

An inventory on the coastal finfish and shellfish species of Zuari estuary, southwest coast of India

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Received 12 September 2016; revised 04 October 2016

Assessment of finfish and shellfish species were carried out for a period of three years through continuous surveys (400 gillnet fishing experiments) with a total fishing effort of 100 fishing days along the Zuari estuary. This study yielded 286 finfish and shellfish species comprising of 156 demersal fish, 68 pelagic fish, 38 molluscan and 24 crustacean species. The species observed in this study covered all the trophic levels in the food web as well as the ecologically vulnerable and less resilient species (20-25%). Majority of the commercially important species of Zuari estuary were also collected in this study contribute to 70% of the catch.

[Key words: Zuari estuary, Goa, Inventory, Species, Shellfish, Finfish]

Introduction

Zuari estuary is one of the major estuaries located along the southwest coast of India. This estuary represents a typical coastal ecosystem of India which is influenced by the freshwater influx from Zuari River and saline water influx from Arabian Sea¹. The entire mudflats along with mangrove vegetation make the region highly productive supporting large number of economically important finfish and shellfish species². This region receives the maximum precipitation during the southwest monsoon accompanied by stormy weather, while quieter conditions prevail during rest of the year³. The existence of typical tropical conditions characterized by high temperature, longer photoperiod and long flushing period are conducive to greater biological productivity and thus, greater species diversity in the estuary^{3,4}. The tidal regime also results in a long flushing period and thus, there is a prevalence of greater species diversity in the estuary⁵. Thus, this coastal ecosystem with high productivity supports aquatic resources with a complex food web.

Traditional small scale fishery in the northern coastal region of the estuary provides livelihood to about 1000 tribal fisherfolk^{4,6}. The entire coastal zone has a bed of rocky patches (which makes it unsuitable for trawling) and hence the gillnet fishery represents majority of the landed catch in this fishery^{4,6}. Northern

region covers fishing villages like Siridao, Cacara, Odxal, Bambolim and Nauxim which lands about 600-1000 tonnes of fish every year. Southern coastal stretches of the estuary is concentrated with industries and Mormugao harbour. Hence, the estuary is also subjected to pollution from industrial and tourism based activities especially on the southern banks⁵. The estuary has been subjected to pollution and intense fishing during the last two to three decades due to economic development. The degradation in the environmental conditions and the ecosystem in particular is bound to have affected the ecological structure and trophic flows of the estuary. Studies reflecting the diversity of fish and shellfish species of the estuary are limited^{1,4,6}. Thus, this study attempts to provide comprehensive information on the species composition of fish and shellfish species in the estuary through rigorous sampling and formulating a descriptive dataset.

Material and Methods

In situ fishing operations were conducted in Zuari estuary on a monthly basis to study the seasonal pattern in fish assemblages, catch rates and value from September, 2013 to August, 2016. Commonly used grounds for commercial gillnet operations were chosen for fishing experiments after consulting with researchers, fishermen and other stakeholders in the fishing industry (Fig. 1).

A total of 400 fishing operations were carried out in 100 fishing days (4 trials per day), three each in a month and the day being selected randomly within each 10 days increment. The experiments were carried out during day time using commercial motorised fishing crafts (hiring) in association with fishermen. Gillnets of 30 mm mesh size (minimum legal mesh size for gillnet) of 400 m length (commonly used by the fishermen) were used for the whole experimental period. The fishing experiments were set to run for 2 hours since most commercial gillnets operate between 2-3 hours of duration at depth ranges of 3-5 m⁶.

Fish and shellfish fauna collected during the study were identified to the family, genus and species levels on the basis of colour, morphology, meristics counts and body patterns^{7,8}. They were also classified on the basis of resource groups⁹ as pelagic, demersal, crustacean and molluscan resources. They were also classified on the basis of habitats (muddy and estuarine; pelagic; rocky and coral; rocky and estuarine; sandy; sandy and estuarine; sandy and muddy and sandy and rocky) and feeding preferences (planktivores, herbivores, carnivores and omnivores)^{7,8}. Further, they were also categorised based on their economic importance (major, minor and non-commercial). They were also classified into different groups according to the ecological resilience and vulnerability⁸.

Results

A total of 400 fishing operations were carried out in 100 fishing days. A total of 93,312 organisms were counted belonging to 286 aquatic species belonging to

99 families were identified during the study (Appendix). The families with largest number of species were Carangidae (19), Sciaenidae (18), Leiognathidae (10), Penaeidae (10), Portunidae (10), Ariidae (9), Lutjanidae (9) and Engraulidae (8). Among these 286 species, there were 156 demersal, 68 pelagic, 38 mollusc and 24 crustacean species were included. *Escualosa thoracata*, *Sardinella longiceps*, *Mugil cephalus*, *Tenuulosa toli*, *Fenneropenaeus indicus*, *Portunus pelagicus*, *Thryssa malabarica*, *Rastrelliger kanagurta*, *Nematalosa nasus* and *Metapenaeus dobsonii* were the most frequent species in the catch. On the basis of trophic level and feeding preferences, there were 148 carnivorous species, 88 omnivorous species, 44 planktivorous species and 6 herbivorous species in this study. On the basis of fisheries importance, there were 52 major, 125 medium, 75 minor and 34 non-commercial aquatic species observed in this study. Based on the ecological vulnerability of aquatic species, there were 91 low, 25 low to moderate, 94 moderate, 26 moderate to high, 35 high and 15 very high vulnerable species caught during this study. On the basis of ecological resilience, there were 108 high resilient, 133 medium resilient and 45 low resilient aquatic species observed in this study. While considering the habitats of the species collected in this study, they were from muddy and estuarine (46 species), pelagic (15 species), rocky and coral associated (54 species), rocky and estuarine (5 species), sandy (9 species), sandy and estuarine (12 species), sandy and muddy (126 species) and sandy and rocky habitats (19 species).

Discussion

The studies in Zuari estuary to document the fish and shellfish species diversity are limited and which gives only confined information on the fisheries resources of the estuary. The earlier reports are mostly concentrated on the abundance of commercially important fish and shellfish species. Nowadays, trawling cannot be carried out in the estuary on account of legal restrictions and the entire coastal zone of the estuary has a bed of rocky patches which makes it unsuitable for trawling. This study has focused on formulating a more strengthened scientific dataset on the fish and shellfish species diversity in the estuary.

There are some important studies carried out in this estuary to document the seasonal variations of fish species assemblages^{1,4,6}. Total number of species observed in this study was very high (286 species)



Fig. 1 — Zuari estuary along the southwest coast of India

and this illustrates the common pattern of aquatic species in estuaries which follow a greater number of aquatic species with low abundances per species^{10,11,12}. The number of commercially important fish species (major and medium groups) in the estuary states that though the tropical ecosystems are highly diverse in fish and shellfish communities, a reduced number of species contributes to the major fishery in these systems^{4,10,11,12,13,14}. Presence of an array of different structural habitats with sandy, muddy, rocky and coral patches in the estuary must have contributed to the huge diversity of aquatic species in the ecosystem^{1,2,4}.

Tropical estuaries are considered as interfaces between land and ocean and they are highly productive and key habitats for the aquatic resources^{4,13,14,15}. This study documents greater finfish and shellfish diversity of Zuari estuary and it underlines that this estuary provides unique diverse habitat characteristics (sandy, muddy, rocky and coral) which attracts diverse fish assemblages to this ecosystem. While analysing the feeding preferences of the fish and shellfish species in the estuary, it was observed that the species from all the trophic levels (primary consumers to top predators) were present which forms a complex food web in the estuary. While analysing the fish communities observed in this study on the basis of ecological vulnerability, it is noticed that the estuary has provided shelter to 286 aquatic species in which 170 ecologically vulnerable (moderate, moderate to high, high and very high) species were included. Moreover, based on the ecological resilience, there were less resilient, moderately resilient and high resilient species in the estuary. This result highlighted that the estuary has a potential role in protecting the vulnerable and ecologically less resilient species.

This updated inventory on the fish and shellfish species of the estuary was prepared through rigorous sampling and intense effort to document the rare species observed in the estuary. In this study, samples were collected through gillnets from different habitats like rocky patches, sandy bed, muddy shore and coral outcroppings in the estuary. The observation of the coral reef associated fish species in this study might be due to the existence of rocky patches, artificial structures and coral outcroppings in this estuary. This study has thus, established a more strengthened database on the fish and shellfish species of the estuary and it is mandatory to continuously monitor the coastal ecosystems for exploring the unique

aquatic diversity associated with them. This database on finfish and shellfish species offer scope for further investigations in the estuary and it is a ready reference for the researchers and government authorities to plan research and developmental activities in the ecosystem.

Acknowledgements

Authors are grateful to Dr. N. P. Singh, Director, ICAR-CCARI, Goa, Dr. Gopal Krishna, Director, ICAR-CIFE, Mumbai and fishermen of Zuari estuary for their support and guidance during the entire study period.

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Appendix — Classification of species collected from Zuari estuary

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
1	Crustacean	Crabs	Portunidae	<i>Scylla serrata</i>	Low	H	Omnivore	Major	Muddy and Estuarine
2	Crustacean	Crabs	Portunidae	<i>Scylla olivacea</i>	Low	H	Omnivore	Minor	Muddy and Estuarine
3	Crustacean	Crabs	Portunidae	<i>Scylla tranquebarica</i>	Medium	H	Omnivore	Medium	Muddy and Estuarine
4	Crustacean	Crabs	Portunidae	<i>Charybdis goaensis</i>	Low	H	Omnivore	Minor	Sandy
5	Crustacean	Crabs	Portunidae	<i>Charybdis variegata</i>	Medium	M	Omnivore	Minor	Sandy
6	Crustacean	Crabs	Matutidae	<i>Matuta lunaris</i>	Medium	M	Omnivore	NC	Sandy
7	Crustacean	Crabs	Portunidae	<i>Charybdis feriatus</i>	Medium	M	Omnivore	NC	Sandy
8	Crustacean	Crabs	Portunidae	<i>Charybdis lucifera</i>	Medium	M	Omnivore	NC	Sandy
9	Crustacean	Crabs	Portunidae	<i>Charybdis natator</i>	Medium	M	Omnivore	NC	Sandy
10	Crustacean	Penaeid shrimps	Penaeidae	<i>Metapenaeus dobsonii</i>	High	L	Omnivore	Major	Sandy and Muddy
11	Crustacean	Penaeid shrimps	Penaeidae	<i>Metapenaeus monoceros</i>	High	L	Omnivore	Major	Sandy and Muddy
12	Crustacean	Penaeid shrimps	Penaeidae	<i>Parapenaeopsis stylifera</i>	High	L	Omnivore	Major	Sandy and Muddy
13	Crustacean	Stomatopods	Squillidae	<i>Lysiosquilla sp.</i>	High	L	Omnivore	NC	Sandy and Muddy
14	Crustacean	Stomatopods	Squillidae	<i>Miyakea nepa</i>	High	L	Omnivore	NC	Sandy and Muddy
15	Crustacean	Penaeid shrimps	Penaeidae	<i>Fenneropenaeus indicus</i>	High	M	Omnivore	Major	Sandy and Muddy
16	Crustacean	Penaeid shrimps	Penaeidae	<i>Fenneropenaeus penicillatus</i>	High	M	Omnivore	Medium	Sandy and Muddy
17	Crustacean	Crabs	Portunidae	<i>Portunus pelagicus</i>	Low	H	Omnivore	Major	Sandy and Muddy
18	Crustacean	Crabs	Portunidae	<i>Portunus sanguinolentus</i>	Low	H	Omnivore	Major	Sandy and Muddy
19	Crustacean	Penaeid shrimps	Penaeidae	<i>Parapenaeopsis hardwickii</i>	Low	H	Omnivore	Medium	Sandy and Muddy
20	Crustacean	Penaeid shrimps	Penaeidae	<i>Metapenaeus affinis</i>	Medium	M	Omnivore	Major	Sandy and Muddy
21	Crustacean	Penaeid shrimps	Penaeidae	<i>Metapenaeus brevicornis</i>	Medium	M	Omnivore	Major	Sandy and Muddy
22	Crustacean	Penaeid shrimps	Penaeidae	<i>Marsupenaeus japonicus</i>	Medium	M	Omnivore	Medium	Sandy and Muddy
23	Crustacean	Prawns	Palaemonidae	<i>Macrobrachium rosenbergii</i>	Medium	M	Omnivore	Medium	Sandy and Muddy
24	Crustacean	Penaeid shrimps	Penaeidae	<i>Parapenaeopsis cornuta</i>	Medium	M	Omnivore	Minor	Sandy and Muddy
25	Demersal	Eels	Muraenesocidae	<i>Muraenesox bagio</i>	High	H	Carnivore	Minor	Muddy and Estuarine
26	Demersal	Croakers	Sciaenidae	<i>Dendrophysa russelli</i>	High	L	Carnivore	Medium	Muddy and Estuarine
27	Demersal	Croakers	Sciaenidae	<i>Johnieops borneensis</i>	High	L	Carnivore	Medium	Muddy and Estuarine
28	Demersal	Croakers	Sciaenidae	<i>Johnieops sina</i>	High	L	Carnivore	Medium	Muddy and Estuarine
29	Demersal	Croakers	Sciaenidae	<i>Johnius amblycephalus</i>	High	L	Carnivore	Medium	Muddy and Estuarine
30	Demersal	Croakers	Sciaenidae	<i>Johnius belangerii</i>	High	L	Carnivore	Medium	Muddy and Estuarine

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
31	Demersal	Croakers	Sciaenidae	<i>Johnius dussumieri</i>	High	L	Carnivore	Medium	Muddy and Estuarine
32	Demersal	Croakers	Sciaenidae	<i>Johnius macropterus</i>	High	L	Carnivore	Medium	Muddy and Estuarine
33	Demersal	Croakers	Sciaenidae	<i>Johnius macrorhynchus</i>	High	L	Carnivore	Medium	Muddy and Estuarine
34	Demersal	Croakers	Sciaenidae	<i>Kathala axillaris</i>	High	L	Carnivore	Medium	Muddy and Estuarine
35	Demersal	Croakers	Sciaenidae	<i>Nibea albida</i>	High	L	Carnivore	Medium	Muddy and Estuarine
36	Demersal	Croakers	Sciaenidae	<i>Otolithes cuvieri</i>	High	L	Carnivore	Medium	Muddy and Estuarine
37	Demersal	Silverbellies	Leiognathidae	<i>Gazza achlamys</i>	High	L	Carnivore	Medium	Muddy and Estuarine
38	Demersal	Silverbellies	Leiognathidae	<i>Gazza minuta</i>	High	L	Carnivore	Medium	Muddy and Estuarine
39	Demersal	Silverbellies	Leiognathidae	<i>Karalla daura</i>	High	L	Carnivore	Medium	Muddy and Estuarine
40	Demersal	Silverbellies	Leiognathidae	<i>Leiognathus brevisrostris</i>	High	L	Carnivore	Medium	Muddy and Estuarine
41	Demersal	Silverbellies	Leiognathidae	<i>Leiognathus dussumieri</i>	High	L	Carnivore	Medium	Muddy and Estuarine
42	Demersal	Silverbellies	Leiognathidae	<i>Leiognathus equulus</i>	High	L	Carnivore	Medium	Muddy and Estuarine
43	Demersal	Silverbellies	Leiognathidae	<i>Leiognathus splendens</i>	High	L	Carnivore	Medium	Muddy and Estuarine
44	Demersal	Silverbellies	Leiognathidae	<i>Nuclequula blochii</i>	High	L	Carnivore	Medium	Muddy and Estuarine
45	Demersal	Catfishes	Ariidae	<i>Nemapteryx caelata</i>	High	L	Omnivore	Medium	Muddy and Estuarine
46	Demersal	Catfishes	Ariidae	<i>Plicofollis dussumieri</i>	High	L	Planktivore	Medium	Muddy and Estuarine
47	Demersal	Silverbellies	Leiognathidae	<i>Secutor insidiator</i>	High	L	Planktivore	Medium	Muddy and Estuarine
48	Demersal	Silverbellies	Leiognathidae	<i>Photopectoralis bindus</i>	High	L	Carnivore	Minor	Muddy and Estuarine
49	Demersal	Croakers	Sciaenidae	<i>Paranibea semiluctosa</i>	High	LM	Carnivore	Medium	Muddy and Estuarine
50	Demersal	Eels	Muraenesocidae	<i>Congresox talabon</i>	High	VH	Carnivore	Minor	Muddy and Estuarine
51	Demersal	Croakers	Sciaenidae	<i>Otolithes argenteus</i>	Low	H	Planktivore	Major	Muddy and Estuarine
52	Demersal	Croakers	Sciaenidae	<i>Panna microdon</i>	Low	MH	Carnivore	Medium	Muddy and Estuarine
53	Demersal	Eels	Muraenesocidae	<i>Muraenesox cinereus</i>	Low	VH	Carnivore	Minor	Muddy and Estuarine
54	Demersal	Croakers	Sciaenidae	<i>Johnius carutta</i>	Medium	LM	Carnivore	Medium	Muddy and Estuarine
55	Demersal	Croakers	Sciaenidae	<i>Otolithes ruber</i>	Medium	M	Carnivore	Medium	Muddy and Estuarine
56	Demersal	Lizardfish	Synodontidae	<i>Saurida tumbil</i>	Medium	M	Carnivore	Minor	Muddy and Estuarine
57	Demersal	Gobies	Gobiidae	<i>Acentrogobius nebulosus</i>	Medium	M	Omnivore	NC	Muddy and Estuarine
58	Demersal	Catfishes	Ariidae	<i>Arius arius</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
59	Demersal	Catfishes	Ariidae	<i>Arius jella</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
60	Demersal	Catfishes	Ariidae	<i>Arius maculatus</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
61	Demersal	Catfishes	Ariidae	<i>Arius platystomus</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
62	Demersal	Catfishes	Ariidae	<i>Arius subrostratus</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
63	Demersal	Catfishes	Ariidae	<i>Arius venosus</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
64	Demersal	Catfishes	Ariidae	<i>Netuma thalassina</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
65	Demersal	Croakers	Sciaenidae	<i>Nibea maculata</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
66	Demersal	Croakers	Sciaenidae	<i>Nibea soldado</i>	Medium	MH	Carnivore	Medium	Muddy and Estuarine
67	Demersal	Surgeonfish	Acanthuridae	<i>Acanthurus nigroris</i>	High	L	Herbivore	Medium	Rocky and Coral
68	Demersal	Bannerfish	Chaetodontidae	<i>Heniochus acuminatus</i>	High	L	Omnivore	Medium	Rocky and Coral
69	Demersal	Bannerfish	Chaetodontidae	<i>Heniochus intermedius</i>	High	L	Omnivore	Medium	Rocky and Coral
70	Demersal	Bannerfish	Chaetodontidae	<i>Heniochus singularis</i>	High	L	Omnivore	Medium	Rocky and Coral
71	Demersal	Butterflyfish	Chaetodontidae	<i>Chaetodon collare</i>	High	L	Omnivore	Medium	Rocky and Coral
72	Demersal	Butterflyfish	Chaetodontidae	<i>Chaetodon decussatus</i>	High	L	Omnivore	Medium	Rocky and Coral
73	Demersal	Butterflyfish	Chaetodontidae	<i>Chaetodon lunula</i>	High	L	Omnivore	Medium	Rocky and Coral
74	Demersal	Squirrelfish	Holocentridae	<i>Sargocentron rubrum</i>	High	L	Carnivore	Minor	Rocky and Coral
75	Demersal	Tiger perches	Terapontidae	<i>Terapon Puta</i>	High	L	Carnivore	Minor	Rocky and Coral
76	Demersal	Tiger perches	Terapontidae	<i>Terapon theraps</i>	High	L	Carnivore	Minor	Rocky and Coral
77	Demersal	Snappers	Lutjanidae	<i>Lutjanus indicus</i>	High	LM	Carnivore	Major	Rocky and Coral
78	Demersal	Tiger perches	Terapontidae	<i>Pelates quadrilineatus</i>	High	LM	Carnivore	Minor	Rocky and Coral
79	Demersal	Sweepers	Pempheridae	<i>Pempheris molucca</i>	High	LM	Carnivore	NC	Rocky and Coral
80	Demersal	Wrasse	Labridae	<i>Halichoeres nigrescens</i>	High	M	Omnivore	Medium	Rocky and Coral
81	Demersal	Groupers	Serranidae	<i>Epinephelus coioides</i>	Low	H	Carnivore	Major	Rocky and Coral
82	Demersal	Groupers	Serranidae	<i>Epinephelus tauvina</i>	Low	H	Carnivore	Major	Rocky and Coral
83	Demersal	Snappers	Lutjanidae	<i>Lutjanus argentimaculatus</i>	Low	H	Carnivore	Major	Rocky and Coral
84	Demersal	Groupers	Serranidae	<i>Epinephelus areolatus</i>	Low	H	Carnivore	Medium	Rocky and Coral
85	Demersal	Lionfish	Scorpaenidae	<i>Pterois miles</i>	Low	H	Carnivore	Medium	Rocky and Coral
86	Demersal	Snappers	Lutjanidae	<i>Lutjanus ehrenbergii</i>	Low	H	Carnivore	Medium	Rocky and Coral
87	Demersal	Snappers	Lutjanidae	<i>Lutjanus fulvus</i>	Low	H	Carnivore	Medium	Rocky and Coral
88	Demersal	Snappers	Lutjanidae	<i>Lutjanus quinquelineatus</i>	Low	H	Carnivore	Medium	Rocky and Coral
89	Demersal	Snappers	Lutjanidae	<i>Lutjanus russelli</i>	Low	H	Carnivore	Medium	Rocky and Coral
90	Demersal	Grunts	Haemulidae	<i>Plectorhinchus schotaf</i>	Low	H	Carnivore	Minor	Rocky and Coral
91	Demersal	Grunts	Haemulidae	<i>Plectorhinchus chubbi</i>	Low	H	Omnivore	Minor	Rocky and Coral
92	Demersal	Surgeonfish	Acanthuridae	<i>Acanthurus blochii</i>	Low	M	Herbivore	Medium	Rocky and Coral
93	Demersal	Emperor	Lethrinidae	<i>Lethrinus nebulosus</i>	Low	MH	Carnivore	Major	Rocky and Coral

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
94	Demersal	Angelfishes	Pomacanthidae	<i>Apolemichthys xanthurus</i>	Low	MH	Omnivore	Medium	Rocky and Coral
95	Demersal	Eels	Muraenidae	<i>Gymnothorax pseudothyrsoides</i>	Low	MH	Carnivore	Minor	Rocky and Coral
96	Demersal	Snappers	Lutjanidae	<i>Lutjanus johni</i>	Medium	H	Carnivore	Major	Rocky and Coral
97	Demersal	Groupers	Serranidae	<i>Epinephelus diacanthus</i>	Medium	LM	Carnivore	Major	Rocky and Coral
98	Demersal	Snappers	Lutjanidae	<i>Lutjanus lutjanus</i>	Medium	LM	Carnivore	Medium	Rocky and Coral
99	Demersal	Sweepers	Pempheridae	<i>Pempheris multiradiata</i>	Medium	LM	Carnivore	NC	Rocky and Coral
100	Demersal	Batfish	Ehippidae	<i>Platax teira</i>	Medium	M	Carnivore	Medium	Rocky and Coral
101	Demersal	Groupers	Serranidae	<i>Epinephelus erythrurus</i>	Medium	M	Carnivore	Medium	Rocky and Coral
102	Demersal	Grunts	Haemulidae	<i>Pomadasys guoraca</i>	Medium	M	Carnivore	Medium	Rocky and Coral
103	Demersal	Lionfish	Scorpaenidae	<i>Pterois radiata</i>	Medium	M	Carnivore	Medium	Rocky and Coral
104	Demersal	Lionfish	Scorpaenidae	<i>Pterois volitans</i>	Medium	M	Carnivore	Medium	Rocky and Coral
105	Demersal	Batfish	Ehippidae	<i>Platax orbicularis</i>	Medium	M	Omnivore	Medium	Rocky and Coral
106	Demersal	Moorish idol	Zanclidae	<i>Zanclus cornutus</i>	Medium	M	Omnivore	Medium	Rocky and Coral
107	Demersal	Bamboo sharks	Hemiscyllidae	<i>Chilloscyllum griseum</i>	Medium	M	Carnivore	Minor	Rocky and Coral
108	Demersal	Tiger perches	Terapontidae	<i>Terapon jarbua</i>	Medium	M	Carnivore	Minor	Rocky and Coral
109	Demersal	Boxfish	Ostraciidae	<i>Ostracion cubicus</i>	Medium	M	Omnivore	Minor	Rocky and Coral
110	Demersal	Damselfish	Pomacentridae	<i>Chromis chromis</i>	Medium	M	Omnivore	Minor	Rocky and Coral
111	Demersal	Triggerfish	Balistidae	<i>Odonus niger</i>	Medium	M	Omnivore	Minor	Rocky and Coral
112	Demersal	Tripod fishes	Triacanthidae	<i>Triacanthus biaculeatus</i>	Medium	M	Omnivore	NC	Rocky and Coral
113	Demersal	Grunts	Haemulidae	<i>Plectorhinchus gibbosus</i>	Medium	MH	Carnivore	Major	Rocky and Coral
114	Demersal	Snappers	Lutjanidae	<i>Pinjalo pinjalo</i>	Medium	MH	Carnivore	Medium	Rocky and Coral
115	Demersal	Filefish	Monacanthidae	<i>Aluterus monoceros</i>	Medium	MH	Omnivore	Medium	Rocky and Coral
116	Demersal	Grunts	Haemulidae	<i>Pomadasys furcatus</i>	Medium	MH	Carnivore	Minor	Rocky and Coral
117	Demersal	Eels	Muraenidae	<i>Gymnothorax javanicus</i>	Medium	VH	Carnivore	Medium	Rocky and Coral
118	Demersal	Filefish	Monacanthidae	<i>Aluterus scriptus</i>	Medium	VH	Omnivore	Minor	Rocky and Coral
119	Demersal	Cowfish	Ostraciidae	<i>Lactoria cornuta</i>	Medium	LM	Carnivore	Minor	Rocky and Estuarine
120	Demersal	Asian seabass	Latidae	<i>Lates calcarfier</i>	Medium	VH	Carnivore	Major	Rocky and Estuarine
121	Demersal	Goatfish	Mullidae	<i>Upeneus sulphureus</i>	High	L	Carnivore	Medium	Sandy
122	Demersal	Goatfish	Mullidae	<i>Upeneus tragula</i>	High	L	Carnivore	Medium	Sandy
123	Demersal	Guitarfish	Rhinobatidae	<i>Glaucostegus granulatus</i>	Low	VH	Carnivore	Medium	Sandy
124	Demersal	Big Jawed Jumper	Lactariidae	<i>Lactarius lactarius</i>	High	L	Carnivore	Major	Sandy and Estuarine
125	Demersal	Breams	Sparidae	<i>Sparidentex hasta</i>	Low	MH	Carnivore	Medium	Sandy and Estuarine
126	Demersal	Rays	Dasyatidae	<i>Himantura fluviatilis</i>	Low	VH	Carnivore	Medium	Sandy and Estuarine
127	Demersal	Rays	Dasyatidae	<i>Himantura imbricata</i>	Low	VH	Carnivore	Medium	Sandy and Estuarine
128	Demersal	Rays	Dasyatidae	<i>Himantura uarnak</i>	Low	VH	Carnivore	Medium	Sandy and Estuarine
129	Demersal	Rays	Myliobatidae	<i>Aetobates falgellum</i>	Low	VH	Carnivore	Medium	Sandy and Estuarine
130	Demersal	Rays	Myliobatidae	<i>Aetobatus narinari</i>	Low	VH	Carnivore	Medium	Sandy and Estuarine

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Appendix — Classification of species collected from Zuari estuary — (*Contd.*)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
131	Demersal	Breams	Sparidae	<i>Acanthopagrus berda</i>	Medium	M	Carnivore	Medium	Sandy and Estuarine
132	Demersal	Threadfin bream	Nemipteridae	<i>Nemipterus bipunctatus</i>	High	L	Carnivore	Medium	Sandy and Muddy
133	Demersal	Silverbiddies	Gerreidae	<i>Gerres filamentosus</i>	High	L	Omnivore	Medium	Sandy and Muddy
134	Demersal	Silverbiddies	Gerreidae	<i>Gerres limbatus</i>	High	L	Omnivore	Medium	Sandy and Muddy
135	Demersal	Silverbiddies	Gerreidae	<i>Gerres oyena</i>	High	L	Omnivore	Medium	Sandy and Muddy
136	Demersal	Silverbiddies	Gerreidae	<i>Gerres setifer</i>	High	L	Omnivore	Medium	Sandy and Muddy
137	Demersal	Monacle bream	Nemipteridae	<i>Scolopsis vosmeri</i>	High	L	Carnivore	Minor	Sandy and Muddy
138	Demersal	Flounder	Paralichthyidae	<i>Pseudorhombus triocellatus</i>	High	L	Omnivore	Minor	Sandy and Muddy
139	Demersal	Soles	Soleidae	<i>Solea ovata</i>	High	L	Omnivore	Minor	Sandy and Muddy
140	Demersal	Tongue soles	Cynoglossidae	<i>Cynoglossus puncticeps</i>	High	L	Omnivore	Minor	Sandy and Muddy
141	Demersal	Cardinal fish	Apogonidae	<i>Archamia bleekeri</i>	High	L	Carnivore	NC	Sandy and Muddy
142	Demersal	Cardinal fish	Apogonidae	<i>Ostorhichus fasciatus</i>	High	L	Carnivore	NC	Sandy and Muddy
143	Demersal	Cardinal fish	Apogonidae	<i>Ostorhichus pleuron</i>	High	L	Carnivore	NC	Sandy and Muddy
144	Demersal	Pufferfishes	Tetraodontidae	<i>Arothron immaculatus</i>	High	L	Omnivore	NC	Sandy and Muddy
145	Demersal	Pufferfishes	Tetraodontidae	<i>Lagocephalus wheeleri</i>	High	L	Omnivore	NC	Sandy and Muddy
146	Demersal	Pufferfishes	Tetraodontidae	<i>Tetraodon fluviatilis</i>	High	L	Omnivore	NC	Sandy and Muddy
147	Demersal	Gobies	Gobiidae	<i>Istigobius diadema</i>	High	LM	Omnivore	NC	Sandy and Muddy
148	Demersal	Pufferfishes	Tetraodontidae	<i>Lagocephalus inermis</i>	High	LM	Omnivore	NC	Sandy and Muddy
149	Demersal	Monacle bream	Nemipteridae	<i>Parascolopsis aspinosa</i>	High	M	Carnivore	Minor	Sandy and Muddy
150	Demersal	Threadfins	Polynemidae	<i>Polynemus heptadactylus</i>	Low	H	Carnivore	Major	Sandy and Muddy
151	Demersal	Threadfin bream	Nemipteridae	<i>Nemipterus japonicus</i>	Medium	LM	Carnivore	Medium	Sandy and Muddy
152	Demersal	Gobies	Gobiidae	<i>Trypauchen vagina</i>	Medium	LM	Omnivore	Minor	Sandy and Muddy
153	Demersal	Soles	Soleidae	<i>Brachirus orientalis</i>	Medium	LM	Omnivore	Minor	Sandy and Muddy
154	Demersal	Soles	Soleidae	<i>Synaptura commersonii</i>	Medium	LM	Omnivore	Minor	Sandy and Muddy
155	Demersal	Threadfins	Polynemidae	<i>Leptomelanosoma indicum</i>	Medium	M	Carnivore	Major	Sandy and Muddy
156	Demersal	Indian Halibut	Psettodidae	<i>Psettodes erumei</i>	Medium	M	Carnivore	Medium	Sandy and Muddy
157	Demersal	Silverbiddies	Gerreidae	<i>Gerres longirostris</i>	Medium	M	Omnivore	Medium	Sandy and Muddy
158	Demersal	Drift fishes	Drepanidae	<i>Drepane longimana</i>	Medium	M	Carnivore	Minor	Sandy and Muddy

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
159	Demersal	Drift fishes	Drepanidae	<i>Drepane punctata</i>	Medium	M	Carnivore	Minor	Sandy and Muddy
160	Demersal	Flounder	Paralichthyidae	<i>Pseudorhombus elevatus</i>	Medium	M	Omnivore	Minor	Sandy and Muddy
161	Demersal	Soles	Soleidae	<i>Solea stanalandi</i>	Medium	M	Omnivore	Minor	Sandy and Muddy
162	Demersal	Tongue soles	Cynoglossidae	<i>Paraplagusia bilineata</i>	Medium	M	Omnivore	Minor	Sandy and Muddy
163	Demersal	Flatheads	Platycephalidae	<i>Platycephalus indicus</i>	Medium	M	Carnivore	NC	Sandy and Muddy
164	Demersal	Flatheads	Platycephalidae	<i>Rogadius pristiger</i>	Medium	M	Carnivore	NC	Sandy and Muddy
165	Demersal	Flatheads	Platycephalidae	<i>Thysanophrys armata</i>	Medium	M	Carnivore	NC	Sandy and Muddy
166	Demersal	Pufferfishes	Tetraodontidae	<i>Chelonodon patoca</i>	Medium	M	Omnivore	NC	Sandy and Muddy
167	Demersal	Flounder	Paralichthyidae	<i>Pseudorhombus arsius</i>	Medium	MH	Omnivore	Minor	Sandy and Muddy
168	Demersal	Tongue soles	Cynoglossidae	<i>Cynoglossus dispar</i>	Medium	MH	Omnivore	Minor	Sandy and Muddy
169	Demersal	Tongue soles	Cynoglossidae	<i>Cynoglossus macrolepidotus</i>	Medium	MH	Omnivore	Minor	Sandy and Muddy
170	Demersal	Dragonet	Callionymidae	<i>Callionymus erythraeus</i>	Medium	MH	Omnivore	NC	Sandy and Muddy
171	Demersal	Threadfins	Polynemidae	<i>Eleutheronema tetradactylum</i>	Medium	VH	Carnivore	Major	Sandy and Muddy
172	Demersal	Porcupine fish	Diodontidae	<i>Diodon hystrix</i>	Low	MH	Carnivore	Minor	Sandy and Rocky
173	Demersal	Rays	Dasyatidae	<i>Neotrygon kuhli</i>	Low	VH	Carnivore	Medium	Sandy and Rocky
174	Demersal	Sea horse	Syngnathidae	<i>Hippocampus kuda</i>	Medium	L	Planktivore	Medium	Sandy and Rocky
175	Demersal	Rabbitfishes	Siganidae	<i>Siganus canaliculatus</i>	Medium	L	Herbivore	Minor	Sandy and Rocky
176	Demersal	Rabbitfishes	Siganidae	<i>Siganus vermiculatus</i>	Medium	L	Herbivore	Minor	Sandy and Rocky
177	Demersal	Rabbitfishes	Siganidae	<i>Siganus javus</i>	Medium	LM	Herbivore	Minor	Sandy and Rocky
178	Demersal	Stingfish	Scorpaenidae	<i>Minous monodactylus</i>	Medium	LM	Carnivore	NC	Sandy and Rocky
179	Demersal	Porcupine fish	Diodontidae	<i>Diodon holocanthus</i>	Medium	M	Carnivore	Minor	Sandy and Rocky
180	Demersal	Stone fish	Synanceiidae	<i>Trachicephalus uranoscopus</i>	Medium	MH	Omnivore	NC	Sandy and Rocky
181	Molluscan	Bivalves	Mytilidae	<i>Perna viridis</i>	Medium	M	Planktivore	Major	Rocky and Estuarine
182	Molluscan	Bivalves	Ostreidae	<i>Crassostera madrasensis</i>	Medium	M	Planktivore	Major	Rocky and Estuarine
183	Molluscan	Bivalves	Ostreidae	<i>Saccostrea cuculata</i>	Medium	M	Planktivore	Major	Rocky and Estuarine
184	Molluscan	Bivalves	Placunidae	<i>Placuna placenta</i>	Low	H	Planktivore	Medium	Sandy and Muddy
185	Molluscan	Bivalves	Arcidae	<i>Anadara formosa</i>	Low	H	Omnivore	Minor	Sandy and Muddy
186	Molluscan	Bivalves	Arcidae	<i>Tegillarca granosa</i>	Low	H	Omnivore	Minor	Sandy and Muddy

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
187	Molluscan	Bivalves	Cardiidae	<i>Cardium asiaticum</i>	Low	H	Omnivore	Minor	Sandy and Muddy
188	Molluscan	Gastropods	Babyloniidae	<i>Babylonia spirata</i>	Low	H	Omnivore	Minor	Sandy and Muddy
189	Molluscan	Gastropods	Potamididae	<i>Cerithideopsis cingulata</i>	Low	H	Omnivore	NC	Sandy and Muddy
190	Molluscan	Cephalopods	Loliginidae	<i>Loliolus hardwickeii</i>	Medium	M	Carnivore	Major	Sandy and Muddy
191	Molluscan	Cephalopods	Loliginidae	<i>Uroteuthis duvaucelli</i>	Medium	M	Carnivore	Major	Sandy and Muddy
192	Molluscan	Cephalopods	Sepiidae	<i>Sepiella inermis</i>	Medium	M	Carnivore	Major	Sandy and Muddy
193	Molluscan	Bivalves	Corbiculidae	<i>Villorita cyprinoides</i>	Medium	M	Planktivore	Major	Sandy and Muddy
194	Molluscan	Bivalves	Veneridae	<i>Paphia malabarica</i>	Medium	M	Planktivore	Major	Sandy and Muddy
195	Molluscan	Cephalopods	Octopodidae	<i>Octopus dofusii</i>	Medium	M	Carnivore	Medium	Sandy and Muddy
196	Molluscan	Bivalves	Veneridae	<i>Meretrix casta</i>	Medium	M	Planktivore	Medium	Sandy and Muddy
197	Molluscan	Bivalves	Veneridae	<i>Meretrix metretrix</i>	Medium	M	Planktivore	Medium	Sandy and Muddy
198	Molluscan	Gastropods	Melongenidae	<i>Hemifusus pugilinus</i>	Medium	M	Carnivore	Minor	Sandy and Muddy
199	Molluscan	Gastropods	Turritellidae	<i>Turritella duplicata</i>	Medium	M	Carnivore	Minor	Sandy and Muddy
200	Molluscan	Gastropods	Turritellidae	<i>Turritella terebra</i>	Medium	M	Carnivore	Minor	Sandy and Muddy
201	Molluscan	Gastropods	Turbinidae	<i>Turbo brunneus</i>	Medium	M	Omnivore	Minor	Sandy and Muddy
202	Molluscan	Bivalves	Arcidae	<i>Scapharca pilula</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
203	Molluscan	Bivalves	Donacidae	<i>Donax scortum</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
204	Molluscan	Bivalves	Donacidae	<i>Donax variabilis</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
205	Molluscan	Bivalves	Mactridae	<i>Spisula voyi</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
206	Molluscan	Bivalves	Tellinidae	<i>Serratina capsoides</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
207	Molluscan	Bivalves	Veneridae	<i>Dosinia prostrata</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
208	Molluscan	Bivalves	Veneridae	<i>Marcia opima</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
209	Molluscan	Bivalves	Veneridae	<i>Paphia textile</i>	Medium	M	Planktivore	Minor	Sandy and Muddy
210	Molluscan	Gastropods	Bursidae	<i>Bursa tuberculata</i>	Medium	M	Carnivore	NC	Sandy and Muddy
211	Molluscan	Gastropods	Naticidae	<i>Natica picta</i>	Medium	M	Carnivore	NC	Sandy and Muddy
212	Molluscan	Gastropods	Trochidae	<i>Umbonium vestiarium</i>	Medium	M	Carnivore	NC	Sandy and Muddy
213	Molluscan	Gastropods	Nassariidae	<i>Nassarius stolatus</i>	Medium	M	Omnivore	NC	Sandy and Muddy
214	Molluscan	Gastropods	Neritidae	<i>Nerita crepidularia</i>	Medium	M	Omnivore	NC	Sandy and Muddy

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
215	Molluscan	Gastropods	Naticidae	<i>Natica sp.</i>	Medium	M	Planktivore	NC	Sandy and Muddy
216	Molluscan	Gastropods	Potamididae	<i>Telescopium telescopium</i>	Medium	M	Planktivore	NC	Sandy and Muddy
217	Molluscan	Gastropods	Rostellariidae	<i>Tibia curta</i>	Medium	M	Planktivore	NC	Sandy and Muddy
218	Molluscan	Gastropods	Trochidae	<i>Trochus radiatus</i>	Medium	M	Omnivore	Minor	Sandy and Rocky
219	Pelagic	Milkfish	Chanidae	<i>Chanos chanos</i>	Medium	M	Herbivore	Major	Muddy and Estuarine
220	Pelagic	Carangids	Carangidae	<i>Alepes djedaba</i>	High	L	Carnivore	Major	Pelagic
221	Pelagic	Barracudas	Sphyraenidae	<i>Sphyraena obtusata</i>	High	LM	Carnivore	Major	Pelagic
222	Pelagic	Carangids	Carangidae	<i>Caranx heberi</i>	High	LM	Carnivore	Medium	Pelagic
223	Pelagic	Carangids	Carangidae	<i>Caranx tille</i>	High	LM	Carnivore	Medium	Pelagic
224	Pelagic	Carangids	Carangidae	<i>Caranx ignobilis</i>	High	LM	Carnivore	Medium	Pelagic
225	Pelagic	Carangids	Carangidae	<i>Caranx sexfasciatus</i>	High	LM	Carnivore	Medium	Pelagic
226	Pelagic	Carangids	Carangidae	<i>Alectis ciliaris</i>	Low	H	Carnivore	Major	Pelagic
227	Pelagic	Barracudas	Sphyraenidae	<i>Sphyraena jello</i>	Low	VH	Carnivore	Major	Pelagic
228	Pelagic	Carangids	Carangidae	<i>Alectis indicus</i>	Medium	H	Carnivore	Major	Pelagic
229	Pelagic	Carangids	Carangidae	<i>Scomberoides commersonianus</i>	Medium	H	Carnivore	Major	Pelagic
230	Pelagic	Carangids	Carangidae	<i>Scomberoides lysan</i>	Medium	M	Carnivore	Major	Pelagic
231	Pelagic	Carangids	Carangidae	<i>Scomberoides tol</i>	Medium	M	Carnivore	Major	Pelagic
232	Pelagic	Horse mackerel	Carangidae	<i>Megalaspys cordyla</i>	Medium	M	Carnivore	Major	Pelagic
233	Pelagic	Seerfishes	Scombridae	<i>Scomberomorus commerson</i>	Medium	M	Carnivore	Major	Pelagic
234	Pelagic	Seerfishes	Scombridae	<i>Scomberomorus guttatus</i>	Medium	M	Carnivore	Major	Pelagic
235	Pelagic	Fusiliers	Caesionidae	<i>Caesio cunning</i>	Medium	M	Planktivore	Minor	Rocky and Coral
236	Pelagic	Fusiliers	Caesionidae	<i>Pterocaesio chrysozona</i>	Medium	M	Planktivore	Minor	Rocky and Coral
237	Pelagic	Halfbeaks	Hemiramphidae	<i>Hyporamphus limbatus</i>	High	L	Carnivore	Minor	Sandy and Estuarine
238	Pelagic	Halfbeaks	Hemiramphidae	<i>Hemiramphus lutkei</i>	High	LM	Carnivore	Minor	Sandy and Estuarine
239	Pelagic	Halfbeaks	Hemiramphidae	<i>Hyporamphus dussumieri</i>	High	LM	Carnivore	Minor	Sandy and Estuarine
240	Pelagic	Full beaks	Belonidae	<i>Strongylura strongylura</i>	Medium	M	Carnivore	Minor	Sandy and Estuarine
241	Pelagic	Sand whiting	Sillaginidae	<i>Sillago sihama</i>	High	L	Carnivore	Major	Sandy and Muddy
242	Pelagic	Mackerel	Scombridae	<i>Rastrelliger kanagurta</i>	High	L	Planktivore	Major	Sandy and Muddy
243	Pelagic	Sardines	Clupeidae	<i>Sardinella longiceps</i>	High	L	Planktivore	Major	Sandy and Muddy
244	Pelagic	White sardine	Clupeidae	<i>Escualosa thoracata</i>	High	L	Planktivore	Major	Sandy and Muddy
245	Pelagic	Long finned herring	Pristigasteridae	<i>Opisthopterus tardoore</i>	High	L	Omnivore	Medium	Sandy and Muddy
246	Pelagic	Shads	Pristigasteridae	<i>Ilisha megaloptera</i>	High	L	Omnivore	Medium	Sandy and Muddy
247	Pelagic	Shads	Pristigasteridae	<i>Ilisha melastoma</i>	High	L	Omnivore	Medium	Sandy and Muddy
248	Pelagic	Bony breams	Clupeidae	<i>Anodontostoma chacunda</i>	High	L	Planktivore	Medium	Sandy and Muddy

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
249	Pelagic	Moustached anchovies	Engraulidae	<i>Thryssa malabarica</i>	High	L	Planktivore	Medium	Sandy and Muddy
250	Pelagic	Moustached anchovies	Engraulidae	<i>Thryssa mystax</i>	High	L	Planktivore	Medium	Sandy and Muddy
251	Pelagic	Rainbow sardine	Dussumieriidae	<i>Dussumieria acuta</i>	High	L	Planktivore	Medium	Sandy and Muddy
252	Pelagic	Sardines	Clupeidae	<i>Sardinella albella</i>	High	L	Planktivore	Medium	Sandy and Muddy
253	Pelagic	Sardines	Clupeidae	<i>Sardinella gibbosa</i>	High	L	Planktivore	Medium	Sandy and Muddy
254	Pelagic	Shads	Clupeidae	<i>Tenualosa toli</i>	High	L	Planktivore	Medium	Sandy and Muddy
255	Pelagic	Whitebaits	Engraulidae	<i>Encrasicolina devisi</i>	High	L	Planktivore	Medium	Sandy and Muddy
256	Pelagic	Whitebaits	Engraulidae	<i>Stolephorus commersonii</i>	High	L	Planktivore	Medium	Sandy and Muddy
257	Pelagic	Whitebaits	Engraulidae	<i>Stolephorus indicus</i>	High	L	Planktivore	Medium	Sandy and Muddy
258	Pelagic	Glassy perchlets	Ambassidae	<i>Ambassis urotaenia</i>	High	L	Carnivore	Minor	Sandy and Muddy
259	Pelagic	Glassy perchlets	Ambassidae	<i>Ambassis ambassis</i>	High	L	Carnivore	Minor	Sandy and Muddy
260	Pelagic	Glassy perchlets	Ambassidae	<i>Ambassis gymnocephalus</i>	High	L	Carnivore	Minor	Sandy and Muddy
261	Pelagic	Scat	Scatophagidae	<i>Scatophagus argus</i>	High	L	Omnivore	Minor	Sandy and Muddy
262	Pelagic	Shads	Pristigasteridae	<i>Ilisha filigera</i>	High	L	Omnivore	Minor	Sandy and Muddy
263	Pelagic	Shads	Pristigasteridae	<i>Pellona sp.</i>	High	L	Planktivore	Minor	Sandy and Muddy
264	Pelagic	Silversides	Atherinidae	<i>Atherinomorus duodecimalis</i>	High	LM	Omnivore	Minor	Sandy and Muddy
265	Pelagic	Ribbonfishes	Trichiuridae	<i>Lepturacanthus savala</i>	High	M	Carnivore	Medium	Sandy and Muddy
266	Pelagic	Mulletts	Mugilidae	<i>Liza tade</i>	Low	H	Omnivore	Major	Sandy and Muddy
267	Pelagic	White pomfret	Stromateidae	<i>Pampus argenteus</i>	Low	H	Planktivore	Major	Sandy and Muddy
268	Pelagic	Tenpounder	Elopidae	<i>Elops machnata</i>	Low	H	Carnivore	Medium	Sandy and Muddy
269	Pelagic	Ribbonfishes	Trichiuridae	<i>Trichiurus lepturus</i>	Medium	H	Carnivore	Medium	Sandy and Muddy
270	Pelagic	Mulletts	Mugilidae	<i>Liza macrolepis</i>	Medium	M	Omnivore	Medium	Sandy and Muddy
271	Pelagic	Mulletts	Mugilidae	<i>Liza parsia</i>	Medium	M	Omnivore	Medium	Sandy and Muddy
272	Pelagic	Golden anchovies	Engraulidae	<i>Coilia dussumieri</i>	Medium	M	Planktivore	Medium	Sandy and Muddy
273	Pelagic	Moustached anchovies	Engraulidae	<i>Thryssa hamiltonii</i>	Medium	M	Planktivore	Medium	Sandy and Muddy
274	Pelagic	Moustached anchovies	Engraulidae	<i>Thryssa setirostris</i>	Medium	M	Planktivore	Medium	Sandy and Muddy
275	Pelagic	Mulletts	Mugilidae	<i>Mugil cephalus</i>	Medium	MH	Omnivore	Major	Sandy and Muddy
276	Pelagic	Mulletts	Mugilidae	<i>Valamugil cunnesius</i>	Medium	MH	Omnivore	Major	Sandy and Muddy

(Contd.)

Appendix — Classification of species collected from Zuari estuary — (Contd.)

SN	Class	Group	Family	Species	Res	Vul	FT	FI	Hab
277	Pelagic	Tarpon	Megalopidae	<i>Megalops cyprinoides</i>	Medium	VH	Carnivore	Medium	Sandy and Muddy
278	Pelagic	Carangids	Carangidae	<i>Alepes kalla</i>	High	L	Carnivore	Medium	Sandy and Rocky
279	Pelagic	Carangids	Carangidae	<i>Alepes kleinii</i>	High	L	Carnivore	Medium	Sandy and Rocky
280	Pelagic	Carangids	Carangidae	<i>Alepes melanoptera</i>	High	L	Carnivore	Medium	Sandy and Rocky
281	Pelagic	Carangids	Carangidae	<i>Atule mate</i>	High	L	Carnivore	Medium	Sandy and Rocky
282	Pelagic	Carangids	Carangidae	<i>Carangoides praeustus</i>	High	L	Carnivore	Medium	Sandy and Rocky
283	Pelagic	Bony brems	Clupeidae	<i>Nematalosa nasus</i>	High	L	Planktivore	Medium	Sandy and Rocky
284	Pelagic	Carangids	Carangidae	<i>Atropus atropus</i>	Medium	L	Carnivore	Medium	Sandy and Rocky
285	Pelagic	Carangids	Carangidae	<i>Gnathanodon speciosus</i>	Medium	M	Carnivore	Major	Sandy and Rocky
286	Pelagic	Carangids	Carangidae	<i>Trachinotus mookalee</i>	Medium	M	Carnivore	Medium	Sandy and Rocky

Res-ecological resilience, Vul-ecological vulnerability (H-high, L-low, LM-low to moderate, M-moderate, MH-moderate to high, VH-very high), FT-feeding type, FI-fishery importance, Hab-habitat type
