



Studies on Some Aspects of Distribution and Biochemical Composition of Eight Fish Species of Serranidae Family from Vasishta Godavari Estuary

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ABSTRACT

In the current study eight Serranidae family fish species were identified from the Vasishta Godavari estuary. Keeping in view of nutritional point, in this study we have conducted experiments on the proximate composition of the recorded species belongs Serranidae family. Minimum moisture (74.66±1.34%) in Epinephelus areolatus was observed and the maximum (77.84±1.21%) was recorded in Epinephelus quoyanus. Minimum protein (16.89±0.57%) in Epinephelus quoyanus was recorded and the maximum (19.02±0.44%) was noticed in Epinephelus areolatus. Minimum carbohydrate (0.7±0.002%) in Epinephelus lanceolates was recorded and the maximum (1.4±0.007%) was noticed in Epinephelus diacanthus. Minimum lipid (1.6±0.21%) in Epinephelus malabaricus was recorded and the maximum (2.2±0.16%) was noticed in Epinephelus lanceolates. Minimum ash (2.67±0.22%) in Epinephelus quoyanus was observed and the maximum (3.22±0.17%) was recorded in Epinephelus latifasciatus. It is evident from the present findings that the Serranidae family fish species may be very good choice for protein diet, those suffering from protein energy malnutrition.

Keywords: Proximate composition, protein, lipid.

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INTRODUCTION

Gopal and Chauhan [1] studied the biodiversity of fish fauna in Sundarban mangrove ecosystem. Brindaet al., [2] investigated the diversity of fin fish larvae of Vellar estuary and they recorded 45 species of juveniles belonging to 34 genera. Rashed-Un-Nabiet al., [3] studied the temporal and spatial distribution of fish fauna in the Bakkhali River estuary of Bangladesh. Behera et al., [4] studied ichthyo-faunal diversity of Bahuda estuary, Odisha. They observed 25 species under 2 classes, 6 orders and 18 families. Krishnan and Mishra [5] described 312 numbers of species; these include fresh water and estuarine varieties. Rathod and Khedkar [6] described the fish diversity of Godavari River with reference to elevation, latitude and longitude, 53 species of fish belonging to 9 orders, 21 families and 37 genera were reported. Further Rankhamb [7] described 26 species of fish belonging to 5 orders, 7 families and 15 genera for River Godavari. In the present study an attempt has been made to evaluate the diversity and distribution of Serranidae fish fauna from the Vasishta Godavari Estuary. Serranidae fish species have very good nutritional components; hence in this study we have conducted experiments on the proximate composition of the recorded species.

MATERIAL AND METHODS

In the current study we have used the Serranidae family fishes. The fishes were identified by following the identification procedures mentioned in standard books [8-10]. The Serranidae family fishes were procured from Vasishta Godavari, Andhra Pradesh, Antarvedi. The collected fish samples were brought to laboratory of Department of Zoology, S.V.K.P. and Dr. K.S. Raju Arts and Science College (A), Penugonda,

West Godavari for analysis. The identified fishes were thoroughly cleaned with deionized water to remove any adherent particles on the skin. Then the specimens were carefully dissected and muscle tissue in good condition was separated and same was used for the experimentation. Known amount of the tissue was taken for the estimation of proximate composition in fishes.

Biochemical Analysis

The moisture content of the sample was analyzed by drying the samples in a hot air oven AOAC [11]. The protein and lipid contents of the fishes were performed by following the method of Lowry *et al.*, [12] and Folchet *et al.*, [13] respectively. Total Carbohydrate content was determined according to the method of Dubois *et al.*, [14]. The ash content was determined according to the method of AOAC [15].

Study Area Description

The River Godavari is the second largest in India, flows about 1465 Km, transverses the states of Maharashtra and Andhra Pradesh and opens into the Bay of Bengal on the east coast of India. It has a catchment area of about 3, 12,812 Sq. Km, which lies in the states of Maharashtra, Madhya Pradesh, Karnataka, Orissa and Andhra Pradesh. Originating at Triambak which is about 110 Km. north-east of Mumbai on the west coast, it receives several small tributaries and assumes imposing proportions towards its lower reaches. The River Godavari enters Andhra Pradesh and flows south-east, at Rajahmundry, it is about 3.2 Km, wide and further down at the head of the delta near Dhowleswaram, a masonry Dam (1857) and recently a barrage (1970) was constructed in four sections across the river. At Dhowleswaram which is approximately about 90 Km from the sea, the river divides into two principal branches namely the Vasistha Godavari to the west and Gowtami Godavari to the east. The Vasistha Godavari in turn branches at Ayodhyalanka into two sub-branches namely Vasistha Godavari to the west and Vainateya Godavari to the east both opening into the Bay of Bengal independently. Vasistha Godavari opens into the sea at Antervedi and Vainateya Godavari opens at Odalarevu. The Gowtami Godavari flows south-east and opens into the Bay of Bengal at two places south of Yanam, namely Kottapalem and Bhairavapalem villages. The Gautami Godavari is also connected to the big Kakinada Bay by two channels namely the Coringa arising at Yanam and the Gaderu arising at Bhairavapalem. The remaining two branches of the Godavari i.e. middle one, Vaintheya branch opens at Vodalareru (near Amalapuram) without forming any swampy-mangrove habitats, while the southernmost branch, Vasistha opens into the Bay of Bengal at Antervedi, near Narsapur town (west bank), where good mangrove formations were seen earlier to 1980. The estuarine waters of this branch extends upto about 15 Km upstream to Narsapur.

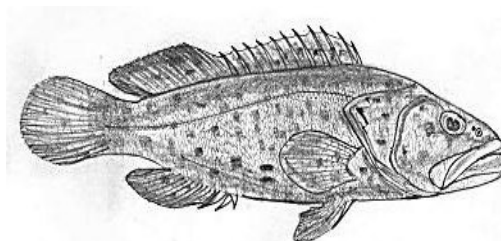
RESULTS AND DISCUSSION

Family: Serranidae

Operculum bearing 3 spines-a main spine with one below and one above it. Lateral line complete and continuous, not reaching onto caudal fin (lacking in one species). Dorsal fin may be notched, with 7-12 spines. Three spines on anal fin. Caudal fin usually rounded, truncate, or lunate, rarely forked. Tip of maxilla exposed even with mouth closed. No scaly axillary pelvic process. One spine on pelvic fin, soft rays 5. Branchiostegal rays usually 7. Vertebrae 24-26. Monoecious with some functional hermaphrodites; groupers are protogynous hermaphrodites. Anthiinae are mostly small colorful planktivores feeding primarily on tiny crustaceans and fish eggs. They change sex from females to a few dominant males. Despite their attractive colors they need zooplankton as food. Groupers attain up to 3 m maximum length and weights of up to 400 kg. They are bottom-dwelling predators and highly commercial food fish. Grammistinae get their name from a bitter tasting skin toxin, grammistin, which can kill other animals.

Distribution: Tropical and temperate oceans. Some enter fresh water.

Epinephelus malabaricus (Bloch & Schneider, 1801)



Holecentrus malabaricus Bloch & Schneider, 1801

Cephalopholis malabaricus (Bloch & Schneider, 1801)

Epinephelus malabarica (Bloch & Schneider, 1801)

Holocentrus salmoides Lacepede, 1802.

Genus: *Epinephelus*

Species: *malabaricus*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
12/17	-	19	1/5	3/9	15

TL	SL	HL	Sn.L	E.D	HOB	PDL	PD.SC	LL.SC	LL.V.SC
17.7	14.9	5.0	1.2	0.8	4.2	2.1	19	90	19

Description: Body is flattened. Inter-orbital space is flat, the maxilla extends to below the posterior edges of the orbit, opercle with three spines, the central one is being the longest. Scales are ctenoid type. There are about 15 rows of scales between the 6th dorsal spine and the lateral line. Body is brownish, fading to grey or dirty white on abdomen, brown spots appears on the body.

Common name: Malabar grouper.

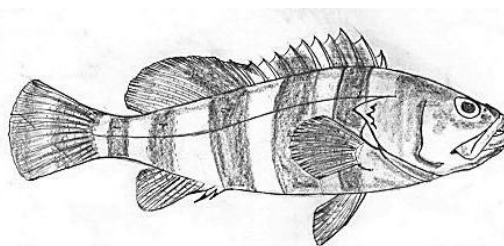
Habit and habitat: Marine, brackish, reef associated.

Economic importance: Highly commercial.

Status and Conservation: Near threatened (NT) IUCN Red list.

Distribution: Indo-Pacific.

***Epinephelus diacanthus* (Valenciennes, 1828)**



Serranus diacanthus Valenciennes, 1828

Epinephelus dayi Bleeker, 1874

Genus: *Epinephelus*

Species: *diacanthus*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
11/15	-	18	1/5	3/8	15

TL	SL	HL	Sn.L	E.D	HOP	PDL	PD.SC	LL.SC	LL.V.SC
23.5	18.5	8.2	1.7	1.6	7.5	6.0	59	76	36

Description: Body is an elongated, there are 11 dorsal spines, anal spines are 3 in number, Anal soft rays are 8 in number. Mouth is superior; shape of lateral body is fusiform. Maxilla reaches to below the hind edge of the orbit. Two canines are present on both sides of jaw. Scales are ctenoid type. Six vertical blotches are present.

Common name: Spiny cheek grouper

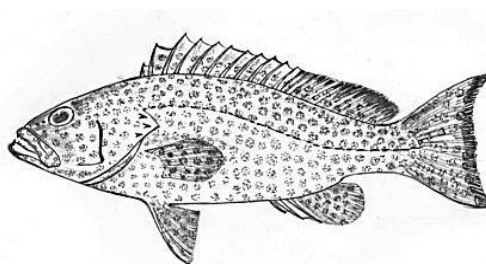
Habit and habitat: Marine, demersal

Economic importance: Commercial

Status and Conservation: Near threatened (NT) in IUCN Red list

Distribution: Indian Oceans, Western Pacific.

***Epinephelus areolatus* (Forsskal, 1775)**



*Percaareolata*Forsskal,1775
Epinephelus angularis (Valenciennes,1828)
Serranus celebicus Bleeker,1851

Genus: *Epinephelus*

Species: *areolatus*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
11/16	-	16	1/5	3/9	19

TL	SL	HL	Sn.L	E.D	HOB	PDL	PD.SC	LL.SC	LL.V.SC
23.5	19.2	8.0	2.2	1.6	7.1	7.1	60	75	-

Description: Body is moderately elongated, there are 11 dorsal spines, anal spines are 3 and anal soft rays are 9 in number, body is grey to whitish color with numerous close-set orange to brown spots. Narrow white margin is present on tail, body scales are ctenoid, truncate caudal fin is present. Rounded dark spots present all over the body.

Common name: Areolate grouper.

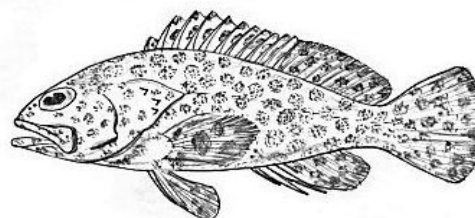
Habit and habitat: Marine, reef-associated.

Economic importance: Commercial

Status and Conservation: Not evaluated in IUCN Red list

Distribution: Indo-Pacific, South Africa, Japan Northern Australia.

***Epinephelus quoyanus*(Valenciennes, 1830)**



*Serranusmegachir*Richardson,1846*Epinephelusgi*

lberti(Richardson,1842)

*Serranusquoyanus*Valenciennes,1830

Genus: *Epinephelus*

Species: *quoyanus*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
11/17	-	18	1/5	3/8	20

TL	SL	HL	Sn.L	E.D	HOB	PDL	PD.SC	LL.SC	LL.V.SC
18.2	16.0	6.0	1.2	1.3	7.0	5.5	-	80	-

Description: Body is an elongated and laterally flattened, Pre-operculum with a convex, finely serrated edge and a wide shallow notch above its angle. Teeth are in narrow bands and present in 2 series on sides of jaws, canines are present at front of jaws. Dorsal fin with 11 spines, pectoral fins are broad and slightly longer than head without snout. Snout sub-equal to eye diameter. Caudal fin is rounded. Body is pale brown in colour and has numerous circular markings. Breast has a W-shaped mark.

Common name: Longfin grouper

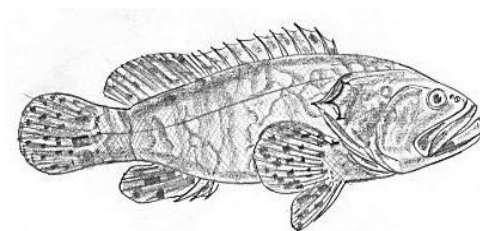
Habit and habitat: Marine, reef associated.

Economic importance: Commercial

Status and Conservation: Least concern (LC) in IUCN Redlist

Distribution: Western Pacific, Japan to Australia.

***Epinephelus lanceolatus* (Bloch, 1790)**



Holocentrus lanceolatus Bloch, 1790

Promicrops lanceolatus (Block, 1790)

Serranus lanceolatus (Block, 1790)

Serranus geographicus Valenciennes, 1828

Genus: *Epinephelus*

Species: *lanceolatus*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
11/15	-	19	1/5	3/8	15

TL	SL	HL	Sn.L	E.D	HOB	PDL	PD.SC	LL.SC	LL.V.SC
19.3	16.3	5.6	2.2	1.4	6.3	6.6	-	96	-

Description: Body elongated, pale colored blotches are present on body. Dorsal head profile is convex. Inter-orbital area is slightly convex. Axillary scales present on body. There are 2 dorsal fins present, 3 anal spines are present. Dorsal fin spines of large individuals increase in size from front to back. It is the largest of all coral reef dwelling bony fishes. Body is dark grey color with pale blotches. Cycloid scales are present on the body. Small canine teeth at front of jaws. Scales in lateral line series are 96.

Common name: Giant grouper

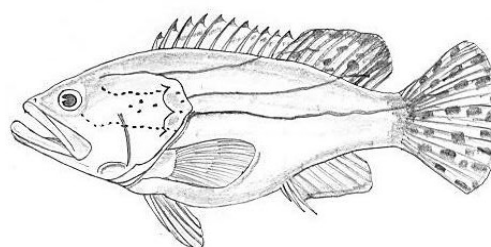
Habit and habitat: Marine, brackish, reef-associated.

Economic importance: commercial

Status and Conservation: Vulnerable (VU) in IUCN Red list

Distribution: Indo-Pacific, Japan

***Epinephelus latifasciatus* (Temminck&schlegel, 1842)**



Serranus latifasciatus Temminck& Schlegel, 1842

Serranus grammicus Day, 1868

Epinephelus grammicus (Day, 1868)

Genus: *Epinephelus*

Species: *latifasciatus*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
11/12	-	18	1/5	3/8	15

TL	SL	HL	Sn.L	E.D	HOB	PDL	P.D.SC	LL.SC	LL.V.SC
27.0	21.5	9.5	2.8	1.4	8.5	-	56	65	-

Description: Body is an elongated, abdomen rounded, grayish with golden gloss about the head. A narrow black line runs from the upper margin of the orbit to the last dorsal spine, a second black line passes from the upper third of the orbit to the sixth dorsal ray. A third from the lower edge of the orbit below the central-opercular spine and on the upper third of the caudal fin, where it assumes the form of rounded blotches. An intermediate band exits on the head between the 2nd and 3rd bands. Dorsal fin with black spots caudal with yellow and black spots. Teeth with a small canine on either side of the upper jaw, Eyes are golden in colour, lateral line scales are 61.

Common name: striped grouper

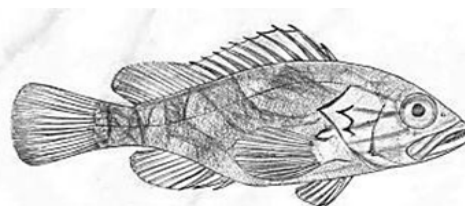
Habit and habitat: Marine, demersal

Economic importance: Commercial

Status and Conservation: Data Deficient (DD) in IUCN Red list

Distribution: Indo-west Pacific.

***Epinephelus radiatus* (Day, 1868)**



Serranus radiatus Day, 1868

Epinephelus radiates (Day, 1868)

Epinephelus radians (Day, 1868)

Genus: *Epinephelus*

Species: *radiates*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
11/14	-	18	1/5	3/8	18

TL	SL	HL	Sn.L	E.D	HOB	PDL	P.D.SC	LL.SC	LL.V.SC
27.5	21.0	9.4	2.8	1.4	7.0	-	56	98	-

Description: Body is an elongated, abdomen rounded. Tan body color with 5 oblique dark-edged pale bands; dark bands with scattered small black spots and pale blotches, especially dorsally; pale inter-spaces with small dark brown spots, mainly arranged in series along the middle of the inter-spaces; Body having dark brown line from the lower edge of the eye to the edge of the sub-opercle, faint dark band along the maxillary groove and continuing to the edge of the inter-opercle, dorsal fin and caudal fin covered with small dark spots. Body depth 3 times in SL; head length 2.3 times in SL, nearly flat inter-orbital, dorsal head profile slightly convex, 3 distinctly enlarged serrae on pre-opercle angle. Upper edge of operculum almost straight, maxilla reaches to rear edge of eye, 2 rows of teeth on mid-lateral part of lower jaw.

Common name: Oblique banded grouper

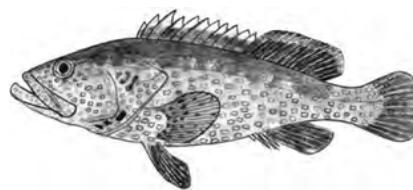
Habit and habitat: Marine, demersal.

Economic importance: commercial

Status and Conservation: Least concern in IUCN Red list

Distribution: Indo-west Pacific

***Epinephelus scoioides* (Hamilton, 1822)**



Bola cooides Hamilton 1822

Serranusnebulosus Valenciennes 1828

Genus: *Epinephelus*

Species: *cooides*

Fin Formula:

Dorsal -I	Dorsal -II	Pectoral	Pelvic	Anal	Caudal
11/14	-	19	1/5	3/8	18

TL	SL	HL	Sn.L	E.D	HOB	PDL	P.D.SC	LL.SC	LL.V.SC
60.0	45.0	15.0	9.0	2.0	17.0	16.3	-	101	-

Description: Body is an elongated, abdomen rounded. Orange coloured spots present on body from head to tail. Body is dark green in colour, 4 irregular, slightly H shaped vertical dark blotches also present. Head is large. Eyes bulb like. Snout length is very large than eye diameter. Lower jaw is longer than upper jaw. Jaws has villi form teeth, upper jaw having canines also. Dorsal fin elongated with 11 spines and 14 soft rays. Caudal fin not forked.

Common name: Orange spotted grouper

Habit and habitat: Marine, demersal

Economic importance: Commercial

Status and Conservation: Near threatened (IUCN Red list)

Distribution: Indo-west Pacific.

Proximate Composition

Table 1. Proximate composition of Serranidae family fish species (mean \pm SD; average value of three determinations)

S. No.	Name of the species	Moisture	Protein	Carbohydrate	Lipid	Ash
1	<i>Epinephelus malabaricus</i>	77.45 \pm 1.01	17.20 \pm 0.45	0.9 \pm 0.002	1.6 \pm 0.21	2.85 \pm 0.21
2	<i>Epinephelus diacanthus</i>	76.79 \pm 1.23	16.89 \pm 0.66	1.4 \pm 0.007	1.9 \pm 0.18	3.02 \pm 0.25
3	<i>Epinephelus areolatus</i>	74.66 \pm 1.34	19.02 \pm 0.44	1.2 \pm 0.005	2.0 \pm 0.15	3.12 \pm 0.19
4	<i>Epinephelus quoyanus</i>	77.84 \pm 1.21	16.89 \pm 0.57	0.8 \pm 0.001	1.8 \pm 0.14	2.67 \pm 0.22
5	<i>Epinephelus lanceolates</i>	75.64 \pm 1.03	18.54 \pm 0.61	0.7 \pm 0.002	2.2 \pm 0.16	2.92 \pm 0.31
6	<i>Epinephelus latifasciatus</i>	76.13 \pm 1.12	17.55 \pm 0.73	1.3 \pm 0.004	1.8 \pm 0.22	3.22 \pm 0.17
7	<i>Epinephelus radiatus</i>	76.25 \pm 1.01	18.04 \pm 0.63	1.0 \pm 0.003	1.7 \pm 0.17	3.01 \pm 0.23
8	<i>Epinephelus cooides</i>	76.92 \pm 1.05	17.42 \pm 0.59	0.8 \pm 0.001	1.9 \pm 0.19	2.96 \pm 0.19

Moisture content

In the present study the average moisture contents of the fishes ranged from 74.66 \pm 1.34% to 77.84 \pm 1.21% (Table 1). Palani Kumar *et al.*, [16] studied on the proximate composition of 23 medium sized marine fin fishes from Thoothukudi Coast of India. They have reported the moisture content in Serranidae family fish i.e. *Epinephelus areolatus* (78.99 \pm 0.23), which was slightly higher than the average moisture content reported in this study. Harinth [17] recorded more or less a similar variation in the moisture contents in *M. rosenbergii* and *M. malcomsoni* were ranged from 77.29 \pm 1.24 to 79.01 \pm 1.75%.

Protein content

In the present study the average protein contents of the fishes ranged from 16.89 \pm 0.57% to 19.02 \pm 0.44% (Table 1). The recorded values are well in agreement with the findings of Palani Kumar *et al.*, [16] who reported the protein content in Serranidae family fish *Epinephelus areolatus* was 16.84 \pm 0.35. Similar

trends of protein content (18.25%) in *Heteropneus tesfossilis* was reported by Salam [18] and Ludiya Podili Rani [19].

Carbohydrate content

In the present study the average carbohydrate contents of the fishes ranged from 0.7±0.002% to 1.4±0.007% (Table 1). The findings of the present study are well in agreement with Mohanty and Nayak[20] who recorded the carbohydrate contents were ranged from 0.11±0.07 to 0.60±0.57. Radhakrishnan and Natarajan[21] recorded the carbohydrate content in the muscle tissues were varied from 0.3 to 0.63% in *P. vigil*. More or less similar trends of carbohydrate contents were recorded by several researchers in different species (Radhakrishnan [22], Dinakaranet *al.*,[23]; Dinakaranet *al.*,[24].

Lipid content

In the present study the average lipid contents of the fishes ranged from 1.6±0.21% to 2.2±0.16% (Table 1). Darwin *et al.*,[25] reported the lipid content in *P. bufo* (4.56±0.54 %) which were slightly higher than the average values of lipids recorded in the present investigation. More or less similar values of lipid contents were recorded by Mohanty and Nayak[20]. Similar trends of lipid contents were reported by various workers in different species (Thirunavukkarasu [26]; Murugesanet *al.*,[27]; Sudhakaret *al.*,[28].

Ash content

In the present study the average ash contents of the fishes ranged from 2.67±0.22% to 3.22±0.17% (Table 1). The recorded values are well in agreement with the findings of Islam *et al.*,[29] who reported the ash content in *Odontamblyopus rubicundus* was 2.035 ± 0.16. Oyase Anthony *et al.*, [30] recorded the ash contents in five different fishes were ranged from 3.7390±0.21 to 5.4210± 0.16 from River Niger in Edo State, Nigeria. Similar trends of ash content (3.79 ± 0.16) in *Epinephelus areolatus* was recorded by Palani Kumar *et al.*,[16].

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