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Fishery Status and Taxonomy of the Carangids (Pisces) in the Northern Arabian Sea Coast of Pakistan

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Additional information is available at the end of the chapter

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Abstract

The objectives of this study were i) to evaluate number of existing members of the family Carangidae in the area ii) to establish a distinguishable and lucid key based on the taxonomic characteristics, meristic count and otolith description. In this study, thirty-six species were collected from the main fish landing facilities between 2012-2015. Fish body colour, taxonomic characteristics, fin rays and otolith shape description were used to identify each species. Otolith description comprises of shape of ostium, sulcus and margins of anterior and posterior surface along with distinct definite shape possess by each species make it easier for identification.

This species catalogue would treasure and latest information on the existing species of the family Carangidae in the area, and provide an ease to identification especially for closely resembling species. In addition, this list includes seven unreported species from the area.

Keywords: Carangidae, taxonomy, otolith, Fishery, Northern Arabian Sea Coast, Pakistan

1. Background information

Family Carangidae comprises 140 species and is widely distributed throughout the Western Indian Ocean and Western Pacific, from Japan to Australia and eastward to Fiji [1–3] (Table 1). The carangids inhabit coastal, estuarine, and marine waters of tropical, subtropical, and temperate regions. This family has attracted many researchers around the world due to its recognition for sport fishing, recreational, and substantial marketable

value particularly species of *Scomberoides*, *Megalaspis*, *Parastromateus*, and *Caranx*. Genus *Scomberoides* comprises of four species: *S. commersonnianus*, *S. lysan*, *S. tala*, and *S. tol* found in the Indian Ocean. In terms of biomass, many species of this family are well known for instance [4] recorded 27.2 kg *Caranx hippos*, this fish species is considered as a recreational and commercial throughout its wide distribution. Popularity of jacks in game fishing highlighted [5, 6] and added that because of huge demand and human consumption indicated that stocks of such fishes have been gradually depleting throughout the world. The carangids has specific role in food web and ecosystem such as these are large predatory species exclusively feeds on clupeid, engraulid, trichurid, cuttlefish [7]. They are active swimmer fishes, pelagic, and gregarious, live in turbid water by forming school (small to large) or solitary, in clear water [8]. Most of the species rather common in the inshore reef, coastal or in shore waters within the depth range of 20–100 m. Some species such as *Carangoides ferdau* and *C. hedlandensis* are benthic confined to 100–200 m depth [8]. Recently, Panhwar et al. and Qamar et al. [9, 10] documented the population dynamics of *Megalaspis cordyla*, *Scomberoides commersonnianus*, and *S. tol* in Pakistan. Skeletal anomalies found in *M. cordyla* collected from Karachi fish harbor and Ormara based on x-ray photograph was also reported [11].

Author	Year	Location	Genera	Species
Present study	2015	Northern Arabian Sea Coast of Pakistan	19	36
Abdussamad et al. [14]	2013	Tuticorin, India.	20	60
Matsunuma et al. [15]	2011	East coast of Malay peninsula, Malaysia	15	27
Quigley [16]	2007	North-Eastern Atlantic & Mediterranean	14	25
Kuiter [17]	2000	South-eastern Australia	13	23
Gunn [18]	1990	Australia	18	63
Huda [19]	1988	Pakistan	16	34
Farooq and Niazi [20]	1988	Pakistan	4	9
Bianchi (FAO) [1]	1985	Pakistan	20	42
Laroche et al. [21]	1984	World wide	30	140
Nelson [22]	1984	World wide	32	140
Fischer & Bianchi [8]	1983	Indian ocean	22	65
Jalil & Khaliluddin [23]	1972	Pakistan	N/A	24

*Courtesy by Ahmed M, Marine Fisheries of Pakistan, 1985.

Table 1. List of genera and species of the family Carangidae reported around world.

Torpedo trevally, *Megalaspis cordyla* is monotypic schooling species and comprises approximately 25% in terms of biomass to the family Carangidae in Pakistan. Marine fisheries statistics indicated highest landing (9722 mt) in 2001 and the lowest (3559 mt) in 2008 [11]. However, no separate data for queenfishes are recorded by MFD, though the

members of *Scomberoides* genus have largely contributing in the capture fishery of the country, but recent trends indicated that the landing of genus *Scomberoides* has been reduced from 17,779 MT in 1999 to 9073 MT in 2009 [12]. The major portion of the catch belongs to *S. commersonnianus* whereas torpedo trevally, *Megalaspis cordyla* is also landed in sufficient quantity recorded at the major fish landing sites. The FAO, 2012 has figured out landing records of *S. commersonnianus* in the Western Indian Ocean, which have increased from 4994 in 2001 to 11,374 in 2010 [13]. In the local market, talang queen fish is mainly sold at approximately US\$ 2–3/kg, whereas needle scaled queenfish, and torpedo trevally at approximately US\$ 1–2 and 0.5 and 1.5 kg, respectively, depends upon the premium to the lowest quality. Carangids mainly caught with gill nets, seines on hook and line and trawl nets. The seasonal variations in the landings of *S. commersonnianus* showed higher quantities in between the period of August to October (Katti) and smaller quantities in April to May (Cheeta) following in June to July (Unaro) due to the excessive monsoon currents and closed fishing season in the area [1].

This family encompasses a diverse group of fishes known variously by common names such as jacks, scads, pompanos, queen fishes, king fishes, and trevallies, among others, which are characterized by variable body shapes elongated, fusiform to extremely ovate and strongly compressed [22, 24, 25]. The characteristics features of carangids are the presence of elongated Pterygiophores and one or two anal spines often embedded in adults [26], deeply forked caudal fin with equal lobes, slender caudal peduncle [27], and a distinctive swimming mode known as “carangiform” responsible for the name of this family [28]. A detailed description, comparison, ecological distribution, and key characters of the carangids documented from the Australian waters [18]. Abdussamad et al. [14] have reported occurrence of 60 species belonging to 20 genera of the family Carangidae based on macrotaxonomic characters from Indian waters. Further, they added a new morphological feature based on the first dorsal fin for the differentiation of carangids: group I, first dorsal fin is absent such as genus *Parastromateus* and *Alectis*; group II, described as modification of first dorsal fins into spines such as Genus *Scomberoides*, *Trachinotus*, and *Naucrates*; group III, well-developed first dorsal fin with spiny rays such as genus *Megalaspis*, *Elagatis*, *Decapterus*, *Seriolina*, *Seriola*, *Atropus*, *Ulua*, *Uraspis*, *Gnathanodon*, *Carangoides*, *Alepes*, *Caranx*, *Selaroides*, *Atule*, and *Selar*.

In Pakistani waters, the number of species is not clearly known, since Bianchi [1] identified 42 and Huda [19] 34 species. Nevertheless, the family Carangidae is a dominant finfish group in these waters contributing a major contribution of the commercial fisheries resources. According to Bianchi [1], species representing four subfamilies (tribes) of carangids in Pakistani waters: *Alectis ciliaris*, *A. indicus*, *Alepes djedaba*, *A. melanoptera*, *A. vari*, *Atropus atropos*, *Atule mate*, *Carangoides caeruleopinnatus*, *C. chrysophrys*, *C. ferdau*, *C. fulvoguttatus*, *C. gymnostethus*, *C. malabaricus*, *C. bajad*, *C. hedlandensis*, *C. oblongus*, *C. plagiotaenia*, *C. praeustus*, *C. talamparoides*, *Caranx ignobilis*, *C. melampygus*, *C. sexfasciatus*, *C. para*, *Decapterus macrosoma*, *D. russelli*, *Elagatis bipinnulata*, *Gnathanodon speciosus*, *Megalaspis cordyla*, *Naucrates ductor*, *Parastromateus niger*, *Scomberoides commersonniansus*, *S. lysan*, *S. tol*, *Selar crumenophthalmus*, *Selaroides leptolepis*, *Seriolina nigrofasciata*, *Trachinotus africanus*, *T. baillonii*, *T. blochii*, *T. mookalee*, *Trachurus indicus*, *Uraspis secunda*.

In the present study, various surveys of major fish landing sites were made along the Sindh and Baluchistan coast during 2012–2015 to evaluate number of existing species of the family Carangidae in Pakistani waters. In these surveys, thirty-six species were identified with seven new from the area, namely *Alepes kleinii*, *Carangoides armatus*, *Caranx sem*, *Scomberoides tala*, *Seriola dumerili*, *Trachinotus russelii*, *Uraspis uraspis*. The morphometric and meristic count was taken for each specimen following the protocols of Smith-Vaniz [27]: Standard length(S L), head length (HL), curve and straight lateral line length (CLL, SLL), number of gill rakers (upper and lower), number of spines and fin rays, number of lateral line scales and scutes, number of anal spine, pattern of breast squamation, type of adipose eyelid, and all possible body measures. The parameters of each sagittal otolith such as length, height, weight, and shapes of cauda, ostium, excisura, and sulcus acusticus were recorded. Finally, the sex identification was established from macroscopic observation based on color pattern and size of the gonad [29].

The study was aimed to prepare a species catalogue with otolith descriptions for the available species of the family Carangidae to provide an ease in taxonomic identification of closely resembling species on the basis of characteristics derived from [18, 27] (**Table 2**), (**Figure 1**).

Serial	Species (N)	Author name	TL	FL	GIRTH	BW	OL/TL	OH/OL	OW	SEX
1	<i>Alectis ciliaris</i> (2)	Bloch, 1788	43	39.5	26.2	895	50	2.2	0.0037	M
2	<i>Alectis indicus</i> (4)	Rüppell, 1830	23.5	20.5	24	108.4	50	2.1	0.0048	F
3	<i>Alepes djedaba</i> (18)	Forsskål, 1775	24	21.8	19.5	270	27	2.6	0.0048	M
4	<i>Alepes kleinii</i> (16)	Bloch, 1793	17.6	14.8	12.8	50	50	2.4	0.0034	M
5	<i>Alepes melanoptera</i> (5)	Swainson, 1839	17.5	15	11.5	52	44	2.1	0.0029	M
6	<i>Alepes vari</i> (9)	Cuvier, 1833	22.1	19	14.2	101.75	24	2.3	0.0047	F
7	<i>Atropus atropos</i> (25)	Schneider, 1801	15.8	13.5	16	60	57	2.1	0.0009	M
8	<i>Atule mate</i> (15)	Cuvier, 1833	27	23.4	16	61.08	45	2.1	0.0054	M
9	<i>Carangoides armatus</i> (4)	Rüppell, 1830	37	32	29	85	43	2.5	0.011	F
10	<i>Carangoides chrysophrys</i> (7)	Cuvier, 1833	21.4	18.5	18.5	136.47	44	2.4	0.0022	M
11	<i>Carangoides hedlandensis</i> (12)	Whitley, 1933	18.1	16	15	51	40	2.9	0.010	M
12	<i>Carangides malabaricus</i> (20)	Bloch & Schneider	23	19.8	17	113	56	2.5	0.0042	F
13	<i>Carangoides praeustus</i> (18)	Bennett, 1830	20.8	18.2	14	94	44	2	0.0039	F
14	<i>Caranx ignobilis</i> (3)	Forsskål, 1775	28.5	24.5	21	265.4	36	1.9	0.0054	M
15	<i>Caranx para</i> (2)	Cuvier, 1833	16.5	15	13	53.5	44	2.7	0.0039	M
16	<i>Caranx sem</i> (2)	Cuvier, 1833	76	69.5	49	4000	36	0.7	0.0055	M
17	<i>Caranx sexfasciatus</i> (17)	Quoy & Gaimard, 1824	19	16.3	13	83	38	2.5	0.0069	M
18	<i>Decapterus russelli</i> (22)	Rüppell, 1830	19.5	18.5	9.5	60.8	58	3.6	0.0041	F
19	<i>Elagatis bipinnulata</i> (03)	Quoy & Gaimard, 1824	35	28.5	16	271	40	1	0.0024	M

Serial	Species (N)	Author name	TL	FL	GIRTH	BW	OL/TL	OH/OL	LOW	SEX
20	<i>Gnathanodon speciosus</i> (02)	Forsskål, 1775	20.8	18.5	14	94	56	1.8	0.0027	F
21	<i>Megalaspis cordyla</i> (298)	Linnaeus, 1758	42.7	38.7	22	710	50	2.5	0.0015	M
22	<i>Parastromateus niger</i> (56)	Bloch, 1975	25.6	27.2	24	320	56	1.8	0.0027	F
23	<i>Scomberoides commersonianus</i> (1044)	Lacepède, 1802	64.3	56.1	34.5	1900	33	2	0.0016	F
24	<i>Scomberoides lysan</i> (18)	Forsskål, 1775	73	63	32.5	2200	38	1.1	0.0078	M
25	<i>Scomberoides tala</i> (9)	Cuvier, 1832	51	43.5	28	213.9	38	1.6	0.0083	F
26	<i>Scomberoides tol</i> (255)	Cuvier, 1832	68	59	24.5	1700	38	1.4	0.0079	M
27	<i>Selar crumenophthalmus</i> (23)	Bloch, 1793	21	19.5	12	93.2	60	2.4	0.0081	M
28	<i>Selaroides leptolepis</i> (8)	Cuvier, 1833	17	15	12	62.18	63	2.6	0.0046	F
29	<i>Seriola dumerili</i> (10)	Risso, 1810	21.3	19	12.5	95	40	1.7	0.003	M
30	<i>Seriolina nigrofasciata</i> (14)	Rüppell, 1829	35.1	31.6	19.6	405.5	56	1.3	0.003	F
31	<i>Trachinotus baillonii</i> (4)	Lacepède, 1801	15.8	14	15	55.8	44	23	0.0021	M
32	<i>Trachinotus blochii</i> (6)	Lacepède, 1801	26	22	23	226	49	2.5	0.0017	M
33	<i>Trachinotus mookalee</i> (6)	Cuvier, 1832	27.8	22.8	22	238	50	1.5	0.0029	M
34	<i>Trachinotus russelii</i> (4)	Cuvier, 1832	54	40	32	1200	27	23	0.0058	M
35	<i>Trachurus indicus</i> (3)	Nekrasov, 1966	27.6	24	14	168	50	2.9	0.0229	F
36	<i>Uraspis uraspis</i> (8)	Günther, 1860	25.6	22.5	21.4	257.5	27	2.3	0.0015	F

Table 2. Summary of the length and otolith data of the 36 species and sex.

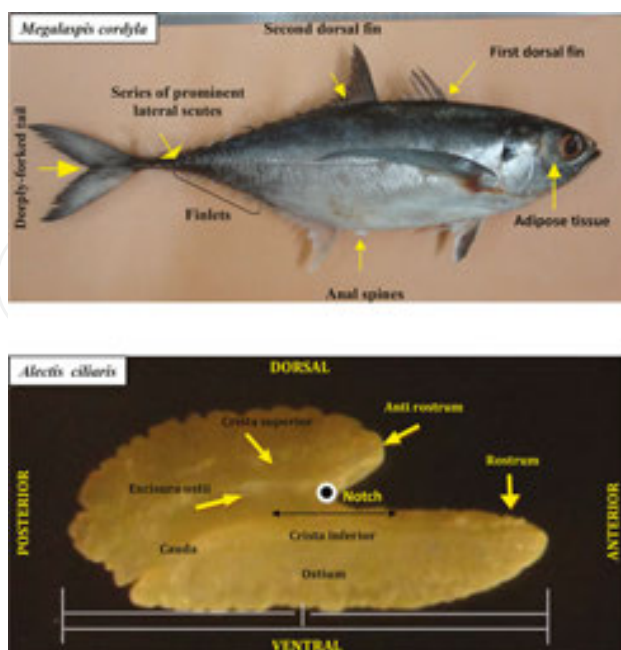


Figure 1. General Description of Fish and Otolith.

2. Morphological and otolith descriptions 36 species

2.1. African pompano, *Alectis ciliaris*

Body has ovate (to pentagonal) shape, strongly compressed, tapering evenly from midpoint posteriorly and elongated with growth. Dorsal and ventral profile is equally convex. Eye is large and greater than snout length. Mouth is low with protractile jaws. Villiform teeth are arranged in bands in lower jaw, villiform teeth also present in tongue, palatines, and vomer. Maxilla extends two-thirds behind of eye. Head large comprised 30% of FL and nape is rounded. Gill rakers 5 upper and 13 on the lower limb of first gill arch. Dorsal fin with 7 short-free embedded spines. Second soft dorsal fin with 1 spine followed by 19 rays. First 7–8 rays of soft dorsal and anal fin are elongated and filamentous in juveniles. Pectoral fin long, falcate, extended beyond the straight lateral line and greater than pelvic fin. In juveniles, pelvic fin is elongated. Anal fin with 1 spine followed by 19 rays, and caudal fin is deeply forked. Lateral line is strongly concave above pectoral fin, deeply arched and junction of curved and straight lateral line is below 12–14 dorsal soft rays. Curve lateral line is greater than straight lateral line, straight lateral line with 22 scutes. Scales are minute and deeply embedded in the skin, in juveniles, 5–7 crosses extensive bands throughout the body present (**Figure A1**).

Otolith shape: lanceolated. Margins: dorsoventrally crenate. Sulcus acusticus: heterosulcoid, ostiocal, median in position. Ostium: funnel-like shorter than cauda. Cauda: tubular and elliptic in shape, slightly curved ending closed to the postero ventral region. Anterior region: lanceolated; rostrum narrow, elongated, and pointed; antirostrum short, broad, pointed; excisura wide “v” shaped with a deep notch. Posterior region: oblique - round (**Figure A2**).

2.2. Indian threadfish, *Alectis indicus*

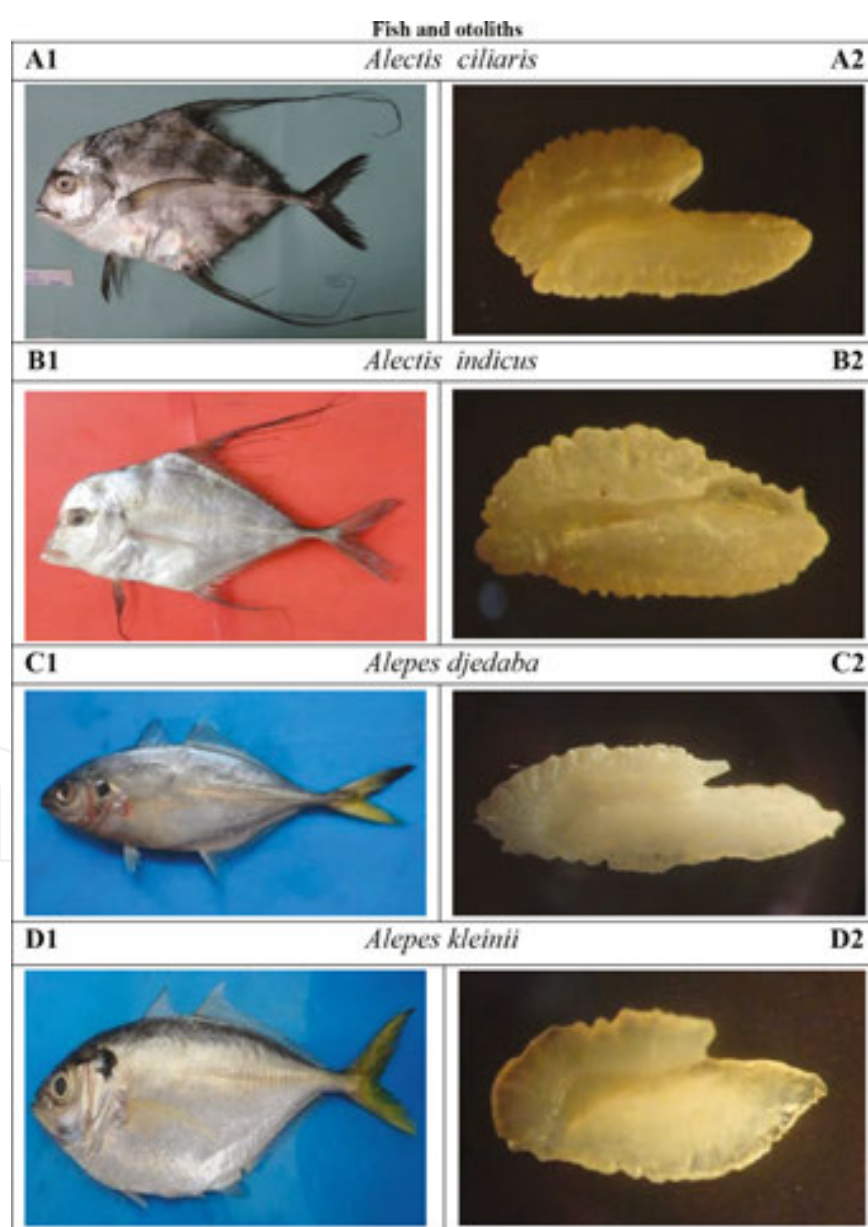
Body has ovate to pentagonal shape, strongly compressed, tapering evenly with midpoint posteriorly and strongly compressed laterally. Dorsal and ventral profile is evenly convex. Eyes are small and about half the length of snout. Mouth is low with protractile jaws, villiform teeth are arranged in bands in lower jaw and also present on tongue, palatines, and vomer. Teeth are absent in adults. Maxilla extends slightly before the anterior margin of eye. Head is angled-shaped, large and comprises 33% of FL. Gill rakers: 8 upper and 21 in the lower limbs of first gill arch. Dorsal fin with 7 short-free embedded spines. Second soft dorsal fin with 1 spine followed by 20 rays. First five rays of soft dorsal and anal fin are elongated and filamentous in young. Pectoral fin is long, falcate, reaching the straight lateral line, and equal than HL. In juveniles, pelvic fin is elongated. Anal fin with 1 spine followed by 16 rays. Caudal fin is deeply forked and 28% of FL. Lateral line is strongly concave above pectoral fin and deeply arch and junction of curved and straight lateral line is below sixth dorsal soft rays. Curve lateral line is greater than straight lateral line. Straight lateral line with 4 scales and 14 weak scutes. Scales are minute and deeply embedded in the skin (**Figure B1**).

Otolith shape: oblong. Margins: dorsal sinuate, ventral crenate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like. Cauda: elliptic, straight ending close to the

ventral margin. Anterior region: peaked; rostrum broad, long, rounded; antirostrum absent; excisura wide without notch. Posterior region: oblique (**Figure B2**).

2.3. Shrimp scad, *Alepes djedaba*

Body has fusiform shape, strongly compressed. Dorsal and ventral profile is evenly convex. Eye is covered with adipose eyelid posteriorly. Snout is pointed and equal to eye diameter about 25% of HL. Superior maxilla is large, slightly concave posteriorly. A single row of minute comb-like teeth present in row on both jaws. Minute teeth also present in tongue, vomer, and palatines. Shoulder girdle margin is smooth and without papilla. Head length is about 25% of FL. Gill rakers 10 upper and 29 lower, in first gill arch.



First dorsal fin is membranous, with 8 spines (third spine is moderately high), second dorsal fin with 1 spine followed by 25 rays. Two detached anal spines are present. Anal fin with 1 spine and 19 soft rays. Pectoral fin is long and falcate about 33% of FL. Dorsal fin is low, anal fin slightly falcate. Caudal fin is deeply forked about 26% FL. The distance from snout to anal fin origin is 51% FL. Curved lateral line is shorter than straight line and junction is below second soft dorsal fin rays. Curve lateral line with 33 scales and straight lateral line with 2 scales and 46 scutes (**Figure C1**).

Otolith shape: lanceolated. Margins: dorsal margin crenate, ventral margin irregular. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the ventral margin. Anterior region: peaked; rostrum broad, long, pointed; antirostrum short, narrow, pointed; excisura wide a shallow notch. Posterior region: oblique (**Figure C2**).

2.4. Razorbelly scad, *Alepes kleinii* (new record)

Body has oblong shape, laterally compressed. Ventral profile is more convex than dorsal profile. Eye diameter is equal to snout length. Posterior half of the eye is covered with adipose eyelid. Maxilla is slightly concave posteriorly. Tiny comb-like teeth arranged in band is present in upper jaw. Opercular spot is very distinct. Head length comprises of 24% FL. Gill rakers 10 in upper limb and 24–28 in lower limb.

Two separate dorsal fin. First dorsal fin is membranous with 7–8 spines. Second dorsal fin with 1 spine followed by 20–23 soft rays. Pectoral fin is long and falcate. Pelvic fin is short and hyaline. Anal fin with 2 detached anal spines and 1 spine followed by 18–20 soft rays. Caudal fin is deeply forked about 33% of the FL. Vertical 9–10 brownish band equal in width are present above the lateral line. Curve lateral line is shorter than straight lateral line. Scales on curve lateral line are 28–31, and scutes on straight lateral line are 32–40. Junction of CLL and SLL is below the seventh–eighth ray of second dorsal fin (**Figure D1**).

Otolith shape: lanceolated. Margins: dorsal margin irregular, ventral margin crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the posterior margin. Anterior region: peaked; rostrum broad, medium, pointed; antirostrum short, broad, round; excisura wide with a shallow notch. Posterior region: round (**Figure D2**).

2.5. Blackfin scad, *Alepes melanoptera*

Body has oblong shape, moderately compressed. Dorsal and ventral profile evenly convex. Eye covered with adipose eyelid posteriorly. Snout is pointed and equal to eye. A single row of minute uniserate, comb-like teeth present in row on both jaws. Biserate dentition on premaxilla. Maxilla ends at the center of eye. Head length about 24% forked length. Gill rakers 9 upper and 23 lower, in first gill arch. Smooth Shoulder girdle margin without papillae.

First dorsal fin is membranous, with 8 spines, second dorsal fin with 1 spine followed by 24 rays. Two detached anal spines are present. Anal fin with 1 spine and 18 soft rays. Pectoral fin

long and falcate about 30% forked length. Longest spine of first dorsal fin about equals to second dorsal fin. Soft dorsal fin low, anal fin slightly falcate. Caudal fin deeply forked about 28% forked length. The distance from Snout to anal fin origin is 57% forked length. Curved lateral line shorter than straight line and junction below second soft dorsal fin rays. Chord of curved line 2.2 times shorter than straight lateral line. Curve lateral line with 30 scales and straight lateral line with 4 scales and 50 scutes (**Figure E1**).

Otolith shape: lanceolated. Margins: crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, slightly curved at the end, ending far from the ventral margin. Anterior region: peaked; rostrum narrow, long, pointed; antirostrum absent or few developed; excisura wide without notch. Posterior region: oblique (**Figure E2**).

2.6. Herring scad, *Alepes vari*

Body has fusiform shape, moderately compressed. Dorsal and ventral profile evenly convex. Eye is covered with adipose eyelid posteriorly. Snout is pointed and greater than eye. A single row of minute uniserrate, comb-like teeth present in row on both jaws. Bi-serrate dentition in premaxilla. Maxilla extends to one-third of eye. Head length is about 24% of FL. Gill rakers 10–12 upper and 26–29 lower, in first gill arch. Smooth shoulder girdle margin without papillae.

First dorsal fin is membranous, with 8 spines, second dorsal fin with 1 spine followed by 20–25 rays. Two detached anal spines are present. Anal fin with 1 spine and 19 soft rays. Pectoral fin is long and falcate about 27% of FL. Longest spine of first dorsal fin is shorter than second dorsal fin. Soft dorsal fin is low, anal fin slightly falcate. Caudal fin is deeply forked about 26% of FL. The distance from snout to anal fin origin is 50% of FL. Curved lateral line is shorter than straight line, and junction is below third soft dorsal fin rays. Chord of curved line is 2.1–2.5 times to straight lateral line. Curve lateral line with 38–42 scales and straight lateral line with 2 scales and 50–55 scutes (**Figure F1**).

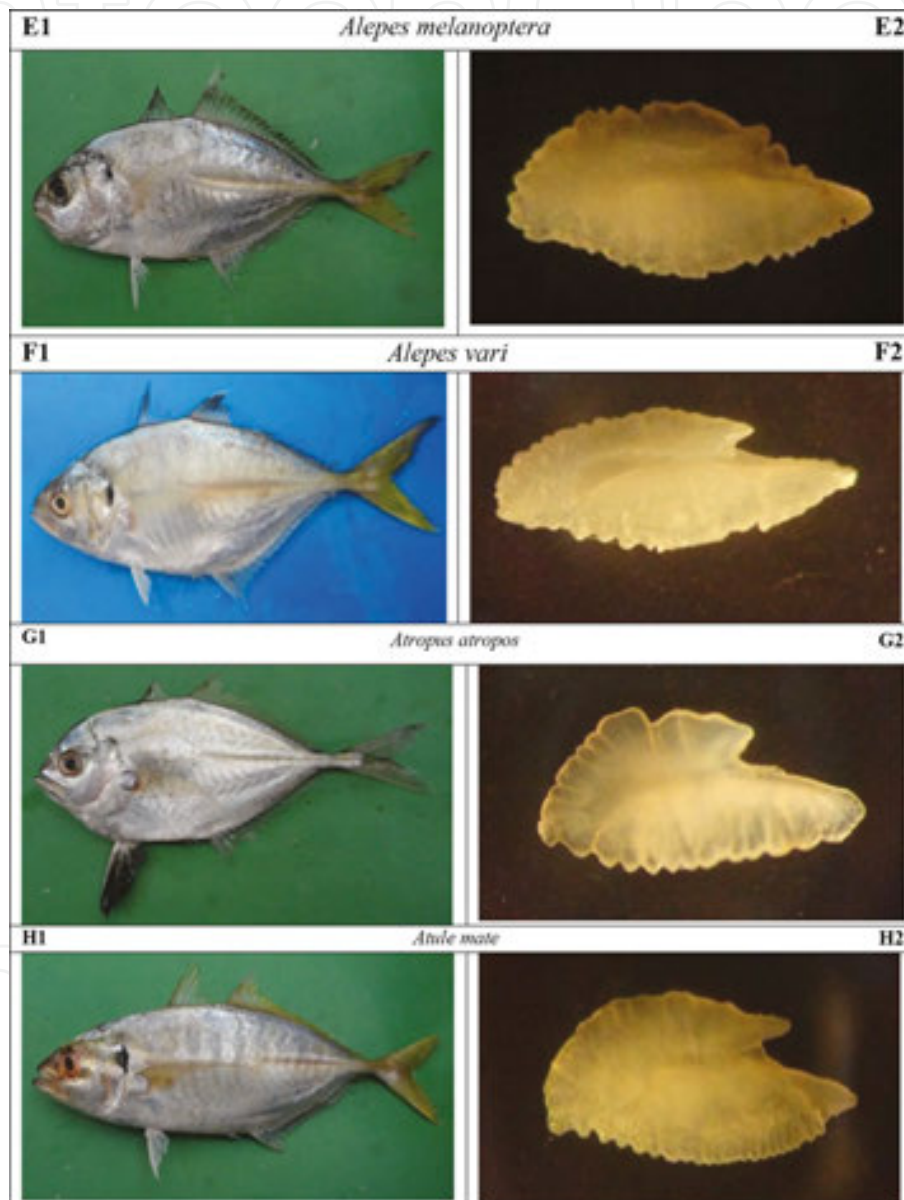
Otolith shape: fusiform. Margins: dorsal margin sinuate, ventral margin crenate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like longer than cauda. Cauda: tubular, markedly flexed posteriorly from the ventral margin. Anterior region: peaked; rostrum broad, elongated, pointed; antirostrum short, peaked; excisura wide with a small shallow notch. Posterior region: oblique (**Figure F2**).

2.7. Cleftbelly trevally, *Atropus atropus*

Body is ovate, strongly compressed. Nape profile is convex. Eye is equal or slightly larger to snout length. Narrow band of teeth is present on upper jaw. Lower jaw with a single series of teeth. Head is about 26% of FL. Gill rakers upper 9, lower 18 in first gill arch. Ventral side of breast is naked, and diagonally extends to the base of pectoral fin. Prominent opercular spot is present.

First dorsal fin with 8 spines, soft dorsal fin with 21 soft rays. Pectoral fin is falcate and greater than pelvic fin. Pelvic fin is large and blackish. Lobe of second dorsal fin length is 15% of FL.

Anal fin with 1 spine followed by 20 soft rays. Adult shows sexual dimorphism between the second and twelfth ray of soft dorsal fin, filamentous in male. Belly has a deep median groove covering pelvic fin and anal spine. Two detached anal spines are present. Tip of pelvic fin extends to the origin of anal fin. Caudal fin is deeply forked and constituting 27% of FL. Lateral line is concave above pectoral fin and junction is below 4–6 rays of soft dorsal fin. Straight lateral line is greater than curved lateral line, having 3 scales and 38 strong scutes (**Figure G1**).



Otolith shape: elliptic-lanceloted. Margins: dorsal irregular, ventral serrate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like shorter than cauda. Cauda: tubular, strongly flexed ending close to the ventral margin. Anterior region: peaked; rostrum broad, long, pointed; antirostrum short, narrow, pointed; excisura wide with an acute v-shaped medium notch. Posterior region: oblique (**Figure G2**).

2.8. Yellowtail scad, *Atule mate*

Body has fusiform shape, moderately compressed. Dorsal and ventral profile is evenly convex. Eye is covered with adipose eyelid except for vertical slit centered on pupil. Snout is pointed and greater than eye. A single row of minute uniserate, comb-like teeth present on both jaws. Biserate dentition in premaxilla. Maxilla extends to one-third of eye anteriorly. Head length is about 26% of FL. Gill rakers 10–12 upper and 24–26 lower in first gill arch. Smooth shoulder girdle margin without papillae.

First dorsal fin is membranous, with 8 spines, second dorsal fin with 1 spine followed by 20–24 rays. Two detached anal spines are present: anal fin with 1 spine and 19 soft rays. Pectoral fin is long and falcate about 31% of FL. Soft dorsal fin is low, anal fin slightly falcate. Caudal fin is deeply forked about 33% of FL. The distance from snout to anal fin origin is 50% of FL. Curved lateral line is shorter than straight line, and junction is below sixth soft dorsal fin rays. Chord of curved line is 2.1 times to straight lateral line. Curve lateral line with 40 scales and straight lateral line with 2 scales and 52 scutes. Last soft dorsal and anal fin finlet are joined by inter radial membrane and about twice the length of previous ray (**Figure H1**).

Otolith shape: fusiform. Margins: dorso-ventral posterior margin dentate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the posterior margin. Anterior region: lanceolated; rostrum broad, medium, pointed; antirostrum short, narrow, pointed; excisura wide with a shallow notch. Posterior region: oblique (**Figure H2**).

2.9. Longfin trevally, *Carangoides armatus* (new record)

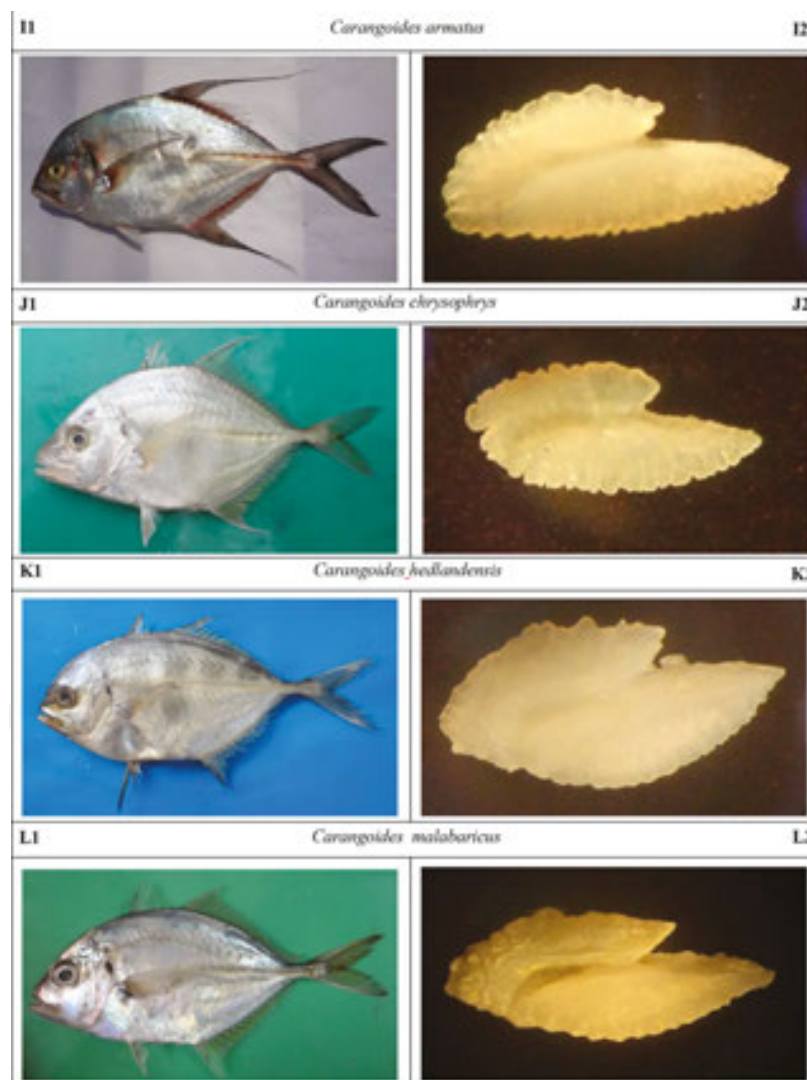
Body has ovate (to hexagonal) shape, deep, and compressed; eye diameter is less than snout length. Head is steep and straight from snout to nape without any break in contour (bump). Villiform teeth are arranged in bands in both jaws, which expended anteriorly. Vomerine tooth is wedge patch shaped. Breast is ventrally naked to behind the origin of pelvic fin up to naked base of pectoral fin. Head length comprises of 30% of FL. Gill rakers are 10 lower and 23 upper in first gill arch.

First dorsal fin is modified into 8 free spines, and soft dorsal fin consists of 1 spine followed by 22 soft rays. Dorsal and anal fin 3–12 middle rays elongate and filamentous, longer than head length in male. Pectoral fin is long and falcate. Pelvic fin is long in juveniles. Anal fin with two detached anal spines with 1 spines followed by 20 rays. Caudal fin is deeply forked and 27% of FL. Lateral line is strongly arched, and junction is below 12–14 soft dorsal rays. Curved lateral line is longer than straight line. Straight lateral line consist of 20 scales and 23 scutes (**Figure I1**).

Otolith shape: lanceolated. Margins: dorsal margin sinuate, ventral margin crenate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like longer than cauda. Cauda: tubular, strongly flexed posteriorly. Anterior region: peaked; rostrum broad, elongated, pointed; antirostrum short, roundly peaked; excisura wide with a shallow notch. Posterior region: oblique (**Figure I2**).

2.10. Longnose trevally, *Carangoides chrysophrys*

Body has oval shape, strongly compressed. Dorsal profile is more convex. Snout is greater than eye diameter. Dorsal outline of snout to nape is straight and then convex to the origin of dorsal fin. Small villiform teeth are arranged in bands anteriorly widened. Head length comprises of 30% FL. Gill rakers: 5 in upper limb and 15 in lower limb. Two separate dorsal fin. First dorsal fin is membranous with 7–8 spines, second dorsal fin with 1 spine followed by 21 soft rays. Pectoral fin is long and falcate. Pelvic fin is short and hyaline. Anal fin with 2 detached anal spines and 1 spine followed by 16 soft rays. Caudal fin is deeply forked about 27% of FL. Curve lateral line is shorter than straight lateral line. Scales on curve lateral line is 28–31 and scutes on straight lateral line are 32–40. Junction of CLL and SLL is below seventh–eighth ray of second dorsal fin (Figure J1).



Otolith shape: lanceolated. Margins: dorso-ventrally crenate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like. Cauda: tubular, strongly flexed posteriorly.

Anterior region: lanceolated; rostrum narrow, elongated, peaked; antirostrum short, broad, round; excisura wide with a shallow notch. Posterior region: oblique-irregular (**Figure J2**).

2.11. Bumpnose trevally, *Carangoides hedlandensis*

Body has ovate shape and deep, laterally compressed. Ventral profile is more convex than dorsal side. Snout length is equal to eye diameter. Head profile is steep, dorsal contour of forehead convex, with “bump” on interorbital space. Villiform teeth are arranged in bands in both jaws which widens anteriorly. Patchy wedge-shaped vomerine teeth. Breast is naked and confined below pectoral fin. Head constituted 27% of FL. Gill rakers 8 upper and 25 lower limbs of first gill arch.

First dorsal fin membraneous with 8 spines and second dorsal fin with 1 spine followed by 21 rays (3–8) producing filamentous and elongate, longer than head length in male. Pectoral fin is long and falcate. Pelvic fin short. Anal fin with two detached spines with 1 spine followed by 18 soft rays. Caudal fin is deeply forked and 26% of FL. Lateral line is strongly arched, and junction is below 12–14 soft dorsal rays. Curved lateral line is longer than the straight line. Straight laterally consists of 12 scales and 28 scutes (**Figure K1**).

Otolith shape: lanceolated. Margins: crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the ventral margin. Anterior region: peaked; rostrum narrow, long, pointed; antirostrum short, broad, round; excisura wide with a shallow notch. Posterior region: oblique (**Figure K2**).

2.12. Malabar trevally, *Carangoides malabaricus*

Body has oval shape, deep, and compressed; dorsal profile more convex is prominent to nape. Eye diameter is less than snout length. Head is steep and straight from snout to nape without any break in contour (bump). Villiform teeth are arranged in bands in both jaws, which expended anteriorly. A conical outer tooth is present. Vomerine tooth is roughly triangular. Breast is ventrally naked and behind the origin of pelvic fin upto origin of second dorsal fin. Head length comprises of 24–28% of FL. Gill rakers are 12 lower and 25 upper in first gill arch.

First dorsal fin is modified into 8 free spines and second dorsal fin consists of 1 spine followed by 23 soft rays. Pectoral fin is long and falcate. Pelvic fin is short. Anal fin with two detached anal spines with 1 spines followed by 18–19 rays. Caudal fin is deeply forked and 27% of FL. Lateral line is strongly arched, and junction is below 12–14 soft dorsal rays. Curved lateral line is longer than straight line. Straight lateral line consists of 19 scales and 38 scutes (**Figure L1**).

Otolith shape: fusiform. Margins: dorsal, lobed, ventral, sinuate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved posteriorly ending close to the ventral margin. Anterior region: peaked; rostrum broad, short, pointed; antirostrum short, broad, pointed; excisura wide with a shallow v-shaped notch. Posterior region: peaked (**Figure L2**).

2.13. Brownback trevally, *Carangoides praeustus*

Body is elliptic, elongated, and laterally compressed. Dorsal and ventral profile is identical. Snout is greater than eye. Straight head profile dorsally. Mouth is pointed and terminal. Teeth are conical, arranged in small irregular row in both jaws. Narrow bands of anterior tooth are arranged in upper jaw. Head length is 26% of FL. Breast ventrally naked, small patch of prepatch scale, remained separated from naked base of pectoral. Gill rakers upper 12 and 30 in lower limb of first gill arch.

First dorsal fin is membranous with 8 spines, and second dorsal fin consists of 1 spine followed by 23 soft rays. Height of third longest spinous dorsal fin is equal to soft dorsal fin lobe. Pectoral fin is long and falcate. Pelvic fin is short. Anal fin with two detached anal spines with 1 spine followed by 18–19 rays. Caudal fin is deeply forked and 28% of FL. Lateral line is strongly arched, and junction is below 11–12 soft dorsal rays. Curved lateral line is longer than straight line. Straight lateral line consists of 10 scales and 30 scutes (**Figure M1**).

Otolith shape: Trapezoidal-lanceolated. Margins: dorsal margin sinuate, ventral margin crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the posterior margin. Anterior region: peaked; rostrum broad, medium, pointed; antirostrum short, narrow, pointed; excisura wide with an acute medium notch. Posterior region: oblique (**Figure M2**).

2.14. Giant trevally, *Caranx ignobilis*

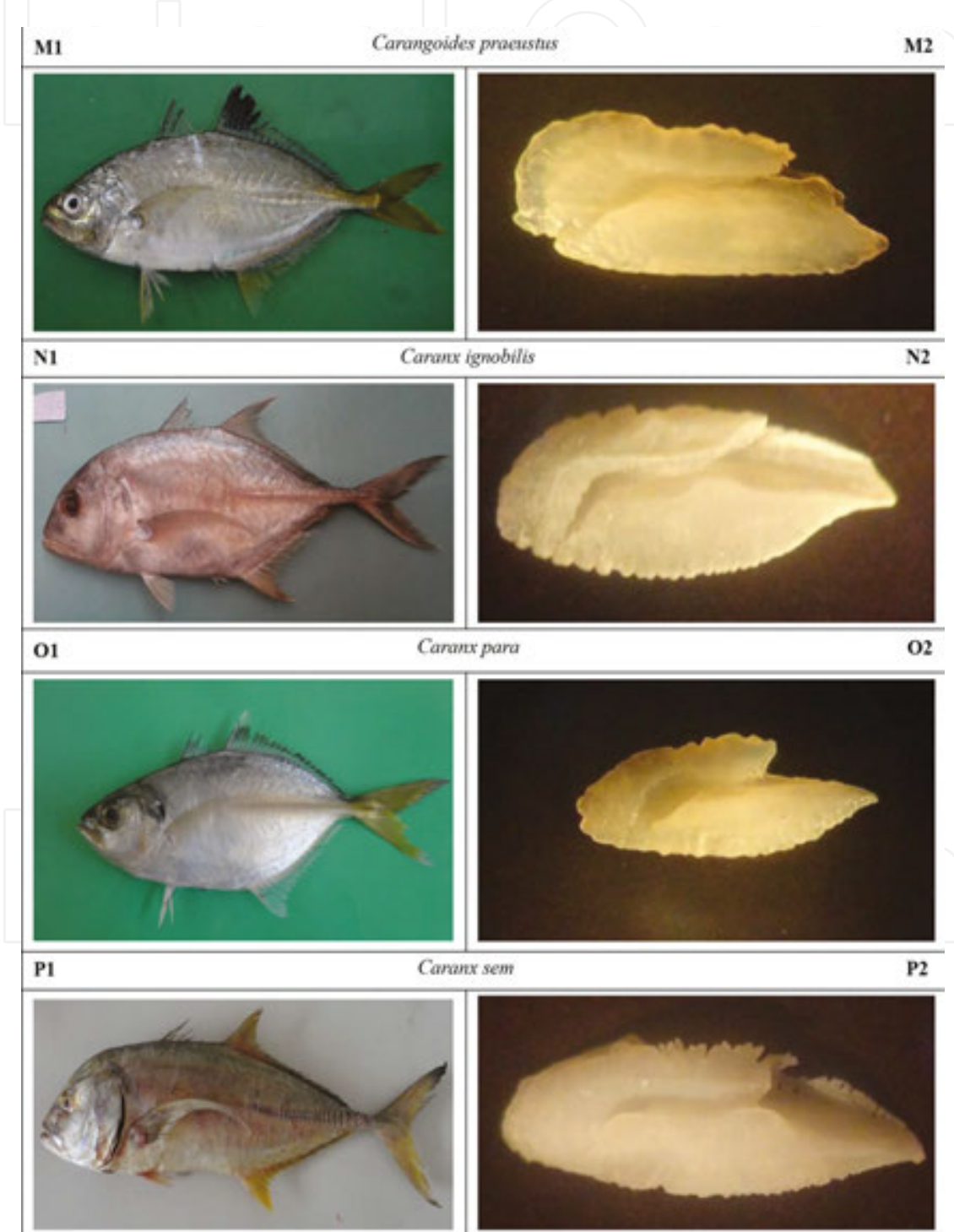
Body has oblong shape, laterally compressed. Profile of dorsal body is more convex from snout to soft dorsal fin. Snout is pointed and greater than eye. Adipose eyelid covered the eye, extending beyond the posterior border of the eye. Maxilla slightly extends to posterior margin of eye. Strong canines in outer row tooth of both jaws. Small villiform tooth is present in inner bands of upper jaw. In upper jaw, canines are widely spaced in adult. Ventral profile of breast is completely naked with a patch of prepelvic scale. Head length comprises 29% of FL. Gill rakers 4 upper and 14 lower in first gill arch.

First dorsal fin is membranous, with 8 spines and second dorsal fin with 1 spine followed by 18 rays. Two detached anal spines are present, anal fin with 1 spine followed by 16 soft rays. Pectoral fin is long and falcate about 37% of FL and longer than HL. Pelvic fin is short. Soft dorsal fin and anal fin lobe is slightly falcate. Caudal fin is deeply forked about 23% of FL. The distance from snout to anal fin origin is 62% of FL. Curved lateral line is longer than straight line, and junction is below fourth–fifth soft dorsal fin rays. Curved lateral line with 46 scales and straight lateral line with 4 scales and 29 scutes. Scale in body is cycloid and small, entirely covered the body except small portion behind pectoral fin (**Figure N1**).

Otolith shape: fusiform. Margins: crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the ventral margin. Anterior region: slightly curved at tip, peaked; rostrum broad, long, pointed; antirostrum absent; excisura wide without notch. Posterior region: oblique (**Figure N2**).

2.15. Green jack, *Caranx para*

Body oval, laterally compressed and ventral profile more convex. Eye equal to snout length and covered with adipose eyelid which extends posterior half of eye. Maxilla broad and concave posteriorly. Teeth of lower jaw are arranged in irregular rows. Lower jaw with a single row of conical teeth. Head profile steep from snout to origin of second dorsal fin and ovate



posteriorly. Head length is 28% of forked length. Shoulder girdle margin smooth and without papillae. Gill rakers upper 12 and 26 lower limbs of the first gill arch.

First dorsal fin membranous with 8 spines, soft dorsal fin with 1 spine followed by 25 soft rays and 1.75 times shorter than head length. Dorsal and anal fin lobe falcate. Pectoral fin long 34% of forked length, falcate, tip end reaches beyond the junction of CLL and SLL. Anal fin with two detached anal spines with 1 spine followed by 20 rays. Anal fin behind the origin of soft dorsal fin. Caudal fin deeply forked, dorsal lobe longer, and 31% of forked length. Lateral line strongly arched and junction below fourth–sixth soft dorsal rays. Straight lateral line is longer than curved lateral line. Straight lateral line consists of 45 scutes and scales small and cycloid (**Figure O1**).

Otolith shape: lanceolated. Margins: dorso-ventral posteriorly sinuate. Sulcus acusticus, heterosulcoid, ostial, median. Ostium: funnel-like equal to the length of cauda. Cauda: tubular, markedly curved posteriorly from the middle region. Anterior region: peaked; rostrum elongated, pointed; antirostrum short, broad, peaked; excisura wide with a V-shaped notch. Posterior region: round-oblique (**Figure O2**).

2.16. Blacktip trevally, *Caranx sem* (new record)

Body has oblong and elongated shape, laterally compressed. Profile of dorsal body is more convex from snout to soft dorsal fin. Ventral profile is slightly convex. Snout is pointed and greater than eye. Eye is moderate and covered anteriorly with small adipose eyelid and posteriorly extends to the pupil. Maxilla extends to the posterior margin of the eye. Strong canines present in outer row teeth of both jaws. Small villiform teeth are present in inner bands of upper jaw. Head length comprises 30% of FL. Gill rakers: 4 upper and 15 lower in first gill arch.

First dorsal fin is membranous, with 8 spines, second dorsal fin with 1 spine followed by 20 rays. Two detached anal spines are present. Anal fin with 1 spine followed by 16 soft rays. Pectoral fin is long and falcate longer than HL. Pelvic fin is short. Soft dorsal and anal fin is slightly falcate. Caudal fin is deeply forked about 30% of FL. Curved lateral line is longer than straight line, and junction is below fourth–fifth soft dorsal fin rays. Straight part of lateral line is 2.4 times of forked length with 4 scales and 30 scutes. Scale in body is cycloid and small, entirely covered the body and in breast, small-to-large patch of prepelvic scale. All fins are brightly yellow to olive yellow in color, and distal half of upper lobe of caudal fin is dark black (**Figure P1**).

Otolith shape: fusiform. Margins: dorsal dentate, ventral crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the ventral margin. Anterior region: slightly curved at tip, peaked; rostrum broad, long, pointed; antirostrum absent; excisura wide without notch. Posterior region: oblique-round (**Figure P2**).

2.17. Bigeye trevally, *Caranx sexfasciatis*

Body has fusiform shape, laterally compressed. Profile of dorsal body is more convex from snout to soft dorsal fin. Snout is pointed and greater than eye. Adipose eyelid completely

covered the eye, which extends moderate anteriorly and posteriorly to the margin of pupil. Maxilla extends to posterior margin of eye. Strong canines in outer row tooth of both jaws. Small villiforms teeth are present in inner bands of upper jaw. Breast is completely covered with scales. Head length comprises 27–30% of forked length. Gill rakers 6 upper and 16–18 lower in first gill arch. First dorsal fin is membranous, with 8 spines, second dorsal fin with 1 spine followed by 20–21 rays. Two detached anal spines are present. Anal fin with 1 spine followed by 16–19 soft rays. Pectoral fin is long and falcate about 31% of FL and longer than HL. Pelvic fin is short. Soft dorsal fin is low, anal fin slightly falcate. Caudal fin is deeply forked about 30% of FL. The distance from snout to anal fin origin is 58% of FL. Curved lateral line is longer than straight line, and junction is below fourth–fifth soft dorsal fin rays. Curve lateral line with 46 scales and straight lateral line with 6 scales and 32–37 scutes. Scale in body is cycloid and small, which is entirely covered the body except small portion behind pectoral fin (**Figure Q1**).

Otolith shape: fusiform. Margins: dorsal crenate, ventral serrate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like equal to ostial length with perforated colliculum. Cauda: tubular, strongly curved posteriorly ending close to the ventral margin. Anterior region: slightly curved at tip, peaked; rostrum broad, elongated, pointed; antirostrum absent; excisura wide without notch. Posterior region: oblique (**Figure Q2**).

2.18. Indian scad, *Decapterus russelli*

The body has fusiform shape and elongated, quite slender, and considerably compressed. Prominent moderate eye covered entirely with adipose except vertical slit centered on the pupil. Eye diameter is smaller than snout length. Eye is moderate and covered by adipose eyelid in a vertical slit. The upper jaw is slightly concave, ending straight above with a narrow band of minute teeth. Lower jaw has an irregular series of minute teeth. Body is bright yellow with transparent fins. Head length comprises of 28% of FL length. Gill rakers: upper 10, lower 33–34 on first gill arch. Shoulder girdle margin with two papillae: The lower papilla is larger.

First dorsal fin is separate and membranous with 7 spines and second dorsal fin with 1 spine followed by 26–28 rays. Terminal dorsal and anal fin with distinct single-detached finlet. Pectoral fin is long, and end tip reaches to the second ray of second dorsal fin. Anal fin with 2 detached spines and 1 spine followed by 24 soft rays. Caudal fin is deeply forked with 18% of FL. Anal fin origin is slightly beyond the vertical line of second dorsal fin. Curve lateral line shorter than straight lateral line, junction of curve and straight lateral line below eleventh–twelfth ray of second dorsal fin. The scale in CLL is 38 and 2 in SLL followed by 35–39 scutes (**Figure R1**).

Otolith shape: elliptical. Margins: dorsal sinuate, ventral crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending close to the ventral margin. Anterior region: peaked; rostrum broadly pointed, medium; antirostrum short, broadly pointed; excisura wide with a medium notch. Posterior region: peaked (**Figure R2**).

2.19. Rainbow runner, *Elagatis bipinnulata*

Body has elongated shape, subcylindrical, and fusiform. Snout diameter is greater than eyes. Mouth is small, and head is pointed. Eye is small, moderately developed adipose. Maxilla does not extend to the anterior margin of the eye. Villiform teeth are arranged in both jaws, vomer, and palatines in bands, tongue centrally arranged in bands. Head length comprised of 24% FL. Gill rakers: upper 11 and 23, lower on first gill arch.

First dorsal fin is modified into 7 spines. Second dorsal fin with 1 spine followed by 26 rays excluding finlet. Terminal detached dorsal and anal fin with distinct double rayed finlet. Pectoral fin length is equal to pelvic fin length and double in head length. Anal fin without detached spines with 1 spine attached followed by 19 soft rays. Caudal fin is deeply forked with 31% FL. Anal fin origin is beyond the soft dorsal fin. Anal fin base is shorter than about 1.5 times lower than soft dorsal fin base. Lateral line is slightly arch without scutes. (Figure S1).

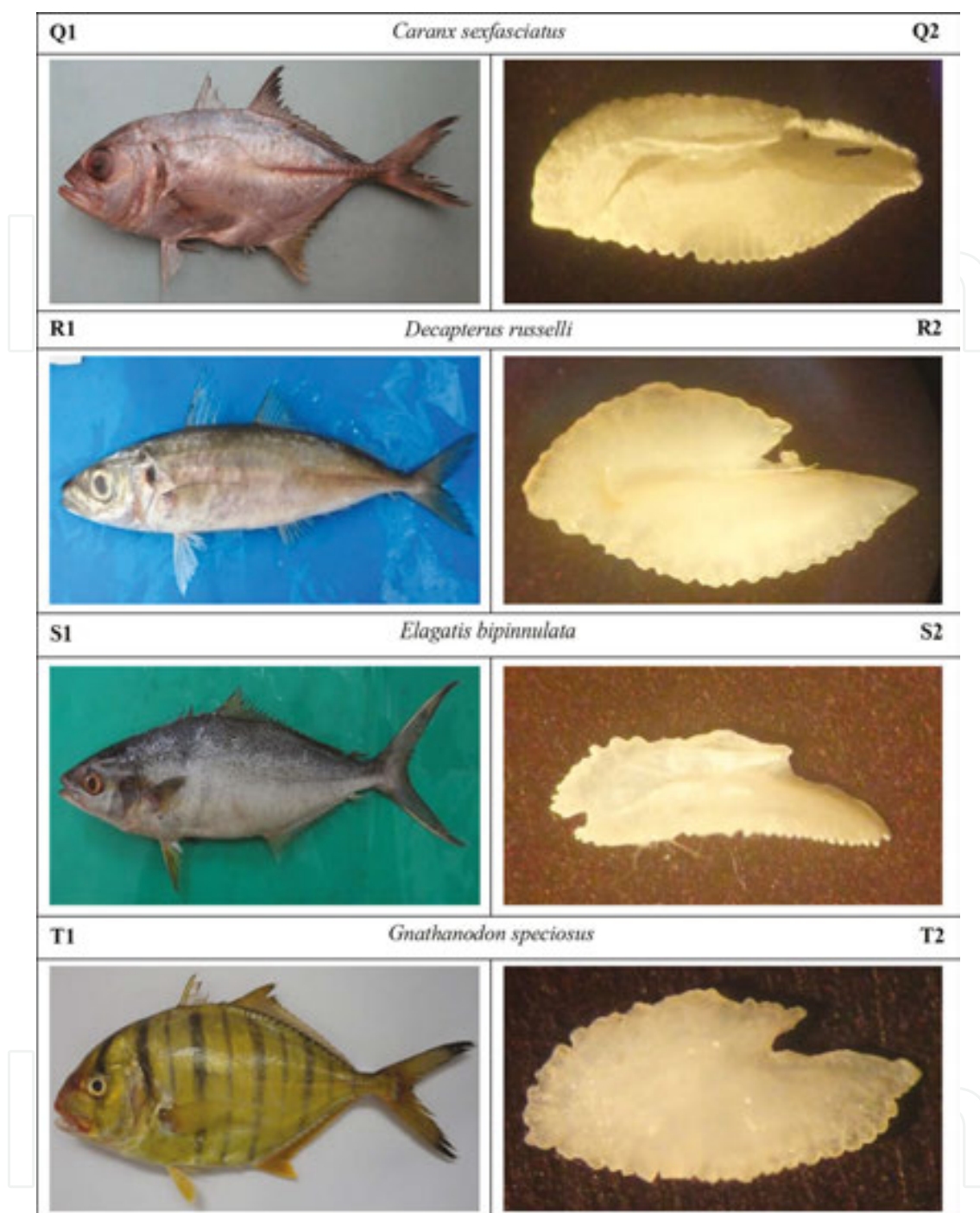
Otolith shape: lanceolated, clearly curved. Margins: dorsal irregular, ventral serrate-dentate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular slightly curved ending posteriorly very close to the ventral margin. Anterior region: lanceolated-curved; rostrum narrow, long, pointed; antirostrum short, broad, pointed; excisura wide with a U-shallow notch. Posterior region: oblique-irregular (Figure S2)

2.20. Golden trevally, *Gnathanodon speciosus*

Body has oblong shape, laterally compressed. Snout length is greater than eye. Maxilla is protractile and extends to below posterior one-third of an eye. Lips are papillose. Upper jaw without teeth and lower jaw with small teeth (absent in adult). Head is 26% of FL. Gill rakers: 6 upper, 20 lower in first gill arch.

First dorsal fin is membranous with 7 spines and second dorsal fin with 1 spine followed by 22 soft rays. Soft dorsal is low. Anal fin is falcate. Pectoral fin is long, falcate and 35% of FL. Anal fin with 2 detached spines. Anal fin with 1 spine and 18 soft rays. Anal fin is slightly behind the second dorsal fin. Snout to anal fin distance is 49% of FL. Caudal fin deeply forked 30% of FL. Body color is golden with 7–11 alternating broad black bands. Lateral line is moderately arching anteriorly, junction of curved and straight lateral line below twelfth ray of second dorsal fin. Curve lateral line is longer than straight lateral line contained 0.85 times in a straight line. Straight part of lateral line containing 10 scale followed by 24 scutes. Breast is completely covered with scale (Figure T1).

Otolith shape: elliptic-fusiform. Margins: crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like shorter than cauda. Cauda: tubular, strongly flexed posteriorly from the middle margin. Anterior region: peaked; rostrum broad, medium, pointed; antirostrum short, narrow, pointed; excisura wide with an acute medium notch. Posterior region: oblique (Figure T2).



2.21. Torpedo scad, *Megalaspis cordyla*

Body has fusiform and elongate shape, posteriorly compressed and subcylindrical. Eye is large and greater than snout length with well-developed adipose eyelid covered entirely except vertical slit, snout is blunt, and maxilla extends posteriorly to the center of eye. Small villiform teeth is in upper jaw, anteriorly narrow bands and single row of teeth in lower jaw. Head length comprises of 28% of FL. Gill rakers are 10–12 lower and 24–30 upper in first gill arch.

First dorsal fin is membranous with 8 spines, and second dorsal fin consists of 1 spine followed by 17 soft rays posteriorly 8–10 consisting of detached finlets. Second dorsal fin and anal fin lobe is falcate. Pectoral fin is long falcate and tip end reaches to the straight lateral line. Anal fin with two detached anal spines with 1 spines followed by 18 soft rays, posteriorly 8–10 consisting of detached finlets. Anal fin is behind the origin of soft dorsal fin. Caudal peduncle with a marked median keel. Caudal fin is deeply forked and 28% of FL. Curved lateral line is shorter than straight line. Straight lateral line consists of 8 scales and 22 scutes. Scales are small and cycloid (**Figure U1**).

Otolith shape: lanceolated. Margins: dorsally sinuate, ventrally dentate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like. Cauda: tubular, markedly flexed posteriorly from the middle region ending close to the ventral margin. Anterior region: lanceolated with dentate protuberances; rostrum narrow, elongated, pointed; antirostrum absent; excisura wide with a square-shaped medium notch. Posterior region: oblique (**Figure U2**).

2.22. Black pomfrets, *Parastromateus niger*

Body has deep and ovate shape, laterally compressed, dorsal and ventral profile is convex. Mouth is terminated with enlarged teeth that bridge the epibranchial 4-ceratobranchial 4 joints. Form of teeth on the pharyngeal teeth plates is elongate and filamentous. Color is dark brown in juvenile and silvery gray to bluish brown in adult. Gill rakers: upper 8–10 and lower 15–24 on first gill arch. The first dorsal fin is superficially absent. The first dorsal fin with small, short 4–5 embedded spines followed by one spine and 38–44 soft rays. Pectoral fin is long and falcate. Pelvic fin absent in adult. Dorsal and anal fin entirely rounded, broad lobes, and identical. Anal fin with 2 anal spines followed by 1 spine and 33–42 soft rays. The lateral line is visible with slight curved entirely become straight at 29–31 soft dorsal fin rays. Straight part of lateral line with 15- to 17-week scutes forming straight keel on caudal peduncle (**Figure V1**).

Otolith shape: elliptical-lanceolated. Margins: dorsal irregular, ventral crenate-dentate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like equal to caudal length. Cauda: tubular, slightly curved ending far to the ventral margin. Anterior region: peaked; rostrum broad, elongated, pointed; antirostrum short, broad, round; excisura wide with an acute shallow notch. Posterior region: oblique (**Figure V2**).

2.23. Talang queenfish, *Scomberoides commersonianus*

The body has fusiform shaped and elongated, laterally compresses. Dorsal and ventral profiles are identical. Adipose eyelid is developed. Snout length is greater than eye diameter. Snout blunt, head, and nape are slightly concave. Maxilla extends beyond the posterior margin of the eye. Lower jaw has two rows of teeth. Large conical tooth presents in outer row. Small villiform tooth is present in inner row. Head length comprises 19% of FL. Gill rakers are large and slender, 2–5 upper, and 11–14 lower.

First dorsal fin with 1 embedded spine and 6–7 free short spines, and second dorsal fin with 1 spine followed by 18–20 soft rays. Pectoral fin is short and greater than pelvic fin. Pelvic fin is

short, depressible into shallow groove. Soft dorsal and anal fin is falcate, equal in length. Posteriorly consisting of semi-detached finlet. Two detached anal spine are present. Anal fin with 1 spine followed by 17–20 soft rays. Distal half of dorsal and anal fin is dusky. Caudal fin is deeply forked and comprises 25% of FL. Dorsal and anal fin is originated in a line. Scales are lanceolate below the lateral line and deeply embedded. Lateral line is little angulated just above the pectoral fin, slightly irregular and without scutes. A series of plumbeous blotches (6–8) round to oval is present just above or touching the lateral line. Caudal peduncle groove is absent (**Figure W1**).

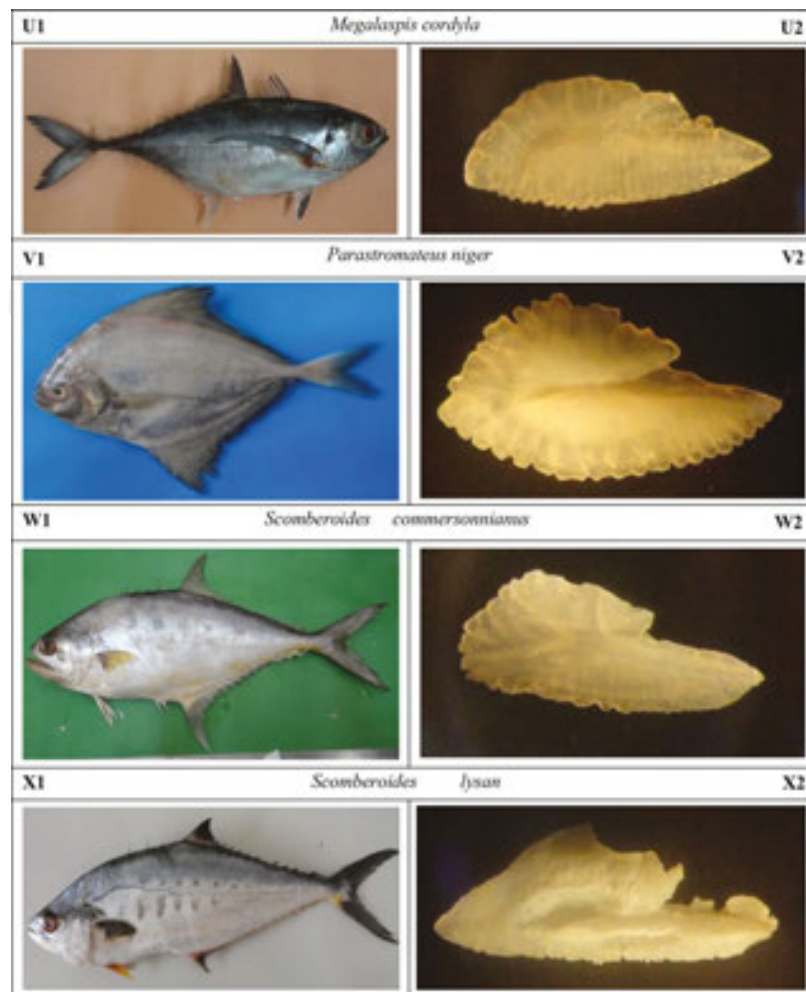
Otolith shape: lanceolated-triangular. Margins: dorsal sinuate, ventral crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular slightly curved posteriorly ending very close to the ventral margin. Anterior region: lanceolated; rostrum narrow, elongated, pointed; antirostrum short, broad, pointed; excisura wide with a shallow notch. Posterior region: round-irregular (**Figure W2**).

2.24. Doublespotted queenfish, *Scomberoides lysan*

Body has fusiform and elongated shape, laterally compressed. Dorsal and ventral profile is identical. Adipose eyelid is developed. Snout length is greater than eye diameter. Snout blunt, head, and nape are slightly concave. Maxilla extends beyond the posterior margin of the eye. Lower jaw has two rows of teeth. Large conical tooth presents in outer row. Small villiform teeth is present in inner row. Dentary is subequal in length. Head length comprises 19% of FL. Gill rakers are large and slender, 4–9 upper, and 14–21 lower.

First dorsal fin with 1 embedded spine and 6–7 free short spines, and second dorsal fin with 1 spine followed by 18–21 soft rays. Pectoral fin is not falcate and equal in length of pelvic fin. Pelvic fin is short, depressible into shallow groove. Soft dorsal and anal fin is falcate, equal in length, posteriorly consisting of semidetached finlet. Two detached anal spine are present, anal fin with 1 spine followed by 18–20 soft rays. Soft dorsal and anal fin comprises 11–12% of FL, and distal half of soft dorsal fin is pigmented black. Caudal fin is deeply forked and comprises 26% of FL. Anal fin is originated slightly just behind the second dorsal fin. Scales are lanceolate below the lateral line and mid-body, deeply embedded. Lateral line is little angulated just above the pectoral fin, slightly irregular and straight posteriorly without scutes. Two series of (6–8) blotches rounded to vertically oblong is present just above and below the lateral line. Caudal peduncle groove is absent (**Figure X1**).

Otolith shape: approximately triangular. Margins: dorsal sinuate, ventral crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved posteriorly from the middle region ending far from the ventral margin. Anterior region: lanceolated with dentate protuberances; rostrum narrow, elongated, pointed; antirostrum very short, broad, pointed upward; excisura wide with a shallow notch. Posterior region: oblique (**Figure X2**).



2.25. Barred queenfish, *Scomberoides tala* (new record)

Body shaped is elongated, dorsal, and ventral profile strongly compressed. Adipose eyelid is well developed. Snout length is greater than eye diameter. Snout blunt with midline joint to the upper lip by a frenum. Maxilla extends beyond the posterior margin of the eye. Lower jaw has two rows of teeth, large conical teeth present in inner row. Small villiform teeth are present in outer row. Head length comprises 19% of the forked length. Gill rakers are large and slender, 2–3 upper, and 8–10 lower.

First dorsal fin with 1 embedded spine and 6–7 free short spines. Second dorsal fin with 1 spine followed by 18–20 soft rays. Pectoral fin is slightly falcate and shorter in pelvic fin length. Pelvic fin is short, depressible into shallow groove. Soft dorsal and anal fin is falcate, equal in length, posteriorly consisting of semidetached finlet. Two detached anal spine are present, anal fin with 1 spine followed by 17–19 soft rays. Soft dorsal and anal fin comprises 14–15% of the forked length in a specimen greater than 40 cm FL. Caudal fin is deeply forked and comprises 27% of the forked length, anal fin origin in a line with second dorsal fin. Scales are lanceolate below the lateral line on mid-body, deeply embedded in skin. Lateral line is little angulated just above the pectoral fin, slightly irregular and straight posteriorly without scutes. A single

series of (4–8) blotches rounded to vertically oblong is present, and first 6–7 blotches intersecting the lateral line. Caudal peduncle groove is absent (**Figure Y1**).

Otolith shape: lanceolated-triangular. Margins: dorsal sinuate, ventral serrate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular slightly curved posteriorly from the middle region ending very close to the ventral margin. Anterior region: lanceolated; rostrum narrow, long, pointed; antirostrum short, broad, pointed; excisura wide with a medium notch. Posterior region: oblique-irregular (**Figure Y2**).

2.26. Needlescaled queenfish, *Scomberoides tol*

The body has fusiform and elongated shape, laterally compressed. Dorsal and ventral profile are identical. Adipose eyelid is developed. Snout length is greater than the eye diameter. Snout blunt, head, and nape are slightly concave. Maxilla extends beyond the posterior border of the pupil. Lower jaw has two rows of teeth. Large conical teeth present in outer row. Small villiform teeth are present in inner row. Dentary in both jaw are sub equal in length. Head length comprises 18% of FL. Gill rakers are large and slender, 5–8 upper, and 16–20 lower.

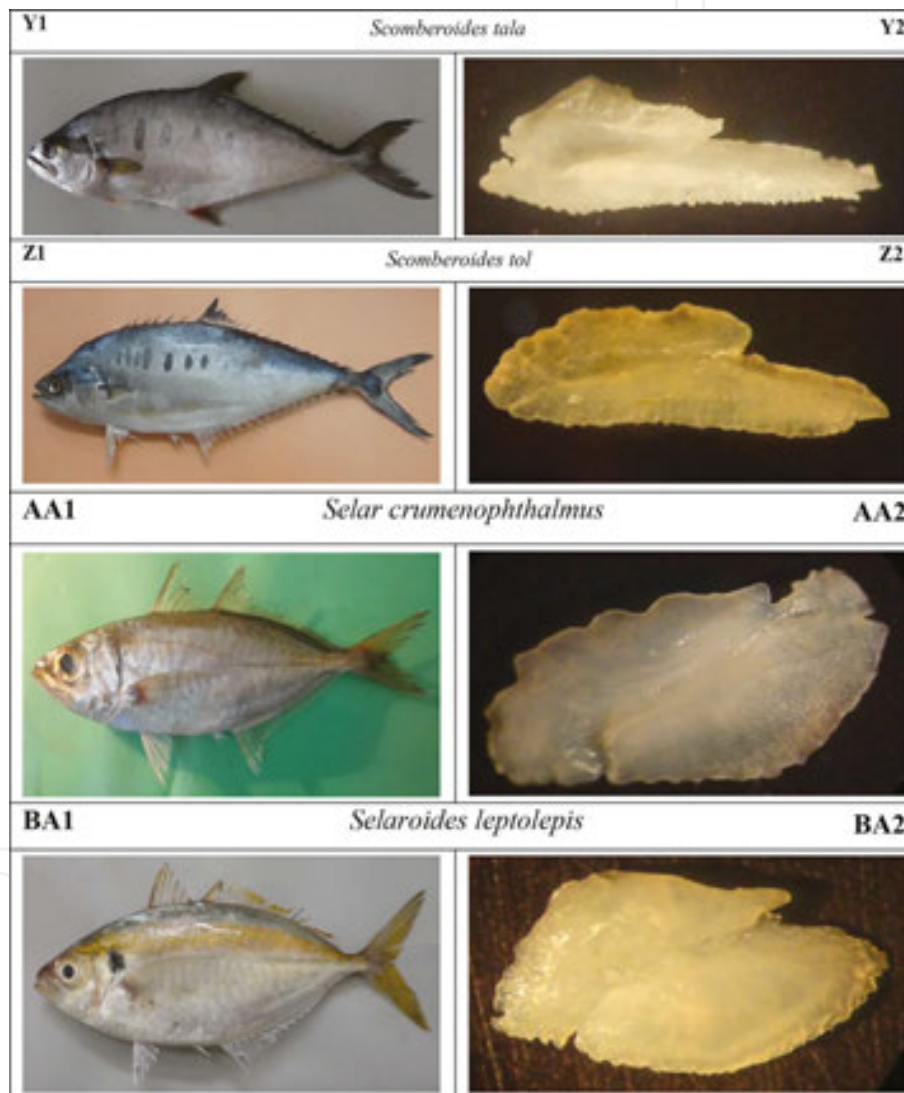
First dorsal fin with 1 embedded spine and 6–7 free short spines, and second dorsal fin with 1 spine followed by 17–20 soft rays. Pectoral fin is not falcate and equal in length of pelvic fin. Pelvic fin is short in shallow groove. Soft dorsal and anal fin is falcate, equal in length, posteriorly consisting of semidetached finlet. Two detached anal spine are present. Anal fin with 1 spine followed by 18–21 soft rays. Soft dorsal and anal fin comprises 10% of FL and the distal half of soft dorsal fin are pigmented black. Caudal fin is deeply forked and comprises 23% of FL, anal fin origin in a line with second dorsal fin. Scales are needle like, below the lateral line and mid-body, deeply embedded in skin. Lateral line is little angulated just above the pectoral fin, slightly irregular, and straight posteriorly without scutes. A single series of (5–8) blotches rounded to vertically oblong is present, first 4–5 blotches intersecting the lateral line. Caudal peduncle groove is absent (**Figure Z1**).

Otolith shape: lanceolated, slightly curved. Margins: dorsal sinuate, ventral crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular slightly curved ending very close to the ventral margin. Anterior region: lanceolated; rostrum narrow, long, pointed; antirostrum short, broad, peaked; excisura wide with a shallow notch. Posterior region: oblique (**Figure Z2**).

2.27. Bigeye scad, *Selar crumenophthalmus*

Body has fusiform and elongated shape, moderately compressed. Ventral profile of body is more convex than dorsal. Eye is large and greater than snout length and covered with adipose eyelid except for vertical slit centered on pupil. Snout is pointed. Lower jaw with a single row of minute is uniserrate tooth. Villiform tooth is also arranged in vomer, palatines, and on central band on tongue. Maxilla extends to below anterior two-third of eye. Head length is about 30% of FL. Gill rakers: 10–11 upper and 30–34 lower in first gill arch. Smooth shoulder girdle margin with deep furrow having 2 papillae, large papilla above, and lower papilla near lower edge. First dorsal fin is membranous, with 8 spines, and second dorsal fin with 1 spine followed by

20–21 rays. Two detached anal spines are present, anal fin with 1 spine and 19–22 soft rays. Pectoral fin is long and falcate about 24–27% of FL and shorter than HL. Pelvic fin is short. Soft dorsal fin is low, anal fin slightly falcate. Dorsal and anal fins without detached terminal finlet. Caudal fin is deeply forked about 24% of FL. The distance from snout to anal fin origin is 57% of FL. Curved lateral line is longer than straight line, and junction is below twelfth–fourteenth soft dorsal fin rays. Curve lateral line with 48 scales and straight lateral line with 11 scales and 30–37 scutes. Scales in body are cycloids and small, entirely covered the body except small portion behind pectoral fin (**Figure AA1**).



Otolith shape: elliptic. Margins: dorsal, entire, ventrally, sinuate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: oval. Cauda: tubular, markedly curved posteriorly ending close to the ventral margin. Anterior region: peaked, broad with one big protuberance; rostrum broad, small, pointed; antirostrum very short; excisura tiny notch. Posterior region: round (**Figure AA2**).

2.28. Yellowstripe scad, *Selaroides leptolepis*

Body has elliptic and oblong shape, laterally compressed. Dorsal and ventral profile is identically and equally convex. Yellow stripes on broad eyes equally or slightly greater than snout length. Eye is covered with adipose eyelid posteriorly. Maxilla is protractible and concave above. No tooth in upper jaw and lower jaw with minute tooth. Head is small and comprised of 24–27% of FL. Gill rakers: 10–12 upper, 21–24 in lower limb of first gill arch. Breast is completely covered with First dorsal fin is membranous with 8 spines and second dorsal fin with 1 spine followed by 26 soft rays. Dorsal and anal fin rays are low, not falcate. No ventral grooves are present. Third spine of first dorsal fin is about double than second dorsal fin. Anal fin with two detached spines. Anal fin with 1 spines followed by 19–22 soft anal rays is present. Caudal fin is deeply forked about 28% of FL. Lateral line is deeply concave above pectoral fin, straight part is greater than curved part, and their junction is below the twelfth ray of soft ray (**Figure BA1**).

Otolith shape: elliptic. Margins: dorsal, entirely smooth, ventral, crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved posteriorly ending close to the ventral margin. Anterior region: pointed; rostrum elongated, broadly pointed; antirostrum narrow, short, blunt; excisura wide with a shallow notch. Posterior region: oblique (**Figure BA2**).

2.29. Greater amberjack, *Seriola dumerilli* (new record)

Body has fusiform shape, moderately compressed and shallow. Eye is moderate, lower than snout length. Ventral profile is more convex. Maxilla is broad at end extending posterior margin of eye. Super maxilla is broad. Teeth are arranged in a broad band in both jaws. Head length is 25–28% of FL. Gill rakers: upper 6–8, lower 14–16 in first gill arch.

First dorsal spinous fin is short and membranous with 7–8 spines, and second dorsal fin consists of 1 spine followed by 28–34 soft rays. Anterior ray of second dorsal fin is slightly elevated and 13–14% of FL. Pectoral fin is shorter than pelvic fin. Anal fin with 2 detached spines (embedded in larger specimen) followed by 1 spine and 19–21 soft rays. Caudal fin is deeply forked and about 23–26% of FL. The distance from snout to origin of anal fin is 60–64% of FL. Lateral line without scutes, moderately curved above pectoral fin and smoothly straight posteriorly. A cutaneous keel on each side of caudal peduncle is present. Body color is olive dorsally and laterally and silvery belly, snout to the origin of second dorsal fin (**Figure CA1**).

Otolith shape: lanceolated. Margins: dorsal lobed, ventral serrate-dentate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved ending posteriorly far from the posterior margin. Anterior region: lanceolated; rostrum narrow, long, pointed; antirostrum short, narrow, pointed; excisura wide with an acute shallow notch. Posterior region: rounded-irregular (**Figure CA2**).

2.30. Blackbanded trevally, *Seriolina nigrofasciata*

Body shape is oblong and elongated, moderately shallow and compressed. Snout is rounded and greater than the eye. Super maxilla is slender and rounded. Maxilla rounded at the end

extending beyond the posterior border of the pupil. Head consists of 25–29% of FL. Head profile is steeply raising to interorbital region and point a curve moderately to spinous dorsal fin. Minute villiform teeth arranged in series in both jaws and in central band on tongue. Gill rakers of first gill arch comprised of 2–5 upper, 7–9 lower such as a knob-like masses, including rudiments.

First dorsal spinous fin is short and membranous with 7- to 8-week spines, of which some are embedded in skin, and second dorsal fin consists of 1 spine followed by 33–37 rays. A ray of dorsal and anal fin is slightly elevated but not falcate. Pectoral fin is short, not falcate. Pelvic fin is greater than pectoral fin in length 18% of FL. Anal fin 1 embedded spine followed by 18–20 soft rays. The distance from snout to anal fin origin is 60% of FL. Caudal fin consists of 23–28% of FL. A cutaneous keel on each side of caudal peduncle is developed in adult. Curve lateral line is arched moderately below 24 soft ray of second dorsal fin. In juveniles, 6–7 dark oblong band and blotches is present which disappear with age (**Figure DA1**).

Otolith shape: lanceolated. Margins: dorsal lobed, ventral crenate. Sulcus acusticus: heterosulcoid, ostial, median in position. Ostium: funnel-like. Cauda: tubular, strongly curved posteriorly ending close to the ventral margin. Anterior region: lanceolated; rostrum narrow, long, pointed; antirostrum short, narrow, pointed; excisura wide with a shallow notch. Posterior region: angled (**Figure DA2**).

2.31. Small spotted dart, *Trachinotus bailloni*

Body has elliptical and oblong shape, laterally compressed. Dorsal and ventral profile is identical. Eye is equal to snout length. Snout is pointed. Maxillae extend beyond the anterior border of eye. Palatine and villiform teeth are arranged in bands in jaws and vomer in a triangular patch. Tongue without teeth. Head is small and comprises 25–27% of FL. Gill rakers on upper 6–7, lower 14–18 on first gill arch.

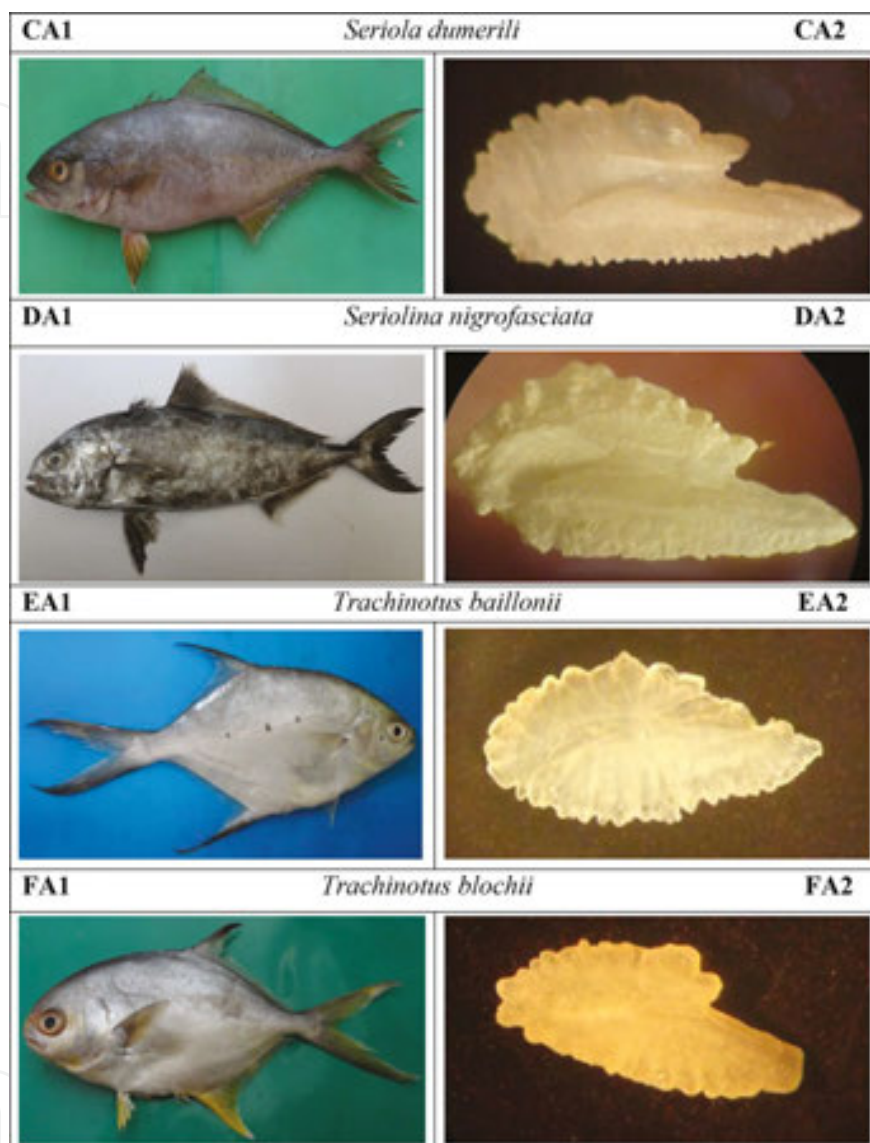
First dorsal fin modified into 6–7 short free spines, and second dorsal fin with 1 spine followed by 22–24 soft rays. Dorsal fin is long, falcate, and comprises of 35% of FL. Pectoral fin greater than pelvic fin, but relatively shorter than dorsal and anal fin. Two detached anal spine are present. Anal fin consists of 1 spine followed by 18–21 soft rays. Anal fin originated just behind the dorsal fin. Lateral line is slightly irregular, weekly convex above pectoral fin, containing 2–5 black spot (less than eye diameter) along the line. No scutes and caudal pedunclee groove are present. Caudal fin deeply forked about 40% of FL (**Figure EA1**).

Otolith shape: elliptic-fusiform. Margins: Dorso-ventrally crenate-serrate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like shorter than cauda. Cauda: tubular, slightly curved posteriorly ending close to the ventral margin. Anterior region: peaked with a small protuberance; rostrum long, broad, peaked; antirostrum short, broad, round; excisura wide without notch. Posterior region: round (**Figure EA2**).

2.32. Snubnose pompano, *Trachinotus blochi*

Body shape is elliptical and oblong, laterally compressed. Dorsal and ventral profile is identical. Eye is smaller than snout length. Snout is rounded. Maxillae extend beyond the

anterior border of eye. Small villiform teeth are arranged in band in both jaws. No teeth on tongue. Head is small and comprises 22–28% of FL. Gill rakers on upper 6, lower 8–12 on first gill arch.



First dorsal fin modified into 6–7 short free spines, often embedded in adult, and second dorsal fin with 1 spine followed by 22–23 soft rays. Pectoral fin is greater than pelvic fin, but relatively shorter than dorsal and anal fin. Two detached anal spine present. Anal fin consists of 1 spine followed by 17–18 soft rays. Anal fin originated just behind the dorsal fin. Snout to anal fin distance is 56–62% of FL. Height of second dorsal fin lobe is 28% of FL. Lateral line is slightly irregular, weakly convex above pectoral fin and straight posteriorly. First predorsal bone inverted teardrop-shaped, and supra-occipital bone is thin and blade like in young. No scutes and caudal peduncle groove are present. Caudal fin deeply forked about 26–34% of FL (**Figure FA1**).

Otolith shape: fusiform. Margins: crenate-lobed. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, slightly curved ending posteriorly close to the ventral margin. Anterior region: peaked; rostrum long, broad, pointed; antirostrum short, broad, blunt; excisura wide with a shallow notch. Posterior region: oblique-irregular (**Figure FA2**).

2.33. Indian pompano, *Trachinotus mookalee*

Body has ovate shape, laterally compressed. Dorsal and ventral profile is identical. Eye is smaller than snout length. Snout is rounded. Maxillae extend beyond the anterior border of eye. Small villiform teeth are arranged in band in both jaws. Narrow patches of teeth are present in a tongue. Head is small and comprises 25–26% of FL. Gill rakers on upper 6–8, lower 10–15 on first gill arch.

First dorsal fin modified into 6–7 short free spines, and second dorsal fin with 1 spine followed by 20–22 soft rays. Pectoral fin is greater than pelvic fin, but relatively shorter than dorsal and anal fin. Two detached anal spine are present. Anal fin consists of 1 spine followed by 17–18 soft rays. Anal fin is originated just behind the dorsal fin. Snout to anal fin distance is 55% of FL. Height of second dorsal fin lobe is 28% of FL. Lateral line is slightly irregular, weekly convex above pectoral fin. First predorsal bone shaped as an inverted-L with the anteriorly projecting arm. No scutes and caudal peduncle groove are present. Caudal fin deeply forked about 37% of FL (**Figure GA1**).

Otolith shape: elliptic-fusiform. Margins: Dorso-ventrally crenate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, slightly curved posteriorly ending close to the ventral margin. Anterior region: irregular with a prominent protuberance joining to antirostrum; rostrum long, wide pointed upward; antirostrum very short, broad, peaked; excisura wide without notch. Posterior region: oblique (**Figure GA2**).

2.34. Large spotted dart, *Trachinotus botla (russelii)* (new record)

Body has elliptical shape, laterally compressed. Dorsal and ventral profile is identically convex. Snout rounded. Teeth villiform are arranged in bands in both Jaws and absent in adult. Gill rakers: 7–9 on upper limb and 11–15 lower limb of first gill arch.

First dorsal fin with 6 short free spines, second soft dorsal fin with 1 spine followed by 23 soft rays. Pectoral fin is short and shorter than pelvic fin. Anal fin with 1 spine followed by 19 rays. Dorsal fin lobe is greater than anal fin lobe. Anal fin with 1 spine and 22 soft rays. Caudal fin is deeply forked. Lateral line is strongly concave above pectoral fin and deeply arch. Scales are minute and deeply embedded in the skin. A series of 5 plumbeous spots present, first three large spots intersecting the lateral line and other small two spots touching the lateral line. Scutes are absent in lateral line (**Figure HA1**).

Otolith shape: fusiform. Margins: irregular to dentate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, slightly curved posteriorly ending close to the ventral margin. Anterior region: peaked; rostrum moderately long, broad, rounded; antirostrum short, broad, irregular upward; excisura wide with an acute and deep notch. Posterior region: round-irregular (**Figure HA2**).

2.35. Arabian scad, *Trachurus indicus*

Body shape is elongate, laterally compressed; dorsal and ventral profile is identical. Eye is moderate, slightly smaller than snout. Adipose eyelid is covered the entire eye except the vertical slit of the eye. Maxilla extends to the middle of pupil. Small villiform teeth are arranged single row in both jaws. Opercular dark crescent shape blotch is present. Head length comprises of 29% FL. Gill rakers: 12–15 in upper limb, 35–40 in lower limb of first gill arch.

Two separate dorsal fin. First dorsal fin is membranous with 7–8 spines. Soft dorsal fin with 1 spine followed by 32 soft rays. Pectoral fin is long and falcate and greater than HL. Pelvic fin is moderate and hyaline. Anal fin with two detached anal spines and 1 spine followed by 28 soft rays. Finlet absent. Caudal fin is deeply forked about 28% FL. Curve lateral line is longer than straight lateral line. Scutes on curve lateral line are 38, and scutes on straight lateral line are 37–40. Junction of CLL and SLL is below the ninth–tenth ray of second dorsal fin. Dorsal accessory lateral line is terminating at the base of caudal peduncle (**Figure IA1**).

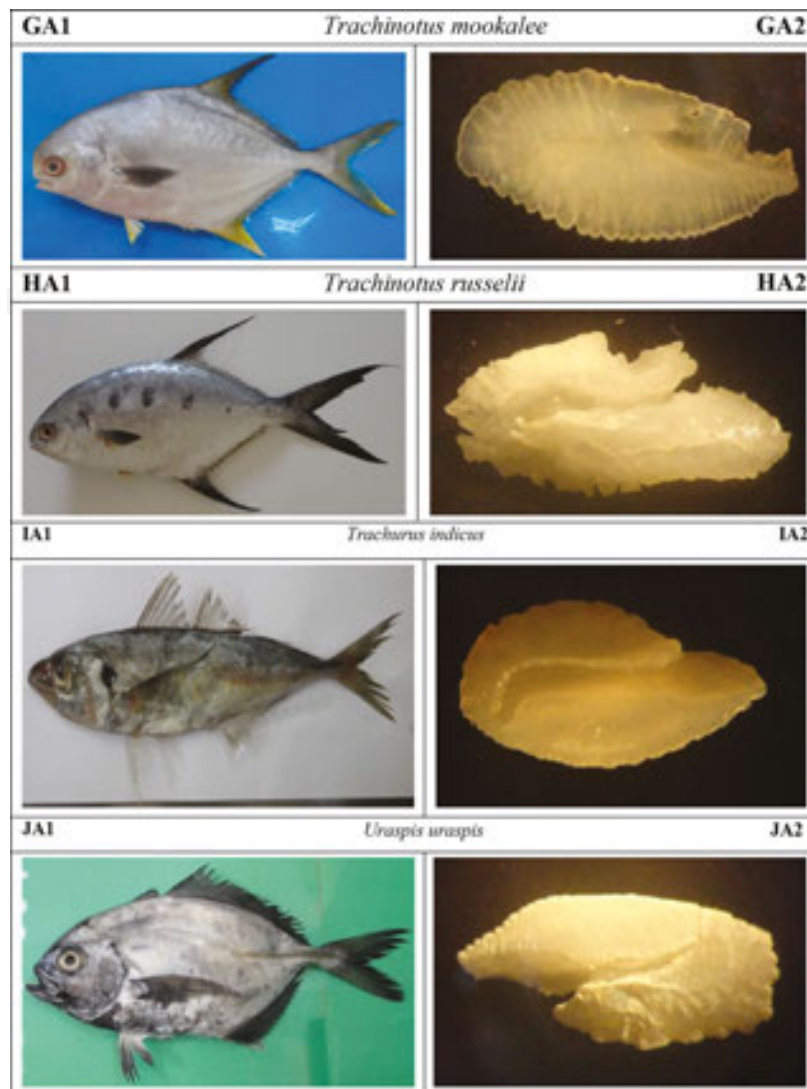
Otolith shape: lanceolated. Margins: sinuate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, slightly curved ending close to the ventral margin. Anterior region: peaked; rostrum long, broad, peaked; antirostrum short, broad, blunt; excisura wide without notch. Posterior region: oblique (**Figure IA2**).

2.36. Whitemouth jack, *Uraspis uraspis* (new record)

Body shape is oval; compressed, ventral profile is slightly convex to isthmus than straight to the origin of second dorsal fin. Maxilla is extended to the anterior margin of the eye. Small pointed teeth are arranged in bands on both jaws. Tongue and floor of mouth is white with dark blue to black border. Naked area of breast extends to half of the pectoral fin base. Head length is 30.6% of FL. Gill rakers upper 3–5 and 13–15, lower limbs of the first gill arch.

Two detached dorsal fin with 3–4 posteriorly embedded spines before first dorsal fin. First dorsal fin section is small, membranous and consists of 7–8 spine and second dorsal fin with 1 spine followed by 27–32 spines. Pectoral fin is long, falcate and reaches to the junction of curved and straight lateral line. Pectoral fin length is 31.8% of FL. Pelvic fin length decreases with age. Anal fin with two detached and embedded spines followed by 19–23 soft rays. Caudal fin is deeply forked 33.6% of FL. Straight lateral is 1.02–1.05% shorter than straight lateral line. Scutes on straight lateral line are strong to moderate consist of 35–38 antrose (projecting anteriorly) (**Figure JA1**).

Otolith shape: elliptic-lanceolated. Margins: dorsal irregular, ventral sinuate. Sulcus acusticus: heterosulcoid, ostial, median. Ostium: funnel-like. Cauda: tubular, strongly curved posteriorly ending close to the ventral margin. Anterior region: peaked; rostrum long, narrow, peaked. Anti-rostrum short, broad, pointed; excisura wide with an acute and deep notch. Posterior region: oblique-flattened (**Figure JA2**).



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