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Carangids (Family: Carangidae) in the seas around Indian subcontinent with description of macro-taxonomic characters for the field identification of genera and species

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ABSTRACT

Carangids formed nearly 5.5% of the marine fish production from Indian waters during 2004-2010. Fishery was supported by 60 species with 14 at commercial scale. Most of the species exhibit changes in morphologic/meristic characteristics and colour patterns with growth and some even exhibit sexual dimorphism. Taxonomy of each species and species specific variations in morphology, meristic counts as well as colour patterns with growth and sexual maturity were studied and based on very striking macro-taxonomic characters, a key was developed for field identification of genera and species of carangids from Indian waters. Pictorial illustrations on morphometric changes with growth and sexual dimorphism in those species wherever applicable has been provided.

Keywords: Carangids, Field identification, Indian seas, Macro-taxonomic characters

Introduction

Carangidae forms one of the largest families of bony fishes, enjoying wide distribution world over and is represented by about 140 species belonging to 32 genera. In the seas around Indian sub-continent, they are represented by 60 species, forming an assemblage of highly diverse group of fishes with size varying from very small to large having complex morphological and meristic characteristics, making their identification highly complicated. Carangids can be distinguished from other teleost groups by the presence of detached (free) anal spine(s), lateral line scutes, cutaneous fleshy lateral keels, dorsal and ventral grooves on caudal peduncle, adipose eyelids *etc*. Presence of one or a combination of the above different characters is used to distinguish them from other groups. Though many identification keys are available (Smith-Vaniz, 1984; Joshi *et. al*., 2011), their application in the field is difficult and confusing as they are based on several minute taxonomic characteristics. Moreover, many exhibit morphological changes with growth, exhibiting even sexual dimorphism and are often confused and misidentified as different species.

Considering the above points and importance of carangids in commercial fishery, a field identification key for genera and species has been prepared. This article is an illustrative guide for field identification of species using macro-taxonomic characters. The characters provided in this article is very distinct and striking even under field conditions.

Materials and methods

Carangid fishery along the Indian coast were monitored during 2004-'10 at weekly intervals covering all fishing regions. Samples covering all size groups were collected and colouration of body and fins were recorded afresh. Meristic counts and morphometric measurements were made following Hubbs and Lagler (1947) as well as Smith-Vaniz and Staiger (1973). Counts of fin-rays, spines, gillrakers, lateral line scutes, scales, branchiostegal rays and body measurements were taken from all size groups of each species, as far as possible. For all the abundant species, more than 30 specimens covering all the size groups were studied and for others according to availability.

Based on analysis of the data collected and published information (Smith-Vaniz, 1984, 1999 a&b, Smith-Vaniz, *et al*., 1999), a key was prepared for field identification of carangid species from Indian waters. Very distinct morphologic/meristic and colour features, which are observable with ease alone were made use of. Based on the morphology of first dorsal fin, they were grouped under three categories. They were further grouped under subcategories, genera and species based on the body squamation, morphology of fins, lateral line, scutes, gillrakers, presence of adipose eyelid as well as colourations of body, fins and mouth.

Results and discussion

Species diversity

Carangid resources in the Indian waters comprise 60 species belonging to 20 genera (Table 1).They include 13 species of scads belonging to six genera, 28 trevallies belonging to six genera, six leather jackets of single genus, six pompanos/darts of two genera and four jacks of two genera. Genera under other groups were represented by single species each.

Description of genera

No pelvic fin, (present in very small fishes and positioned anterior to pectoral origin); body including dorsal and anal fin covered with small deciduous scales……. Genus: *Parastromateus*.

Pelvic fin present; body superficially naked……. Genus: *Alectis*

Table 1. Major genera and species of the family Carangidae from the Indian seas

Group	Genus	Species
Scads	*Alepes*	*Alepes djedaba, A. kalla, A. melanoptera, A. vari.*
	Atule	*Atule mate*
	Selar	*Selar crumenophthalmus, Selar boops*
	Selaroides	*Selaroides leptolepis*
	Decapterus	*Decapterus kurroides, D. macarellus, D. macrosoma, D. tabl, D. russelli*
	Megalaspis	*Megalaspis cordyla*
Runners	*Elagatis*	*Elagatis bipinnulata*
Trevallies	*Atropus*	*Atropus atropus*
	Carangoides	*Carangoides armatus, C. bajad, C. chrysophrys, C. caeruleopinnatus, C. dinema, C. equula, C. ferdau, C. fulvoguttatus,C. gymnostethus, C. hedlandensis, C. malabaricus, C. praeustus, C. talamparoides, C. uii, C. plagiotaenia, C. oblongus*
	Caranx	*Caranx hippos, C. ignobilis, C. lugubris, C. melampygus, C. paupensis, C. sem, C. sexfasciatus, C. tille*
	Ulua	*Ulua mentalis*
	Gnathanodon	*Gnathanodon speciosus*
	Seriolina	*Seriolina nigrofasciata*
	Naucrates	*Naucrates ductor*
Pilot fishes	*Seriola*	*Seriola dumerili, S. rivoliana*
Jacks	*Uraspis*	*Uraspis helvola, U. uraspis*
Black pomfret	*Parastromateus*	*Parastromateus niger*
Queenfishes	*Scomberoides*	*Scomberoides commersonianus, S. lysan, S. tala, S. tol*
Pompanos and darts	*Alectis* *Trachinotus*	*Alectis ciliaris, A. indicus. Trachinotus baillonii, T. blochii, T. mookalee, T. russelli,T. coppingeri.*

Categorisation of carangids

Based on the morphology of first dorsal fins, carangids can be broadly grouped under three broad categories:

Category I : Superficially first dorsal fin absent.

Category II. : First dorsal fin modified in to short spines.

Category III : First dorsal fin entire and spinous.

Category I : Superficially first dorsal fin absent

Body deep and compressed, first dorsal fin absent, spine(s) occasionally visible in small juveniles. Members belonging to two genera *Parastromateus* and *Alectis* represented this category.

i. *Genus: Parastromateus*

Genus is represented by single species, *Parastromateus niger*

Description of species

Body deep, ovate and compressed, dorsal and ventral profile strongly and evenly convex; mouth terminal; body becomes slightly elongated with growth; body colouration dark brown in juveniles, uniform silvery gray to bluish brown in adults; fins with dark edges; young ones with 5 to 6 broad dark bands, which fades and disappears with age; lateral line with few (12-14) weak scutes; gillrakers on first gill arch, 26-27 total (8-9 upper, 17-19 lower) ……. *Parastromateus niger* (Bloch, 1795), Black pomfret (Fig. 1).

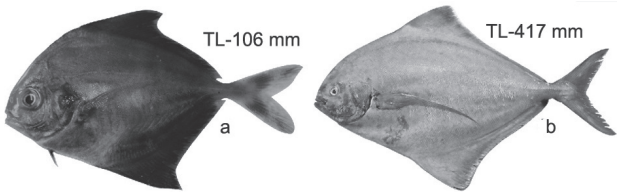


Fig. 1. *Parastromateus niger,* a) Juvenile; b) Adult

ii. *Genus: Alectis*

Dorsal profile more convex than ventral profile, body very deep and anterior soft rays of second dorsal, anal and pelvic fins extremely long and filamentous in young; undergo considerable morphological changes with growth, body elongates and filamentous rays shorten as the fish grows. Genus is represented by two species; *Alectis indicus* and *Alectis ciliaris.*

Description of species

Profile of head and nape angular; upper jaw ending just before the anterior margin of the eye; gillrakers on first gill arch 31 total (9 upper, 22 lower); lateral line with few weak (11-13) scutes…….*Alectis indicus* (Ruppell, 1830), Indian threadfish (Fig. 2).

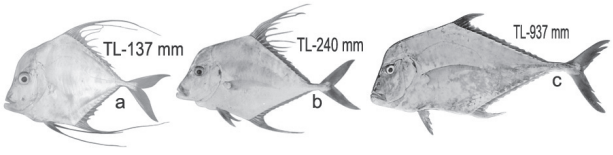


Fig. 2. *Alectis indicus* a) Juvenile; b) Sub-adult; c) Adult

Profiles of head and nape broadly rounded; upper jaw extends below beyond middle of the eye; gillrakers on first gill arch 19-20 total (5 upper, 14-15 lower); lateral line with 15-18 scutes …….. *Alectis ciliaris* (Bloch, 1788), African pompano (Fig. 3).

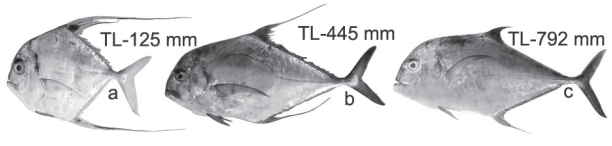


Fig. 3. *Alectis ciliaris* a) Juvenile; b) Sub-adult; c) Adult

Category II : *First dorsal fin modified as short spines*

Body elongate and compressed; first dorsal fin modified as free spines (Fig. 4) and occasionally with low membraneous inter-connection; no lateral line scutes. Members of three genera; *Scomberoides, Trachinotus* and *Naucrates* represented this category.

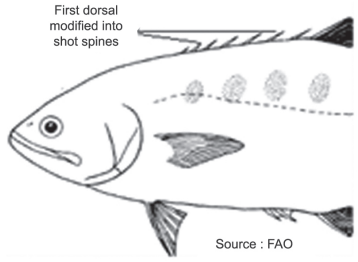


Fig. 4. Modification of first dorsal fin as free spines in Category II

Description of genera

Posterior part of soft dorsal and anal fins with several semi-detached finlets ……. *Genus: Scomberoides.*

No detached or semidetached finlets after second dorsal and anal fin ……. A

A. Body deep to ovate or sub-ovate, strongly compressed; first dorsal fin modified into 6 short spines; anterior lobes of second dorsal, anal and caudal fin falcate…… *Genus: Trachinotus*

Body elongate, shallow nearly rounded or sub-cylindrical; first dorsal modified into 4 or 5 spines; fins not falcate …….. *Genus: Naucrates*

iii. Genus: Scomberoides

Body oblong to elliptical, dorsal profile more convex than ventral; first dorsal consists of 6 or 7 short spines, anal with two detached spines; upper jaw extends well beyond the posterior margin of the eye. Four species *viz.*, *Scomberoides commersonianus, S. lysan, S. tala* and *S. tol* represent the genus.

Description of species

Two series of 6-8 round or vertically oblong blotches, one above and another below the lateral line; dorsal profile of head and nape concave; anal origin slightly behind second dorsal origin; distal half of second dorsal lobe pigmented black; gillrakers on first gill arch 25 total (8 upper, 17 lower)…….*Scomberoides lysan* (Forsskal, 1775), Double spotted queen fish (Fig. 5).

Fig. 5. *Scomberoides lysan*

Only single series of blotches along the sides … A

A. Single series of plumbeous round blotches above or touching lateral line, first one or two slightly intersect

lateral line; snout pointed; dorsal profile of head and nape convex; anal origin in line with the second dorsal origin; gillrakers on first gill arch 13-15 total (3-5 upper, 10 lower).....*Scomberoides commersonianus* Lacepede, 1802 Talang queen fish (Fig. 6).

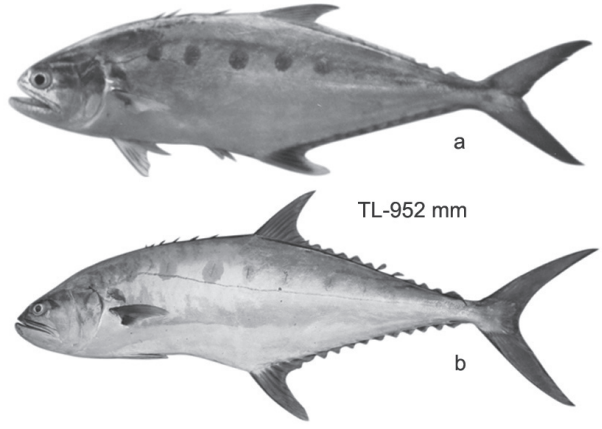


Fig. 6. *Scomberoides commersonianus* a. Sub-adult, b. Adult

Lateral blotches vertically elongate, ovate or oblong…. B

B. Blotches vertically elongate, plumbeous and intersects lateral line; dorsal profile of head and nape concave; anal origin slightly ahead of second dorsal origin; gillrakers on first gill arch 12 total (4 upper, 8 lower).....*Scomberoides tala* (Cuvier, 1832), Barred queenfish (Fig. 7).

Fig. 7. *Scomberoides tala*

Blotches oval or vertically oblong, first 4-5 intersects lateral line and others just touches the lateral line; snout pointed; dorsal profile of head and nape concave; anal origin in line with the second origin; distal half of second dorsal lobe abruptly and heavily pigmented in small ones; gillrakers on first gill arch 23-24 total (6-7 upper, 17 lower).....*Scomberoides tol* (Cuvier, 1832), Needle scaled queenfish (Fig. 8).

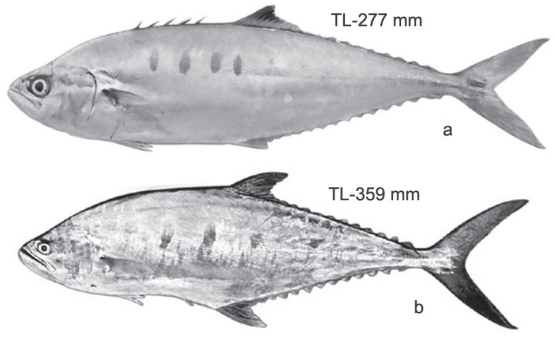


Fig. 8. *Scomberoides tol,* a) Juvenile; b Adult

iv. *Genus : Trachinotus*

Dorsal and ventral profile more or less equally convex or dorsal slightly more convex in some; anal with two detached spines. Five species; *Trachinotu baillonii, T. coppingeri, T. russelii, T. blochii* and *T. mookalee* represented the genus.

Description of species

No black spots or blotches on sides along lateral line…. A

A row of black spots or blotches on sides along lateral line … B

A. Anterior margin of fin lobes brownish; second dorsal lobe longer than anal, lobe height decreases with age; gillrakers on first gill arch 14-15 total (6-7 upper, 8 lower) .....*Trachinotus blochii* (Lacepede, 1801), Snubnose pompano (Fig. 9).

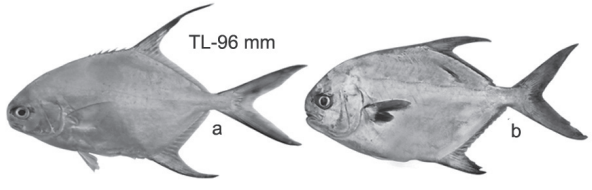


Fig. 9. *Trachinotus blochii* a) Sub-adult; b) Adult

Fin lobes without brownish anterior margin; lobe of second dorsal longer than anal; gillrakers on first gill arch, 15-18 total (7 upper, 8-10 lower) .....*Trachinotus mookalee* Cuvier, 1832, Indian pompano (Fig. 10).

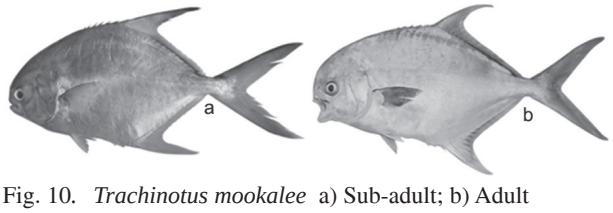


Fig. 10. *Trachinotus mookalee* a) Sub-adult; b) Adult

B. Black spots along the lateral line 2-5, smaller than eye diameter, middle ones being more sharp and relatively large; snout blunt; mouth terminal; caudal symmetrical; gillrakers on first gill arch 24-25 total (7-9 upper, 16-17 lower)……..*Trachinotus baillonii* (Lacepede, 1801), Small spotted dart (Fig. 11).

Fig. 11. *Trachinotus baillonii*

Black spots/blotches along the lateral line larger than eye diameter ……. C

C. Lateral line spots 4 to 5, plumbeous, anterior ones larger, about 2/3rd of the spot above lateral line; snout blunt; mouth terminal; second dorsal and anal lobe highly falcate, gillrakers on first gill arch 19-20 total (7 upper, 12-13 lower), soft anal with 19-21 rays ……..*Trachinotus russelli* Cuvier, 1832, Large spotted dart (Fig. 12).

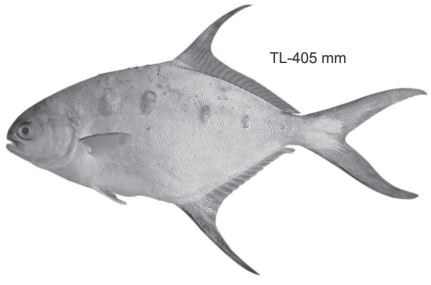


Fig. 12. *Trachinotus russelli*

Lateral line spots 5 to 7, oval/vertically elongate, anterior two above pectoral fin; 2nd and 4th larger, snout blunt; mouth terminal; lateral line irregular; gillrakers on first gill arch 20-21 total (6-8 upper, 13-14 lower), soft anal with 22-24 rays…….. *Trachinotus coppingeri* Cuvier, 1832, Large spotted dart (Fig. 13)

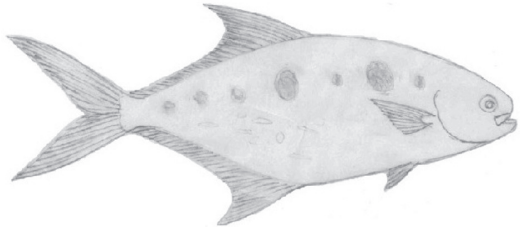


Fig. 13. *Trachinotus coppingeri*

v. *Genus: Naucrates*

Dorsal and ventral profile almost equal; upper jaw narrow towards posterior end; anal fin with only one detached spine; caudal peduncle with dorsal and ventral groove and lateral fleshy cutaneous keel. Genus is represented by a single species, *Naucrates ductor.*

Description of species

Head profile tapering sharply, snout blunt; upper jaw very narrow at end extending below to the level of anterior margin of the eye; pectoral short; gillrakers on first gill arch, 21 to 23 total (6 upper, 15-17 lower); body with 6-7 black bars against a light silvery background; tips of caudal, second dorsal and anal fin lobes white…….. *Naucrates ductor* (Linnaeus, 1758), Pilot fish (Fig. 14).

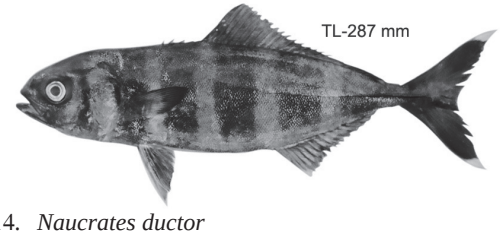


Fig. 14. *Naucrates ductor*

Category III : First dorsal fin entire (normal)

Possesses one or more detached or semidetached finlet(s) after second dorsal and anal fins ……. I

No finlets after second dorsal and anal fins …….. II

I. Several detached finlets after second dorsal and anal fin (7-9 and 8-10 respectively), chord of straight part of lateral line longer than the curved part and with broad prominent scutes; eyes covered completely with well-developed adipose eyelid; opercle with small black blotch ……Genus: *Megalaspis*

Only single detached finlet after second dorsal and anal fin ……. A

A. Finlet double-rayed; no lateral line scutes; caudal peduncle with dorsal and ventral groove; no adipose eyelid; detached anal spines not visible externally in large specimens; no opercular blotch……Genus: *Elagatis*

Finlet single rayed; chord of the straight part of lateral line shorter than curved part and with very prominent scutes; no caudal peduncle grooves; eyes with well developed adipose eyelid; opercle with a small black blotch …….Genus: *Decapterus*

II. Straight part of lateral line without scutes; caudal peduncle with dorsal and ventral grooves; first dorsal very short, nearly 0.25 times or less of second dorsal height. ……. A

Straight part of lateral line with scutes, caudal peduncle without ventral grooves, first dorsal more than 0.25 times of second dorsal height ……. B

A. Upper jaw narrow, broadly rounded at the end with moderately slender supramaxilla terminating below the posterior margin of the eye; caudal peduncle with lateral cutaneous keel; pelvic long, equal or slightly longer than second dorsal lobe; body elongate, shallow and sub-cylindrical; ……Genus: *Seriolina*

Upper jaw truncate, broad at the end, with broad supramaxilla terminating below the anterior margin of the pupil; caudal peduncle without lateral cutaneous keel; pelvic shorter than second dorsal lobe; body elongate, moderately deep and slightly compressed;…….. Genus*: Seriola*

B. Adipose eyelid totally absent or poorly developed …… a

Adipose eyelid developed only towards posterior half of the eye …….. b

Adipose eyelid fleshy, well-developed and covering entire eye; first dorsal as high as second dorsal …… c

a. Belly with deep median groove, conspicuously long jet black pelvic fin with white rays – fin extend up to the base of anal; body deep, strongly compressed and ovate ……. Genus: *Atropus*

Belly without deep median grove……..... i

i. Lower jaw very prominent with angle of chin projecting beyond the upper jaw; gillrakers of first gill arch long and more numerous (74-86) and projected into the mouth along the side of tongue, body deep, strongly compressed and ovate, second dorsal and anal falcate…..….. Genus*: Ulua*

Lower jaw normal, not projecting significantly beyond the upper jaw……ii

ii. No detached anal spines; first dorsal relatively short with 8 spines; fin spines reduced or resorbed, tongue, roof and floor of the mouth whitish/creamy, the rest blue black; body oblong and compressed, dorsal more convex than ventral…….. Genus: *Uraspis*

Two detached anal spines……. iii

iii. Lips and jaws fleshy (papillose), upper jaw strongly protractile, jaws without teeth (young fishes may have few feeble teeth on lower jaw)…….. Genus: *Gnathanodon*

Lips and jaws normal not fleshy and non-protractile, jaws with bands of fine teeth; body vary widely in shape - elongate/oblong/ovate/rhomboidal, dorsal and ventral profile convex ……. Genus: *Carangoides*

b. Chord of curved part of the lateral line distinctly shorter than straight part, entire length of straight part with very prominent scutes/scales, body elongate and compressed, ventral more convex than dorsal; ……..Genus: *Alepes*

Chord of curved part of the lateral line almost equal or slightly shorter than the straight part, straight part with relatively large and strong scutes and nil to few anterior scales; body mostly oblong and compressed, dorsal profile strongly convex to second dorsal, ventral almost straight or slightly concave to anal; upper jaw with an outer row of widely spaced strong conical or canine teeth..……Genus: *Caranx*

Chord of curved part of the lateral line longer than the straight part, straight part with relatively small scutes; shoulder with a prominent black spot; mouth terminal with strongly protractile upper jaw, body oblong and compressed, dorsal and ventral profile evenly convex; ……Genus: *Selaroides*

c. Terminal ray of second dorsal and anal fins, finlet like, slightly more separated and nearly twice in length than penultimate ray; second dorsal and anal fin without a basal sheath, body elongate and moderately compressed, dorsal and ventral profiles evenly convex, ……..Genus*: Atule*

Terminal ray of second dorsal and anal fins as high as penultimate ray and not separated, body elongate, moderately compressed, ventral profile more convex than dorsal; eyes large and prominent; ……. Genus: *Selar*

vi. Genus: *Megalaspis*

Only single species, *Megalaspis cordyla* represented the genus.

Description of species

Body elongate, sub-cylindrical and torpedo shaped; caudal peduncle with a medial keel; breast naked ventrally and laterally in triangular area; straight part of lateral line with 51-55 broad prominent scutes, gillrakers on first gill arch 28-30 total (10-12 upper, 18 lower) ……. *Megalaspis cordyla* (Linnaeus, 1758), Torpedo scad (Fig. 15).

Fig. 15. *Megalaspis cordyla*

vii. Genus: *Elagatis*

Single species, *Elagatis bipinnulata* represented the genus

Description of species

Body elongate and fusiform, head and snout pointed; no adipose eyelid; first dorsal very short, nearly 0.33 times of second dorsal height, pectoral shorter than head. Body dark olive blue green above, white below, two narrow light blue or bluish white stripes along sides with a broad yellow stripe between them……..*Elagatis bipinnulata* (Quoy and Gaimard, 1824), Rainbow runner (Fig. 16).

Fig. 16. *Elagatis bipinnulata*

viii. Genus: *Decapterus*

Five species represented the genera; *Decapterus macrosoma, D. macarellus, D. tabl, D. kurroides* and *D. russelli.*

Description of species

Pectoral shorter than head length, tip falling short of a vertical line from the posterior margin of first dorsal base; body very slender, elongate and somewhat circular in cross section …….. A

Pectoral equal to or slightly longer than head length, tip extends beyond a vertical line from the origin of the second dorsal fin; body elongate, slender and slightly compressed; almost the entire straight part of the lateral line with scutes or prominent scales……C

A. Posterior upper opercular margin serrated (rough); caudal bright red, tips of soft dorsal fin rays fringed with red; except few anterior scales (4-10), entire straight part of the lateral line with (nearly 37) scutes; gillrakers on first gill arch 44 total (11 upper, 33 lower); …… *Decapterus tabl* Berry, 1968, Roughear scad (Fig. 17).

Fig. 17. *Decapterus tabl*

Posterior upper opercular margin not serrated…….B

B. Posterior end of upper jaw (supramaxilla) concave above, rounded and produced below; posterior 2/3rd of the straight part of lateral line with relatively short scutes (33 nos.); gillrakers on first gill arch 44 total (10 upper, 34 lower). ……. *Decapterus macrosoma* Bleeker, 1851, Shortfin scad (Fig. 18)

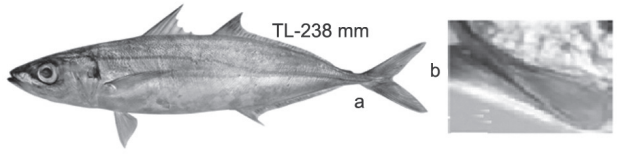


Fig. 18. a. *Decapterus macrosoma;* b. supramaxilla

Posterior end of upper jaw (supramaxilla) straight above, moderately rounded and slanted antero-ventrally; scutes only on posterior half of the straight part of lateral line (29-32 scutes); gillrakers on first gill arch 45-46 total (10-11 upper, 34-35 lower); caudal yellow green and occasionally have reddish tinge……..*Decapterus macarellus* Cuvier, 1833, Mackerel scad (Fig. 19).

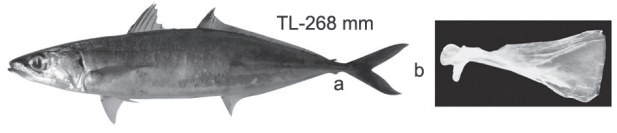


Fig. 19. a. *Decapterus macarellus;* b. supramaxilla

C. Entire stretch of straight part of the lateral line with prominent scutes (36-37 nos.), totally devoid of anterior scales; caudal bright red in fresh condition; gillrakers on first gill arch 43-44 total (11-12 upper, 32 lower); body with yellow mid-lateral stripe ……. *Decapterus kurroides* Bleeker, 1855 (Redtail scad) (Fig. 20).

Fig. 20. *Decapterus kurroides*

Almost entire stretch of straight part of the lateral line with scutes (34-35 nos.), anterior scales if present, only few (0-4); caudal fin hyaline to yellowish; gillrakers on first gill arch 46-48 total (12 upper, 34-36 lower) ……. *Decapterus russelli* (Ruppell, 1830), Indian scad (Fig. 21)

Fig. 21. *Decapterus russelli*

ix. Genus: *Seriolina*

Only single species, *Seriolina nigrofasciata* represented the genera.No detached anal spine (embedded under skin); first gill arch with only a single rudimentary gillraker; body dark grey to black dorsally, belly paler, young ones with 5-7 dark oblique bands on the body, more prominent dorsally and lobe tips of anal and second dorsal white…….*Seriolina nigrofasciata* (Ruppell, 1829), Black banded trevally (Fig. 22).

Fig. 22. *Seriolina nigrofasciata* a) Juvenile; b) Adult

x. Genus*: Seriola*

Two species, *Seriola rivoliana* and *S. dumerili* represented the genus.

Second dorsal and anal lobes longer than pectoral; first gill arch with well-developed gillrakers 25-27 total (7 upper, 18-20 lower), a conspicuous dark band extends backward from the upper jaw across the eye to the tip of the second dorsal lobe along the anterior margin (colour of the band fades with growth); anal margin fringed white; ……. *Seriola rivoliana* Valenciennes, 1833, Almaco jack (Fig. 23).

Fig. 23. *Seriolina rivoliana*

Second dorsal and anal lobe equal to or only slightly longer than pectoral; first gill arch with well developed gillrakers 25 total (including 3 rudiments) (8 upper, 17 lower); body dark grey to olivaceous green above, lighter below…….*Seriola dumerili* (Risso, 1810), Greater amberjack (Fig. 24).

Fig. 24. *Seriola dumerili*

xi. Genus: Atropus

Only one species, *Atropus atropus* represented the genus.

a. Breast naked ventrally and extend diagonally to the base of pectoral; chord of straight part of lateral line longer than curved part and its entire length with scutes (32-34 nos.); gillrakers on first gill arch 29 total (9 upper, 20 lower); opercular spot prominent; young ones with indistinct dark bands. Adults show sexual dimorphism with males having elongate and filamentous central soft ray of varying length in second dorsal fin……*Atropus atropus* (Schneider, 1801), Cleftbelly trevally (Fig. 25).

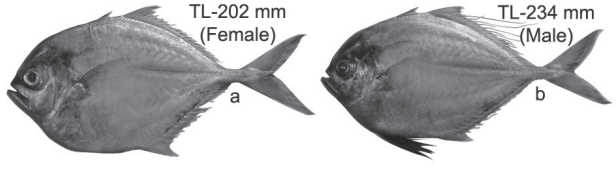
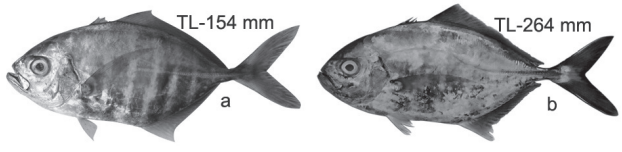


Fig. 25. *Atropus atropus,* a) female; b) male

xii. Genus: Uraspis

Two species, *Uraspis uraspis* and *Uraspis helvola* represented the genus.

a. Chord of straight part of lateral line distinctly shorter than curved part; almost the entire straight part of lateral line with small scutes (35); pectoral reach only up to the junction of straight and curved part; breast naked ventrally to the origin of pelvic fin and laterally extends to the naked base of pectoral fin; gillrakers on first gill arch 21 total (6 upper, 15 lower) …… *Uraspis uraspis* (Gunther, 1860) Whitemouth jack (Fig. 26).



Fig, 26. *Uraspis uraspis* a) Juvenile b) Adult

b. Chord of straight part of lateral line equal or longer than the curved part; pectoral extends beyond the junction of straight and curved part; straight part of lateral line with relatively narrow scutes (23-40) and few anterior scales; breast naked ventrally to the origin of pelvic fin, remain separated from naked base of pectoral; gillrakers on first gill arch 19-20 total (5 upper, 14-15 lower) ……. *Uraspis helvola* (Forster, 1801), Whitetongue jack (Fig. 27).

Fig, 27. *Uraspis helvola*

xiii. Genus: *Gnathanodon*

The genus consists of only one species, *Gnathanodon speciosus.*

Body golden yellow in young ones, alternate broad and narrow bands and one oblique band above the eye, caudal lobes tinged black, yellow colouration, darkness of bands and caudal tips fades and several irregular blotches appear with growth, blotches become large irregular with further growth; gillrakers on first gill arch 28 total (9 upper, 19 lower); posterior straight part of lateral line with 22 scutes……*Gnathanodon speciousus* (Forsskal, 1775), Golden trevally (Fig. 28).

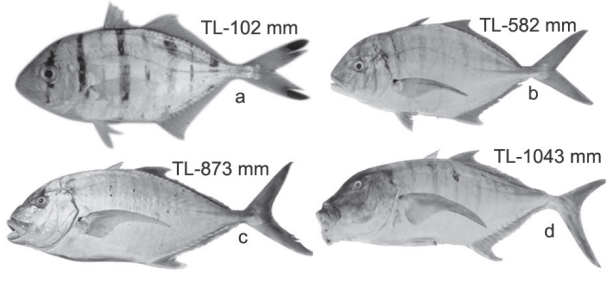


Fig. 28. *Gnathanodon speciosus,* a) Juvenile; b and c) Sub-adults; d) Adult

xiv. Genus: Ulua

Only single species, *Ulua mentalis* represented the genus.

a. Second dorsal and anal fin falcate, second dorsal lobe longer than head; gillrakers on first gill arch long and numerous, 77 total (23 upper, 54 lower); breast naked ventrally and extends laterally to the base of pectoral; straight part of lateral line with 32 small scutes**……..***Ulua mentalis* (Cuvier, 1833), Longrakered trevally (Fig. 29).

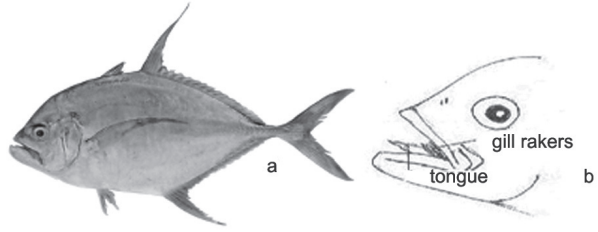


Fig. 29. a) *Ulua mentalis,* b) Gillrakers projected in to mouth

v. *Genus: Carangoides*

The genus is represented by 16 species.

Body elongate and compressed, dorsal and ventral profile equally convex; head profile nearly straight or slightly angular; lobe of second dorsal distinctly shorter than head length (in adults)…….. A

Body oblong (sub-ovate in young ones of some), compressed, head profile mostly convex or straight in some …… B

Body rhomboidal, very deep and strongly compressed, profile of snout and nape almost straight…… H

Body ovate, very deep and strongly compressed profile of snout and nape convex…… I

A. Lower jaw enlarged and projecting beyond upper jaw**;** first dorsal nearly 0.5 times of second dorsal lobe; breast completely scaled; straight part of lateral line with small scutes towards the posterior half, gillrakers on first gill arch 27-40 total (8-14 upper, 19-27 lower); young ones possess 5-6 dark bands across the body; large adults with small yellow spots on sides…… *Carangoides plagiotaenia* Bleeker, 1857, Barcheek trevally (Fig. 30).

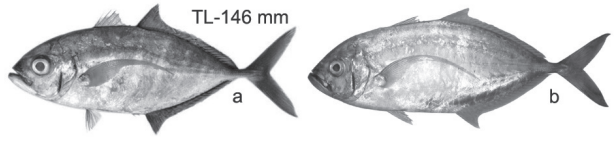


Fig. 30. *Carangoides plagiotaenia,* a) Juvenile; b) Adult

Mouth pointed with lower and upper jaw at the same level, first dorsal as high as second dorsal or slightly shorter; breast naked ventrally, with a small patch of pre-pelvic scales, remain separated from naked base of pectoral; almost entire straight part of lateral line with scutes (28-32); gillrakers on first gill arch 40-43 total (12-14 upper, 28-30 lower), distal half of second dorsal lobe abruptly black with

a white margin wide anteriorly ……. *Carangoides praeustus* (Bennett, 1830), Brownback trevally (Fig. 31).

Fig. 31. C*arangoides praeustus*

A. Small dark blotches broader posteriorly on the back between the bases of dorsal fin rays; lobes of second dorsal and anal fin strongly falcate, lobe of second dorsal distinctly longer than head length; breast naked ventrally to behind the origin of pelvic and remain separated from the naked base of pectoral by a band of scales.....…… C

No dark blotches on the back between the bases of dorsal fin rays, lobe of second dorsal distinctly shorter than head length in most; pattern of breast nakedness vary for species.....…… D

C. Head profile convex, chord of curved part of the lateral line almost equal or slightly shorter than the straight part; pectoral extends only up to the junction of straight and curved part of lateral line or slightly beyond ……. *Carangoides oblongus* (Cuvier, 1833), Coachwhip trevally (Fig. 32).

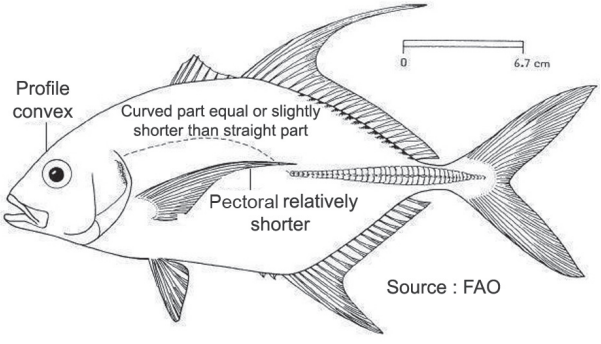


Fig. 32. *Carangoides oblongus*

Head profile nearly straight, chord of curved part of the lateral line longer than the straight part; pectoral relatively long and extends well beyond the junction between straight and curved part of lateral line; …… *Carangoides dinema* Bleeker, 1851, Shadow trevally, (Fig. 33).

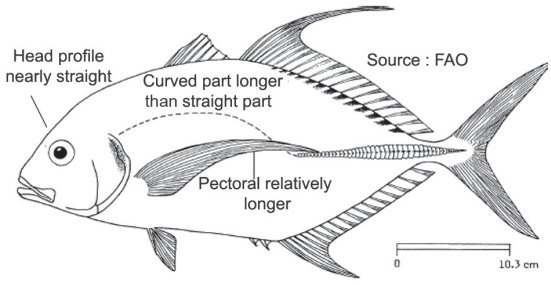


Fig. 33. *Carangoides dinema*

D. Dorsal and ventral evenly convex; first dorsal short, 0.25 times of second dorsal lobe or less; breast naked ventrally to the origin of pelvic fin and separated from the naked base of pectoral, snout bluntly rounded; body with 5-6 dark bands which fades with growth; numerous inconspicuous golden spots on sides above the level of pectoral; distal margin of anal fin whitish; gillrakers on first gill arch 22-25 total (7-8 upper, 15-17 lower); posterior half of straight part of lateral line with 29 (21-37) scutes……*Carangoides ferdau* (Forsskal, 1775), Blue trevally (Fig. 34).

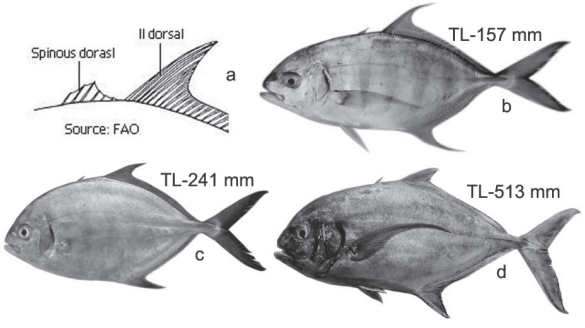


Fig. 34. *Carangoides ferdau,* a) dorsal fins; b) Juvenile; c) Sub-adult; d) Adult

Dorsal more convex than ventral; first dorsal nearly 0.5 times of second dorsal lobe …… E

E. Breast completely scaled or with a narrow naked area antero-ventrally, mouth cleft distinctly below the level of eye; body sub-cylindrical, second dorsal and anal short, first dorsal as high as second dorsal or slightly shorter, numerous golden yellow spots on the body even below the level of pectoral fin, gillrakers on first gill arch 25-33 total (7-9 upper, 18-21 lower); scutes on straight part of lateral line 20-40 ……..*Carangoides bajad* (Forsskal, 1775), Orangespotted trevally (Fig. 35).

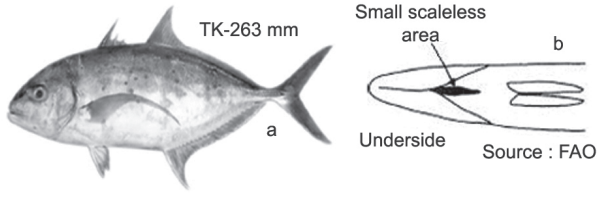


Fig 35. a. *Carangoides bajad;* b) Scale-less area

Breast naked ventrally to behind the origin of pelvic and laterally extends to the naked base of pectoral ..... F

F. Snout gently sloped, then abruptly vertical just above mouth cleft; body moderately deep, inter-radial membranes of second dorsal and anal fin dark and often with white spots basally in anal fin, gillrakers on first gill arch 23-24 total (7-8 upper, 16 lower), posterior half of straight part of lateral line with 26 (20-37) weak scutes .....*Carangoides chrysophrys* (Cuvier, 1833), Longnose trevally (Fig. 36).

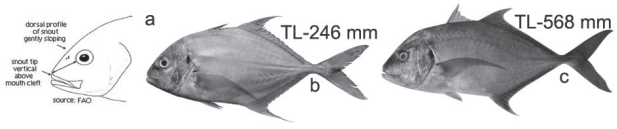


Fig 36. *Carangoides chrysophrys,* a) Snout; b) Juvenile; c) Adult

Snout pointed above mouth cleft, several small golden or brassy spots in adults mainly above the mid-line .... G

G. Mouth cleft distinctly below the level of eye; body elongates with growth; head and nape convex, become steaper with age; gillrakers on first gill arch 26 total (7 upper, 19 lower); posterior half of the straight part of lateral line with 18 small scutes .....*Carangoides fulvoguttatus* (Forsskal, 1775), Yellowspotted trevally (Fig. 37).

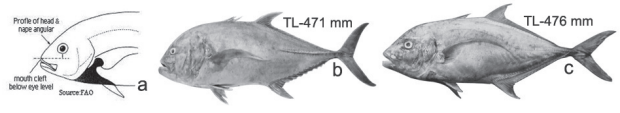


Fig. 37. *Carangoides fulvoguttatus,* a) Mouth position; b) Sub-adult; c) Adult

Mouth cleft in level with lower margin of the eye; last ray of second dorsal and anal fin longer than the penultimate ray; body sub-cylindrical, head and nape convex, gillrakers on first gill arch 22-23 total (8-9 upper, 14 lower), straight part of lateral line with 22-23 small scutes. .....*Carangoides gymnostethus* (Cuvier, 1833**)** (Bludger) (Fig. 38).

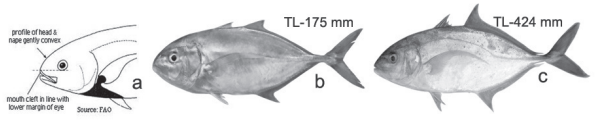


Fig. 38. *Carangoides gymnostethus.* a) Mouth position; b) Sub-adult; c) Adult

H. Breast completely scaled or with a narrow naked area antero-ventrally, second dorsal and anal fin with sub-marginal black to brown band, white distally; gillrakers on first gill arch 27-32 total (7-10 upper, 18-23 lower); almost entire length of straight part of lateral line with scutes (22-32 scutes and 0-6 scales); caudal, pectoral and pelvic yellowish to white.....*Carangoides equula* (Temminck & Schlegel, 1844), Whitefin trevally (Fig. 39).

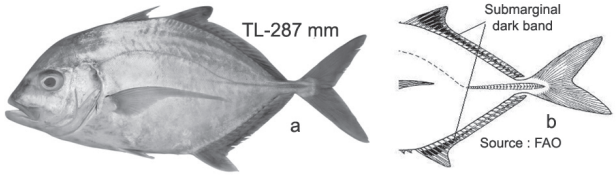


Fig. 39. a) *Carangoides equula;* b) Sub marginal fin band

Breast naked ventrally to behind the origin of pelvic and extends laterally to the naked base of pectoral, no submarginal black/brown band on second dorsal and anal fin, numerous small yellow spots on the body; opercle with small black blotch; gillrakers on first gill arch 24 total (7 upper, 17 lower); scutes on straight part of lateral line 35 .....*Carangoides caeruleopinnatus* (Ruppell, 1830), Coastal trevally (Fig. 40).

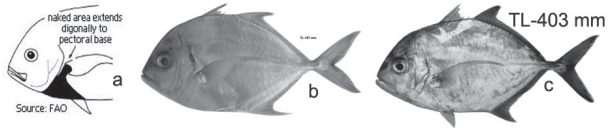


Fig. 40. *Carangoides caeruleopinnatus,* a) Scale-less area; b) Juvenile; c) Adult

I. Dorsal profile strongly convex than ventral; breast naked ventrally to behind the origin of pelvic and extends laterally to the naked base of pectoral fin and above, second dorsal and anal fin short, second dorsal height equal to or shorter than head length and distinctly shorter than anal fin lobe in adults (lobe moderately long in young, become short with age); first dorsal short, 0.5 times of second dorsal height or slightly more..... J

Dorsal and ventral equally convex; breast naked ventrally to behind the origin of pelvic and extends laterally only to the naked base of pectoral, second dorsal and anal lobes longer than head length, elongates with growth and become filamentous; young ones possesses 5-6 broad dark vertical bands across the body, bands fades with growth.....K

J. Tongue darker - grayish brown to brown; inter-radial membranes of soft anal fin often with white spots basally; gillrakers more numerous on first gill arch 35-36 total (13-14 upper, 22 lower); straight part of lateral line with 31 weak scutes.....*Carangoides malabaricus* (Bloch & Schneider, 1801), Malabar trevally (Fig. 41).

Fig. 41. *Carangoides malabaricus,* a) Juvenile; b) Adult; c) Scale-less area

Tongue paler - white to pale grey; base of inter-radial membrane of soft anal fin often with white spots; first gill arch with only few gillrakers, 28-29 total (7-8 upper, 21 lower); straight part of lateral line with 22-24 weak scutes ……... ….*Carangoides talamparoides* Bleeker, 1852, Imposter trevally (Fig. 42).

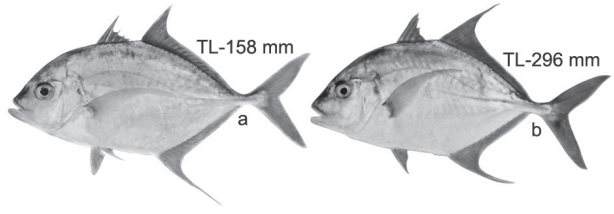


Fig. 42. *Carangoides talamparoides* a) Juvenile; b) Adult

K. Almost entire length of straight part of lateral line with scutes or prominent scales; mouth acutely pointed; second dorsal lobe distinctly longer than anal lobe in adults; eye diameter smaller than snout length; gillrakers on first gill arch few, only 23-24 total (6-7 upper, 17 lower); scutes on straight part of lateral line 15-16 ……. *Carangoides uii* Wakiya, 1924, Onion trevally (Fig. 43).

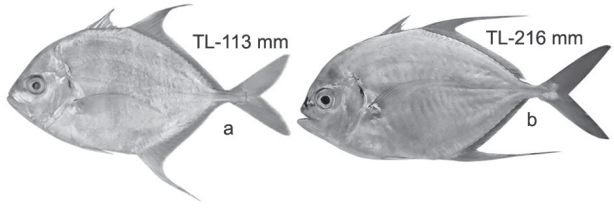


Fig. 43. *Carangoides uii a*) Juvenile; b) Adult

Posterior 2/3rd of straight part of lateral line possesses scutes or prominent scales, pelvic fins jet black with white rays in juveniles, darkness fades with growth; species exhibit sexual dimorphism - middle rays of second dorsal and anal fins elongate and filamentous with varying length in mature males …….. L

L. Head profile very steep, relatively straight from snout to nape without any break in contour (bump); eye diameter less than snout length; gillrakers on first gill arch 33-35 total (11-13 upper, 21-23 lower); pelvic fins long and reach almost anal origin in young ones ……..*Carangoides armatus* (Ruppell, 1830), Longfin trevally (Fig. 44).

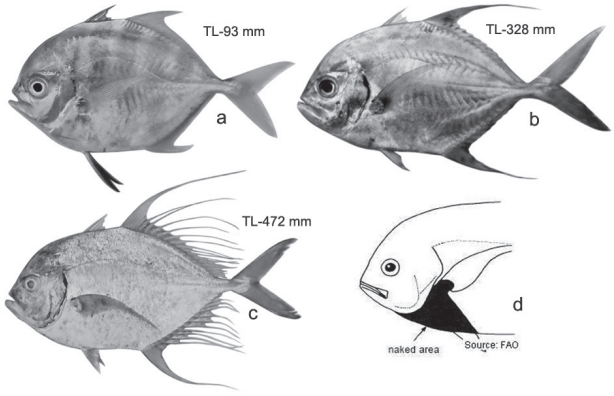


Fig. 44. *Carangoides armatus, a*) Juvenile; b) Female; c) Male; d) Scale-less area

Head profile steep, with a distinct break in contour (bump) in the inter orbital region (more pronounced in adults); eye diameter equal to or larger than snout length; gillrakers on first gill arch few, 24-25 total (9 upper, 15-16 lower); in young ones pelvic fins relatively short and reach only half way to anal origin or slightly beyond …….*Carangoides hedlandensis* (Whitley, 1933), Bumpnose trevally (Fig. 45).

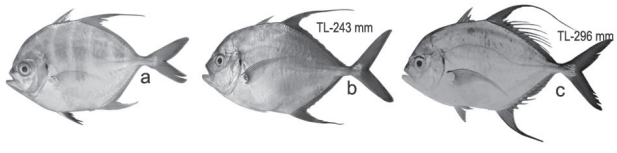


Fig. 45. *Carangoides hedlandensis, a*) Juvenile; b) Female; c) Male

xvi. Genus: Alepes

Five species represent the genus

Description of species

A. Body very deep and ovate, ventral distinctly more convex than dorsal profile, Dark bands on sides above - more prominent in small fishes; end of upper jaw broad and slightly concave posteriorly; caudal asymmetrical with long upper lobe; opercular spot large spreading to adjacent areas of shoulder; gillrakers on first gill arch 41-43 total (11-12 upper, 32 lower), lateral line with 42-43 scutes. ……..*Alepes kalla* Cuvier, 1833, Banded scad (Fig. 46).

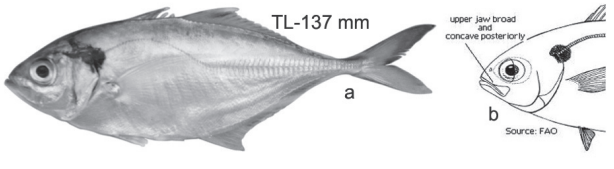


Fig. 46. a. *Alepes kalla;* b) Upper jaw

Body oblong, dorsal and ventral profile almost equally convex…… B

B. Length of ultimate ray of second dorsal and anal fin almost equal to penultimate ray, inter radial membrane of first dorsal jet-black; snout bluntly rounded; end of upper jaw narrowly rounded; gillrakers on first gill arch 24-30 total (7-9 upper, 17-24 lower); straight part of lateral line with 49-69 relatively large scutes……. *Alepes melanoptera* Swainson, 1839, Blackfin scad (Fig. 47).

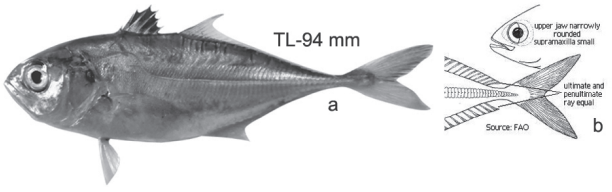


Fig. 47. a) *Alepes melanoptera;* b) Upper jaw and dorsal and anal details

Ultimate ray of second dorsal and anal fin longer than penultimate ray ……. C

C. Caudal asymmetrical with relatively long upper lobe; opercular spot bordered above by a small white spot; upper jaw broad and slightly concave posteriorly, gillrakers on first gill arch 39-40 total (11-12 upper, 28 lower), straight part of lateral line with 46-49 relatively large scutes.…… *Alepes djedaba* (Forsskal, 1775), Shrimp scad (Fig. 48).

Fig. 48. *Alepes djedaba,* a) Juvenile; b) Adult; c) Upper jaw, dorsal and anal

D. Caudal symmetrical with relatively elongated lobes; end of upper jaw straight posteriorly and supramaxilla relatively large; gillrakers on first gill arch 36 total (12 upper, 24 lower); lateral line with relatively small, but more numerous (61) scutes than other species…….*Alepes vari* (Cuvier, 1833), Herring scad (Fig. 49).

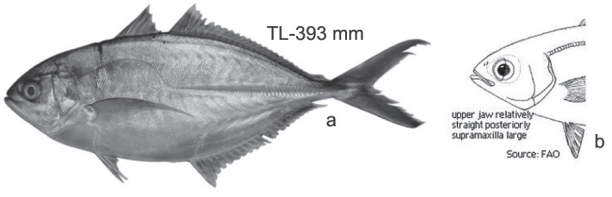


Fig. 49. a). *Alepes vari;* b) Upper jaw

xvii. Genus: Caranx

Members of the genus undergo considerable changes in morphology and colour with growth, body compressed, generally deep in young, become oblong and elongate in adults (Fig. 50).

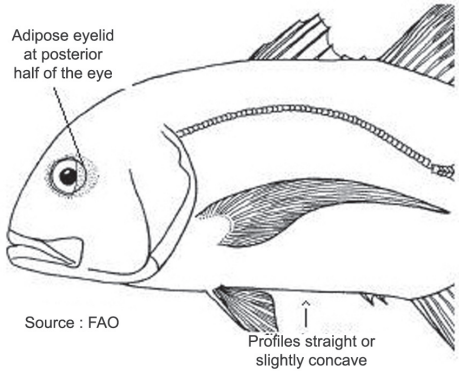


Fig. 50. Typical shape of *Caranx*

Eight species represented the genus in Indian waters

Description of species

Breast naked ventrally and typically with a small patch of pre-pelvic scales ….. A

Breast completely scaled…….. D

A. Upper jaw relatively short ending below, before the middle of the eye, a conspicuous white spot behind the postero-dorsal margin of opercle; small black spots scattered on the dorsal part of the body in larger fishes; lower lobe of caudal, pelvic and anal with a distinct narrow white margin; gillrakers on first gill arch 26 total (8 upper, 18 lower)……..*Caranx paupensis* Alleyne & Macleay, 1877, Brassy trevally (Fig. 51).

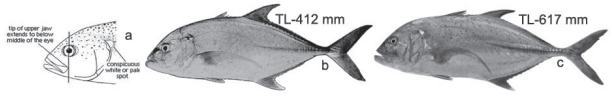


Fig. 51. *Caranx paupensis,* a) Supra maxilla; b) Sub-adult; c) Adult

End of upper jaw extends to the posterior border of pupil or only slightly beyond …… B

B. Opercle with black posterior margin; first dorsal fin black in young ones and possess 5-6 dark cross bars, fin become paler and bars disappear with growth; soft fins yellowish, lobes and leading edges of second dorsal and caudal pigmented black; body moderately deep; gillrakers on first gill arch 22-25 total (7-8 upper, 16-17 lower) ……*Caranx hippos* (Linnaeus, 1766)/*(Caranx carangus),* Blacktailed trevally (Fig. 52).

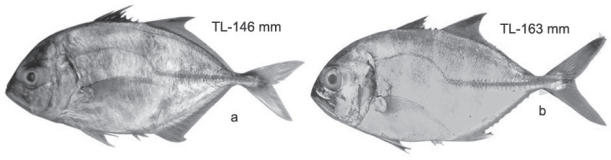


Fig. 52. *Caranx hippos,* a) Juvenile; b) Sub-adult

No opercular spot ……. C

C. Body very deep; adults exhibit sexual dimorphism in colouration with males having darker body and fins than females; gillrakers on first gill arch 20-23 total (6-7 upper, 13-16 lower)…….*Caranx ignobilis* (Forsskal, 1775), Giant trevally (Fig. 53).

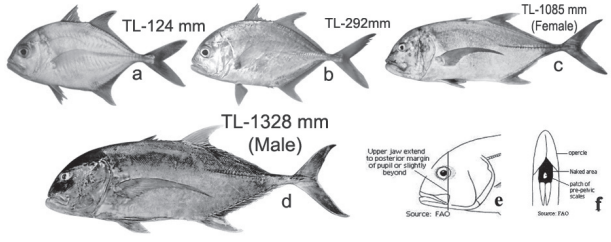


Fig . 53. *Caranx ignobilis,* a) Juvenile; b) Sub-adult; c) Adult female; d) Adult male; e) Supra maxilla; f) Ventral scaleless area

Body moderately deep; yellow green/bronze above; soft fins yellowish, upper lobe of caudal fin pigmented deep black; in juveniles distal margin of second dorsal lobe dark; gillrakers on first gill arch 23-26 total (7-8 upper, 15-18 lower)……*Caranx sem* Cuvier, 1833, Blacktip trevally (Fig. 54).

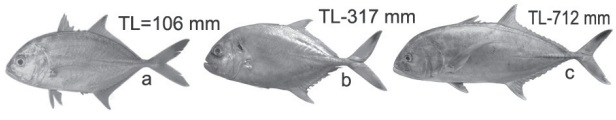


Fig. 54. *Carax sem,* a) Juvenile; b) Sub-adult; c) Adult

D. Upper jaw long, extends beyond the posterior margin of the eye……. E

Upper jaw ends below or before the eye…… F

E. Head profile moderately steep in adults; opercular spot smaller than pupil diameter; second dorsal with a distinct white tip in large fishes, lateral line scutes dark to black; gillrakers on first gill arch 22-24 total (6-7 upper, 15-17 lower),…… *Caranxsex fasciatus* Quoy & Gaimard, 1824, Bigeye trevally (Fig. 55).

Fig. 55. *Caranxsex fasciatus,* a) Juvenile; b) Sub-adult; c) Adult

Head very steep in adults, opercular spot prominent and equal to pupil diameter; second dorsal without white tip, lateral line scutes grey, gillrakers on first gill arch 21-23 total (6 upper, 15-17 lower), …… *Caranx tille* Cuvier, 1833, Tille trevally (Fig. 56).

Fig. 56. *Caranx tille,* a) Juvenile; b) Adult; c) Supra maxilla

F. Upper jaw ends below middle of the eye, head steep, anterior part of the nape slightly concave above eye; opercular spot smaller than pupil; second dorsal and anal lobe falcate; body and fins uniform grey to brown, lateral line scutes usually dark brown to black; gillrakers on first gill arch 23-30 total (6-8 upper, 17-22 lower) …… *Caranx lugubris* Poey, 1860, Black jack (Fig. 57).

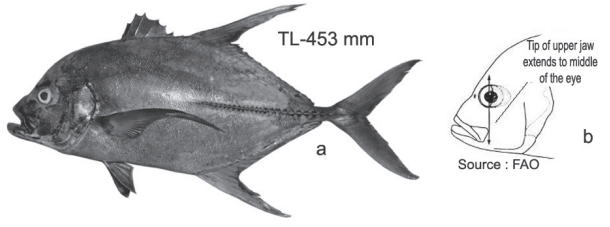


Fig. 57. a) *Caranx lugubris;* b) Upper jaw

Upper jaw ends below anterior margin of the eye; pectoral yellowish in young, colour changes with growth and soft fins become electric blue in adults, head and dorsal half of the body in adults brassy, suffused with blue and covered with blue black spots; gillrakers on first gill arch 26 total (7-9 upper, 17-19 lower) …… *Caranx melampygus* Cuvier, 1833, Bluefin trevally (Fig. 58).

Fig. 58. *Caranx melampygus* a) Juvenile; b) Adult; c) Upper jaw

xviii. Genus: Selaroides

Only one species under the genus; *Selaroides leptolepis*

a. Body with a broad yellow stripe from upper margin of eye to caudal peduncle, opercular spot encroaching to shoulder, pelvic white, other fins dusky yellow; eye diameter shorter than snout, upper jaw toothless; gillrakers on first gill arch 40-44 total (12 upper, 27-32 lower), straight part of lateral line with 25-26 small scutes …….*Selaroides leptolepis* (Cuvier, 1833), Yellow stripe scad (Fig. 59).

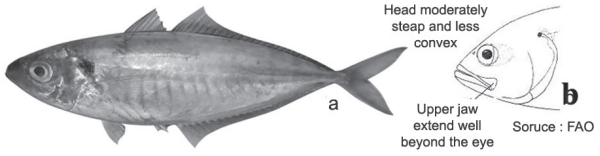


Fig. 59. a) *Selaroides leptolepis;* b) upper jaw

xix. Genus*: Atule*

Only one species under the genera; *Atule mate*

Chord of curved part of lateral line shorter than straight part; body with 9-10 dorso-ventral faint gray bars and prominent black opercular spot; eyes moderate; gillrakers on first gill arch 29-31 total (13 upper, 26-28 lower); lateral line with 41-43 scutes…….*Atule mate* (Cuvier, 1833), Yellowtail scad (Fig. 60).

Fig. 60. *Atule mate,* a) Juvenile; b) Adult; c) Semi-detached finlet

xx. Genus: Selar

Upper jaw extends to below the middle of the pupil; a wide golden yellow stripe from opercle to upper part of caudal peduncle in fresh condition; pectoral fins falcate. The genus is represented by two species.

a. Straight part of lateral line longer than chord of curved part with very prominent 42-45 scutes, curved part with 22-24 scales, pectoral ends well beyond the junction between straight and curved part of lateral line, snout shorter than eye diameter. Body relatively deep (0.28 times of TL); eyes very large with prominent pupil; gillrakers on first gill arch 10-11 upper, 27- 29 lower.……*Selar boops* (Cuvier, 1833), Oxeye scad (Fig. 61).

Fig. 61. *Selar boops*

b. Straight part of lateral line shorter than chord of curved part with 38-41 scutes, curved part with 50-56 scales, pectoral ends before the junction between straight and curved part of lateral line, snout equal or longer than eye diameter. Body less deep (0.25 times of TL); gillrakers on first gill arch 9-11 upper, 29-32 lower.……. *Selar crumenophthalmus* (Bloch, 1793), Bigeye scad (Fig. 62).

Fig. 62. *Selar crumenophthalmus*

Species identification catalogues report occurrence of several species of carangids in the Indian waters. But many were not represented in the fishery till recent past. With the recent expansion of fishing operations to previously unexploited grounds, some of them are appearing now in the landings in varying quantities. However, due to confusion on the identity many are not being documented properly. The present article will aid in identification of genera and species with ease in the field. Final confirmation can be made by conventional as well as molecular taxonomic tools.

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