentrations in the last two decades were more than two-fold due to eutrophication.

The findings revealed that there was a significant increase in chlorophyll-a $(8.13 \pm 5.72 \ \mu g \ l^{-1})$ compared to the values reported in 1996–1997 (1.44 ± 1.48 $\mu g \ l^{-1}$; [4]), in 2001 (2.62 ± 1.48 $\mu g \ l^{-1}$; [3]) and in 2005



 $(2.14 \pm 1.94 \ \mu g \ l^{-1})$. Khodaparast [10] reported that in the south-western Caspian Sea, chlorophyll-a levels in 1994 and 2006 varied from 0.56 to 1.34 $\mu g \ l^{-1}$ and 2.71 to 35.3 $\mu g \ l^{-1}$, respectively.

According to the findings on the community structure and diversity, a total of 44 phytoplankton taxa were distinguished. Of these taxa, 27 taxa diatoms (22 genera and 27species), 8 taxa dinoflagellates (4 genera and 8 species), 6 taxa cyanophytes (6 genera and 6 species), 2 taxa chlorophytes (2 genera and 2 species) and 1 taxa euglenoid (1 genus and 1 species) were distinguished in the south-western Caspian Sea. The diatoms *Dactyliosolen fragilissimus* (Bergon) G.R. Hasle, and *Skeletonema costatum* (Greville) P.T. Cleve and the cyanophyte *Oscillatoria* sp. were the dominant species in the south-western Caspian Sea.

In total, 44 phytoplankton taxa were identified during the study and the total taxa were lower than the total phytoplankton taxa reported in 1983 (71 taxa), in 1996–1997 (50 taxa), in 2005 (96 taxa) and in 2006 (97 taxa) [2, 4, 11]. In the present study, high diatom densities except during the summer period were probably related to a rise in freshwater inflow by rivers which contain high nutrients concentrations and especially high silicate levels in the south-western Caspian Sea.

4.Conclusion

This study documented the temporal distribution of phytoplankton in the south-western Caspian Sea in 2009–2010. We believe that atmospheric and hydrologic variations such as water temperature, fluctuations of silicate and especially increased nutrient discharges by rivers have played important roles in the variation of phytoplankton composition and high phytoplankton abundance in the south-western Caspian Sea.

References

[1]- Raymond, R. (2010), Phytoplankton species and abundance observed during 2008 in the vicinity of the Klamath Hydroelectric Project. Prepared by E&S Environmental Chemistry, Inc., Corvallis, Oregon/Prepared for: PacifiCorp Energy, Portland, 47 pp.

[2]- Kosarev, A.N. and Yablonskaya, E.A. (1994), The Caspian Sea. The Hague, The Netherlands: SPB Academic Publishing.

[3]- Kideys, A.E., Soydemir N., Eker E., Vladymyrov, V., Soloviev, D. and Melin, F. (2005), Phytoplankton distribution in the Caspian Sea during March 2001. Hydrobiology, Vol. 543, No. 4, 159–168.

[4]- Nasrollahzadeh, H.S., Din Z.B., Foonga S.Y. and Makhlough A. (2008), Spatial and temporal distribution of macronutrients and phytoplankton before and after the invasion of the ctenophore, Mnemiopsis leidyi, in the Southern Caspian Sea. Journal of Chemical Ecology, Vol. 24, No. 4, 233–246.

[5]- Bagheri, S., Mansor, M., Marzieh, M., Sabkara, J., Mirzajani, A., Khodaparast, S.H., Negaresatan,H., Wan Maznah, W.O., Ghandi, A., Z. and Khalilpour, A. (2011), Fluctuations of Phytoplankton



Community in the Coastal waters of Caspian Sea in 2006, *American Journal of Applied Sciences*, Vol. 8, No. 12, 1328–1336.

[6]- Kideys, A.E., Roohi, A., Eker, E., Melin, F. and Beare, D. (2008), Increased chlorophyll a levels in the southern Caspian Sea, following an invasion of jellyfish. Research Letters in Ecology, Vol. 2008, Article ID 185642, 4 pp.

[7]- Bagheri, S., Mansor M., Turkoglu, M., Makaremi, M. and Babaei, H. (2012), Temporal distribution of phytoplankton in the south-western Caspian Sea during 2009–2010: a comparison with previous surveys. Journal of the Marine Biological Association of the United Kingdom, Vol. 92, No. 6, 1243–1255.

[8]- Tiffany, L.H. and Britton, L.E. (1971), The algae of Illinois. New York, USA: Hansfer Publishing Company.

[9]- Vinyard, W.C. (1974), Key to the genera of diatoms of the inland waters of temperate North America. Eureka, CA: Mad River Press.

[10]- Khodaparast, H. (2006), Harmful algal bloom in the south-western basin of the Caspian Sea. Tehran: Iranian Fisheries Research Organization (IFRO), 26 pp.

[11]- Roohi, A. (2009), Population dynamic and effects of the invasive species ctenophore Mnemiopsis leidyi in the southern Caspian Sea. PhD thesis. Universiti Sains Malaysia, Penang, Malaysia.

Spatial Distribution and Abundance of Ichthyoplankton in the Northeastern Persian Gulf of Iran

Hakimelahi, Maryam, Rezai, Hamid

Iranian National Institute for Oceanography and Atmospheric Science hakimelahi.m@gmail.com

Abstract

Despite of its importance in the marine food webs, Ichthyoplankton of Persian Gulf waters has received little attention and is not well known. The published worked, in this field, are not enough to give complete figure of the Ichthyoplankton population in the Persian Gulf. The objective of this paper, is study of Spatial distribution and abundance of Ichthyoplankton in the northeastern Persian Gulf of Iran. Distribution and abundance of the ichthyoplankton community were analyzed in early Autumn (November 2012) and Summer (August 2013) during two cruises of the Persian Gulf and Oman Sea Oceanographic study (PG-GOOS) in the northeastern Persian Gulf of Iran. The locations of these stations are given in Fig. 1.In November, in group of zooplankton, 12 specimens of fish larvae and 96 egg samples were counted in all sampling stations. Fish larvae have the highest frequency at stations D, 104, 106 and G with an average 2 ind.m-3 (± 2.8) and fish eggs at station A with an average of 34 ind.m-3 (± 2.8). A total of 88 samples of fish larvae and 5454 egg samples from Neuston were counted in all sampling stations. the highest frequency of larvae in the Neuston group belonged to station 123 with an average of 27 ind.m-3 (\pm 37.5) and 12 ind.m-3 (\pm 5.7) belonging to Station 125. also, the highest frequency of eggs belonged to Station A with an average 2252 ind.m-3 (±1012.6). Comparing the frequency of larvae and eggs of zooplankton and neuston, the frequency of larvae and neuston eggs is greater than that of zooplankton. In August, in group of zooplankton, the highest frequency of larvae belonged to Station 88 with an average 28.6 ind.m-3 (±24.6) and the highest frequency of eggs belonged to Station F with an average 39 ind.m-3 (± 12.5). in group of neuston, the highest frequency of larvae belonged to Station 73 with an average 1 ind.m-3 (± 0.7) and Station 123 with an average 1 ind.m-3 (± 0.3). Also, the highest frequency of eggs belonged to Station 104 with an average 1 ind.m-3 (± 0.1). Comparison of the frequency of larvae and eggs in zooplankton and neuston groups at different stations indicates that the highest frequency of larvae belonged to zooplankton group and the highest frequency of eggs belonged to Neuston group (Figures 2,3). However, during November, the frequency of larvae and eggs in neuston groups is higher than that in zooplankton groups. In conclusion, the ichthyoplankton distribution patterns of the most abundant family were expounded as coincidences in the life history to develop the geographical basis of the larval expulsion beyond the northeastern Persian Gulf area [2], [3]. by studying the distribution of fish larvae and eggs, we can provide clue on natural breeding areas and spawning time, which present valuable data for the conservation and management of fishery resources, especially in relation to successful recruitment [4], [5]. Such information is essential for native fish management and conservation.

Keywords : Ichthyoplankton, Fish larvae, Fish egg, Distribution, Abundance, Persian Gulf



1.Introduction

Despite of its importance in the marine food webs, Ichthyoplankton of Persian Gulf waters has received little attention and is not well known. The published worked, in this field, are not enough to give complete figure of the Ichthyoplankton population in the Persian Gulf. The objective of this paper, is study of Spatial distribution and abundance of Ichthyoplankton in the northeastern Persian Gulf of Iran. Distribution and abundance of the ichthyoplankton community were analyzed in early Autumn (November 2012) and Summer (August 2013) during two cruises of the Persian Gulf and Oman Sea Oceanographic study (PG-GOOS) in the northeastern Persian Gulf of Iran. The locations of these stations are given in Fig. 1.



Fig. 1. Locations of stations in the northeastern part of the Persian Gulf (PG-GOOS)

2.Results

In November, in group of zooplankton, 12 specimens of fish larvae and 96 egg samples were counted in all sampling stations. Fish larvae have the highest frequency at stations D, 104, 106 and G with an average 2 ind.m⁻³ (\pm 2.8) and fish eggs at station A with an average of 34 ind.m⁻³ (\pm 2.8). A total of 88 samples of fish larvae and 5454 egg samples from Neuston were counted in all sampling stations. the highest frequency of larvae in the Neuston group belonged to station 123 with an average of 27 ind.m⁻³ (\pm 37.5) and 12 ind.m⁻³ (\pm 5.7) belonging to Station 125. also, the highest frequency of eggs belonged to Station A with an average 2252 ind.m⁻³ (\pm 1012.6). Comparing the frequency of larvae and eggs of zooplankton and neuston, the frequency of larvae and neuston eggs is greater than that of zooplankton. In August, in group of zooplankton, the highest frequency of larvae belonged to Station 73 with an average 1 ind.m⁻³ (\pm 0.7) and Station 123 with an average 1 ind.m⁻³ (\pm 0.3). Also, the highest frequency of eggs belonged to Station 104 with an average 1 ind.m⁻³ (\pm 0.1). Comparison of the frequency of larvae and eggs in zooplankton and neuston groups at different stations indicates that the highest frequency of larvae belonged to Station 73 with an average 1 ind.m⁻³ (\pm 0.1). Comparison of the frequency of larvae and eggs in zooplankton and neuston groups at different stations indicates that the highest frequency of larvae belonged to Zooplankton and neuston groups at different stations indicates that the highest frequency of larvae belonged to Zooplankton group and the highest frequency of eggs belonged to Neuston group figures



2,3). However, during November, the frequency of larvae and eggs in neuston groups is higher than that in zooplankton groups.



Fig 2. Comparison of the frequency of fish larvae in zooplankton group and Neuston group at different stations.



Fig 3. Comparison of the frequency of fish eggs in zooplankton group and Neuston group at different stations.

During this study, the highest observed groups were Apogonidae, Carangidae, Lethrinidae, Nemipteridae, Engraulididae and Scomberoides families. Some specimens of larvae and eggs in this study are shown in Figures 4 and 5 [1].







Fig 4. Some samples of fish larvae in the Persian Gulf (PG-GOOS)







Fig 5. Some samples of fish eggs in the Persian Gulf (PG-GOOS)

3.Conclusion

In conclusion, the ichthyoplankton distribution patterns of the most abundant family were expounded as coincidences in the life history to develop the geographical basis of the larval expulsion beyond the northeastern Persian Gulf area [2], [3]. by studying the distribution of fish larvae and eggs, we can provide clue on natural breeding areas and spawning time, which present valuable data for the conservation and management of fishery resources, especially in relation to successful recruitment [4], [5]. Such information is essential for native fish management and conservation.

References

[1] Leis J.M., Carson-Ewart, B.M., 2000. The larvae of Indo-Pacific coastal fishes: (An identification guide to marine fish larvae).

[2] Moser, H.G., Smith, P.E., 1993. Larval fish assemblages and oceanic boundaries (Introduction to Symposium-Advances in the Early Life History of Fishes). Science Marine of Bulletin. Set 53, pp.

283-289.

[3] Doyle, M.J., Morse, W.W., Kendall, A.W., 1993. A comparison of larval fish assemblages in the temperate zone of the northeast Pacific and northwest Atlantic Oceans. Bulletin of Marine Science. 53:588-644.

[4] Bialetzki, A., Nakatani, K., Sanches, P. V., Baumgartner, G. (2004), Eggs and larvae of the 'curvina' Plagioscion squamosissimus (Heckel, 1840) (Osteichthyes, Scianidae) in the Baía River, Mato Grosso do Sul State, Brazil. J. Plankton Res., 26 (11), 1327-1336.

[5] Lima, A.C. de and Araújo-Lima, C.A.R.M. (2004), The distributions of larval and juvenile fishes in Amazonian rivers of different nutrient status. Freshwater Biology, 49, 787-800.

Theme

Marine Engineering and Technology



Enaluation Of Different Measures To Reduce Shaling Process In Neka Port

M.R. Salargarna¹, Kh. Hosseini² and S.F. Mousavi³ Master of Civil Engineering Hydraulic Structures, Civil Engineering Faculty, Semnan University, Semnan, Iran, Email:reza_salargarna@yahoo.com Associate Prof., Civil Engineering Faculty, Semnan University, Semnan, Iran, Email: khhoseini@semnan.ac.ir Professor, Civil Engineering Faculty, Semnan University, Semnan, Iran, Email: mousavi SF@yahoo.com

1-Introduction

Sediment disposal from the access ways of ports is one of the most expensive operations in port rehabilitation. The most effective parameter influencing the shoaling in ports is the layout plan of port via the direction of dominant wave (Ommen et al. [1]). Van Maren et al. [2] studied the siltation on harbors and investigated the effect of dock length on the siltation phenomenon. In an experimental research, Yukesk [3] studied the effect of length and orientation of breakwater on the sedimentation in harbor. He found the increase in length and degree of breakwater prevents the sedimentation in harbor. Panigrahi et al. [4] investigated the dynamic of sediment in site selection for wind power plant on Ireland coasts, using Mike 21 software. In this study, Mike 21 is used to determine the sedimentation in access way are examined.

2- Methods and Materials

....

-

The governing equations are the continuity, momentum and sediment transport equations which used in Mike 21 soft0wage are as follows:

$$\frac{\partial H}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = 0$$
(1)
$$\frac{\partial p}{\partial t} = \partial \left(\frac{p^2}{2} \right) - \partial \left(\frac{pq}{2} \right) - \partial H = \frac{gp}{2} \sqrt{p^2 + q^2}$$

$$\frac{\partial p}{\partial t} + \frac{\partial}{\partial x} \left(\frac{p}{h} \right) + \frac{\partial}{\partial y} \left(\frac{pq}{h} \right) + gh \frac{\partial x}{\partial x} + \frac{gp \sqrt{p+q}}{c^2 h^2} - \frac{1}{\rho w} \left(\frac{\partial}{\partial x} (h\tau_{xx}) + \frac{\partial}{\partial y} (h\tau_{xy}) \right) - \Omega p - fvv_x + \frac{h}{\rho w} \frac{\partial}{\partial x} (pa) = 0$$
(2)



$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial y} \left(\frac{q^2}{h} \right) + \frac{\partial}{\partial x} \left(\frac{pq}{h} \right) + gh \frac{\partial H}{\partial y} + \frac{gq \sqrt{p^2 + q^2}}{c^2 h^2} - \frac{1}{\rho w} \left(\frac{\partial}{\partial y} \left(h\tau_{yy} \right) + \frac{\partial}{\partial x} \left(h\tau_{xy} \right) \right) - \Omega p - fvv_y + \frac{h}{\rho w} \frac{\partial}{\partial y} \left(pa \right) = 0$$
(3)

$$q_{b} = 2d_{50}\sqrt{\frac{\tau_{c}}{\rho}} \exp\left(\frac{-0.27(s-1)d_{50}\rho g}{\mu_{r}\tau_{wc}}\right)$$
(4)

$$q_s = 1.83q_B \left(I_1 \ln\left(\frac{h}{0.033k_s}\right) + I_2 \right)$$
(5)

In which, h, H, c, g & f are depth of water, water surface elevation, Chezy coef., gravity acceleration and wind friction coef., respectively. V, $v_x \& v_y$ are the wind velocity and its horizontal components. p & q are the discharge in x and y directions, respectively. q_b , q_s are discharge of bed load and suspended load, respectively. The parameters correspond to the sediment transport formula: τ_c , τ_{wc} , d_{50} , s, ρ , μ_r . k_s are critical shear stress for initiation movement of bed materials, bed shear stress induced by current and wave, representative diameter of bed material, relative density of bed materials, water density, form coef. of bed materials, roughness height of bed materials. I_1 , I_2 are the integrals defined by Einstein.

Neka port is situated on the south coast of Caspian Sea in $53^{0}16'$ east and $36^{0}15'$ north. Figure 1 shows the situation of Neka port.



Fig. 1) Layout plan of Neka Port.

3- Results and Discussions

The numerical simulation of flow and sediment patterns is achieved by using Mike 21 software. After performing the verification tests and calibrating parameters, the different scenarios are carried out to obtain the best results. Numerical simulation is carried out in two scales: large scale with the great mesh sizes for the whole Caspian Sea to find the wave approaching the coast, little scale or local model with the little mesh sizes for the zone interested to study the different phenomena the more accuracy.

4-1 Verification Tests

The general flow pattern in Caspian Sea is originated from Volga estuary and extended along the coasts and rotates counter clock-wise. In the southern coasts with low depth zones, the



Caspian Sea is evaluated by numerical model and compared with the field measurements in figure 2. As shown in this figure, a good adjustment is achieved between numerical simulation and field surveys.

The dominant wave (amplitude and frequency) approaching the port is also obtained from global model and presented in figure 3. In this figure, 4 sections are identified in plan, in which, the measured and calculated bed profiles are compared for a period of 3 months. As shown in this figure, a good adjustment is obtained between the numerical results and the survey measurements.



Fig. 2) General layout of flow pattern in Caspian Sea





4-2 Actual Status and Scenarios for Rehabilitation

Three scenarios are proposed to rehabilitate Neka port as the perspective of shoaling. The proposed changes are shown in figure 4. The mean changes in bed level for the sections as defined before, for actual status and different scenarios are compared in table 1. The details of scenarios are:

Scenario a) extending about 150 meters the western breakwater along the deep water which causes less shoaling in the entrance of port and also has non-effect on navigation. The cost is 61 milliard Rials.

Scenario b) extending 100 meters the western breakwater and 50 meters the eastern breakwater. This scenario has the same effect as the scenario a for preventing the entrance of sediment into port, but in the point of view navigation, this scenario disturbs the navigation. The cost is 58.5 milliard Rials.

Scenario c) the eastern breakwater extended 100 meters towards the west and after that, 100 meters towards the deep water. This scenario does not affect the navigation. The cost is 71.3 milliard Rials.



Table 1) Bed level changes for actual condition and different scenarios

Section	Bed Level Change (cm)				
	Actual	Scenario a	Scenario b	Scenario c	
1	8.8	7.3	7.1	9.2	
2	7.7	6.8	6.5	8.5	
3	5.7	4.7	4.3	6.9	
4	8.3	7.5	7.2	8.7	
Cost (Milliard Rials)		61	58.5	71.3	

5- Conclusions

As mentioned in the above paragraphs, the sedimentary hydraulics could be simulated by numerical simulation. A calibrated numerical model permits to evaluate the different scenarios for rehabilitation of a port. In this research, the proposed scenarios are examined in the point of view shoaling, navigation facilities and the cost. It is found that the extension of western breakwater is the best scenario.



References

[1] Ommen H. C., Schaap G., (1995), Nautical dredging problems in marinas: Rep.O.N.44.03151, 1992 Grontmij Environment, De Bilt, The Netherlands (in Dutch).

[2] Van Maren, D.S., Winterwerp, J.C., Sas, M. and Vanlede, J. 2009. The effect of dock length on harbor siltation. Continental Shelf Research, 29: 1410-1425

[3] Yüksek, Ö. 1992. A study on the sedimentation processes in fishery harbors and developing appropriate design criteria. PhD Thesis, Black Sea, Tech. Univ., Trabozna, Turkey. (In Turkish).

[4] J K Panigrahi, P N Ananath, P A Umesh (2009) Coastal morphological modeling to assess the dynamics of Arklow Bank, Ireland International Journal of Sediment Research (Elsevier) 24: 3. 299-314 Sept

Proceeding of the First International Conference on Oceanography for West Asia

30-31 October 2017 IRAN - Tehran



Determination of Mass Center of a Jacket type Platform by a New Method Associated with Added Mass Concept

Ketabdari, Mohammad Javad¹, Ahani, Alireza² Marine Technology, Amirkabir University of Technology, Tehran, Iran ¹Faculty of ketabdar@cic.aut.ac.ir Marine Technology, Amirkabir University of Technology, Tehran, Iran ²Faculty of alireza1372@aut.ac.ir

Keywords: Jacket platform, Circular cylindrical elements, Added mass, Center of gravity, Analytical approach

1- Introduction

In this paper, a new implementation of added mass matrix to determine the mass center of an object is applied. The paper has a sequenced procedure of deriving relationships that gives a desired formula. This formula uses some elements of added mass matrix to determine mass center. In order to verify the method, required elements of added mass matrix for a circular section cylinder is derived and summed over the same elements to result overall added mass matrix of some arbitrary platforms with this type of structural elements.

2- Method

2-1- Energy equation

Suppose a moving submerged body with a relative velocity with surrounding fluid. It can cause kinematic energy in fluid particles. This energy is expressed as [1, 2]:

$$T_{A} = \frac{1}{2} \nu^{T} M_{A} \nu$$
In which:

$$M_{A} = \begin{bmatrix} m_{11} & m_{12} & m_{13} & m_{14} & m_{15} & m_{16} \\ m_{21} & m_{22} & m_{23} & m_{24} & m_{25} & m_{26} \\ m_{31} & m_{32} & m_{33} & m_{34} & m_{35} & m_{36} \\ m_{41} & m_{42} & m_{43} & m_{44} & m_{45} & m_{46} \\ m_{51} & m_{52} & m_{53} & m_{54} & m_{55} & m_{56} \\ m_{61} & m_{62} & m_{63} & m_{64} & m_{65} & m_{66} \end{bmatrix}$$

$$\nu^{T} = [u, v, w, p, q, r]$$
(1)
(1)
(1)
(2)
(3)

These are respectively denoted as added mass matrix (M_A) and velocity vector (ν) . As a result of using Green's identity [3] in Eq.1, one could show that the added mass matrix is symmetrical:



$$m_{ij} = m_{ji} \tag{4}$$

We could also rewrite Eq.1 in sigma notation as:

$$T_A = \frac{1}{2} \sum_{i=1}^{6} \sum_{j=1}^{6} m_{ij} \nu_i \nu_j$$
(5)

2-2- Transformation of coordinate system

Suppose that angles between the new coordinate system (primed letters) and the old one is represented as [3].

$$\begin{array}{cccccc} x & y & z \\ x' & \alpha_{11} & \alpha_{12} & \alpha_{13} \\ y' & \alpha_{21} & \alpha_{22} & \alpha_{23} \\ z' & \alpha_{31} & \alpha_{32} & \alpha_{33} \end{array}$$
(6)

The new and old coordinate system's linear velocities are denoted by ν' and ν respectively. Considering the angular velocity of new coordinate system is Ω and position in old coordinate system is $R(\xi, \eta, \zeta)$, then we have:

$$\nu' = \nu + \Omega \times R \tag{7}$$

Therefore linear velocity of a fluid particle in the old coordinate system can be written as follows:

$$v_{1} = \sum_{i=1}^{3} v_{i}' \alpha_{i1} - (\Omega_{2}\zeta) \qquad v_{2} = \sum_{i=1}^{3} v_{i}' \alpha_{i2} - (\Omega_{3}\xi) \qquad v_{3} = \sum_{i=1}^{3} v_{i}' \alpha_{i3} - (\Omega_{1}\eta) \qquad (8)$$

Angular velocity can be presented as:

$$\Omega_i = v_{3+i} = \sum_{j=1}^3 \sum_{i=1}^3 v'_{3+j} \alpha_{ji}$$
(9)

where v'_{3+j} (j = 1,2,3) are projections of angular velocity Ω onto the principal axes of new coordinate system x'y'z'.

By substituting expressions for v_1 to v_6 into Eq. the kinematic energy equation in the new coordinate system is obtained in which the corresponding coefficients for $v'_i v'_j$ are m'_{ij} . In other words these are elements of new added mass matrix.

In this research for planar transformation we should expect this condition:

Then mass matrix elements in a new coordinate system with these elements can be expressed as [3]:

$$m'_{11} = m_{11}\cos^2\beta + m_{22}\sin^2\beta + m_{12}\sin 2\beta$$

$$m'_{22} = m_{11}\sin^2\beta + m_{22}\cos^2\beta - m_{12}\sin 2\beta$$
(11)



$$\begin{split} m_{12}' &= & 0.5(m_{22} - m_{11})\sin 2\beta + m_{12}\cos 2\beta \\ m_{16}' &= & (m_{16} + m_{11}\eta - m_{12}\xi)\cos\beta + (m_{26} - m_{22}\xi + m_{12}\eta)\sin\beta \\ m_{26}' &= & -(m_{16} + m_{11}\eta - m_{12}\xi)\sin\beta + (m_{26} - m_{22}\xi + m_{12}\eta)\cos\beta \\ m_{66}' &= & m_{66} + m_{11}\eta^2 + m_{22}\xi^2 - 2m_{12}\xi\eta + 2(m_{16}\eta - m_{26}\xi) \end{split}$$

2-3- Mass center equations

Having new system added mass matrix elements (Eq.11) in parameters of transformation vector and rotating angles gives a significant property to derive our desired equations. In this paper, we are seeking for new axes in a way that origin of the new coordinate system would be the center of mass. For this, we remind the property of this point which is $m'_{12} = 0$. Besides, to have a solution for Eq.11 we have:

$$\begin{cases} m_{16} = m_{12}\xi - m_{11}\eta \\ m_{26} = m_{22}\xi - m_{12}\eta \end{cases}$$
(12)

As can be seen, it is possible to evaluate mass center of any 3D body that has a symmetry plane with transformation vector of $R(\xi, \eta, 0)$ where ξ and η are obtained from the following set of equations:

$$\begin{cases} \xi = C \\ \eta = \frac{Cm_{12} - m_{16}}{m_{11}} \end{cases} \quad \text{Where } C = \frac{-m_{26}m_{11} + m_{16}m_{12}}{m_{12}^2 - m_{11}m_{22}} \quad (13) \end{cases}$$

3- Circular cylinder matrix elements

Here an approximate formulation of added mass matrix elements for an inclined cylinder of a fixed jacket type platform (see Fig. 1) is brought to verify the method. These types of platforms are constituted of cylindrical elements with circle sections. The inclined cylinder is an element which is also a representative for horizontal and vertical cylindrical elements of the jacket. An empirical expression is used to derive the required added mass matrix of the elements. This expression states that as a result of unit acceleration in direction normal (OE in Fig. 2) to the cylindrical element axis (FG in Fig. 2), there must be an added force (added mass) in that direction with this value [4]:

$$k = \rho C_m \pi d^2 L/4 \tag{14}$$





Fig. 1) A typical jacket type platform.



Fig. 2) Cylinder FG as a general element of platform.

In which C_m is a constant equal to 1 for circular sections and d and L are diameter and length of cylinder respectively. Regarding Fig. 2 and using some geometric relationships elements of added mass matrix in Oxyz reference frame are derived:

$$m_{11} = k \sin^2 \alpha$$

$$m_{12} = k \cos \alpha \cos \beta$$

$$m_{22} = k \sin^2 \beta$$
(15)

In order to get elements m_{16} and m_{26} we use the property of Eq.4 and derive m_{61} and m_{62} instead. These are added moments about Oz due to linear accelerations along Ox and Oy axes respectively. However before introducing forces along Ox and Oy axes due to unit acceleration parallel to Ox:



$$\frac{m_{11}dl}{L}$$
 and $\frac{m_{21}dl}{L}$ (16)

Those are needed in deriving the value of m_{61} that is:

$$m_{61} = \int_{0}^{L} x \left(\frac{m_{21}dl}{L}\right) - \int_{0}^{L} y \left(\frac{m_{11}dl}{L}\right) = m_{21}x_m - m_{11}y_m$$
(17)

in which x_m means x value of the cylinder center. The same derivation goes for m_{62} that gives: $m_{62} = m_{22}x_m - m_{12}y_m$ (18)

4- Case Study

In this section the method is verified with four different structures that have a symmetry plane parallel to the flow direction (see Fig.3). The results are presented in Table 1.



Fig. 3) Different structures to verify method.

Table 1) Results of case studies							
		Actual mass center (A : Actual)	Mass center with added mass method	x component Error $ (A - AM)/A \times 100$	y component Error $ (A - AM)/A \times 100$		
		(• • • • • • • • • • • • • • • • • • •	(AM : Added Mass method)				
Case 1	X	13.77 m	13.45 m	2.32	13.8		
	У	7.45 m	6.42m		10.0		
Case 2	х	7.12 m	8.24 m	15 73	14 9		
	у	4.96 m	4.22 m	15.75			
Case 3	х	7.06 m	6.43 m	8 92	15.0		
	у	3.33 m	2.83 m		10.0		
Case 4	Х	10.0 m	10.18 m	1.8	5.4		
	У	7.33 m	6.93 m	1.0	0.1		

As can be seen from table1, this method gives a good approximation of mass center of the structure withy maximum error of 15%. It should be noted that empirical equations of section



4 are just approximations of real added mass matrix and don't describe the real added mass. This consequently causes such errors in the case studies, otherwise it could be zero.

5- Conclusion

The presented method is not only a way to approximate mass center as it sounds, but also a powerful way to verify the added matrix for engineering applications in any design stage as we explained above.

Here using such a method for a 3D structure with no plane of symmetry is still possible but very cumbersome compared to present work since finding corresponding expressions for $m'_{12} = 0, m'_{13} = 0, m'_{23} = 0$ in terms of β, ψ, θ and m_{ij} (*i*, *j* = 1,2,3) is much more difficult.

6- References

[1] Fossen, T. I. (1994), Guidance and control of ocean vehicles, *University of Trondheim*, Norway, 32-35.

[2] Triantafyllou, M. S. (2003), Maneuvering and control of marine vehicles, *Massachusetts Institute of Technology*, USA, 1-2,124-126.

[3] Korotkin, A. I. (2009), Added masses of ship structures, *Krylov Shipbuilding Research Institute*, Russia, 3-10, 17-20.

[4] Patel, M. H., Kolenkow, R. (1989), Dynamics of offshore structures, London, UK, 104-107.

[5] Kleppner, D., Kolenkow, R. (2014), An introduction to mechanics, Cambridge, UK, 119-124.

Theme Marine Hazards


Toxic Dinoflagellate Resting Cysts Distribution in the Surface Sediments of the Northeast of the Persian Gulf in Ralation with Environmental Parameters and Their Role in Bloom Formation

Hosseini Araghy, Hesameddin

Department of Geology, Faculty of Sciences, University of Tehran, Tehran, Iran Hesam.araghy82@ut.ac.ir

Abstract

Some dinoflagellates including some toxic groups produce resting cysts as part of their life cycle mainly in unfavorable environmental conditions and in termination of their blooming phase. Resting cysts have a resistant multilayer organic wall (contrary to temporary cysts) which can remain viable in the sediments for a long period of time. Resting cysts have a mandatory dormancy period and after it elapsed and when the environmental conditions are favorable, they excyst and the motile cell returns back to the water column. Therefore, resting cysts can be sources for new bloom initiation. Two main Paralytic Shellfish Poisoning toxin producer (PSTs) dinoflagellates; Pyrodinium bahamense and Gymnodinium catenatum, which both produce resting cysts as part of their life cycle, are present in the Persian Gulf. There is no large-scale bloom reported caused by either of these species, this is in spite of the fact that resting cysts of P. bahamense is abundant in the surface sediments. Lingulodinium polyedrum and Gonyaulax spinifera are two other dinoflagellate bloom forming species, which can produce yessotoxins, and their resting cysts are abundant in the surface sediments of the Persian Gulf. In 2008-2009 a bloom of toxic dinoflagellate Cochlodinium polykrikoides occurred in the Persian Gulf; however there are ambiguities regarding resting cysts production of this specie at the end of the bloom, since the resting cysts are not found in large numbers in places where the bloom occurred. In this study, resting cysts of this specie is not identified as well. In the case of an environmental stress such as long term heavy rain which affects salinity of water or persistent entrance of nutrients by fresh water run-off or aquaculture industry, conditions can turn in favor of bloom formation of the mentioned species.

Keywords: Toxic dinoflagellate, Resting cysts, Harmful Bloom, Persian Gulf

1. Introduction

Gymnodinum catenatum and *Pyrodinium bahamense* are two dinoflagellate species that can produce Paralytic Shelfish Toxin (PST), which can cause illness and fatality in human. *Lingulodinium polyedrum* is identified to produce Yessotoxin (YTX) in Adriatic Sea [1] and *Gonyaulax spinifera* can produce much higher levels of Yessotoxin (YTX) than levels recorded for New Zealand isolates of *Protoceratium reticulatum* [2]. In addition, Yessotoxin is potentially harmful for human and damaging for aquaculture industry [3]. All the mentioned four species can produce resting cysts and their resting cysts are present in the surface sediments of the Persian Gulf (Table 1). Resting cysts are produced by some dinoflagellates in



their life cycle by sexual homothallic or heterothallic gamete fusion mainly to overcome unfavorable environmental conditions [4]. Unlike temporary (pellicle cysts), which can be produced during both asexual and sexual phase and are considered to temporarily aid the species maintenance in the water column in short adverse conditions [5], resting cysts can be settled in the sediments and remain there for long period of time for excystment in favorable environmental conditions. They can be fossilized due to their resistant organic multilayer wall and thus can help investigating possible blooms in the past by vertically studying their distribution in the sediments. Therefore, resting cysts are considered as possible sources for new dinoflagellate bloom initiation. Resting cysts have a mandatory dormancy period and after this period elapsed; their excystment is mainly controlled by environmental conditions such as darkness, temperature, salinity and presence of predator [5]. The dormancy period varies in different environmental conditions and is different for various types of species. For resting cysts to be source of a new bloom, both bottom and surface water conditions must be suitable.

Table 1) Toxic dinoflagellate resting cyst species reported from samples

Dinoflagellate species	Resting cysts (paleontology)	Abbreviations
Gymnodinium catenatum	Cysts of Gymnodinium catenatum	CGCAT
Lingulodinium polyedrum	Lingulodinium machaerophorum	LMAC
Pyrodinium bahamense	Polysphaeridium zoharyi	PZOH
Gonyaulax spinifera	Spiniferites mirabilis	SMIR
Gonyaulax spinifera	Spiniferites ramosus	SRAM
	Spiniferites spp.	SSPP

2. Methodes

2-1. Sample preparation and study

Samples were collected from 12 stations from northeast of the Persian Gulf by Grab sampling device (Fig.1). About 5 cm³ was picked from each sample and dried, then sieved by 120 μ m steel mesh, in order to be prepared for maceration process. First, cold 20 % HCL acid was added to dried sediments and remained for 1 hour in order to remove calcium carbonate minerals from the sediments. Then HCL was neutralized by distilled water. Second, cold 40% HF acid was added to the sediments and remained for 24 hours to remove silicate minerals from the sediments. Then HF was neutralized by distilled water. Heavy liquid separation was applied using ZnCl2 as a heavy liquid to separate the dinoflagellate cysts from heavy minerals. A 20 μ m nylon mesh was used to sieve the cysts from smaller particles such as fine silt and clay. The cysts were mounted on the slides using Canada balsam as a mounting liquid and studied by CETI Magnum-B/T and Olympus CX22LED biological microscopes with 1000X and 400X magnifications. Cyst images were captured by Canon SX40 and SX50 series. Cysts dimensions were measured and scaled by Image J software.





Fig. 1) Map of the Persian Gulf showing position and name of studied stations.

2-2. Statistical analysis

Multivariate statistical analysis is conducted using CANOCO 4.5 software [6] to study quantitatively how environmental factors affected the resting cysts distribution of toxic species in the surface sediments. First DCA (Detrended Correspondence Analysis) was performed to check the strength of linear relationship among data. The longest gradient value reported by the software was shorter than 3 which indicates linear method is probably a better choice [6], therefore RDA (Redundancy Analysis) was used which is a linear method similar to PCA (Principle Components Analysis), except the ordination axes are constrained by environmental variables. Logarithmic transformation selected to be carried out by the software to reduce the effect of different units of measurement of the data. The environmental variables which are used in this analysis are; depth of which sediments were collected, sediment grain size change of sand, silt and clay, salinity and temperature of sea surface in autumn, when the samples were collected, which labeled as SSS, SST respectively, and levels of phosphate (P) and nitrate (N) measured at samples stations.

3. Results

3-1. Toxic dinoflagellate resting cysts distribution

Resting cysts of *Pyrodinium bahamense* (*Polysphaeridium zoharyi*) are the most abundant cysts among toxic and non-toxic resting cysts in almost all the 12 studied stations (except station D, which *Spiniferites* spp. are more in number) (Fig. 2).





Fig. 2) Diagram illustrating number of toxic dinoflagellate resting cysts in each station.

Spiniferites spp. and resting cysts of *Lingulodinium polyedrum* are the second and third most abundant resting cysts in the surface sediments in the studied stations of the Persian Gulf. This is consistent with the result of Bradford who studied surface sediments in a much broader scale in the whole region of the Persian Gulf [7]. It must be mentioned that number of all toxic and non-toxic dinoflagellate resting cysts is low in stations 84 and 106 (Fig. 3, Fig. 4, Fig. 5 A); therefore environmental parameters responsible for either low cyst production or low dinoflagellate motile cells presence should be investigated separately in the two stations. Resting cysts produced by most *Gonyaulax* spp., are usually hard to be distinguished under the microscope mainly because of inappropriate orientation, poor preservation and close morphological similarities. Therefore, cysts that their species type determined, only partly represent the actual number of their specie in the samples (Fig. 4 B). Hence, all the unidentified resting cysts with similar morphological features grouped under *Spiniferites* spp.

Resting cysts of *P. bahamense* are the most abundant in stations 92, 104, 92 and C (Fig. 3 A), and *Spiniferites* spp. are the most abundant in stations D and 104 (Fig. 4 A), resting cysts of *L. polyedrum* are also the most abundant in stations D, 104, C and Ts (Fig. 5 A). Therefore, all the three species are abundant in station 104. The distribution of resting cysts at different stations depends on the location of station in relation with nutrient availability, slight sea surface temperature increase away from the coast, marked temperature difference seasonally, and various living strategies of the species. Surface salinity seems to play less important role since the euryhaline nature of the species.

Resting cysts of *Gymnodinium catenatum* are rare compared to other toxic resting cysts (Fig. 2); they are higher in number in stations close to the coast and are few mainly in satiations far from the coast. This



can be as result of nutrient increase close to the coast and temperature increase away from the coast (Fig.3 B).



Fig. 3) Map showing cysts distribution of A) Pyrodinium bahamense, B) Gymnodinium catenatum.



Fig. 4) Map showing cysts distribution of A) spiniferites spp., B) Gonyaulax spiniferites.





Fig. 5) Map showing A) Cysts distribution of *Lingulodinium polyedrum*., B) Comparison between phosphate level and abundance of *Lingulodinium polyedrum*.

3-2. Statistical analysis results

Based on RDA, the first two axes showed 69.2 and 23.4 % of the total variance respectively (Fig. 6). Axes 1 is characterized by negative scores of resting cysts of *P. bahamense*, *L. polyedrum* and *Gonyaulax* spp and clay and silt opposition. Phosphate level is also highly correlated (R = 0.8211) with axes 1.Axes 2 is defined by negative score of resting cysts of *G. catenatum* and surface temperature and salinity are well correlated to axes 2 (R = 0.7027 and R = 0.4375).Nitrogen level is the least correlated with the both axes (Fig. 6).





It seems dinoflagellates that promoted their ability for sexual resting cysts production are the ones which their echophysiological skills in planktonic life is less enhanced, thus they take the advantage of both benthic and planktonic life stages for survival. Therefore, resting cysts are useful evidences for presence of toxic dinoflagellate species in the Persian Gulf region and highlights future potential blooms rather than reflecting high number of motile cells in the water column at the present. In the case that an unusual change in environmental parameters occurs (such as heavy rain that affects salinity and vertical density or persistent nutrient upload to the region) situation might turn in favor of bloom of any of discussed toxic dinoflagellate species. However, *G. catenatum* seems to have higher chances of bloom due to its faster vegetative growth, long chain formation, and better nutrient up take abilities. Finally, studying the resting cysts distribution vertically to investigate any possible bloom occurrences of toxic species in the Persian Gulf history is advisable.

Refrences

 Draisci, R., Ferreti, E., Palleschi, L., Marchiafava, C., Poletti, R., Milandri, A., Ceredi, A., Pompei, M., 1999. High levels of yessotoxin in mussels and presence of yessotoxin and homoyessotoxin in dinoflagellate of the Adriatic Sea. Toxicon 37, 1187 -1193.

[2] Rhodes, L., McNabb, P., de Salas, M., Briggs, L., Beuzenberg, V., Gladstone, M., 2006. Yessotoxin production in Gonyaulax spinifera. Harmful Algae 5, 148-155.

[3] Riccardi, M., Guerrini, F., Roncarati, F., Milandri, A., Cangini, M., Pigozzi, S., Riccardi, E., Ceredi, A., Ciminiello, P., Dell'Aversano, C., Fattorusso, E., Forino, M., Tartaglione, L., Pistocchi, R., 2009.
Gonyaulax spinifera from the Adriatic sea: Toxin production and phylogenetic analysis. Harmful Algae 8, 279-290.

[4] Figueroa, R.I., Rengefors, K., Bravo, I., Bensch, S., 2010. From homothally to heterothally: Mating preferences and genetic variation within clones of the dinoflagellate Gymnodinium catenatum. Deep-Sea Research II 57, 190-198.

[5] Bravo, I., Figueroa R.I., 2013. Towards an Ecological Understanding of Dinoflagellate Cyst Function. Journal of Microorganisms.

[6] Ter Braak, C.J.F., Smilauer, P., 1998. CANOCO reference manual and user's guide to Canoco for windows. Microcomputer power, Ithaca, USA. 352 pp.

[7] Bradford, M.R., 1975. New dinoflagellate cyst genera from the recent sediments of the Persian Gulf, Gulf of Oman, and northwestern Arabian Sea. Canadian Journal of Botany 53, 3064-3074.

Theme Marine Meteorology



Analysis of an Axisymmetric Tropical Cyclone Model; A Case Study Example

Pegahfar, Nafiseh¹, Ghafarian, Parvin¹, Gharaylou, Maryam²,

1-Assistant Professor, Atmospheric Research Center, Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran

2-Assistant Professor, Institute of Geophysics, University of Tehran, Tehran, Iran. gharaylo@ut.ac.ir

Abstract

In this research, the results of an axisymmetric tropical cyclone model for an intensive tropical cyclone, tropical cyclone Haiyan (TCH) that formed on 3 November 2013 over the Western part of Pacific Ocean, have been analyzed. This model based on conservation principles and assumed axisymmetry and steadiness. For this aim, analysis and observational data have been used. The analysis data sets with 6-hourly intervals have been obtained from Global Forecast System (GFS), with the spatial resolution of $0.5^{\circ} \times 0.5^{\circ}$. The observational data sets have been extracted from the Best Track Data from Joint Typhoon Warning Center (JTWC) produced by Japan Meteorology Agency. The model has been run for three various sets of external parameters and the results have been analyzed.

Keywords: Haiyan Tropical Cyclone, Numerical Model, Convective Entropy Flux

1. Introduction

Various physical parameters including dynamic and thermodynamic ones have been defined to show TC characteristics. Meanwhile, the role of entropy and the other entropy-dependent parameters have been marked ([1]), such as air-sea thermodynamic disequilibrium ([2]) and entropy deficit ([3]). For example surface and convective entropy fluxes from the ocean during a TC intensification have been noted ([4,5]) and their importance have been proved by observations, indicated that a TC (I) only develops where significant potential heat flux from sea exists, and (II) also decays over land even when plentiful amount of moisture and instability exist.

Therefore, entropy derivatives have been used in some numerical models to explain TC behavior. For this aim various frameworks have been used. In the current work applicability of a theoretical concept has been employed to study its applicability in studying convective entropy flux during a chosen TC. \

2. Methodes

This model is based on conservation principles and closely parallels that of Bister and Emanuel ([6]). Throughout the derivation, axisymmetry and steadiness is assumed and slantwise neutrality requiring the saturation isentropes be congruent to angular momentum surfaces is also supposed.



The first law of thermodynamics for saturated conditions combined with the momentum equations and a pseudoadiabatic assumption, ignoring the contribution of liquid water and ice to the entropy. Unbalanced effects are likely not absolutely critical to describe the basic behavior of the intensity of ventilation-modified TC. Following, integrating around a closed circuit bounded by two isotherms. To achieve the neutrality constrain, the subcloud layer is divided up in to two regions, as sketched in Fig. 1: an "inner" region from r_1 to r_2 centered around the radius of maximum wind and an "outer" region from r_2 to r_3 . Then, the entropy flux by the mean transverse circulation through the boundaries of the subcloud layer control volume is adequate to the sum of internal sources and sinks of entropy, and aerodynamic flux formula for the surface flux of entropy along with the expression for the contribution of dissipative heating to the entropy equation are used. Expressing u as some fraction of the maximum wind velocity, u_m , and r as some proportion of the radius of maximum wind, r_m , in the following fashion

$$u = \begin{cases} u_m & r_1 < r < r_2 \\ \gamma u_m & r_2 < r < r_3 \end{cases}, \quad r = \begin{cases} r_m & r_1 < r < r_2 \\ \alpha u_m & r_2 < r < r_3 \end{cases}$$
(1).

By assuming the turbulent flux of angular momentum at the surface as the aerodynamic flux formula and an expression for $\langle u \rangle$ in the outer-region as

$$F_{\rm M}(z=0) = -C_{\rm D}|u|rv \tag{2}$$

$$< u > \approx -\frac{C_D |u_m| r_m}{h},$$
(3)

the relation of convective entropy flux is obtained as

$$\overline{\acute{ws}} = \frac{c_{\rm D}\gamma|u_{\rm m}|\alpha}{\alpha - 1} (s^{\rm o}_{\rm b} - s^{\rm i}_{\rm b}) + C_{\rm k}\gamma|u_{\rm m}|(s^{*}_{\rm SST} - s_{\rm a}) + \frac{c_{\rm D}}{r_{\rm s}}\gamma^{3}|u_{\rm m}|^{3},$$
(4)

where \overline{ws} is convective entropy flux, s_{SST}^* is the saturation entropy at the sea surface temperature, s_a is an ambient value of saturation moist entropy, s_b^i is the subcloud layer entropy of the inner region, and s_b^o is the subcloud layer entropy of the outer region, C_k and C_D are the enthalpy and drag coefficients, α and γ are two external parameters. The external parameter of γ ($0 \le \gamma \le 1$) controls the radial wind decay and the α one ($\alpha \ge 1$) controls the ratio of the width of both the inner and outer regions to the radius of maximum wind.



Fig. 1) Sources and sinks of entropy and angular momentum in the subcloud layer and free troposphere for (a) the low-level pathway and (b) the midlevel pathway: surface fluxes of entropy, $F_s(z = 0)$, and angular momentum, $F_M(z = 0)$ (wavy arrows); dissipative heating, H; advection by the secondary circulation (gray arrow); convective entropy flux, $\overline{\dot{ws}}$ (vertical block arrow); and eddy entropy flux, \dot{us} , through outer angular momentum surface in the free troposphere (horizontal block arrow) ([7])



3.Data and case study

In the current work, two dataset produced by (I) Japan Meteorology Agency including eye location (latitude and longitude) and (II) NCEP-GFS reanalysis data with $0.5^{\circ} \times 0.5^{\circ}$ horizontal resolution at 26 pressure levels with 6-h intervals have been used. All data have been used during 03-11 November 2013. Tropical cyclone Haiyan (TCH) with the extra-ordinary intensity of 170 kts intensified as the highest ever observed TCs globally and reached 35 kts well above the threshold of 135 kts as the existing highest value for category-5 ([8]).

4. Results

Time series of three terms of Eq. 4 together with that of \overline{ws} have been calculated and analyzed. Only the results of \overline{ws} have been plotted in Figure 2 and 3, with different set up for external parameters (α and γ). To emphasize the importance of discrepancy between inner- and outer- regions entropy, various sets have been chosen.

The selected values of α and γ and the size of inner- and outer- regions are as $\alpha = 2$ and $\gamma = 0.3$ with $R_i = 0.5^{\circ}$ and $R_o = 1^{\circ}$, $\alpha = 2$ and $\gamma = 0.8$ with $R_i = 0.5^{\circ}$ and $R_o = 1^{\circ}$, and $\alpha = 2.5$ and $\gamma = 0.9$ with $R_i = 1^{\circ}$ and $R_o = 2.5^{\circ}$, respectively. The results for first and the last conditions are shown in Figures 2 and 3.



Fig. 2) Time series of $\frac{1}{66}$ using Eq.4. Inner- and outer-region sizes and external parameters have been demonstrated at the top of the figure



Fig. 3) Same as Fig. 4, but with different inner- and outer-region sizes and external parameters that have been demonstrated at the top of the figure.

5. Conclusion

Analysis of results at the peak activity of TCH (1800 UTC 7 November 2013) indicated that increasing of specific volume (α) decrease the entropy discrepancy between inner- and outer- regions. Implying various α and γ shows that the first term on the right hand side decreases by increasing of α and γ . The second term increases from 0.5 for the first condition to 10 for the second condition and to 7.5 for the last

Proceeding of the First International Conference on Oceanography for West Asia condition. The third term increases by increasing of α and γ . The most important result is the dependency **30-31 October 2017 IRAN - Tehran** of \overline{ws} trend on α and γ values. For example, first condition resulted in the value of -0.5 at TCH peak activity time, while second and third conditions led to the values of 2 and 5, in that order. Moreover in second and third conditions, time of the maximum value of \overline{ws} occurred after and before TCH maximum intensity, correspondingly. Conclusively, findings of this research show that choosing the best setting for the selected axisymmetic model needs more research on various TCs and different categories.

References

[1] Emanuel, K. A., (1995), Sensitivity of tropical cyclones to surface exchange coefficients and a revised steady-state model incorporating eye dynamics", *J. Atmos. Sci.*, Vol. 52, 3969–3976.

[2] Emanuel, K., (2010), Tropical cyclone activity downscaled from NOAA\CIRES reanalysis, 1908– 1958, *Journal of Advances in Modeling Earth Systems*, Vol. 2, 1.

[3] Tang, B., and Emanuel, K., (2010), Midlevel ventilation's constraint on tropical cyclone intensity", *J. Atmos. Sci.*, Vol. 67, 1817-1830.

[4] Riehl, H., (1951), A model for hurricane formation, J. Appl. Phys., Vol. 21, 917–925.

[1] Kleinschmidt, E., Jr., (1951), "Grundlagen einer theorie der tropischen zyklonen", *Arch. Meteor. Geophys. Bioklimatol.*, Vol. 4A, 53–72.

[5] Bister, M., Emanuel, K., (1998), Dissipative heating and hurricane intensity. *Meteor. Atmos. Phys.*, Vol. 65, 233–240.

[6] Tang, B.H.A., (2010), "Midlevel ventilation's constraint on tropical cyclone intensity", Doctoral Thesis, Massachusetts Institute of Technology.

[7] Lin, I I., Pun, I. F., Lien, C. C., (2014), "Category-6" supertyphoon Haiyan in global warming hiatus: Contribution from subsurface ocean warming", *Geophysical Research Letters*, Vol. 41, No. 23, 8547-8553.

Abstracts



The effect of oil contamination on sugars metabolome of Avicennia marina roots

Babak Moradi¹, Hassan ZareMaivan², Mehry Seyed Hashtroudi³, Mona Sorahinobar⁴, Jens Rohloff⁵, Atle M. Bones⁶

1. Department of Plant Biology, Faculty of Biological Science, Tarbiat Modares University, Tehran,

Iran

- 2. Department of Plant Biology, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
- 3. Department of Biological Science, Marine Science Research Center, Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran
- 4. Department of Plant Biology, and Center of Excellence in Phylogeny of Living Organisms in Iran, School of Biology, College of Science ,University of Tehran, Tehran, Iran
- 5. Department of Biology, Norwegian University of Science and Technology, Trondheim, Norway
- 6. Department of Biology, Norwegian University of Science and Technology, Trondheim, Norway

Abstract

Mangrove ecosystems of Iran, located in the shores of the Persian Gulf, near one of the busiest oil shipping routes, are exposed to petroleum pollution. To assess the effects of petroleum contamination of sediments on root metabolism of mangroves, Avecennia marina seedlings were grown on different levels of oil-contaminated soil (0, 0.2.5, 5.0 and 7.5 w/w). Metabolome analysis of roots of two months old seedlings confirmed that with the increase of oil concentration in the soil the content of glucose and cellobiose was increased while the concentration of ribose, sucrose and myoinositol decreased. Our findings indicated that oil contamination caused severe metabolic changes of Avecennia marina roots.

Keywords: Oil contamination, Avicennia marina, Sugars, Glucose, Sucrose, Root



Study of Oil Pollution in the Sediments of the Southern Coasts of the Qeshm Island (Mesen Area) in the Persian Gulf

Nasser Hadjizadeh Zaker¹

1. Associate Professor at University of Tehran

Abstract

Marine oil pollution occurs in different ways including the accidents of oil tankers and offshore oil platforms, illegal discharge of ships ballast water, sewage and industrial waste water. Marine oil pollution could result in severe damages to the marine environment and use of marine resources. The southern coastal area of the Qeshm Island, due to its location in the entrance of the Persian Gulf near the route of oil tankers, have been exposed to oil marine accidents. These coastal areas are highly interested for human uses in particular for fisheries activities and fish culture in the sea. Therefore, the study of oil pollution in these areas are very important. However, the number of these type of studies are very limited. In this paper the level of oil pollution in the southern coastal areas of the Qeshm Island near Mesen are presented using the Total Petroleum Hydrocarbons (TPH) concentration in the surface sediment samples collected in 8 stations located in depths of 3 to 20 meter in the study area. The results showed that the TPH concentration varied between 3 to 10 mg/kg which indicated a no oil pollution. The results of this study can also be used in similar areas along the southern coasts of the Qeshm Island.

Keywords : Persian Gulf, Qeshm Island, Marine Environment, Oil Pollution, Sediment, TPH



Identification and Evaluation of Macrobenthos Density and Diversity and Evaluation of the Effect of Particular Parameters on Rangeland (Site Intervals)

sahar jamali nia¹, seyed mohammad baqer nabavi², mohammad ali salari-ali abadi³, ahmad savari⁴

1. Master student of of marine biology

2. Associate Professor of Khorramshahr University of Science and Technology

- 3. Associate Professor of Khorramshahr University of Science and Technology
- 4. Professor of Marine Science and Technology University of Khorramshahr

Abstract

Considering the importance of nurseries as one of the most productive ecosystems in the biosphere, it is important to recognize their aquatic tissues. Sampling in January 2012 and April of 1395 was carried out with the help of Greenstein Wien and environmental permeability measurements including temperature, salinity, acidity and oxygen and analysis of organic matter sedimentation and grading in this study. In general, 15 species of 12 families, the percentage of the relative frequency of identified groups in the whole study period were respectively endodontic with 8 species 45%, 3rd species 21%, excellent hardwood with 1 species 18%, bivalve 1 The species was 10% and stomata with 1 species 6%. The dominant species of the region from the end of the abdominal region are Sp Barleeia and Sp Hydrobia in both seasons. The most effective factor in macrobenthos concentration is temperature, salinity and organic matter.

Keywords : *Identification, Macrobenthos, Diversity, Environmental Parameters, Rhizome, Frontier Site*



behavior bioaccumulation of heavy metals in the gill, liver and muscle of five fish species from Lengeh Port and Khamir Port

abuzar.alavi¹, Mohammad ali Salari-ali abadi², Alireza Safahieh³

1. Master student of sea pollution orientation

2. Associate Professor of Khorramshahr University of Science and Technology

3. Assistant Professor of Khorramshahr University of Science and Technology

Abstract

In recent years, due to development of industries, increase of industrial activity, and release of wastewater, coastal area and marine environment has pollution. marine ecosystem has an important role in the food supply of human. Marin pollution and feed of pollutant fish may threat human health. This study investigated heavy metal content in the gill, liver and muscle tissues and compare to standard indices of fish health. Five species of fishes (John s snapper, Green Back Mullet, Bartail flathead, Koli (shark), Black grouper) was couth in Bander Lengeh, and Bandar Khamir in the summer, 2015. Samples in the laboratory dries, and acid digestion were done with flame atomic absorption (analytic jena, Germany). Results of contr AA300 indicate heavy metals in the organs of Bandar Lengeh and Bandar Khamir have the different pattern, but often this pattern was liver>gill>muscle. Also, heavy metal content was zinc>copper>Nickel>lead>cadmium. Chloride cells and absorption in the ionic pomp show that higher accumulation of Nickel was in the gill tissue. Bartail flathead had higher accumulation of heavy metal in the tissue in the Bander Lengeh, may because of feeding of the benthos. Concentration of the heavy metal in the gill, liver, and muscle of fishes of Bander Lengeh not significant differt from Bandar Khamir. Nickel content of John s snapper, Green Back Mullet in Bandar Lengeh, and in Bartail flathead Bandar Khamir was rather higher than FDA and USEPA standards. These fishes have tissues with Nickel pollution. Although Nickel is essential element for human metabolism, but based on the standards, consumption of these fishes can threat human health.

Keywords : bioacumullation, heavy metals, Lengeh Port, Khamir Port

Preconcentration and determination of Manganese in antennia autenni seaweed from Chabahar bay using emulsification based dispersive liquid-liquid microextraction

mahmoud nassiri¹, hamid ershadifar², elham gamshadzehi³

- 1. chabahar maritime university
- 2. chabahar oceanography center
- 3. m.sc chabahar maritime university

Abstract

Research was conducted to investigate the concentration of Chromium on red algae in Chabahar Bay. Heavy metal pollution can easily be transmitted to higher stages of the food chain and ultimately into the living tissue of humans, in various ecosystems. For this reason, the presence of these harmful chemical compounds in the environment is always a serious threat to the health of living and human beings. In this study, the method of micro-extraction of liquid-emulsion based on emulsion formation was used to measure the heavy metal of chromium with acetyl-acetone ligand as a preconcentration phase as well as a complex in the range of 275 nm. Under optimized conditions, the method showed a linear response in the range of 0.01 to 100 ppb (R2=0.9960) and a detection limit of 0.0036.

Keywords : acetylene, Chabahar bay, algae antenna autennia



Air Pollution Reduction through Fuel Consumption Optimization

Mesbah Sayebani¹, Yaser Sharifi², Hamid Zanganeh³

1. Assistant Professor; Department of Naval Architecture; Amir- Kabir University of Technology; msaybani@aut.ac.ir

.2 M.S. student of Maritime Transport; Department of Naval Architecture; Amir-Kabir University of Technology; yaser.sharifi@aut.ac.ir

3. M.S. Maritime Transport; Department of Naval Architecture; Amir-Kabir University of Technology; maham_193@yahoo.com

Abstract

Maritime transport as the main artery of the global economy is one of the most important greenhouse gas emission factors and accordingly activists in this area pave the way to reduce costs and gas emission due to the growth in demand for maritime trade. Shipping companies try to reduce fuel consumption in a number of ways, including investing in technological improvements in ships, using larger ships, creating regular route lines and reducing ship speed and optimizing the maritime route. Reviewing the status of the emission of pollutants, the article studies the reduction of fuel consumption due to the optimization of the maritime route and the speed of the ship and its effect on the reduction of the emission of GHG from shipping.

Keywords : fuel consumption, speed reduction, air pollution, optimization of the maritime route, maritime transport



A Review the Study of Pollution from Heavy Metals in Aquatic Environment Persian Gulf

Parisa norouzifard¹, Samar Mortazavi², sedigheh asad³, Nasrin Hassanzadeh⁴

1. PhD. Candidate of Environmental Science, Malayer University, Malayer, Iran

2. Assistant Professor of Environmental Pollution, Department of Environmental science, Malayer University, Malayer, Iran

3. Assistant Professor of Biotechnology, Department of Biotechnology, College of Science, University of Tehran

4. Assistant Professor of Environmental Pollution, Department of Environmental science, Malayer University, Malayer, Iran

Abstract

metals with high bioaccumulation, toxicity, biomagnification, Heavy nonbiodegradation and temperature are stability and abundant pollutants that are exist naturally and mainly due to human activities in the environment and organisms. These metals come from various sources and activities, including wastewater and industrial, agricultural and urban wastes, marine transport, land erosion, and atmospheric deposition into the environment and especially water bodies. In this regard, the the Persian Gulf is due to its low depth, semi-closed, subtropical location, temperature fluctuations, high salinity and evapotranspiration, long time of water flowing is one of the areas exposed to various pollutants. In the present study, we tried to review the state of contamination of metals in the region by reviewing the studies carried out on measuring metal contaminants on Persian Gulf water. The results showed that in most of the cases, the concentration of metals was lower than the corresponding standards, but they had higher concentration values than those that were less affected by human activities, which could be attested to the role of humans and activity Human beings will increase the amount of these metals in the region. Finally, it can be considered indispensable to monitor the temporal and spatial of these pollutants as an immediate action, Environmental Impact Assessment and using the latest technologies as long-term actions to prevent and cleaning the pollution from these metals.

Keywords : pollution, Persian Gulf, Heavy metals, Aquatic Environment



The crisis of heavy metals in aquatic ecosystems and its removal methods

Parisa norouzifard¹, Samar Mortazavi², sedigheh asad³, Nasrin Hassanzadeh⁴

1. PhD. Candidate of Environmental Science, Malayer University, Malayer, Iran

2. Assistant Professor of Environmental Pollution, Department of Environmental science, Malayer University, Malayer, Iran

3. Assistant Professor of Biotechnology, Department of Biotechnology, College of Science,

University of Tehran

4. Assistant Professor of Environmental Pollution, Department of Environmental science, Malayer University, Malayer, Iran

Abstract

Environmental pollution, especially the water pollution crisis, is rising rapidly due to the introduction of agricultural runoffs, industrial wastewater discharges and residential areas in the aquatic ecosystems. Among these, the only solution is to find new sources of water, reuse of refined wastewater and use of various methods to eliminate relevant pollutants. Heavy metals are one of the most contaminated and toxic pollutants in contaminated waters such as Cu, Zn, Pb, Cd, Ni, Hg, etc. Due to their toxicity, various contaminants are produced. Today, these toxic metals have exposed humans and society to serious damage and environmental hazards. In this regard, in order to address the concerns raised, the importance of developing and applying methods for the removal of heavy metals has increased. In the present review, a general description of the purification methods and heavy metal adsorption capacity from industrial wastewater has been introduced, then the purification function, removal capacity of metal contaminants and their likely effects on health and the environment are investigated. Finally, with emphasis on the separation of heavy metals from industrial effluents, the use of efficient wastewater treatment methods is presented.

Keywords : sequestration, treatment technologies, Heavy metals, wastewater, environment



Risk assessment of heavy metals in aquatic ecosystems based on water quality indicators

Parisa norouzifard¹, Samar Mortazavi², sedigheh asad³, Nasrin Hassanzadeh⁴

1. PhD. Candidate of Environmental Science, Malayer University, Malayer, Iran 2. Assistant Professor of Environmental Pollution, Department of Environmental science, Malayer

University, Malayer, Iran

3. Assistant Professor of Biotechnology, Department of Biotechnology, College of Science, University of Tehran

4. Assistant Professor of Environmental Pollution, Department of Environmental science, Malayer University, Malayer, Iran

Abstract

Due to its location in dry and semi-arid region, Iran is among the world s critical countries in terms of per capita water supply. Increasing population, the expansion of industries and the need for water on the one hand and increasing the discharge of pollutants into water resources on the other hand, has placed water as a critical issue of interest to many researchers. Pollution from heavy metals in aquatic environments becomes more important in terms of stability, accumulation in the food chain, ecological effects, and a negative impact on human health. Anthropogenic metals are a source of highly mobile and bioavailable, thus increasing the Possibility of their adverse effects. However, in determining water quality standards, attention has not been to the contamination chemical form in the water column. In this regard, indices for assessing water quality, assessing the potential risk of these metals, as well as assessing the synergistic effects of pollutants are provided. In this study, an overview of the risk assessment and water quality control indices including the contamination index (Cd), Modified degree of contamination (mCd), Nemerow pollution index (PN) and potential ecological risk index (RI), the Heavy Metal Pollution Index (HPI) and Heavy metal Evaluation Index (HEI) is presented.

Keywords : Aquatic ecosystem, Risk assessment, Heavy metals, Indices



Water quality assessment of the Boghan river in Bushehr province using WQI water quality index

Amir Ali Emadi¹, Lida Salimi², Mohammad Taghi Sadatipour³

- 1. Ph.D. student of Water and Wastewater Economics Azad University Tehran West Branch
 - 2. Department of Environmental Engineering, Islamic Azad University, North of Tehran
 - 3. Department of Environmental Engineering, Islamic Azad University, North of Tehran

Abstract

Background and Objectives: Baghan River is one of the rivers in Bushehr province, which is important for water supply in agriculture and industry. In these studies, recognition of the quality of water entering the Bagan dam and the qualitative changes of water at the entrance to the dam were investigated and the main pollutant sources affecting the water quality of the river were studied. Method: For data analysis, the WQI water quality index was used. For this purpose, the stations were selected along the river route. Sampling was carried out in June and July of the year. The dissolved oxygen parameters, pH, oxygen demand, biochemical requirements, turbidity, temperature difference, phosphate, nitrate and total soluble solids were measured and then the quality index of each parameter was calculated and its qualitative value was calculated. Results and findings: The WQI Water Quality Index varies between 45-55 in the range of 45-55 and is in the middle group. The water quality index of the river is from the first station around the forest (upstream of the dam) to the last station of the average condition, which is the parameter Effective factors include total calcium and total hardness, dissolved oxygen and EC. Caloriferous humans and extinctions of some living organisms, as well as agricultural land washing due to rainfall and water drainage, high human communities, especially villages and residential areas adjacent to the river and overlooking it can be considered as one of the pollutants. The type of river bed and the presence of limestone and dolomite formations can be attributed to the high total hardness in the water samples of the region, which can increase the total difficulty along the river s course

Keywords : Pollutants, qualitative parameters, turbidity, qualitative index, Bagan River



Study of the effects of Chamkhaleh River pollution on the Caspian Sea macrobenthos

Morteza Farshchi¹, Ali Nasrolahi²

1. Shahid Beheshti University Email: morteza_farshchi@yahoo.com 2. Shahid Beheshti University Email: a_nasrolahi@sbu.ac.i

Abstract

One of the ways to study the effect of river pollution on marine ecosystems is to evaluate macrobenthic communities, which is the most common method for detecting the effects of turbulence on biological communities. In this study, the effect of Chamkhaleh contamination on the frequency and diversity of macrobenthic species was investigated. This study was carried out in winter at the estuary of the river at 6 stations. Sampling of bulk creatures was carried out using a grab with a cross sectional area of 025/0 square meters. In this study, a total of 248 individuals including 10 species belonging to 5 categories were counted and identified. The most frequent species was Tubificides fraseri (41%) and the least frequent was Straco (2.4%). On average, the abundance, species richness and richness of the station have been affected by contamination by the control stations. Using these results, it can be concluded that river contamination can change the abundance and frequency of macrobenthos in the Caspian Sea. Therefore, precautionary measures such as refinement of the judiciary should be taken to enter the rivers and the sea.

Keywords : Macrobenthos, Variety and density, Chamkhaleh River, Caspian Sea





The Comparison Study of ecological health status in the South East ports of Caspian Sea based on Biotic Index AMBI,M-AMBI

Mehrnaz baniamam¹, Kazem darvish bastami²

1. pHd marine biology 2. MSc. marine opllution

Abstract

Biological and Ecological studies Eco-marine systems and environmental health are issues that have become important in recent decades. How challenging is environmental health and how it integrates into ecomarine planning studies is challenging. In this study, in order to assess the ecological health status in the south East ports of Caspian Sea, The oil pollution were investigated.Sediment samples were collected using a Van Veen grab at 12 sampling points, seasonally during 2015-2016. The average oil compounds (PAHs) in four sample chapters Trade between $(27/0 \pm 3/3)$ to $(81/67 \pm 8/359)$ nano-g was observed. the results of ANOVA showed that the concentrations of PAHs in different seasons there is a significant difference (P < 0.05) and their distribution between seasons as autumn> summer> winter> spring was measured with GC-Mass .Average AMBI, M-AMBI in the south-east coast of the Caspian Sea in the spring, respectively, 6/55, 17/10 and in season summer 1/55, 47/8 and in autumn 6/55, 17/10 and in winter, 6/49, 21/9, respectively. Based on the results we can conclude that the stations with high pollution load, Macrobenthos density is lower because the oil has harmful effects of toxic metal pollutants and their ecological and life species are reduced or destroyed.

Keywords : PAHs, biological indicator, AMBI, M-AMBI, the Caspian Sea



Effect of Heavy Metals on Fish Abnormalities

Parvin Sadeghi¹, Elahe Afsa²

1. Assistant Professor of Marine Biology Department of Marine Science Chabahar University of Maritime and Marine Science Chabahar - Iran

2. MSC student of Marine Biology Department of Marine Science Chabahar University of Maritime and Marine Science Chabahar - Iran

Abstract

Water pollution by heavy metals influences different biological processes in fish, including growth and evolution. Heavy metals are associated with many fish abnormalities in natural populations as well as in laboratory samples. Anomalies have destructive effects on fish populations, which affects survival, growth rate, and appearance. Although extensive studies have been conducted on the exposure of heavy metals to the embryo stage, there is not much information about larvae in fish and adult fish. In the present article, information on the effects of heavy metals on the deformation of larvae (anomalies) in different parts of the world has been investigated. In order to evaluate the long-term effects of heavy metals pollutants, the use of fish anomalies as biological markers is investigated.

Keywords : Heavy metals, anomalies, fish



Measuring the concentrations of essential heavy metals Cu, Zn and Fe in muscle tissues of Scomberomorus commerson and Scomberomorus guttatus in Bushehr seaport.

Razagh Obeidi¹, Abdol Hassan Doolah²

1. Young Researchers and Elite Club, Bushehr Branch, Islamic Azad University, Bushehr, Iran 2. Department of Nursing, Islamic Azad University, Ahvaz Branch, Ahvaz, Iran

Abstract

The aim of this study was to determine the concentrations of heavy metals Cu, Zn and Fe in muscle tissues of Scomberomorus commerson and Scomberomorus guttatus in Bushehr seaport during 2017.20 samples of Scomberomorus commerson and 20 samples of Scomberomorus guttatus were caught completely at random from Bushehr seaport by the area local fishermen should be omitted. After biometry of the samples, the muscle tissues of the samples were separated and chemical digestion of the samples was done by MOOPAM, then Cu, Zn and Fe accumulation level in tissues were measured using Graphite furnace atomic absorption instrument (VARIAN AA 100). Comparison between the research results and international standards revealed that the concentrations of the Cu and Zn heavy metals in muscle tissues of the Scomberomorus commerson and Scomberomorus guttatus in the study area were lower than the WHO, FAO, NHMRC, and UK(MAFF) approved standard levels. However, the concentration of Fe was higher than the FDA-approved level.

Keywords : Heavy metals, Bushehr seaport, Scomberomorus commerson, Scomberomorus guttatus.



Investigating the contamination of lead, cadmium, copper and aluminum in sediments of Mangrove forests of Qeshm Island

Esmail Sezavar¹, Homira Agah², Lida Salimi³

1. Master in marine chemistry Islamic Azad university North Tehran Branch, Marine sciences faculty

2. Assisstant Prof. Iranian National Institute for Oceanography and Atmospheric sciences aaagah hom@yahoo.com

3. Assistant Prof. Islamic Azad university North Tehran Branch, Marine sciences faculty, Marine chemistry department salililida@yahoo.com

Abstract

Abstract In this investigation, heavy metal contamination was studied in Hara forests in Qeshm Island and Bandar Khamir. The sediment samples were analyzed by ICP-AES to determine Aluminum (AL), copper (Cu), Lead (Pb) and cadmium (Cd) after acid digestion. The decreasing trend of metals were observed as Al > Cu > Pb > Cd. Comparison of metal values in the sediment samples with American and Chinese standards showed that the metal concentrations were lower than the standards, except for cadmium, which was in the range of critical level. High concentrations of cadmium in the sediments of Mangrove forest of Qeshm can become a serious threat to the ecosystem and its aquatic organisms. Although the other element levels in this region was not very critical, but to prevent their future toxic effects on the environment it is necessary to manage protection of the forest environment.

Keywords : Key words: Pollution, Heavy Metals, Hara War, Qeshm, Persian Gulf



Modeling of produced water discharges from Salman oil field to the Persian Gulf

leila kasebnejad¹, mohamadali zahed², mohamadhosein niksokhan³

- 1. university of tehran
- 2. kharazmi university
- 3. university of tehran

Abstract

The effect of produced water discharges from Salman oil field to the Persian Gulf is predicted using Marine Environmental Modeling Workbench / Dose-related Risk and Effects Assessment Model)MEMW /DREAM(software. Salman oil field is located 144 kilometers south of Lavan, The Persian Gulf. The modeling was carried out based on Environmental Impact Factor (EIF) according to Predicted Environmental Concentration (PEC) and Predicted No Effect Concentration (PNEC) data estimation. The results indicated that 15 kilometers around oil field can affect by toxic compound as the results of produced water discharges.

Keywords : Produced water, DREAM, Salman oil field, Persian Gulf



A preliminary assessment of PAH concentration in the sediments and coral Acropora downingi from Hengam Island

Mehri Seyed Hashtroudi¹, Abolfazl Saleh², Neda Sheijooni Foumani³

1. Iranian National Institute for Oceanography and atmospheric Science Email:hashtroudi@inio.ac.ir 2. Iranian National Institute for Oceanography and atmospheric Science Email: saleh@inio.ac.ir

3. Iranian National Institute for Oceanography and atmospheric Science Email: n.sheijooni@inio.ac.ir

Abstract

Coral reefs are one of the most significant ecosystems which are functionally important both to humans and marine species. They have very fragile nature and need clear and clean water to survive. Land based marine pollution, pollution from shipping operations and also natural disturbances are serious threats to the coral reefs and their associated communities. So it is vital for environmental policymakers to start carefully implemented monitoring programs to quantify changes on coral reef and reduce the risk of further damage. The entry of chemicals to the marine environment endangers coral life directly and indirectly. Polycyclic aromatic hydrocarbons (PAHs) which are generated through natural and anthropogenic activities, has well known impacts on the aquatic environment. This study was conducted to provide a preliminary conception of PAH levels in Acropora downingi, the dominant coral and surrounding sediments of Hengam Island located in the eastern Persian Gulf. Both the coral samples and sediments were gathered by diving and freeze dried. The PAHs were extracted using ultrasonic method and their analysis was performed by HPLC equipped with UV and Fluorescence detectors. 15 PAHs were detectable. The individual PAH concentrations in corals (33-123 ng/g) were higher than that of surrounding sediments (25-94 ng/g). Considering the diagnostic ratios showed that the PAHs were of pyrogenic origin. The results showed that contamination of corals by PAHs in the studied area is lower than such areas like Kenting National Park (143-1715 ng/g), Taiwan and Gulf of Mexico (243-2121 µg/g).

Keywords: Polycyclic Aromatic Hydrocarbons (PAHs), Coral Acropora downingi, sediment, Hengam Island



Evaluation of heavy metals transfer from sediments of Gorgan River to the east coast of the Caspian Sea, Iran

Mohammad Abadi¹, Abbas Ali Zamani², Abdolhossein Parizanganeh³, Younes Khosravi⁴, Hamid Badiee⁵

1. M.Sc. Student of Environmental Science, Department of Environmental Sciences, Faculty of Sciences, University of Zanjan, Iran. Email: M.abadi@znu.ac.ir

2. Assistant Professor, Department of Environmental Sciences, Faculty of Sciences, University of Zanjan, Zanjan, Iran. Email: Zamani@znu.ac.ir

3. Professor, Department of Environmental Sciences, Faculty of Sciences, University of Zanjan, Zanjan, Iran. Email: h_Zanganeh@znu.ac.ir

4. Assistant Professor, Department of Environmental Sciences, Faculty of Sciences, University of Zanjan, Zanjan, Iran. Email: khosravi@znu.ac.ir

5. PhD Student of Chemistry, Department of Chemistry, Faculty of Science, Guilan University-University Campus, Rasht, Iran. Email: hamidbadiee@yahoo.com

Abstract

Heavy metal pollution in many river ecosystem of the world is a common environmental problem due to rapid population growth, industrialization and economic development. In particular, the final destination of rivers sediments is its downstream which is leading to the seas. Therefore understanding the status of heavy metal pollution in the aquatic ecosystems is critical subject for remediating pollutants in the environment. In this study, surface sediments (0-5 cm) samples from 6 stations within the three intertidal zones Gorgan River were collected for heavy metals metal (Cu, Ni and Pb) contamination analysis in summer 2016. Results show that the mean concentration (mg kg-1) of heavy metals in surface sediment samples followed in order Ni (38.35) >Pb (28.66) >Cu (21.55). Application of containing contamination factor (C _ f ^ i) and potential ecological risk factor of individual metals (E rⁱ) showed that the highest value of the above factors belongs to the lead element. Also an assessment potential ecological risk index (RI), contamination degree (Cd) and pollution load index (PLI) suggests that there is no significant environmental concern. In addition, this investigation shows that the concentration of Cu, Pb and Ni in the stations before and after the Gorgan River has increased. This suggests that the transition of heavy metals from river sediments to the Caspian Sea coast.

Keywords : Caspian Sea, Gorgan River, Heavy Metal, Sediment, Environmental Indicators



An investigation into the effect of PH and ionic strength on the extraction of strintium from seawater using Fe3O4 / FA nanocomposite

nayereh ghaeni¹, Mojtaba Taleshi², fatemeh elmi³

- 1. University of Mazandaran, Babolsar, Iran.
- 2. University of Mazandaran, Babolsar, Iran.
- 3. University of Mazandaran, Babolsar, Iran.

Abstract

In this study, Magnesium nanoparticles Fe3O4 / FA were used as an appropriate magnetic absorbent for the absorption of strontium from sea water. FT-IR experiments were used to characterize the produced product. The results of the FT-IR spectrum showed that new functional groups are located on the synthesized absorbent surface. The absorption of ions absorbed by atomic absorption was measured. In this study, we investigated the effect of pH on the amount of optimized strontium adsorption. At pH 8 = maximum adsorption was achieved and adsorbent absorbed more than 98% of strontium. Also, by screening adsorbent in an ionic solution, the adsorbent absorbed about 80% of the strontium. Due to the fact that the sea water is rich in various ions and the water pH is approximately 8, the synthesized absorber is a great way to absorb strontium from the sea. The initial results of this study showed that synthesized nanocomposite as a naturally occurring compound with high absorption efficiency as a suitable nano-absorbent material could be used to extract strontium from sea water.

Keywords : Seawater, Strontium, Iron oxide, Foluvic acid, Nanocomposites



sources of underwater sound in marine environments: the potential effects on aquatic animals

Saeed Shafiei Sabet¹

1. Assistant Professor, Staff Member, Fisheries Department, Faculty of Natural Resources, Sowmeh Sara, University of Guilan postcode:1144

Abstract

Aquatic environments are similar to terrestrial environments in that they are filled with a variety of abiotic and biotic sound sources. Furthermore, in the last few decades, sound generating human activities are responsible for so-called "anthropogenic noise", which has spread in time and space and is now recognized as potential driver of environmental changes in many aquatic habitats. Mainly, anthropogenic noise, has been recognized as an environmental pollution potentially may have detrimental effects on reproductive and survival of aquatic animals. A number of studies have shown that the effects of anthropogenic sound on marine organisms, depending on the differences in the intensity, interval and frequency of the noise and the distance from the noise source, can range from no influence to immediate death. In this study regarding to the importance of the sounds, prevalent sound sources and their characteristics have been investigated.

Keywords : Aquatic eenvironment, Ocean, Sea, Sound sources, Aquatic animals.



Acoustic noise impact with diffrent intensity and frequency on marine ecosystem by investigation of radiated noise level measurement of three comercial ships in Persian Gulf

Aliasghar Abniki¹, Mahdi Khoshhali²

1. Sharif University of Science and Technilogy 2. Khajeh Nasir University of Science and Technilogy Email:m.khoshhali@gmail.com

Abstract

Various kinds of noise including seismic air-gun noise, boating and shipping noise, sonar, white noise, noise generated by experimental noise emanating device, oil and gas exploration device, pile driving and coastal constructions, and other activity with wide range of intensity and frequencies increases significantly at this age, this noise increase gives rise to a new type of pollution that known as noise pollution, noise effects can depends frequency and intensity of noise sources, at this research we determined radiated noise of three commercial ships by means of standard method of measurement in Persian Gulf and investigate the impact of noise on marine organism such as adult fish and mammals. Vessel noise from a range of different ship types substantially elevated ambient noise levels across the entire recording band from 0.025 to 160 kHz at ranges between 60 and 1km. in this research radiated noise of three oil tankers as a broadband source level [1-2500Hz] observed between 215-219 dB re 1µPa @ 1m. This results illustrated that radiated noise from commercial ships can pollute significantly and when the number and traffics of this ships and exposure level of ship noise, increasing, damaging impacts can affect marine organisms seriously. This kinds of noise can cause auditory masking, leading to cochlear damage, changes in individual and social behavior and altered metabolisms. In addition to causing auditory and histological damage in hearing systems leading to behavioral alteration, and changing population and abundance, noise pollution can induce a series of Physiological responses such as stimulating nervous activity, and reducing immunity for example noise exposure also led to a depression in immune system in the white whale.

Keywords : pollution, noise, frequency, intensity, ship, measurement


Investigation of Bisphenol A Biodegradation Potential by Indigenous Ochrobacterium sp. Isolated from Mousa Creeks Sediments

Razieh Nasrolahzadeh¹, Alireza Safahieh², Hossein Zolgharnein³, Issac Zamani⁴, Kamal ghanemi⁵

1. Khorramshahr Marine Science and Technology University Email: r_nasrolahzadeh@yahoo.com .2 Khorramshahr Marine Science and Technology University Email: safahieh@hotmail.com

3. Khorramshahr Marine Science and Technology University Email:zolgharnein@kmsu.ac.ir

- 4. Khorramshahr Marine Science and Technology University Email: issac.zfr@gmail.com
- 5. Khorramshahr Marine Science and Technology University Email: kamalghanemi@gmail.com

Abstract

Bisphenol A is a chemical that abundantly used in the production of polycarbonate and epoxy resins as most are endocrine disrupting chemicals that may adversely affect human health and wildlife. It is found to be abundant in the aquatic environment, and biodegradation is one of the main ways to remove this material from contaminated sediments. In this study, contaminated sediments were collected from Mousa Creek. Strain Ochrobacterum sp. bacteria were identified with 99% similarity after sampling, purification, isolation and identification by 16S rRNA method. Growth and degradation ability of isolated bacteri was measured in 100, 200 and 300 mg/l of BPA in 24-hour intervals for 6 days. Bacterial growth rate was detected with spectrophotometer at 600 nm. Efficiency of BPA degradation was performed by Liquid-liquid extraction method and measured by HPLC. This strain not only was able to tolerate concentrations of 100, 200 and 300 mg/l of bisphenol A but also with efficiency of 61.5, 65 and 51 Percent, respectively showed good performance in the biodegredation of bisphenol A. These results demonstrated that the using feasibility of this indigenous bacteria (Ochrobacterum sp.) to biodegredation of BPA.

Keywords : Biodegredation, Bisphenol A, Mousa Creek sediments, Ochrobacterum sp.

Review and Analyze Effective Factors on Execution Sea Pollution Convention in Imam Khomini Port

Seyyed Fateme Mousavi Nezhad¹, Heydar Zare²

1. Operator of Port Authority of Khouzestan Port and Maririme Organization 2. Experts of Port Authority of Ehtemam Gostar Mahshahr Company

Abstract

the aim of research was identify effective factors on execution of marine conventions specially conventions relate to marine pollution and environment challenges.

Keywords : marine pollution, international convention, Imam Khomeini Port



microexraction and determination of Ciprofloxacin in water samples

Ahmad Manbohi¹, Seyyed Hamid Ahmadi²

1. Iranian National Institute for Oceanography and Atmospheric Science, P.O. Box 14155-4781, Tehran,

Iran

2. Chemistry & Chemical Engineering Research Center of Iran, P.O. Box 14334-186, Tehran, Iran

Abstract

Many people live in coastal cities. Entry of pollutions to the sea can cause many problems. One of the contaminations that has just been raised is the pollution caused by the entry of Pharmaceutical waste. To manage this problem, you need to determine the concentration of drugs in the water. In this work, Ciprofloxacin was studied in seawater using magnetic nanoparticles of iron oxide and surfactant, which were used as sorbent. To extract and determine this drug, SPME and HPLC were coupled. Many parameters that affect the absorption were optimized and the figures of merits of the method were obtained. Then, the spiked samples of Ciprofloxacin were determined. Fast analysis and increased sensitivity are some of the advantages of the proposed method.

Keywords : Drugs, Water pollution, Microextraction, Nanoparticles



Ecological assessment of Bushehr coast (Oli to Kangan) based on the following ecological criteria IUCN

Hoda Khaledi¹, Azadeh Rezaei²

1. Member of the faculty of the National Oceanic and Atmospheric Research Institute 2. Master of Science in Biology of the Sea

Abstract

The purpose of this study was to evaluate the ecological values of the Persian Gulf (Coasts Ouli to Kangan) according to IUCN ecological subcriteria. IUCN ecological subcriteria include biodiversity, naturalness, dependency, representativeness, uniqueness, productivity, vulnerability and Integrity. We evaluated these area according to IUCN degree of protection. IUCN degree of protection composed of 6 classes, each requires a specific management. To achieve this Macrobenthos were sampled. Macrobenthos organism ares appropriate for ecological studies due to their characteristics. Some of these characteristic being sedentary, the impact of adopting the bed changes and show the effects of these changes, a high diversity, easy collection of ecological studies and High tolerance to pollution. Macrobenthos sampling was done during the summer and winter in the research area. In each area, sampling was carring from Supratidal, Midtidal, Infratida and Subtidal points. The temperature, salinity, pH, EC, Turbidity, organic matter and aggregation were measured. To assess the subcriteria it is important to collect industrial and fish information as well as field benthic and environmental data. Finally the subcriteria were evaluated and rated. Each subcriterion was rated in the range of 1 to 4. Score 32 is the highest score for each region. After scoring subcriteria in all three regions, earned points were expressed as a percentage. According to these points, IUCN degree of protection was determined. All three areas, Ouli, Dayyer and Kangan were earn points of 70-85 percent. With these range of point the areas were in category II (Ecosystem conservation and recreation (National Park)). Due to these area were placed in category II and according to the management of this degree of protection, activities such as traditional fishing, diving and tourism activities in these ecosystems can be done. Aquaculture, mining activities, discharge of untreated wastewater, mining in the bed and the creation of artificial reefs is prohibited in these ecosystems. Key Words:Oli coast, Dayyer, Kangan, IUCN, ecological subcriteria, Macrobenthos, Ecosystem conservation and recreation

Keywords : Oli coast, Dayyer, Kangan, IUCN, ecological subcriteria, Macrobenthos, Ecosystem conservation and recreation



Study on distribution and species diversity of macrobenthos in Bahrekan waters using shanon and simpson indices

Seyedeh Narges Nabavi¹, Jamileh Pazooki², Seyed Mohammad Bagher Nabavi³

1. Ph.D. student of marine biology Marine Zoology , Marine Science and Technology University of Khorramshahr

2. Associated Professor of Marinre Biology, Shahid Beheshti University

3. Associated Professor of Marine Biology, Marine Science and Technology University of Khorramshahr

Abstract

During Summer and Winter 2014, forthy sediment samples were taken from Bahrekan Bay region using VanVeen grab (0.025 m^2 area). At the sametime the environmental parameter namely Do, pH, Salinity and Temperature were measured using Horiba U10 Analyzer. The percentage of %TOM and Particle size analysis of the sediment were done in the laboratory using standard methods outlines by Buchanan. According to the results, 59 species were identified. There was a positive correlation between %TOM, %Silt and Clay fractions and macrofaunal assemblages. The dominant species in all studied stations were Cerithium sp. ,Cerithidea cingulata, Pseudonoba sp.2, Tornatina persiana and Paraprionospio pinnata. Silt and Clay fractions were dominate in all stations (more than %90) with high percentage of TOM ranging from 6 ± 0.15 to $20.76\pm$ 0.33 in winter. The highest and lowest number of individuals of macrofauna were counted in Summer (2038 ind. / 0.025 m2) and Winter (1722 ind. / 0.025 m2) respectively. During this study, Bivalvia were the dominance group (%39.14) followed by Gastropoda (%38.47) Polychaeta (%19.23), Crustacea (%2.92), Scaphopoda (%0.17), Echinodermata (%0.07) and Soft Corals (%0.04). The comparison of H' values with Welch model shows that study area is in the moderate level of this model with low species diversity.

Keywords : *Persian Gulf, Bahrakan Bay, Macrobenthos, H' index and* λ *index*



Support Vector Machine Regression (SVR) approaches for predicting chlorophyll-a concentration in the southern Caspian Sea by using climatic indices

Mohammad Khosravizadeh¹, Hadi Mehdipour², Omid Beyraghdar Kashkooli³

1. Assistant Professor, Department of Marine Natural Resources, Khorramshahr university of marine science and Technology, Khorramshahr, Iran. Email:mohamad.27kh@gmail.com

2. Assistant Professor, Department of Electronic and Computer Engineering, Esfarayen University of Technology, Esfarayen, Iran. Email: mahdipourhadi@gmail.com

3. Assistant Professor Department of Natural Resources, Isfahan University of Technolog, Isfahan, Iran. Email: omid.beyraghdar@gmail.com

Abstract

Environmental variabilities may induce profound changes in phytoplankton communities in marine food webs. Understanding and modeling of phytoplankton communities dynamics (through using specific indices) in relation to climate variability can play an important role in effective management of marine ecosystems at different levels. Models performance may severely influenced by the natural characteristics of marine systems including biochemical and physical processes and their interactions. To cope with this problem and to have a better understanding of phytoplankton communities dynamics in the Caspian Sea, in this study Chlorophyll-a (Chl-a) concentration (as one of phytoplankton community indices) was modeled by Support Vector Machine Regression (SVR) approach using climatic indices; then the results were compared with multiple linear regression as the reference model. Monthly, seasonal and annual mean of large-scale climatic indices represented by the North Atlantic Oscillation (NAO), the Southern Oscillation (SO), and the East Atlantic West Russian patterns (EAWR) as well as the local-scale Sea Surface Temperature (SST) were used as the model inputs. The results showed one month time lag effect of NAO, EAWR and SST along with 3 month time lags effect of SO on Chl-a concentration variability. Also, the results showed that the annual NAO, EAWR and SO may affect Chl-a at a time lag of one year and SST at a time lag of 3 years. The simulation results of one month forward Chl-a concentration showed model including Chl-at-1, EAWR, SO an SST as model inputs led to the highest degree of explanation with R2= 56.44 %.

Keywords : Caspian Sea, Support Vector Machine Regression, Chlorophyll-a, Climate change



A survey of symbiotic zooxanthellae of hermatypic corals and zoantharians during bleaching in Hengam Island

Atoosa Noori Koupaei¹, Hamed Dehghani², Pargol Ghavam Mostafavi³, Seyed Mohammad Reza Fatemi⁴

> 1. Tehran Science and Research Branch, Islamic Azad University Email:atoosa.noori.koupaei@gmail.com

Email:atoosa.noori.koupaei@gmail.com

2. Tehran Science and Research Branch, Islamic Azad University Email:drdehghani.hamed@gmail.com

3. Tehran Science and Research Branch, Islamic Azad University Email:mostafavi_pa@srbiau.ac.ir

4. Tehran Science and Research Branch, Islamic Azad University Email:reza_fatemi@hotmail.com

Abstract

Reef corals and associated reef biota, including zoantharians, are hosts to a group of exceptionally diverse dinoflagellate symbionts in the genus Symbiodinium. It has been established that there are at least nine major clades of this dinoflagellate genus. Each clade consists of numerous subclades, which can exhibit considerable differences in physiology. High irradiance and temperature can cause the breakdown of this symbiosis, termed bleaching. Various cnidarians have different sensitivities during bleaching events. These differences have been attributed to thermal and irradiance tolerances exhibited by zooxanthellae. In the Persian Gulf, high temperature is known as the main factor of bleaching events. The present study aimed to specify the zooxanthellae types of Scleractinia and Zoantharia in the Northern Persian Gulf during a bleaching event. For this purpose, seven species of corals and three zoantharian species were collected in August 2013 at several sites off Hengam Island. Sampling was combined with molecular phylogenetic analyses utilizing different DNA markers to determine the presence of Symbiodinium type in each colony. Results showed that Symbiodinium clade A, the most irradiance-tolerant zooxanthellae clade, was the most abundant symbiont in unbleached anthozoans while clade C and D were dominant in bleached colonies. Contrary to previous findings, anthozoans do not harbor clade D, the heat-tolerant Symbiodinium type, to thrive in extreme conditions of the Persian Gulf. Consequentially, anothozoans of the Persian Gulf are likely more sensitive to high light intensity than high temperature. Therefore, they select for clade A to adapt to high levels of UV irradiation.

Keywords : Hermatypic coral, Zoantharian, the Persian Gulf, Bleaching, Irradiance, Clade A.



Macro zooplanktonic stocks in Khozestan artificial reefs

Simin Dehghan Madiseh¹, Yousef Mayahi²

- 1. Assistant professor, Aquaculture Research Center- South of Iran, Iranian Fisheries Science Research Institute, Agricultural Research Education and Extension Organization (AREEO), Ahvaz, Iran
 - 2. biology expert, Aquaculture Research Center- South of Iran, Iranian Fisheries Science Research Institute, Agricultural Research Education and Extension Organization (AREEO), Ahvaz, Iran

Abstract

Due to the assessment of macro zooplanktonic species composition consequence to the construction of artificial reefs, the sampling was conducted at four stations around areas of constructed artificial reefs in Hendijan shores of Khuzestan from May 2011 to March 2012. The result showed that different groups of Crustaceans include more than 82% of the macro zooplanktons. The mean density of Decapods, Branchiopods (mainly larval stages of Cladocera), and Copepoda were 302, 296, and 191.5 species/m3 respectively. Macro zooplanktonic communities showed high diversity after constructing the reefs rather than the previous. Moreover, in comparison with clay bottom of Khuzestan shores, various species were observed in these areas while some parts of them were not present in the previous reports. Animal groups which scatter in the water column during a part of their life stage and need to a substrate for settling and survival in immovability position showed rich diversity in these areas. The Larvae of attached and substrate dependent animals introduced to these ecosystems that can play an important role in ecological food chain of the seashores.

Keywords : Artificial Reefs, Macro zooplanktons, Bahrekan shores, Hendijan.



Study of changes in protein involved in metabolism in ovary of previtellogenic and vitellogenic Acipenser ruthenus

Mohammad Youneszadeh¹, Amir Parviz Salati², Saeed Keyvanshokooh³

1. Department of Fisheries, Faculty of Marine Natural resources, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran

2. Department of Fisheries, Faculty of Marine Natural resources, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran

3. Department of Fisheries, Faculty of Marine Natural resources, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran

Abstract

One of the challenges of sturgeon aquaculture industry is the late puberty of sturgeon fish. Sexual maturity of the female sturgeon is stopped in the pre-vitellogenic. The length of period is remained unknown. The pattern of protein expression in relation to late maturity of sturgeon can help to better understand changes in sexual maturity. The goal of this study was to survey of ovary proteome in cultured Sterlet sturgeon Acipenser ruthenus females in previtellogenic and vitellogenic sturgeons. In relation with identified protein in vitellogenin stage, proteins were related 50% to metabolism and energy production (TPI, ES1, creatin kinase,enolase, nucleoside diphosphate kinase), 20% to cell defense (thioredoxin and dislophid isomease) and 10% to transport(FABP). In pre-vitellogenic sage, the protection of primary structure of egg was very important because cell need until protected memberance egg from side effect. The almost of identified proteins in this stage were related to cell defence While in vitellogenic stage, gonadal cells were required to proteins that can create and store energy for growing and developing follicles.

Keywords : Acipenser ruthenus, ovary, metabolism, vitellogenesis



Study of the amount of biomass and pigments of a symbiotic microalgae Symbiodinium goreau isolated from Cnidaria of the Persian Gulf

Mina Yaseri Gohari¹, Behrouz Zarei Darki², Faezeh Ghanati³

 M.sc student of Marine Biology, Faculty of Marine Sciences, Tarbiat Modares University, Noor, Iran
Assistant Professor of Marine Biology Group, Faculty of Marine Sciences, Tarbiat Modarres University, Noor, Iran

3. Department of Plant Science, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran

Abstract

Among the dinoflagellates species of Symbiodinium genus contain the bioactive compounds such as peridinin, chlorophylls, protein and lipid. Peridinin is a carotenoid that is only synthesized by dinoflagellates, and is used in the various fields of medical, chemical, and food industry, as well as coloring and aquaculture. Nowadays, biotechnology looks for the effective methods of increasing the biomass amount in algae. In the present study, Symbiodinium goreaui was cultured at the temperature 23 ± 1 °C and light intensity of 50 µmol m–2 s-1 in photobioreactors (PBRs) system for 14 days. The parameters such as biomass, growth rate, and amount of peridinin, chlorophyll a and c were measured during the investigation. According to the result, the highest amount of biomass was obtained 28.66 g.m-2 on the 14th day while the growth rate was 0.148 d-1. The amount of peridinin, chlorophyll a and c represented 0.315, 0.051, and 0.122 g.m-2, respectively. However, it seems that the best culture method for the symbiotic species is a method on a hard substratum.

Keywords: dinoflagellates, zooxanthellae, carotenoid, Peridinin, chlorophyll, photobioreactors



Abundance and species composition of phytoplankton in the Coastal Waters of Oman Sea

Mahshid Jalili¹, Homaira Agah², Fatemeh Amini Yekta³

1. Marine Biology Department, Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

2. Marine Biology Department, Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

3. PhD Student in Marine Biology

Abstract

Phytoplankton assemblages of the coastal waters around the Oman Gulf were studied in order to investigate their abundance, distribution and Species composition. Water samples were obtained from 6 stations in pre and post Monson by Niskon bottle (1.5 liter) in 3 replicates. In this study, total phytoplankton abundance were 1944333 ± 5271 (Cell L-1) and 994000 ± 4475 (Cell L-1) in surface and depth (7 m) waters. In the first phase (Pre Momson, May) 30 phytoplankton species belonged to 7 groups (Bacillarophyceae, Dinophyceae, Cyanophyceae, Alphaproteobacteria, Prymnesiophyceae, Zygnemophyceae and Chlorophyceae) were identified. The most dominant phytoplankton groups were Dinophyceae and Bacillariophyceae, respectively. The maximum and minimum abundances of phytoplankton community were detected at Ramin and Tis stations, respectively. In second phase (Post Monsoon) 57 species were identified. Similar to the first monitoring, Bacillariophyceae (49.4%) and Dinophyceae (44.5%) were the most dominant phytoplankton groups, respectively. In this survey, we found no significant (p>0.05) correlation coefficient between phytoplankton abundance, temperature and salinity. The Mann- Whitney analysis showed that there was significant difference in the density of phytoplankton between different stations. Our results demonstrated that Tis station had higher distribution of phytoplankton than other sampling stations.

Keywords : Key words: Species composition, Abundance, distribution, phytoplankton, Oman Sea, Chabahar bay



Distinct symbiont types in three different hard coral hosts from Qeshm Island: Proof of stable associations between hosts and particular zooxanthellae

Mahshid Oladi Kelarijani¹, Mohammad Reza Shokri², Hasan Rajabi-Maham³, Nasim Zarei Polgardani⁴, Soudabeh Rouzbehani⁵

1. Shahid Beheshti University, Email: M_Oladikelarijani@sbu.ac.ir

2. Shahid Beheshti University, Email: M_shokri@sbu.ac.ir

- 3. Shahid Beheshti University, Email: H_rajabi@sbu.ac.ir
- 4. Tarbiat Modares University, Email: zarei_nasim@yahoo.com

5. Shahid Beheshti University, Email: soodaberoozbehani@yahoo.com

Abstract

Coral reefs are considered particularly susceptible to rapid climate change, and it is important to understand the mechanisms contributing to their resilience. Therefore, identification of their unicellular algae is of great importance in distinguishing sensitive corals from the resistant ones and setting conservation priorities. Despite living in an extreme environment, corals of the Persian Gulf have survived and adapted to its suboptimal conditions. Host-symbiont specificity and acclimatization capacity of corals, most importantly due to the type of their zooxanthellae, are crucial factors in determining the robustness of corals in a changing environment. In this contribution, the present study investigated the type of symbiont algae genus Symbiodinium associated with three reef-building corals Acropora downingi, Porites harrisoni and Stylophora sp. in Oeshm Island, northern Persian Gulf. In doing so, a total of 50 fragments of these corals were obtained by SCUBA diving and were analyzed for genotyping (using ITS2 region). The constructed phylogenetic trees illustrated that all A. downingi samples harbored type D1, all P. harrisoni samples contained type C15 and all Stylophora sp. samples bore type A1 symbionts. Type D1 was once believed to be exclusively associated with Pocillopora corals, but the current study illustrates that acroporid corals could benefit from its thermal tolerant nature as well. Poritid corals from the Indo-Pacific region are usually associated with type C15 and it is suggested that the Porites-C15 holobiont is resistant to thermal stress. Type A1 sequences obtained from Stylophora sp. were placed in the same clade as some clade A symbionts isolated from Indo-Pacifics' Stylophora. This may prove a stable symbiosis between Stylophora and this particular symbiont. Although it is commonly believed that inflexible host-Symbiodinium associations may be restricting hosts' distribution and make it more vulnerable to environmental stress, the wide distribution of these corals, especially Porites sp., throughout the Persian Gulf may raise the assumption that these stable partnerships are in advantage of these corals.

Keywords : Symbiodinium, Zooxanthellae, Coral, Persian Gulf, Host-Symbiont Specificity.



Length-Weight relationship and length frequency of rock oyster, Saccostrea cucullata in the Persian Gulf coastal waters

Rouhollah Zare¹, Ali Nasrolahi², Ehsan Kamrani³

1. Marine Biology Department, Chabahar Maritime and Marine Science University Email:ru_zare@yahoo.com

Department of Marine Biology, Shahid Beheshti University Email:a_nasrolahi@sbu.ac.ir
Fisheries Department, Hormozgan University Email: eza47@yahoo.com

Abstract

This study, aimed to achieve length frequency, condition factor and length-weight relationship of the rock oyster, Saccostrea cucullata in the coastal waters of the Persian Gulf. Sampling was carried out by 0.25 m2 quadrat through intertidal zone from winter 2015 to autumn 2016. According to the results, length-weight relationship calculated as W=0.000004L2.79 for both sexes. In addition, coefficient of determination (R2) value was determined as 0.94. Furthermore, b value was significantly differed from 3. Mean length and weigh in spring, summer, autumn and winter was calculated as 34.4 ± 4.96 , 36.8 ± 8.46 , 30.25 ± 7.1 and 33.31 ± 4.31 cm and 8.9 ± 7.57 , 10.4 ± 9.8 , 10.9 ± 6.11 and 7.8 ± 4.19 gr, respectively. Maximum and minimum length calculated as 97mm in the spring and 2 mm in the autumn. Maximum dry weight was found in winter (2.21gr) and the minimum was determined in the autumn (0.009 gr). Maximum length frequency in all seasons was observed in the 35-45 mm range class. However, range class of 40-45 mm was also frequent in the spring. According to the nMDS results based on length and weight ordination, autumn was distinct from all seasons which could be as a results of juvenile recruitment in this season.

Keywords : Abundance, Length-weight relationship, Persian Gulf, Saccostrea cucullata



Relationship between physicochemical parameters of water and phytoplankton assemblages in Makoran coasts (Pasabandar-Bris)

Kamalodin Kor¹, Amir Ghazilou², Hamid Ershadifar³, Emad Koochaknejad⁴, Hossein Negarestan⁵

- 1. Chabahar oceanography center of Iranian national institute for oceanography and atmospheric science, Chabahar, Iran- Email: kamalodin.kor@inio.ac.ir
- 2. Chabahar oceanography center of Iranian national institute for oceanography and atmospheric science, Chabahar, Iran- Email:amir.ghazilou@inio.ac.ir
- 3. Chabahar oceanography center of Iranian national institute for oceanography and atmospheric science, Chabahar, Iran- Email: hamid.ershadifar@inio.ac.ir
- 4. Chabahar oceanography center of Iranian national institute for oceanography and atmospheric science, Chabahar, Iran- Email: emad.koochaknejad@inio.ac.ir
- 5. Chabahar oceanography center of Iranian national institute for oceanography and atmospheric science, Chabahar, Iran- Email: h.negarestan@inio.ac.ir

Abstract

The aim of our study was to investigate the relationship between physicochemical parameters of water and phytoplankton assemblages in Makoran coasts (i.e. Pasabandar & Beris coasts). To this end, water sampling was conducted at six stations within 3 depth layers of 0.5, 5 and 10 m in each coast. Physicochemical parameters i.e. pH, temperature, salinity, conductivity and dissolved oxygen were measured at each sampling time. Also, sampling of phytoplankton assemblages was carried out in 3 replicates and fixed with lugol solution at each station. Overall, 28 phytoplankton genera belonging to 6 phyla (i.e. Dinoflagellata, Bacillariophyceae, Ochrophyta, Myzozoa, Cyanobacteria and Ciliophora) were recorded, amongst which the Bacillariophyceae was the most diverse group. The maximum phytoplankton density was found in April, 2017 at the depth of 10m in station 1 and minimum value were recorded in March, 2017 at the depth of 5 in station 5. Average phytoplankton density varied between 1000 ± 43 cells per litter (depth 10; station 4) to 686667 ± 370 cell per litter (depth 5; station 1). There were a significant effect of time and location on total phytoplankton density (p>0.05). The investigation of the relationship between physicochemical parameters of water and composition/structure of phytoplankton assemblages was performed, considering all five factors (i.e. pH, DO, temperature, salinity and electrical conductivity). Based on linear models, three factors including pH, DO and temperature were considered as the main parameters to affect the composition of the phytoplankton assemblages in the tested areas and winter clusters were found to be mostly impacted. On the other hand, only two factors (temperature and DO) were identified as the main factors affecting the structure of phytoplankton communities. The observed effects were highest for winter assemblages.

Keywords : phytoplankton assemblages- physicochemical parameter- Pasabandar- Beris-Makoran coasts



Molecular phylogeny of Scylla serrata from the Persian Gulf (Bushehr) by using DNA barcoding method

Farideh Chenari¹, Seyed Mohammad Bagher Nabavi², Mohammad Ali Salari³, Ahmad Savari⁴, Hossein Zolgharnein⁵, Shafa Hoveazavi⁶

1. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran, chenari_bio@yahoo.com

- 2. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran, nabavishiba@yahoo.com
- 3. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran, salari@kmsu.ac.ir
- 4. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran, savari 53@yahoo.com
- 5. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran, zolgharnein@kmsu.ac.ir
- 6. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran, shafa2004@gmail.com

Abstract

Keywords : Scylla serrate, Molecular phylogeny, DNA Barcoding, Persian Gulf



Investigation of Density Driven in the Strait of Hormuz

Jafar Azizpour¹, Ahmad Arabzadeh²

1. PhD in Physical Oceanography, INIOAS, Tehran, Iran 2. Msc. in Marine Structures , INIOAS, Tehran, Iran

Abstract

in this study density driven currents investigated in the southern part of the Strait of Hormuz. current data selected for 5, 25, 55 and 85 m depth and investigated. density driven currents extracted by using of Butterworth low-pass filter and for more than 15 days. for better understanding of current mechanism along-shore currents calculated by PCA method. Outflow of currents were evident from 55 m depth to the bed, while from surface to 55 m depth current had different manner. Maximum and minimum of currents quantity observed at the surface layer and 25 m depth, respectively. the results shows water column were two layers in the period of observation.

Keywords: Strait of Hormuz, Water Current, ADCP, Density Driven Currents



Distribution of Wind and Sea Surface Temperature Effects on the Surface Currents of the Oman Sea

Amirhossein Barzandeh¹, Fahimeh Hosseinibalam², Smaeyl Hassanzadeh³

1.M.Sc. in Physical Oceanography, Physics Department, Faculty of Sciences, University of Isfahan, Iran
2. Associate Professor, Physics Department, Faculty of Sciences, University of Isfahan, Iran
3.Professor, Physics Department, Faculty of Sciences, University of Isfahan, Iran
ahbarzandeh@gmail.com

Abstract

In the present paper, correlations of sea surface current with wind and sea surface temperature were studied separately. For this purpose, gridded long-term daily timeseries data were obtained for each of mentioned variables on the Oman Sea basin. At first, In order to get a glimpse, the existence of the dominant patterns of these variables was calculated and investigated. As a result, it was determined that in addition to the different temperature distribution in different parts of the Oman Sea, the dominant wind speeds and the dominant surface velocities vary in the range from 1.5 to 6 m / s and from 10 to 35 cm/s, respectively. then, statistical analysis were applied to each of the data on the Oman Sea. According to the results, the range of correlation coefficients between velocity of wind and surface current and also between temperature and velocity of surface current were determined separately. The correlation coefficient between wind and sea surface velocity varies from 0.73 to 0.85 for the entire Oman Sea surface. Also, according to the results of the analysis of correlations, the interaction between the temperature and the sea surface current of the Oman Sea is different for different regions of the sea, and the relationship between these two may be strong or weak, and at the same time direct or inverse.

Keywords: sea surface current, wind, sea surface temperature, correlation coefficient



Investigation of Deep Sound Channel in the Northern Arabian Sea by Using the Gibbs Function and the Thermodynamics Equations of Sea Water on the Argon Data

Majid Sadehgi Ardestani¹, Amirhossein Barzandeh²

 Jihad, NEDAJA, Islamic Republic of Iran Army, Tehran, Iran
Msc in Physical Oceanography, Physics Department, Faculty of Sciences, University of Isfahan, Iran ahbarzandeh@Gmail.com

Abstract

in this study, the sound speed profile and possibility of existence of deep sound channel was calculated and surveyed by using Gibbs function, thermodynamic equations of sea water and the 329 ARGO data stations from January 2014 to December 2016 for a certain area of the northern Arabian Sea. According to the results, the application of the TEOS-10 equations on the ARGO profiles generally indicates the presence of the deep sound channel in the study area. The depth of the dominant axis of the SOFAR is changed annually, so that in the warm months of the year (June and July) it reaches to a minimum of about 1600 meters and increases towards the cooler months more than 1800 meters.

Keywords: deep sound channel, sound speed, thermodynamic, ARGO data



Study of Physical and Dynamical Structure of Coastal Waters Over the Southern Continental Shelf of the Caspian Sea

Siamak Jamshidi

Iranian National Institute for Oceanography and Atmospheric Science (INIOAS), Tehran, Iran

Abstract

The Caspian Sea as the largest inland water body in the world is very important due to its unique characteristics. Iran is located in the southern coasts of the Caspian Sea and has very important position and role in the western part of Asia. Sustainable development of coastal areas and ports, and optimal operation of the Caspian Sea requires environmental and oceanography knowledge in shallow and deep waters of the sea. The research focus on physical and dynamical structure of coastal waters over the continental shelf in the southern part of the Caspian Sea based on the field data collection.

Keywords: Thermal Stratification, Sea Current, Continental Shelf, Caspian Sea.



Real-time prediction of Water Level Fluctuation Using Adaptive Neuro-Fuzzy Inference System (ANFIS) in the Caspian Sea

Masoud Dehbashi¹, Seyed Ali Azarmsa², Mehdi Vafakhah³

1.M.Sc., Faculty of Marine Sciences, Tarbiat Modares University masood.dehbashi@gmail.com

2. Associate Professor, Faculty of Marine Sciences, Tarbiat Modares University

3. Associate Professor, Faculty of Natural Resources, Tarbiat Modares University

Abstract

The Caspian Sea is the world's largest enclosed basin of the water that terms of oil and gas resources as well as its significant role in the areas of shipping, trade, economy and its impacts on the neighboring countries climate, has a very importance of international. On the other hand, rapid variations in sea level, especially uplift the last few decades in sea water surface had substantial social and economic consequences and caused much damage in the coastal areas of Caspian Sea. Hence, evaluation, modeling, and prediction of water level fluctuations essential for the comprehensive management of sea and coastal sustainable development in this area. Therefore in the present research, models of various adaptive neuro-fuzzy inference system (ANFIS) using the data measured monthly sea water level in two coastal gauges of Anzali and Noushahr respectively for 40 years and 14 years, in the of South Caspian Sea, have been developed. Comparison of predicted values of water balance by final models with measured values at each station and according to the statistical indices of R2, RMSE and CE indicate that the adaptive neuro-fuzzy inference system in learning and forecasting of complex and nonlinear behavior of the Caspian Sea is very good performance and can be considered as a new approach for predicting the state of fluctuations in this basin.

Keywords: Water level modeling, Sea Level Fluctuation, Caspian Sea, Neuro-Fuzzy, ANFIS



Seasonal Changes of Bed Profiles in the Makran Coasts (Case Study: Roudic Fishery Port)

Mehdi Shafieefar¹, Mohammad Bagheri², Mohammad Hosein Neamati^{*}, Aghil Hajmomeni^{*}, Ahmad Rezaee Mazyak^{*}

1.Faculty of Civil and Environmental Engineering, Tarbiat Modares University, Tehran, Iran
2.Department of Coastal Engineering, Ports and Marine Organization, Tehran, Iran
3.Pars Geometry Consultants, Tehran, Iran
ahmadrezaee2010@gmail.com

Abstract

Study of the bed profile changes pattern are important in parts of coastal engineering such as the determination of the ports layout, the location of coastal facilities and the dredging periods of ports. Investigating the bed profile changes around the Roudik port in the Monsoon season indicates the formation of sediment bars at the offshore. The formation of sediment bars caused increments the width of the littoral area.

Keywords: bed profile, Makran coasts, Monsoon, roudic fishery port



Modeling an Intelligent Under Water Robot to Explore the Ocean s Depths by Modeling Dolphin Behavior in a New Method of Computational Fluid Dynamics

mehdi farzaneh¹, mahmood rostami²

Master of Engineering in Marine Engineering
Assistant professor of the Department of Engineering of the Sea

Abstract

The basis of various ideas about inventions and discoveries of humankind has long been based on the attitude towards the adaptation of elements in nature and the universe. Different scientists have used nature to study their engineering affairs, which is a fundamental symbol of life and life cycle. They used natural prototypes for any theory that has been used to argue their scientific fundamentals. In this paper, the dynamic analysis of the underwater body was presented with a modeling of the Dolphin behavior, which is one of the fastest marine waters, and changes were made to the shape of a submarine robot that was mostly located at the nose. Given the behavior of this marine creature in six degrees of freedom, it is possible to achieve acceptable results in terms of fast and instantaneous movement with minimum forces applied to it, and also the reason for the low forces of dolphin moving at high speeds is calculated. And was matched to the underlying body of the underwater robot, and appropriate results were extracted. For numerical modeling, powerful Star ccm+ software has been used, and the process of wave analysis under single-phase conditions is limited by volume.

Keywords: Numerical Modeling, Oceanography, Under sea Robot, Dolphin, Force and Pressure, Star ccm



Landsat Satellite Data (TM5 Sensor) for Water Monitoring, Caspian Case Study

ZEINAB KHARKAN¹, MOHAMAD AKBARINASAB², TAHER SAFARAD³

1.Student MSc in Physical Oceanography, Faculty of Marine and Ocean Sciences, Mazandaran 2.Assistant Professor, Department of Marine Physics, Faculty of Marine and Ocean Sciences, Mazandaran University, Babolsar, Iran

3. Assistant Professor of Department of Geography, Faculty of Humanities, Mazandaran University,

Babolsar, Iran

akharkan9071@yahoo.com

Abstract

The present study was conducted to determine the best color combination in order to monitor the freshwater of the White River and the salt water of the Caspian Sea. The optimal OIF index, band correlation, and standard deviation for classification and fabrication of false color combinations of Landsat satellite data, TM sensors were calculated. The data classification is monitored. In this study, six sensing bands were recalled in ENVI software and the data of these bands was investigated. Vegetation index NDVI has been used to detect vegetation. The color combination of 452 was the most suitable color combination with the clarity and variety of colors in water and drought, since it represents the highest OIF.

Keywords: fresh water - salt water -normalized difference vegetation index - optimum index factor



Effect of Thermocline Formation on Underwater Acoustic Waves Propagation in Persian Gulf

Vahid Zarepour¹, Aliasghar Abniki²

1.Department of Physical Oceanography, Faculty of Marine Science and Technology, Islamic Azad University, Science and Research Branch, Tehran, Iran

2.Department of Engineering, Faculty of Mechanics, Sharif University of Technology, Tehran, Iran

vzarepour@yahoo.com

Abstract

The thermocline layer has significant effects on the propagation of sound waves in the Persian Gulf. So far, comprehensive research on the recognition of the thermocline layer and especially its features, including the depth of the beginning, thickness, and thermothermal gradient of the Gulf have not been done. Also, the influence of the thermocline on the issue of the dissemination of underwater sound waves, such as the loss of propagation and the formation of sound channels in the Persian Gulf, has not been studied. In addition, major studies have been done on the effects of thermocline on lowemission emissions, and the high frequencies were less studied. Therefore, in this research, we try to resolve these ambiguities and issues. In this study, data from the Rapid Sea Cruise Measurement Data were collected that were collected in the Gulf in the summer of August (2001). The Bellhop model is used to simulate the sound propagation based on the theory of beam tracing in solving the wave-wave equation. The advantage of the theory of beam tracing is that the effect of the high frequencies can be studied. The results show that the change of each of the characteristics of the thermo-layering layer and the formation of the sound channel has a significant effect on the change in the amount of dissipation emissions. The loss of diffusion due to the change in any of the characteristics of the thermo-layer is generally 3 dB, and if the source and receiver are located in the audio channel (due to the thermo-layer), the dissipation of the emission is significantly reduced (up to 8 dB). This is a useful guide in detecting sonars and how they are deployed

Keywords: Thermocline layer, Emission dissipation, Persian Gulf, High depth of thermocline, Thickness of thermocline, Thermocline gradient.



Study of the Effect of Density over Gibbs Free Energy of Caspian Sea Waters

Milad Ghods Qazvini¹, Fatemeh Elmi¹

1- Sea Chemistry, Faculty of Marine and Ocean Sciences, Mazandaran University, Babolsar, Iran milad.ghods@umz.ac.ir

Abstract

In 2010 International Oceanographic Commission (IOC) has published The International Thermodynamic Equation of Seawater-2010 (TEOS-10) which provides a new definition of salinity a long with various equations for calculating the thermodynamic properties of seawater. Comparing this publication to its predecessor (EOS-80) which is currently utilized by almost all of marine research institutions in Iran, TEOS-10 with a new scientific approach have numerous advantages which are briefly explained in this paper. Utilization of TEOS-10 for Caspian seawater has also been studied and results are compared with measurements and EOS-80.

Keywords: Caspian Sea, Density, Absolute Salinity, Thermodynamic, TEOS-10



Investigating the Velocity of Water Flow in Gorgan Bay, Under the Influence of Variable Wind Patterns Using Mike 21

Majid Dastdaran¹, Afshin Mohseni arasteh², Hossein Morovvati³, Masoud Torabi Azad², Kamran Lari²

1. Ph.D. student, Physical Oceanography, Coastal orientation, Islamic Azad University, North Tehran Branch, Iran

2. Associate Professor. Department of Physical Oceanography, Islamic Azad University, North Tehran Branch, Iran

3. Assistant Professor. Department of Physical Oceanography, Islamic Azad University, North Tehran Branch, Iran

majid.dastdaran@yahoo.com

Abstract

Gorgan Bay has been registered worldwide as one of the world's biodiversity reserves due to its high bioavailability. Due to the increased entry of Gulf municipal and industrial wastewater, there is an environmental risk that the continuation of this process threatens the survival of this ecosystem. On the other hand, currents play an important role in the distribution of environmental pollution. Therefore, it is necessary to obtain a flow pattern in the short and long term for any research. This research, with the purpose of field and numerical studies, addresses the mechanism of flow pattern within the Gorgan Bay. In this research, the two-dimensional hydrodynamic model of Gorgan Bay is presented using the Mike 21 hydrodynamic model software to calculate the flow velocity value. Environmental temperature exchange data, time variations in water level in the only open boundary of the model (Ashurade open port - Turkmen port), Gulf primary water level, weather parameters including rainfall, evaporation, wind, time step, and coefficient of roughness of the floor in the appropriate range to the model Applied. Using hydrodynamic data, the hydrodynamic model was accurately calibrated and verified. The results of the study showed that the flow directions in the Gorgan during the year are clockwise. The average water flow velocity is 0.029 m/s. Also, the flow pattern generated by the model with field measurements of the flow through floating tracking is a good match.

Keywords: water flow velocity, Variable wind pattern, Gorgan Bay, Mike21



Determining the Distance between the Transmitter and Receiver in a Layered Sound with Acoustic Reverse Method in the Laboratory.

Mohammad ahmadnejad¹, mohammad akbarinasab², mohammad kazemirad³, ali mohammadi⁴

- 1. Ph.D. student of Physical Oceanography and Faculty Member of Imam Khomeini Naval Sciences University, Noshahr
 - 2. Assistant Professor, Faculty Member and Director of Department of Physical Oceanography, Mazandaran University
- 3. Ph.D. student of Marine Telecommunications and Faculty member of Imam Khomeini Marine Science University, Noshahr
 - 4. Member of faculty member of Imam Khomeini Naval Sciences University, Nowshahr ahmadnejad.amin@gmail.com

Abstract

In order to estimate the distance between the transmitter and receiver placement of transmitting audio (at a frequency of 50 kHz) in a stratified environment (three layers of different densities) used in laboratory conditions. Experiments in a glass tank with a length of 300 cm and a width of 50 cm and depth of 100 cm is conducted. is water, we recorded the noises contained in data Batrvs removed using a filter. Receivers, sound passing through each layer due to the speed of sound changes due to the density difference between layers with a time lag receives. By comparing this Akhtlafzmany there when passing through an environment resulting from changes in the speed of sound layering, and a homogeneous environment (tank full of water) and changes in peak-to-peak signal, received signal power and strength to help in moments of sound transmission techniques. Compressed pulse we calculate the distance between the sensors.

Keywords: Scattering, pulse compression, inverse acoustic, Chynhbndy water, acoustic waves.



The Wind-Wave Climate of the Makran Coastlines(A: appraising of ERA-Interim results)

Mohammadreza Khosravi¹, Mohammad Bagheri², Mohammadhosein Nemati², Mehdi Shafieefar³, Aghil Hajmomeni¹, Ahmad Rezaee Mazyak¹

 Pars Geometry Consultants Co., Tehran, Iran
Department of Coastal Engineering, Ports and Maritime Organization, Tehran, Iran
Faculty of Civil and Environmental Engineering, Tarbiat Modares University, Tehran, Iranmohammad.r.khosravi@gmail.com

Abstract

Wave pattern is an important marine component and its recognition is of great importance. In this paper, an assessment of the climate conditions in the area of the coast of Makran has been studied. The data used by the global ERA-Interim model in 2016 has been extracted. The results of the global model have been compared with the measured data at the Pasabandar, Pozm and Meidani. The results show that the predicted model has optimal accuracy in terms of waves, while the precise prediction range for propagation of waves is reduced from east to west.

Keywords: ERA-Interim, Makran coasts, wave climate, measurement data



Specifying Bottom Friction Coefficient in the Mond Estuary with TELEMAC3D Model

Ahmad Arabzadeh¹, Jafar Azizpour²

1. persian gulf center- boushehr, iranian national institute for oceanography and atmospheric science (INIOAS), boushehr, iran, ahmadarabzadeh@inio.ac.ir

2. Ocean Sciences Research Center, Iranian National Institute for Oceanography and Atmospheric Science (INIOAS), Tehran, Iran

Abstract

In this paper, Calibration and validation of the TELEMAC-3D model is investigated to specify the coefficients of bottom friction in different points of the Mond Estuary. The estuary is located along the northern coasts of the Persian Gulf. The model sensitivity is initially tested for variations in the friction coefficient, when applying the Manning, Chezy and Nikuradse laws of bottom friction. Then, model was calibrated against field data measurements of tidal fluctuations and velocity during a typical 25-hours tidal cycle from 22-Feb-2014 to 23-Feb-2014. The The best agreement was resulted by using Chezy coefficient of 90 in the estuary downstream where the tidal effects is stronger than another effects of river discharge and the sediments have mainly marine source while in upstream of the estuary, Manning law of bottom friction (M=0.25) was appropriate where estuarine sediments is mainly affected by the river discharge due to dissipating of tidal wave

Keywords: Bottom Friction Coefficient, TELEMAC-3D, Mond Estuary, Persian Gulf



Comparison of Tidal Components Using Hydrodynamic Simulation and Tidal Global Models in the Persian Gulf

Ehsan Shad¹, Mahyar Majidi nik², Mahdi Jafarzade³

1. MSc of Coastal, Port, and Marine Structures Engineering, Faculty of Engineering, Qom University, Email: Ehsan.shad@ymail.com

2. MSc of physical oceanography, Department of Natural Resources and Marine Sciences, Tarbiat Modares University, Email: M.majidynik@yahoo.com

3. MSc of physical oceanography, Department of Marine and Ocean Sciences, Mazandaran University, Email: Mahdimayvan@gmail.com

Abstract

Study of tidal patterns using numerical simulation in depth and coastal shores to plan and manage shores is one of the basic needs of each country. Therefore, the purpose of this study is to evaluate and validate the 3D hydrodynamic model in the Persian Gulf using field measurements and comparisons of simulated tidal components and tidal global models. Numerical simulations have been performed using the Mike s hydrodynamic module and have been validated using Field Measurement. In the next step, the main tidal components are extracted and compared with the tidal components of admirable tables and components extracted from the TMD toolbox. Based on the results of study, the tidal components obtained from the simulation in the deep zones, the tandem components of the TMD showed admirlty tables, while in the coastal areas and in the smaller regions there was less difference between the corresponding components.Based on the results, the amplitude of the tidal components obtained from simulations showed less adaptability and less precision in deep areas with TMD tidal components, while showed a lower difference between the corresponding components in coastal areas.

Keywords: Tidal components, numerical simulations, field measurements, tidal global models, Persian Gulf



Study of kelvin Waves in the Southern Caspian Sea Using Satellite and Field Data

zahra salmani ghazvini¹, abbasali aliakbari bidokhti², sayyed abbas haghshenas³, javad babagoli mati kalaei⁴

1. Graduated from the Institute of Geophysics, University of Tehran, Iran-mmzz1350@yahoo.com 2. Geophysicist Professor, Institute of Geophysics, University of Tehran, Iran-bidokhti@ut.ac.ir

Assistant Professor, Department of Geophysics, University of Tehran, Iran-sahaghshenas@ut.ac.ir
Graduated from the Institute of Geophysics, University of Tehran, Iran-javadbabagoli@ut.ac.ir

Abstract

The Caspian Sea (CS), the world's largest inland enclosed water body, consists of three basins namely northern, the middle and the southern. This study investigates kelvin wave in the Caspian Sea. Satellite and ADCP data are used to study kelvin wave in the Caspian Sea, especially the southern part of this Sea. ADCP data are acquired from the National Institute of Oceanography and Atmospheric Sciences that are for the November 2004 up to the end of January 2005, between the estuary of the Sefidrood River and Anzali. The analysis of ADCP data shows that some short period motions, typically with a period of a few hours, and long period motions of about 2.5-11 days exist. The long period motions are probably to the coastal Kelvin waves that move along the CS coasts. The analysis of Satellite data completely confirm Kevin wave in Caspian Sea because there are some anomalies in sea level between 2 to 12 days. Due to different periods of wave, Wavelength, angular velocity and the wave equations were obtained. The result show that the Rossby reduce deformation is 8 km for this wave.

Keywords: Keywords: Southern Caspian Sea, Spectral data analysis, coastal Kelvin waves, dynamic of waves, Sea level changes.



How Sensitive are Tidal Energetics to Bottom Friction Variability in Chabahar Bay

Akbar Rashidi Ebrahim Hesari¹, Hassan Rabeie²

1. Member of Marine Physics Department, Tarbiat Modares University Email: akbar.rashidi@modares.ac.ir

2. Msc. Student of Physical Oceanography, Tarbiat Modares University Email: rabeie1371@gmail.com

Abstract

In this study the modified version of non-linear 3D finite elements hydrostatic QUODDY-4 model is used to investigate the sensitivity of energetics of tidal constituents M2, S2, K1 and O1 in Chabahar bay to variability of bottom friction coefficient. This version differs from the original version in that it has a module introduced to calculate the bottom friction coefficient in the bottom boundary layer, based on Kagan s resistance laws for different types of underlying surfaces from hydrodynamic perspective. Model is run in two modes for each four tidal constituents, considering constant and variable friction coefficient. According to the results, the use of constant and variable resistance coefficient does not make significant changes on dynamics and energetics in the Chabahar bay.

Keywords: Chabahar Bay, QUODDY-4 Model, Bottom Friction Coefficient, Barotropic Tidal Energetics



Internal Waves Detection in the Persian Gulf

Hamed Deldar¹, Amir Heydari¹

1. Center of Environmental Studies, Jihad Organization. h.deldar@inio.ac.ir

Abstract

As there are waves on the sea surface, in the sea and between different layers of densities, waves may be formed called internal waves. The existence of internal waves can be identified with remote sensing instruments, especially satellite imagery. The main objective of this study is to identify the Persian Gulf waves using Landsat satellite imagery. For this purpose, after collecting satellite imagery from 2000 to 2015, the edge extraction method and the canny algorithm were used and internal waves were determined. The collected images featured Sunlight, which is very important in image processing. The internal waves, which were often around the Sirri Island, had dimensions ranging from 3 to 22 kilometers. According to the results, it can be said that the internal waves in the Persian Gulf are forming of relatively high densities. Considering the changes in the depth of the Persian Gulf region, the most important factor for formation of these waves is flow of tidal wave on the bed. It can also be said that the use of Edge Extraction in Landsat satellite images of internal waves in the Persian Gulf is very useful. Because the edge is the most important feature for each objects information in the image.

Keywords: Internal waves, The Persian Gulf, Landsat, satellite images, edge algorithm



Observation of Across-Channel Flow in the Khuran Channel, Persian Gulf, Iran

Maziar Khosravi¹, Seyed Mostafa Siadatmousavi², Vahid Chegini³, Ross Vennell⁴

1. PhD student, INIOAS, Tehran, Iran

Assistant professor, Iran University of Science and Technology, Tehran, Iran
Assistant professor, INIOAS, Tehran, Iran
Professor, University of Otago, Dunedin, New Zealand

Abstract

The Khuran Channel, Southern Iran (26°45'N), is an open channel at both ends. Because of its particular shape and geometry, this narrow channel is subjected to strong tidal currents. Spatial distributions of the mean and tidal flows were obtained over a semidiurnal tidal cycle where the highest tidal velocity in the third day of the secondary spring tide exceeded 140 cm/s. A 614.4 kHz Teledyne RDI Workhorse Broadband ADCP was employed to observe the current profiles over 13 repetitions of a cross-channel transect. The 3.1 km long transect ran north/south across the channel. Contrary to the previous surveys in this channel, which concluded a westward mean flow for the whole channel, the current study showed a westward mean flow in the deep parts of the channel and an eastward mean flow over the shallow slopes, with the maximum magnitudes (15-20cm/s) near the surface in the north side.

Keywords: Flow, Khuran Channel, Persian Gulf



Designing a Three-Dimensional Oceanic Model for Study of Monsoon Wind Induced Currents in the West of Northern Indian Ocean

Ardeshir Farhady¹, Mohammad Taghy Zamanian², Akbar Rashidy³

1. Iran Atmospheric Sciences & MEteorological Research Center (ASMERC) Email:ardeshir.farhady@yahoo.com

2. Iran Atmospheric Sciences & MEteorological Research Center (ASMERC) Email:zamanianmohammadtaghi@gmail.com

3.- Iran, Tarbiat Modares University Email:akbarrashidi@gmail.com

Abstract

We have designed a three-dimensional finite difference hydrodynamic oceanic model using baroclinic primitive equations based on the earth s spherical coordinates modified by vertical sigma coordinate with eleven levels equivalent to five layers to study the monsoon wind induced currents in the west of northern Indian Ocean. In this model, which we named it as ASMERC-1, the horizontal finite difference scheme is staggered and, the model uses a modified Arakawa C grid with the two-step Lax-Wendroff scheme and DuFort-Frankel scheme to simulate the advection terms and diffusion terms, respectively. The ASMERC-1 model is forced by monsoon wind that data obtained from the European Center for Medium range Weather Forecasting (ECMWF) model as a series of 3-hour intervals in the summer between June 15 to July 15, 2006 to investigate monsoon wind induced currents by procedure of simulation. The results of this model, which have good agreements with the measurements and previous findings, show that the monsoon wind induced currents flows northeastward during the period of monsoon and extended over the entire basin, from the Somali coasts to the eastern Bay of Bengal. The Ekman drift and Ekman suction are the most important processes for the currents in the central northern Indian Ocean and upwelling in western and northern parts of the northwest Indian Ocean.

Keywords: three-dimensional modeling, ASMERC-1 Model, Monsoon Wind Induced Current, West of Northern Indian Ocean



Interannual Variations of the Water Surface Layer: An Arctic Ocean Field Experience

Nahavandian, Somayeh¹; Gratton, Yves²

 Assistant professor of Department of Marine Physics, Faculty of Natural Resources and Marine Sciences, Tarbiat Modares University, Noor, Mazandaran, Iran,
Professor of Institut National de la Recherche Scientifique (Université du Québec), Centre Eau Terre

Environnement, Quebec City (QC), Canada

s.nahavandian@modares.ac.ir

Abstract

The climate change has already affected our planet. It has had significant effects on the physical characteristics of oceans and seas, including water level, rainfall and retreat of sea ice especially in the Arctic. The Arctic Ocean plays an important role in the global climate and the climate change in this region is the most pronounced. Since the sea ice reflects more sunlight toward the space than the water, thereby it plays an important role to keep water temperature enough cold to maintain polar ice balance. The present report is a brief overview of the current scientific programs that study the impacts of climate change in the Canadian Arctic. The analysis of the surface salinity and mixed layer depth using the data collected during different programs, shows that during 2007-2008 MLDs are significantly deeper than in 2003-2004 with the exception of June and July where they were similar. This difference is due to a strong upwelling in fall 2007 which mixed completely water column and leads increasing the water column salinity and its effects maintained as late as the spring of 2008.

Keywords: Climate change, Arctic Ocean, CASES, CFL, ArcticNet, Mixed Layer Depth


Numerical Modeling of Barotropic Response to Shamal Wind in the Persian Gulf

Alireza Sezavar¹, Hirose, Naoki²

1.Graduated MSc student from Research Institute for Applied Mechanics, Kyushu university, Kyushu, Japan,

2.Research Institute for Applied Mechanics, Kyushu University, 6-1 Kasuga-kouen, Kasuga 816-8580, Japan

ali.r.sezavar@gmail.com

Abstract

Persian Gulf is quite shallow with an average water depth of about 35 m. The Shamal wind is a strong northerly or northwesterly wind which is one of the most important forcing in this region. It mainly occurred during November to March and is associated with mid-latitude disturbances traveling from west to east. Winter Shamal can be divided into two types: (a) those, which last 24 to 36 hours, and (b) those, which last 3 to 5 days (Monsoon) [1]. Several modeling studies have been done on circulation, water mass formation, oceanic response to a wintertime short-term atmospheric forcing on the circulation, and heat budget in Persian Gulf [2]. However, none of them has examined the response of the short-term Shamal winds (a, b) on the external mode as geophysical hydrodynamics of the Persian Gulf. The purpose of this study is evaluation of the shortterm phenomena such as Kelvin wave, gravity wave and geostrophic adjustment associated with Shamal forcing (a, b) in the Persian Gulf. This study is based on a linear 2D shallow water model with grid resolution 3.7 km in both longitude and latitude directions which used at the Persian Gulf and developed by Kim and Yoon (1996). The result showed that summer Shamal is important as well as winter time. Strong Shamal was occurred at point (26.5_N, 52_E), and the strongest magnitude of wind speed observed in the summer time on the contrary of previous study [1]. Moreover, the propagation of Kelvin wave occurred near boundaries.

Keywords: Barotropic, Kelvin wave, Coriolis force, Shamal wind, Numerical modeling, Persian Gulf



Optimization of total phenolic Compounds in Sargassum sp. and sea lettuce (Ulva sp.) seaweeds in Chabahar Bay (Oman Sea) using ultrasonic Extraction

Morteza Ziyaadini¹, Gholamrasoul Baskaleh², Mir Mahdi Zahedi dizji³

1- Chabahar Maritime University Email:Morteza ziaadini@yahoo.com

2- Chabahar Oceanography Center, INIOAS Email:baskaleh@yahoo.com

3- Chabahar Maritime University Email:m.zahedi@cmu.ac.ir

Abstract

The phenolic compounds have antioxidant properties that can be effective in the treatment of some chronic and malignant diseases. The aim of this study was to evaluate the optimization parameters of extraction and comparison of phenolic compounds in Sargassum sp. and Sea lettuce (Ulva sp.) in Chabahar Bay (Oman Sea). The extracts of these two algae were extracted by ultrasonic method and the optimization parameters consisted of solvent type (water, methanol, ethanol, or acetone), sample size (500, 250, 125, or 63 micron) and dry sample (0.1, 0.2, 0.3, 0.4, or 0.5 g) in 10 ml solvent and ultrasonic time (10, 20, or 30 mins) and temperatures (20, 40, 50, or 60°C). Determination of total phenolic compounds were done using Folin ciocalteu reagent and standard curve gallic acid by spectrophotometric method. Maximum total phenol content was obtained by water as a solvent, particle size of 125 microns for Sargassum sp. and 250 microns for Ulva sp., dry extract of 0.4 g per 10 ml solvent, and ultrasonic time of 10 minutes at 40 ° C for both algae. Under optimized conditions, the highest total phenolic compounds were obtained for Sargassum algae (i.e. 2.57 ± 0.054 mg gallic acid per gram of dry sample) and for Sea lettuce (i.e. 1 ± 0.14 mg gallic acid per gram of dry sample). The results of this study showed that Sargasum algae can be used as a appropriate natural marine antioxidant in the food and pharmaceutical industries.

Keywords : Phenolic compounds, Chabahar Bay (Oman Sea), Sargassum, sea Lettuce, Ultrasonic, Folin Ciocalteu



Bioavailability and geochemical speciation of phosphorus in surface sediments of the Southern Caspian Sea

Kazem Darvish Bastami¹, Ali Hamzehpour², Hosein Bagheri³, Mehrshad Taheri⁴

1- Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

2- Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

3- Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

4- Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

Abstract

The purpose of this study was to quantify phosphorus bioavailability and various forms of this element in surface sediments of the southern Caspian Sea. To do, sediment samples were collected from different depths in autumn 2015 using a Van Veen Grab. Phosphorus forms were recognized by a sequential extraction procedure (SEDEX). Results revealed that the range of total phosphorus (TP) was between 431 ppm and 594 ppm with a mean value of 535.25±45.05 ppm. Organic phosphorus (OP) ranged from 62 to 99 ppm and contributed 14.85±2.21 % of total phosphorus in average. The contents of loosely phosphorus, iron-bound phosphorus, authigenic phosphorus and detrital phosphorus varied 35-55 ppm, 50-94 ppm, 125-189 ppm and 152-217 ppm, respectively. Generally, inorganic phosphorus (IP) was between 365-522 ppm which comprised 81.9-88.53% of total phosphorus. Findings showed levels of different phosphorus forms in a descending order: detrital P>Authigenic P>Organic P> Fe-P > Loosely P. Bioavailable phosphorus concentration was between 153 ppm and 240 ppm and consisted 37.21±3 % of total phosphorus. Based on molar ratio of TOC/OP, organic matter obtained from the studied stations suggested a terrestrial origin.

Keywords : Total Phosphorus-Organic Phosphorus-Sediment-Caspian Sea



Hydrchemical studies of southern deep-water basin of the Caspian Sea

Abolfazl Saleh¹, Ali Hamzehpour², Ali Mehdinia³, Kazem Darvish Bastami⁴, Said Mazaheri⁵

1- Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran

2- Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran

3- Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran

4- Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran

5- Iranian National Institute for Oceanography and Atmospheric Science, Tehran, Iran

Abstract

In this work the results of hydrochemical studies aboard the R/V Iran Behshahr in southern Caspian Sea in late-winter 2014 were presented. Salinity, temperature, dissolved oxygen, pH, dissolved inorganic carbon, total alkalinity, nitrate, phosphate and silicate concentrations in water column of Neka-Amir Kabir oil platform section in the southern Caspian Sea were measured to study the status of hydrochemistry of this area. Results showed that the hypoxia continues to intensify in the deep-water basin of the South Caspian Sea. Near-zero concentration of dissolved oxygen and accumulation of phosphate, silicate and dissolved inorganic carbon in near-bottom layers in the study area showed that vertical winter mixing of water column did not reach the near-bottom layers at the time of this survey. Nitrate showed its maximum concentration at the intermediate maximum depth of 300 m.

Keywords : South Caspian Sea, hydrochemistry, nutrients, total alkalinity



Forecast of Climate Change in Kermanshah Province and Its Impacts On The Environment

Nohegar Ahmad¹, Tavana Mehrabni Farah²

 Faculty Member of Tehran University
Master of Natural Disaster Management dav.hasanzadeh@gmail.com

Abstract

Climate change and global warming are one of the most important challenges facing humanity, which causes changes in rainfall, wind speed, solar radiation, and air temperature. These changes have a direct impact on sustainable development, which involves the interaction of the three factors of economy (economy, society, and the environment. General Circulation Models (GCMs) are the most appropriate tools for studying the phenomenon of climate change, but these models simulate large-scale climatic parameters. In order to apply the output of the general circulation models on regional and local scales, there is a need for intermediate models that perform exponential imaging. These types of models are categorized in two categories: statistical and dynamic. There are different types of exponential microscopic models. In this study, a climatic data mining model CLIMGEN was used to identify and predict climate fluctuations in Kermanshah. The purpose of this study was to simulate the maximum and minimum temperatures using a climgen data source. According to the models forecast, in the next 20 years, the temperature trend will increase and rainfall and relative humidity will decrease. These changes will have a negative effect on the soil, vegetation, agricultural resources and food security and the health of the inhabitants of the region. But for the wind after 2020, there will be a steady trend that might be a weakness of the model. Key words: (Kermanshah, CLIMGEN model, maximum and minimum temperatures, precipitation, wind)

Keywords: Kermanshah, CLIMGEN model, maximum and minimum temperatures, precipitation, wind



Using Ocean Dataset For Mangrove Forests Species Distribution Modeling in Iran

Ghayoumi Razieh¹, Ebrahimi Elham²

 Research Group of Biodiversity and Biosafety, Research Center for Environment and Sustainable Development, RCESD, Department of Environment, Tehran, Islamic Republic of Iran
M.Sc Student in Environmental Engineering, Environmental Sciences Institute, Shahid Beheshti

University, Tehran, Iran r.ghayoumi@gmail.com

Abstract

Aquatic ecosystems have a diverse variety of organisms which their distribution and ecological preferences have often not been studied. Species Distribution Modeling (SDM) can improve our knowledge in this area and enhance the ecosystem management and protection. Mangroves are one of the world's valuable aquatic habitats. These forests with high biomass and productivity play an important role for fauna and flora both land and sea, providing shelter, nursing and feeding grounds. In this study, 9 biochemical variables from Bio-ORACLE database were compiled. Then, the correlation coefficient between each pair of variables was calculated to identify highly correlated variables and reduce multi collinearity. Finally, the distribution model of mangrove forests were produced with maximum entropy method (MaxEnt). Results show that suitable habitats for mangrove forests distribution have placed in the Eastern part of the Persian Gulf and the Oman Sea. Moreover, Chlorophyll-a minimum, range, sum maximum and Ph were found to be the top variables affecting the distribution of mangrove forests. This study can be used in a decision-making framework that helps managers develop an effective strategy and conservation outcomes as a result of their management.

Keywords: Mangrove Forest, Avicenia marina, Ocean dataset, Species Distribution Modeling



Investigation of the Relationship Between Different Indices of Aneux With Temperature of Chabahar Synoptic Station

Khajeh Amiri Khaledi Chakavak¹, Salari Fanoodi Mohammad Reza²

1. Department of Oceanography, Faculty of Marine Science, Chabahar Maritime University, Chabahar,

Iran

2. Ph.D. Student in Climatology, University of Sistan and Baluchestan rsalari@sbmet.ir

Abstract

The temperature parameter is one of the important indicators in the climate classification that is important in determining the role and dispersion of other elements of the climate. Remote link patterns are defined as the simultaneous link between the fluctuations of the weather elements of a location with changes in pressure patterns and sea level temperatures at other geographical locations, and with regard to the proximity of Chabahar to free waters, as well as the importance of recognizing the relationship between remote link patterns and In the present study, the temperature parameter of the Chabahar synoptic station during the period of 54 years (1966-2016) was monthly and seasonally with different indices of Enso (Nino 1 + 2, Nino 3, Nino 3 + 4), Nino 4, MEI, BEST and SOI) were analyzed by Pearson correlation and determination coefficient. Finally, in the monthly state, three patterns of NINO1 + 2 and NINO4 and NINO3 + 4 with a temperature of 0.01 were meaningful, their correlation coefficients were equal to-41.99 and 0.242 and 0.223 respectively. In seasonal conditions, the summer and winter seasons in the NINA4 and NINA1 + 2 patterns in the level of 0.05were significant, which had a negative and inverse relation with the temperature of the region, and the seasons of spring and autumn, none of the patterns to the level of meaning You did not get

Keywords: Chabahar, Enso, temperature, correlation

Evaluating the Impacts of Climate Change on Wind and Wave fields in Anzali Port

Ghader, Arashi¹, Hajizadeh Zaker, Nasser²

 University of Tehran.
University of Tehran a.ghaderi90@ut.ac.ir

Abstract

In recent decades, climate change has brought about tangible changes at surface temperature, precipitation, seawater levels, wind speed, and consequently a change in the altitude of waves and coastlines and other phenomena. Given the importance of wave profiles on coastal engineering issues, the assessment of the potential impacts of climate change on these phenomena in developing ports and beaches is necessary. In this study, the effect of climate change on wind speed and wave heights of the Anzali Port in the Caspian Sea was evaluated. Quantitative scaling of the data was done using a statistical approach based on local data from the ECMWF. Wind turbine data was used in wave modeling for the period 2081-2100 (future period), while the ECMWF wind field was used to simulate waves from 1991 to 2010 (control period). The wave modeling results of these two 20-year intervals using the SW module of the MIKE21 model showed that the average annual wave heights will decrease slightly compared to the control period, but will not change significantly for the prevailing wave. Also, by comparing the wind and future winds, it can be seen that wind speed will decrease slightly in the future, but its direction will not change.

Keywords: Climate change, Wind, wave modeling, Anzali Port



Assessment of Climate Change Effects on Hydro-Climatic Components under RCP Scenarios (Case Study: Zayandeh-Rud river basin)

Amin, M. A.¹, Torkan, G.², Eslamian, S. S.³, Zareian, M. J.⁴

1.Isfahan University of Technology, Isfahan, Iran

2. Isfahan University of Technology, Isfahan, Iran

3. Isfahan University of Technology, Isfahan, Iran

4. Water Research Institute (WRI), Ministry of Energy, Tehran, Iran

aminiamin2016@gmail.com

Abstract

According to studies by the Intergovernmental Panel on Climate Change (IPCC), global warming is evident, and since the 1950s, many of the observed changes have been unprecedented for decades and thousands of years. So that greenhouse gas emissions have reached the highest level in history, and they have a large impact on the climate and nature. The human activities are the main driver of these changes in the climate system. Hence, recognizing the effects of climate change in the future is essential for adapt to the future problems. In this study, among the 15 general circulation models (GCMs), the models that were most adaptation with the temperature and rainfall data at the stations studied in the Zayandeh-Rud river basin were selected, and their climatic information was obtained for future weather forecasting. In the following, the data of the GCMs after the downscaling were generated using the weather generator LARS-WG under the scenarios of RCP2.6 and RCP8.5 for the future period (2050-2079). Based on the results obtained in mentioned scenarios, the temperature will increase at all stations, as well as the rainfall will increase in most stations, except for north part of the basin.

Keywords: Precipitation, Zayandeh-Rud river basin, Temperature, IPCC-AR5, LARS-WG.





Assessment the Effect of Climate Change on Temperature and Precipitation in Shahrekord in Future Decades under RCP2.6 Scenario

Tirgarfakheri, fateme¹, Arezoomandi lili²

phd student of climatology, kharamy university, tehran, Iran
2- phd student of climatology, kharamy university, tehran, Iran ffakheri@yahoo.com

Abstract

The warming caused by the increase in greenhouse gases (especially carbon dioxide) in recent decades, which are referred to as climate change, has changed the pattern of weather parameters. The purpose of this research is to identify temperature and precipitation changes at Shahrekord station under climate change conditions. Three cluster models (BCC-CSM1.1, GFDL-ESM2G, NorESM1-M) were used in the scenario RCP2.6 to study the climate impacts on rainfall and temperature in the Ermand Basin. Temperature and precipitation were calculated in the following period (2060-2020). According to the results of the research at Shahrekord station, there is a gradual increase in the average annual temperature in the period 2021-2060 at the station, including the results of the increase in temperature, so that the highest temperature rise will occur in the summer. The results showed that under conditions of climate change, rainfall will decrease in the coming decades. The amount of seasonal precipitation also varies, so that rainfall in the seasons is increased and the precipitation of other seasons decreases.

Keywords: Precipitation, Temperature, Climate change, RCP2.6 Scenario, Shahrekord, General atmospheric Circulation models



A Numerical Modeling Approach to Forecast the Effect of Climate Change on Surface Temperature of the Gulf of Oman

Farkhani Shirin¹, Hadjizadeh Zaker Nasser²

Graduate Faculty of Environment, University of Tehran, Tehran, Iran, s_farkhani @ut.ac.ir
Graduate Faculty of Environment, University of Tehran, Tehran, Iran, nhzaker @ut.ac.ir

s_farkhani @ut.ac.ir

Abstract

In accordance with accomplished climatology predictions by global models along with measurements, the ocean's temperature is increasing. Regarding the important role which water temperature plays in aquatic ecosystems, the impact evaluation of climate change on water temperature seems to be essential. In terms of biological variety and fishery resources, the Gulf of Oman is considered as one of the most significant water bodies in the world. It is also one of the most important waterways in the world. This paper presents the assessment of effect of climate change on surface temperature of the Gulf of Oman, using MIKE three-dimensional numerical model. Parameters such air temperature, relative humidity, wind speed, precipitation rate and the sky clearness have been used for hydrodynamics simulation of the region. For this purpose, time series of mentioned parameters downloaded from ECMWF, were used as the model's input for the control period (1980 - 2000) simulation. CORDEX projections under RCP 2.6, RCP4.5 and 8.5 were used as future (2080-2100) input data. The effect of the climate change on the surface temperature was evaluated by studying the differences between the patterns in three scenarios and the control period. The results indicated that surface water temperature in future, for three scenarios, will have an increasing trend. This increment becomes smaller towards the East because of higher depth of that region. In addition; the temperatures in RCP 8.5 contain the most variation in the future in comparison with the past condition. The highest variations will occur in summer with the value of $3.475 \circ c$.

Keywords: Climate change, Global warming, Sea surface temperature, Gulf of Oman



Assessment of CORDEX Wind Field in the Persian Gulf

Alinejhad Tabrizi Tahereh¹, Hadjizadeh Zaker Nasser¹, Kamranzad Bahareh²

 Graduate Faculty of Environment, University of Tehran
Iranian National Institute for Oceanography and Atmospheric Science t.alinejhad@ut.ac.ir

Abstract

Increasing the greenhouse gases emission causes the climate changes. Climate variability can change the wind and consequently wave pattern. Due to the importance of beaches and ports and the significant impact of waves on these areas, assessment of the potential effect of climate change on the wind regime is important. in this paper wind characteristics obtained from CORDEX was used for assessing the effect of climate change on wind regime in the Persian Gulf. For this purpose, CORDEX results were compared with those of ECMWF at three points and the results showed that CORDEX wind speeds are overestimated for average, maximum and minimum values. Dominate wind directions represented by two wind fields are nearly similar. The variations of the annual wind speed in this area were also investigated until 2100. For this purpose, time series of annual averages of the wind speeds were plotted in three points for the period of 1981 to 2100. Results indicated a decreasing trend in all points of the domain for all RCPs.

Keywords: Climate change, ECMWF, CORDEX, Persian Gulf



Criminological management of coast Zones in North of Iran: Case Study of Coasts of Guilan Province

Jalaladdin Hassani¹, Hamidreza Babayi²

- 1. Islamic Azaz University of Rasht Email: hassanijalal@gmail.com
- 2. Energy university Email: babaei_moshaverhoghoghi@yahoo.com

Abstract

Criminality is a natural phenomena in realm of human life.

Keywords : Coast Zone, Caspian Sea, Guilan Province, Criminality, Prevention to Crime



Legal and security considerations for the transit of warships from the territorial sea with an emphasis on the practice of the Islamic Republic of Iran

Esmaeil Karimipoor¹, Hossein Taleghani², Abbas Barzegarzadeh³

1. Master of International Law ,Islamic Azad University of Bushehr,Iran,ekarimipoor@gmail.com

2. PHD of International Law ,Islamic Azad University of Bushehr ,Iran.

3. PHD of International Law, Islamic Azad University of Bushehr, Iran.

Abstract

One of the most important issues in the development of international law of the seas was the issue of the territorial sea that most marine theorists regarded it as part of the coastal land that coastal states had absolute sovereignty in order to protect their territorial jurisdiction. It can be said that the regime of innocent passage which allows the passage of all ships, including military and merchant ships, from the territorial sea of the countries, has been created in order to restrict the absolute sovereignty of the coastal states on the territorial sea and, in fact, an opportunity to expand freedom navigation of the dominant countries to the baseline of the coastal state. This research aims to support the theory of countries that oppose the passage of warships from the territorial sea and is subject to the permission and authorization of coastal state authorities, underlining the hypothesis that warships are inherently due to the equipment, capabilities and objectives of the intelligence and The operation designed for them is threatening the coastal country and, as a result, has the potential to violate the innocent passage of Article 19 of the 1982 convention on the law of the sea Without violating the conditions of innocent passage be detectable, identifiable, and prosecution. As a result, it can be said that the innocent passage referred to in the above article, in addition to the fact that it does not have sufficient guarantees of military ships cannot be assessed and discovered in case of violation of these conditions Therefore, in the future developments of international law of the seas, it is necessary to distinguish between innocent passage from the territorial sea between military and commercial vessels, in such a way that the passage of warships from the territorial sea with the permission of the coastal states to the coastal country has an adequate opportunity To observe the motions of these vessels and to prevent them from entering their territorial sea if they are threatened.

Keywords: International Law of the Sea, 1982 UN Convention on the Law of the Sea, Warships, Innocent Passage.



Effect of Monsoon seasonal variations on Sediment Characteristics in Chabahar Bay

Mohammad Afarin¹, Mohammadali Hamzeh², Hossein Negarestan³

1. Chabahar Oceanographic Center, Iranian national institute for oceanography and atmospheric science, Chabahar, Iran Email: Afarin.m@inio.ac.ir

2. Bandarabbas oceanography center, Iranian national institute for oceanography and atmospheric

science, Bandarabbas, Iran Email: hamzeh@inio.ac.ir

3. Chabahar Oceanographic Center, Iranian national institute for oceanography and atmospheric science, Chabahar, Iran Email: h.negarestan@inio.ac.ir

Abstract

Monsoon cycles are of outstanding characteristics of the Oman Sea posing profound impact on its environmental condition. The main objective of the present study is to evaluate the effect of monsoon seasonal variations on sedimentology and beach profile of the Chabahar Bay. The selected methods include grain sizing, determination of calcium carbonate and organic matter content and beach profiling survey and data processing using statistical and geographical information system applications in two phases of early and after monsoon. Based on the above data, during the monsoon, Chabahar Bay sedimentary environment was divided into three parts: Tis (sandy deposits), Konarak (clayey deposit), and mouth of the Chabahar Bay (clayey sand deposits). After monsoon, the area divided into: Tis (high sand content), Konarak and mouth of the bay (high silt content), and Ab-Shirin-kon (the same contents of sand and silt). Data revealed that the high energy SW monsoon waves carry small particles to offshore leading to increase proportion of sand particles in the eastern and central parts of the bay. However, as is sheltered by a headland, the Konarak coast is lesser affected by monsoon waves and therefore is covered by finer sediment particles (mostly clay). It seems that the longshore currents are responsible for fine grain sedimentation in Konarak. After monsoon, however, wave energy reduction leads to deposition of finer grain sediments and formation of sand bars and berms along coasts Chabahar Bay.

Keywords : Summer monsoon, Oman Sea, sediment texture, Beach profile



Study of the Mobility Pattern of Rip Channels Due to Waves Perpendicular to Beach

Azadeh Valipour¹

1. Assistant Professor, Islamic Azad University(IAU), Jouybar Branch, Email: a.valipour@yahoo.com

Abstract

Rip currents are the most visible currents in surf zone, which have a deceptive nature due to instability and the alongshore migration. In this research, first a pattern was presented for the mobility and persistence of rip channels against waves attack perpendicular to beach proportional to beach state in the model (Rhythmic bar and Beach (RB)) using the software Mike21/3. In the next step, the presented pattern for rips mobility was verified through the empirical CERC equation taking into account the results of field observations that the mobility of rip channels is due to alongshore sediment transport. Then, the results of the model were evaluated with Holman's field researches by comparing the mean rip mobility rate (V) versus a proxy for longshore current (vl) and showed a very good agreement. The main results of this study indicate that, in the case of waves attack perpendicular to beach, the mobility of rip channels is dependent on the bed topography, channels depth and also beach slope. As when the slope of one of the edges of rip channel reaches to a critical slope(two and a half times the beach slope) due to the fall of upper sediments and the sedimentation, mobility of channel is started in the direction of the alongshore sediment transport and continues until the opposite edge reaches critical slope.

Keywords : rip current, surf zone, mobility, rhythmic bar, sedimentation, critical slope.



Road Map for Developing the Equipment of Geotechnical Drilling, Sampling and In Situ Testing in Water Environments

Hadi Gerivani¹

1. Assistant Professor in iranian national institute for oceanography and atmospheric science

Abstract

One of the technological needs of country at the moment is developing marine geotechnical equipment. Absence of a road map for manufacturing and developing the required equipment can cause loss lots of money and time or all the needs maybe not achieved. Therefore, in this study, it has been tried to establish a road map for developing offshore geotechnical technologies.For this, first, the global advances were reviewed and then, the national capabilities were assessed. Finally, a road map including 3 stages has been presented. In the first stage, the simple samplers of seabed must be manufactured. In the second stage, the goal is drilling, sampling and in situ testing in the water depth up to 150 m which covered all the Persian Gulf and offshore of Oman and Caspian sea and in the third stage, developing required geotechnical equipment for water environments deeper than 150 m has been suggested.

Keywords : Road Map, Technology Developing, Marine Geotechnics



CLASSIFICATION OF SOUTHERN COASTS OF CASPIAN SEA BASED ON POTENTIAL OF EROSION AND SEDIMENTATION, ASSESSING THE PAST STUDIES

Hadi Gerivani¹

1. Assistant Professor in iranian national institute for oceanography and atmospheric science

Abstract

Erosion and sedimentation is two basic agent of morphological deformation in coasts. Morphological deformation of coasts can cause a lot of damages in developed or developing areas. Knowing which process, erosion or sedimentation, are dominated in a coast can help us to plan and manage sustainable and permanent development and prevent economical loss. Some studies were done about erosion and sedimentation in the southern coasts of Caspian Sea, but most of them, usually, were done for a small part of coasts or based on limited data and their results cannot be referred for all southern coasts. So, in this study, all the past studies were assessed and based on the results, southern coasts of Caspian Sea were classified in 7 area including: Astara, Talesh, Anzali, Delta of Sefid Roud, east of Mazandaran, west of Mazandaran and Golestan. These 7 areas can be the base of future studies about erosion and sedimentation.

Keywords : Caspian Sea, erosion, sedimentation, coast.



Investigation of sea level changes using magnetic Susceptibility data in the southeast of the Caspian Sea

Hossein bagher¹, kazem darvish Bastami², Ali hamzepour³, reza rahnama⁴

- 1. Iranian National Institute for Oceanography and Atmospheric Science
- 2. Iranian National Institute for Oceanography and Atmospheric Science
- 3. Iranian National Institute for Oceanography and Atmospheric Science
- 4. Iranian National Institute for Oceanography and Atmospheric Science

Abstract

The magnetic susceptibility is one of the most important methods for monitoring of sediment composition changes in environmental studies. In this survey, in order to sedimentological studies and determine the Gorgan Bay level fluctuations by variations in magnetic susceptibilities 5 cores were taken from bottom sediments, along the East to West. These samples have been analyzed for grain size, total organic carbon content, carbonate content, and magnetic susceptibility (MS). The results show a close relation between particle size distribution and MS magnitude due to variation in detrital influx, caused by sea-level fluctuations in different time. This process is reflected in increasing particle size (increase mud) and magnitude of MS simultaneously with sea level fall and decreasing particle size (increase mud) and magnitude of MS and carbonate was not observed.

Keywords: Gorgan Bay, Cores, Sea-level fluctuations, Magnetic Susceptibility.



Effect of Dietary Magnesium on Growth and Chemical Composition Muscle of (Barbus Grypus)

Roomiani, Laleh¹, Bavi, Amal², Eslami Zadeh, Hossein²

Assistant Proffesor, Department of Fisheries, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran
Student MSc, Department of Fisheries, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran
l.roomiani@yahoo.com

Abstract

A study was conducted to investigate effects and interactions of magnesium (Mg) on growth performance and, body composition parameters of Barbus grypus. To do this study, in research center of aquatic animal breeding and culture of Islamic Azad University of Ahvaz, 4 treatments (1: control (Mg without), 2: 0.5 mg kg-1 Mg, 3: 1 mg kg-1 and 4: 2 mg kg-1) were fed for 60 days. The results showed that Mg improves the weight factor that significant differently with control treatment (P < 0.05). The results of chemical composition showed that control treatment had highest moisture and fourth treatment had lowest. The highest % of fat was observed in third treatment. Increasing of Mg resulted in a decrease in protein. The best efficiency at the highest level of magnesium was not observed and the second and third treatments had better performance than the fourth treatment.

Keywords: Mg, Diet, Growth, Chemical composition, Barbus gr



The Effects of Diets Containing b-glucan that Extracted from Saccharomyces Cerevisiae on Cortisol and Glucose of Sea Bass Lates Calcarifer under the Transportation Stress

Bavi, Zeinab¹, Nafisibahabadi, Mahmood²

1. Iran Khoramshahr Marine Science and Technology University 2. Iran University of Persian Gulf Boushehr zibshalon@gmail.com

Abstract

In this study, the effect of using β -glucan extracted from Saccharomyces cerevisiae on the levels of cortisol and glucose in Asian seabass was investigated under transport stress. Fishes with an average weight of 34 ± 4.5 g were stored in 300 L tanks and fed on three diets containing of 0, 1% and 2% macrogard for 30 days. cortisol and glucose were evaluated at 0 and 24 hours after transportation. Blood plasma samples of fish fed diets containing 2% Macrogard were significantly different in terms of cortisol levels and glucose levels compared to control and 1% macrogard treatments at 0 and 24 hours after transportation. There was no significant difference in cortisol levels between treatments containing different macrogard percentages (P <0.05).

Keywords: Beta glucan, Transportation, Cortisol, Glucose, Asian Seabass



Analysis of Tin Element in the Golden Grey Mullet (Liza aurata) in Three Coastal Provinces of the Caspian Sea

Norouzi, Mehrnoosh¹, Behrouz, Mohammad²

 Azad University, Tonekabon Branch, Department of Biology, Tonekabon, Iran
Islamic Azad University, Science and Research Branch of Tehran, Department of Biology, Tehran, Iran mohammad_behrooz@ymail.com

Abstract

The research goal was to examine the concentration of metal elements namely tin (Sn), on muscle tissues of the golden grey mullet (Liza aurata). Samples were obtained from golden grey mullet coastal provinces of the Caspian Sea, Gilan, Mazandaran and Golestan provinces. According to standard methods, metals were extracted from the tissues of muscles of digestion method using an acid mix. Concentrations were measured using an atomic absorption spectroscopy device equipped with a graphite furnace $\mu g/g$ dry weight. The results showed that the absorption of tin metal in three coastal provinces was Mazandaran> Golestan> Gilan in muscle tissue. Tin metal element accumulation in samples collected in Guilan province was 0.66 $\mu g / g$, Mazandaran province was 0.22 $\mu g / g$ and Golestan province was 10 $\mu g / kg$ dry weight. Based on Pearson correlation test, there was no significant relationship between fish weight and length with tin accumulation in fish muscle tissue. The comparison of concentrations of metal elements in muscle tissues to the standard WHO concentration showed that concentrations of tin under study were lower than the standard levels.

Keywords: Tin element, folden grey mullet, suscle tissues, Caspian Sea



Enhacment of Rainbow Trout Immunity (Oncorhynchus Mykiss) Fed by Polyssacharides from Marine Microalgae, Spirulina ((Spirulina Platensis)

Valipoor, Amir Hossein¹, Abedian Kenari, Abdolmohammad², Tabarsa, Mehdi³

 MS.c Student in Tarbiat Modares University
Prof. in Tarbiat Modares University
Assist Prof. in Tarbiat Modares University avalipoor@modares.ac.ir

Abstract

This study was conducted to evaluate the effect of water-soluble polysaccharides extracted from marine microalgae (Spirulina platensis) as a food additive on immune response in rainbow trout (Oncorhynchus mykiss) for 60 days. Polysaccharides were added to the diet at different levels of 500, 1000, 2000, 3000 mg / kg and control (without additive). At the beginning of the course, 5 days will be allocated to adaptation and delivery of fish. After adaptation to the laboratory conditions, 15 fish were distributed in 5 treatments and 3 replicates (total of 15 tanks) with an average weight of 17 g. Feeding was done in the same conditions by visual satiation. Blood plasma lysozyme activity was measured and the results showed that fish fed with 2000 and 3000 mg polysaccharide / kg diet had a significant difference compared to the control group. At the end of the experiment period, stress concentration and manipulation were performed, and blood glucose levels were measured in 4 periods (0, 1, 3 and 8 hr. after manipulation). Results indicated that glucose levels in 3000 treatment were higher than all other treatments at times, the stress level (zero moment) was approaching to the initial level were faster than other treatments at the same time but did not show significant difference. The lowest level of glucose was related to control treatment and later than the other treatments, they approached the initial level. Finally, the results showed that the use of high amounts of polysaccharide (2000 and 3000 mg / kg) in rainbow trout heighten fish immunity.

Keywords: olysaccharide, *sicroalgae*, Immunity, Spirulina platensis, Oncorhynchus mykiss

Study of the Effect of Remote Sensing Environmental Parameters on Estimating Invasive Combined Distribution by Using Mahalanubis Method in the South Caspian Sea Basin

Abadijoo Ravari, Mahdieh¹, Gholamalifard, Mehdi², Allah Mahmoudi, Nemat³

1.M.Sc. Student, Department of Environment, Faculty of Natural Resources, Tarbiat Modares University (T.M.U.), Noor, Iran

2. Assistant Professor, Department of Environment, Tarbiat Modares University (T.M.U.), Noor, Iran -

3. 3Assistant Professor, Department of Fisheries, Faculty of Marine Sciences, Tarbiat Modares University, Noor, Mazandaran, Iran

mahdieh.abadijooravari@gmail.com

Abstract

Modeling the distribution of species refers to species observations (species spots) and a variety of environmental variables to find species niches and to use this information for species distribution projects at time and place. The Mnemiopsis leidyi was a striking species that immediately affected the Caspian Sea ecosystem and caused a decrease in the population of Kalkakhanis. In this study, the geographic factors affecting the potential distribution of this species in the Caspian Sea basin were evaluated using the Mahalanobis typicality model. For this purpose, biogeographic variables including depth and three variables of chlorophyll, photosynthesis active radiation and surface temperature of water derived from MODIS were studied. Validation of the model demonstrates the proper performance of the Mahalanubis model in combating dispersion modeling (AUC = 80 /.). The prediction map of the potential habitat distribution of the species showed that most of the habitats of this species are in the indexes 15, 25 and 26

Keywords: Invasive comb jelly, Kilka Fish, Mahalanobis typicality, Sensor, Modeling, Caspian Sea Basin



Comparisons of Morphological and Molecular Identification in Favites Pentagona (Esper, 1795) off Abu-Musa and Sirri Islands, Persian Gulf

Alidoostsalimi, Parisa, Ghavam Mostafavi, Pargol, Chen, Allen, Fatemi, Mohammad Reza

1.Department of Marine Biology, Graduate School of Marine Science and Technology, Science and Research Branch, Islamic Azad University, Tehran, Iran p alidoostsalimi@yahoo.com

Abstract

Over the past two decades, molecular studies have shown that the morphological classification of hard corals (Cnidaria; Anthozoa: Scleractinia),don t consider the evolutionary relationship of many taxa. The morphological features that underpin traditional scleractinian taxonomy are very variable in different condition and these lead to phenotypic overlap that cause difficulty in species boundaries. So, molecular analysis could be used as comfortable tools in determination of species boundaries. Favites pentagona is one of the coral species which occur in the Persian Gulf with low abundance. The mentioned species have two different colony forms. The purpose of this paper is to compare morphological and molecular identification of Favites pentagona in Abu Musa and Siri islands. In order to molecular analysis, rDNA marker was used. Molecular phylogeny studies have not been conducted in coral of the Persian Gulf and the present research is a first attempt in this case.

Keywords: Persian Gulf, Abu-Musa Island, Sirri Island, rDNA, Favites p



Effects of Aspergillus Toxicity on Body Composition and Hematological Parameters of Shrimp (Litopenaeus vannmei)

Jamshidizadeh, Sara¹, Amrollahi biuki, Narges², Yousefzadi, Morteza³, Aramide, Ali⁴

1. Ph.D. Student, marine Biology, Hormozgan University, Bandar Abbas, Iran

2. Professor of Department of Marine Biology, Faculty of Marine Science & Technology, Hormozgan University, Bandar Abbas, Iran

3. Accistant professor of Faculty of Marine Science & Technology, Hormozgan University, Bandar

Abbas, Iran 4. master education sarajamshidi370@gmail.com

Abstract

In recent years, due to the rapid development of aquaculture and the high cost of fishmeal as a diet, researchers are continually looking for plant-based alternatives as feedstock for aquaculture. However, the source used in the aquatic diet increases the risk of exposure to aflatoxin. Aflatoxins are polycyclic aromatic hydrocarbons and a large group of mycotoxins produced by specific fungal species of Aspergillus species. In this study the effect of aflatoxin toxicity produced by Aspergillus fungus on two groups of control shrimp (fed with healthy food) and treated (fed with contaminated food with aflatoxin with different concentrations) on the body composition and vancomychemistry of hematology parameters were examined. For this purpose, the shrimp was collected from the hatchery shrimp center. Next, Aflatoxin contaminated diets were prepared with different concentrations and experimental shrimp were considered in 6 groups, fed for 28 days. After a long period of shrimp testing, blood samples were taken to measure body composition. The results of this study showed changes in the amount of body composition parameters including decreased fat content and increased moisture and protein in treatment groups compared to the control group. Also, statistical analysis showed a significant difference in moisture content among all experimental groups (P < 0.05). Conversely, the difference in protein and fat parameters of total muscle in all experimental groups was not significant. (P < 0.05). Changes in the level of hematologic parameters in the treatment groups also indicated increased activity of aspartate aminotransferase and alanine aminotransferase enzymes, decreased protein and fat in comparison to the control group.

Keywords: Aspergillus, Aflatoxin, Body composition, Litopenaeus vannamei



Investigation of Temporal Variations and Substrate Surface Effect on Mytilaster Lineatus Settlement in Iranian Coasts of the Caspian Sea

Golinia, Parissa¹, Heydari, Elahe², Nasrolahi, Ali³, Pazouki, Jamile⁴

1.Department of Marine Biology, Faculty of Biological Sciences and Technology, Shahid Beheshti University, Tehran, Iran

2. Department of Marine Biology, Faculty of Biological Sciences and Technology, Shahid Beheshti University, Tehran, Iran

3. Department of Marine Biology, Faculty of Biological Sciences and Technology, Shahid Beheshti University, Tehran, Iran

4. Department of Marine Biology, Faculty of Biological Sciences and Technology, Shahid Beheshti University, Tehran, Iran

p_golinia@sbu.ac.ir

Abstract

The Caspian Sea is the largest continental body of water in the world with valuable species. In early 20th century, as Volga channel was opened, non-indigenous species, including Mytilaster lineatus, entered the Caspian Sea in various ways. This study is conducted from July 2013 to June 2014, in the southern basin of the Caspian Sea, Amirabad Port. Temporal variations and substrate surface effect on M. lineatus was examined using PVC panels. Accordingly, 10 replicates of PVC panels ($10 \times 10 \times 0.3$ cm) were deployed horizontally at a depth of 1m of water. They were replaced with new panels every four months. Density and biomass of M. lineatus on the both sides of the panels were calculated. TWO-WAY ANOVA test was carried out using SPSS (v.22). The results showed that time significantly affected density and biomass of these mussels, but substrate surface and time-surface interaction had no such effect on density and biomass. The highest density and biomass were observed during the first 4 months. According to researches, increasing temperature can increase density and biomass of M. lineatus. Due to increasing man-made structures in marine environments and effects of global warming on biofouling species, investigation of invasive species, such as M. lineatus, is important. Thus, this and further studies are influential in managing the effects of biofouling.

Keywords: Mytilaster lineatus, Temporal variations, Substrate surface, Biofouling, Caspian Sea



Effect of Microencapsulation of Probiotic Bacteria Lactobacillus rhamnosus on Growth Indicators, Hematology and Bacterial Flora of Rainbow Trout (Oncorhynchus mykiss)

Hooshyar, Yalda¹, Abedian Kenari, Abdolmohammad², Gandomi Nasrabadi, Hassan³

1.Ph.D Student, Department of Aquaculture, Faculty of Marin Sciences, Tarbiat Modares University, Noor, Iran

2. Professor, Department of Aquaculture, Faculty of Marin Sciences, Tarbiat Modares University, Noor,

Iran

3. Associate Prof, Department of Food Hygiene, Faculty of VeterinaryMedicine, University of Tehran, Tehran, Iran

y.hooshyar@modares.ac.ir

Abstract

In this study, the effect of microencapsulation of probiotic Bacteria Lactobacillus rhamnosus on rowth Indicators, blood factors and bacterial flora of Rainbow Trout (Oncorhynchus mykiss) is investigated. 108 fish with average initial weight of 10.65±2.24 g under 3 feeding treatments (in 3 replicates) in 60day were tested: the control group (without probiotic), treatment containing of probiotic bacteria (Lactobacillus rhamnosus) with encapsulated and treatment containing of bacteria without encapsulation. The end of the experiment, growth indices, blood parameters and immune parameters and bacterial flora were measured. Results showed that growth indices such as final weight, specific growth rate (SGR) and FCR were significantly increased in treatment groups compared to control (P<0.05). The total number of red blood cells (RBCs), hematocrit (Ht), hemoglobin (Hb) and white blood cell count (WBC) in fed containe of bacteria encapsulated significantly increased (P<0.05). The highest levels of blood immune factors, including lysozyme, IgM and complement, belonged to microencapsulated bacteria-fed diets and lower values belonged to the control group (P < 0.05). The total lactic acid bacteria counts in treatment 2 and treatment 3 was significantly higher than control treatments (P<0.05). The results of this study showed that microencapsulation of bacteria largely preserves bacteria and replaces them in the gastrointestinal tract and, subsequently, positively affects the growth and immune factors of rainbow trout during the breeding season.

Keywords: Oncorhynchus mykiss, Microencapsulation, Growth, immuno, Gut microflora



Changes in Star and Cyp1 Expression during Reproductive Cycle in Acipenser Ruthenus

Ranay Akhavan, Sobhan¹, Salati, Amir Parviz¹, Jalali, Amir Hossein², Falahatkar, Bahram³

1. Department of Fisheries, Faculty of Natural Resources, Marine Science and Technology University of Khorramshahr

2. Department of Fisheries, Faculty of Natural Resources, University of Guilan

3. Department of Fisheries, Faculty of Natural Resources, Isfahan University of Technologyapsalati@kmsu.ac.ir Email

Abstract

The aromatase cytochrome P450 family 19 (cyp19a) and Steroidogenic acute regulatory protein (star) mRNA levels were investigated in the ovarian follicles of captive Sterlet sturgeon Acipenser ruthenus by Real-Time PCR from previtellogenic to early atresia. Expression levels of both cyp19a and star transcripts were affected by gonadal development. Total star ovarian transcript was markedly up-regulated at post vitellogenic Sterlet. The results indicating a relation between the expressions of steroidogenesis related gene with gonadal development.

Keywords: Acipenser ruthenus, Ovary, Cyp1, Star



Effect of Acute Salinity Challenge on Some Hematological Parameters of Acanthopagrus Latus

Reza Farshadian¹, Amir Parviz Salati¹, Saeed Keyvanshokooh¹, Hossein Pasha-Zanoosi²

1. Department of Fisheries, Faculty of Marine Natural resources, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran

2. Department of Physical Oceanography, Faculty of Marine Sciences, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran apsalati@kmsu.ac.ir

Abstract

108 juvenile Acanthopagrus latus were captured and transferred to laboratory. Fish maintained for 14 days to adapt to new conditions in 300 liters cylindrical fiberglass tanks in salinity 20 ppt. after 24h starvation fish divided in salinities 34, 12 and 5 ppt randomly. Blood samples were taken at 0, 2, 24 and 48 h. After expose to environmental salinities in 12 ppt group hematocrit showed an incremental pattern until 24h and then decreased to basal values. In other groups significant changes was not recorded. In fish exposed to 12 and 34 ppt, neutrophil percentage increased 10h after salinity challenge. Monocyte percentage decreased in all groups.

Keywords: Salinity, Hematology, Acanthopagrus latus



UV-absorbing Mycosporine-like Compounds in the Marine Macroalgae Hypnea Musciformis (Wulfen) J.V. Lamouroux and Caulerpa Sertularioides (S.G. Gmelin) M. Howe Forma Farlowii

Maryam Kokabi, Morteza Yousefzadi

1. Hormozga University, Bandarabas morteza110110@gmail.com

Abstract

The purpose of this study was to investigate the presence of UV-absorbing compounds in two species of macroalgae from two different taxonomic groups. Red algae Hypnea musciformis (Cystocloniaceae) and green algae Caulerpa sertularioides forma Farlowii (Caulerpaceae), collected both from the coasts of Qeshm Island/ Hormozgan province. Dried algae was powdered and extracted with 20% methanol at 45°C during 2 h. The spectrophotometric results of the extracts showed that the red algae contained UVabsorbing compounds (possibly palythines), while the green algae samples did not contain these compounds.

Keywords: Macroalgae, Mycosporine, UV-absorbing Compounds, Qeshm



Comparisonal Study on Histological Structure of Kidney in Dominant Fish Species from Northwestern Regions of the Persian Gulf

Maryam Eslami¹, Abdolali Movahedinia², Mohammad Taghi Rounagh³, Negin Salamat⁴

1.M.Sc. in Department of Marine Biology, Faculty of Marine Sciences, Khorramshahr University of Marine Science and Technology, Khorramshahr, P.O. Box:669.

2. Associate Professor in Department of Marine Biology, Faculty of Marine Sciences, University of Mazandaran, Babolsar, Iran.

3. Associate Professor in Department of Marine Biology, Faculty of Marine Sciences, Khorramshahr University of Marine Science and Technology, Iran.

4. Assistant Professor in Department of Marine Biology, Faculty of Marine Sciences, Khorramshahr University of Marine Science and Technology, Iran.

amovahedinia@yahoo.com

Abstract

In this research, histological structures of different parts of kidney (trunk and head kidney) were described in 21 fish species from northwest regions of the Persian Gulf. Fishes were anesthetized and then their kidneys with some adjacent vertebral column were collected and fixed in Buin's solution for histological purposes. Samples were processed according to routin paraffin method sectioned (5 micrometers) and stained (Hematoxylin and Eosin). According to the results, kidneys have two distinct structures including hematopoitic and excretory tissues. Head kidney has more hematopoitic role with nephrons among them. Different types of blood cell such as red blood cell, lymphocytes, monocytes and granolocytes as well as plasmacells, reticular cells and macrophages were observed in head kidney. There were melanomacrophage bodies among hematopoitic tissues in some species. Excretory parts in studied species were included of glomerules and nephric tubules. Neck section, proximal tubule (I and II), distal tubule and collecting tubule were present in nephric tubules. In chondroichthyes such as Grey Bamboo Shark (Chiloscyllium griseum) and stingary (Himantura walga) nephrones have bigger parts in comparison with osteichthyes due to evolutionary aspects.

Keywords: Ichthyology, Histology, Excretory system, Nephron, Persian Gulf



Identifying and Studying the Effects of Biofouling on Concrete Docks in Khorramshahr Port

Boshagh, Mahdieh¹, Salari-Aliabadi, Mohammad Ali², Doustshenas, Babak³, Savari, Ahmad⁴, Jahanpanah, Masomeh⁵

1. MSc in Marine Biology, Faculty of Marine and Ocean Affairs, Marine Science and Technology University of Khorramshahr

- 2. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Khuzestan, Iran.
- 3. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Khuzestan, Iran.
- 4. Department of Marine Biology, Faculty of Marine Science, Khorramshahr University of Marine Science and Technology, Khorramshahr, Khuzestan, Iran.

5. Environmental department employee of Khorramshahr Ports and Maritime Administration

Parvaz.0098@yahoo.com

Abstract

The purpose of this study is to investigate the effects of Biofouling on the structures and construction coastal of Khorramshahr port. Sampling was carried out in January 2015 and June 2016 from the docks in the tidal zone of the port with the assistance of a quadrature 15×15 cm diameter. After identifying and investigating the Fouling species, 11 species belonging to 10 families, were calculated, which consisted of 79% Maxillopoda, 5% Bivalvia, 3% Green algae, 4% Malacostraca, 3% Bryozoa, 1%, Polychaeta. The dominant species was Amphibalanus amphitrite with density of 4261 individuals per unit plane. The most damaged docks of the port are by other environmental factors. And the effects of Biofouling are very superficial and caused by the jaw excrementof the Isopoda and or the Green algae from produced secretions and Bivalvia that make the digestion of concrete structures. Due to the unevenness of the Barnacles coating on concrete surfaces, it not only prevents the insulation of these organisms, but also exacerbates corrosion and erosion at the naked surfaces of Barnacle.

Keywords: Identification, Biofouling, Destruction, Dock Port, Arvand River



Effect of Sulfated Polysacharide Extracted from Ulva Intestinalis on Immune Response of Oncorhynchus Mykiss

Safavi, Vahid¹, Abedian Kenari, Abdolmohammad², Tabarsa, Mahdi³

1. student Ms.C, Aquaculter, Natural Resources & Marine Sciences, University of Tarbiat modares, Noor,

Iran,

2. Professor, Department of Aquaculture, Faculty of Marin Sciences, Tarbiat Modares University, Noor, Iran

3. Sea Food Processing Technology, Faculty of Marin Sciences, Tarbiat Modares University, Noor, Iran vsafavi1371@gmail.com

Abstract

The present study was designed and implemented in order to Effect of sulfate polysaccharide extracted from extracted from Ulva intestinalis on the immune response of rainbow trout. In this study, fish were fed with levels 0, 500 and 1500 mg / kg diet, polysaccharide sulfated extracted from U.intestinalis for 8 weeks. Finally, immune parameters including lysozyme and complement hemolytic activity (ACH50) were measured. The highest activity of lysozyme and ACH50 was observed in the treatment 1500 mg /kg diet sulfated polysaccharide from U.intestinalis and was significantly different with the control group (P<0.05). The results of this study showed that using sulfated polysaccharide extracted from U.intestinalis, especially in the level of 1500 mg/kg diet, can improve immune function in rainbow trout.

Keywords: Uliva intestinalis, Sulfated polysacharid, Immune response, Oncorhynchus mykiss



Effects of Probiotic (Pediococcus Acidilactici) on Heamatological parameters, immunological responses and digestive enzymes of Astacus leptodactylus juveniles

Vaezi, Mirarman¹, Esmaeili Fereidoni, Abolghasem², Manaffar, Ramin³, Amini, Kourosh⁴

1. Department of Fisheries, Sari Agricultural Sciences and Natural Resources University, Sari, Iran.

2. Department of Fisheries, Sari Agricultural Sciences and Natural Resources University, Sari, Iran.

3. Department of Biology and Aquaculture, Urmia Lake Research Institute, Urmia University, Urmia,

Iran.

4. Inland Waters Aquatic Stocks Research Center, Gorgan, Iran. armanvaezi1396@gmail.com

Abstract

In this study, the effect of four levels of probiotic Pediococcus acidilactici on the diet of Astacus leptodactylus juvenile, on some hematolymphoid and immune system and enzyme system, in 84 days was investigated. For this purpose, juvenile crayfish, weighing 10 to 20 gr, was fed in 4 groups of probiotic concentrations and one control group with three replicates for 84 days. At the end of the experimental period, hemolymph in order to measure the hemolymph, immune and enzyme indices and crayfish intestines for digestive enzymes sampling was performed. The results of this study showed that, after the end of the experiment, in all treatments and control, the highest to lowest homocysts belonged to semi-granitic, large granular and hyaline hemogens, respectively. After feeding with probiotic, the total number of hemocytes, semi-granular hemocytes, large granular hemocytes and hyaline in probiotic-treated treatments increased significantly compared to the control (P < 0.05). Also, the activity of superoxide dismutase and phenol oxidase in hemolymphs of crayfish, after feeding with probiotic, and in comparison with the control group showed a significant increase in the trend (P < 0.05). Measuring the activity of the main digestive enzymes including lipase, amylase and protease in order to investigate the effect of probiotics on digestion and dietary intake, also showed a significant positive effect on all three enzymes (P <0.05). Considering the positive and significant effects of probiotic P. acidilactici on immunological and digestive indices of young crayfish, it can be used to further increase in the productivity.

Keywords: Astacus leptodactylus, Pediococcus acidilactici, Probiotic, Immune indices, Digestive enzyme



A Review of Hundred Years Studies on the Crustaceans in the Persian Gulf and the Sea of Oman

Momtazi, Farzaneh, Maghsoudlou, Abdolvahab

1.Iranian National Institute for Oceanography and Atmospheric Science momtazi.f@gmail.com

Abstract

Based on the available non-database information sources (books, thesis, articles, and research reports) the history of biodiversity studies of crustaceans in the Persian Gulf and the Gulf of Omandates back about 100 years ago. In 2013 a research projects conducted by Iranian National Institute for Oceanography and Atmospheric Science (INIOAS) to extracted biodiversity data of the Iranian southern Seas based on the Ocean Biogeographic Information System (OBIS) scheme. Through the project 6408 distribution records of marine crustaceans were extracted from 333 non-database information sources. The first records goes back to 1916 belong to Pontocaris affinis. Taxa diversity of the distribution records showed the presence of 4 classes, 29 orders, 182 families and 394 genera and 642 valid species. Most of the reported species belonged to the Malacostraca (67%). Of the 642 species: Aglaiocypris pellucida, Alpheus lobidens, Metapograpsus messor, Nanosesarma sari had the most distribution records. Until 2014, twenty four new species of marine crustaceans described. Our results showed that some groups studied well while others ignored in biodiversity studies that require greater attention in the future surveys.

Keywords: Crustacea, Persian Gulf, Gulf of Oman, Malocostraca, Aglaiocypris pellucida


Assessment of Species and Proximate Composition of some Important Fish in the Trawl by-catch and Discard of Khuzestan, North-West Coast of Persian Gulf

Hoveizavi, Shafa,¹* Doustshenas, Babak,¹ Eskandari, Gholamreza, ²Savari, Ahmad, ¹ Mohammadasgari₁ Hossein, ³Chenari, Farideh¹

 Department of Marine Biology, Faculty of Marine and Oceanic Sciences, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran
South Aquaculture Research Center, Ahvaz, Iran

3.Department of Environment, Faculty of Natural Resources, Khorramshahr University of Marine Science and Technology, Khorramshahr, Iran shafa2004@gmail.com

Abstract

The protein, lipids and ash contents of 27 species of fish classified under 13 families collected from the trawl by catch and discards of Khuzestan, North-west coast of Persian Gulf were estimated. Carangidae that presented the largest number of species. According to the result of body biochemical, the highest and lowest content of protein in Parastromateus niger (75.27 ± 0.359) and Pomadasys stridens (49.36 ± 0.04), Lipid in Pomadasys stridens(32.66 ± 0.355) and Johnius borneensis (3.48 ± 0.444), Ash in Acanthocephola ehaviore (28.14 ± 0.377) and Parapercis robinsoni (1.82 ± 0.003), respectively observed.

Keywords: Trawl fishery, protein, total Lipids, biochemical composition



State of Phytoplankton, Chlorophyll-a and Nutrient variations in the Southwestern Caspian Sea

Bagheri, Siamak¹, Makaremi, Marzieh², Dadai Ghandi, Azemat²

 Iranian Fisheries Sciences Research Institute
Inland Waters Aquaculture Research Center siamakbp@gmail.com

Abstract

This study focuses on distribution, species composition of phytoplankton, and nutrient variations in the south-western Caspian Sea between July 2009 and March 2010. Samples were collected from 12 stations along three transects: Lisar, Anzali and Sefidrood. Among 44 identified phytoplankton species, diatoms (70.2%) and cyanophytes (25.0%) were dominant. The average phytoplankton abundance was calculated as $1.085E \pm 05$ cells l-1. Among the phytoplankton groups, diatom density was higher (70.2%) than two out of three of total abundance in density of $1.085E \pm 05$ cells 1-1. Diatoms Dactyliosolen fragilissimus and Skeletonema costatum and cyanophyte Oscillatoria sp. numerically dominated in the system. There were major changes in phytoplankton composition and average phytoplankton density was higher than those documented in 1996-1997 and 2005. The average concentrations of dissolved inorganic nitrogen (DIN), dissolved inorganic phosphorus (DIP) and dissolved inorganic silicate (DIS) were 5.10 \pm 3.98, 1.14 \pm 0.44 and 14.5 \pm 6.32 μ M respectively, and these concentrations were strikingly high. Increases in DIN and DIP concentrations were more than twofold compared to recorded values during the last 2 decades due to the eutrophication. Fluctuations in nutrients played an important role in the variation of phytoplankton composition and abundance. Chlorophyll-a concentrations varied between 3.22 and 16.1 µg l-1 and there was a significant increase in chlorophyll-a as compared with previously studies.

Keywords: Phytoplankton, abundance, chlorophyll-a, nutrient, Caspian Sea





Spatial Distribution and Abundance of Ichthyoplankton in the Northeastern Persian Gulf of Iran

Hakimelahi, Maryam, Rezai, Hamid

1. Iranian National Institute for Oceanography and Atmospheric Science hakimelahi.m@gmail.com

Abstract

Despite of its importance in the marine food webs, Ichthyoplankton of Persian Gulf waters has received little attention and is not well known. The published worked, in this field, are not enough to give complete figure of the Ichthyoplankton population in the Persian Gulf. The objective of this paper, is study of Spatial distribution and abundance of Ichthyoplankton in the northeastern Persian Gulf of Iran. Distribution and abundance of the ichthyoplankton community were analyzed in early Autumn (November 2012) and Summer (August 2013) during two cruises of the Persian Gulf and Oman Sea Oceanographic study (PG-GOOS) in the northeastern Persian Gulf of Iran. The locations of these stations are given in Fig. 1.In November, in group of zooplankton, 12 specimens of fish larvae and 96 egg samples were counted in all sampling stations. Fish larvae have the highest frequency at stations D, 104, 106 and G with an average 2 ind.m-3 (± 2.8) and fish eggs at station A with an average of 34 ind.m-3 (± 2.8). A total of 88 samples of fish larvae and 5454 egg samples from Neuston were counted in all sampling stations, the highest frequency of larvae in the Neuston group belonged to station 123 with an average of 27 ind.m-3 (\pm 37.5) and 12 ind.m-3 (\pm 5.7) belonging to Station 125. also, the highest frequency of eggs belonged to Station A with an average 2252 ind.m-3 (±1012.6). Comparing the frequency of larvae and eggs of zooplankton and neuston, the frequency of larvae and neuston eggs is greater than that of zooplankton. In August, in group of zooplankton, the highest frequency of larvae belonged to Station 88 with an average 28.6 ind.m-3 (\pm 24.6) and the highest frequency of eggs belonged to Station F with an average 39 ind.m-3 (± 12.5). in group of neuston, the highest frequency of larvae belonged to Station 73 with an average 1 ind.m-3 (± 0.7) and Station 123 with an average 1 ind.m-3 (±0.3). Also, the highest frequency of eggs belonged to Station 104 with an average 1 ind.m-3 (± 0.1). Comparison of the frequency of larvae and eggs in zooplankton and neuston groups at different stations indicates that the highest frequency of larvae belonged to zooplankton group and the highest frequency of eggs belonged to Neuston group (Figures 2,3). However, during November, the frequency of larvae and eggs in neuston groups is higher than that in zooplankton groups. In conclusion, the ichthyoplankton distribution patterns of the most abundant family were expounded as coincidences in the life history to develop the geographical basis of the larval expulsion beyond the northeastern Persian Gulf area [2], [3]. by studying the distribution of fish larvae and eggs, we can provide clue on natural breeding areas and spawning time, which present valuable data for the conservation and management of fishery resources, especially in relation to successful recruitment [4], [5]. Such information is essential for native fish management and conservation.

Keywords: Ichthyoplankton, Fish larvae, Fish egg, Distribution, Abundance, Persian Gulf



Retrieval of Bathymetry Close to Parresar Basin Using Remote Sensing

Reza Emami Hamzekolai¹, Seyed Mostafa Siadatmousavi², mojaradi@iust.ac.ir³

1- Iran University of Science and Technology, Email: rezaemamihamze@yahoo.com

2- Iran University of Science and Technology, Email: siadatmousavi@iust.ac.ir.

3- Iran University of Science and Technology, Tehran, Email: mojaradi@iust.ac.ir

Abstract

Updated and detailed coastal topography and bathymetry are increasingly being required for a wide variety of purposes including research, management, and marine spatial planning. With the expansion of coastal and marine economic activities, there is a growing need to develop fast and accurate measurements of nearshore regions, as well as to describe the physical features of the sea bottom and adjoining coastal areas, particularly for the purposes of modelling and monitoring. Accurate bathymetries are the most essential data for driving coastal modelling and monitoring. Currently, two of the most widely used techniques for acquiring bathymetric data rely on single- or multibeam echo-sounding and airborne Light Detection and Ranging (LiDAR). However, the cost and logistical difficulties of obtaining nearshore bathymetry using these methods make survey updates rare or allows them to be conducted only on sites of special interest; hence, the ability to derive continuous bathymetry from satellite images has become a topic of interest for coastal monitoring. The main aim of this study is to investigate the capability of Lyzenga and Stumpf methods to estimate the water depth close to Parresar basin using Landsat images. The results show that Lyzenga method is less sensitive to water quality in contrast the Stumpf method.

Keywords : Bathymetry, Remote sensing, Parresar, Landsat images



Assessment of the spatial accuracy of the Caspian Sea Wind Speed Sensors in the GIS environment

Milad Rhahime Malekshan¹, Mehdi Gholamalifard², Akbar Rashidi Ebrahim Hesari³

1- Department of Environment, Faculty of Natural Resources, Tarbiat Modares University,

2- Department of Environment, Faculty of Natural Resources, Tarbiat Modares University,

3- Department of Marine Physics, Faculty of Marine Sciences, Tarbiat Modares University

Abstract

The Caspian Sea has the world's largest aquatic blue area with its own characteristics. Wind is one of the parameters of the study of characteristics and changes. Therefore, temporal and spatial changes change the accuracy and accuracy of its various sources. Therefore, in the present study, the objective of evaluating and matching the various sources of ECMWF and QuickScat and RapidScat satellites during the missions of these satellites is from 2000 to 2009 and 2014 to 2016, respectively. According to the results, monthly and spatial changes affect the accuracy and consistency of the data. Finally, the local consistency of data for the three parts of the Caspian Sea was evaluated, with the lowest in the north with a coefficient of variation of 0.59 and the highest in the middle section with a coefficient of variation of 0.85.

Keywords : QuickSCAT RapidSCAT wind Speed , Caspian Sea,



Measure the flow rate using Acoustic Tomography Technology On the coast of the Caspian Sea

Kamal Mohtasham¹, Masoud Bahreini Motlagh², Mehdi Rahi³, Abbas Asadzadeh⁴

Asia Sea Knowledge Development Company, Shiraz, Iran
Research Institute for Water Resources Research, Water Research Institute, Tehran, Iran
Graduated from Islamic Azad University, Tehran South Branch, Tehran, Iran
Ph.D. student of Imam Hossein University, Tehran, Iran

Abstract

Sound speed and sea speed are the most important parameters that are needed in most field activities and are used in many research work. Today, measurement knowledge is widely used as an effective tool for monitoring environmental parameters. By using electromagnetic waves, satellites measure surface water fluxes on a large scale. But the electromagnetic waves inside the water are rapidly weakened and unable to penetrate the blue environment. While the acoustic waves are capable of passing thousands of kilometers into the water. Hence, the researchers invented a branch of knowledge measuring instruments that measure the parameters of water flow at different depths using the transmission of sound waves in water. Acoustic Tomography is a branch of knowledge measurement that is used to monitor the flow characteristics such as sound speed in water, water temperature, flow velocity, salinity and water flow in rivers, lakes, seas and oceans [3]. Sonic degeneracy was developed by Walter Munch and colleagues in 1979 to monitor the temperature and velocity of ocean currents [4] [5]. Ocean Acoustic Tomography Systems (OAT) is used to measure the speed of sound, temperature and velocity of ocean currents at the mesoscale scale of 1000km in frequency proportions of low wavelengths (less than 1kHz) [6] [7] [8] [9]. Japanese researchers devised and initialized the Coastal Acoustic Tomography System (CATS) device for measuring sea currents at intervals of less than 100km in 1997 [10]. Many studies have been done to measure flow, temperature, directional changes, and ... using CATS [11] [12] [13] [14] [15] [16] [17]. Then, in 2010, the Fluvial Acoustic Tomography System (FATS) was designed and used for distances less than 1000m [18]. In recent years, many studies have been carried out by FATS [19] [20] [21] [22] [23] [24] [25]. In this study, an analysis of the calculation of sound velocity and water flow velocity using FATS on the Caspian Sea coast is presented.

Keywords : Acoustic Tomography Technology, Water flow rate, Caspian Sea



Investigating the Effective Parameters on Vibration of the Drilling string by Analytical and Finite Elements

milad noorabadi1, abas nobakhti2, jafar eskandari jam3

Faculty member
Faculty member
Faculty member

Abstract

drill string is the main part of drilling in oil and gas industry transmitting the moment to the drill bit. well drilling in order to reach the oil and gas sources is the main objective of drilling.in this paper, the effect of efficacious parameters (stabilizer, drilling fluid)on natural frequency of drill string structure is considered through analytical and numerical methods. First, the governing equations on the drill string and its structural vibration are presented. at the following, a model of drill string with specific geometrical specifications is simulated in a finite element software, and effect of various parameters on the vibration of the structure is considered. results obtained from finite element numerical simulation are compared with those obtained from analytical DQM. results are shown as well as in contours and graphs

Keywords : drill string, stabilizer, drilling fluid, finite element, DQM



Investigation of launching of a truss spar platform by a launch barge

Mojtaba Khalifehie¹, Keyvan Sadeghi²

1- Iran University of Hormozgan Email : mojtaba.mcengineer@gmail.com 2- Iran University of Buein Zahra Technical Email : s.keyvan@gmail.com

Abstract

The dynamic analysis of launching process of a truss spar platform with the help of a launch barge is the main objective of this paper. In the launching process, it is necessary to correctly predict all forces acting on the platform and the barge and the trajectory of them to prevent problems such as capsizing, collision or hitting of the platform to the sea bed. The launching process is simulated by Moses software. Time histories of the motions of the barge and the truss spar platform and the forces acting on them are derived. The output graphs of Moses show the behavior of platform and barge in every stage of the launching process. Comparison of the results with other numerical results shows that the performed analysis can be used as an aid for proper design of launching process, as the most critical stage in the installation of the platform.

Keywords : Offshore launching, Truss spar platform, Moses, Boundary element, Dynamic analysis, Launch barge



DISTRIBUTION OF SURFACE SEA TEMPERATURE (SST) OF THE SOUTH CASPIAN SEA COASTS BY USING LANDSAT 8 (CASE STUDY: HOT WATER RETURN CHANNEL FOR THE NEKA POWER PLANT)

Amir Esafandiarnejad¹, Reaza Kamalian², Sharvin Faghihi Rad³

Master of Science of Water Research Institute, Tehran, Iran
2- Faculty of Qom University, Qom, Iran
3- Faculty of Water Research Institute, Tehran, Iran

Abstract

Seawater is used for the cooling operation at the facilities and turbines of the Neka Power Plant. Then the Hot water outlet returns to the Caspian sea through the canal. Exhaust hot water has caused problems in the vicinity of intake and made environmental issues. In this research, in order to study the surface water temperature pattern, the Sea surface temperature (SST) images were generated near the Neka power plant. Calculating by using data from Landsat 8 for determination of Land Surface Temperature (LST), split window algorithm (SWA) based on bands 10 and 11 and emissivity water coefficient are carried out. The analysis of the results provided useful information for engineering judgment in the thermal emission of the hot water outlet which includes: • The thermal diffusion near the power plant s sea site was influenced by the general current of the sea, with the status of the dominant water flow. • The highest temperature difference between the hot water return channel and the sea environment was 3 °C on 14 August 2015 and the lowest was 1 °C at 24 October 2015. • The highest sea surface water temperature was observed at 32.5 °C in August 2015 and its lowest value was 24.5 °C in the October 2015 at the outlet of the hot water return channel. . In the design of the power plant, the maximum sea water temperature was considered 27 to 28 °C degrees Therefore; Sadra port has no significant effect on the thermal stability of the pond.

Keywords : sea surface temperature, water temperature of Caspian sea, Caspian sea, Landsat 8 *TIRS band*



Numerical study of wave transformation using a fully Dynamic numerical model in time domain Case study at Nowshar port

Abolfazl Yousefi¹, Peyman Badiei², Seyed Masoud Mahmoudof³

1- University of Tehran Email: abolfazl.yousefi@ut.ac.ir

2- University of Tehran Email: pbadiei@ut.ac.ir

3- National Institute of Oceanography and Atmospheric Science Email: m_mahmoudof@inio.ac.ir

Abstract

Data obtained from field measurement, independently or in combination with numerical simulations provide a basis to achieve an appropriate understanding of hydrodynamic characteristics. Determining the governing wave patterns, together with an appropriate long terms distribution of wave height and period in any management and development plan in the coastal and offshore project. The main goal of this research is to evaluate the performance of a fully dynamic numerical wave model in time domain in calculating characteristic wave height and peak wave period during shoaling and breaking processes. In this respect, the results of the simulation of such model are compared with field measurement data obtained at a site near Nowshahr Port.

Keywords : Numerical model, Simulation wave, Nowshahr port, Characteristic wave height, Peak period



Study of nonlinear wave-wave interactions of main tidal constituents near the eastern Iranian coasts of Makran

Seyed Masoud Mahmoudof¹, Mohammad Bagheri²

1- Iranian National Institute for Oceanography and Atmospheric Sciences (INIOAS), Tehran, 1411813389, IR Iran, Email: m_mahmoudof@inio.ac.ir

2- MSc in marine structures Engineering, Ports and Maritime Organization, Project Manager at Coasts and Ports Engineering Department, Tehran, Iran, Email: mbagheri@pmo.ir

Abstract

In the present study, the sum and difference nonlinear triad interactions between main tidal constituents near the eastern coasts of Makran at 3 stations of Beris, Ramin and Pasabandar are investigated using Bispectral analysis. The results show that the most intensive sum interactions are happened between diurnal constituents of K1, O1 and P1. However, this type of interaction between semi-diurnal constituents are intensive and considerable. On the other hand, the most intensive difference interactions are observed between semi-diurnal constituent of S2 and diurnal constituent of P1 or K1. It is really necessary to determine the main tidal constituents using least square method analysis and based on length of data recording, tidal potential amplitude and Rayleigh criteria. The corresponding frequencies to main tidal constituents are illustrated by fast Fourier transform of tidal level time-series and the maximum Bicoherence values reveal the interacted main tidal constituents, consequently. The Bispectral analysis is conducted with 3 degrees of freedom of 16, 32 and 64. The triad interactions are considered as the serious one which can be attained with all three D.O.F.s and pair of interacted frequencies are in the range of main tidal constituents' frequencies.

Keywords : Makran, tide, nonlinear interaction, Bicoherence, least square analysis



Qualitative review of SWASH model performance for wave breaking in the southern coasts of Caspain Sea

Seyed Masoud Mahmoudof¹

1- Iranian National Institute for Oceanography and Atmospheric Sciences (INIOAS), Tehran, 1411813389, IR Iran, Email: m mahmoudof@inio.ac.ir

Abstract

In the present study the performance and ability of numerical model of SWASH for wave breaking is investigated, qualitatively. For this purpose, the filed waves date measured at the western coast of Nowshahr port was exploited. The water level fluctuation data at the deepest station is exerted at the open boundary of model and results are extracted at the corresponding coordinates to 4 measurement stations. The time and frequency domain analysis reveal the appropriate capability of model to predict the height variables such as Hs and Hm0. Also, SWASH can recognize and model the peak frequency, properly. The infra-gravity amplification as a result of random wave breaking and active dynamic of this group of waves are evaluated as the valuable skillfulness of this model. Alongside of these talents, the neglecting of short waves formation as a sequence of wave breaking can be pointed out as the deficiency of SWASH. Therefore, the energy of high frequency harmonics are not enhanced in during of wave breaking and the time domain analysis shows no increment of total number of waves. This problem is serious so that not only the decreasing of mean period of waves is not attained in during of wave breaking but also this value increases shoreward, unexpectedly.

Keywords : SWASH model, wave breaking, spectral analysis, time domain analysis, wave characteristics, Caspian Sea



Investigation of the effective factors on access channel and port basin sedimentation (Case study: Nowshahr port)

Sadeq Kamali¹, Maryam Rajaee², Mohammad Javad Ketabdari³

Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, ketabdar@aut.ac.ir
Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, ketabdar@aut.ac.ir
Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, ketabdar@aut.ac.ir

Abstract

Ports have a special place in the economy of each country. In last few decades according to the protection of coasts and ports, the problem of sediment transport can be considered as an effective factor in the loss of coasts and ports. This research was carried out in order to investigate, identify and prioritize the factors affecting the sedimentation of the port of Nowshahr, one of the important ports of Northern Iran. Identification of the effect of sea level changes on Caspian Sea water on sediment behavior around the port and sedimentation at the span was also investigated. The trend of coastline changes around the port and the annual dredging amunts and annual hydrographs of the port span have been studied. Then, the effect of decreasing and increasing the sea level in the Caspian Sea over the past few decades on the change in the capacity of natural sediment storage along the western coast and its impact the sediment flow was studied from the front of the main breaker head. The impact of changes in the port s design on the surrounding water circulation and the possibility of transfer of sediment from the eastern shore to the span was also investigated. The results show that increasing the sea level during the years 1977 to 1995 prevented a significant sediment problem for the port. On the other hand, in the years when sediment runs off the head of the waveguide, the water level reduction has intensified the sediment flow. Also sediment transport of upstrem rivers is one of the important factors in the sedimentation of this port.

Keywords : Port, Breakwater, Basin, Access Chanel, Sedimentation



Numerical Study on Vortex Induced Vibrations in Spar Platform

Ramin Kharazmi¹, Mohammad Javad Ketabdari²

1- Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, raminkharazmi@aut.ac.ir

2- Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, ketabdar@aut.ac.ir

Abstract

Vortex Induced Vibration (VIV) of a Spar platform is an important phenomenon in the design of Spar moorings and risers. During the design phase, the VIV characteristics of a Spar configuration are evaluated by hydrodynamic model testing. The basis for hydrodynamic model testing is that geometric and dynamic similitude between prototype and model parameters are satisfied. Reynolds number and Froude number scaling are the two relevant scaling parameters for Spar VIV model testing. However, simultaneously satisfying Reynolds and Froude scaling for the model and prototype conditions is practically impossible. This leads to compromises in model test Reynolds number scaling and inherent uncertainties in extrapolating the model test VIV predictions to full-scale design conditions. Hence measurement of full-scale Spar VIV responses provides valuable data for validation of design assumptions. Comparisons are made between numerical simulations of VIV at small scale and experimental test results. Predictions are made for full-scale behavior using computational fluid dynamics (CFD) and detached eddy simulation (DES). This paper presents the results of laboratory models and numerical simulations were compared. Also, by comparing the results, it is evident that the more detailed modeling, the more accurate results in the laboratory and numerical calculations. Furthermore accurate meshing leads to more suitable simulation.

Keywords : Spar platform, Vortex Induced Vibration , CFD, DES



The role of underwater gliders in oceanographic researches (Case study: Iranian Seas)

Sayed Hamid Sohrabi¹, Mohammad Javad Ketabdari²

1- Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran,

s.h.sohrabi@aut.ac.ir

2- Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, ketabdar@aut.ac.ir

Abstract

Nowadays, underwater gliders are one of the most important basis of marine exploration researches. Oceanographic research activities and studies on subsurface flows, aquatic and military studies are some of most important fields for the use of marine gliders. The gliders have a self-reliance system, which reduces their dependence on the electric energy of the batteries and thus increases the time of their presence in ocean subsurface. Also, the growth of applied researches in the field of thermal buoyancy engines, has led to a further decrease in dependency on electric energy and increasing the floating operation periods. In this paper these small but extremely important vessels were considered from technologic and strategic point of view. The state of the country in terms of design, construction and application of these vessels has been then reviewed. Finally, the emphasize was made on the importance of investing in the design and construction of these floats to reduce heavy data mining costs by research vessels in the field of oceanographic studies.

Keywords : Oceanography, Underwater Data Collecting, Underwater Gliders, Buoyancy Engine, Iranian Seas



Feasibility study of constructing composite breakwater considering in situ geotechnical condition (Case study: Ciric Port in Persian Gulf)

Khaled Pourali¹, Arno Petrosian², Mohammad Javad Ketabdari³

Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, pourali@aut.ac.ir
Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, petrosian@aut.ac.ir
Faculty of Marine Technology, Amirkabir University of Technology, Tehran, Iran, ketabdar@aut.ac.ir

Abstract

Breakwater is one of the most useful structures for developing a safe and calm environment for the berthing of ships. In fact, such structures are used to damp waves and, as a result, coastal protection. The cost of construction of breakwaters is significantly more than other coastal structures. Two important types of breakwaters are rubble mound and composite caisson breakwaters. The latter is composed of two main parts as caisson concrete structure and basement rock mass. Therefore the term composite" refers to these two parts. One of the reasons for the use of composite breakwaters is to save on the costs of breakwater, as well as the ability to moor the small boats in the internal vertical wall of the basin. Therefore, in this paper, the feasibility of constructing a composite breakwater in the Ciric Port was studied and discussed. After a thorough investigation on the geotechnical aspects of this area it was revealed that due to the lack of enough strength in sub layers of the bed, constructing a composite breakwater in this area cannot be recommended.

Keywords : *Ciric Port, Composite breakwater, Feasibility study, Geotechnical characteristics, Liquefaction.*



The Assessment of Akashiwo Sanguinea (Dinophyceae) Life Cycle Isolated from Sediment of Chabahar Bay with Potential to Form HABs

Attaran Fariman Gilan¹, Parvaz Elham²

 1.Associate Prof. of Marine Biology , Faculty of Marine Sciences, Chabahar Maritime University, Chabahar, Iran,gilan
2. M.sc biology, Chabahar Maritime University, Chabahar, Iran

attaran@gmail.com

Abstract

Akashiwo sanguinea is an unarmoured species belonging to the dinoflagellate. It is a cosmopolitan microalga which frequently forms dense harmful algal blooms (HABs) in temperate to tropical estuaries and coasts around the world. It has a negative impact to the other organisms and human health. A. sanguinea produces resting cysts during sexual life cycle. The resting cyst production can play a key role in the geographic expansion of dinoflagellates and initiation of HABs. In this study, sediments collected from Chabahar bay and single cyst isolated from sediment and placed in a well containing culture medium and incubated under a proper condition. Germinated plankton cells were morphologically assessed. Therefore studies of the life cycle of this alga, including cyst production is very important and could be the basis for further research.

Keywords: Chabahar Bay, Akashiwo sanguinea, harmful algal blooms, cyst

Comparison of Different Data Assimilation Techniques in the Improvement of Sea Level Fluctuations Induced by Wind and Atmospheric Pressure Changes

Afshar-Kaveh Naghmeh¹, Ghaheri Abbas¹, Chegini Vahid², Nazarali Mostafa³

 Iran University of Science and Technology
Iran Fisheries Organization
Pouya Tarh Pars consulting engineers company afshar n@iust.ac.ir

Abstract

Storm surge is one of the main reasons of fatalities and damage to coastal properties. It is the rising of sea level due to high winds and low atmospheric pressure which happens in a hurricanes or intense storms. In this situation, it is appropriate to gain a better understanding of mechanisms of sea level fluctuations due to the atmospheric forcing. In this study sea level fluctuations of semi-enclosed basin, the Persian Gulf, were simulated by a hydrodynamic model. Separating the tide from other non-tidal residuals (NTR), it is concluded that the hydrodynamic model suffers from lack of accuracy due to approximate boundary conditions and other input parameters of the numerical model. In order to improve the estimated of the hydrodynamic model, some data assimilation techniques were employed in which they combine the hydrodynamic model results with field observations. Four data assimilation schemes were applied in this study including linear interpolation, Cressman scheme, Barnes scheme, and optimal interpolation. The difference between the mentioned methods is the formulation of their weight functions. Applying these methods, the NTR estimations of two tide gauge locations in the Persian Gulf were improved significantly. The results of this study have shown that Barnes scheme has the best performance in the improvement of initial NTR predictions.

Keywords: Persian Gulf, sea level, data assimilation, wind, atmospheric pressure



Northeast of the Persian Gulf in Ralation with Environmental Parameters and Their Role in Bloom Formation

Hosseini Araghy Hesameddin

1. PhD student of Paleontology and stratigraphy, Science and Research branch of Azad University-Hesam.araghy82@ut.ac.ir

Abstract

Some dinoflagellates including some toxic groups produce resting cysts as part of their life cycle mainly in unfavorable environmental conditions and in termination of their blooming phase. Resting cysts have a resistant multilayer organic wall (contrary to temporary cysts) which can remain viable in the sediments for a long period of time. Resting cysts have a mandatory dormancy period and after it elapsed and when the environmental conditions are favorable, they excyst and the motile cell returns back to the water column. Therefore, resting cysts can be sources for new bloom initiation. Two main Paralytic Shellfish Poisoning toxin producer (PSTs) dinoflagellates; Pyrodinium bahamense and Gymnodinium catenatum, which both produce resting cysts as part of their life cycle, are present in the Persian Gulf. There is no large-scale bloom reported caused by either of these species, this is in spite of the fact that resting cysts of P. bahamense is abundant in the surface sediments. Lingulodinium polyedrum and Gonyaulax spinifera are two other dinoflagellate bloom forming species, which can produce yessotoxins, and their resting cysts are abundant in the surface sediments of the Persian Gulf. In 2008-2009 a bloom of toxic dinoflagellate Cochlodinium polykrikoides occurred in the Persian Gulf; however there are ambiguities regarding resting cysts production of this specie at the end of the bloom, since the resting cysts are not found in large numbers in places where the bloom occurred. In this study, resting cysts of this specie is not identified as well. In the case of an environmental stress such as long term heavy rain which affects salinity of water or persistent entrance of nutrients by fresh water run-off or aquaculture industry, conditions can turn in favor of bloom formation of the mentioned species.

Keywords: Toxic dinoflagellate, Resting cysts, Harmful Bloom, Persian Gulf

Radar cross-section modeling to interpret satellite altimeter wind speed in coastal areas

Hossein Farjami1, Pavel Golubkin2, Bertrand Chapron3

 1.Iranian National Institute for Oceanography and Atmospheric Science
2. Russian State Hydrometeorological University, Russia
3. IFREMER, French hfarjami@gmail.com

Abstract

In the satellite altimeter measurements, the significant wave height and wind speed are estimated by normalized radar cross section. In these measurements, algorithms that use to extract wind speed have been developed for open oceans. In the coastal areas, it is necessary to modify the algorithms. In this research, it has been shown that the satellite altimeter wind speed is not 'true' in coastal areas. Therefore the method is suggested to retrieve real wind speed in these areas. In this method, to modeling the normalized radar cross section, the wave age and dimensionless significant wave height with limited fetch are used. The presented method can be used to improve the satellite altimeter measurements in coastal areas.

Keywords: Radar Cross Section, Sea Surface Wind Speed, Satellite Altimeter, Coastal Areas



Air-sea interaction on the tropical cyclone

ahmad rezaee mazyak¹, mehdi shafieefar², saeed moghimi³

Ph.D. Candidate, Tarbiat modares university, a.rezaeemazyak@modares.ac.ir
marine structure professor, shafiee@modares.ac.ir
assistant professor

Abstract

The complexity of the air-sea interactions have been caused to study and understanding the effective mechanisms in recent decades. In the tropical storm, the ocean environment vary considerably due to the intensity of the wind field and the momentum and heat fluxes between ocean and atmosphere. In this study, based on the KEO station measurements during the occurrence of the Fengshen and Kammuri tropical storms, the interaction of ocean and atmosphere have been investigated. The results of the studies indicate that the temperature of the atmosphere decreases due to the formation of the cold wake on the ocean surface, which can reduce the severity of subsequent storms.

Keywords : air-sea interaction, tropical storm, transfer heat and momentum between air and sea, buoyancy fluxe



Joint probability density function of wind speed and direction over southern Caspian sea

Seyedeh Yasna Razavi Sharifi¹, Moharam Dolatshahi Piroz², Asghar Bohluly³, Sarmad ghader⁴

Iran University of Tehran, Tehran, Iran
vrazavi@ut.ac.ir

2

Abstract

In this paper, the study of wind characteristics as one of the most influential factors in many marine phenomena is considered and Joint statistical analysis of velocity and wind direction are discussed. Because these two variables are related to each other, and the best tool for studying their changes and simultaneous interpretation is joint probability density function. In this regard, Carta et al. Presented a hybrid model that it's parameters are calculated by curve fitting and therefore have a good compatibility with data. So, this model has been selected to fit to the wind data of southern Caspian Sea. Also, other models such as isotopic Gaussian model of McWilliams-Weber and non-isotropic Gaussian model of Weber were also used to make a comparison. The compatibility and degree of fitness of noted methods are measured by the quantity R2 or the coefficient of determination. It should be mentioned, the wind data of Caspian Sea is result of the studies of Grader's studies Which is simulated by the WRF model and confirmed by observational data.

Keywords: joint probability density function, Isotropic Gaussian function, Anisotropic Gaussian function, Normal and Weibull mixture Distributions, von Mises mixture Distribution



Analysis of dust event over the Persian Gulf using satellite images and numerical models: A case study

Parvin Ghafarian1, Sahar Tajbakhsh2, Nafiseh Pegahfar3, Elham Mobarak Hassan4

phd assistant professor from inioas
phd assistant professor
phd assistant professor from inioas
phd assistant professorp.ghafarian@inio.ac.ir

Abstract

In this research a dust event over Persian Gulf occurred during 18 -19 February 2017 has been investigated. For this aim, 3 datasets including Observational data (measured by IRIMO), satellite Images (MODIS) and numerical models outputs (NAAPS and HYSPLIT) have been used. Satellite images revealed dust extension from Iraq and south east part of Iran to the Persian Gulf. Results of NAAPS model for a specific point highlight significant dust concentration over the Persian Gulf that was extended up to 800 hPa. HYSPLIT model output demonstrated dust source over Iran and Iraq that may be a result of long-mtime drought in the countries bordering the Persian Gulf.

Keywords: Dust storm, Persian Gulf, NAAPS model, HYSPLIT model



A study of the wind velocity of ECMWF data in the eastern coast of Caspian Sea using Sepehr Software

Maryam Shiea¹, Milad Shiea²

1,2. Caspian Climate Company m.shiea@gmail.com

Abstract

The Caspian Sea is the largest isolated body of water on earth that can be divided into three regions: north (covering 80000 km2), middle (covering 138000 km2) and south (covering 1648400 km2). Due to the isolation of the Caspian Sea from the World Ocean, the circulation regime proceeds only under the action of atmospheric processes over the sea basin. In this study, in the warm months of the year, the horizontal components of wind speed (10 m), Forecast (ERA-Interim) ECMWF data ($0.5^{\circ} \times 0.5^{\circ}$ degree resolution and 6 hourly) using Sepehr software (Persian language) in the eastern coasts of the Caspian Sea have been investigated. The results of the software have shown that the average of wind velocity and direction between 2000 - 2004 in the warm months of the year is nearly from the north to the south, the strongest form of which has been observed in July, but this pattern has been weakened in September. Then using the satellite data (GHRSST level 4 AVHRR) and the mean monthly of its sea surface temperature shows the temperature of the sea surface in the eastern coast of the MCS is colder than regions further away from the coast and this shows a relatively good coordination wind velocity on the same months. Also, From June to August the advection of cold upwelling waters occur from eastern area of the Caspian sea as also have been noted by Tuzhilkin and Kosare. The results show that the temperature of the east coast was lower than the west coast.

Keywords: ECMWF, Caspian Sea, Sepehr Software, Wind velocity, The dominant wind pattern



Regional Verification of Severe Winds and Storm in Isfahan Province with Physical Schemes and Different resolution

leila amini¹, majid bijandi², gholamleza khakian dehkordi³, fateme zahra saydan⁴

1. Head of the Isfahan Meteorological Research Center

2. Isfahan Meteorological Directorate

3. Agro Meteorological expert of Isfahan

4. Expert on the forecast center of Isfahan

Abstract

Atmospheric systems create atmospheric conditions due to climate. Accordingly, it is not possible to provide accurate prediction of time based on large scale models. Intermediate and small scale models are only responsive with spatial and temporal steps and determining the appropriate schemas for prediction. In this research, the storm of January 27 and May 26, 2015 in Isfahan Province was simulated using the WRF model, and for each case, five schemas, each of which had 10 configurations, were investigated. In the case of the storm of May 26, 2015, spatial steps of 5/13 and 5/4 were selected, and on January 27, a 9 and 3 km span was selected. In each of the five configurations, the conditions were maintained and only the micro-physics of the research and comparison were performed. The results of the zoning verification showed that, based on the zonations, the maximum winds displayed in the range of 20 to 30 m / s indicate the occurrence of the storm. The occurrence of storms and severe winds are well characterized. Given the fact that in some places the wind speed has been reported to be over 30 m / s and the probability of occurrence in higher mountainous areas, none of these 10 microphysical wind patterns have shown more than 30 m / s

Keywords : WRF model, spatial and temporal step, physical schemas, intense wind of Isfahan, Isfahan storm, Verification



Analysis of an axisymmetric tropical cyclone model; A case study example

Pegahfar, Nafiseh1, Ghafarian, Parvin22, Gharaylou, Maryam33

Abstract

In this research, the results of an axisymmetric tropical cyclone model for an intensive tropical cyclone, tropical cyclone Haiyan (TCH) that formed on 3 November 2013 over the Western part of Pacific Ocean, have been analyzed. This model based on conservation principles and assumed axisymmetry and steadiness. For this aim, analysis and observational data have been used. The analysis data sets with 6-hourly intervals have been obtained from Global Forecast System (GFS), with the spatial resolution of [0.5] ^o× [0.5] ^o. The observational data sets have been extracted from the Best Track Data from Joint Typhoon Warning Center (JTWC) produced by Japan Meteorology Agency. The model has been run for three various sets of external parameters and the results have been analyzed.

Keywords: Haiyan Tropical Cyclone, Numerical Model, Convective Entropy Flu