



**Identification Key of Philippine Groupers, Family Serranidae:  
Epinephelinae, Tribe**

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**Abstract**

Forty (40) noteworthy species of groupers belonging to 6 genera of the tribe Epinephelini, subfamily Epinephelinae, family Serranidae were identified based on specimens obtained from several localities (Iloilo City, Cebu City, Camarines Norte, Batangas), wet markets of the National Capital Region (Manila, Quezon City, and Paranaque City), and the grouper collection of the Philippine National Museum. The species identified were *Anyperodon leucogrammicus*, *Cephalopholis aurantia*, *C. boenak*, *C. cyanostigma*, *C. formosa*, *C. micropion*, *C. miniatus*, *C. leopardus*, *C. sexmaculata*, *C. sonnerati*, *C. urodeta*, *Cromileptes altivelis*, *Epinephelus areolatus*, *E. bleekeri*, *E. coeruleopunctatus*, *E. chlorostigmata*, *E. coioides*, *E. corallicola*, *E. fasciatomaculosus*, *E. fasciatus*, *E. fuscoguttatus*, *E. hexagonatus*, *E. maculatus*, *E. malabaricus*, *E. melanostigma*, *E. merra*, *E. morrhua*, *E. ongus*, *E. polypekadion*, *E. quoyanus*, *E. sexfasciatus*, *E. spilotoceps*, *E. tauvina*, *E. undulosus*, *Plectropomus areolatus*, *P. Leopardus*, *P. maculatus*, *P. oligacanthus*, *Variola albimarginata*, and *V. louti*. Each species is redescribed based on diagnostics characters of color and coloration, meristics, and metrics, and each is photographed, and treated in taxonomic keys. Nomenclature of species-taxa is based primarily on Randall and Heemstra (1999). Problems of synonymies and misidentifications were discussed and resolved based also on Randall and Heemstra (1999). As a result of the study, seven instances of synonymies, misidentifications, and misspellings were noted and 9 outdated names were recommended for revision of Herre's (1953) Checklist of Philippine Fishes. Finally, 14 new records of groupers are added to the collection of the Philippine National Museum namely: *Cephalopholis formosa*, *C. sexmaculata*, *C. sonnerati*, *Epinephelus bleekeri*, *E. corallicola*, *E. coioides*, *E. fuscoguttatus*, *E. malabaricus*, *E. maculatus*, *E. melanostigma*, *E. polyphekadion*, *Plectropomus areolatus*, *P. oligacanthus*, and *Variola albimarginata*.

## I. Introduction

The serranid fishes of the subfamily Epinephelinae are commonly known as groupers or rock cods; they are of considerable economic importance, especially in the coastal fisheries of tropical and subtropical areas. The Epinephelinae are generally demersal fishes inhabiting a wide range of habitats from the shoreline or shallow coastal waters, sea grass beds and mud or sandy bottoms; however, most of them are found in the coral reefs and rocky bottoms. In addition, these fishes occur in depths of 100 to 200 meters (occasionally to 500 m); on the other hand, the majority inhabits depths less than 100 m, and the juveniles are often in tide-pools or estuaries (Heemstra & Randall 1993; Myers 1991; Smith & Heemstra, 1990).

Their size ranges from small to very large (8 to 270 cm), but most species are less than 50 cm. Most of them are solitary and territorial and may be recognized by their color patterns, which are useful field characters. In addition, all are predators feeding on crustaceans, on small fishes, and occasionally on cephalopods. They are protogynous hermaphrodites, beginning life as females and then later, changing sex to spawn as males (Heemstra & Randall, 1999; Smith & Heemstra, 1990; Broad, 2003; Schroeder, 1980).

Spawning in groupers is typically seasonal and synchronized by moon phase (Myers, 1991). Peak seasons are variable in different provinces (most with 1-2 peak seasons, some with 3-4 seasons per day depending on rainfall/annum). Peaks are mostly June to December or October to November and April to May. Since groupers are territorial fishes, they spawn in aggregate in a certain location. They become vulnerable to overfishing and hence, are exploited by fisher folks who catch them in large number (Heemstra and Randal, 1993).

Many groupers are of considerable importance in the commercial, sport, and artisanal fisheries of tropical and subtropical seas. A few species are used in aquaculture; *Epinephelus coioides*, *E. malabaricus*, *E. akaara*, and *Cromileptes altivelis*. Several species are commonly used in cage-culture operations, thus having their economic importance. It has been estimated that 90% of the world's harvest of marine food is derived from artisanal fisheries, and groupers are major component of the artisanal fisheries resource (Randall & Heemstra, 1991).

Species of groupers have so frequently been misidentified, even in recent years as those of the Epinephelinae. This taxonomic confusion is particularly unfortunate because of the commercial importance of many of these fishes. Not

infrequently, biological and fisheries data have been reported under erroneous specific names of the fishes. The principal reasons for the nomenclatural ineptitude are the species themselves; many are difficult to differentiate from their close relatives. Another reason is the paucity of specimens of many of the species, especially the larger ones in museums. Most lots in museum consist of only 1 or 2 specimens and also, there has been a tendency for field workers to retain only small specimens of the larger species. This is due to the higher cost of larger specimens (if purchased from fishermen or markets); furthermore, the difficulty of preserving and transporting big specimens, and the awareness that proper museum containers for storing large fishes may not be available. Therefore, there are often insufficient large specimens to properly diagnose a species (Randall & Heemstra, 1993).

## II. Methodology

### A. Research locale

The specimens used in the study were obtained by the investigator from Talin Bay, Batangas, from wet markets in the National Capital Region (Manila City, Paranaque City, and Quezon City), and wet markets in Iloilo City and Cebu City. Also included in the study were groupers in the collection of the Philippine National Museum. For the collection in Talin bay, the fishes were caught using the hand net trap and spear.

The study is limited to the tribe Epinepheline of the subfamily Epinephelinae. The data for the study were limited to available specimens brought directly from the wet markets of the aforementioned places and from the preserved specimens of the Philippine National Museum. The researcher was accompanied by expert ichthyologists in the likes of Dr. Kent Carpenter and Dr. Reynaldo M. dela Paz to assist in the taxonomic descriptions & to verify the existence of the grouper in the said areas. The testimonials of the fishermen and fish vendors were also taken into account on the occurrence of the specimens in the vicinity. In addition, preserved specimens from the Philippine National Museum were restudied and re-described. The researcher used the preserved samples based on the account of the researchers who collected the specimens

### B. Preservation of fishes

The fishes collected by the researcher were preserved using ten parts water to one part of 40 percent formaldehyde by weight. For bigger specimens, a higher concentration was used (8 parts water to 1 part formaldehyde). For large

specimens, an incision was made in the belly to insure the penetration of the preservative. The fishes were fixed in formalin solution for at least one week. Afterwards, the specimens were washed by soaking them in water for at least two days, and then transferred in 70% alcohol.

### C. Identification of specimens

The most important characteristic for a quick identification of species is the color and color pattern or coloration of the fish. For this purpose, the investigator consulted the colour plates of the family Serranidae, based on photographs of freshly-caught specimens prepared by J.E. Randal for the FAO species Identification Guide for Fishery Purposes (Heemstra & Randall *in* Carpenter & Niem, 1999).

For verification of the initial identification, the writer then consulted the re-descriptions of species in the works of Randall and Heemstra (1999), Heemstra and Randall (1993), and Heemstra and Randall (*in* Carpenter & Niem, 1999).

For the analysis of species that look alike, the investigator consulted the key of Heemstra and Randall (*in* Carpenter & Niem, 1999). In using the key, other characters (metric and meristics) were also taken into account. Nomenclature of species-taxa is based primarily on Heemstra and Randall (*in* Carpenter & Niem, 1999).

## III. Results and Discussion

A total of forty (40) species of groupers were identified including problems of synonymy and misidentification of closely similar species-taxa, doubtful identification in the grouper collection of the Philippine Museum, outdated species names and additional records for the checklist of Philippine fishes.

### A. Problems of synonymy and misidentification of closely similar species-taxa

**Example 1** *C. micropion* is a wide-ranging species occurring in the Tropical Eastern Indian Ocean and Western Pacific. *C. boenak* is “primarily continental in its distribution, occurring from Kenya to Southern Mozambique and eastwards to the Western Pacific. It is not known from the Red Sea, Persian Gulf nor the islands of Micronesia or Polynesia except for Palau” (Heemstra & Randall *in* Carpenter & Niem, 1999).

Many authors tend to confuse the two species together on account of their great similarity. However, the presence of black-edged blue ocelli on the head and front of body clearly distinguishes micropion from boenak (Heemstra & Randall *in* Carpenter & Niem, 1999)

In Rau and Rau's (1980) account of the fishes of the Central Visayas, the two species of interest hereto were named *Cephalopholis boenak* and *C. pachycentron*. It will be noted, however, that *C. pachycentron* is considered a junior synonym of *C. boenak* (see Heemstra & Randall, 1993). Therefore, *C. pachycentron* is invalidated.

De la Paz et al. (1987) had called attention to an ambiguity in Rau and Rau's (1980) account of the groupers, that is, concerning their description of *C. pachycentron*. Their statement "head and front of body sometimes with black-edged blue ocelli" gives the impression that the species under consideration could in fact be *C. micropion* and not *C. pachycentron*, which is a junior synonym of *C. boenak*. In effect, two species-taxa are involved but they tend to be confused as one.

On the other hand, there appears to be something wrong in the illustration of the fish labelled *C. boenak* in Rau and Rau (1980). Thus, it appears to this writer that based on the coloration, the fish illustrated and labelled *C. boenak* in Rau and Rau (1980) is in fact *C. formosa* (Shaw & Nodder, 1812) (cf. Heemstra & Randall *in* Carpenter & Niem, 1999 p.2478), in which the species is authenticated in the present species account.

**Example 2** *E. coioides* (Hamilton 1822), *E. malabaricus* (Bloch & Schneider, 1801), *E. tauvina* (Forskål, 1775). In general coloration, there is a great similarity among these three species. *E. coioides*, *E. tauvina*, and *E. malabaricus* look quite alike in the presence of dark spots on head, body, and fins, but the spots are reddish brown or brownish orange in *E. coioides*, and blackish brown and much smaller in *E. malabaricus*. *E. tauvina* has dull orange red to dark brown spots on head, body, and fins, but the spots on head are progressively smaller anteriorly. Moreover, there is a noteworthy presence of a black blotch (or group of black spots) at the base of the last four dorsal fin spines.

On account of the great similarity in the general color and coloration, the three species are frequently synonymised or misidentified among themselves. Although the three species are widely divergent from each other when fully adult, the problem is that the three species tend to look alike in their general coloration in the

post juvenile stages (cf. Heemstra & Randall *in* Carpenter & Niem, 1999).

Heemstra and Randall in Carpenter and Niem, 1999 stated that *E. tauvina* has “no verifiable records” from the Philippines and among other neighboring localities. *E. Tauvina* has extensive record in many Philippine localities according to Herre (1953); however, he used the common name “Malabar grouper” for the species, which makes one doubt if the species has been confused with *E. Malabaricus*.

In this study, there is one quite positive record of *E. Malabaricus* (from Divisoria market) and another quite positive record of *E. Tauvina* in the National Museum (NMI 11861 from Antique). On other hand, *E. coioides* is not listed at all in Herre (1953), although the species listed as *E. nebulosus* (Valenciennes 1828) appears to be the junior synonym of *E. coioides* (Hamilton 1822).

As far as the data at hand are concerned, this study sets the record for the genuine occurrence of the three species namely: *E. coioides*, *E. malabaricus*, and *E. tauvina* matter that is not quite clear in the reports of previous researchers.

**Example 3** *E. sexfasciatus* is a wide-ranging Indo-Pacific grouper according to Heemstra & Randall, (1999) and Carpenter & Niem, (1999). *E. diacanthus* is a northern Indian sister species of *E. sexfasciatus*. Both species are listed in Jordan and Richardson (1910) and Herre (1953). However, there is reason to doubt the record for *E. diacanthus* on account of its disjunct distribution. It would appear therefore that *E. sexfasciatus* and *E. diacanthus* are geographic counterparts (vicariants) of each other and could not, in principle, be sympatric, as the Philippine record would show.

### A. Outdated species names in the checklist of Philippine Fishes

During the operation of this research in the Philippine National Museum, the researcher encountered specimens with dubious labels, on account of misidentification, synonymy, and/ or misspelling.

**Table 1. Summary-list of groupers with obsolete labels in the collection of the Philippine National Museum**

Erroneous or outdated species name	NMI nos.	Replacement name	Remarks
<i>Cephalopholis kendalli</i> (Evermann and Seale 1907)	530 & 761	<i>Cephalopholis cyanostigma</i> (Valenciennes 1828)	Juniorsynonym
<i>Cephalopholis urodetus</i> & <i>Epinephelus urodetus</i> (Forster 1801)	4474 & 2655	<i>Epinephelus urodetus</i> (Forster 1801)	Juniorsynonym
<i>Epinephelus caeruleopunctatus</i> (Bloch 1790)	11863 & 3760	<i>Epinephelus coeruleopunctatus</i> (Bloch 1790)	Misspelling

<i>Epinephelus megachir</i> (Richardson 1846)	1134 & 5893	<i>Epinephelus quoyanus</i> (Valenciennes 1828)	Juniorsynonym
<i>Epinephelus pachycentron</i> & <i>Cephalopholis pachycentron</i> (Valenciennes 1828)	1044 & 5893	<i>Cephalopholis boenak</i> (Valenciennes 1828)	Juniorsynonym
<i>Epinephelus summana</i> (non Forskål 1775)	3870, 48523, 4651 & 12449	<i>Epinephelus ongus</i> (Bloch 1790)	Misidentification
<i>Cephalopholis urodeta</i> (Forster 1801)	1446	<i>Epinephelus undulosus</i> (Quoy and Gaimard 1824)	Misidentification

In addition, the author has also noted ambiguities in the names of some species of groupers listed in Herre's (1953) checklist on account of synonymy and/or misidentification. Eleven of these aforesaid species are mentioned in this paper.

**Table 2. List of binomens that have been outdated by reasons of synonymy and/or misidentification**

Outdated names	Replacement names
<i>Cephalopholis pachycentron</i> (Valenciennes 1828)	<i>Cephalopholis boenak</i> (Valenciennes 1828)
<i>Cephalopholis urodeta</i> (Valenciennes 1828)	<i>Cephalopholis urodeta</i> (Valenciennes 1828)
<i>Cephalopholis kendalli</i> (Evermann and Seale 1907)	<i>Cephalopholis cyanostigma</i> (Valenciennes 1828)
<i>Cephalopholis maculatus</i> (	<i>Cephalopholis miniata</i> (Forskål 1775)
<i>Epinephelus nebulosus</i> (Valenciennes 1828)	<i>Epinephelus coioides</i> (Hamilton 1822)
<i>Plectropomus truncatus</i> (Fowler and Bean 1930)	<i>Plectropomus areolatus</i> (Rüppell 1830)
<i>Epinephelus summana</i> (Forskål 1775) – Valid name but dubious record	<i>Epinephelus ongus</i> (Bloch 1790)
<i>Epinephelus megachir</i> (Richardson 1846)	<i>Epinephelus quoyanus</i> (Valenciennes 1828)
<i>Epinephelus diacanthus</i> (Valenciennes 1828) – Valid name but dubious record	<i>Epinephelus sexfasciatus</i> (Valenciennes 1828)
<i>Cephalopholis boenack</i> (Bloch 1790)	<i>Cephalopholis boenak</i> (Bloch 1790) – Valid orthography
<i>Epinephelus caeruleopunctatus</i> (Bloch 1790)	<i>Epinephelus caeruleopunctatus</i> (Bloch 1790) – Valid orthography

## B. Additional records for the Checklist of Philippine fishes

One of the fruitful outcomes of this research is the establishment of new records of epinepheline groupers with verifiable specimens. These specimens originated from this writer's original collections.

**Table 3. List of additional species-taxa with verifiable records but no records in the Philippine National Museum**

1. *Cephalopholis formosa* (Shaw and Nodder 1812)
2. *Cephalopholis sexmaculata* (Rüppell 1830)
3. *Cephalopholis sonnerati* (Valenciennes 1828)
4. *Epinephelus bleekeri* (Vaillant 1877)
5. *Epinephelus coioides* (Hamilton 1822)
6. *Epinephelus corallicola* (Valenciennes 1828)
7. *Epinephelus fuscoguttatus* (Forskål 1775)

8. *Epinephelus malabaricus* (Bloch & Schneider 1801)
9. *Epinephelus maculatus* (Block 1790)
10. *Epinephelus melanostigma* (Schultz 1953)
11. *Epinephelus polyphkadion* (Bleeker 1849)
12. *Epinephelus areolatus* (Rüppell 1830)
13. *Plectropomus oligacanthus* (Lacépède 1802)
14. *Variola albimarginata* (Baissac 1952)

The 14 species-taxa enumerated in table 3 are those without verifiable specimens in the Philippine National Museum, however, some of them have been cited in the species accounts of Fishbase. It is probable that many more species-taxa remain for identification if studies are to be conducted on more expanded and more extensive collections.

#### IV. Summary, Conclusion, and Recommendations

A total of forty (40) species of groupers to 6 genera, namely, *Anypserodon* (1 species), *Cephalopholis* (10), *Epinephelus* (22), *Plectropomus* (4), and *Variola* (2) were identified based on examination of 146 specimens collected from the different localities (Iloilo City, Cebu City, Camarines Norte, Bicol), from wet markets in the National Capital Region (Paranaque City, Quezon City, and Manila City), and including the collection of groupers in the Philippine National Museum.

Each species is re-described based on diagnostic characters of colors and coloration, meristics, and metrics and each is named based on the nomenclature adopted by Heemstra & Randall (1999) for the fishes of the Western Central Pacific (Vol. 4). Problems of synonymies and misidentifications were resolved. Based on the opinions of Heemstra & Randall (1999), it is concluded that 7 specimens in the collection of the Philippine Museum are misidentified or outdated, while 11 binomens listed in Herre's (1953) Checklist of Philippine Fishes are outdated or made obsolete by reason of synonymy, invalid orthography, and dubious record.

Finally, 14 new records of groupers are added to the collection of the Philippine National Museum namely: *Cephalopholis formosa* (Shaw & Nodder 1812), *Cephalopholis sexmaculata* (Rüppell 1830), *Cephalopholis sonnerati* (Valenciennes 1828), *Epinephelus bleekeri* (Vaillant 1877), *Epinephelus corallicola* (Valenciennes 1828), *Epinephelus coioides* (Hamilton 1822), *Epinephelus fuscoguttatus* (Forsskal 1775), *Epinephelus malabaricus* (Bloch & Schneider 1801), *Epinephelus maculatus* (Bloch 1790), *Epinephelus melanostigma* (Schultz 1953), *Epinephelus polyphkadion* (Bleeker 1849), *Plectropomus areolatus* (Rüppell 1830), *Plectropomus oligacanthus* (Lacépède 1802) and *Variola albimarginata* (Baissac 1952).

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