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Abundance of Three Teraponid Species of Family Teraponidae Along Karachi Coast, Pakistan

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Abstract. This paper is based on the distribution pattern and abundance of teraponid species of the family teraponidae from Karachi coast, Pakistan. For this study, 1304 specimens of family teraponidae were collected during January, 2013 to December, 2014 from commercial landings at Karachi Fish harbour. Three species of family teraponidae (*Terapon jarbua,T. puta* and *T. theraps*) were investigated from the samples.The frequency distribution pattern of teraponid species was recorded as 51.84% for *T. jarbua* and 47.70% for *T. puta, T. theraps* was rarely present in the commercial catch at Karachi coast.

Keywords: frequency distribution, diversity, teraponid species, commercial landing, Pakistan

Introduction

The family teraponidae comprises small to medium-size fishes. Mouth is protractile and moderate in size. Teeth are conical. Preopercle with serration. Operculum with 2 spines, the lower spine larger and stronger. Body is oblong and moderately compressed. Three or more longitudinal body stripes are present in most of the marine species. Single dorsal fin, having XI to XIV spine rays and 8 to 14 soft rays. Anal fin having III strong spines and 7 to 12 soft rays. Caudal fin emarginate and lateral line is complete and single. Scales adherent, finely ctenoid and rough to touch. Body colour tan or light grey. They inhabit near shore marine and brackish waters, while some of them also enter freshwaters. They are good edible fishes entering the catches by artisanal and other inshore fisheries, but none of the species is important enough to support a special fishery (Froese and Pauly, 2015; Vari, 1984 and 2001).

The diversity within the teraponidae has evolved over the past forty years. Vari (1978) provided a cladistics analysis of the family and divided it into 16 genera and 48 species. This level of diversity was also supported by Nelson (2006) who also suggested 16 genera and 48 species in this family. Many studies have done systematics at the molecular level that results in the formation of new species. Lee and Tsai (1999) studied the systematics of teraponids and described that *Terapon theraps* may place in a new genus *Pseudotherapon*. Vari and Hadiaty (2012) described the systematic position and correct identification of a teraponid species, *Lagusia micracanthus* and re-evaluated its phylogenetic position. More recently, Froese and Pauly (2015) identified 52 species belonging to 16 genera within this family.

Scientists have studied *Terapon jarbua* from Pakistan waters examining topics such as toxicology, parasitic infections, population dynamics and distribution and abundance. Khattak and Khattak (2013) examined arsenic and cadmium contamination in *T. jarbua* along Karachi-Makran coast; Qasim and Ayub (2012) examined the parasitic infections on *T. jarbua* from Karachi Fish Harbour, Pakistan and Saleem *et al*. (1999) reported the heavy metal concentration in *T. jarbua* which respect by Khan and Imad (2000) had investigated the population dynamics of *T. jarbua* respect Abbas and Siddiqui (2007) reared *T. jarbua* in seawater tanks and examined the effects of stocking density on the growth and survival of *T. jarbua*. Ahmed *et al.* (2015) have worked on heavy metals in *T. puta*. Whereas, some other fishery workers have reported the distribution of family teraponidae from Pakistan such as Khatoon *et al.* (2014a and b) Siddiqui and Amir (2011a and b); Niazi (2001); Ahmed and Niazi (1988); WWF (2008); Bianchi (1985); Qureshi (1955). Still, there is a lack of information regarding the abundance of teraponid species along the Karachi coast. Therefore, the study aimed to enumerate the abundance pattern of teraponid species in the commercial catches at the Karachi coast.

Materials and Methods

Pakistan has a coastline of 1046 Km (61°38′ to 68°10′ E longitude and 23°43′ to 25°12′ N latitude). The

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coastline is mainly divided into two provinces, Sindh and Balochistan. About 295 Km of the coastline is in Sindh province and about 771 Km coastline is in Balochistan province (Psomadakis *et al*., 2015).

For this study, the specimens of family teraponidae were collected randomly from the commercial landings at Karachi Fish harbour. A total of 1304 specimens were collected during the study period from January, 2013 to December, 2014. The yearly and monthly distribution of the teraponid species was studied to understand the abundance and frequency distribution pattern, followed by the method of Mortuza and Rahman (2006). ANOVA was applied to check the variations and significance in the abundance of Teraponid species during different months of the study period using Minitab statistical software version 18.

Results and Discussion

The abundance and frequency distribution pattern of teraponid species (family teraponidae) was recorded from January, 2013 to December, 2014. The results show that *Terapon jarbua* (51.84%) was most commonly found, followed by *T. puta* (47.70%), while, *T. theraps* contributed only 0.46% in total catches (Table 1). The monthly frequency distribution of teraponid species (Table 2) shows the presence of two teraponid species (*Terapon jarbua* and *T. puta*) throughout the study period, while *T. theraps* was found only during May, June, and August of 2014. The total catch of teraponid species was found higher in March and November, 11.43% and 12.58% respectively. During June (4.22%) and July (5.06%), teraponid species were found less in numbers. The results of ANOVA (at 5% significance level) show significant variations in the abundance of teraponid species during different months of the study period.

Species distribution and abundance are important tools to describe and assess the fish diversity in areas. During the present study, the individuals of *Terapon jarbua* were observed more numerous than *T. puta,* which agreed with the findings of Murugesan *et al.* (2011) from the neighbouring country India. During this research, teraponid species were found less during the monsoon period because there is a ban enforced on trawl fishery at Pakistan coast by the government in the monsoon season. During the monsoon season when the trawl fishery is closed, small boats are still allowed to fish in nearshore waters. It might be a reason for the presence of *Terapon theraps* during these months because the sampling site also affects the fish distribution (Morgan *et al*., 2006). Whereas, migration in fishes plays a crucial role in the distribution and abundance of species (Renato *et al.,* 2000). The differences inthe abundance of species during this study may be affected by the several reasons such as sampling site or species association (Morgan *et al*., 2006), water depth (Paterson and Whitfield, 2000), tolerance range of fish (Jalal *et al.,* 2012), dissolved oxygen and turbidity (Bruno *et al.,* 2013). According to Brinda *et al.* (2010), temperature may influence the distribution of species.

Several factors such as sampling techniques, oceanographic and environmental conditions have been cited as the drivers for observed species abundance and relative composition in a given area (Ward and Myers, 2005). Variations in distribution or abundance of Teraponid fishes may depend on water depth, salinity, and food availability. Whereas, macrophytes such as *Potamogeton* sp. and *Halophila* sp. provides protection and food for most of the fish species. Therefore, fish landings have been reported higher from the areas, where macrophytes are abundant (Karna *et al.,* 2011). Anthropogenic effects such as the utilization of coastal areas as human housing and industrial activities near

Table 1. Total catch of the teraponid species during January, 2013 to December, 2014

No. of observations	Species	Size range (TL)	No. of males	No. of females	Total catch of each species examined	Female	Male	Percentage of each species examined
					N	%	%	
1	*Terapon jarbua*	153-325	325	351	676	48.08	51.92	51.84
2	*Terapon puta*	103-166	213	409	622	34.24	65.756	47.7
3	*Terapon theraps*	130-145	1	5	6	16.67	83.333	0.46

TL = Total body length in mm; Total catch (N)= 1304

Table 2. Monthly distribution of Teraponid species during January, 2013 to December, 2014

No. of observations	Species	Size range (TL)	Months												Total (each species)		ANOVA	
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	n	%	F-value	P-value
1	*Terapon jarbua*	153-325	64	49	51	57	41	27	39	97	72	52	82	45	676	51.84	37.76	0.00
2	*Terapon puta*	103-166	38	76	98	60	39	26	27	31	44	49	82	52	622	47.7		
3	*Terapon theraps*	130-145	0	0	0	0	1	2	0	3	0	0	0	0	6	0.46		
Total catch/month	102	125	149	117	81	55	66	131	116	101	164	97	1304					
Percentage/ month	7.82	9.59	11.43	8.97	6.21	4.22	5.06	10.05	8.9	7.75	12.58	7.44						

TL = Total body length in mm

shore affects the habitat and nursery grounds of many fish species thus, the population and distribution of species are also disturbed in respective areas (Jalal *et al.,* 2012). Overfishing activities in coastal or shallow waters do affect the distribution of fishes. As the capturing of juveniles reduces the recruitment in the population and therefore populations may show a decline trend in particular areas (Posada *et al.,* 1999).The water turbulence or wave action may affect the distribution or abundance of species (Meager *et al*., 2005). Fish abundance found higher at the places where the tide effect is low (Bruno *et al*., 2013). The calmer areas such as the inside of bays and estuaries are the most abundant fish sites as they provide recruits in the populations (Oliveira and Pessanha, 2014). During this study, the distribution of species may be affected due to the time of capture, physical conditions of the habitat such as tidal state (Masood and Yasmeen, 2012). Despite these factors, turbidity is one of the major factors which affect the distribution of species, because high turbidity reduces the predation (Blaber and Blaber, 1980). The fishing and predation are the main causes which alter the distribution of fishes. However, food availability, spawning rates, breeding ground and shelter, vegetation, and water depth also act as limiting factors (Abowei, 2009) that might be a reason for difference in the abundance of Teraponid species during different months of the study period.

Conclusions

A total of 1304 samples of teraponid fishes (family teraponidae) were collected during the study period (January, 2013 to December, 2014). These samples were mainly comprised of two teraponid species i.e., *Teraponjarbua* and *T. puta.*Whereas, *Terapon theraps* contributed <1% of the total catch examined for this study. Therefore, it can be concluded that only two teraponid species (*T.jarbua* and *T. puta*) formed a significant part of commercial landings at Karachi coast, Pakistan.

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Conflict of Interest. The authors declare no conflict of interest.

References

Abbas, G., Siddiqui, P.J.A. 2007. Effect of stocking density on growth and survival of the juvenile crescent perch, Therapon jarbua (Forsskal, 1775) reared in sea water tanks. *International Journal of Biology and Biotechnology*, **4:** 73-81. http://www.ijbbku.com/assets/custom/journals/2007/SI/EFFECT%20OF%20STOCKING%20DENSITY%20ON%20GROWTH%20AND%20SURVIVAL%20OF%20THE%20JUVENILE%20CRESCENT%20PERCH,%20THERAPON%20JARBUA%20(FORSSKAL%201775)%20REARED%20IN%20SEAWATER%20TANKS.pdf

Abowei, J.F.N. 2009. The abundance, condition factor and length-weight relationship of *Cynoglossus senegalensis* (Kaup, 1858) from Nkoro river Niger delta, Nigeria. *Advance Journal of Food Science and Technology*, **1:** 57-62. https://maxwellsci.com/print/ajfst/57-62.pdf

Ahmed, N.M.F., Sadiq, M. 1988. *Edible Fishes of Pakistan. Zoological Survey Department*. 31pp. https://agris.fao.org/agris-search/search.do?recordID=US201300650369

Ahmed, Q., Bat, L., Yousuf, F. 2015. Heavy metals in Terapon puta (Cuvier, 1829) from Karachi coasts, Pakistan. *Journal of Marine Biology*, **2015:** 1-5. https://www.hindawi.com/journals/jmb/2015/132768/

Bianchi, G. 1985. FAO species identification sheets for fishery purposes. *Field Guide to the Commercial Marine and Brackish Water Species of Pakistan*, Prepared with the support of PAK/77/033/ and FAO (FIRM) Regular Programme. FAO, Rome. 200pp. http://www.fao.org/3/a-r7066e.pdf

Blaber, S.J.M., Blaber, T.G. 1980. Factors affecting the distribution of juvenile estuarine and inshore fish. *Journal of Fish Biology*, **17:** 143-162. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1095-8649.1980.tb02749.x

Brinda, S., Srinivasan, M., Balakrishnan, S. 2010.Studies on diversity of fin fish larvae in *Vellar Estuary*, *Southeast Coast of India.World Journal of Fish and Marine Sciences*, **2:** 44-50. https://www.researchgate.net/publication/202243392_Studies_on_Diversity_of_Fin_Fish_Larvae_in_Vellar_Estuary_Southeast_Coast_of_India

Bruno, D.O., Barbini, S.A., Astarloa, J.M.D.de., Martos, P. 2013. Fish abundance and distribution patterns related to environmental factors in a choked temperate coastal lagoon (Argentina). *Brazilian Journal of Oceanography*, **61:** 43-53. https://www.scielo.br/pdf/bjoce/v61n1/a05v61n1.pdf

Froese, R., Pauly, D. 2015. *Fish Base*. World Wide Web electronic publication. www.fishbase.org, version (04/2015).

Jalal, K.C.A., Ahmed-Azher, M., Akbar-John, B., Kamarruzzaman, Y.B., Shahabudin, S. 2012. Diversity and community composition of fishes in tropical estury Pahang Malaysia. *Pakistan Journal of Zoology*, **44:** 181-187. http://zsp.com.pk/pdf44/181-187%20_24_%20PJZ-552-10%20corrected%20pahang%20estuary%2017th%20aug,%202011.pdf

Karna, S.K., Panda, S., Guru, B.C. 2011. Length-weight relationship (Lwr) and seasonal distribution of *Valamugil Speigleri* (Valancienues) through size frequency variation and landing assessment in Chilika Lagoon, India. *Asian Journal of Experimental Biological Sciences*, **2:** 654-662. https://scholar.google.com.pk/citations?user=dol89fEAAAAJ&hl=tr

Khan, M.A., Imad, A. 2000. Population dynamics of Terapon jarbua (Froskal) in coastal area of Pakistani waters. *Pakistan Journal of Marine Sciences*, **9:** 91-96. http://aquaticcommons.org/19273/1/PJMS9_091.pdf

Khatoon, Z., Paperno, R., Hussain, S.M. 2014 a. Length-weight relationships of five fish species collected from Manora channel and associated backwaters of the northern Arabian sea. *Journal of Applied of Ichthyology*, **30:** 235-238. https://doi.org/10.1111/jai.12183

Khatoon, Z., Paperno, R., Hussain, S.M. 2014b. Spatial and temporal changes in the fish communities from a mangrove-dominated creek system near Karachi, Pakistan. *Journal of Applied of Ichthyology*, **30:** 350-358. https://doi.org/10.1111/jai.12377

Khattak, M.I., Khattak, M.I. 2013. Evaluation of heavy metals (As and Cd) contamination in the edible fish along Karachi-Makran coast. *Pakistan Journal of Zoology*, **45:** 219-226. http://zsp.com.pk/pdf45/219-226%20_29_%20%20PJZ-537-10%208-1-13%20Khatak-paper.pdf

Lee, S-C., Tsai, M-P. 1999. Molecular systematics of the thornfishes genera *Terapon and Pelates* (Perciformes: Teraponidae) with reference to the new genus Pseudoterapon. *Zoological Studies*, **38:** 279-286. http://zoolstud.sinica.edu.tw/Journals/38.3/279.pdf

Masood, Z., Yasmeen, R. 2012. Distribution of grey mullets (Mugiliformes; Mugilidae) on Karachi coast, Pakistan. *International Journal of Biology and Biotechnology*, **9:** 387-392. http://www.ijbbku.com/assets/custom/journals/2012/4/DISTRIBUTION%20OF%20GREY%20MULLETS%20(MUGILIFORMES;%20MUGILIDAE)%20ON%20KARACHI%20COAST,%20PAKISTAN.pdf

Meager, J.J., Williamson, I., King, C.R. 2005. Factors affecting the distribution, abundance and diversity

of fishesof small, soft-substrata tidal pools within Moreton Bay, Australia. *Hydrobiologia*, **537:** 71-80. https://link.springer.com/article/10.1007/s10750-004-2308-x

Mortuza, M.G., Rahman, T. 2006. Length-weight relationship, condition factor and sex-ratio of freshwater fish, *Rhinomugil corsula* (Hamilton) (Mugiliformes: Mugilidae) from Rajshahi, Bangladesh. *Journal of Bio-science*, **14:** 139-141. https://www.banglajol.info/index.php/JBS/article/view/460

Murugesan, P., Purusothaman, S., Muthuvelu, S. 2011. Trophic level of fishes associated in the trawl bycatch from Parangipettai and Cuddalore, southeast coast of India. *Journal of Fisheries and Aquatic Science*, 1-10. https://scialert.net/fulltext/?doi=jfas.2012.29.38

Nelson, J.S. 2006. *Fishes of the World*. John Wiley & Sons, Inc. 4th Edition. 624pp. New York USA. https://batrachos.com/sites/default/files/pictures/Books/Nelson_ea_2016_Fishes%20of%20the%20World.pdf

Niazi, R.M. 2001. A trawl study of benthic marine macro-organisms found in the near shore waters of Karachi, Pakistan. *Pakistan Journal of Fisheries*, **2:** 13-3. https://agris.fao.org/agris-search/search.do?recordID=PK2007000534

Oliveira, R.E.M.C.C., Pessanha, A.L.M. 2014. Fish assemblages along a morphodynamic continuum on three tropical beaches. *Neotropical Ichthyology*, **12:** 165-175. https://www.scielo.br/ scielo.php?pid=S1679-62252014000100165&script=sci_abstract&tlng=en

Paterson, A.W., Whitfield, A.K. 2000. Do shallow-water habitats function as refugia for juvenile fishes? *Estuarine*, *Costal and Shelf Science*, **74:** 263-273. https://saeis.saeon.ac.za/Archive/Literature/Journal%20Papers/Paterson%20AW%20&%20AK%20Whitfield_2000.pdf

Posada, J.M., Ivan, M.R., Michael-Nemeth. 1999. Occurance, abundance and length frequency distribution of queen conch, *Strombus gigas*, (Gastropoda) in shallow waters of the Jaragua National Park, Dominican Republic. *Caribbean Journal of Science*, **35:** 70-82. http://www2.cedarcrest.edu/academic/bio/jcigliano/MFEC/Conch_DomRep.pdf

Psomadakis, P.N., Osmany, H.B., Moazzam, M. 2015. Field identification guide to the living marine resources of Pakistan. FAO Species Identification Guide for Fishery Purposes.Rome, FAO. x + 386 pp., 42 colour plates. http://www.fao.org/3/a-i4932e.pdf

Qasim, S., Ayub, Z. 2012. Prevalence and intensity of parasites in edible fishes landing at Karachi Fish Harbour. *Pakistan Journal of Zoology*, **44:** 1467-1471. https://www.zsp.com.pk/pdf44/1467-1471%20_1_%20PJZ-808-11%2030-10-12%20page%20proof.pdf

Saleem, M., Kazi, G.H., Memon, M.Q. 1999. Heavy metal concentration in the fish and shellfish of Karachi harbour area. *Pakistan Journal of Marine Biology*, **5:** 143-154. https://www.research gate.net/profile/Monawwar_Saleem2/publication/291074597_HEAVY_METAL_CONCENTRATION_IN_FISH_AND_SHELLFISH_OF_KARACHI_HARBOUR_AREA/links/569ddbec08ae16fdf079ae59/HEAVY-METAL-CONCENTRATION-IN-FISH-AND-SHELLFISH-OF-KARACHI-HARBOUR-AREA.pdf

Siddiqui, P.J., Amir, S.A. 2011a. *Baseline Survey of Fish Diversity at Astola Island, Balochistan*. Report submitted by Center of Excellence in Marine Biology University of Karachi to Pakistan Wetland Programme. 12pp. https://www.yumpu.com/en/document/view/8790182/baseline-survey-of-fish-diversity-at-astola-island-pakistan-

Siddiqui, P.J., Amir, S.A. 2011b. *Baseline Survey of Fish Diversity at Miani Hor, Balochistan*. Report submitted by Center of Excellence in Marine Biology University of Karachi to Pakistan Wetland Programme. 17pp. https://www.academia.edu/1129302/Baseline_Survey_of_Fish_Diversity_at_Miani_Hor_Balochistan

Silvano, R.A.M., Amaral, B.D.do., Oyakawa, O.T. 2000. Spatial and temporal patterns of diversity and distribution of the upper Jaru'a River fish community (Brazilian Amazon). *Environmental Biology of Fishes*, **57:** 25-35. https://link.springer.com/article/10.1023/A:1007594510110

Vari, R.P. 1978. The terapon perches (Percoidei. Teraponidae). A cladistic analysis and taxonomic revision. *Bulletin of the American Museum of Natural History*, **159:** 175-340. http://digitallibrary.amnh.org/handle/2246/1273

Vari, R.P. 1984. Terapontidae. In: *FAO Species Identification Sheets for Fishery Purposes*, Fisher W. & Bianchi G. (eds.), Western Indian Ocean (Fishing Area 51) (Vol. 1-6) Rome: FAO. http://www.fao. org/3/ad468e/ad468e00.htm

Vari, R.P. 2001. Teraponidae. In: *FAO Species Identification Guide for Fisheries Purposes. The Living Marine Resources of the Western Central Pacific*. Carpenter, K.E, and Niem, V.H. (eds.), Vol. 5. pp. 3305-3316. FAO, United Nations, Rome. http://www.fao.org/3/y0770e/y0770e00.htm

Vari, R.P., Hadiaty, R.K. 2012. The endemic Sulawesi fish genus *Lagusia* (Teleostei: Terapontidae). *The Raffles Bulletin of Zoology*, **60:** 157-162. https://lkcnhm.nus.edu.sg/app/uploads/2017/06/60rbz157-162.pdf

Ward, P., Myers, R.A. 2005. Shifts in open-ocean fish communities coinciding with the commencement of commercial fishing. *Ecology*, **86:** 835-847. https://www.researchgate.net/publication/237271016_Shifts_in_open-ocean_fish_communities_coinciding_with_the_commercial_fishing