

REVIEW OF CARDINAL FISHES OF FAMILY APOGONIDAE OF PAKISTAN

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ABSTRACT

Cardinal fishes belonging to Family Apogonidae are represented by many species in Pakistan, however, there is no comprehensive review of the known species of the area is ever published. Present study reports details of cardinal fishes occurring in Pakistan based on published literature as well as through the collection of specimens from various parts of Pakistan. A total of 42 species belonging to 16 genera of this family are reported from Pakistan. *Apogon dhofar*, *A. indicus*, *A. fugax*, *Taeniamia pallida* and *Jaydia lineata* are reported for the first time from Pakistan coast. *Apogonichthyoides cf. maculipinnis* is previously reported from Pakistan. This species is considered to be endemic in the Maldives, however, the specimen from Pakistan seems to have characters which suggest that it may be a new species. Additional specimens have to be collected/examined to ascertain this. Members of cardinal fishes, as such, are little or no commercial importance, however, they play important role in coral reef assemblages and other shallow waters ecosystem.

Keywords: Cardinal fishes, *Apogon dhofar*, *A. indicus*, *A. fugax*, *Taeniamia pallida*, *Jaydia lineata*, *Apogonichthyoides maculipinnis*

INTRODUCTION

Family Apogonidae includes cardinal fishes which are usually small (>20 cm) in size (except *Holapogon maximus* which can attain a maximum size of 30 cm) and mostly nocturnal in nature. These are carnivorous fishes which feed mainly upon zooplankton or small invertebrates. They are characterized in having two dorsal fins, large eyes and mouths. Most species appear lighter and more iridescent at night. Rear margin of preopercle of these fishes has characteristic double edge, which is variously serrated or smooth. Cardinal fish are often handsomely patterned in stripes or spots. Their common name comes from the red colour of many of the species, although they come in all colours from yellow to brown and blue. These fishes are known from tropical and subtropical waters of Atlantic, Indian, and Pacific oceans. Most species are found in marine waters except a few which are found in brackish water. Often found in small groups, sheltering among the rocks, reefs or other hiding places during the day.

There is no separate publication that deals with members of family Apogonidae from Pakistan, however, members of this family are included in many checklists including Hoda (1985b, 1988), Hussain (2003) and Jalil and Khaliluddin (1972, 1981). There are other publications that report a few species from Karachi such as Regan (1905), Psomadakis *et al.* (2015) have reported 12 species of family Apogonidae from Pakistan whereas Ali *et al.*, (2021) has reported 6 species of cardinal fishes from coral reefs along Pakistan coast. Present paper reviews the species of cardinal fishes belonging to the family Apogonidae known from Pakistan with a few new records.

MATERIAL AND METHODS

Published scientific literature was examined for the records of various cardinal fish species occurrence from Pakistan coast (Fig.1). In addition, specimens of family Apogonidae collected between 2005 and 2022 from Karachi Fish Harbour which is the largest fish landing centre for domestic fleet operating along coastal and offshore waters of Pakistan. Samples collected from the harbour, were photographed and salient features and measurement were recorded, before their preservation in 5 % neutralized formalin and stored in Fish Museum of Marine Fisheries Department. In addition, a few samples of cardinal fishes were obtained from Fisheries Resource Surveys carried out in coastal and offshore waters of Pakistan on-board R/V Firdous in 2009 and 2015 and R/V Fridtjof Nansen in 2010. A few photographs of cardinal fishes taken by amateur divers from various locations along Pakistan coast are also included in this paper.



Fig. 1. Pakistan coast showing some of the sites from where cardinalfishes were collected

RESULTS

An enumeration of the species belonging to family Apogonidae already reported from Pakistan is made in this paper. The paper reviews the status of previously species as well as reports of 5 new records from Pakistan. The species are arranged as per the classification (families and subfamilies) by Mabuchi *et al.* (2014).

Family Apogonidae
 Subfamily: Amioioidinae
 Genus: *Holapogon* Fraser 1973
Holapogon maximus (Boulenger, 1888)

Fig. 2



Fig. 2. *Holapogon maximus* collected from Karachi Fish harbor on September 14, 2015.

Titan cardinal fish, as it is commonly known was reported from Pakistan by Froese and Pauly (2022) and Psomadakis *et al.* (2015). This species was originally described as *Apogon maximus* from Muscat, Oman by Boulenger (1888). Its holotype is not known, however, syntypes are housed in Natural History Museum, London, U. K. (Frickle *et al.* 2022). It was previously known from Red Sea, Oman, Yemen, Southern Arabian Coast to southwestern India and Pakistan (Boulenger, 1888, Fraser, 1973, Frickle *et al.*, 2022; Froese and Pauly, 2022; Psomadakis *et al.*, 2015; Randall, 1995).

Characteristically this species is pinkish tan to brownish yellow dorsally, shading to brassy with pink iridescence on side and ventrally. Its body and nape have numerous small brown spots, some on ventral part of body tending to merge to form irregular stripes. There are two slightly diagonal bars present on head, one from top of iris across lower cheek and the second (containing some dark spots) from nape across opercle. Fin are yellowish and the first dorsal with a black spot anteriorly at base. This is the largest known species of family Apogonidae. During present study a number specimen ranging between 19 and 28 cm (TL) were examined. This species is widely distributed

between 40 and 100 m (Randall, 1995). Along Pakistan coast it is mainly caught by shrimp trawlers operating coastal and offshore waters and occasionally reported in commercial catches at Karachi Fish Harbour.

Material Examined:

- One Specimen – Karachi Fish harbor, collected on April 18, 2014 (19 cm TL)
- One Specimen – Karachi Fish harbor, collected on September 14, 2015 (28 cm TL)
- One Specimen – Karachi Fish harbor, collected on April 8, 2017 (26 cm TL)
- One Specimen – Karachi Fish harbor, collected on May 16, 2017 (21.5 cm TL)
- One Specimen – Karachi Fish harbor, collected on September 4, 2018 (22 cm TL)

Subfamily Apogoninae
Tribe Apogonichthyini
Genus *Fowleria* Jordan and Evermann 1903
Fowleria aurita (Valenciennes, 1831)

This species is commonly known as crosseyed cardinalfish and was reported from Sindh by Murray (1880). It was also listed among fishes from Pakistan without identifying any specific location by Hoda (1985b, 1988). Murray (1880) listed it as *Apogon auritus* whereas Hoda (1985b, 1988) reported this species as *Papillapogon auritus*. This species was originally described as *Apogon auritus* from Mauritius by Valenciennes (1831). Its holotype (MNHN 8760) is housed in Museum National d’Histoire Naturelle, Paris, France (Frickle *et al.* 2022). This species is reported from Red Sea south to Natal, South Africa and eastward to Samoa and Mangaréva, north to the Ryukyu Islands, south to northern Australia and Lord Howe Island. In the area, it is known from India (Kapoor *et al.*, 2002) and Oman (Randall, 1995). No specimen was examined during the present study.

This species is reddish to orange brown in colour with edges of scales darker than centres. A yellow rimmed black spot larger than pupil basally on opercle. Its fin rays are red or orange while the membrane is translucent (Randall, 1995).

Tribe Apogonini
Genus *Apogon* Lacepède 1801
Apogon coccineus Ruppell, 1838

This species which is known as ruby cardinalfish which was reported from a depth of 158m in the offshore waters of Karachi by Hussain and Kidwai (1994) whereas it is listed among fish species found in Pakistan without mentioning about any locality by Hussain (2003). It was originally described from Massawa (Eritrea), Red Sea by Ruppell (1838). Its holotype is not known, however, lectotype (SMF 973) is housed in Forshungs Institut und Natur Museum Senckenberg, Frankfurt, Germany (Frickle *et al.*, 2022). This species is known from Red Sea and East Africa (Gon, 1986a) to the Marquesan and Easter islands, north to southern Japan, and south to Lord Howe Island. In the area, it is known from India (Kapoor *et al.*, 2002), Oman and Persian Gulf (Fraser *et al.*, 2022; Randall, 1995). The collected specimen (CEMB 13001) from Karachi was 7.8 cm which is housed in Fish Museum of Centre of Excellence in Marine Biology University of Karachi. This species is semi-transparent to translucent, and scales reddish with darkish edges, most prominently dorsally; darkish mark on sides of peduncle. No specimen was examined during the present study.

Apogon dhofar Mee, 1995
(Fig.3)



Fig. 3. *Apogon dhofar* collected from Gwader, December 27, 2015

This species is known as Dhofar cardinalfish and reported for the first time from Pakistan coast. It was originally described by Mee in Randall (1995) from Eagles Retreat near Mirbat, (16°58'00"N, 54°42'50"E), Oman, Arabian Sea. Its holotype (CAS 82327) is housed California Academy of Sciences, San Francisco, California, USA (Frickle *et al.*, 2022). *A. dhofar* was considered to be a synonym of *Apogonichthyoides enigmaticus* (Fraser *et al.*, 2022; Frickle *et al.*, 2022). However, according to Froese and Pauly (2022) *A. dhofar* is a valid species whereas *A. enigmaticus* may be considered as a synonym of *Ostorhinchus apogonoides*. Late J. R. Randall was provided with photographs of the specimen collected from Gwadar and he was convinced that *A. dhofar* is a valid species and stressed on the need for delineation of its distribution in the regional countries.

Its body is light brown, shading to silvery brown with iridescence ventrally and the edges of scales dark brown. Two narrow dark brown but faint bars on body each continuing onto front of a dorsal fin. Head brown without any obvious dark markings.

This species is abundantly found along the rocky outcrops of Balochistan coast especially and usually caught on handlines used by amateur fishermen. Because of no commercial value, it is usually dehooked and discarded.

Material Examined:

- _ One specimen collected by handline at Gwadar Headland on December 27, 2015 (13 cm)

Apogon maculatus (Poey, 1860)

This species which is commonly known as flamefish which was reported from Sindh coast by Murray (1880). It was originally described as *Monoprion maculatus* from Cuba by Poey (1860). No holotype is known, however, syntypes are housed in Museum of Comparative Zoology - Harvard University, Massachusetts, USA (Frickle *et al.*, 2022). This species is known from west coast of Americas (Massachusetts to Brazil), therefore, it is safe to presume that it is a misidentification and in the absence of any detailed information given by Murray (1880), it is difficult to assign it to any other species. This species, therefore, may not be included in the list of species known from Pakistan.

Apogon fugax Gon, Bogorodsky, Mal and Alpermann 2020 (Fig. 4)

Elusive cardinalfish as it is commonly known was reported from Pakistan by Psomadakis *et al.* (2015) as *Apogon talboti* Smith 1961. Psomadakis *et al.* (2015) had some doubts in its identification, but specimens from Pakistan were considered comparable to *Apogon talboti*. Detailed examination of the specimens collected from Pakistan, it is certain that it is *Apogon fugax* described from Red Sea, Myanmar and Western Australia by Gon *et al.* (2020).



Fig. 4. *Apogon fugax* collected board R/V Dr. Fridtjof Nansen Cruise on October 10, 2010.

Apogon fugax was originally described from Red Sea, Saudi Arabia, off Jizan, (16°53.052' N; 42°21.122' E) by Gon *et al.* (2020). Its holotype (SMF 35884) is housed in Forshungs Institut und Natur Museum Senckenberg,

Frankfurt, Germany. This species is known to be distributed from Red Sea, Bay of Bengal (Myanmar) and off Western Australia (Gon *et al.*, 2020). It was reported to found between depths of 60 to 160 m (Gon *et al.*, 2020).

This species was reported to be reddish orange colour all over body, scale edges enhanced by larger chromatophores; five black dots orientated vertically on membrane between 2nd and 3rd dorsal-fin spines; faint dark dots of various sizes across caudal peduncle immediately in front of caudal-fin base. According to Gon *et al.* (2020), 'talboti look-alikes' species group including *A. caudicinctus*, *A. dianthus*, *A. soloriens*, *A. rubrifuscus* and *A. deetsie* shares characters with the *A. fugax* in having two supraneurals, 12 pectoral-fin rays (13 rays in *A. soloriens*), and an enlarged, membranous, ventral preopercular edge. *Apogon fugax* is distinguished from the species of the 'talboti look-alikes' species group, *A. deetsie* and *A. rubrifuscus*, in having a large head (2.2–2.4 in SL versus 2.4–2.8 in SL), longer first dorsal-fin spine (1.7–2.0 versus 2.7–4.0 in length of the second spine), and in their gill rakers count (developed gill rakers on the first gill arch 11–12 versus 8–9 in *A. soloriens* and 13–20 in the other four species).

This species is occasionally caught from trawling grounds along the coast of Pakistan, as well. During the present study a large number specimens were examined that were collected by research vessels operating in depth between 20 and 100 m.

Material Examined:

- One specimen collected from on board R/V Dr. Fridtjof Nansen Cruise in the offshore waters of Pakistan on October 10, 2010 (7 cm TL).
- One specimen collected from offshore waters of Karachi during inshore survey on 23 May, 2010 (11.2 cm TL).
- One specimen collected from offshore waters of Karachi during inshore survey on 22 August, 2010 (9.7 cm TL).
- One Specimen – Off Taq, Ormara by gillnet collected on October 30, 2015 (18.1 cm TL)

Apogon indicus Greenfield 2001

(Fig. 5)

This species is commonly known as Indian cardinalfish and was originally described from Mauritius, southwestern coast, Passe de L'Ambulante, off le Morne, outside lagoon, Mascarenes, southwestern Indian Ocean (20°26'10"S, 57°17'40"E, depth 6-8 meters) by Greenfield (2001). Its holotype (USNM 341643) is housed in National Museum of Natural History, Washington D.C., U.S.A. (Frickle *et al.*, 2022). This species is reported for the first time from Pakistan.



Fig. 5. *Apogon indicus* collected on board local trawler in December 14, 2015.

This species has pectoral fins 13 rays; GR 7–9 (1 on upper limb); 2 large scales above lateral line below 1st dorsal fin, and 1 small scale nearest dorsal-fin base; circumpeduncular scales 14. Body translucent reddish, without darkish markings on scales above lateral line or on peduncle (Fraser *et al.*, 2022).

This species is known from Indo-West Pacific area including South Africa, Tanzania, Comoros, Madagascar, Agalega Islands (Mauritius), and western Mascarenes (La Réunion, Mauritius) east to Palau and southern Line Islands (Kitibati), north to southern Japan and the Philippines, south to New Caledonia and Tonga (Frickle *et al.*, 2022). During present study a number specimen ranging between 3.5 and 4.0 cm (TL) were examined.

Material Examined:

- _ One Specimen –collected on board R/V Firdous cruise February 27, 2015 (3.8 cm TL)
- _ One Specimen –collected on board local trawler in December 14, 2015 (3.5 cm TL)

Tribe Archamiini
Genus *Archamia* Gill 1863
Archamia bleekeri (Gunther, 1859)
(Fig. 6)



Fig. 6. *Archamia bleekeri* collected from Karachi Fish harbour on June 30, 2015.

Commonly known as Gon's cardinal fish, this species was reported from Pakistan by Ali *et al.*, (2021), Fraser *et al.* (2022) and Psomadakis *et al.* (2015). Like typical cardinalfish it has two separate dorsal fins, the first has 6 spines whereas the second has 1 spine and 9 soft rays. The spines are slender and not robust. Anal fin in this species has 2 spines and 15–17 soft rays. Its stomach and intestine are blackish. Its body is translucent and does not have any striped or barred patterns. Its snout, lips and lower jaw are greenish yellow. There is a dark basicaudal spot which is not larger than pupil. There are no stripes or other markings in dorsal, pectoral and pelvic fin.

This species was originally described as *Apogon bleekeri* by Günther (1859) from Ambon Island, Molucca Islands, Indonesia; Jakarta, Java, Indonesia. Its holotypes are not known, however, lectotype (RMNH 33905) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2022). It is a wide-ranging species, occurring along the east coast of Africa south to Durban, and eastward to the Gulf of Oman, India, Sri Lanka, Thailand, Singapore, Indonesia, Taiwan, and Queensland (Gon and Randall 2003a). According to Allen and Erdmann (2012) this is a reef-associated cardinalfish which is found between depths of 10 to 30 m, however, during the present study it was trawled from a depth of 76 m. Ali *et al.*, (2021) reported this to be a coral reef associated fish species along Pakistan coast. It seems that this species has a wider distribution in shallow coral reef to upper part of continental shelf. During present study a number specimen ranging between 6 and 8 cm (TL) were examined.

Material Examined:

- _ One Specimen –collected on board R/V Firdous cruise February 14, 2015 (7.0 cm TL)
- _ One Specimen –collected on board R/V Firdous cruise February 27, 2015 (8.0 cm TL)
- _ One Specimen – Karachi Fish harbor, commercial catch collected on June 30, 2015 (6.5 cm TL)
- _ One Specimen – Karachi Fish harbor, commercial catch collected on August 7, 2015 (6.0 cm TL)

Genus *Taeniamia* Fraser 2013
Taeniamia pallida (Gon & Randall 1995)
(Fig. 7)

This species is reported from Pakistan for the first time. It was originally described as *Archamia pallida* from eastern side of Masirah Island, Oman, depth 12 meters by Gon and Randall (1995). Its holotype: (BPBM 36158) is housed in Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA. This species has anal fin with 2 spines, 13 or 14 rays; pectoral fins 14 or 15 rays. Preopercle posterior edge serrate on lower half; ventral edge serrate on rear half. Scaly sheath along anal-fin base poorly developed or absent (Fraser *et al.*, 2022).



Fig. 7. *Taeniamia pallida*. Collected from Karachi Fish harbour on April 24, 2009.

This species is known from Western Indian Ocean including Kenya; Masirah Island, Oman (Frickle *et al.*, 2022; Froese and Pauly, 2022). A few specimens of this species were examined during the present study which were collected from trawling in coastal waters off rocky ledges.

Material Examined:

- One Specimen – Karachi Fish harbor, commercial catch collected on April 24, 2009 (6.5 cm TL)

Taeniamia lineolata (Cuvier, 1828)

This species which is commonly known as shimmering cardinal is reported from Paradise Point, Karachi (Moazzam and Rizvi, 1980). It was also listed among the fishes from Pakistan without mentioning any particular location by Hoda (1985b, 1988). It was originally described as *Apogon lineolatus* from Red Sea by Cuvier (1828). Its holotype (ZMB 66) is housed in Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2022). According to Gon and Randall (2003b) and Frickle *et al.*, (2022), this species is known only from the Red Sea and Gulf of Aden. Reports outside this area are misidentifications of several other species of cardinal fishes including *bleekeri*, *flavofasciata*, *fucata*, *macroptera*, and *mozambiquensis*. During the present study we have not examined any specimen. Its reports from Pakistan may be considered doubtful till authentic material is available.

Tribe Cheilodipterini

Genus *Cheilodipterus* Lacepède 1801

Cheilodipterus arabicus (Gmelin 1789)

This species is commonly known as tiger cardinalfish. It was reported from Pakistan by Fraser *et al.* (2022). It was originally described as *Perca arabica* from Jeddah, Saudi Arabia, Red Sea by Gmelin (1789). No types of this species are known (Frickle *et al.*, 2022).

This species has pectoral fins which usually have 14 (rarely 13) rays. Preopercle ridge smooth; preopercle edge with small to minute serrations, uppermost third sometimes smooth. Body pale brown, with 13–16 darker brown longitudinal stripes, 1st dorsal fin dusky to dark brown, other fins pale to dusky. Basicaudal spot or bar small, its vertical diameter 3.4–4.6 in peduncle depth, encircled by yellow area, and sometimes covered by dark brown bar around peduncle, and distinct white bar sometimes present in front of spot or bar.

This species is known to be widely distributed in Western Indian Ocean including Pakistan, Gulf of Oman, Arabian Sea, Red Sea, Tanzania, Mozambique, Seychelles and India (Fraser *et al.*, 2022; Frickle *et al.*, 2022). No specimen of this species was examined during the present study.

Cheilodipterus macrodon (Lacepede, 1802)

Large-toothed cardinalfish was reported from Sindh by Murray (1880) and from Karachi by Anonymous (1999). It is also reported from Pakistan without mentioning any specific location by Gon (1993) and Qureshi (1965). Anonymous (1999) and Murray (1880) reported this species as *Cheilodipterus octovittatus* which is considered to be a synonym of this species (Gon, 1993). However, Frickle *et al.* (2022) and Mabuchi *et al.* (2014) consider the latter to be a valid species.

This species was originally described as *Centropomus macrodon* from Mauritius or Reunion, Island by Lacepede (1802). No holotype of this species is known, however, syntype is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2022). This species is known from Red Sea and East Africa including Pakistan (Gon, 1993) to Pitcairn, north to the Ryukyu Islands, south to Lord Howe Island and Rapa.

This species is known to have large canine-like teeth on jaws. Preopercular margin in this species serrated (Yoshida *et al.*, 2010). Juveniles of this species have a large black blotch on the caudal peduncle which becomes diffuse with age. Adults have wider stripes with darker interspace (Myers, 1999). It is further characterized in having pale grey colour and eight red-brown stripes on side. Its caudal fin base whitish and dark caudal fin margins (Allen and Erdmann, 2012). During the present study no specimen of this species was examined/collected.

Cheilodipterus quinquelineatus Cuvier, 1828

This species which is commonly known as five-lined cardinalfish was reported from Buleji, Hawks Bay, Karachi by Ahmed and Wazarat (1993). It is also listed among fishes of Pakistan without mentioning any specific location by Ahmed (1996), Hoda (1985b, 1988), Hussain (2003), Jalil and Khaliluddin (1972, 1981) and Qureshi (1965). This species was originally described from Bora Bora, Society Islands by Cuvier (1828). Its holotype (MNHN 9147) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2022). It is known from Red Sea to Mozambique (Gon, 1986a) and eastward to the Pitcairn Group, north to southern Japan, south to Lord Howe Island and Rapa. In the area, it is known from India (Kapoor *et al.*, 2002), Oman (Randall, 1995) and Yemen (Zajonz *et al.*, 2000). It is pale grey to whitish in colour with five narrow black stripes. Base of its caudal fin is yellow (Allen and Erdmann, 2012). During the present study no specimen of this species was examined/collected.

Tribe Glossamiini

Genus *Yarica* Whitley 1930*Yarica hyalosoma* (Bleeker, 1852a)

Humpbacked cardinalfish, as it is commonly known, is reported from Paradise Point, Karachi by Moazzam and Rizvi (1980). It was originally described as *Apogon hyalosoma* from Ambon, Batavia (Samarang), Bima (Sumbawae), Benculen, Padang, Priaman (Sumatra) Indonesia by Bleeker (1852a). Its holotype is not known, however, syntypes are housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2022).

It is known from Japan south to Indonesia and Papua New Guinea. It is recorded from New Caledonia (Thollot, 1996), and Micronesia (Donaldson and Meyers, 2002). It is not reported from northern Indian Ocean, therefore, it seems that its record from Pakistan is based on misidentification of some other species.

Tribe Lepidamiini

Genus *Lepidamia* Gill 1863*Lepidamia multitaeniata* (Cuvier, 1828)

(Fig. 8)

This species which is commonly known as smallscale cardinalfish was reported from Karachi by Hoda (1985a). It was also listed among fishes of Pakistan without mentioning any location by Hoda (1985b, 1988). It was originally described as *Apogon multitaeniatus* from Red Sea by Cuvier (1828). Holotype used to be housed in Museum National d'Historie Naturelle, Paris, France but apparently lost (Frickle *et al.*, 2022). According to Cuvier (1828) this species has pink body with many brown longitudinal line and tail is half forked.



Fig.8. *Lepidamia multitaeniata* collected from Karachi Fish Harbour on January 22, 2015.

According to Fraser *et al.* (2022) its body is generally red, with darker brownish red narrow stripes; body above lateral line and across entire caudal-fin base blackish; 1st dorsal fin black, all other fins mostly red; base of dorsal and anal fins pale; pale pink stripe on distal third of pelvic fin. Pakistani specimens comes in confirmation with the colour pattern described by Fraser *et al.* (2022).

This species is considered to be endemic to north-western Indian Ocean including Red Sea Gulf of Aden, Socotra (Fraser *et al.*, 2022; Frickle *et al.*, 2022; Froese and Pauly, 2022; Smith and Smith, 1963). Although there are previous records of presence on this species in Pakistan but present paper confirms its presence outside Red Sea and Gulf of Aden extending to northern Arabian Sea along Pakistan coast.

Genus *Lepidamia* is represented by four species in the northern Indian Ocean including *L. kalosoma*, *L. multitaeniata*, *L. natalensis* and *L. omanensis* (Gon, 1995). These can be distinguished from number of pectoral fin rays (Table-I) which are 14 (rarely 13) in *L. multitaeniata* (15 in *L. natalensis* and *L. kalosoma*) 16-17 in *L. omanensis*). *L. natalensis* was reported from Pakistan by Psomadakis *et al.* (2015) but *L. omanensis* is not so far recorded from Pakistan. These two can also be distinguished on the basis of colour of pectoral fin base which is black in *L. natalensis* and of body colour or dusky at upper base in *L. omanensis*.

Table 1. Distinguishing characteristics of genus *Lepidamia* occurring in Northern Indian Ocean.

Characteristics	<i>Lepidamia kalosoma</i>	<i>Lepidamia multitaeniatus</i>	<i>Lepidamia natalensis</i>	<i>Lepidamia omanensis</i>	Specimens from Pakistan
Pre-dorsal scales	6–8	3–6	2–5	3–5	3-5
Pectoral -fin rays	15	14	15	16–17	14
Developed gill rakers	9–10	12–17	8–10	10–11	12-14
lateral-line scales	39–45	36–40	40–47	43–48	37-40
Distribution	Bombay to Vietnam	Endemic in Red Sea and Gulf of Aden	Western Indian Ocean	Oman.	Pakistan

Table 1 clearly demonstrates that the specimens collected from Pakistan belong to *Lepidamia multitaeniatus*. In Pakistan, this species is mainly found in the shallow as well as near shore waters with rocky bottom including in the intertidal areas where these can be seen hiding among rocks or in the rock pools. It is commonly caught by anglers on rocky shores along Karachi coast. In addition, it is also caught by shrimp trawlers and bottom set gillnets operating in shallow coast waters. During present study a number specimen both from Karachi Fish Harbour and from rocky shore at Buleji, Hawks Bay, Karachi ranging between 15.0 and 17.6 cm (TL) were examined.

Material Examined:

- One Specimen – collected from intertidal area on Bulegi, Hawks Bay, Karachi on January 28, 2010 (16.3 cm TL)
- One Specimen – Karachi Fish harbor, commercial catch collected on March 14, 2011 (14.2 cm TL)
- One Specimen – Karachi Fish harbor, commercial catch collected on March 10, 2014 (17.0 cm TL)
- One Specimen– Karachi Fish harbor, commercial catch collected on January 22, 2015 (15.0 cm TL)
- Two specimens-Buleji, Hawks Bay Karachi caught on handline on April 15, 2015 (15.7 cm, 17.6 cm TL)

Lepidamia natalensis Gilchrist and Thompson, 1908
(Fig.9)

This species was reported from Pakistan by Fraser *et al.* (2022) and Psomadakis *et al.* (2015). It is commonly called many-lined cardinalfish and previously known from Red Sea to Durban, South Africa and Oman (Fraser *et al.*, 2022; Randall, 1995). It was described as *Apogon natalensis* from Natal, South Africa by Gilchrist and Thompson (1908). Its holotype (SAM 9985) is housed in South African Museum, Cape Town, South Africa (Frickle *et al.*, 2022). *Apogon polylepis* (12 cm) was reported from Karachi by Regan (1919) which is now considered to be a synonym of this species, however, according to Frickle *et al.* (2022) and Fraser *et al.* (2022) *A. polylepis* it is considered as a synonym of *Lepidamia kalosoma* (Bleeker 1852b).



Fig. 9. *Lepidamia natalensis* collected from Karachi Fish Harbour on April 22, 2015.

This species was reported from Pakistan by Fraser *et al.* (2022) and Psomadakis *et al.* (2015). It is commonly called many-lined cardinalfish and previously known from Red Sea to Durban, South Africa and Oman (Fraser *et al.*, 2022; Randall, 1995). It was described as *Apogon natalensis* from Natal, South Africa by Gilchrist and Thompson (1908). Its holotype (SAM 9985) is housed in South African Museum, Cape Town, South Africa (Frickle *et al.*, 2022). *Apogon polylepis* (12 cm) was reported from Karachi by Regan (1919) which is now considered to be a synonym of this species, however, according to Frickle *et al.* (2022) and Fraser *et al.* (2022) *A. polylepis* it is considered as a synonym of *Lepidamia kalosoma* (Bleeker 1852b).

This species has striking colour with light red and the body with longitudinal dark brown lines along the upper and lower edges of the scale, those above lateral lines following its curvature, those below are straight. Fins are light red; first dorsal fin with a black spot on third membrane near the base whereas a semicircular dark brown spot across pectoral fin base. Margin of the caudal fin narrowly blackish. These can be distinguished from number of pectoral fin rays which are 15 in *L. natalensis* (14 in *L. multitaeniata*). This species is found around rocky and coral out crops at depths between 1 and 10 m. During present study a number specimens from Karachi Fish Harbour ranging between 19.0 and 20.3 cm (TL) were examined.

Material Examined:

- _ One Specimen – Karachi Fish harbor, commercial catch collected on April 22, 2015 (17 cm TL)
- _ Four specimens photographed at off PNS Nathiagali, Karachi on October 2, 2022. (17.2, 16.3, 11.2, 12.4 cm TL)

Lepidamia kalosoma (Bleeker 1852)

This species is commonly known as pinstripe cardinalfish and was reported from Pakistan by Karachi by Regan (1919) as *Apogon polylepis* (12 cm). Regan (1919) determined the specimen from Karachi to belong to *Apogon noordzieki* Bleeker, 1859 which is also included in the synonym of *Lepidamia kalosoma*. Regan (1919) further pointed out that *A. noordzieki* can be distinguished by having only three series of scales between lateral line and spinous dorsal, the third dorsal spine longer than the fourth. It also lack dark spot at the base of pectoral fin.

This species was originally described as *Apogon kalosoma* by Bleeker (1852b) from Bangka, Indonesia. Its holotype (RMNH 5589) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2022). This species is known to be distributed in the Eastern Indian Ocean and western Pacific including Bangladesh, western Indonesia and Borneo (Indonesia, Malaysia, Brunei) north to Taiwan (Frickle *et al.*, 2022). Adults of this species are reddish, with numerous dark red to dusky brown narrow stripes on body. Two other species of genus *Lepidamia* known from Pakistan (*L. multitaeniata* and *L. natalensis*) have distinct black spot at the base of pectoral, however, Regan (1919) reported a black spot present on his description of *A. polylepis*. It therefore, seems that *A. polylepis* described by Regan (1919) is more close to *Lepidamia natalensis*. During the present study, no specimen of this species was examined. It seems that this species may not be occurring in Pakistan as report of *Apogon polylepis* may be considered as *Lepidamia natalensis*.

Tribe Ostorhinchini

Genus *Ostorhinchus* Lacepède 1802*Ostorhinchus aureus* (Lacepède, 1802)

(Fig. 10)



Fig. 10. *Ostorhinchus aureus* collected during trawl survey onboard R/V Firdous on February 14, 2015.

This species is commonly known as ringtailed cardinalfish. It was reported from Karachi by Niazi (2001). It was also recorded from Pakistan by Hussain (2003) and Misra (1962) without mentioning any specific location. Preopercular ridge in this species is smooth with posterior and most of ventral margin is serrated. It is coppery coloured with iridescence and paler posteriorly. A blackish stripe, bordered by a blue line run from front of snout through eye and beyond. A narrow blue streak is present on maxilla. Mouth is large and oblique. Black bar encircling caudal peduncle present in both young and adult (Randall *et al.*, 1990).

This species was originally described as *Centropomus aureus* from Mauritius and Reunion Island by Lacepede (1802), however, no type is known (Frickle *et al.*, 2022). This species is known from Red Sea and East Africa to Papua New Guinea, north to Miyakejima, Japan, south to Australia and New Caledonia (Froese and Pauly, 2022; Randall, 1995).

Gon (1987) concluded that Lacepade's figure is the apogonid now known as *O. fleurieu*, but it was placed *O. aureus* in the synonymy. Randall *et al.* (1990) showed that *O. aureus* is a valid species very similar to *O. fleurieu*. It differs from *O. fleurieu* in having 22-27 total gill-rakers, and the dorsal and ventral ends of the dark caudal peduncle bar are wider than the middle, thus giving it the shape of an hourglass. During the present study a number of specimen of this species were examined.

Material Examined

- One specimen collected onboard R/V Firdous on February 14, 2015 (11 cm TL).

Ostorhinchus cookii (Macleay, 1881)
(Fig. 11)



Fig. 11. *Ostorhinchus cookii* Photo taken by Shabib Asghar at Churna Island.

It was commonly known as Cook's cardinalfish reported from Karachi by Regan (1905) and from Astola Island, Balochistan by Anonymous (2001). It was also reported by Fraser *et al.* (2022) without mentioning any specific location along Pakistan coast. This species was originally described as *Apogon cookii* from Endeavour River and Darnley Island, Australia by Macleay (1881). No holotype of this species is known, however, syntypes are housed in Australian Museum, Sydney, N. S. W., Australia and University of Sydney, Macleay Museum, Sydney, New South Wales, Australia (Frickle *et al.*, 2022). *Apogon melanotaenia* described by Regan (1905) from Karachi, Pakistan is considered to be a synonym of this species (Randall and Lachner, 1986).

Caudal fin in this species is forked with rounded lobes. It is whitish in colour with 5-6 stripes (dark brown to yellowish) which are broader than pale interspaces. The first stripe is mid-dorsal; the second runs from snout to upper caudal fin base; the third narrow and not extending beyond second dorsal fin; the fourth runs from snout through eyes and ending in a distinct black spot at caudal fin base (Randall *et al.*, 1990). This dark spot at middle of caudal fin base merged with mid-lateral stripe (Allen and Eradmann, 2012).

This species is reported from Red Sea and the Gulf of Oman south to Natal and east to the western Pacific where it ranges from Japan to the Great Barrier Reef and New Caledonia. It is also known from Tonga (Randall *et al.*, 2003) and Persian Gulf (Carpenter *et al.*, 1997). During the present study, a number of photographs taken by amateur SCUBA divers at Churna Island, Balochistan. In addition, Ali (2017) has provided a photograph of the specimen from Northern sheltered sites, Hawks Bay, Karachi, Pakistan

Material Examined:

- One Specimen – Photographed by Shabib Asghar; a SCUBA diver, at Churna Island, Balochistan on 12 November, 2020.

Ostorhinchus endekataenia (Bleeker, 1852b)

This species is commonly known as candy stripe cardinalfish and was reported from Paradise Point, Karachi by Moazzam and Rizvi (1980). It was also listed by Hoda (1985b, 1988) without mentioning any specific location. It was originally described as *Apogon endekataenia* from Bangka or Lepar Island, Indonesia by Bleeker (1852b). Its holotype (RMNH 5593) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2022).

Although it is reported from India and Sri Lanka (Kapoor *et al.*, 2002), however, this species has distribution mainly in the western Pacific including from Tokyo Bay to Taiwan and southward. Also reported from Samoa (Wass, 1984). No specimen of this species was examined during the present study. Its presence in Pakistan may be considered as questionable.

Ostorhinchus fasciatus (White 1790)
(Fig. 12)



Fig.12. *Ostorhinchus fasciatus* collected from Karachi Fish Harbour on January 1, 2008.

This species which is commonly known as broad-banded cardinalfish was reported from Sindh by Murray (1880), from Karachi by Anonymous (1999) and Niazi (2001) and from off Indus Swatch by Anonymous (2001). It is also listed from Pakistan by Hoda (1985b, 1988), Hussain (2003), Jalil and Khaliluddin (1972, 1981) and Psomadakis *et al.* (2015) without mentioning any specific location. This species was originally described as *Apogon fasciatus* from Port Jackson, N. S. W. Australia by White (1790). Its holotype is not known, however, neotype (USNM 59972) is housed in National Museum of Natural History, Washington D.C., U.S.A. (Frickle *et al.*, 2022). Anonymous (1999), Hoda (1985b, 1988), Hussain (2003), Jalil and Khalil uddin(1972, 1981), Murray (1880) and Niazi (2001) reported this species as *Apogon fasciatus*. *Ostorhinchus quadrifasciatus* (Cuvier 1828) originally described from Puducherry, India and now known from East Africa to Indonesia (also migrated to Mediterranean Sea). is considered to be a synonym of this species (Fraser (2005), however, Kuitert and Kozawa (2019), Psomadakis *et al.* (2020) and Frickle *et al.* (2022) consider it to be a valid species.

This species is dorsally grey, shading to silvery white on sides and ventrally. It has two blackish stripes, the narrow first runs from interorbital along back of upper edge of caudal peduncle. The second stripes runs from front of snout through eyes alongside a little above middle of body to end at posterior end of caudal fin. The stripes are darkest on opercle and caudal fin. Colour pattern of specimens collected from Pakistan come close to the pattern photographed shortly after collection by Kuitert and Kozawa (1999; 2019) and reproduced by Fraser (2005). Another species *Apogon pleuron* Fraser, 2005 which reported from India to China, Philippines and New Guinea is almost similar to *A. fasciatus*. It has a middle dark stripe with lower edge developing into narrow vertical bars which is lacking in *A. fasciatus*.

It is widely distributed in the Indo-Pacific area including Red Sea and Persian Gulf south to Mozambique and east to the western Pacific where it ranges from Japan to Sydney (Fraser, 2005; Froese and Pauly, 2022). It has migrated to the Eastern Mediterranean (Zenetos *et al.*, 2010). According to Psomadakis *et al.* (2015) this species

inhabits coastal reefs, in sandy or weedy areas at depths between 2 and 127 m. and it is mainly caught with trawl net that is operated near rock shores and coral habitats. This species is possibly the most commonly occurring cardinalfish in Pakistan. During present study a number specimen both from Karachi Fish Harbour and from fisheries resource surveys ranging between 9.0 and 11.0 cm (TL) were examined.

Material Examined:

- One Specimen – Karachi Fish harbor, commercial catch collected on January 1, 2008 (10.1 cm TL)
- One specimen collected onboard R/V Firdous on February 27, 2015 (11 cm TL)
- One Specimen – Karachi Fish harbor, commercial catch collected on July 9, 2015 (9.0 cm TL)
- One specimen collected from Maori, Sindh Coast (24°15.300 N; 60°35.540E) by trawl net on October 27, 2015 (10.6 cm TL)
- One Specimen – Karachi Fish harbor, commercial catch collected on April 1, 2016 (11.0 cm TL)

Ostorhinchus flagelliferus Smith 1961

It is commonly known as coachwhip cardinalfish and reported from coral areas along the coast of Pakistan by Ali (2017) and Ali *et al.*, (2021). This species was described as *Ostorhynchus flagelliferus* by Smith (1961) from Mozambique, western Indian Ocean. Its holotype SAIAB (formerly RUSI 351) is housed in South African Institute for Aquatic Biodiversity, Rhodes University, Grahamstown, Makhanda, South Africa.

This species has typical pinkish red, becoming stronger on head and anterior spines of dorsal, anal and pelvic fins; red spots along lateral line; edge of scales darker red; alternating red and silvery reflecting vertical bars may be found under lateral line; caudal spot small; dark stripe from tip of snout to eye. This species is known to be distributed from, South Africa and East Africa to Madagascar (Frickle *et al.*, 2022). During the present study no specimen of this species was examined. Ali (2017) has, however, provided a photograph of the specimen from Northern sheltered sites, Hawks Bay, Karachi, Pakistan.

Ostorhinchus fleurieu Lacepède, 1802

(Fig. 13)



Fig.13. *Ostorhinchus fleurieu* collected during trawl survey onboard R/V Firdous on February 14, 2015.

This species which is commonly known as flower cardinalfish is reported from Pakistan by Fraser (1972), Hoda (1988), Hussain (2003) and Jalil and Khaliluddin (1972, 1981) but without mentioning any specific location. It was originally described from Manuabada Island, Port Moresby, Papua New Guinea by Lacepede (1802). No holotype of this species is known, however, neotype (BPBM 15921) is housed in Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A. (Frickle *et al.*, 2022).

This species has dark brown to black intestine. It is coppery with iridescence in colour. Juveniles of this species has peduncular spot which expand to a broad blackish bar in adults. There is a broad blackish stripe on the flank. Sometimes this species is confused with *A. aureus* from which it can be distinguished from lower gill raker count (19-23 as compared to 22 to 27 in *A. aureus* and in having a round spot on caudal peduncle (a band in *A. aureus*)

(Randall, 1995). According to Smith (1961). It is brilliant coloured with blue stripes through eyes, lower more prominent and with prominent dark bar round peduncle, extending to basal margins of lobes. This species is known to be widely distributed in the Indo-Pacific area including Red Sea and Persian Gulf, Gulf of Oman and scattered localities in East Africa, Seychelles, India, Sri Lanka, the Indo-Malayan region, and Hong Kong; south to Australia; east to Fiji (Randall *et al.*, 1990).

According to Psomadakis *et al.* (2015) this species is commonly found in shallow coastal reefs with moderate currents and also in tidal channels of the estuaries. During present study a number of specimens of this species were examined which were mainly collected from coastal waters by trawling.

Material Examined:

- _ One specimen collected onboard R/V Firdous on February 14, 2015 (8.5 cm TL)
- _ One specimen collected onboard R/V Firdous on February 27, 2015 (11 cm TL)

Ostorhinchus gularis (Fraser and Lachner, 1984)
(Fig. 14)



Fig. 14. *Ostorhinchus gularis* collected during trawl survey onboard R/V Firdous on February 27, 2015.

Commonly known as gular cardinalfish, this species is reported from Pakistan by Fraser *et al.* (2022) and Psomadakis *et al.* (2015). It was originally described as *Apogon gularis* from Red Sea, Yemen (14°55'N, 42°28'E) by Fraser and Lachner (1984). Its holotype (USNM 225672) is housed in United States Natural History Museum, Washington DC, USA (Frickle *et al.*, 2022). *Apogon smithvanizi* described by Allen and Randall (1994) from off Bahrain, Persian Gulf is considered to be a synonym of this species.

Opercular ridge of this species is smooth or weakly crenulate whereas preopercular edge is finely serrated. Its digestive tract and anus is black in colour. Its body is pale, with a narrow blackish stripe from front of snout to eye, sometimes continuing across operculum and onto body as double line. Sometimes there is another dusky narrow stripe below 1st dorsal fin base. Its fins are pale in colour. Farser and Lachner (1984) have examined specimens preserved in 70 % ethanol, therefore, colour may be lost. During present study, a number of specimens were examined which have spots from cheek extend onto opercle in diagonal fashion as noted by Farser and Lachner (1984). We have noticed that upper lobe of caudal fin is pinkish in colour where lower lobe is hyaline with black tips (Fig. 14).

This species is known from western and northern Indian Ocean including Red Sea (Goren and Dor, 1994), Yemen (Fraser and Lachner, 1984), Bahrain and Oman (Allen and Randall, 1994). It is also reported from Andaman Islands and the Philippines (Allen and Erdmann, 2012). During the present study a number of specimens were examined; most of which were collected trawling in the offshore waters of Pakistan.

Material Examined:

- _ One specimen collected during trawl survey onboard R/V Firdous on February 27, 2015 (9 cm TL)

Ostorhinchus holotaenia (Regan, 1905)

(Fig. 15)



Fig. 15. *Ostorhinchus holotaenia* collected from Cape Monz on April 15, 1999.

This species is known as copper striped cardinalfish and is a new record from Pakistan. Many specimens collected during the present study from Cape Monz and Buleji, Karachi. This species was described from Muscat, Oman as *Apogon holotaenia* by Regan (1905). No holotype of this species is known, however, syntypes are housed in British Museum of Natural History, London, U. K. (Frickle *et al.*, 2022). Presently this species is known from Oman, India, Reunion and Malaysia (Froese and Pauly, 2022; Randall, 1995).

It is bluish silver with seven coppery stripes. Lower most stripe poorly developed, the bluish silver stripe above it is replaced with a series of bluish silvery spots and the mid lateral stripe becoming dark brown on caudal peduncle and continuing to the end of caudal fin. During the present study a few specimens of this species were examined which were collected through trawling near rocky outcrops..

Material Examined:

- One specimen collected from collected from Cape Monz, Karachi on April 15, 1999 (12.1 cm TL).

Ostorhinchus novemfasciatus (Cuvier 1828)

This species is commonly known as seven striped cardinalfish and was is reported from Karachi by Niazi (2001) and Nielsen (1960). It was listed among the fishes from Pakistan by Hoda (1985b, 1988), Hussain (2003) and Jalil and Khaliluddin (1972, 1981) without mentioning any specific location. This species is characterized in having alternating dark brown and whitish stripes, dark stripes narrower than pale ones; dark midlateral stripe extending onto caudal fin (Allen and Erdmann, 2012).

This species was described as *Apogon novemfasciatus* from Timor and Guam, Mariana Islands, western Pacific by Cuvier (1828). Its holotype is not known, however, syntypes are housed in Australian Museum Sydney, Museum National d'Historie Naturelle, Paris, France and ForshungsInstitut und Natur Museum Senckenberg, Frankfurt, Germany (Frickle *et al.*, 2022).It is known to have distribution in eastern Indian Ocean and Western Pacific including Christmas Island to the Line Islands, north to the Izu Islands, south to Great Barrier Reef (Froese and Pauly, 2022). It is reported from India and Sri Lanka by Kapoor *et al.*, (2002), however, it distribution into western Indian Ocean is doubtful. Presence in Pakistan is also questionable and most reports are based on wrong identification. During the present study no specimen of this species was examined.

Ostorhinchus spilurus Regan, 1905
(Fig. 16)



Fig. 16. *Ostorhinchus spilurus* collected from Karachi fish Harbour on March 24, 2004.

This species may be commonly called Pakistani cardinalfish. It was reported for the first time from Karachi, Pakistan by Regan (1905) as *Apogon spilurus* which was later on also reported by Fraser *et al.* (2022), Frickle *et al.* (2022), Froese and Pauly (2022), Gon and Randall (2003b) and Mee (1996). Its holotype is not known, however, syntypes are housed in British Museum of Natural History, London, U. K. (Frickle *et al.*, 2022). *Ostorhynchus micromaculatus* described by Kotthaus (1970) from southern Red Sea, north of Perim, Yemen is considered to a synonym of this species (Golani and Fricke 2018; Frickle *et al.*, 2022; Gon and Randall, 2003b).

This species is known from southern Red Sea, Somalia and Pakistan (Gon and Randall, 2003b). This species is characterized to have preopercular edge is serrated and preopercular ridge is smooth. Caudal fin notched with rounded lobes. A blackish spot on each side at the base of the caudal fin, usually above the lateral line. A blackish stripe along the base of anal fin (Regan, 1905). A few specimens of this species were examined during the present study.

Material Examined:

- One specimen collected from Karachi fish Harbour on March 24, 2004 (7.9 cm TL)

Tribe Pristiapogonini
Genus *Pristapogon* Klunzinger, 1870
Pristiapogon fraenatus (Valenciennes, 1832)

This species is commonly known as bridled cardinalfish and was reported from Pakistan by Ali *et al.*, (2021) and Qureshi (1965). It was originally described as *Apogon fraenatus* from New Guinea by Valenciennes (1832). Its holotype is not known, however, lectotype (MNHN 8709) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2022).

The colour is grey to tan dorsally, shading on sides to silvery with iridescence. There is a mid-lateral tapering black stripe (Myers, 1999) ending in a near pupil-sized (Kuitert and Tonzuka, 2001) basicaudal spot whose lower edge at level with the lower ray of the central two rays in the caudal fin. Leading edge of the first dorsal fin is broadly black whereas upper and lower edges of the caudal fin black.

It is known to be widely distributed in Indo-Pacific area including Red Sea, East Africa, South Africa, Persian Gulf, Socotra, Madagascar and Mascarenes east to Line and Gambier Islands, north to Ryukyu Islands (southern Japan), south to Western Australia, New South Wales (Australia), New Caledonia and Austral Islands. (Frickle *et al.*, 2022; Froese and Pauly, 2022). In the area it is known from Oman (Randall, 1995) and India (Kapoor *et al.*, 2002). During the present study no specimen of this species was examined.

Tribe Rhabdamiini
 Genus *Rhabdamia* Weber, 1909
Rhabdamia nuda (Regan, 1905)
 (Fig. 17)



Fig. 17 *Rhabdamia nuda* collected on board R/V Firdous Cruise on February 27, 2015

This species is commonly known as naked cardinalfish and was reported from Karachi by Fraser *et al.* (2022), Frickle *et al.* (2022), Fowler and Bean (1930), Mabuchi *et al.* (2014) and Regan (1905). It was originally described as *Apogonichthys nudus* from Karachi, Pakistan by Regan (1905). Its holotype is not known, however, syntypes are housed in British Museum of Natural History, London, U. K. (Frickle *et al.*, 2022). According to Frickle *et al.* (2022) and Yoshida *et al.*, (2018) it is not a valid species and included in the synonym of *Rhabdamia gracilis* (Bleeker 1856), however, Mabuchi *et al.* (2014) and Froese and Pauly (2022) consider it a valid species. According to Smith (1961) *R. gracilis* is translucent pink (in life) whereas preserved specimens have uniform yellowish, some adults with a line of fine black dots from top of operculum alongside to beyond pectoral apex. However in specimens from Pakistan no such line of fine black dots from top of operculum alongside to beyond pectoral apex. In general shape and colouration specimens from Pakistan comes close to the description and sketch provided by Regan (1905).

This species is so far known from Pakistan and may be endemic in the area. During the present study a few specimens of this species was examined.

Material Examined:

- One specimen collected from on board R/V Firdous Cruise in the offshore waters of Pakistan on February 27, 2015 (3.7 cm TL).

Tribe Sphaeramiini
 Genus *Apogonichthyoides* Smith, 1949
Apogonichthyoides enigmaticus Smith 1961
 (Fig.18)



Fig. 18. *Apogonichthyoides enigmaticus* collected during trawl survey onboard R/V Firdous on February 27, 2015.

It is commonly known as short-tooth cardinal. It was reported from Pakistan by Fraser *et al.* (2022) and Psomadakis *et al.* (2015). This species was originally described from Durban, KwaZulu-Natal, South Africa, western Indian Ocean by Smith (1961). Its holotype (SAM 13817) is housed in South African Museum, Cape

Town, South Africa (Frickle *et al.*, 2022). According to Froese and Pauly (2022) and WoRMS (2022), *A. enigmaicus* is included in the synonymy of *Ostorhinchus apogonoides*. *Apogon dhofar* Mee, 1995 is considered to be a synonym of this specie (Fraser *et al.*, 2022; Frickle *et al.*, 2022), however, *A. dhofar* is consider a valid species by Froese and Pauly (2022)

According to Fraser *et al.* (2022) the its pectoral fins has 14 or 15 rays and median predorsal scales. It has body brown, scale edges and head darker brown, and snout sometimes with yellow tinge; narrow dark brown bar usually present anteriorly below each dorsal fin, with bars merging with dark leading edge of dorsal fins, but bars may be indistinct below lateral line; pupils usually encircled with narrow white ring.

This species is reported from Pakistan, Oman, Somalia and (KwaZulu-Natal) South Africa (Fraser *et al.*, 2022). During the present study a few specimens collected from Pakistan coast were examined.

- One specimen collected onboard R/V Firdous on February 27, 2015 (11 cm TL)

Apogonichthyoidea cf. maculipinnis Regan, 1908
(Fig. 19)



Fig. 19. *Apogonichthyoidea cf. maculipinnis* collected from offshore waters of Pakistan on Board R/V Firdous cruises in Pakistan on February 14, 2015

This species is commonly known as specklehead cardinalfish reported from Pakistan by Psomadakis *et al.* (2015). It can be distinguished from congeners in having subtruncated to truncated caudal fin. Upper part of its 1st dorsal fin is blackish. This species was originally described as *Apogon maculipinnis* by Regan (1908) from Haddumati, Maldives. Its holotype (BMNH 1901.12.31.7) is housed in Natural History Museum, London, U. K.

According to Regan (1908) its head and body powdered with blackish dots; body with a few irregular spots; upper parts of spinous dorsal blackish; soft dorsal, anal, and ventrals with series of small dark spots; caudal with numerous dark dots with several spots on body. According to Fraser (2018), the photo of Regan (1908) shows a black mark on distal portion of third and fourth spinous-dorsal-fin membranes. Otherwise no pattern remains on darkish head and body of preserved specimen and there are tiny dark spots on body and a faint outline of cheek markings (Fraser, 2018).

Fraser (2018) detailed colour of the specimen collected from Laamu Atoll, Maldives. He observed that head pale overlain by small brownish spots including snout, occiput, nape, upper and lower jaws, and cheeks; a dark wedge-shaped bar extending from the bottom of eye past end of maxilla to lower portion of preopercle, followed by a wide pale area on cheek with central collection of fine melanophores, bordered above with a short wedge-shaped dark stripe from rear edge of middle iris ending in a dark vertical bar along rear rim of preopercle; three dark lines radiating from upper rear quadrant of iris extending to edge of nape; iris multicolored with brownish spots, larger along periphery and many tiny whitish spots; pupil black. He also observed that body mostly speckled with various shades and intensities of browns and whites, often dark outlining of scale edges; dark spots on each lateral-line scale from below first dorsal fin curving down to caudal peduncle; two additional straight rows of dark spots along body, upper along lateral midline from behind opercle flap to mid-caudal peduncle, lower parallel to second, from behind

pectoral fin to above middle of anal fin; about 5 faint dark bars along body, first under first dorsal fin, second faint under dorsal fin interspace, third darker under end of dorsal fin with a discrete small dark spot immediately under last two dorsal-fin soft rays; fourth and fifth bars on caudal peduncle. First dorsal fin with a small dark mark on distal portion of second spine, a large dark blotch covering distal membranes of third and fourth dorsal-fin spines, remaining fin translucent with irregular brown spots; second dorsal fin with translucent zone at base of fin with a brownish band above followed by a fainter band, then translucent area to tip of fin rays with irregular small brownish marks; anal fin with small irregular spots on the proximal half; pectoral fins translucent; pelvic fins with small irregular brownish spots; caudal fin translucent with concentrated small brown spots near base and followed by scattered tiny spots.

According to Psomadakis *et al.* (2015) and Fraser (2018), the specimen from Pakistan has black soft dorsal and anal fins; a diagonal line of dark spots, one per scale, from near the upper edge of the preopercle down to the mid-body between the soft dorsal and anal fins; a second line of spots, one per scale, from near the upper edge of the pectoral fin to the lower anterior caudal peduncle; and is lacking small brown spots. The colour pattern of specimen referred as *Apogonichthyoides cf. maculipinnis* by Psomadakis *et al.* (2015) is quite different from the description of holotype given by Regan (1908) and by specimens collected from Maldives, therefore, Fraser (2018) opined the specimen from Pakistan may belong to an undescribed species. *A. maculipinnis*, therefore, seems to be endemic in Laamu Atoll, Maldives (Fraser, 2018).

Material Examined:

- 1 specimen collected from offshore waters of Pakistan on Board R/V Firdous cruises in Pakistan on February 14, 2015 (14.2 cm TL).

– *Apogonichthyoides nigripinnis* (Cuvier, 1828)
(Fig. 20)



Fig. 20. *Apogonichthyoides nigripinnis* collected during trawl survey onboard R/V Firdous on February 27, 2015.

This species is commonly known as bullseye and was reported as *Apogon nigripinnis* from Sindh coast, Pakistan by Murray (1880). It was originally described from Java, Indonesia and Pondicherry, India by Cuvier (1828). No holotype of this species is known, however, syntypes is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2022).

This species has distinguishing colour pattern having dark vertical bar present below each dorsal fin and on caudal base; a fourth bar may be present between the 2nd dorsal and the caudal base (Gon, 1986a). It normally has large yellow edged black ocellus above pectoral fins which is clearly larger than pupil and its pelvic fins are black. Pectoral fins of this species are light and other fins are dusky to dark in colour. An oblique dark brown line is present between lower edge of eye to corner of preopercular. According to Gon, 2000), this species is characterized by having a large dark ocellus above the pectoral fin and a pale distal edge of the second dorsal fin.

This species is known from Red Sea and south to Delagoa Bay, Mozambique to east to Indo-Malayan Region and Australia (Randall, 1995). It is also known from Arafura Sea (Russell and Houston, 1989). It is one of the species that is reported to have migrated to the Mediterranean through the Suez Canal (Por, 1978). In the region

known from Oman (Randall, 1995) and Iran (Assadi, and Dehghani 1997). According to Gon (2000) distribution of *A. nigripinnis* is restricted to east coast of India, Andaman Sea and Australia.

Material Examined:

- One Specimen – Karachi Fish harbor, collected on November 21, 2010 (10.7 cm TL)
- One specimen collected onboard R/V Firdous on February 27, 2015 (12.1 cm TL)
- One Specimen – Karachi Fish harbor, commercial catch collected on October 6, 2016 (11.2 cm TL)

Apogonichthyoides pharaonis Bellotti, 1874
(Fig. 21)



Fig. 21. *Apogonichthyoides pharaonis* Collected from Karachi Fish Harbour on July 9, 2015.

It is commonly known as Pharaoh's cardinalfish and was reported from Pakistan by Fraser *et al.* (2022), Froese and Pauly (2022) and Gon (2000). This species characteristically have; 16-21 developed gill rakers on 1st gill arch. There are three dark bars on body; 1st bar from anterior part of 1st dorsal base containing a large ocellus ringed in white above pectoral fins (ocellus sometimes faint or absent on one side) and the 2nd bar is located between bases of 2nd dorsal and anal fin whereas 3rd bar is present at caudal. The first dark bar joins dark leading edge of first dorsal fin; second dark bar extends at least to middle of second dorsal and anal fin.

This species was originally described as *Apogon pharaonis* from Suez, Gulf of Suez, Egypt, Red Sea by Bellotti (1874). Its holotype which used to be housed in Museo Civico di Storia Naturale di Milano, Milan, Italy was destroyed in 1943 (Conci and Michelangeli, 1974; Frickle *et al.*, 2022). *Apogon pharaonis* is distinguished from *A. nigripinnis* in having more gill-rakers and a shorter pelvic fin. Gon (2000) has examined specimens studied by Regan (1905) from the Persian Gulf (BMNH 1899.5.8.23) and the Arabian Sea (BMNH 1901.1.29.5-14) are actually belong to this species.

In addition to Pakistan, *A. pharaonis* is known from the Red Sea, Persian Gulf, Iran, Zanzibar, Mozambique, South Africa (north of Durban), Seychelles and Madagascar (Gon, 2000). It is also migrated to the Mediterranean through the Suez Canal (Por, 1978; Corsini-Foka, 2010) and also reported from Greece (Galil, 2007) and Syria (Saad, 2005).

Material Examined:

- One Specimen – Karachi Fish harbor, collected on March 22, 2008 (10.1 cm TL)
- One specimen collected onboard R/V Firdous on February 14, 2015 (12.3 cm TL)
- One Specimen – Karachi Fish harbor, commercial catch collected on July 9, 2015 (9.0 cm TL)

Apogonichthyoides pseudotaeniatus (Gon, 1986b)
(Fig. 22)



Fig. 22. *Apogonichthyoides pseudotaeniatus* collected from Karachi on June 26, 2013. The specimens on right were photographed by amateur diver at Churna Island.

This species is commonly known as doublebar cardinalfish and was reported from Pakistan by Fraser et al. (2022), Psomadakis et al. (2015), Ali (2017) and Ali et al. (2021). It can be distinguished from its congeners in having 17–20 developed gill rakers on 1st gill arch. Its caudal fin is slightly emarginated with rounded lobes. It is light reddish brown to grey dorsally, shading to light silvery grey with iridescence on side. It has two narrow dark brown bars on body, the 1st continuous with a band at front of 1st dorsal fin, the 2nd originating below anterior part of 2nd dorsal fin. It has a distinct dark basicaudal spot present on the lateral line posteriorly on caudal peduncle.

This species was originally described from off Nelson Village, Eilat, Gulf of Aqaba, Red Sea by Gon (1986b). Its holotype (BPBM 27395) is housed in Bernice P. Bishop Museum, Hawaii (Frickle et al., 2022). This species reported from Red Sea (Baranes and Golani, 1993) and the Persian Gulf to the Indo-Malayan region, north to Japan (Frickle et al., 2022; Randall, 1995). It is also known from Hong Kong (Ni and Kwok, 1999) and Oceania (Kailola, 1987). Gon (2000) has examined specimens of *A. pseudotaeniatus*: from Pakistan housed in Natural History Museum, London confirming its presence in the area. Ali (2017) has, however, provided a photograph of the specimen from Northern sheltered sites, Hawks Bay, Karachi, Pakistan.

Five specimens of this species ranging in size from 9 to 13 cm collected from Pakistan were examined which meet the description given by Randall (1995), however, the black coloration on the soft dorsal in some specimens were observed to covering its outer margin.

Material Examined:

- 1 specimen collected from Karachi Fish Harbour on January 2, 2009 (10.0 cm TL).
- 1 specimen collected from Karachi on October 27, 2009 (9.0 cm TL)
- 1 specimen collected from Karachi Fish Harbour on June 16, 2010 (9.0 cm TL)
- 1 specimen collected from offshore waters of Pakistan on November 4, 2009 on Board R/V Firdous cruises in Pakistan.
- 1 specimen from Karachi Fish Harbour on June 26, 2013 (13.0 cm TL).

Apogonichthyoides sialis (Jordan & Thompson 1914)

(Fig. 23)

This species is commonly known as twinbar cardinalfish and reported from Pakistan by Fraser et al. (2022), Psomadakis et al. (2015), Ali (2017) and Ali et al., (2021). Posterior edge of preopercle in this species has small serrae; serrae on anterior half of ventral edge minute or absent whereas preopercle ridge smooth and post-temporal is serrate. Its caudal fin is emarginated where intestine is pale. Its body colour is brownish to greenish grey anteriorly, shading to pale grey posteriorly. There are intense dark brown bars on the body, reaching ventrally to level of lower pectoral-fin base or slightly lower. The bars joining equally dark leading edge of both dorsal fins. Remaining part of first dorsal fin is white and that of second dorsal fin translucent. Its pelvic fins are dark brown with white leading edge and it has distinct dark, small caudal spot.



Fig. 23. *Apogonichthyoides sialis* collected from Karachi Fish Harbour on August 15, 2004. The specimens on right were photographed by amateur diver at Churna Island.

According to Gon (2000), although the colour pattern of *Apogonichthyoides sialis* is virtually identical to that of *A. pseudotaeniatus*, but there several differences making the two as distinct species. *A. sialis* has a higher first dorsal fin (third dorsal spine 2.0-2.45 in head length in *A. pseudotaeniatus*). Colour of the intestine is pale in *A. sialis* where it is dark in *A. pseudotaeniatus* whereas axil of pectoral is dark in *A. sialis* and pale in *A. pseudotaeniatus*. There are also differences in the lengths of upper and lower jaw, lengths of second dorsal and pelvic-fin spines, and the caudal spot diameter. He however suggested that there is need for further study to ascertain validity of *A. pseudotaeniatus* by studying more specimens of both species.

This species was originally described as *Amia sialis* by Jordan and Thompson (1914) from Suruga Bay, Japan. Its holotype (FMNH 57084) is housed in the Field Museum of Natural History (FMNH) (Frickle *et al.*, 2022). This species is widely distributed in the Indo-Pacific Eastern Indian Ocean, western Pacific: eastern India, Bangladesh and Myanmar; South China Sea east to Philippines, north to Japan. Brunei, China, the Philippines and Suruga Bay, Japan. (Allen and Erdmann, 2012; Froese and Pauly, 2022) It is also reported Kerala, southwest coast of India (Manjebraiyakath *et al.*, 2012).

Ali (2017) has, however, provided a photograph of the specimen from Northern sheltered sites, Hawks Bay, Karachi, Pakistan. During the present study a number of specimens of this species were examined.

Material Examined:

- _ One specimen collected from Karachi Fish Harbour on August 11, 2004 (13.2 cm TL)
- _ One specimen collected from Karachi Fish Harbour on October 12, 2009 (11.1cm TL)

Apogonichthyoides taeniatus Cuvier, 1828 (Fig. 24)



Fig. 24. *Apogonichthyoides taeniatus* collected from Karachi Fish Harbour on October 11, 2011.

This species is commonly known as two belt cardinal and was reported from Pakistan by Froese and Pauly (2022), Hoda (1985b, 1988), Hussain (2003), Jalil and Khaliluddin (1972, 1981) without mentioning any specific location whereas Anonymous (1999), Jenkins (1910) and Misra (1962) reported it from Karachi. Anonymous (1999)

and Jenkins (1910) reported this species as *Apogon bifasciatus* which is considered to be a synonym of this species. This species is known to be distributed in western Indian Ocean from Red Sea and Persian Gulf (Carpenter *et al.*, 1997), Oman (Randall, 1995) south to Mozambique, Aldabra and Madagascar (Frickle *et al.*, 2022).

This species was originally described from Red Sea by Cuvier (1828). Its holotype is not known, however, syntypes are housed in Museum National d'Histoire Naturelle, Paris, France and Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2022).

This species characterized to have eyes which slightly larger than snout. Its preopercular edge is serrated and preopercular ridge is smooth, however, it is weakly denticulate at angle. It has 14–15 pectoral fin rays. It is brownish or silver grey in colour with 3 darker vertical bands on each side of the body. An ocellus with yellow or white ring in the first band situated below dorsal fin, above pectoral fin and below lateral line. The last band near the base of caudal fin. Indistinct dusky lines along scale rows. Ventrals with white leading edge with a small black mark on tip.

Material Examined:

- One specimen collected from Karachi Fish Harbour October 11, 2011 (12.1 cm TL).

Apogonichthyoides uninotatus (Smith and Redcliffe, 1912)

This species is commonly known as onepoint cardinal fish and species was reported from Buleji, Karachi by Hoda (1985a) and also listed in the fishes of Pakistan without mentioning any specific location by Hoda (1985b, 1988). This species was originally described as *Amia uninotatus* from Bisucay Island, Cuyos Islands, Philippines by Smith and Redcliffe (1912). Its holotype (USNM 70248) is housed in National Museum of Natural History, Washington D.C., U.S.A. (Frickle *et al.*, 2022). In addition to the Philippines, it is also reported from Persian Gulf by Wright (1988), however, there is a need to verify its distribution and Persian Gulf and Pakistan (Froese and Pauly, 2022; Frickle *et al.*, 2022). Body dusky, with reddish brown shades; a round blackish blotch larger than the pupil midway between pectoral and lateral line (Redcliffe, 1912). According to Kuitert and Kozawa (2019) mid-body spot has a thin pale yellowish halo. No specimens of this species was examined during the present study.

Genus *Joydia* Smith, 1961
Joydia truncata (Bleeker, 1855)
(Fig. 25)



Fig. 25. *Joydia ellioti* collected from Karachi Fish Harbour on February 1, 2009

This species is commonly known as flag-fin cardinalfish and was reported from Karachi by Niazi (2001) as *Apogonichthys ellioti*. This species was originally described as *Apogon truncatus* by Bleeker (1855) from Jakarta, Java, Indonesia. Its holotype (RMNH 5582) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2022). Fraser (2000), Gon (1997), Mabuchi *et al.* (2014) and Randall (1995) consider *Joydia ellioti* to be a synonym of *A. truncatus* which originally described as *Apogon ellioti* from Madras, India by Day (1875). Its

holotype is not known, however, lectotype (ZSI F1904) is housed in Zoological Survey of India, Kolkata (Frickle *et al.*, 2022). Frickle *et al.* (2022), Froese and Pauly (2022) and Kuitert and Kozawa (2019) consider *J. ellioti* to be valid species.

Colour pattern of this species make distinguishable to its congeners. It is generally has golden colour with upper surface of head and jaws and upper portion of opercle with black spots. It has a greyish band along the side. First dorsal white, with its upper half deep black. Second dorsal yellow, having a black band along its centre and a black outer edge and likewise black median band. Caudal fin grey with a white band margined, with black and an external white edge.

This species was reported to be widely distributed in Indo-West Pacific area including Persian Gulf east to Philippines and New Guinea, north to southern Japan, south to northern Australia (Frickle *et al.*, 2022). Many specimens of this species were examined, usually found in reef areas, rocky outcrops and found in the offshore areas up to a depth of 100 m.

Material Examined:

- One specimen collected from Karachi Fish Harbour on April 22, 2008 (7.9 cm TL).
- One specimen collected from Karachi Fish Harbour on February 1, 2009 (8 cm TL).
- One specimen collected from on board R/V Firdous Cruise on February 27, 2015 (10 cm TL).

Jaydia queketti Gilchrist, 1903

(Fig.26)



Fig.26 *Jaydia queketti*. collected from on board R/V Dr. Fridtjof Nansen Cruise on October 16, 2010.

This species is commonly known as spotfin cardinal and was reported from Pakistan by Hoda (1985b, 1988), Hussain (2003), Jalil and Khaliluddin (1972, 1981) and Psomadakis *et al.* (2015). It was originally described as *Apogon queketti* Natal coast off Teguela River mouth, South Africa by Gilchrist (1903). Its holotype is not known, however, syntypes are housed in British Museum of Natural History, London, U. K. and South African Museum, Cape Town, South Africa (Frickle *et al.*, 2022). This species is known from Western Indian Ocean: southern Red Sea, East Africa, South Africa, Socotra and Persian Gulf, Arabian Sea, east to India and Myanmar (Frickle *et al.*, 2022; Froese and Pauly, 2022). It is known to have migrated to the Mediterranean Sea (Bilecenoglu, 2010).). Hoda (1985b) reported this species as *Apogonichthys queketti*.

Its colour has light pinkish grey dorsally shading to silvery on sides and ventrally, with a dark brown spot on scales on side of body below lateral line forming longitudinal rows; 1st dorsal fin with a large black spot in outer posterior part. It is collected on a number of occasions from depth ranging from 30 to 160 m along Pakistan coast.

Material Examined:

- One specimen collected from on board R/V Dr. Fridtjof Nansen Cruise in the offshore waters of Pakistan on October 16, 2010 (9 cm TL).
- One specimen collected from Karachi Fish Harbour on February 27, 2013 (11 cm TL).
- One specimen collected from Karachi Fish Harbour on April 26, 2014 (9 cm TL).
- One specimen collected from Karachi Fish Harbour on May 22, 2014 (10 cm TL).

- One specimen collected from on board R/V Firdous Cruise in the offshore waters of Pakistan on February 27, 2015 (10 cm TL).

Jaydia striata (Smith and Radcliffe 1912)

(Fig.27)

This species was reported from Gwader by Day (1875) and from Balochistan coast by Zugmeyer (1913). It was also reported from Pakistan coast without mentioning any specific location by Fraser et al. (2022), Frickle et al. (2022), Gon and Randall (2003), Hoda (1985b, 1988), Psomadakis *et al.* (2015), Qureshi (1965), Randall (1995).



Fig. 27. *Jaydia striata* collected from Karachi Fish Harbour on February 1, 2009.

Its peritoneum is silvery white with dusky spots. Its body has 7–11 narrow dark brown bars. Scale pockets above lateral line have dark edge. Cheek stripe are usually present and distal half of 1st dorsal fin is dusky.

This species was originally described as *Amia striata* from western coast of Luzon Island (16°30'36"N, 120°11'06"E), Philippines, Albatross station 5442, depth 45 fathoms. By Smith and Radcliffe (1912). Its holotype (USNM 68403) is housed in United States National Museum, Washington D. C. USA (Frickle *et al.*, 2022). This species is known to have wide distribution in the Indo-West Pacific area including Persian Gulf and Pakistan east to Philippines and Papua New Guinea (Frickle *et al.*, 2022).

Material Examined:

- One specimen collected from Karachi Fish Harbour on February 1, 2009 (9 cm TL).
- One specimen collected from Karachi Fish Harbour on October 21, 2012 (9.5 cm TL).
- One specimen collected from on board R/V Firdous Cruise in the offshore waters of Pakistan on February 27, 2015 (9 cm TL).

Jaydia lineata (Temminck & Schlegel 1843)

(Fig. 28)



Fig. 28. *Jaydia lineata* collected from Karachi Fish Harbour on January 2, 2011.

This species was reported for the first time from Pakistan coast. This species was originally described as *Apogon lineatus* by Temminck and Schlegel (1843) from Nagasaki, Japan. Its holotype is not known but its lectotype (RMNH 70a) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2022). This

species is characterized in having 10 to 12 brown bands on sides of body, however, number and width of these bands varies with habitat (Froese and Pauly, 2022). Body shape and coloration closely resembles *A. ellioti*, but distinguished by not having luminous organ. According to Randall (1995), it is light grey dorsally, the edges of scales, dusky; shading to silvery on sides and ventrally. It also has ten dusky bars on body narrower than pale interspaces; a dusky bar from below posterior part of eyes and another longer bar from behind upper part of eye to corner of preopercle; front of snout and chin dusky; outer half of the first dorsal fin blackish; second dorsal and caudal fins slightly dusky. Its caudal fin is slightly rounded.

This species is known from Funka Bay of Hokkaido to the South China Sea and farther south (Masuda *et al.* 1984), India (Kumar *et al.*, 2019) and Oman (Randall, 1995). During the present study a number of specimens of this species ranging from 9 to 10 cm were examined from commercial landings in Karachi Fish Harbour.

Material Examined:

- One specimen collected from Karachi Fish Harbour on January 2, 2009 (9 cm TL).
- Two specimens collected from Karachi Fish Harbour on December 23, 2011 (9.0 and 9.5 cm TL).
- One specimen collected from Karachi Fish Harbour on March 16, 2014 (9.1 cm TL).

Kuiter and Kozawa (2019) provides details of colour and other description of *Jaydia striata*, *Jaydia lineata* and their congener *Jaydia striatodes* (Günther 1859) which indicates that:

- *Jaydia striata* is known to be distributed in the Indo-West Pacific including Persian Gulf and Pakistan east to Philippines and Papua New Guinea (Frickle *et al.*, 2022). This species is characterized in having pale yellowish grey to silvery colour with 9 to 11 black narrow bands on sides. Fins area yellowish, often with dusky broad margins and caudal fins slightly rounded.
- *Jaydia lineata* is characterized to have silvery grey body with 8 to 10 black thin bars alongside, from behind head to last one on basicaudal. Caudal fin usually slightly rounded but shape variable to truncate or emarginated with shallow central indent.
- *Jaydia striatodes* is known from Eastern Indian Ocean, western Pacific: Andaman Sea east to Philippines, north to northern Vietnam and southern China (Frickle *et al.*, 2022). This species is almost similar to *J. striata* but its body is pale grey to silvery with 6 to 9 dark bars on sides. Its eyes are yellowish and its caudal fin is rounded.

Genus *Nectamia* Jordan, 1917

Nectamia bandanensis (Bleeker, 1854)

This species is commonly known as bigeye cardinalfish and was reported from Balochistan, Pakistan by Zugmayer (1913). It was originally described as *Apogon bandanensis* from Banda Neira, Banda Islands, Indonesia by Bleeker (1854). Its holotype is not known, however, syntypes are housed in Rijksmuseum van Natuurlijke Historie, Leiden and British Museum of Natural History, London, U. K. (Frickle *et al.*, 2022).

This species is characterized in having coppery or silvery colour with saddle or bar across the caudal peduncle and a wedge-shaped bar below the eye. Leading edge of ventral fin in this species is clearly pale-blue. It is further characterized by grey caudal peduncle with broad dark bar at base (Allen and Erdman, 2012)

This species is known to be distributed from Moluccas and Philippines to Samoa, north to the Ryukyu Is., south to southern Great Barrier Reef; Mariana, Micronesia and also from Mozambique (Froese and Pauly, 2002). With the exception of a doubtful record from Mozambique by Pereira (2000), this species is not known from Western and northern Indian Ocean. Zugmayer (1913) reported from Pakistan, therefore, needs further authentication. During present study no specimen of this species was examined.

Genus *Sphaeramia* Fowler and Bean, 1930

Sphaeramia orbicularis (Cuvier, 1828)

This species is commonly known as orbiculate cardinalfish and was reported as *Apogon orbicularis* from Pakistan by Hoda (1985b, 1988). It was originally described as *Apogon orbicularis* from Java, Indonesia by Cuvier (1828). Its holotype (RMNH 49) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2022). It is greenish grey in colour with dark vertical bar from origin of spiny dorsal to just in front of anus. There are scattered spots on body, head and 1st dorsal membrane. Its pelvic fins are dark (Gon, 1986a, Kuitert and Tonzuka, 2001).

This species is known from East Africa to Kiribati, north to the Ryukyu Islands, south to New Caledonia; Belau to eastern Caroline and Mariana Islands in Micronesia (Frickle *et al.*, 2022). No specimen of this species was examined during the present study.

Tribe Zoramiini

Genus *Fibramia* Fraser & Mabuchi in Mabuchi, Fraser, Song, Zauma and Nichida, 2014

Fibramia thermalis Cuvier, 1829

This species is commonly known as half-barred cardinal and was reported from Karachi coast by Moazzam and Rizvi (1980) and Niazi (2001). It was originally described as *Apogon thermalis* from sources of hot waters of Cania, Sri Lanka and Red Sea by Cuvier (1829). Its holotype (MNHN 8686) is housed in the Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2022). This species is widely distributed in the Indo-Pacific area extending to south to Natal, South Africa and east to western Pacific.

This species is known to have black stripe that runs from snout through eye to angle of opercle. There is a caudal spot present. Sometimes it has yellow barring on sides or 2-3 tiny black spots along base of dorsal fin. No specimens of this species was examined during the present study.

CONCLUSIONS

Most of the species of Family Apogonidae are brightly coloured and generally small fish, with most species being less than 10 cm except *Holapogon maximus* which may attain a size of about 28 cm. These species mainly inhabit coral habitats, however, along the coast of Pakistan coral habitats are limited to a few locations including Churna island, Ormara, Astola Island and Gwader (Ali *et al.*, 2021). A number of species reported in this study are mainly collected from fishing grounds located in coastal waters and inner continental shelf. Nevertheless a few species are exclusively collected from coral habitats along the coastline (Ali *et al.*, 2021). Cardinal fishes feed upon a wide variety from small fishes, crabs, prawns and other tiny animals including plankton.



Fig. 29. broadband cardinalfish (*Ostorhinchus fasciatus*) trawled from offshore waters Karachi off Cape Monz.

Cardinal fishes are considered to be of little or no commercial value because of their small size and rarity of occurrence. Along Pakistan coast, there are few occasions when reasonable quantities of broadband cardinalfish (*Ostorhinchus fasciatus*) are caught by shrimp trawling operating in coastal waters off rocky outcrops (Fig. 29). In such cases, these fishes are dried and used a raw material for fish meal production.

A few species such as smallscale cardinalfish (*Lepidamia multitaeniata*) are caught by handlines along the rocky outcrops along Pakistan coast (Fig. 30). Because of their comparatively large size (15 to 17 cm), these are consumed by anglers along with other species caught from the area. Other than these species, no other species are of commercial importance. In Pakistan, sea water aquarium are not popular, therefore, cardinalfishes are being caught for keeping in aquarium or for export.



Fig.30. Smallscale cardinalfish (*Lepidamia multitaeniata*) caught by angler along with other fishes at Buleji, Hawkbay, Karachi.

During the present study, 42 species of cardinal fishes belonging to 16 genera are reported from Pakistan. Of these, five species including *Apogon dhofar*, *A. indicus*, *A. fugax*, *Taeniamia pallida* and *Jaydia lineata* are reported for the first time from Pakistan. There are a number of species of cardinalfishes may also be occurring in coral habitats and associated ecosystem, however, because of difficulty in their collection and taking their good photographs, these could not be included in present study.

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