

The first Record and Reports of Nettastomatidae Identification in Iranian Museums of the Persian Gulf and Oman Sea's Waters

Fereridoon Owfi, Hodeis Abbasi Ghadikolaei, Mahnaz Rabbaniha, Maryam Abbasi Ghadikolaei

Abstract- *Nettastomatidae* from *Anguilliformes* order was a part of fish fauna in the Persian Gulf and Oman Sea. It has commercial and nourishing value. This research revising the samples classification and systematic specimens of *Nettastomatidae* in south coast of Iran such as: Bushehr, Chabahar, Bandar Abbas, Bandar lengeh and the rest from museums, Universities and Research centers in Iran from 2007-2008. The whole Ichthyology valid published references in this area (Fishing area 51) were considered. The result showed that: Among 27 eel's samples one sample is in *Nettastomatidae* family's *Hoplunis diomedianus* (Good & Bean, 1896) was record and reported for the first time in the Persian Gulf and Oman Sea's of Iranian waters.

Key words: *Nettastomatidae*, systematic review, Persian Gulf, Oman Sea

I. INTRODUCTION

Anguilliformes order included 4 subclass, 18 families, 156 genera and more than 500 species [23]. There appeared 9 families in Iranian waters; consisting of Anguillidae, Mastacembelidae (Echelidae), Muraenesocidae, Muraenidae, Ophichthidae, Ophididae (from: Ophiidiformes), Synphobranchidae. Seven families are live in marine environments [17]. It seems that previews author's do not discussed about two families as name Anguillidae and Echelidae, which their main habitats are in Iranian fresh water [19]. Eels and moray families (*Anguilliformes* order) are common group of fishes in the Persian Gulf and Oman Sea. They have ornamental respect and food value in some species. They are eel shape and long body, have small pectoral and anal fins. In some species anal and pectoral fins are not presented. Almost they have long dorsal fin through the caudal fin. Fins have soft rays without spines. Have cycloid and under skin scales. Pelvic fins are absence, holobranchia or have bronchia pit on beneath or side of the head [12]. Characters research in Iranian waters of the Persian Gulf and Oman Sea divided to four stages included: [17].

- **1st stage:** [2]; (Danish investigation) Introduced 216 species none Genus and species of it belong to *Nettastomatidae*
- **2nd stage:** [15 and 16]; (KISR investigation)¹

introduced 465 species consisting of 244 collected commercial species and 222 reported species, two families in two genus and species belong to the sea's eels.

- **3rd stage:** [9] (FAO investigation); introduced 380 species from fishing area 51. [4] introduced three families of eels in six genus and species. [5; 1] were introduced Four genus and five species in two families of eels; [6] which introduced 577 commercial and noncommercial fish species
- **4th stage:** After 2000 investigation: [7]; introduced 260 species consisting of 77 families, [14; 13]; introduced 114 Ornamental marine species consisting of 44 families [18 and 17]; introduced 902 species.

So, recent study has done by the goal of to achieve the specific and new information about *Nettastomatidae* taxonomy, systematic and morphology of the Eels and morays in Iran. According to related studies, there has not yet been a documented examination on systematic identification and taxonomic of eels. Actually, most of the ichthyologic studies on eels have been local studies. This article is specifically about *Nettastomatidae* family. However these fish are economical, Ornamental, and lemon sole, they are religiously taboo in Iran. So there were some limitations in collecting samples, examining, identifying and classifying the species

II. MATERIALS AND METHODS

All museum samples of the *Nettastomatidae* were collected in Iranian terrestrial waters of the Persian Gulf and the Oman Sea since 1976 - 2006. The present study reviewed to the 1 sample from *Nettastomatidae* family in 2006 – 2008. 1 genera and 1 species by different types of keeping like taxidermy dedicated in Iranian museums. This fish species following in Ichthyology Museum - Fisheries Education Center – Rasht – Ref. code: A Assessment of Biometrical Parameters and appearance characters were classified in two groups.

1- Meristic parameters included of: Total length, Fork length, Standard length, Fins length, Fin base, Caudal peduncle length, Head length, Snout length, Eye diameter, Body depth and in some parts use the relation parts for identify keys.

2- Morphometrical parameters, such as: Number of vertebrate, soft rays and spines, Scales, Teeth, Head spines, upper and lower spines of gill arch [3].

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Used microscope and binocular, Biometrical board, caulis by 0.01 attention, magnifying glass, this information recorded in identification sheet. Samples categorized on different family taxon [10; 22]. Identifying in genus and species by fins formula standard identification table [22]. Comparing the sample of diagnostic characters by valid reference qualities and Ichthyologic reliable sites such as: Fish Base, Reef Base, and Fish Catalogue of Life for finally accordance and species collation [22;1;6]. This argues mentioned that, all of the specimens were collected and studied from museums, therefore were limited some morphometrics and meristics parameters clarifying.

III.RESULTS

Nettastomatidae contain two Greece words of Netta(Nesa) and soma by meanings of duck and mouth . Included 6 genera and 30 species, specially lives in sea waters by warms and humid weather.

1 genera and 1 species identified in ref code A. Generally collected in Raamin Creek (Oman Sea - Sistan & Baluchistan province) (Table1).

1) *Hoplunnis diomedianus*(Good & Bean, 1896)

English name: Black Tail pike Conger

Persian name: Mar Mahi -e- Dom Siyah

Morphology: Maximum total length is 36.6 cm.180-290 number of vertebra. Snout long and pointed dorsal and anal fins are black, along posterior part of tail.

Collected from Meidani area in the Oman Sea and kept on Ichthyology Museum (Ref. code: A) by scientific code 98 and Nettas H.d.1 museum code (Table.1)(figure1).



Hoplunnis diomedianus(Good & Bean,1896)

Ref code:(A) By Owfi And Abbasi,2007

Table I: First record and reported of Nettastomatide species from Iranian Museums from the Persian Gulf and Oman Sea base on ecological groups

Scientific name	Number of sample	Research centers and Museums	Museum code	Scientific code
<i>Hoplunnis diomedianus</i>	1	Ref. code: A	Nettas H.d.1	98

IV. DISCUSSION AND CONCLUSION

The eels and morays are not edible and un-common groups in Iranian market. It has an unusual in fisheries exploitation system, thus would be limited in taxonomical research carefully. In the studied area there is less attention to noncommercial fishes. Hence data collections are very limited in taxonomical research of this species. From conclusively the lack of the public systematic studies in the region had led to misidentification of the species. So any review to identification and classification of the species are necessary although is not easy. In this regard it should be mentioned that one species of eels and moray (Nettastomatidae) have not been reported so far. So, this is

the first record and report from mentioned specie in Iranian waters (Table.I)

Necessary and the first factor of biological studies in each research can be true knowledge on the morphological characters of dwellers, Asses sex related and breeding fecundity across the optimum biological specialist too [17]. In the research pay attention to final classification changing around all taxons of order including family, genera and

Scientific name	References						
	A	B	C	D	E	F	G
<i>Echidna nebulosa</i> (Ahl,1789)			*	*			*
<i>Gymnomuraena zebra</i> (Shaw,1797)				*			
<i>Gymnothorax phasmatodes</i> (Smith,1962)				*			
<i>Gymnothorax undulates</i> (Lacepede,1803)				*			
<i>Thyrsoideamacrura</i> (Bleeker,1854)				*			
<i>Lamnostoma Orientalis</i> (McClelland, 1844)			*	*	*		
<i>Muraenichthys schultzei</i> (Bleeker, 1857)			*	*	*	*	
<i>Ophichthus apicalis</i> (Bennett, 1830)	*						*
<i>Ophichthus celebicus</i> (Bleeker, 1856)							*
<i>Pisodonophis hoevenii</i> (Bleeker, 1853)				*	*		
<i>Conger Cinereus cinereus</i> (Ruppell, 1828)	*	*	*	*	*	*	*
<i>Uroconger lepturus</i> (Richardson, 1848)				*			*
<i>Congresox talabon</i> (Curvier, 1829)	*	*	*				*
<i>Congresox Talabonoides</i> (Bleeker, 1853)	*	*		*	*	*	*

species. All systematic information presented in table.1. This information basis to compose correct scientific name and identification species by collected or /and comparing this data by [17and18] reported (Table II).

Table II: Determined Eels and Moray species of the Persian Gulf & Oman Sea 2005 (Owfi, 2005b)

A: Iranian Fisheries Research Organization – IFRO (1986-88)

B: Marine Science and Fisheries Center of Oman – MSFCO (1995)

C: Kuwait Institute for Scientific Research – KISR (1986)

D: Iranian Fisheries Research Organization – IFRO (2001-02)

E: FAO, 1986, F: FAO, 1997, G: Owfi, 2005

Based on the available data, it was obvious that 1 sample of Nettastomatide belonging to 1 genera and 1 spices were observed for the first time in Iranian waters (tableI). There were some similarities and differences between these identified sample and the ones identified on the UNCC project [17and18] (TableII).

- Based on the reports, of the UNCC project 15 samples from 3 other families of Anguliformes were identified (Owfi, 2005a&b).
- Just the family taxa, genera and species of the samples were identified.
- this sample was renamed sample, had not record and reported by (Owfi, 2005b) .

Table III: Changed name of Nettastomatidae Species base on ecological groups

Accepted scientific name	reference	Changed scientific name
<i>Hoplunnis diomedianus</i>	Fish base,2013; Vander laan etal,2013	<i>Hoplunnis diomediana</i>

Table IV - Nettastomatidae species diversity of the Persian Gulf and Oman Sea, base on ecological groups

Scientific name	English name	Persian Gulf	Oman Sea	Ecological group
<i>Hoplunnis diomedianus</i>		*	*	R&D

R&D: Rocky and Deep water

It should be noted that, *Hoplunnis diomedianus* characters was same to Smith and Heemstera, 1986; Smith and Smith 1963; Vander laan etal, 2013; Fish Base, 2013, but others wouldn't report that but also reported in KISR, 1986 and IFRO, 2002.It has dispersed in Subtropical Marine. It's demersal fish which live in depth range below 200 meter.

Identified as native species in the Western Atlantic Ocean (Froses et al, 2013).Among identified 27 samples of Anguilliformes order this family by one number of sample contain 3.7% of all samples. In the light of biological diversity lived in rocky and deep waters (Table IV).

According to the conclusion significance and main suggestions of research included of:

- A) Less taxonomical information about this class biodiversity in many parts of the world.
- B) Need to power of taxonomical background; consist of reference subject, information banks, and taxonomical experts through the biodiversity of convection in whole area especially on under developed countries.of specimen in the area. Classified coastal land & marine environmental diversities, describe Persian Gulf and Oman Sea's Nettastomatidae by Linnae & Mayer classification and animal geography theories.
- C) Use the results of ichthyology research in fisheries management and planning to calculate& Assess of sustainable yield recruitments on special species or group species, health &disease of fish aspect special hosts such as parasites or other parts of disease in marine environments because eels and morays live in salt waters and non culture in Iranian waters, thus give in information results to Iranian fisheries science & Research organization and Iranian fisheries organization.
- D) Identification and complete information about Marine morays fauna by the goal of stock flexibility/species combination (species diversity index). Planning about endemic and endangered species biodiversity, survey and doing sustainable study in this chart and know the effects of ecological or environmental changing by human or natural too
- E) Taxonomical defects of Anguillifromes in national & territorial levels.
- F) Help to kept of humanly resources, would be hatched &collected samples systems and under structure, then

changed them to curate forms. In addition to several problems in this way; the project is the first complete and collected information about the order and showed the vague side of eels and morays classification.

- G) Recognized the classified position, emphasis to geographical division categories reviews and defects

REFERNCES

- [1.] AL-Abdesalaam, T.Z, 1995. Marine species of the sultanate of Oman Marine science and fisheries center, oman.p234-236,246-247.
- [2.] Belgvad and Loppenthin , 1937.Volum on the fishes of the Iranian Gulf(1944).part III of Danish Scientific Investigation in Iranian Gulf,12col.pls.copenhagen.
- [3.] Biswas, s.p., 1993.Manual of methods in fish biology. South Asia. Publishers' .pvt. Ltd. Newdelhi, 195p.
- [4.] Bianchi, G.1995.Field guide to the commercial marine and brackish water of Pakistan.FAO.Rome.p15-18
- [5.] Coad, W. B, 1992, Check list & Bibliography in Persian Gulf fish,
- [6.] Carpenter, K.E., F.kurp p, O.A.Jones and Zajonz, 1997.Living marine resource of Kuwait, Stern Saudi Arabia, Bahrain, Qatar and United Arab Emirates.Rome.P106-109.
- [7.] Dehghani ,N., and Asadi, 1996. Persian Gulf and Oman Sea fishes publishedfrom Iranian Scientific &Research organization, Tehran.pp:350.
- [8.] FAO, 1986.Review of the fish stated of the world fishery resources; Marine fisheries.Western Indian Ocean (FAO Statistical Area 51), Rome. Italy
- [9.] FAO, 1997.FAO fisheries circular No.920 FIRM/C920. ISSN0429-9329.(FAO Statistical Area 51) Rome.
- [10.] Fischer, W. and Bianchi, G., 1984.FAO species Identification sheets for fishery purposes western Indian ocean (fishing area51), volum1.Rome.p 6- 7.
- [11.] Fish Base, 2013.Available from: www.fishbase.com/July2013.
- [12.] Froese Rainer and Pauly Daniel, 2013. Available from; Seaarounds.org/ Researcher/Dpauly.pdf
- [13.] Hoseinzadeh,H. and Kamali,E. 2003; Ornamental fishes of the Persian gulf published from Iranian fisheries science &Research organization, Tehran.65p.
- [14.] Javid Mohammad Pour,Owfi,F.2001. The reviews and defect of systematic, Taxonomy of Persian Gulf & Oman sea's bony fish classification in International Natural History Museum of Iran, Tehran .MSC. Thesis, Tarbiat Modares University, Noor.
- [15.] Kuronuma, K. and Abe, Y.1986. Fishes of the Bahrain Gulf, Kuwait institute for scientific research .p 45-46.
- [16.] Kuronuma, K. and Abe, Y.1972.fishes of Kuwait,Kuwait.xIV,123pp.20plts.Boards,d/j.
- [17.] Owfi, F.2005a. Check list and species diversity of the Persian Gulf & Oman Sea, Anguilliformes IFRO/ /UNCC Geneva, Suisse.p185.
- [18.] Owfi, F.2005b.Anguilliformes Fishes Diversity IFRO/ /UNCC Geneva, Suisse. p185.
- [19.] Owfi, F and Rabbaniha. M, 2007. Environmental management of Iranian coastal zone (marine fish fauna research) Volume 5; Iranian port and navigate organization, Tehran. P 1-12.
- [20.] Reef Base.com. Available from: www.reefbase.com/july2013.
- [21.] Smith, J.L.B. and Smith, M.M.1963.The fishes of Seychelles. Rhodes University, Grahamstown. 215p.
- [22.] Smith, M. & Heemstra, P.C.1986. Smith's Sea Fishes. Springer – Verlag.
- [23.] Vander laan,R.,Fricke,R. and Eschmeyer,W.N,2013. Fish catalogue of life electronic version accessed dd mmm.



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