

GROUPERS OF FAMILY EPINEPHILIDAE (ORDER: PERCIFORMIS) FROM PAKISTAN-I. TAXONOMIC ENUMERATION

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ABSTRACT

Groupers belong to the family Epinephelidae which includes commercially important species that are locally consumed as well as support a large export industry. Present paper reports 47 species belonging to 8 genera of this family in Pakistan. Speckled grouper (*Epinephelus magniscuttis*), multi-spotted grouper (*Epinephelus gabriellae*) and smooth grouper (*Dermatolepis striolata*) are recorded for the first time from Pakistan. Although there are aimed fisheries for some of the members of the family Epinephelidae in Pakistan, but bulk of the catch is made through multispecies fisheries including trawling, gillnetting and longlining. Spinycheek grouper (*E. diacanthus*) was reported to be the most dominating species of grouper found in Pakistan which was followed by Malabar grouper (*E. malabaricus*), orange-spotted grouper (*E. coioides*), striped grouper (*Epinephelus latifasciatus*) and small-scaled grouper (*Epinephelus polylepis*). Groupers are known to play an important role in coastal and offshore demersal ecosystem as these are top predators in the demersal habitat.

Keywords: Groupers, Epinephelidae, Serranidae, *Epinephelus magniscuttis*, *Epinephelus gabriellae*, *Dermatolepis striolata*, Arabian Sea, *E. diacanthus*, *E. malabaricus*, *E. coioides*, *Epinephelus polylepis*.

INTRODUCTION

Fishes belonging to the family Epinephelidae (Order: Perciformis) includes commercially important groupers and allied species and supports a substantially large export based fishery in Pakistan. Family Epinephelidae was previously included in the Family Serranidae, which included commercially important groupers and allied species. Family Serranidae is now proposed to be split into two families Epinephelidae and Anthiidae. No dedicated review of this important family from was previously published, however, species of this family are included in many checklists including Hoda (1985, 1988), Hussain (2003) and Jalil and Khaliluddin (1972, 1981). Psomadakis *et al.* (2015) have reported 2 species of genus *Cephalopholis*, 17 species of the genus *Epinephelus* and 1 species of the genus *Hyporthodus* from Pakistan. On commercial scale, members of the family Epinephelidae are caught using bottom-set gillnet, handline, longline and trawl-nets. Although this species is relished in Pakistan, however, bulk of the catch is exported mainly to the Persian Gulf countries. These species also play an important ecological role in coastal and offshore habitats, as these are usually top predators in the demersal ecosystem. In the present paper, a review of species of family Epinephelidae from Pakistan in presented.

MATERIAL AND METHODS

Published scientific literature was examined for the records of groupers and allied species from Pakistan coast. In addition, specimens of Family Epinephelidae collected between 2003 and 2023 from Karachi Fish Harbour, were photographed and salient features/measurements were recorded and preserved in 5 % neutralized formalin.

RESULTS AND DISCUSSION

While groupers were traditionally included as the subfamily Epinephelinae belonging to the family Serranidae, however, based on molecular evidence, it was suggested and now widely accepted to elevate the status of subfamily Epinephelinae to the familial level from Family Epinephelidae (Smith and Craig, 2007). This elevation is generally accepted and now all groupers are placed in Family Epinephelidae (Craig and Hastings, 2007; Zhuang *et al.*, 2013). In Pakistan, family Epinephelidae is represented by 8 genera including *Aethaloperca* Fowler, 1904, *Cephalopholis* Bloch & Schneider, 1801, *Chromileptes* Swainson, 1839, *Dermatolepis* Gill,

1861a, *Epinephelus* Bloch, 1793, *Hyporthodus* Gill, 1861, *Plectropomus* Oken, 1817 and *Variola* Swainson, 1839. The species of family Epinephelidae from Pakistan are arranged alphabetically in this paper.

Genus Aethaloperca Fowler, 1904
Aethaloperca rogae (Forsskal, 1775)

This species is commonly known as redmouth grouper. It was reported from Pakistan by Heemstra and Randall (1993). It was originally described from Jeddah, Saudi Arabia, Red Sea as *Perca rogae* by Forsskal (1775), however, no type is known (Frickle *et al.*, 2023).

This species has a deep and compressed body (greatest depth 2.1-2.4 in standard length). Its dorsal head profile is steep, straight or slightly concave along the snout whereas it is distinctly convex from the eye to the dorsal fin. Its middle dorsal and anal-fin rays are elongated, giving these fins an angular profile, with the rear margin almost vertical. Its caudal fin is truncated whereas pectoral fins are asymmetric. The colour of its body is dark brown to black, occasionally with an orange cast, usually with a pale vertical bar on the side of the abdomen.

It is widely distributed in the Indo-Pacific area including South Africa, East Africa, Red Sea, Socotra (Yemen), Persian Gulf, Seychelles, Comoros, Madagascar La Réunion, east to Marshall Islands, Europa Island, Fiji and Samoa, north to southern Japan, south to northwestern Australia, Queensland (Australia) and New Caledonia ((Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).). No specimen of this species was examined during the present study.

Cephalopholis argus Schneider, 1801

This species is commonly known as peacock hind and it was reported from Pakistan by Hoda (1985, 1988), Qureshi (1960, 1962, 1965) and Sorley (1932). It was originally described from the coast of Japan by Bloch and Schneider (1801). Its holotype (ZMB 220) is housed in Zoologisches Museum, Humboldt Universität, Berlin (Frickle *et al.*, 2023). Sorley (1932) reported this species as *Serranus argus*.

The colour of the body of this species is dark brown, with small black-edged blue spots; often with 5-6 pale bars on the rear part of the body and a large pale area over the chest covered with tiny blue ocelli, and often with 5 or 6 pale bars on rear of body, a pale area on chest and median fins with white margins; pectoral fins sometimes maroon distally; tips of spinous dorsal fin orangish brown.

This species is known to be widely distributed Indo-West Pacific area including South Africa, East Africa, Persian Gulf, Socotra (Yemen), Red Sea, Madagascar, La Réunion, Mauritius, Rodrigues Islands; east to Wake Atoll, northern Line Islands and Pitcairn Group, north to southern Japan, south to Australia (Frickle *et al.*, 2023; Heemstra, 2022). It was introduced in the Hawaiian Islands and Tunisia (Froese and Pauly, 2023). No specimen of this species was examined during the present study.

Cephalopholis aurantia (Valenciennes, 1828)

This species is commonly known as golden hind which is reported from Pakistan by Heemstra and Randall (1984) and Hoda (1985, 1988). It was originally described as *Serranus aurantius* from Seychelles by Valenciennes (1828). Its holotype (MNHN 0765) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023).

The colour of this species is pale orange-red to orange-yellow or golden with red or yellow dots on the head, the body, and the base of the dorsal fin. Posterior margin of caudal fin with a pale blue edge and black submarginal line. It has a rounded caudal fin and its pelvic fins usually reach the anus.

This species is known to be widely distributed in the Indo-West Pacific area including South Africa, Socotra (Yemen), Seychelles, Aldabra Atolls, Comoros, Madagascar, La Réunion, Mauritius, Rodrigues Islands; east to Marshall Islands and Pitcairn Group, north to Japan, south to New Caledonia and French Polynesia (Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Cephalopholis boenak (Bloch, 1790)

It is commonly known as chocolate hind and reported from Sindh by Anonymous (1955), Heemstra and Randall (1984) and Sorley (1932); from Balochistan by Heemstra and Randall (1984), Anonymous (1955) and Qureshi (1962). It was reported from the Pakistan coast without mentioning any specific location by Ahmad (1988), Hoda (1985, 1988), Hussain (2003) and Qureshi (1960, 1962, 1965). It was originally described as

Bodianus boenak from East Indies by Bloch (1790). No holotype of this species is known, however, lectotype (ZMB 5220) is housed in Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2023). Anonymous (1955), Hoda (1985) and Qureshi (1952, 1962, 1965) reported this species as *Epinephelus boenack* whereas Sorley (1932) listed it as *Serranus boenack*.

Its greatest body depth is 2.6-3.1 in standard length. Its preopercle is rounded and very finely serrated but has no enlarged spines at the angle whereas the lower edge is fleshy. It has a rounded caudal fin whereas pelvic fins does not usually reach the anus. Its colour is brownish to greenish-grey with 7 to 8 dusky vertical bands over the body. It has a large black spot between upper and middle opercular spines whereas median fins darker distally, with pale bluish line on the outer edges.

This species is known to be widely distributed in the Indo-West Pacific area including East Africa (Kenya, Tanzania, Mozambique), Aldabra Atolls, Seychelles, Comoros, Madagascar and western Mascarenes (La Réunion, Mauritius), the Persian Gulf, east to Philippines, New Ireland (Papua New Guinea) and Solomon Islands, north to China and Japan, south to Western Australia, Queensland and New Caledonia. (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Cephalopholis formosa (Shaw, 1812)
(Fig. 1)

This species is commonly known as bluelined hind. It was reported from Pakistan by Heemstra and Randall (1984), Hoda (1985, 1988), Murray (1880) and Osmany (2021). It was originally described as *Sciaena formosa* from Vishakhapatnam, India by Hamilton (1822), however, no type is known (Frickle *et al.*, 2023). Murray (1880) reported this species as *Serranus formosus*.

Its body is dark brown to yellow-brown with irregular blue stripes. Its snout, lips, lower half of head and chest with small blue spots (Heemstra, 2022),

This species is known to be distributed in the Indo-West Pacific area including Lakshadweep Islands, India, Sri Lanka, and Myanmar east to Indonesia, Philippines, north to China, Taiwan, southern Japan and Australia (Frickle *et al.*, 2023; Heemstra, 2022). During the present study, a number of specimens of this species were examined. Prior to 2000, this species was reported to be extremely rare but since then, it has been frequently caught by gillnet and trawl vessels in coastal areas on continental shelf. The reasons for this unprecedented increase in the occurrence is not known.



Fig. 1. *Cephalopholis formosa*. Lateral view.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on October 18, 2011 (18 cm TL).
- 1 specimen collected from Karachi Fish Harbour on March 15, 2013 (20 cm TL).

Cephalopholis hemistiktos (Ruppell, 1830)

(Fig. 2)

This species is commonly known as yellowfin hind. It was reported from Pakistan by Frickle *et al.*, (2023), Froese and Pauly (2023), Heemstra (2022), Heemstra and Randall (1993), Lieske and Myers (1994), Moazzam *et al.* (1987), Psomadakis *et al.* (2015). It was originally described as *Serranus hemistiktos* from Massawa, Eretrea, Red Sea by Ruppell (1830). Its holotype is not known, however, lectotype (SMF 314) is housed in Forshungs Institut und Natur Museum Senckenberg, Frankfurt, Germany (Frickle *et al.*, 2023).

It is brownish in colour and its body and fins are covered with tiny blue ocelli; median fins are darker than the body, with pale blue margins; tips of spinous dorsal-fin membranes orange; pectoral fins are brown to reddish brown, with some small blue ocelli basally, margin yellowish; pelvic fins dark red to reddish brown with dark rays.

This species is known from the Western Indian Ocean including the Red Sea, northwestern Indian Ocean: Yemen, Gulf of Aden, Socotra Island, Oman, and the Persian Gulf east to Pakistan (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). During the present study, a number of specimens of this species was examined.



Fig. 2. *Cephalopholis hemistiktos*. (a) Lateral view; (b) Commercial landings at Karachi Fish Harbour.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on October 18, 2011 (18 cm TL).
- 1 specimen collected from Karachi Fish Harbour on March 15, 2013 (20 cm TL).

Cephalopholis leopardus (Lacepede, 1801)

This species is commonly known as leopard hind which is reported from Sindh coast by Sorley (1932). It was originally described as *Labrus leopardus* from Indo-Pacific Ocean by Lacepede (1801). Its holotype is not known, however, syntypes are housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023).

It has reddish-brown head with numerous red-orange or pinkish-red spots, extending to the pectoral region. Its body is mottled pinkish brown or orange-red and its upper caudal fin base with a large dark brown saddle with a smaller saddle just behind whereas its pectoral fins is orange or yellowish and its caudal fin has a red-brown submarginal streak dorsally and paler streak on the lower part.

This species is known from the Indo-Pacific area including East Africa (Kenya, Tanzania, Mozambique), Seychelles, Aldabra Atolls, Comoros, Madagascar and Mascarenes Islands (La Réunion, Mauritius, Rodrigues) to the Society Islands, north to the Ryukyu Islands, south to northern Australia to New Caledonia and Tonga (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Cephalopholis miniata (Forsk., 1775)

This species is commonly known as coral hind which is reported from Pakistan by Heemstra and Randall (1984), Hoda (1985, 1988) and Sorley (1932). It was originally described as *Perca minata* from Jeddah, Saudi Arabia or Luhaiya, Yemen, Red Sea by Forsskal (1775). Its holotype is not known, however, syntype is housed in Zoological Museum, University of Copenhagen, Denmark (Frickle *et al.*, 2023).

Its head and body are orange-red to red-brown covered with small bluish spots. Its pectoral fins are orange-yellow distally whereas median fins are often with narrow blue margins and blackish submarginal lines whereas pelvic fins are orange-red.

It is widely distributed in the Indo-West Pacific area including South Africa, East Africa, Socotra (Yemen), Seychelles, Aldabra Atolls, Comoros, Madagascar, Mauritius and Mascarenes (La Réunion, Mauritius), Red Sea, Persian Gulf), east to Line Islands, Fiji and Tonga, north to Japan, south to Western Australia, Queensland (Australia) and New Caledonia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Cephalopholis sexamaculata (Ruppell, 1830)

It is commonly known as sixblotch hind which is reported from Pakistan by Heemstra and Randall (1984) and Hoda (1985, 1988). It was originally described as *Serranus sexmaculatus* from the Red Sea by Ruppell (1830). Its holotype (SMF 2994) is housed in Forshungs Institut und Natur Museum Senckenberg, Frankfurt, Germany (Frickle *et al.*, 2023).

Its caudal fin is rounded whereas pelvic fins do not reach or just about the anus. The colour of its body is orange-red, with small and pale blue spots sparsely scattered but more densely on the head and median fins. The head with elongated blue spots and lines. Its body also has 4 dark bars merging dorsally with blackish blotches at the base of the dorsal fin and extending onto the fin. There are two similar but smaller dark bars/blotches present on the caudal peduncle.

It is widely distributed in the Indo-West Pacific area including South Africa, East Africa (Mozambique, Tanzania, Kenya), Socotra (Yemen), Seychelles, Comoros, Madagascar and western Mascarenes (La Réunion, Mauritius) east to Line Islands, Marquesas Islands and Society Islands (French Polynesia), north to southern Japan and South China Sea, south to Australia, New Caledonia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). According to Froese and Pauly (2023) reports of this species from the Gulf of Oman, Pakistan, India, and Sri Lanka are unsubstantiated. No specimen of this species was examined during the present study.

Cephalopholis sonnerati (Valenciennes, 1828)

(Fig. 3)

This species is commonly known as tomato hind which is reported from Pakistan by Heemstra (2022), Heemstra and Randall (1984), Hoda (1985, 1988), Misra (1962), Psomadakis *et al.* (2015) and Sorley (1932). It

was originally described as *Serranus sonnerati* from Pondicherry, India by Valenciennes (1828). Its holotype is not known, however, lectotype (MNHN A-7671) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023). Misra (1962) reported this species as *Epinephelus sonnerati*.

Its dorsal head profile is straight to concave but the nape is distinctly convex. Its colour is orange-red to red-brown and often with darker and scattered spots and small whitish or purple spots. There is a blotchy purplish network present on the head, maxilla and lips. Its pectoral fins and dorsal-fin rays are orange distally whereas membranes of median fins and pectoral fins are dusky. Its pelvic-fin tips are blackish.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa, Socotra (Yemen), Comoros, Madagascar and Mascarenes (La Réunion, Mauritius, Rodrigueus Islands), east to Marshall Islands, Samoa and Tonga, north to Japan, to Australia and New Caledonia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). During the present study, a number of specimens of this species were examined.



Fig. 3. *Cephalopholis sonnerati*. Lateral view

Material Examined

- 1 specimen collected from Karachi Fish Harbour on September 4, 2018 (36 cm TL).
- 1 specimen collected from Gwadar Fish Harbour on February 20, 2019 (44 cm TL).

Cephalopholis urodeta (Forster, 1801)

This species is commonly known as duskyfin hind. It was reported from Pakistan by Anonymous (1999) and Hoda (1985, 1988). It was originally described as *Perca urodeta* from Santa Christina Island, Marquesas Islands by Forster (1801), however, no type is known (Frickle *et al.*, 2023). According to Heemstra and Randall (1993), this species is probably absent from the Arabian sea and the specimens referred to by Boulenger (1895) from Muscat, Oman and also by Anonymous (1999), Heemstra and Randall (1984), Hoda (1988) from Northern Arabian Sea are probably *C. hemistiktos*. Anonymous (1999), Boulenger (1895), Hoda (1985, 1988) and Heemstra and Randall (1984) reported this species as *Cephalopholis nigripinnis* which is considered to be a synonym of this species. It seems that records from Pakistan are based on misidentification of some other species of *Cephalopholis*.

Its caudal fin is rounded whereas pelvic fins usually do not reaching the anus. The colour of its body is reddish brown anteriorly and dark brown posteriorly. Its caudal fin has two white to bluish white bands that converge posteriorly.

This species is known from the Pacific Ocean: eastward to French Polynesia and the Pitcairn Islands, to Christmas Island in the Indian Ocean Eastern Indian Ocean, western Pacific: Christmas Island and Indonesia

east to Wake Atoll, Line Islands and Pitcairn Group, south to Australia, New Caledonia, Tonga and Rapa (Froese and Pauly, 2023; Frickle *et al.*, 2023). No specimen of this species was examined during the present study.

Genus *Chromileptes* Swainson 1839
Cromileptes altivelis (Valenciennes, 1828)

This species is commonly known as humpback grouper. It was reported from Pakistan by Murray (1880). It was originally described as *Serranus altivelis* from Java, Indonesia and an unknown locality by Valenciennes (1828). Its holotype is not known, however, syntypes are housed in Museum National d'Historie Naturelle, Paris, France and possibly in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2023). The report of the occurrence of this species in the western Indian Ocean is not substantiated.

This species is known for small size of the anterior part of the head as compared to the elevated postorbital part. Its colour is greenish white to light greenish brown with scattered round black spots on the head, body, and fins. The spots on the body are generally larger than those on the head and fins. There are about nine large roundish dusky blotches with some extending partly into the base of dorsal and anal fins.

This species is known from the Western Pacific Ocean including southern Japan to Palau, Guam, New Caledonia and Australia. It is also known from the Eastern Indian Ocean including the Nicobar Islands Bangladesh, Myanmar, Andaman Sea and Indonesia east to Fiji to Western Australia. Reports from the western Indian Ocean by Heemstra and Randall (1984, 1986) are unsubstantiated except one from Kenya (Smith 1954) which seems valid (Froese and Pauly, 2023; Frickle *et al.*, 2023). It seems that records from Pakistan are based on misidentification of some other species. No specimen of this species was examined during the present study.

Genus *Dermatolepis* Gill, 1861a
Dermatolepis striolata (Playfair, 1867)
(Fig. 4)

This species is commonly known as smooth grouper. This is reported for the first time from Pakistan as a number of specimens were photographed by divers at Churna Island. This species was originally described as *Serranus striolata* from Zanzibar by Playfair (1867). Its holotype (BMNH 1867) is housed in the British Museum of Natural History, London, U. K. (Frickle *et al.*, 2023).



Fig. 4. *Dermatolepis striolata*. Underwater photograph taken at Churna Island, Pakistan

It is slightly concave or straight dorsal head profile whereas the caudal fin is rounded or truncated with rounded corners. Its head, body and fins are yellow-brown to red-brown, with a unique pattern of round dark spots over pale blotches.

This species is known from the Western Indian Ocean including Sri Lanka, the Gulf of Oman and the south coast of the Arabian Peninsula, the Gulf of Aden, the Southern Red Sea, Socotra (Yemen), Aldabra (Seychelles), Comoros, Madagascar, and the coast of Africa from Kenya to South Africa (Froese and Pauly, 2023; Frickle *et al.*, 2023). During the present study, photographs of a number of specimens of this species from the Churna Island, Balochistan were examined.

Material Examined

- 1 specimen photographed at Churna Island on February 25, 2022 (about 40 cm TL).
- 1 specimen photographed at Churna Island on October 11, 2022 (about 60 cm TL).

Genus *Epinephelus* Bloch 1793
Epinephelus areolatus (Forsskal, 1775)
 (Fig. 5)

This species is commonly known as areolate grouper. It was reported from Sindh by Sorley (1932) and from Balochistan by Zugmayer (1913). It was reported from the Pakistan coast without mentioning any specific location by Ahmad and Niazi (1988), Froese and Pauly (2023), Heemstra (2022), Hoda (1985, 1988), Misra (1962), Psomadakis *et al.* (2015) and Qureshi (1962). It was originally described as *Perca areolata* from Jeddah, Saudi Arabia, Red Sea by Forsskal (1775). Its possible holotype (ZMUC P43570) is housed in the Zoological Museum, University of Copenhagen, Denmark (Frickle *et al.*, 2023). Sorley (1932) and Zugmayer (1913) reported this species as *Serranus areolatus* whereas Sorley (1932) also referred to it as *Serranus angulasis* (misspelled).

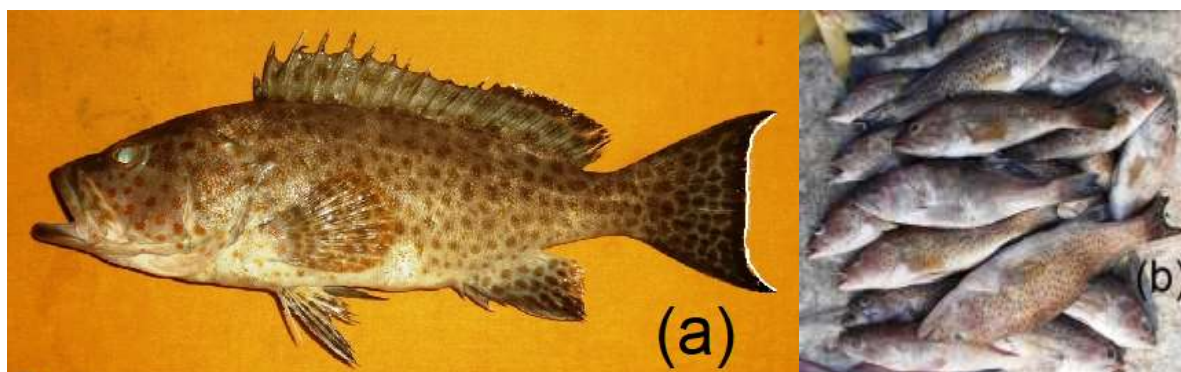


Fig. 5. *Epinephelus areolatus*. (a) Lateral view; (b) Commercial landings at Karachi Fish Harbour.

This species can be easily identified as the colour of its head, body, and fins are pale which is covered with close-set brownish or yellowish spots (about pupil-sized), spots on the front of the head smaller than those on the opercle; pectoral fins pale, with small dark spots on rays whereas its caudal-fin margin is white.

This species is known to be widely distributed in the Indo-Pacific area including South Africa, East Africa (Mozambique, Tanzania, Kenya), Seychelles and Madagascar, the Red Sea, Socotra (Yemen), the Persian Gulf, Pakistan to India and Sri Lanka, Maldives, Lakshadweep to and east to Fiji, Tonga, New Caledonia, Samoa, north to Korea, Japan, south to Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). It is known to be invasive in the eastern Mediterranean Sea (Froese and Pauly, 2023).

It is often confused with *Epinephelus chlorostigma* with which it can be distinguished by having dark spots on the body of adults subequal to pupil size (the largest dark spots on the body of adults are distinctly smaller than pupils in *E. chlorostigma*).

This species is considered commercially important in Pakistan. However, because of its small size (the largest known specimen was recorded to have a length of 45 cm and weigh only 1.2 kg), it does not fetch high prices offered to large groupers. It is not abundant but is still exported mainly to the Persian Gulf countries. There is no specific aim for the fisheries for this species but it is caught with bottom-set gillnets, handlines, and

longlines. Sometimes also caught as bycatch of trawl fisheries. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on September 13, 2004 (29 cm TL).
- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on October 18, 2010 (36 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 24, 2014 (33 cm TL).

Epinephelus bleekeri (Vailant, 1878)
(Fig. 6)

It is commonly known as duskytail grouper which is reported from Pakistan by Ahmad and Niazi (1988), Bianchi (1985), Froese and Pauly (2023), Hoda (1985, 1988), Hussain (2003), Jalil and Khalil (1972, 1981), Psomadakis *et al.* (2015), Qureshi (1960, 1962, 1965) and Sorley (1932). It was originally described as *Serranus bleekeri* from Jakarata, Java, Indonesia by Vaillant (1878). Its holotype (MNHN 7401) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023). *Serranus coromandelicus* described by Day (1878) from Madras, India is considered to be a synonym of this species which was reported by Sorley (1932) from Sindh, Pakistan.

The colour of its head and body is brownish, reddish brown or purplish grey, covered with numerous reddish orange, golden or yellow; dark streaks along the maxillary groove; the pectoral and pelvic fins and distal part of the anal fin is dusky; spinous dorsal fin gold; the upper third of caudal fin with spots like those on the body, the lower two-thirds dusky. Juveniles with 7 faint dark bars dorsally on the body, the first two on the nape, the last on the peduncle, and all bars more or less demarcated by small dark spots; no dark spots on the head or fins.

This species is widely distributed in the Indo-West Pacific including the Persian Gulf, Pakistan, India, Sri Lanka; east to Thailand, Indonesia, China, Taiwan, the Philippines, north to Japan, south to northern Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). During the present study, a number of specimens of this species were examined.



Fig. 6. *Epinephelus bleekeri*. Lateral view.

This species is considered to be a commercially important fish in Pakistan. It is not abundant but is still exported mainly to the Persian Gulf countries. There is no specific aim for the fisheries for this species but it is caught with bottom-set gillnets, handlines, and longlines. Sometimes also caught as bycatch of trawl fisheries.

According to IUCN Red List its conservation status is Near Threatened (NT) due to fishing pressure (Heemstra, 2022).

Material Examined

- 1 specimen collected from Karachi Fish Harbour on March 3, 2009 (65 cm TL).
- 1 specimen collected from Karachi Fish Harbour on December 13, 2010 (56 cm TL).
- 1 specimen collected from Karachi Fish Harbour on November 10, 2012 (70 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 28, 2014 (29 cm TL).

Epinephelus chlorostigma (Valenciennes, 1828)

It is commonly known as brownspotted grouper which is reported from Pakistan by Ahmad and Niazi (1988), Ali (2002), Anonymous (1999), Bianchi (1985), Heemstra and Randall (1984), Hoda (1985, 1988) and Hussain (2003). It was originally described as *Serranus chlorostigma* from Seychelles by Valenciennes (1828). Its holotype is not known, however, lectotype ((MNHN 7430) is housed in the Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023).

According to Heemstra and Randall (1993) *E. chlorostigma* complex consists of three species. Of these, *E. gabriellae* and *E. polylepis* seem to occur in the Northern part of the Indian Ocean. The reports of a third species (*E. chlorostigma*) from Pakistani waters seem to be based on the misidentification of *E. polylepis*. Hussain (2003) reported this species as *Serranus chlorostigma*.

This species can be distinguished from its congeners as its head, body, and fins are pale with small, irregular, close-set dark brown spots, the ground colour forming a pale network; spots on pectoral fins mainly confined to rays; caudal-fin margin white.

This species is known from Indo-Pacific area including South Africa, East Africa, Kenya Madagascar, Seychelles, Mascarenes (La Réunion, Mauritius, Rodrigues), Chagos Archipelago, Gulf of Aden, Persian Gulf, Maldives and Lakshadweep, elsewhere from Japan, New Caledonia and American Samoa (Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Epinephelus coeruleopunctatus (Bloch, 1790)

It is commonly known as whitespotted grouper and was reported from Pakistan by Anonymous (1999), Heemstra and Randall (1984), Hoda (1985, 1988) and Nielsen (1960). It was originally described as *Holocentrus coeruleopunctatus* from an unknown locality possibly in the Indian Ocean by Bloch (1790). Its holotype (ZMB 232) is housed in the Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2023).

This species can be identified in having a brownish grey colour, with large pale blotches on the body overlain with pale spots; 4 or 5 indistinct dark blotches at the dorsal-fin base, and an oblique black saddle on the rear half of the peduncle; prominent black streak on the maxillary groove.

This species is known from Indo-West Pacific including South Africa, East Africa (Mozambique, Tanzania, Kenya), Oman, Persian Gulf, Seychelles, Madagascar and western Mascarenes (La Réunion, Mauritius), Chagos, Maldives, Lakshadweep, India, Sri Lanka, Indonesia east to Marshall Islands, Fiji and Tonga, north to Japan, south to Australia, Tonga and New Caledonia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Epinephelus coioides (Hamilton, 1822)

(Fig. 7)



Fig. 7. *Epinephelus coioides*. (a) Lateral view; (b) Commercial landings at Karachi Fish Harbour.

It is commonly known as orange-spotted grouper from the Sindh coast by Murray (1880), from Goth Jafar, Hawks Bay, Karachi by Anonymous (1993). It was reported from the Pakistan coast without mentioning any specific location by Heemstra and Randall (1993), Psomadakis *et al.* (2015) and Randall and Heemstra (1991). This species was originally described as *Bola coioides* from large Gangetic Estuaries, India by Hamilton (1822). Its holotype is not known (Frickle *et al.*, 2023). Anonymous (1993) reported this species as *Epinephelus nebulosus* whereas Murray (1880) listed it as *Serranus suillus*. This species closely resembles with *E. malabaricus* and *E. tauvina* and is generally confused with these species.

The head and body of this species are tan dorsally and whitish ventrally with numerous pupil-sized orange to reddish brown spots on head, body and median fins. The body has with five faint, irregular, oblique brown bars that bifurcate ventrally (first bar below anterior dorsal fin spines, last on peduncle). It has two dark spots on interopercle, and 1 or 2 spots at the junction of subopercle and interopercle.

This species can be distinguished from *E. tauvina* in having 54–65 scales in lateral line series whereas anterior scales have branching tubules (62–74 scales in lateral line series and none with branching tubules in *E. tauvina*). On the side of the gill arch, there are many small bony platelets (no small bony platelets on the side of the gill arch in *E. tauvina*) and body with five irregular dark bars which tend to bifurcate ventrally (no dark bars on the body in *E. tauvina*). From *E. malabaricus* it can be distinguished in having many orange- to red-brown spots on head, body and median fins (head, body and fins with many well-separated black spots in *E. malabaricus*) and the largest spots about 4–5 times the size of posterior nostrils (largest spots about twice size of posterior nostrils in *E. malabaricus*) and spots on head may be elongate and no pale or white blotches or spots on head and body (pale or white blotches or spots present on head and body in *E. malabaricus*) and pectoral fins with 20 rays (19 rays in *E. malabaricus*).

This species is known from Indo-West Pacific area including South Africa, East Africa, Madagascar and western Mascarenes (La Réunion, Mauritius), the Red Sea, Gulf of Aden, Gulf of Oman, the Persian Gulf, Arabian Sea, Bay of Bengal, India Sri Lanka, Andaman Island, Myanmar, Malaysia, Thailand, Indonesia, Vietnam, the Philippines, China, Taiwan, Japan and eastward to Palau, Fiji and New Caledonia and south to the Arafura Sea and Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). It is reported from the Mediterranean coast of Israel (Froese and Pauly, 2023; Heemstra and Randall, 1993)

This species is considered to be of high commercial importance in Pakistan. It is one the common of the large groupers which is exported mainly to the Persian Gulf countries. Because of its large size and typical colouration, it fetches high prices in the export market. There is no specific aim for the fisheries for this species but it is caught with bottom-set gillnets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on October 27, 2009(31 cm TL).
- 1 specimen collected from Karachi Fish Harbour on February 14, 2010 (24 cm TL).
- 1 specimen collected from Karachi Fish Harbour on February 25, 2010 (91 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 20, 2014 (37 cm TL).
- 1 specimen collected from Offshore area (23°33.100' N; 67°09.100'E) on 14 December 2015 (87 cm TL).

Epinephelus diacanthus (Valenciennes, 1828)

(Fig. 8)

It is commonly known as spinycheek grouper and reported from Sindh by Aitken (1907), Ahmad *et al* (1973), Anonymous (1955), Day (1875, 1889), Heemstra and Randall (1984, 1993), Jenkins (1910), Murray (1880) and Sorley (1932); from Banbhore by Ahmed and Abbas (1999, 2000); from Indus Delta by Anonymous (2000a), Mahmood *et al.* (1999) and Randall and Heemstra (1991); from Karachi by Ahmed *et al.* (1973), Anonymous (1955, 1999), Day (1875, 1889), Misra (1962), Niazi (2001); from Kharo Chan by Ahmed *et al.* (1999); from Balochistan by Day (1875, 1889), Heemstra and Randall (1984, 1993) and Zugmayer (1913); from Makran by Ahmed *et al.* (1973), Anonymous (1955), Qureshi, 1952) and from off Sonmiani Bay by Randall and Heemstra (1991). It was reported from Pakistan coast without mentioning any specific location by Ahmad (1988), Ahmad and Niazi (1988), Arshad (1985), Bianchi (1985), Day (1870), Froese and Pauly (2023), Hoda (1985, 1988), Hussain (2003), Iqbal *et al* (1999), Jalil and Khalil (1972, 1981), Majid *et al* (1992), Misra (1962), Psomadakis *et al.* (2015) and Qureshi (1960, 1962, 1965). It was originally described as *Serranus*

diacanthus from the coast of Malabar, India by Valenciennes (1828). Its holotype is not known, however, lectotype (MNHN 7157) is housed in Museum National d’Histoire Naturelle, Paris, France (Frickle *et al.*, 2023). Aitken (1907), Day (1875, 1889), Jenkins (1910), Murray (1880) and Zugmayer (1913) reported this species as *Serranus diacanthus*.



Fig. 8. *Epinephelus diacanthus*. (a) Lateral view; (b) Specimen collected from Churna Island with dark bars; (c) Commercial landings at Karachi Fish Harbour.

Characteristically this species has a pale brownish grey body which has usually five dark vertical bars and narrower white interspaces (four bars below and extending onto dorsal fin, fifth bar on peduncle faintest); the underside of head and body is pink or reddish; dark maxillary streak continues faintly to lower edge of preopercle. Its fins are greyish brown.

This species is known from the Indian Ocean including the Gulf of Aden, Gulf of Oman, Pakistan, India, Sri Lanka India and Myanmar (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).. Records from the western Pacific are based on misidentifications of *Epinephelus stictus* Randall and Allen 1987 or *E. fasciatomaculosus* (Peters 1865).

This species is considered to be of high commercial importance in Pakistan. It is the most common of the small groupers which are exported mainly to the Persian Gulf countries. Because of its typical colouration, it fetches high prices in the export market. There is no specific aim for the fisheries for this species but it is caught with bottom-set gillnets, trawl nets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on October 18, 2010 (39 cm TL).
- 1 specimen collected from Karachi Fish Harbour on August 25, 2014 (31 cm TL).
- 1 specimen collected from Karachi Fish Harbour on August 27, 2014 (22 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 23, 2014 (20 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 24, 2014 (34 cm TL).
- 1 specimen collected from Churna Island by Angler Mr. Aziz Agha on October 21, 2015 (20 cm TL).

Epinephelus epistictus (Temminck and Schlegel, 1842)
(Fig.9)

This species is commonly known as dotted grouper and reported from Pakistan by Heemstra and Randall (1984, 1993), Hoda (1985, 1988) and Psomadakis *et al.* (2015). It was originally described as *Serranus epistictus* from Nagasaki, Japan by Temminck and Schlegel (1842). Its holotype (RMNH D88) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2023).

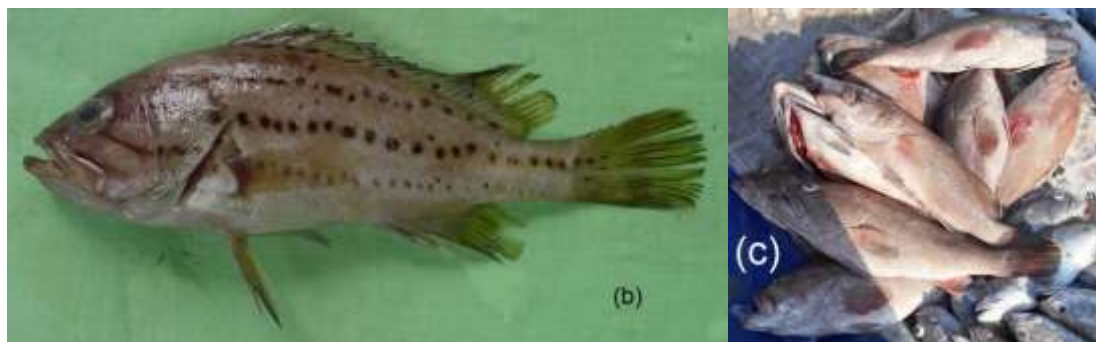


Fig. 9. *Epinephelus epistictus*. (a) Lateral view; (b) Juvenile with dark spots; (c) Commercial landings at Karachi Fish Harbour.

This species characteristically has a brown head, body and fins which have faint black dots usually on the dorsolateral body, There are three dark brown streaks on the cheek, the darkest just behind the maxilla whereas the pectoral fins are reddish brown and margins of the median-fin pale blue or white, Some fish may have a row of faint dark spots on the soft-rayed dorsal fin. Its juveniles are known to have darker and larger spots as compared to adults.

This species is widely distributed in the Indo-West Pacific area including South Africa, Kenya, Somalia, Comoros, Madagascar, the Red Sea, the Persian Gulf, Oman, Pakistan, India, Korea, Japan, China, Taiwan, Hong Kong, Indonesia, the Philippines Papua New Guinea, the Arafura Sea and northern Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species is considered to be of commercial importance in Pakistan. It is marketed as large groupers which is exported mainly to the Persian Gulf countries. Because of its large size and typical colouration, it fetches high prices in the export market. There is no specific aim fisheries for this species but it is caught with bottom-set gillnets, handlines, and longlines. This species was mainly caught in the winter months (September to December). During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on October 17, 2010 (29 cm TL).
- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on October 18, 2010 (43 cm TL).
- 1 specimen collected from Karachi Fish Harbour on September 25, 2014 (20 cm TL).
- 1 specimen collected from Karachi Fish Harbour on September 28, 2015 (54 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 12, 2014 (35 cm TL).

Epinephelus erythrurus (Valenciennes, 1828)

(Fig. 10)

This species is commonly known as cloudy grouper and it was reported from Karachi by Anonymous (1999), Boulenger (1898) and Randall and Heemstra, 1991). It was reported from the Pakistan coast without mentioning any specific location by Froese and Pauly (2023), Heemstra (2022), Heemstra and Randall (1993), Lieske and Myers (1996) and Psomadakis *et al.* (2015). It was originally described as *Serranus erythrurus* from Malabar, India by Valenciennes (1828). Its holotype (MNHN 7545) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023). *Serranus townsendi* described by Boulenger (1898) from Karachi is considered to be a synonym.

This species has characteristically have olive to reddish brown body usually with pale spots and blotches randomly joined forming an irregular dark network of the background colour. It has three dark streaks across the operculum as its median and pelvic fins are mottled whereas pectoral fins are uniform. Large fish may be nearly uniformly brown, or with pale blotches faintly visible. Distinct blotches noticeable in juveniles similar to *E.*

coeruleopunctatus. However, Ariyanti and Farajallah (2019) provided morphological description or variations of juveniles that have been identified as *E. erythrurus* based on CO1 sequences and looks almost similar to *E. coeruleopunctatus*.

This species is widely distributed in Indo-West Pacific area between Socotra (Yemen), Pakistan, India, Sri Lanka, Lakshadweep Islands; east to Gulf of Thailand, Malaysia and Indonesia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

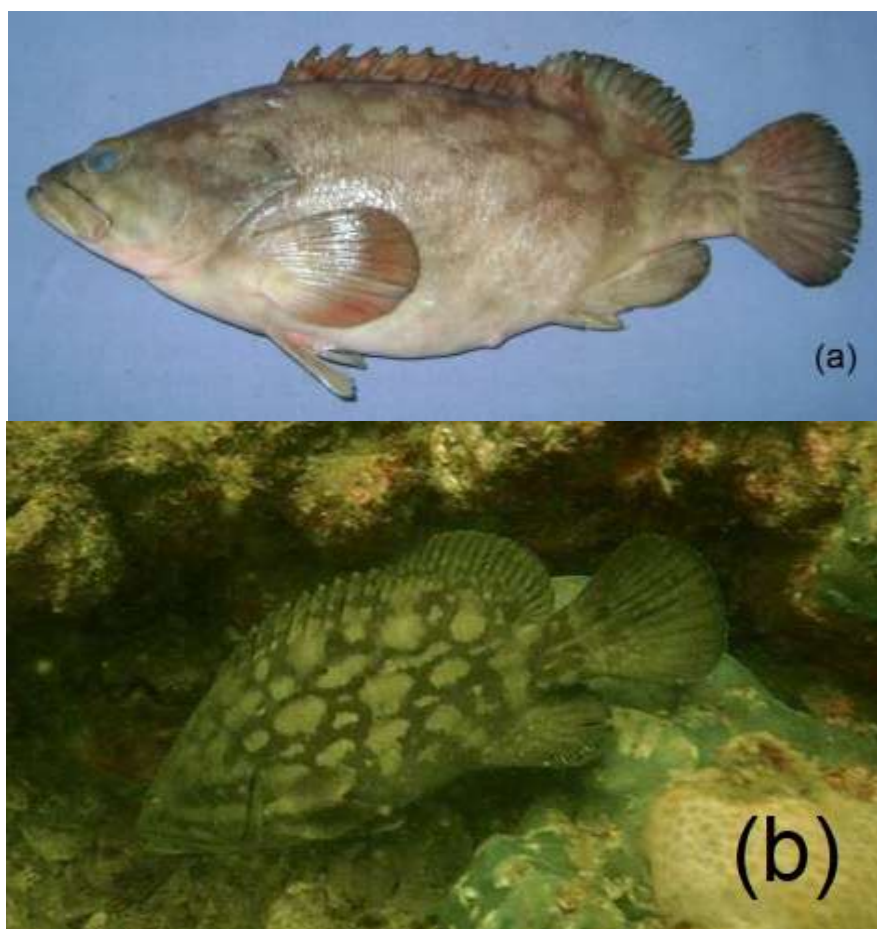


Fig. 10. *Epinephelus erythrurus*. (a) Lateral view; (b) Juvenile photographed at Churna Island.

This species is marketed as large groupers which is exported mainly to the Persian Gulf countries. There is no specific aimed fisheries for this species but it is caught with bottom-set gillnets, handlines, and longline. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on February 13, 2010 (30 cm TL).
- 1 specimen collected from Karachi Fish Harbour on September 25, 2013 (38 cm TL).
- 1 specimen collected from Karachi Fish Harbour on September 28, 2013 (32 cm TL).
- 1 specimen collected from Karachi Fish Harbour on February 2, 2017 (38 cm TL).

Epinephelus fasciatus (Forsskal, 1775)

This species is commonly known as blacktip grouper which was reported from Sindh by Sorley (1932), from Karachi by Niazi (2001) from Tidal Link Canal, Badin District by Jafri (2004) and Jafri *et al.* (2000) and from Balochistan by Zugmayer (1913). It was reported from Pakistan coast without mentioning any specific

location by Ahmad (1988), Ahmad and Niazi (1988), Bianchi (1985), Heemstra and Randall (1984), Hoda (1985, 1988), Hussain (2003), Jalil and Khalil (1972, 1981) and Qureshi (1962). It was originally described as *Perca fasciata* from Ras Mohammad, Red Sea by Forsskal (1775), however, no type is known (Frickle *et al.*, 2023). It was reported by Sorley (1932) and Zugmayer (1913) as *Serranus fasciatus*.

This species has a pale greenish grey or pale reddish yellow to scarlet body and head. Its body often with five or six faint dark bars and body scales with a pale centre and dark edges, producing a faint chequered pattern. The front of the upper jaw, dorsal part of the head, and nape are dark red or reddish brown or with bands and blotches of similar colour on the rims of the orbit black while fins are reddish-orange, pale yellowish green or greenish brown. Outer triangular tips of interspinous dorsal-fin membranes are black.

The records of this species from Pakistan seem to be based on the misidentification of *Epinephelus diacanthus* with which it can be distinguished mainly in having a black outer triangle of interspinous dorsal-fin membranes and edge of orbit narrowly black surrounded by a pale blue line (outer triangle of interspinous dorsal-fin membranes and edge of orbit not black in *E. diacanthus*)

It is widely distributed in the Indo-West Pacific area including South Africa, East Africa, Kenya the Red Sea, Socotra (Yemen), Seychelles, Aldabra Atoll, Comoros, Madagascar, La Pérouse, La Réunion, Chagos, Mauritius, Maldives, Oman, Lakshadweep, India and Sri Lanka; east to Indonesia, Marshall Islands and Pitcairn Group, north to Japan, Korea, south to Western Australia, New Caledonia, Tonga, Hawaii and Rapa (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). It is a Red Sea migrant to the eastern Mediterranean Sea off Lebanon and was introduced in the Canary Islands (Froese and Pauly, 2023). No specimen of this species was examined during the present study.

Epinephelus faveatus (Valenciennes, 1828)

This species is commonly known as barred-chest grouper and reported from Pakistan by Heemstra and Randall (1984, 1993), Hoda (1985, 1988), and Murray (1880). According to Froese and Pauly (2023), it is likely that its distribution is extended to Pakistan. It was originally described as *Serranus faveatus* from Mauritius and Sri Lanka by Valenciennes (1828). Its holotype is not known, however, the syntype is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023). Murray (1880) reported this species as *Serranus bontoo* which is considered to be a synonym of this species.

This species characteristically has a pale colour head, body, and fins which are covered with close-set brown spots of unequal size. It has four groups of two or three spots at the dorsal-fin base darker than other spots on the body. It has two oblique dark bands on the sides of the chest whereas its pectoral fins are dusky, with dark blotch at the base and faint dark spots.

This species is widely distributed in the Indo-West Pacific area including southern India, Sri Lanka, Myanmar, Cocos-Keeling Islands and Indonesia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). During the present study, no specimen of this species was examined.

Epinephelus flavocaeruleus (Lacepede, 1802)

This species is commonly known as blue and yellow grouper and reported from Pakistan by Froese and Pauly (2023), Heemstra and Randall (1984), Hoda (1985, 1988), Hussain (2003) and Jalil and Khalil (1972, 1981). It was originally described as *Holocentrus flavocaeruleus* from Mauritius by Lacepede (1802). Its holotype is not known; however, the neotype (MNHN A-5747) is housed in the Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023).

Its head and body are dark blue to bluish violet with occasionally small pale flecks or blotches. Some fish may have yellow front of the head. Its fins are yellow, but yellow areas may reduce with growth.

This species is known from Indian Ocean including South Africa, Madagascar, Comoros, Seychelles, Cargados Carajos and Rodriguez and Chagos Archipelago, Gulf of Aden Socotra (Yemen), Lakshadweep, Sri Lanka, Andaman Sea, Thailand, Malaysia and Indonesia. (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). During the present study, no specimen of this species was examined.

Epinephelus fuscoguttatus (Forsskal, 1775)

This species is commonly known as brown-marbled grouper. It was reported from Sindh by Day (1870, 1875), from Gharo Creek by Qureshi (2015) and Qureshi *et al.* (2013, 2020), and from Karachi by Nielsen (1960). It was reported from Pakistan coast without mentioning any specific location by Ahmad (1988), Ahmad and Niazi (1988), Bianchi (1985), Day (1870), Heemstra (2022), Heemstra and Randall (1984, 1993);

Hoda (1985, 1988), Hussain (2003), Mahmood, *et al.* (1999), Psomadakis *et al.* (2015) and Qureshi and Khatoon (2015). It was originally described as *Perca summana fuscoguttata* from Sams Pier, Jeddah, Saudi Arabia, Red Sea by Forsskal (1775). Its holotype is not known, however, neotype (USNM 147594) is housed in National Museum of Natural History, Washington D.C., U.S.A. (Frickle *et al.*, 2023). Day (1870, 1875) reported this species as *Serranus fuscoguttatus*.

Its body is pale yellow-brown and has five vertical series of irregular dark brown blotches. Its head, body and fins are covered with close-set brown spots; of which those on dark blotches are much darker than spots in between blotches. There is a small black saddle on the rear of the peduncle whereas there are two or three faint dark bars at the sides of the jaws.

It is widely distributed in the Indo-Pacific area including Red Sea, Socotra (Yemen), East Africa, Tanzania, Kenya, Mozambique, Madagascar, Comoros, Seychelles, Mascarenes (La Réunion, Mauritius, Rodrigues), Chagos, Maldives, Lakshadweep, Persian Gulf, Pakistan and India to Indonesia, Samoa and the Phoenix Islands, north to Japan, south to Australia. Unknown from the Persian Gulf, Hawaii, and French Polynesia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). According to IUCN Red List its conservation status is Near Threatened (NT) due to fishing pressure (Heemstra, 2022). During the present study, no specimen of this species was examined.

Epinephelus gabriellae Randall and Heemstra, 1991
(Fig. 11)

This species is commonly known as multi-spotted grouper and it is reported for the first time from Pakistan coast. It was originally described from the Eagles' Retreat, Oman, Arabian Sea, by Randall and Heemstra (1991). Its holotype (BPBM 33947) is housed in Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A. (Frickle *et al.*, 2023).

Its head and body are pale brownish-grey which is densely covered with close-set, dark orange-brown spots. The median and paired fins are spotted-like body whereas the median fins have white margins and a submarginal blackish zone. Its interorbital area is flat to slightly convex whereas the dorsal head profile with slight indentation above the nostrils. Its preopercle is angular, with enlarged serrae at the angle and a shallow notch just above the angle whereas the upper edge of the operculum is straight (Craig, *et al.*, 2011). It is generally confused with *Epinephelus chlorostigma*.



Fig. 11. *Epinephelus gabriellae*. Lateral view

This species is known from northwestern Indian Ocean including from East Africa (Somalia), Gulf of Aden, Socotra (Yemen) and southern Oman ((Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on March 07, 2009 (29 cm TL).
- 1 specimen collected from Karachi Fish Harbour on April 21, 2010 (34 cm TL).

Epinephelus hexagonatus (Forster, 1801)

(Fig. 12)



Fig. 12. *Epinephelus hexagonatus*. Lateral view

This species is commonly known as star-spotted grouper and it was reported from Pakistan by Day (1889), Heemstra and Randall (1984), Hoda (1985, 1988) and Zugmayer (1913). It was originally described as *Holocentrus hexagonatus* from Tahiti, Society Islands by Froster (1801), however, no type is known (Frickle *et al.*, 2023). Day (1889) and Zugmayer (1913) reported this species as *Serranus hexagonatus*.

The head, body, and fins of this species are characteristically covered with mostly hexagonal, close-set brown to red-brown spots with conspicuous white dots between them, pale interspaces forming a network. There are four or five blackish saddle blotches of darker spots dorsally on the body and peduncle, with the first four blotches extending onto the dorsal-fin base. The margin of the interspinous dorsal fin membranes with blackish-brown triangles and short white or pale yellow filaments behind each spine tip.

This species is widely distributed in the Indo-West Pacific area including East Africa (Kenya, Tanzania, Zanzibar, Mozambique), Aldabra Atolls (Seychelles), Comoros, Mozambique, Madagascar and Mascarenes (La Réunion, Mauritius, Rodrigues) east to Japan, Australia, Kiribati, Tahiti, New Caledonia and French Polynesia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected by Naik Muhammad (Observer WWF-Pakistan) from offshore water at Sapat on April 12, 2016 (37 cm TL).
- 1 specimen collected by Naseeb Rawa (Observer WWF-Pakistan) from offshore water at Gunz on March 7, 2018 (31 cm TL).
- 1 specimen collected from Karachi Fish Harbour on November 14, 2019 (22 cm TL).

Epinephelus jayakari (Boulenger 1889)

It is commonly known as Muscat grouper and mentioned to be possibly occurring in Pakistan by Psomadakis *et al.* (2015). It was originally described as *Serranus jayakari* by Boulenger (1889) from Muscat, Oman, Arabian Sea. Its holotype is not known, however, syntypes (skins BMNH 1888.12.29.32, 1888.12.29.33 and 1888.12.29.34) are housed in the British Museum, London, UK.

This species characteristically has truncated to slightly emarginated caudal fin in adults and rounded in juveniles. Its head and body are uniformly dark brown to bluish-grey and paler ventrally. It lacks dark spots on

the ventral part of the head and chest. Its fins are blackish brown whereas median fins are with narrow white margins.

This species was previously included in the synonym of *Epinephelus multinotatus* (Paxton *et al.* 1989; Randall and Heemstra 1991; Heemstra and Randall 1993; Randall 1995; Hoese *et al.* 2006), however, according to Frickle *et al.* (2023), Parenti and Randall (2020) and Heemstra (2022) *E. jayakari* is a valid species. *E. jayakari* can be distinguished from *E. multinotatus* in having bluish grey to brown head and body, with scattered irregular whitish spots and blotches (dark purplish grey, with scattered irregular whitish spots and blotches in *E. multinotatus*) and it lacks small dark spots on the lower part of head and body (many small dark reddish brown spots ventrally on head and body in *E. multinotatus*). During the present study, no specimen of this species was examined.

Epinephelus lanceolatus (Bloch, 1790)

(Fig. 13)

This species is commonly known as giant grouper. It was reported from Sindh by Aitken (1907), Anonymous (1955), Day (1875, 1889), Jenkins (1910), Murray (1880) and Heemstra and Randall (1984, 1993), from Karachi by Anonymous (1955), from Leth Nullah by Ahmad *et al.* (1985), Niazi and Moazzam (1999), from Paradise Point by Moazzam and Rizvi (1980), from Balochistan by Heemstra and Randall (1984, 1993) and Qureshi (1952). It was reported from the Pakistan coast without mentioning any specific location by Bianchi (1985), Heemstra (2022), Hoda (1985, 1988), Hussain (2003), Jalil and Khalil (1972, 1981), Misra (1962), Psomadakis *et al.* (2015) and Qureshi (1960, 1962, 1965). It was originally described as *Holocentrus lanceolatus* from Indian Ocean by Bloch (1790). Its holotype is not known, however, syntypes are housed in Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2023). Bianchi (1985), Hoda (1988), Hussain (2003), Heemstra and Randall (1984), Jalil and Khalil (1972, 1981), Moazzam and Rizvi (1980), Niazi and Moazzam (1999) and Qureshi (1960, 1965) reported this species as *Promicrops lanceolatus* whereas Aitken (1907), Day (1875, 1889), Jenkins (1910) and Murray (1880) referred it as *Serranus lanceolatus* and Hoda (1985) listed it as *Plectropomus lanceolatus*.

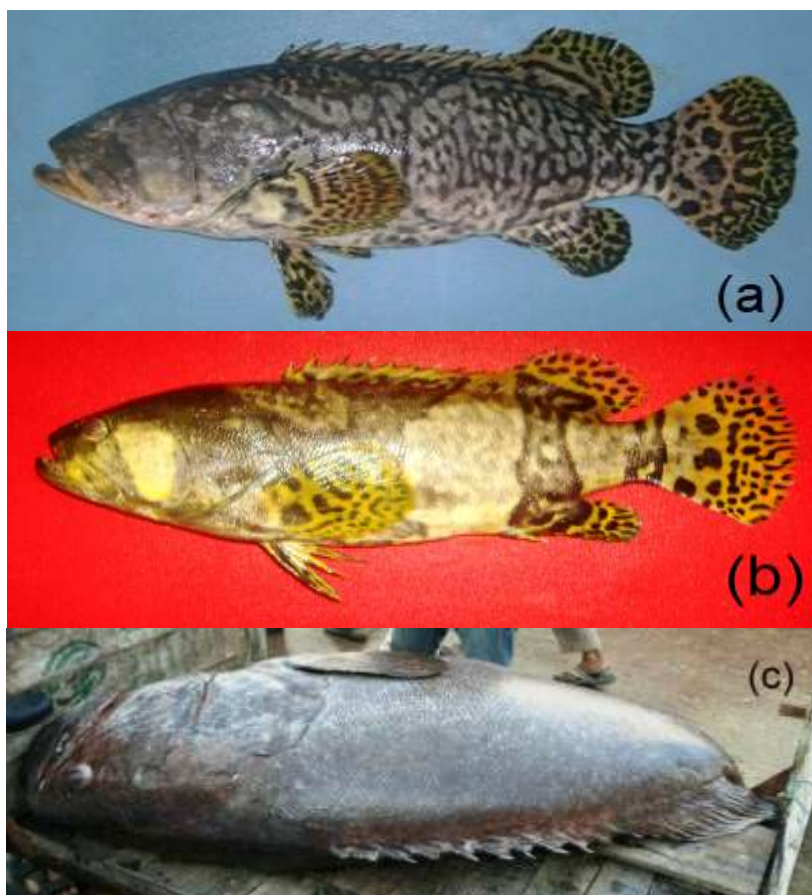


Fig. 13. *Epinephelus lanceolatus*. (a) Lateral view (51 cm); (b) Lateral view (34 cm); (c) Lateral view (227 cm).

This species characteristically has a robust body that is faintly mottled with dark brown whereas the fins are with many black spots. Large adults (160–230 cm TL) have brown with darker fins. Small juveniles (less than 15 cm) are yellow, with 3 irregular black areas, the first from spinous dorsal fin to belly and chest and extending onto the head, the second from the base of the soft dorsal fin to the anal fin and the last at base of the caudal fin.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa, Red Sea, Persian Gulf, Socotra (Yemen), Seychelles, Madagascar and western Mascarenes (La Réunion, Mauritius), Chagos Archipelago, Maldives, Lakshadweep, Oman, Pakistan to India and Sri Lanka; east to Indonesia, Japan, Australia, northern New Zealand, Tonga. Hawaiian Islands (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species is the largest and heaviest bony fish found in Pakistan and is considered commercially important in Pakistan. It is not abundant but still caught occasionally and exported mainly to the Persian Gulf countries. This species is caught with bottom-set gillnets, handlines, and longlines. There is an aimed handline fishery for this species based in Ormara (Balochistan) where large chunks of eel or squids are used as bait. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on January 20, 2008 (51 cm TL).
- 1 specimen collected from Karachi Fish Harbour on September 18, 2013 (34 cm TL).
- 1 specimen collected from Karachi Fish Harbour on November 14, 2013 (227 cm TL).
- 1 specimen collected from Karachi Fish Harbour on December 10, 2013 83 cm TL).

Epinephelus latifasciatus (Temminck and Schlegel, 1842)

(Fig. 14)

This species is commonly known as striped grouper. It was reported from Sindh by Day (1889), from Balochistan by Zugmayer (1913) and Mekran Coast by Niazi (1984). It was reported from the Pakistan coast without mentioning any specific location by Bianchi (1985), Froese and Pauly (2023), Heemstra and Randall (1984, 1993), Hoda (1985, 1988), Hussain (2003), Majid *et al.* (1992), Psomadakis *et al.* (2015) and Randall and Heemstra (1991). It was originally described as *Serranus latifasciatus* from Japan by Temminck and Schlegel (1842). Its holotype is not known, however, lectotype (RMNH D21) is housed in Rijksmuseum van Natuurlijke Historie, Leiden (Frickle *et al.*, 2023). Day (1889) and Zugmayer (1913) reported this species as *Serranus latifasciatus*.

The juveniles of this species are lavender-grey or pale brownish, shading to white ventrally and two black-edged white longitudinal bands; of which the upper band extending from above the eye to the anterior dorsal-fin rays, and the lower band from below the eye to the lower band from below the eye to the lower caudal-fin rays. There are black spots and streaks present on the dorsal and caudal fins. The head and body of large adults are uniformly grey (Craig *et al.*, 2011)

This species is known to be widely distributed in the Indo-West Pacific area including the Red Sea, Persian Gulf, Gulf of Oman, Pakistan, India, Sri Lanka, Vietnam, Hong Kong, China, Taiwan, Korea, southern Japan, Taiwan, New Guinea and northwest Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species is considered commercially important in Pakistan. It is among of the abundant grouper found along Pakistan's coast which is exported mainly to the Persian Gulf countries. This species is caught with bottom-set gillnets, handlines, and longlines. Juveniles are locally consumed. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on October 16, 2010 (21 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 20, 2014 (32 cm TL).
- 1 specimen collected by Muhammad Nisar (Observer WWF-Pakistan) from off Ghora Bari, Sindh (23°36.350'N; 66°47.667'E) on September 27, 2015 (21 cm TL)
- 2 specimens collected from Karachi Fish Harbour on March 3, 2017 (19 cm; 15 cm TL)
- 1 specimen collected from Karachi Fish Harbour on June 07, 2018 (92 cm TL).

- 1 specimen collected from Karachi Fish Harbour on February 11, 2021 (76 cm TL).

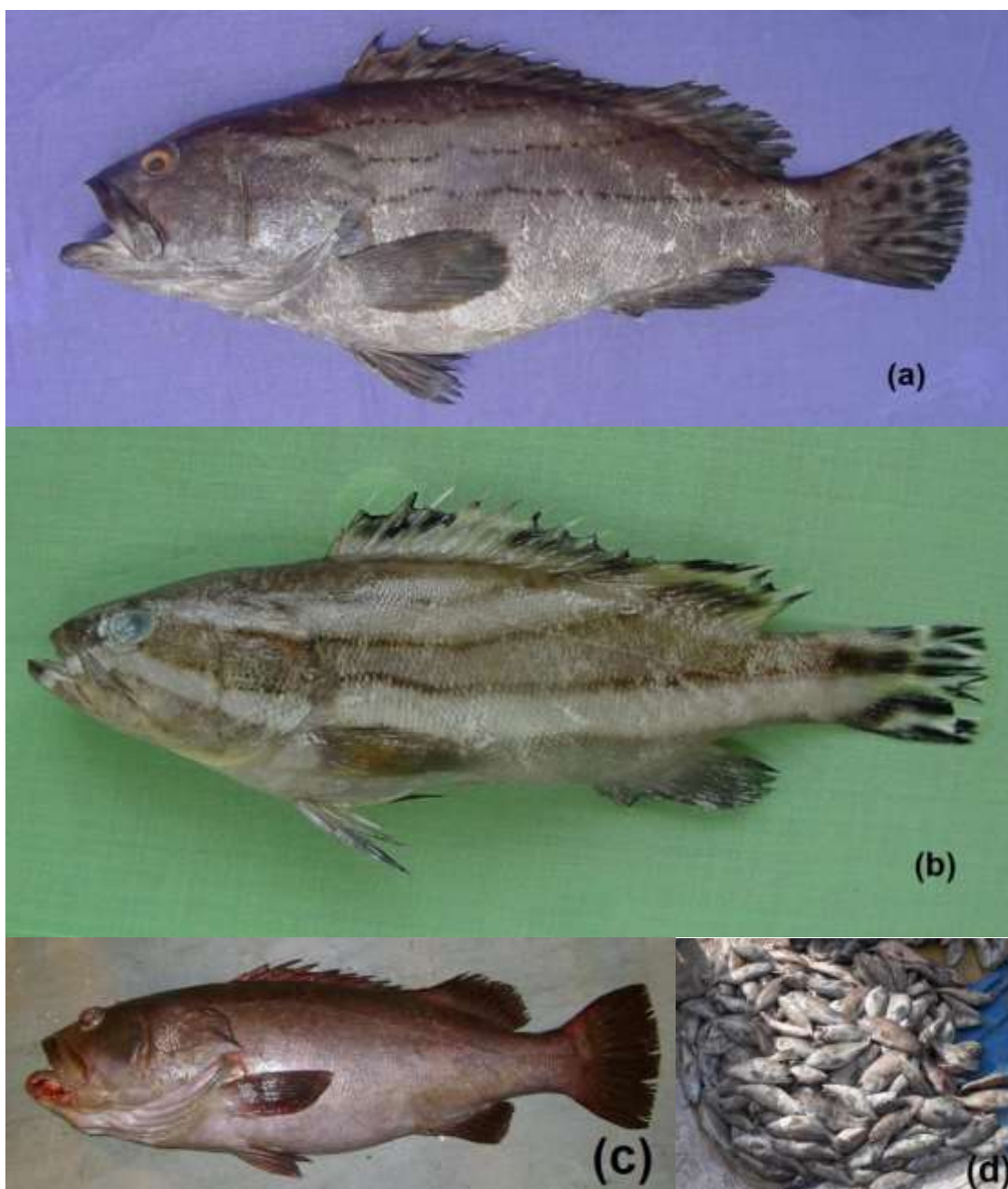


Fig. 14. *Epinephelus latifasciatus*. (a) Lateral view; (b) Juvenile 19 cm; (c) Large specimen 130 cm; (d) Commercial landings at Karachi Fish Harbour.

Epinephelus longispinis (Kner, 1864)
(Fig. 15)

This species is commonly known as lonspine grouper and reported from Pakistan by Heemstra and Randall (1984), Hoda (1985, 1988), Hussain (2003) and Jalil and Khalil (1972, 1981). It was originally described as *Serranus longipinis* from Madras, India by Kner (1864), however, its type is not known (Frickle *et al.*, 2023). It is reported by Hoda (1985, 1988), Jalil and Khalil (1972, 1981) as *E. fario* which is considered to be *nomen dubium* by Heemstra and Randall (1993). They (Heemstra and Randall, 1993) have also noted its absence from the Northern Arabian Sea and Persian Gulf.



Fig. 15. *Epinephelus longispinis*. Lateral view.

This species characteristically has greyish-brown colour with pale blotches. Its head has widely scattered brown spots whereas there are diagonally elongated spots on the body becoming more numerous posteriorly. Its dorsal fin with large dark blotches whereas white blotch on the upper operculum. It has a slightly rounded caudal fin.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa (Mozambique, Tanzania, Kenya), Seychelles, Aldabra Island, Comoros, Madagascar, western Mascarenes (La Réunion, Mauritius) Chagos Archipelago, Maldives, Lakshadweep, India and Sri Lanka east to Banda Sea and Indonesia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species can be of commercial importance in Pakistan but because of its extremely rare occurrence, it is seldom caught in exportable quantities. This species is, however, caught with bottom-set gillnets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Astola Island using monofilament net on December 11, 2008 (25 cm TL).

Epinephelus magniscuttis Postel, Fourmanoir and Guézé, 1963
(Fig. 16)

This species is commonly known as speckled grouper which is reported for the first time from Pakistan. It was described for the first time from Réunion Island, western Mascarenes, southwestern Indian Ocean by Postel, Fourmanoir and Guézé (1963). Its holotype (MNHN 1962-1296) is housed in the Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023).

This species characteristically has a pale brown body colour with small dark brown to greyish green spots unevenly scattered on the dorsolateral parts of the head and body, dorsal and caudal fin whereas one row of close-set spots runs posteriorly from the eye in a distinct line. There are no spots on the body below the level of the pectoral fins or on the anal and paired fins (Craig *et al.*, 2011; Heemstra, 2022).

This species is known from the Indo-West Pacific area including South Africa, southern Mozambique, Socotra (Yemen), Madagascar and western Mascarenes (La Réunion, Mauritius) east to the Philippines, Fiji and Tonga, north to Japan, south to New Guinea, eastern Australia and New Caledonia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species can be of commercial importance in Pakistan but of extremely rare occurrence it is seldom caught in exportable quantities. This species is caught with bottom-set gillnets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on November 5, 2010 (38 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 4, 2020 (54 cm TL).

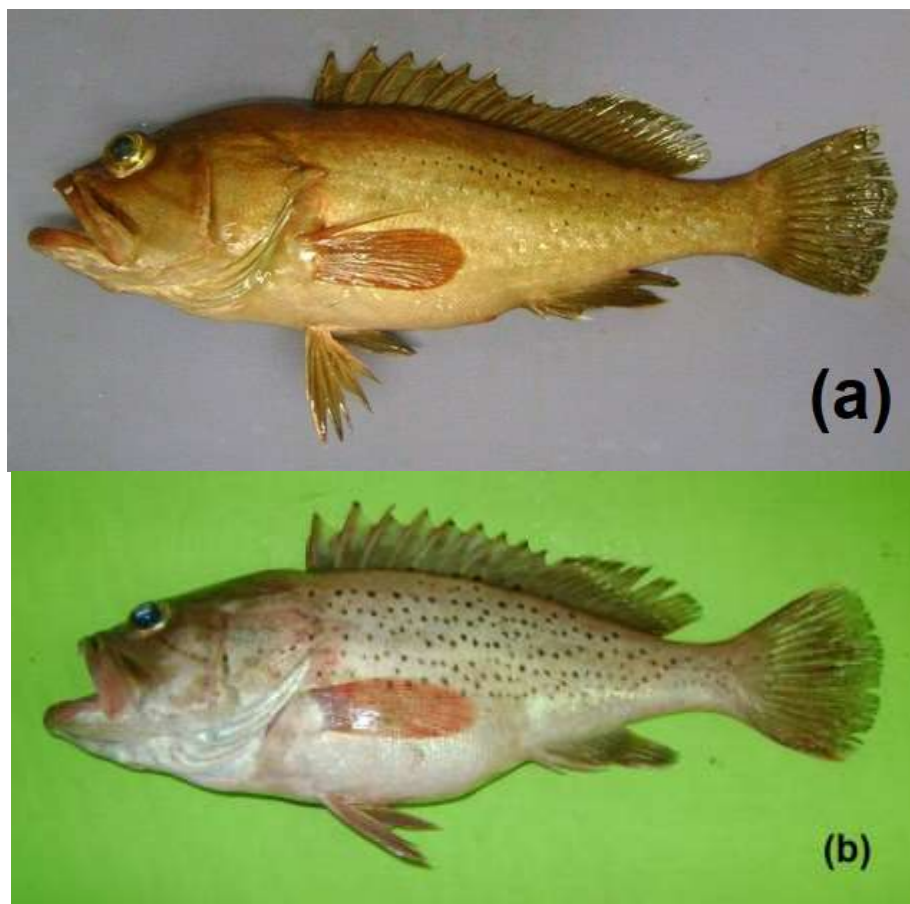


Fig. 16. *Epinephelus magniscuttis*. (a) Lateral view (38 cm) ; (b) Lateral view (54 cm)

Epinephelus malabaricus (Bloch and Schneider, 1801)

(Fig. 17)

This species is commonly known as Malabar grouper. It was reported from Sindh by Punwani (1934) and Sorely (1932) and from Leth Nullah by Ahmad *et al.* (1984) and Niazi and Moazzam (1999). It was reported from the Pakistan coast without mentioning any specific location by Ahmad and Niazi (1988), Ali (2002), Bianchi (1985), Heemstra and Randall (1984), Hoda (1985, 1988), Hussain (2003), Jalil and Khalil (1972, 1981), Majid *et al.* (1992) and Psomadakis *et al.* (2015). It was originally described as *Holocentrus malabaricus* from Tranquebar, India by Bloch and Schneider (1801). Its holotype (ZMB 190) is housed in Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2023). Punwani (1934) reported this species as *Serranus semipunctatus* whereas Sorely (1932) referred it as *Serranus salmonoides*. These two species are considered as synonyms of this species.

This species is characterized by having a light grey to yellowish brown colour with five slightly oblique dark brown bars that bifurcate ventrally and numerous small black spots and blotches in the head and body. Its fins are with scattered small black spots.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa, Socotra (Yemen), Seychelles, Comoros, Madagascar, western Mascarenes (La Réunion, Mauritius), Red Sea, Oman, Pakistan, India, Sri Lanka, east to Tonga, Palau, Yap, Fiji, north to Taiwan, Japan, south to Western Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). It is a Red Sea immigrant to the Mediterranean Sea. According to IUCN Red List its conservation status is Near Threatened (NT) due to fishing pressure (Heemstra, 2022).

This species is considered to be of high commercial importance in Pakistan. It is the second most common of the large groupers which is exported mainly to the Persian Gulf countries. Because of its large size and typical colouration, it fetches high prices in the export market. There is no specific aimed fisheries for this

species but it is caught with bottom-set gillnets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

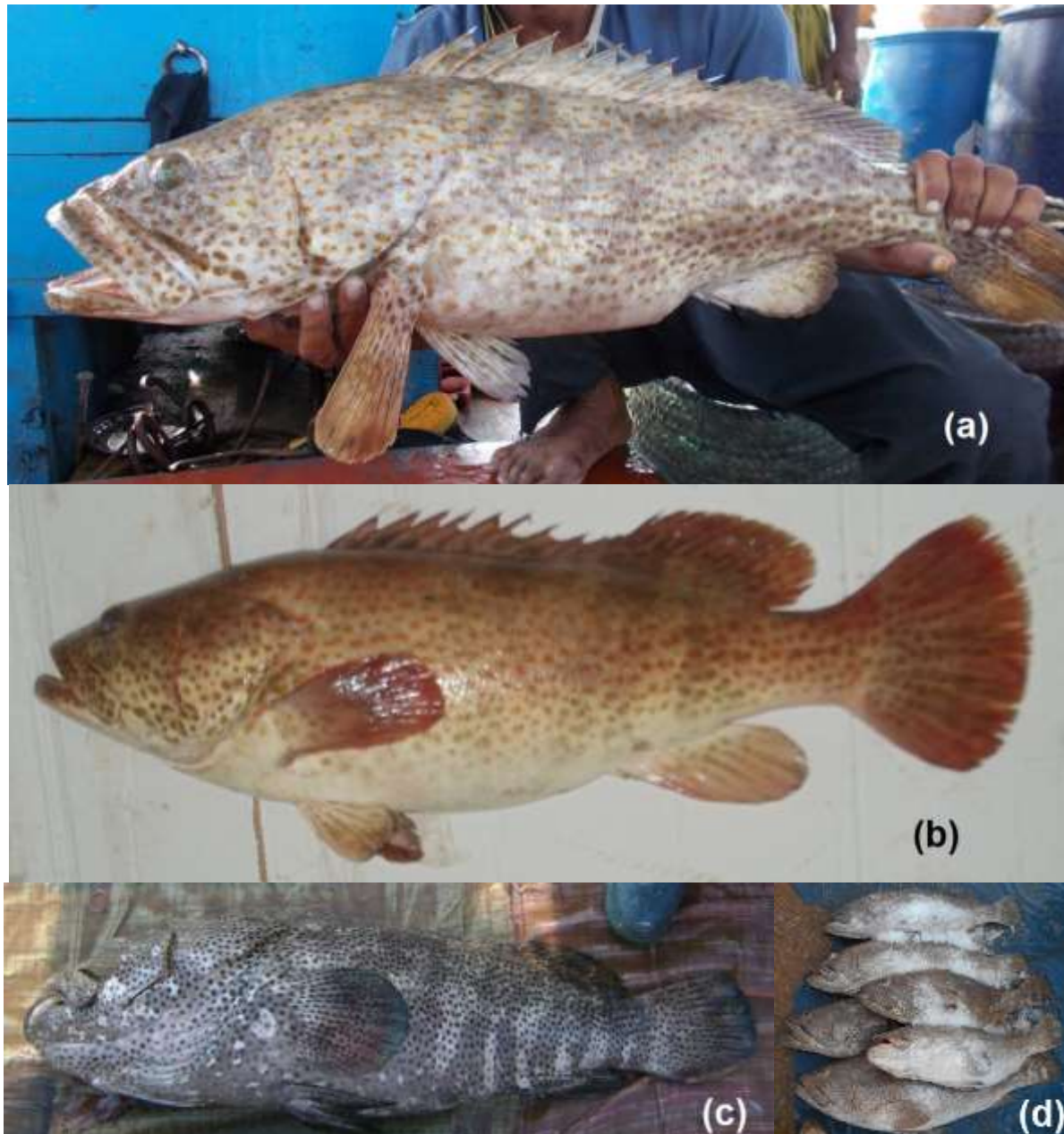


Fig. 17. *Epinephelus malabaricus*. . (a) Lateral view 63 cm; (b) Lateral view of large specimen 72 cm; (c) Large specimen 82 cm; (d) Commercial landings at Karachi Fish Harbour.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on October 25, 2008 (47 cm TL).
- 1 specimen collected from Karachi Fish Harbour on September 16, 2008 (27 cm TL).
- 1 specimen collected from Karachi Fish Harbour on June 20, 2013 (34 cm TL).
- 1 specimen collected from onboard R/V Firdous on February 2, 2015 (72 cm TL).
- 1 specimen collected by Naseeb Rawa (Observer WWF-Pakistan) from off Churna Island on September 29, 2016 (73 cm TL)
- 1 specimen collected from Karachi Fish Harbour on April 1, 2020 (112 cm TL).

Epinephelus melanostigma Schultz, 1953

This species is commonly called one-blotch grouper and was reported from Pakistan by Hoda (1985, 1988). It was described from the Reef off the Swains Islands, American Samoa, western Pacific by Schultz (1953). Its holotype (USNM 115375) is housed in the National Museum of Natural History, Washington D.C., U.S.A. (Frickle *et al.*, 2023).

This species is characterized by having numerous close-set polygon-shaped dark brown spots on the head, body, and fins. The spots on the ventral head and body are more spaced and reddish-brown whereas the spots on the head are gradually smaller anteriorly. A single large black blotch at the base of the last four dorsal-fin spines extends onto the midfin. Median and pelvic fins are with narrow white margins.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa (Mozambique), Comoros, Madagascar, western Mascarenes (La Réunion, Mauritius) and Chagos Archipelago east to Line Islands (Kiribati) and Cook Islands, north to Taiwan, south to Western Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Epinephelus merra Bloch, 1793

This species is commonly known as honeycomb grouper. It was reported from Sindh by Ahmed *et al* (1973), Anonymous (1955) and Murray (1880), from Churna Island by Ahmed and Wazarat (1993) from Karachi by Ahmad *et al.* (1973) and Anonymous (1955), from Makran by Ahmad *et al.* (1973) and Anonymous (1955). It was reported from Pakistan coast without mentioning any specific location by Ahmed (1996), Hoda (1985, 1988), Hussain (2003), Jalil and Khalil (1972, 1981) and Misra (1962). It was originally described from the Japan Sea (possibly Indian Ocean) by Bloch (1793). Its holotype is not known, however, lectotype (ZMB 8716) is housed in Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2023). Murray (1880) reported this species as *Serranus merra*.

The head, body, and fins of this species are pale and are covered with close-set or coalesced dark-brown or reddish-brown spots whereas the interspaces forming an irregular pale reticulum. Its pectoral fins are covered with distinct small black spots, largely confined to the rays which is considered as the best diagnostic character of this species.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa, the Seychelles, Comoros, Madagascar and Mascarenes (La Réunion, Mauritius, Rodrigues), Maldives and Lakshadweep, Indonesia east to Wake Atoll and Pitcairn Group, Tuamotu, north to Japan, south to Australia, New Caledonia, Tonga and Rapa (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). This species is not known from the Red Sea, Persian Gulf and coasts of the Asian mainland. No specimen of this species was examined during the present study.

Epinephelus morrhua (Valenciennes, 1833)

(Fig. 18)

This species is commonly known as comet grouper. It was reported from Pakistan by Bianchi (1985), Froese and Pauly (2023), Heemstra (2022), Heemstra and Randall (1984), Hoda (1985, 1988), Hussain (2003), Jalil and Khalil (1972, 1981) and Psomadakis *et al.* (2015). It was originally described as *Serranus morrhua* from Mauritius by Valenciennes (1833). Its holotype (MNHN 7431) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023).



Fig. 18. *Epinephelus morrhua*. Lateral view

This species characteristically has tan head and body with dark brown bands. The bifurcate band that begins at the rear edge of the eye has its upper branch extending to a dark brown saddle blotch on the nape just in front of the dorsal fin whereas the lower branch runs to the lower opercular spine and continues on the body as midlateral band that bifurcates above the pectoral fin; upper branch of this band running to a dark blotch at the base of third to seventh dorsal fin rays. There is a dark band that starts from the upper edge of the operculum to the base of the fifth to ninth dorsal fin spines. There is a narrow band from the lower edge of the eye to the pectoral fin base which continues as a broken band along the lower part of the body and curves up to the dorsal part of the peduncle. There is a broad band from the maxillary groove to the posterior end of the interopercle. In addition, small dark brown spots are often present in the pale areas between bands. Pectoral fins are hyaline yellow whereas other fins are generally unmarked.

This species is known to be widely distributed in the Indo-West Pacific area including South Africa, East Africa, Red Sea, Socotra (Yemen), Aldabra (Seychelles), Comoros, Madagascar and Mascarenes (La Réunion, Mauritius, Rodrigues) Maldives Chagos Archipelago, Gulf of Oman, Sri Lanka, elsewhere to Andaman Sea east to Cook Islands, north to Japan, south to Australia, Gilbert Island and Cook Island, New Caledonia, Tonga and Tuamotu Archipelago (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022)

This species can be of commercial importance in Pakistan but of rare occurrence. It is seldom caught in exportable quantities. This species is caught with bottom-set gillnets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Astola Island using monofilament net on December 11, 2008 (22 cm TL).
- 1 specimen collected from Karachi Fish Harbour on March 1, 2014 (31 cm TL).

Epinephelus multinotatus (Peters, 1876)

This species is commonly known as white-blotched grouper and reported from Pakistan by Heemstra and Randall (1984), Hoda (1985, 1988), Smith and Heemstra (1986) and Psomadakis *et al.* (2015). It was originally described as *Serranus multinotatus* from Mauritius by Peters (1876). Its holotype (ZMB 9452) is housed in Zoologisches Museum, Humboldt Universität, Berlin (Frickle *et al.*, 2023).

This species characteristically have dark purplish grey head and body with scattered irregular whitish spots and blotches and have many small dark red-brown spots on the lower part of the head and the body. Its pelvic fins are greyish black whereas median fins are with narrow white margins. Its anal, caudal and pectoral fins have spots basally whereas its caudal fin is truncated to slightly emarginated.

This species is widely distributed in the Indian Ocean including South Africa, East Africa (Mozambique, Tanzania, Kenya), Persian Gulf, Socotra (Yemen), Seychelles, Aldabra (Seychelles), Comoros, Madagascar, Saint Brandon's Shoals and Mascarenes (La Réunion, Mauritius, Rodrigues), Maldives, east to India and Myanmar (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). Possibly its distribution extended to Western Australia, from the specimens from that area lack brown spots and differ in scale counts and may be a different species (Heemstra, 2022).

Psomadakis *et al.* (2015) included this species in the list of species known from Pakistan based on the photographic record of an individual resembling this species. A re-examination of the same specimen revealed that it, no doubt, does not belong to the genus *Epinephelus*. It may be added that prior to Psomadakis *et al.* (2015), this species was also reported by a number of workers. Psomadakis *et al.* (2015) further pointed out that this species may be *Epinephelus jayakari* (Boulenger, 1889) which was previously considered as a synonym of *E. multinotatus*. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on February 12, 2014 (39 cm TL).
- 1 specimen collected from Karachi Fish Harbour on November 30, 2020 (43 cm TL).

Epinephelus ongus (Bloch, 1790)

This species is commonly known as white streaked grouper and was reported from Pakistan by Hoda (1985, 1988). It was originally described as *Holocentrus ongus* from Japan (?) by Bloch (1790). Its holotype is not

known, however, the lectotype (ZMB 5533) is housed in the Zoologisches Museum, Humboldt Universitat, Berlin (Frickle *et al.*, 2023).

This species characteristically has brown body, with numerous small white spots or horizontally elongated wavy white lines as well as several round or irregular pale blotches usually superimposed over small white spots. Its median fins have small white spots and streaks with the posterior margin blackish with a white edge whereas paired fins are greyish brown.

This species is widely distributed in the Indo-West Pacific area including East Africa (Mozambique, Tanzania, Kenya), Seychelles, Comoros, Madagascar east to Indonesia, Japan, Marshall Islands, Fiji, Tonga, New Caledonia north to southern Japan, south to Australia and New Caledonia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Epinephelus polylepis Randall and Heemstra, 1991

(Fig. 19)

This species is commonly known as small-scaled grouper and reported from Pakistan by Froese and Pauly (2023), Heemstra and Randall (1993), Randall and Heemstra (1991) and Psomadakis *et al.* (2015). This species was originally described from off Bahrain, Persian Gulf, by Randall and Heemstra (1991). Its holotype (BPBM 30580) is housed in the Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A. (Frickle *et al.*, 2023). This species is usually misidentified as *Epinephelus chlorostigma*.

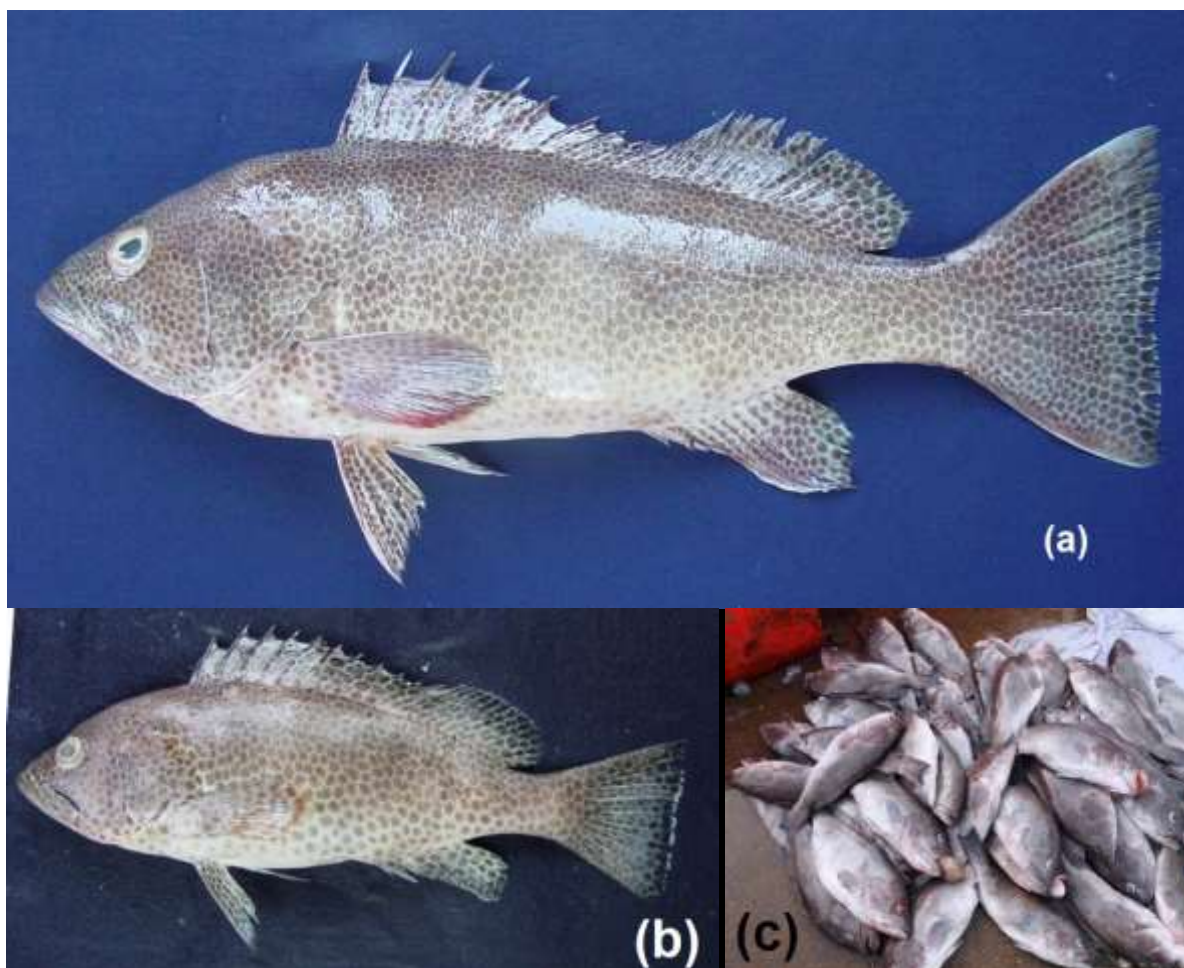


Fig. 19. *Epinephelus polylepis*. (a) Lateral view; (b) Lateral view with distinct white margin of caudal fin; (c) Commercial landings at Karachi Fish Harbour.

This species characteristically has a pale head, body and fins which are covered with numerous small close-set dark brown spots;. Spots on the fins and dorsal parts of the head and body are smaller and closer together

compared to those on the sides and ventrally. The rear edge of its caudal fin has a white line and a row of blackish-brown spots whereas a dark maxillary streak is present which is usually hidden by the maxilla.

This species is known from the Northwestern Indian Ocean including Gulf of Aden, Gulf of Oman and Persian Gulf and the west coast of India (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species is considered to be of high commercial importance in Pakistan. It is among the most common of the medium-sized groupers which are exported mainly to the Persian Gulf countries. Because of its typical coloration, it fetches high prices in the export market. There is no specific aimed fisheries for this species but it is caught with bottom-set gillnets, trawl nets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on January 11, 2007 (32 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 30, 2008 (23 cm TL).
- 1 specimen collected from Karachi Fish Harbour on April 17, 2009 (41 cm TL).
- 1 specimen collected from Karachi Fish Harbour on June 19, 2010 (28 cm TL).
- 1 specimen collected from Karachi Fish Harbour on November 2, 2013 (31 cm TL).
- 1 specimen collected from Karachi Fish Harbour on March 9, 2022 (49 cm TL).

Epinephelus quoyanus (Valenciennes, 1830)

This species is commonly known as longfin grouper and it was reported from Sindh by Sorley (1932) as *Serranus gilberti*. It was originally described as *Serranus quoyanus* from New Guinea by Valenciennes (1830). Its holotype (MNHN 7422) is housed in Museum National d'Historie Naturelle, Paris, France (Frickle *et al.*, 2023).

This species is characteristically has whitish colour head, body and fins which has numerous large close-set hexagonal to roundish dark brown to blackish spots.

It is reported from eastern Indian Ocean and western Pacific including Myanmar, Andaman Sea and Indonesia east to Philippines and New Guinea, north to Korea and southern Japan, south to Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023). Its report from Pakistan seems to be based on misidentification, as it is not known from western Indian Ocean including Arabian Sea. During present study no specimen of this species was examined.

Epinephelus radiatus (Day 1868)

(Fig. 20)

This species is commonly known as halfmoon grouper. It was reported from Pakistan by Heemstra and Randall (1984), Hoda (1985, 1988) and Psomadakis *et al.* (2015). It was originally described as *Serranus radiatus* from Near Madras, India by Day (1868). Its holotype (ZSI F1676) is housed in the Zoological Survey of India, Kolkata, India (Frickle *et al.*, 2023).

This species characteristically has a red-brown head and its body is a mottled pale-brown colour with five or six irregular dark brown bars on the body. Its caudal fin is dark brown with pale speckling. Its small juveniles are mostly dark green-brown, with dark-edged immaculate white markings but lack spots whereas fins are mostly hyaline white. Its juvenile (10–20 cm SL) are dark brown, with black-edged paler bands enclosing many black spots. Small adults (20–40 cm SL) are buff, with 5 oblique dark-edged pale bands with dark spots mainly in series in the middle of the band. Large adults (>40–50 cm SL) have dark-edged bands replaced by a series of dark spots whereas their dorsal fin and most of the caudal fin also covered with dark spots.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa, Socotra (Yemen), Comoros, Madagascar, western Mascarenes (La Réunion, Mauritius), Gulf of Oman, India, Sri Lanka, Red Sea and Gulf of Aden, India, Sri Lanka, east to Tonga, north to Japan, south to Australia and New Zealand (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species is of commercial importance in Pakistan but because of its rare occurrence, it is seldom caught in exportable quantities. Small quantities of this species especially larger specimens are exported to the Persian Gulf countries. This species is generally caught with bottom-set gillnets, trawl nets, handlines, and longlines. During the present study, a number of specimens of this species were examined.



Fig. 20. *Epinephelus radiates*. (a) Lateral view; (b) Juvenile (13 cm) with distinct marking; (c) Commercial landings at Karachi Fish Harbour.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on March 10, 2007 (12 cm TL).
- 1 specimen collected from Karachi Fish Harbour on January 27, 2009 (23 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 12, 2011 (33 cm TL).
- 1 specimen collected from Karachi Fish Harbour on September 21, 2018 (11 cm TL).

Epinephelus stoliczkae (Day, 1875)

(Fig. 21)

This species is commonly known as epaulet grouper. It was reported from Sindh by Ahmad *et al* (1973), Anonymous (1955), Bauchot *et al* (1984), Day (1875, 1889), Frickle *et al.*, (2023), Heemstra and Randall (1984, 1993), Randall and Ben-Tuvia (1983), Randall and Heemstra (1991), Sorley (1932) and Whitehead and Talwar (1976), from Karachi by Ahmad *et al.* (1973) and Anonymous (1955), from Balochistan by Anonymous (1953), Heemstra and Randall (1984, 1993) and Zugmayer (1913), from Astola Island by Anonymous (2000b) and Randall and Heemstra, 1991) and from Makran by Ahmad *et al.* (1973) and Anonymous, 1955). It was reported from Pakistan coast without mentioning any specific location by Anonymous (2000a), Froese and Pauly (2023), Heemstra (2022), Hoda (1985, 1988), Lieske and Myers (1994), Psomadakis *et al.* (2015) and Qureshi (1952, 1962). It was originally described as *Serranus stoliczkae* from coast of Sindh, Pakistan by Day (1875). Its holotype is not known, however, lectotype (ZSI 1679) is housed in the Zoological Survey of India, Kolkata (Frickle *et al.*, 2023). Day (1889), Sorley (1932) and Zugmayer (1913) reported this species as *Serranus stoliczkae*

This species characteristically have a yellowish-grey head and body that also have dark orange-red or reddish brown spots except ventrally and posteriorly. There are two dark grey bars running anteroventrally from the base of the dorsal fin whereas a dark saddle blotch is present on the caudal peduncle. Its fins are generally yellowish brown whereas posterior margin median fins have broad yellowish

This species is reported from the western Indian Ocean including Red Sea, Gulf of Suez, Gulf of Aden, Socotra (Yemen), Gulf of Oman, Persian Gulf, northwestern Indian Ocean to the coast of Pakistan (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species is considered to be of high commercial importance in Pakistan. It is among the common of the large groupers which is exported mainly to the Persian Gulf countries. Because of its large size and typical colouration, it fetches high prices in the export market. There is no specific aim for the fisheries for this species but it is caught with bottom-set gillnets, trawl nets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

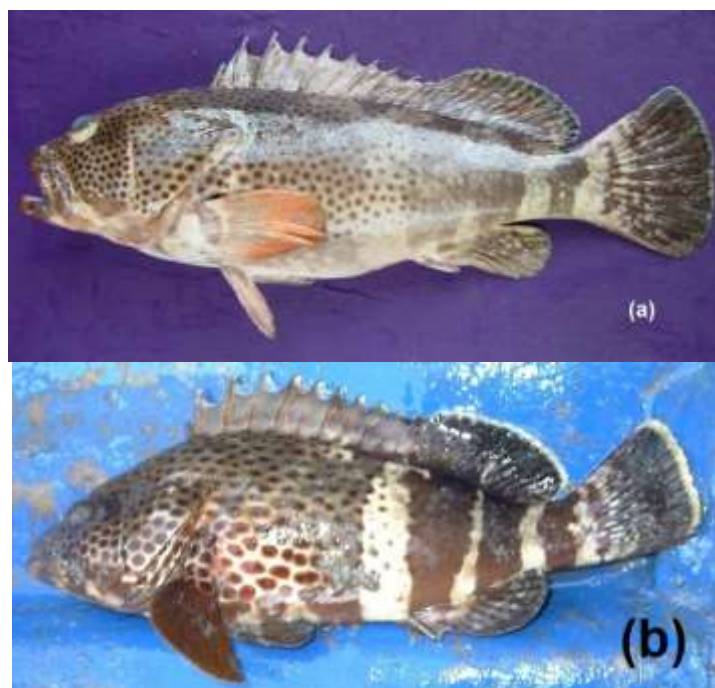


Fig. 21. *Epinephelus stoliczkae*. (a) Lateral view 54 cm; (b) Lateral view juvenile 16 cm.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on January 11, 2005 (27 cm TL).
- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on October 16, 2010 (31 cm TL).
- 1 specimen collected from Karachi Fish Harbour on April 4, 2013 (24 cm TL).
- 1 specimen collected from Karachi Fish Harbour on October 2, 2013 (27 cm TL).
- 1 specimen collected by Naik Muhammad (Observer WWF-Pakistan) from offshore water at Sapat on April 13, 2016 (63 cm TL).
- 1 specimen collected from Karachi Fish Harbour on November 13, 2017 (39 cm TL).

Epinephelus tauvina (Forsskal, 1775)

This species is commonly known as greasy grouper. It was reported from Sindh by Anonymous (1955) and Heemstra and Randall (1984), from Karachi by Anonymous (1955, 1999) and Niazi, 2001), from Makran by Anonymous (1955) and Qureshi (1952). It was reported from the Pakistan coast without mentioning any specific location by Ahmad (1988), Ahmad and Niazi (1988), Bianchi (1985), Froese and Pauly (2023), Hoda (1985, 1988), Hussain (2003), Jalil and Khalil (1972, 1981), Majid *et al.* (1992), Misra (1962) and Qureshi (1960, 1962, 1965). It was originally described as *Perca tauvina* from Jeddah, Saudi Arabia, Red Sea by Forsskal (1775). Its holotype (ZMUC P43565) is housed in Zoological Museum, University of Copenhagen, Denmark (Frickle *et al.*, 2023).

This species characteristically pale greenish grey or brown head and body that have round dark spots that vary from dull orange-red to dark brown which have centres that are darker than the edges. A large black blotch is often visible on the body at the base of the last four dorsal-fin spines. There may be five sub-vertical dark bars present on the body. Dark spots on the soft dorsal, caudal and anal fins of juveniles are so close that the pale interspaces form a white reticulum. Margins of anal, pectoral and caudal fins are often white.

This species is known from the Indo-West Pacific area including South Africa, East Africa, Kenya, Red Sea, Persian Gulf, Seychelles, Comoros, Madagascar and Mascarenes (La Réunion, Mauritius, Rodrigues), Chagos, Maldives and Lakshadweep east to Wake Atoll and Pitcairn Group, north to southern Japan, south to Australia and Rapa (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). There are reports of its migration to the eastern Mediterranean Sea which may possibly be based on misidentification of *Epinephelus coioides*. The reports from Pakistan may also be possible misidentification of other species such as *E. malabaricus* and *E. coioides* etc. Heemstra and Randall (1993) have not recorded this species from the Northern Arabian Sea. No specimen of this species was examined during the present study.

***Epinephelus tukula* Morgans, 1959**
(Fig. 22)

This species is commonly known as potato grouper. It was reported from Sindh by Murray (1880), and from Goth Jaffar, Karachi by Anonymous (1993). It was reported from the Pakistan coast without mentioning any specific location by Bianchi (1985), Froese and Pauly (2023), Heemstra (2022), Heemstra and Randall (1984), Hoda (1985, 1988), Hussain (2003), Psomadakis *et al.* (2015) and Randall and Heemstra (1991). It was originally described from Mafia Island, Tanzania by Morgans (1959). Its holotype is housed in the East African Marine Fisheries Research Organization (Frickle *et al.*, 2023). Murray (1880) reported this species as *Serranus dispar*.

This species characteristically has a pale brown-grey body that is covered with widely spaced dark blotches which are mostly larger than the eye. These blotches are round to oval or dumbbell-shaped. Its head usually has smaller dark spots and streaks; of which many radiate from the eyes. There are dark spots on the fins which are larger basally.

This species is widely distributed in the Indo-West Pacific area including South Africa, East Africa, Seychelles, Comoros, Madagascar, western Mascarenes (La Réunion, Mauritius), Red Sea, Gulf of Aden, , Oman to Pakistan, India and Sri Lanka, east to Papua New Guinea, north to Japan, south to Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

This species is considered to be of high commercial importance in Pakistan. It is among the most common of the large groupers which is exported mainly to the Persian Gulf countries. Because of its large size, it fetches high prices in the export market. There is no specific aim for the fisheries for this species but it is caught with bottom-set gillnets, trawl nets, handlines, and longlines. During the present study, a number of specimens of this species were examined.

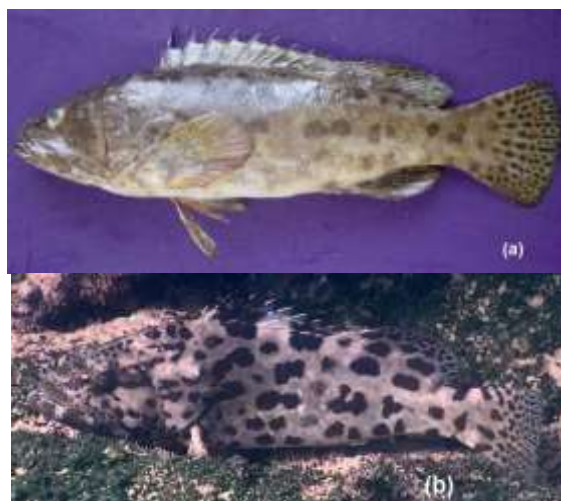


Fig. 22. *Epinephelus tukula*. (a) Lateral view; (b) Underworld photo from Churna Island (courtesy Shabeeb Asghar)

Material Examined

- 1 specimen collected from Karachi Fish Harbour on January 11, 2005 (27 cm TL).
- 1 specimen collected from onboard R/V Dr. Fridtjof Nansen on October 16, 2010 (31 cm TL).
- 1 specimen collected from Karachi Fish Harbour on April 4, 2013 (24 cm TL).

1 specimen collected from Karachi Fish Harbour on October 2, 2013 (27 cm TL).

Epinephelus undulosus (Quoy and Gaimard, 1824)

It is commonly known as wavy-lined grouper which is reported from Pakistan by Bianchi (1985), Heemstra and Randall (1984), Hoda (1985, 1988), Hussain (2003), Misra (1962), Psomadakis *et al.* (2015) and Qureshi (1960, 1965). It was originally described as *Bodianus undulosus* from Waigeo, Indonesia; Rawak Island, Bismarck Archipelago by Quoy and Gaimard (1824), however, no type is known (Frickle *et al.*, 2023).

It characteristically has purplish to brown-grey head, body and fins and has brown to golden-brown dots on the head, wavy longitudinal lines and some dots of the same colour on the upper body whereas the margin of the interspinous dorsal fin narrowly blackish.

This species is widely distributed in the Indo-West Pacific area including East Africa (Kenya, Somalia), Gulf of Aden, Socotra (Yemen), Gulf of Oman, Lakshadweep Islands and Maldives, India, Sri Lanka. The Andaman Islands east to Indonesia, Sarawak (Malaysia), the Philippines and New Guinea, Solomon Islands, north to Taiwan (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). No specimen of this species was examined during the present study.

Genus *Hyporthodus* Gill 1861b
Hyporthodus octofasciatus (Griffen, 1926)
(Fig. 23)



Fig. 23. *Hyporthodus octofasciatus*. Lateral view.

This species is commonly known as eightbar grouper and reported from Pakistan by Heemstra (2022) and Psomadakis *et al.* (2015). It was originally described as *Epinephelus octofasciatus* by Griffin (1926) from Arid Island, off the northeastern coast of Great Barrier Island, Auckland District, New Zealand. Its holotype (AIM MA 259) is housed in the Australian Museum (Frickle *et al.*, 2023).

This species characteristically has a buff body with 8 broad dark brown bars. It has blackish-brown pelvic fins and distal half of the soft dorsal and anal fins. There are faint dark bands from the eye to the middle opercle spine whereas there is a blackish streak on the maxilla.

This species is known from Indo-West Pacific area including South Africa, East Africa, Gulf of Aden, Yemen, Persian Gulf, Socotra (Yemen), Madagascar and western Mascarenes (La Réunion, Mauritius), Chagos Archipelago, Maldives, Pakistan, India, Sri Lanka east to Marquesas Islands (French Polynesia), north to Japan, south to Rottneest Island (Western Australia), New Caledonia, northern New Zealand, Kermadec Islands and Tonga (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

It is a rare species and during the present study, only one specimen of this species was examined.

Material Examined

- 1 specimen collected from Karachi Fish Harbour on May 27, 2013 (19 cm TL).

Genus *Plectropomus* Oken 1817
Plectropomus pessuliferus Fowler, 1904

This species is commonly known as roving coral grouper which was reported from Pakistan by Heemstra and Randall (1984), Hoda (1985, 1988) and Qureshi (1960a, 1965). It was originally described from Padang, Sumatra, Indonesia by Fowler (1904). Its holotype (ANSP 27546) is housed in Academy of Natural Sciences, Philadelphia, Pennsylvania, U.S.A. (Frickle *et al.*, 2023).

This species characteristically have brown to orange-red body and fins which has numerous small dark-edged blue spots. There are 5–12 spots behind and below the centre of the eye to the edge of preopercle whereas some spots are on the sides of the body of adults. Its eyes are narrowly rimmed blue whereas pectoral-fin rays are uniformly pale and the caudal-fin margin is sometimes narrowly whitish.

This species is widely distributed in the Indo-Pacific area including Red Sea, Zanzibar, Maldives, St. Brandon's Shoals, Sri Lanka, Chagos Archipelago, Mauritius, Nazareth Bank, Maldives, Sumatra, Indonesia, Tonga and Fiji (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022). Its subspecies, *Plectropomus pessuliferus marisburi* occurs in the Red Sea, while *Plectropomus pessuliferus pessuliferus* is known from the Indo-Pacific region (Froese and Pauly, 2023). No specimen of this species was examined during the present study.

Genus *Variola* Swainson, 1839
Variola louti (Forsk., 1775)
 (Fig. 24)



Fig. 24. *Variola louti*. Lateral view.

This species is commonly known as yellow-edged lyretail and was reported from Pakistan by Heemstra and Randall (1984) and Hoda (1985, 1988). It was originally described as *Perca louti* from Jeddah, Saudi Arabia or Luhaiya, Yemen, Red Sea by Forsskal (1775). Its holotype (ZMUC P43566) is housed in the Zoological Museum, University of Copenhagen, Denmark (Frickle *et al.*, 2023).

This species has an oblong body, its depth less than its head length. Its preopercle is rounded and finely serrate whereas opercle has three flat spines with the upper edge of the operculum almost straight. The colour of the head, body, and median fins is yellowish brown to orange-red with numerous small round or elongated spots of blue or pink. The rear margin of the median fins is broadly yellow and the pectoral fin rays are red to brown, its distal third is abruptly yellow with an irregular black band along the dorsal part of the body ending below the rear of the dorsal fin and continuing on the head as three irregular black spots. A black blotch is present at the base of upper caudal-fin rays. The head and body with small pale blue to pink spots whereas a pale yellow or white stripe is mid-dorsally on the head from tip of the lower jaw to the dorsal-fin origin.

This species is widely distributed in Indo-Pacific including the Red Sea, Oman, Arabian Sea, East Africa, Socotra (Yemen), to South Africa, Madagascar, Comoros, Seychelles, Mascarenes (La Réunion, Mauritius, Rodrigues), Chagos Archipelago, Maldives, Lakshadweep, India, Sri Lanka, Andaman Islands, Indonesia, Philippines, Japan, Marshall Islands, Society Islands, Rapa (French Polynesia), Pitcairn Islands and Australia (Froese and Pauly, 2023; Frickle *et al.*, 2023; Heemstra, 2022).

Material Examined

- 1 specimen collected from Karachi Fish Harbour on August 17, 2023 (58 cm TL).

DISCUSSION

Groupers are considered to be important marine fishes that are not only consumed locally, but also support a large export market of the Persian Gulf area. While groupers are generally included in the family Serranidae (subfamily Epinephelinae). Based on molecular evidence, Smith and Craig (2007) suggested elevating the status of subfamily Epinephelinae to Family Epinephelidae. In Pakistan, the family Epinephelidae is represented by 8 genera and 47 species. Genus *Epinephelus* Bloch, 1793 was found to be most diversified and represented by 32 species followed by the genus *Cephalopholis* Bloch & Schneider, 1801 with 9 species whereas other genera, including *Aethaloperca* Fowler, 1904, *Chromileptes* Swainson, 1839, *Dermatolepis* Gill, 1861, *Hyporthodus* Gill, 1861, *Plectropomus* Oken, 1817 and *Variola* Swainson, 1839 are represented by one species each in Pakistan.

Most species of the genus *Epinephelus* are of commercial importance and commonly found in the demersal ecosystem whereas three species including speckled grouper (*Epinephelus magniscuttis*), multi-spotted grouper (*Epinephelus gabriellae*) and smooth grouper (*Dermatolepis striolata*) are reported for the first time from Pakistan. *Cephalopholis* and *Variola* are two genera which include colourful species and are represented by only a few specimens caught mainly by bottom-set gillnetting.

The study revealed that spinycheek grouper (*E. diacanthus*) is the most dominating species of grouper found in Pakistan which is found throughout the year and mainly caught by trawling, gillnetting and longlining. Malabar grouper (*E. malabaricus*), orange-spotted grouper (*E. coioides*), striped grouper (*Epinephelus latifasciatus*) and small-scaled grouper (*Epinephelus polylepis*) are also found in substantially large quantities and also exported from Pakistan. In addition to their commercial importance, groupers play an important role in the demersal ecosystem in coastal waters as well as on the continental shelf area.

Of the groupers reported from Pakistan, three species including *Epinephelus bleekeri*, *E. fuscoguttatus* and *E. malabaricus* are considered to be Near Threatened (NT) according to IUCN Red List Assessment which is attributed to excessive fishing pressure on these species.

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