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Latest Content

The Nutrient and Carbon Dynamics that Mutually Benefit Coral and Seagrass in Mixed Habitats under the Influence of Groundwater at Bise Coral Reef, Okinawa, Japan 1-15
Tomihiko Higuchi, Kimberly K. Takagi, Kana Matoba, Syusei Kobayashi, Ryota Tsurumi, Seiji Arakaki, Yosikatsu Nakano, Hiroyuki Fujimura, Tamotsu Oomori, Makoto Tsuchiya

Tourism and ‘Fracking’ in Western Newfoundland: Interests and Anxieties of Coastal Communities and Companies in the Context of Sustainable Tourism 16-41
Wendy BRAKE, Edward ADDO

Dynamics of Rapana venosa (VALENCIENNES, 1846) (Gastropoda: Muricidae) Population in the Black Sea 42-56
Igor P. Bondarev

Pollutants Hazard Potential and Environment Vulnerability of Caspian Sea 57-60
Homayoun Khoshravan, Hafez Ghafari

A Study on Indonesian Mollusk Fishery and its Prospect for Economy 61-66
Selly Kartika, Yongtong Mu

Impact of Sea Level Change of Caspian Sea on Gastropods Temporal and Spatial Variation 67-73
Homayoun Khoshravan, Arya Khoshravan

Excogitated Coastal Tourism Competitiveness by Implementing Eco-tourism in Anyer, Banten, Indonesia 74-81
Hengky Halim

Erosional Impact on Caspian Sea Coasts Stability Capacity 82-87
Homayoun Khoshravan, Zarbali Shabaniyan, Seidmasoumeh Banihashemi

Dynamic of the Vegetation in the Surrounding Zones of the Coastal Village of Playa Florida, Camagüey, Cuba 88-91
José Miguel Plasencia, Daimy Godinez

A Review on Heavy Metal Pollution in Cochin Backwaters, Southwest Coast of India 92-98
P.R. Anu, P.R. Jayachandran, P.K. Sreekumar, S. Bijoy Nandan

Identification and Abundance of Benthic Foraminifera in Sediments of Southern Caspian Sea from Bahnamir to Babolsar, Iran 99-107
Fatemeh Ghane, Mina Sadough, Hamed Manouchehri, Babak Moghaddasi, Majid Nazaran Hasankiadeh

Seasonal Variations of Sediment and Water Quality Correlated to Land-Based Pollution Sources in the Middle of the Black Sea Coast, Turkey 108-118
Levent Bat, Oylum Gökkürt Baki
Deterioration of Wood by Marine Borers in a Tropical Harbour: Influence of Environmental Parameters and Biotic Factors  
S.K. Pati, M.V. Rao, M. Balaji, D. Swain  
119-133

Epifauna Associated with the Asian Green Mussel *Perna viridis* (Mytiloida: Mytilidae) in Cienfuegos Bay, Cuba  
Alexander Lopeztegui Castillo, Adriana Artilles Valor, Yuliesky García Rodríguez, Roberto Castelo Bóez, Ninieska Castro Graña  
134-142

Paleobathymetry of Caspian Sea in Quaternary Sediments  
Homayoun Khoshravan  
143-149

Actor, Interest and Conflict in Sustainable Mangrove Forest Management—A Case from Indonesia  
Asihing Kustanti, Bramasto Nugroho, Cecep Kusmana, Dudung Darusman, Dodik Nurrochmat, Max Krott, Carsten Schusser  
150-159

*Emiliania huxleyi* Spring Bloom in the Black Sea: A Tentative Investigation  
L.V. Stelmakh, E.Yu. Georgieva  
160-165

Increasing CO$_2$ Concentration Impact upon Natural Phytoplankton Community at Spermonde Island, Indonesia: Mesocosm Study  
Nita Rukminasari, Muhammad Lukman, Sahabuddin  
166-178

Comparative Study on Growth, Feed Consumption and Survival of Spiral Babylon *Babylonia spirata* Linnaeus, 1758 (Mollusca: Gastropoda) Fed with Formulated Diets  
G. Chelladurai, J. Mohanraj  
179-182

Hydrometeorological Parameters and Space Temporal Variation of Hydrological Parameters in Guacanayabo’s Gulf, Cuba, Relation to Pink Shrimp (*Farfantepenaeus notialis*) Catches Decrease  
Yuliesky García, Manuel de J. Flores-Montes, Adriana Artilles  
183-193

Confirmed Record of Whitebarred Rubberlip, *Plectorhinchus playfairi* (Pellegrin, 1914) (Pisces: Haemulidae) from Jubail, Saudi Arabia, Arabian Gulf  
L. A. Jawad, Mustafa Ibrahim  
194-196

Pattern of Center Periphery Relationship in Small Islands: A Case Study in Karimunjawa Islands, Indonesia  
Yety Rochwulaningsih, Singgih Tri Sulistiyono, Noor Naelil Masruroh  
197-209

Distribution and Diversity of Intertidal Macrofauna of Dharmadam Beach, South West Coast of India  
V. Anu Pavithran, S. Bijoy Nandan  
210-218

A Study of the Status and Potential of the Marine Fisheries Resources in Kenya  
Aloo P.A., C. Munga, E. Kimani, S. Ndegwa  
219-226
New record of the keeltail pomfret, *Taractes rubescens* (Jordan & Evermann, 1887) (Perciformes: Bramidae) from the Sea of Oman
Laith A. Jawad, Juma M. Al-Mamry, Haithem K. Al-Busaidi

227-230

Economic Importance of Environmental Benefits and Costs for the North Coastal Zone in the Province of Camagüey, Cuba
María Elena Zequeira Álvarez, Ernesto Figueroed Castellanos, María Mercedes León, Pedro Morales Padron, Ricardo Montero, Luis Teodoro García García, Gerson Herrera Pupo, Silvina Beatriz Reyes Varona, and Sila Hermis Yera Castillo Nicholas, July Yoan Naranjo Benítez

231-244

The Use of MDS (Multidimensional Scaling) Method to Analyze the Level of Sustainability of Fisheries Resources Management in Thousand Islands, Indonesia
Kholil, Ita Junita Puspa Dewi

245-252

First Records of *Opisthognathus muscatensis* Bouleneger, 1888 (Opisthognathidae), *Trachinotus baillonii* (Lacepède, 1801) (Carangidae), and *Atrobucca nibe* (Jordan & Thompson, 1911) (Sciaenidae) off the Iraq Coast, Arabian Gulf
Sadek Hussain, Laith A. Jawad

253-258

Comparison of Perception of Landscape Features of the Lagos Lagoon for Recreation by its Users and Experts
Uduma-Ölugu N., Oke dele O.S., Adeniyi M., Obiefuna J.N.

259-268

Biochemical Composition of *Parastromateus niger* (Bloch) from Within and Outside Potential Fishing Zones off Ratnagiri District Coast, Maharashtra State, India
R.S. Tingote, U.H. Mane

Age and Growth Based on the Scale Readings of the Two Scarid Species *Hipposcarus harid* and *Chlorurus sordidus* from Hurgada Fishing Area, Red Sea, Egypt
Sahar F. Mehanna, Muhammad Abu-Elregal, Yasin A. Abdel-Maksoud

New Record of *Neobythites steatiticus* Alcock, 1894 (Actinopterygii: Ophidiidae) from the Marine Waters of Iraq
Laith A. Jawad, Mustafa A. Al-Mukhtar, Abbas J. Al-Faisal, Tariq Hammed

Morphological Study of the Vertebral Column of the Ponyfish *Leiognathus equulus* (Family: Leiognathidae) Collected from the Sea of Oman
Laith A. Jawad, L. Al-Hassani

Study of the Macro Faunal Associates of the Littoral Zoanthid *Palythoa mutuki* (Cnidaria, Anthozoa) from Saurashtra Coast, Gujarat, India
Trivedi J. N., Arya S., Vachhrajani K. D.

Assessment of Natural Radioactivity Distribution in Surface Sediments at Erosion and Accretion Sites of Nile Delta Coastal Profiles, Egypt
Ayman A. El-Gamal
Comparative Studies of Hepatic and Blood Biomarkers in Three Species of Black Sea Elasmobranchs
I.I. Rudneva, I.I. Dorokhova, E.N. Skuratovskaya and N.S. Kuz’minova

Integrated Coastal Management Program in the coastal village of Playa Florida and surrounding areas, Camagüey, Cuba
José Miguel Plasencia Fraga, Daimy Godínez Caraballo, Isis Hernández Sosa, Zoe Griselda Acosta Gutiérrez, Doraegnia Francis Archer

Caudal Fin Deformity in the Wild Silver Pomfret *Pampus argenteus* Collected from the Arabian Gulf Coasts of Oman
L. A. Jawad
Caudal Fin Deformity in the Wild Silver Pomfret *Pampus argenteus* Collected from the Arabian Gulf Coasts of Oman

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Abstract A wild silver pomfret, *Pampus argenteus* with deformity in the caudal fin is described and compared with normal fish specimen. Among the severe abnormalities observed is the complete absence of the caudal skeleton. Minor abnormalities such as undulation of caudal fin rays and pterygiophores and deformity of the haemal spines were encountered in the caudal region of the specimen. The potential causative factors of this anomaly were discussed.

Keywords Caudal fin deformity; Skeletal abnormalities; Silver pomfret; Arabian Gulf

Introduction

Description of the morphological deformities in fish in general and skeletal abnormalities in particular have very good attendance in the literatures (Tutman et al., 2000; Jawad and Hosie, 2007; Jawad and Öktener, 2007; Jawad et al. 2007; Jawad et al., 2010; Al-Mamry et al., 2010). Because of their high incidence in polluted areas, they are used as indicators of the environmental pollution (Bengtsson, 1979). In aquaculture and in the wild, cases of deformity involve absence of the tail, or partial tail (single-lobed), double or triple tail or lobes, compression (Honma, 1990; Dunham et al., 1991; Lemly, 1993; Honma, 1994; Divananch et al., 1996; Jawad et al., 2010). The only caudal deformity case reported from the Omani waters is that of the mullet species, *Moolgarda pedaraki* (Jawad and Al-Mamry, 2012). *Pampus argenteus* (Family: Stromateidae) is a benthopelagic, marine and oceanodromous species that lives in the Omani waters of the Arabian Gulf in particular and in the Indo-West Pacific from the Arabian Gulf to Indonesia, north to Hokkaido and Japan (Froese and Pauly, 2010). In these areas, it has high local economic importance, mostly living and reproducing in the sea during its whole life cycle (Cruz et al., 2000). It is exposed to many physical and chemical variations, from temperature to pollution, in these most threatened ecosystems (Araghi, 2010). This study describes a case of tail deformity in one specimen of the teleost fish *P. argenteus* and shows how it possible for the environmental pollution to have such an effect on fishes which in turn it draws the attention of the society to care for the health of their environment.

1 Materials and methods

Ten specimens of *Pampus argenteus* showing variable cases of deformity of the caudal fin (TL 250-258mm, SL 168-170 mm, 320g) were caught by cast net from the Omani waters of the Arabian Gulf at Khasab City, South west of the Arabian (Figure 1). Ten normal specimens varying in size between 183-260 mm, TL, 173-180mm SL were obtained from the same locality for comparison. There were a total of 250 fish specimens in the catch and the deformed specimens represent 4% of the total catch. The specimens were measured using digital calliper to the nearest mm and weight using electronic balance to the nearest gram. One of the deformed specimens that shown to bear all types of abnormalities present in the other deformed specimens and considered the most deformed specimen among the rest of the abnormal specimens is radiographed with ordinary X-rays to interpret the skeletal anomaly and to check for other anomalies. The specimens were deposited in the fish collection of the Marine Science and Fisheries Centre, Ministry of Fisheries Wealth, Muscat, Sultanate of Oman, catalogue number OMMSTC 1095. Water sample was taken to measure the ecological variables such as
water temperature, salinity, dissolved oxygen and pH using the instrument ‘Hydrolab’ (Model SVR 2-SV) which can measure the hydrographic parameters within the ranges of the following: temperature -5 to +45 °C; DO 0 to 20 mg/l; salinity 0 – 50 ppt; pH 0 to 14 and depth 0 to 200 m. For measuring the heavy metals in the water where the deformed fish specimens obtained, the method of Alyahya et al. (2011) was used. In this method, the water sample was filtered through a 0.45-μm membrane filter before being acidified with concentrated nitric acid. The dissolved trace metals were concentrated by using chelex-100 resin following the procedure of Riely and Taylor (1968). Then the water sample was analyzed, in triplicate, using an atomic absorption spectrophotometer (Model SP 9) for analysis of As, Cd, Hg, Pb, and Zn. Deionised water was used throughout the analysis. Values for hydrographic parameters are shown in Table 1 and values of heavy metals are shown in Table 2.

![Figure 1 Map showing location of the sites sampling. Map showing locality where fish specimens were obtained](image)

Table 1 Mean and range of oceanographic variables of water samples from Khasab, south of the Arabian Gulf

| Oceanographic variables | Range       |
|-------------------------|-------------|
| Temperature (°C)        | Min 23.05, Max 36.43, Ave 28.59 |
| Hydrogen ion concentration (pH) | Min 6.42, Max 9.08, Ave 8.71 |
| Dissolved Oxygen (mg/lit) | Min 6.65, Max 10.04, Ave 8.15 |
| Salinity (ppt)          | Min 36.90, Max 39.40, Ave 37.50 |

Table 2 Concentration of heavy metal (μ g/g dry weight) in water sample from Khasab, south of the Arabian Gulf

| Heavy metal | Value (μg/ml) | Nature concentration of marine water (EPA 2002) |
|-------------|---------------|-----------------------------------------------|
| As          | 10.7          | 3                                             |
| Cd          | 0.42          | 0.11                                          |
| Hg          | 0.04          | 0.03                                          |
| Pb          | 6             | 0.3                                           |
| Zn          | 34.9          | 10                                            |

2 Results

Caudal fin deformity was visible on the fish bodies immediately after capture when compared with the normal specimen (Figures 2 a, b). The external examination of the deformed caudal fin showed that this fin has lost its both dorsal and ventral lobes. In addition, the caudal fin rays appeared to be short, wavy and stuck together. In comparison with the x-ray of the normal specimen (Figures 3 a, b), the abnormal specimen showed some severe anomalies, these are: missing the whole caudal skeleton which includes the following bones, the hypural bones, urostyle, epurals and parhypural; missing two caudal vertebrae; deformed centrum of the vertebra number 35, the last vertebra in the vertebral column of this specimen, and losing its both the neural and haemal spines; neural spine of the vertebrae 33 and 34 are not straight and not curved backward as in the normal specimen; haemal spine of vertebrae 32, 33 and 34 are straight and short with haemal spine of vertebra 32 is the shortest; and vertebra 33 has two haemal spines. Other minor anomalies were also detected these are: strongly undulated caudal fin rays; wavy posterior 14 pterygiophores (counting from the posterior end of the dorsal fin) supporting the dorsal fin; and wavy last five anal fin rays and their supporting pterygiophores.

3 Discussion

The disturbances in the environment where the fish lives can be traced and monitored through the appearance of spinal deformities which can be a sign of the existence of such disturbances in the ecosystem. Therefore, it is important to make people aware of how healthy is the environment that they living in. In fishes, in general, the caudal fin has an important role in maneuvering and steering functions; therefore it must be constructed so as to cope with hydrodynamic stresses with the least possible expenditure of energy (Boglione et al., 1993). Any
Figure 2 A: Normal fish specimen of *Pampus argenteus* (TL 183 mm, SL 173 mm). B: Abnormal fish specimen (TL 250 mm, SL 168 mm)

Figure 3 Radiograph of A. normal specimen of *Pampus argenteus* (TL 183 mm, SL 173 mm). B. abnormal specimen (TL 250 mm, SL 168 mm). Caudal fin of abnormal specimen

Anomaly in the caudal fin will impair the flexibility of the tail, so hindering the performance of the fish (including the capacity to get food and to avoid predators). As far as the author is aware, no similar case of anomalies is reported on any other fish species.

There are several potential environmental factors that cause the caudal fin deformities, these are: heavy metals such as As, Cd, Hg, Pb, and Zn (Sloof, 1982); and the effect of exposure to light and heat during reproduction (Koo & Johnston, 1978). The data for temperature of sea water shown to be higher than those reported by Thangaraja et al. (2011) for the same area and the results of the heavy metals analysis has shown that the levels of of As, Cd, Cr, Pb, and Zn exceeded the standard values in sea water. Such factors are also reported by others to be present in the Omani waters of the Arabian Gulf where biota in the Omani waters has shown to be exposed to different environmental factors and vulnerable to different levels of heavy metals (Reid et al., 2004; De Mora et al., 2004, 2005; Tolosa et al., 2005; Araghi, 2010). Those environmental and pollution factors could well affect the specimen of *P. argenteus* as they are shown to be the cause behind skeletal anomalies in the other fish species collected from the Arabian Gulf area (Laith Jawad, unpublished data).

In the present report, the percentage of the deformed fish is moderate (4%), but on the other hand is alarming. If such percentage showed gradual increase in the future, then it could influence the fishery especially *P. argenteus* is considered high commercially important species (Tutman et al., 2000).

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