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Fish species, families and guilds recorded in selected estuaries of Mozambique

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Abstract

This review documents the occurrence of fish species in a range of estuaries from Mozambique. Altogether 217 fish species were recorded, belonging to 77 families, and dominated in terms of species richness by Gobiidae, Carangidae and Mugilidae. A guild analysis was conducted to compare the occurrence and degree of estuary-association by the various species in tropical Mozambique, with that recorded from nearby predominantly subtropical and warm-temperate estuaries in South Africa. The major difference in guild occurrence between the two countries centered on the higher representation of marine stragglers in Mozambique estuaries, a probable result of the wide mouths and macrotidal exchange of some of the larger systems along this coast. Estuarine lakes and lagoons within the Mozambique coastal region showed increasing reduction in marine connectivity with channel distance from the sea, and a concomitant increase in freshwater fish species domination of these incipient coastal lakes and lagoons. Once these systems lose all connectivity with the sea, they become freshwater coastal lakes and lagoons, and all estuary-associated marine fish species disappear.

Keywords: estuarine fish, species list, fish guilds, African estuaries

Introduction

Although several fisheries related studies have been conducted in some Mozambique estuaries (e.g., Costa *et al*., 2020), little biological or ecological information is available on the ichthyofauna when compared to the extensive work that has been completed on the fishes in a wide range of South African estuaries. The end result is that estuarine fish assemblages in Mozambique, apart from selected fisheries taxa, are relatively poorly known, and understanding of the structure and functioning of estuarine fish communities in this region is still in its infancy. Indeed, there is no comprehensive list of species that have been recorded from estuaries in the country – hence the attempt here to compile such a list. Future ichthyological studies will benefit from this synthesis of information on what taxa are likely to occur in estuaries in this important tropical region on the eastern coast of Africa. Different species are also placed in appropriate fish guilds in order to compare guild composition in Mozambique with that recorded in the predominantly subtropical and warm-temperate estuarine systems of South Africa.

Study area

The Mozambique coast comprises three broad regions based on geomorphological characteristics (Macamo *et al.*, 2016). The dune coast extends from Ponta do Oura in the south to Bazaruto (Fig. 1). Based on available spatial data from Mozambique waterways and Google Earth approximately 18 functional estuaries are found within this region. These include typical

river estuaries and bays but there are also extensive high dunes, behind which estuarine and coastal lakes have developed. The central zone extending north to Angoche (Fig. 1) is a swamp coast, with at least 50 estuaries in this region, many formed by the confluence of more than one river at the coast. This zone has the highest number of river inflows and is characterized by muddy sediments and turbid waters. The coral coast starts north of Angoche, characterized by lower river runoff, reduced sediment input and clean water. Although apparently characterized by an abundance of estuaries (93), most of these are small systems fed by coastal streams and groundwater seeps. Mangroves may be present, and even extensive in typical large permanently open river valley type estuaries, but they are also widespread along deltaic sections of the coast where no immediate estuaries are present (e.g., to the north and south of the Zambezi River Estuary) (Fig. 1).

All the estuaries of Mozambique may be categorized as tropical and most belong to two main types; namely estuarine lakes and lagoons, and permanently open estuaries. An example of an estuarine lake is Lagoa Poelela in southern Mozambique (Fig. 1). This segmented estuarine lake system has a large and deep lake (65 km² in area and an average depth of 13.7 m) at its top end, a fairly uniform lake salinity of 8 ppt, and is connected to the marine environment by a 75 km long channel that intersects a number of estuarine lagoons en route to the sea (Hill *et al*., 1975). There is

Figure 1. Map of Mozambique showing the three major coastal regions and estuarine systems mentioned in the text.

little tidal regime within the Poelela system, and no tidal changes within the upper lake. In contrast, an example of a permanently open estuary is the Bons Sinais system in central Mozambique (Fig. 1) that has a semi-diurnal tidal regime of approximately 4 m during spring tides. This estuary receives a highly seasonal river flow, is 28 km in length, and has channel depths ranging from less than 2 m to more than 20 m in places (Hoguane *et al.*, 2020). The Morrumbene Estuary (Fig. 1) is a similar type of system entering Inhambane Bay. This 20 km long estuary has a channel that is about 10 m deep at the mouth, decreasing to 1-2 m in the middle reaches at low tide (Day, 1974).

One of the largest estuaries in Mozambique is the Zambezi system, a river mouth type of estuary that is dominated by outflowing freshwater from a very large catchment area (1 390 000 km^2). This river flow usually averages about 3 000 m^3 s^{-1} and creates a freshwater plume that enters the coastal ocean and is sensitive to winds on diurnal and synoptic time scales (Nehama and Reason, 2015). Nevertheless, lateral channels and small lagoons on the Zambezi floodplain are frequently influenced by saline tidal inputs during reduced river inflow periods and therefore offer nursery habitats for estuary-associated marine fish species (Bills, 1999). Indeed, there are many mangrove-dominated coastal inlets to the north and south of the Zambezi River Estuary but these inlets, although providing food and shelter for estuary-associated marine fish species, are not estuarine because there is no riverine or land-based freshwater influence on their functionality.

There are also examples of Mozambique estuarine lakes/lagoons that are in the process of becoming completely isolated from the sea (e.g. Lake Piti in southern Mozambique), at which stage they will become coastal lake/lagoon systems that have lost all marine connectivity, such as has occurred at Lake Sibaya in northern KwaZulu-Natal, South Africa (Allanson *et al.*, 1966). Some of these lagoon systems are bounded by longitudinal dunes that separate the water bodies from the sea and will be strongly influenced by climate change and sea level rise in the future (Miguel *et al.*, 2019). Access by marine fish to intermittently open estuaries is limited when the sand berm at the mouth is closed, thus restricting any fish movement to or from the adjacent estuarine system. However, heavy precipitation in the river catchments of these systems, sometimes associated with cyclonic rainfall events, usually breaches the sand berm and restores estuarine-marine connectivity for a period that is determined primarily by the duration of river outflow and scouring action in the mouth.

Methods

Information on the occurrence of fish species from a range of estuaries in Mozambique was collected from both published and unpublished sources (Table 1). Because of the wide variety of gear used in the various studies cited in this table, no attempt has been made to quantify catches, or compare species occurrence between different systems or regions along the coast. Detailed information on the life cycles of most fish species occurring in Mozambique estuaries is scarce. However, by using very broad estuary-associated categories (Table 2), it was possible to place the recorded species into one of seven guilds.

Using data from Whitfield (2019), a similar fish species list and guild classification was compiled for those taxa recorded in South African estuaries to allow for comparisons between the relative composition of life-history categories of estuary-associated fish species in Mozambique and South Africa (Table 3). However, the primary aim of this review was to compile a preliminary list of species and families found in Mozambique estuaries, thus supporting future work on the estuarine ichthyofauna within this important biogeographical region.

Results

Although preliminary, Table 1 indicates a potentially rich ichthyofauna associated with the estuaries of Mozambique. In terms of species richness, Mozambique estuaries have diverse fish assemblages, comprising a total of at least 217 species and belonging to 77 families (Table 1). This compares to the 170 species belonging to 60 families recorded in South African estuaries (Appendix).

A comparison between the occurrence of fish families between estuaries in Mozambique and South Africa revealed a high degree of similarity in terms of species richness (Table 3). Eight of the top ten families were shared between the two countries, with the Gobiidae and Mugilidae being in the top three places from both regions. Most of the families were shared between Mozambique and South Africa and many of the species were the same in both regions (Table 1; Appendix).

An analysis of fish guild composition in estuaries from the two countries revealed some differences in

Table 1. Fish species recorded from Mozambique estuarine systems ([1]Unpublished records from AW Paterson; [2]Costa *et al*., 2020; [3]Mugabe *et al*., 2021; [4]Mocuba *et al*., 2023; [5,6]Unpublished records from SP Weerts; [7]Day, 1974; [8]Published and unpublished records from the SAIAB Fish Collection, including Smith and Heemstra, 1986; Bills 1999, 2001). For a description of the estuarine guild categories see Table 2.

Fish families	Fish species	South African common names	Estuarine guilds	[1]Moebase, Molócuè, Ligonha	[2,3,4] Bons Sinais	[5] Muladi	[6] Phungwe	[7] Morrumbene	[8] SAIAB
Acanthuridae	*Acanthurus triostegus*	Convict surgeonfish	MS	+					
Ambassidae	*Ambassis ambassis*	Longspine glassy	ER	+				+	+
Ambassidae	*Ambassis dussumieri*	Malabar glassy	EM	+		+	+	+	+
Ambassidae	*Ambassis natalensis*	Slender glassy	EM			+	+		+
Anguillidae	*Anguilla bicolor*	Shortfin eel	CM						+
Anguillidae	*Anguilla labiata*	African mottled eel	CM						+
Anguillidae	*Anguilla marmorata*	Giant mottled eel	CM						+
Anguillidae	*Anguilla mossambica*	Longfin eel	CM						+
Apogonidae	*Apogonichthyoides uninotatus*	Onespot cardinal	MS					+	
Apogonidae	*Foa brachygramma*	Weed cardinalfish	MS					+	
Apogonidae	*Ostorhinchus quadrifasciatus*	Two-stripe cardinal	MS	+					
Ariidae	*Arius africanus*	African sea catfish	MI		+				
Ariidae	*Plicofollis dussumieri*	Blacktip sea catfish	MI						+
Atherinidae	*Atherinomorus lacunosus*	Hardyhead silverside	MI					+	+
Atherinidae	*Hypoatherina barnesi*	Slender silverside	MI	+					
Belonidae	*Strongylura leiura*	Banded needlefish	MI			+			+
Belonidae	*Tylosurus crocodilus*	Hound needlefish	MI					+	+
Blenniidae	*Antennablennius bifilum*	Horned blenny	EM						+
Blenniidae	*Omobranchus elongatus*	Cloister blenny	EM					+	
Blenniidae	*Omobranchus ferox*	Gossamer blenny	ER						+
Blenniidae	*Omobranchus punctatus*	Muzzled blenny	EM					+	
Blenniidae	*Petroscirtes mitratus*	Floral blenny	EM					+	
Blenniidae	*Petroscirtes variabilis*	Variable sabretooth blenny	EM					+	
Bothidae	*Bothus pantherinus*	Leopard flounder	MS			+			+
Bothidae	*Engyprosopon natalense*	Natal flounder	MS					+	
Caesionidae	*Caesio xanthonota*	Yellowback fusilier	MS						+
Callionymidae	*Callionymus marleyi*	Sand dragonet	MS					+	
Callionymidae	*Synchiropus marmoratus*	Marbled dragonet	MS					+	
Carangidae	*Alectis indicus*	Indian mirrorfish	MS	+					
Carangidae	*Carangoides armatus*	Longfin trevally	MS					+	
Carangidae	*Caranx heberi*	Blacktip kingfish	MS			+			+
Carangidae	*Caranx ignobilis*	Giant kingfish	MI					+	
Carangidae	*Caranx melampygus*	Bluefin kingfish	MI					+	
Carangidae	*Caranx papuensis*	Brassy kingfish	MI	+		+			
Carangidae	*Caranx sexfasciatus*	Bigeye trevally	MI			+		+	
Carangidae	*Craterognathus plagiotaenia*	Barcheek kingfish	MS	+					
Carangidae	*Megalaspis cordyla*	Torpedo scad	MS	+					
Carangidae	*Platycaranx malabaricus*	Malabar kingfish	MS	+					
Carangidae	*Scomberoides commersonnianus*	Talang queenfish	MI						+
Carangidae	*Scomberoides lysan*	Doublespotted queenfish	MI			+		+	+
Carangidae	*Scomberoides tala*	Barred queenfish	MI					+	+
Carcharinidae	*Carcharinus leucas*	Zambezi shark	MI						+
Centriscidae	*Aeoliscus punctulatus*	Speckled shrimpfish	MS					+	
Chanidae	*Chanos chanos*	Milkfish	MI			+			+
Cichlidae	*Coptodon rendalli*	Redbreast tilapia	FI			+			+
Cichlidae	*Oreochromis mossambicus*	Mozambique tilapia	FI	+	+			+	+
Cichlidae	*Oreochromis placidus*	Black tilapia	FI						+
Cichlidae	*Pseudocrenilabrus philander*	Southern mouthbrooder	FI						+
Cichlidae	*Tilapia sparrmanii*	Banded tilapia	FS						+
Clariidae	*Clarias gariepinus*	Sharptooth catfish	FI		+				+
Clupeidae	*Gilchristella aestuaria*	Estuarine roundherring	ER						+
Clupeidae	*Hilsa kelee*	Kelee shad	MI	+	+		+		+
Clupeidae	*Pellona ditchela*	Indian pellona	MI	+	+				
Clupeidae	*Sardinella albella*	White sardinella	MS		+				
Congridae	*Uroconger lepturus*	Longtail conger	MS	+					
Cynoglossidae	*Cynoglossus durbanensis*	Durban tonguesole	MS					+	
Cynoglossidae	*Paraplagusia bilineata*	Doublelined tonguesole	MS					+	
Cyprinidae	*Enteromius annectens*	Broadstriped barb	FS	+					
Cyprinidae	*Enteromius paludinosus*	Straightfin barb	FS						+

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Cyprinidae	*Enteromius radiatus*	Beira barb	FS	+					
Dasyatidae	*Himantura uarnak*	Reticulate whipgray	MI					+	
Dasyatidae	*Maculabatis ambigua*	Baraka's whipray	MS				+		
Dasyatidae	*Maculabatis gerrardi*	Sharpnose stingray	MS	+					
Dasyatidae	*Pastinachus sephen*	Feathertail stingray	MS	+					
Dorosomatidae	*Sardinella melanura*	Blacktip sardinella	MS					+	
Drepaneidae	*Drepane longimana*	Concertina fish	MS						
Eleotridae	*Butis koilomatodon*	Mud sleeper	EM	+					
Eleotridae	*Eleotris fusca*	Dusky sleeper	ER						+
Eleotridae	*Eleotris mauritiana*	Widehead sleeper	ER						+
Eleotridae	*Eleotris melanosoma*	Broadhead sleeper	ER			+			+
Elopidae	*Elops machnata*	Skipjack	MI						+
Engraulidae	*Engraulis japonicus*	Japanese anchovy	MI	+					
Engraulidae	*Stolephorus commersonnii*	Commerson's anchovy	MI					+	+
Engraulidae	*Stolephorus holodon*	Thorny anchovy	MI	+		+			
Engraulidae	*Stolephorus indicus*	Indian anchovy	MI		+	+		+	
Engraulidae	*Thryssa setirostris*	Longjaw glassnose	MI	+	+				
Engraulidae	*Thryssa vitrirostris*	Orangemouth glassnose	MI	+	+		+		+
Ephippidae	*Platax orbicularis*	Orbicular batfish	MS	+				+	
Ephippidae	*Tripterodon orbis*	Spadefish	MS	+				+	
Epinephelidae	*Epinephelus coioides*	Orange-spotted grouper	MS						+
Epinephelidae	*Epinephelus malabaricus*	Malabar grouper	MI			+	+		
Epinephelidae	*Epinephelus tauvina*	Greasy grouper	MI					+	
Fistulariidae	*Fistularia petimba*	Red cornetfish	MS					+	
Gerreidae	*Gerres filamentosus*	Threadfin pursemouth	MI	+				+	
Gerreidae	*Gerres longirostris*	Strongspine pursemouth	MI			+		+	+
Gerreidae	*Gerres oblongus*	Slender pursemouth	MI					+	
Gerreidae	*Gerres oyena*	Slenderspine pursemouth	MI	+					
Gobiidae	*Aulopareia ocellata*	Taileyed goby	EM				+		
Gobiidae	*Awaous aeneofuscus*	Freshwater goby	FI			+			+
Gobiidae	*Coryogalops sordidus*	Epaulette goby	EM					+	
Gobiidae	*Croilia mossambica*	Naked goby	ER						+
Gobiidae	*Drombus triangularis*	Brown drombus	EM					+	
Gobiidae	*Favonigobius melanobranchus*	Blackthroat sandgoby	EM			+			
Gobiidae	*Glossogobius callidus*	River goby	ER	+					+
Gobiidae	*Glossogobius giuris*	Tank goby	ER	+		+		+	+
Gobiidae	*Istigobius ornatus*	Ornate sandgoby	EM			+			
Gobiidae	*Mugilogobius mertoni*	Chequered mangrove goby	ER						+
Gobiidae	*Oligolepis acutipennis*	Sharptail goby	ER	+		+			
Gobiidae	*Oxyurichthys keiensis*	Kei goby	ER	+		+			
Gobiidae	*Oxyurichthys ophthalmonema*	Eyebrow goby	EM	+		+			
Gobiidae	*Pandaka silvana*	Dwarf goby	EM						+
Gobiidae	*Paratrypauchen microcephalus*	Comb goby	ER	+					
Gobiidae	*Periophthalmus argentilineatus*	Barred mudskipper	ER				+	+	
Gobiidae	*Periophthalmus kalolo*	Common mudskipper	ER	+		+			+
Gobiidae	*Psammogobius biocellatus*	Sleepy goby	ER	+		+			
Gobiidae	*Redigobius balteatus*	Bull goby	EM	+		+			
Gobiidae	*Redigobius dewaali*	Checked goby	ER						+
Gobiidae	*Silhouettea sibayi*	Barebreast goby	ER						+
Gobiidae	*Stenogobius kenyae*	Africa rivergoby	FI						+
Gobiidae	*Yongeichthys nebulosus*	Shadow goby	EM	+					+
Grammistidae	*Belonoperca chabanaudi*	Arrowhead soapfish	MS	+					
Haemulidae	*Diagramma pictum*	Painted sweetlips	MS					+	
Haemulidae	*Plectorhinchus playfairi*	Whitebarred rubberlip	MS					+	
Haemulidae	*Pomadasys commersonnii*	Spotted grunter	MI						+
Haemulidae	*Pomadasys furcatus*	Banded grunter	MS						+
Haemulidae	*Pomadasys kaakan*	Javelin grunter	MI	+	+	+	+		
Haemulidae	*Pomadasys maculatus*	Saddle grunter	MI	+	+			+	
Haemulidae	*Pomadasys multimaculatus*	Cock grunter	MI	+				+	
Hemiramphidae	*Hemiramphus far*	Spotted halfbeak	MI	+				+	
Hemiramphidae	*Hyporhamphus affinis*	Tropical halfbeak	EM						+
Hemiramphidae	*Hyporhamphus capensis*	Cape halfbeak	EM						+

Fish families	Fish species	South African common names	Estuarine guilds	[1]Moebase, Molócuè, Ligonha	[2,3,4] Bons Sinais	[5] Muladi	[6] Phungwe	[7] Morrumbene	[8] SAIAB
Hemiramphidae	*Hyporhamphus improvisus*	Shortfin halfbeak	EM	+					
Kuhliidae	*Kuhlia mugil*	Barred flagtail	MI						+
Labridae	*Stethojulis strigiventer*	Three-ribbon wrasse	MS					+	
Leiognathidae	*Deveximentum ruconius*	Pugnose soapy	MS	+					
Leiognathidae	*Deviximentum insidiator*	Slender soapy	MS	+					
Leiognathidae	*Gazza minuta*	Toothed soapy	MI	+		+		+	
Leiognathidae	*Leiognathus equula*	Slimy	MI	+		+		+	+
Lethrinidae	*Lethrinus nebulosus*	Spangled emperor	MS					+	+
Lobotidae	*Lobotes surinamensis*	Tripletail	MI						+
Lutjanidae	*Lutjanus argentimaculatus*	Mangrove snapper	MI	+		+		+	
Lutjanidae	*Lutjanus fulviflamma*	Dory snapper	MI	+		+		+	
Lutjanidae	*Lutjanus fulvus*	Blacktail snapper	MI					+	+
Lutjanidae	*Lutjanus monostigma*	Onespot snapper	MS	+					
Lutjanidae	*Lutjanus sanguineus*	Humphead snapper	MS					+	
Megalopidae	*Megalops cyprinoides*	Oxeye tarpon	MI	+					+
Mochokidae	*Synodontis zambezensis*	Zambezi squeaker	FS	+					
Monocanthidae	*Paramonacanthus frenatus*	Wedgetail filefish	MS					+	
Monocanthidae	*Stephanolepis aurata*	Porky	MS					+	
Monodactylidae	*Monodactylus argenteus*	Round moony	MI	+				+	
Monodactylidae	*Monodactylus falciformis*	Oval moony	MI						+
Mugilidae	*Chelon dumerili*	Grooved mullet	MI					+	+
Mugilidae	*Chelon melinopterus*	Giant-scale mullet	MI	+			+		+
Mugilidae	*Crenimugil buchanani*	Bluetail mullet	MI					+	+
Mugilidae	*Crenimugil seheli*	Bluespot mullet	MI					+	+
Mugilidae	*Ellochelon vaigiensis*	Squaretail mullet	MI	+					
Mugilidae	*Moolgarda cunnesius*	Longarm mullet	MI	+			+		
Mugilidae	*Mugil cephalus*	Flathead mullet	MI		+				+
Mugilidae	*Osteomugil robustus*	Robust mullet	MI				+	+	+
Mugilidae	*Planiliza alata*	Diamond mullet	MI						+
Mugilidae	*Planiliza macrolepis*	Large-scale mullet	MI	+			+	+	
Mugilidae	*Planiliza subviridis*	Greenback mullet	MI						+
Mullidae	*Upeneus sulphureus*	Sunrise goatfish	MS	+					
Mullidae	*Upeneus vittatus*	Yellowbanded goatfish	MS	+				+	
Muraenesocidae	*Muraenesox bagio*	Pike conger	MI	+			+		
Opichthidae	*Brachysomophis crocodilinus*	Crocodile snake eel	MS						+
Opichthidae	*Pisodonophis boro*	Rice-paddy eel	MI					+	
Opichthidae	*Pisodonophis cancrivorus*	Longfin snake-eel	MI					+	
Ostraciidae	*Lactoria cornuta*	Longhorn cowfish	MS					+	
Ostraciidae	*Ostracion cubicum*	Yellow boxfish	MS					+	
Paralichthyidae	*Pseudorhombus arsius*	Largetooth flounder	MS	+				+	
Pegasidae	*Pegasus volitans*	Longtail seamouth	MS					+	
Pinguipedidae	*Parapercis robinsoni*	Smallscale grubfish	MS					+	
Platycephalidae	*Papilloculiceps longiceps*	Tentacled flathead	MS					+	
Platycephalidae	*Platycephalus indicus*	Bartail flathead	MI	+				+	
Platycephalidae	*Thysanophrys celebica*	Celebes flathead	MS					+	
Plotosidae	*Plotosus lineatus*	Striped eel catfish	MI					+	
Polynemidae	*Polydactylus plebeius*	Striped threadfin	MI	+					
Polynemidae	*Polydactylus sextarius*	Sixfinger threadfin	MI	+					
Pomacentridae	*Abudefduf saxatalis*	Sergeant-major	MS					+	
Priacanthidae	*Priacanthus hamrur*	Moontail bullseye	MS					+	
Pristidae	*Pristis microdon*	Smalltooth sawfish	MI						+
Pristidae	*Pristis zijsron*	Longcomb sawfish	MI						+
Pseudochromidae	*Pseudochromis natalensis*	Natal dottyback	MI					+	
Rhinobatidae	*Acrotariobatus leucospilus*	Greyspot guitarfish	MS	+					
Samaridae	*Samaris cristatus*	Cockatoo flounder	MS					+	
Scaridae	*Leptoscarus vaigiensis*	Marbled parrotfish	MS					+	
Sciaenidae	*Johnius amblycephalus*	Bearded croaker	MS		+				
Sciaenidae	*Johnius dorsalis*	Small croaker	MI	+					
Sciaenidae	*Otolithes ruber*	Tigertooth croaker	MI		+				
Scorpaenidae	*Dendrochirus brachypterus*	Dwarf lionfish	MS					+	
Scorpaenidae	*Parascorpaena aurita*	Golden scorpionfish	MS					+	
Scorpaenidae	*Pterois volitans*	Red lionfish	MS						+

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Siganidae	*Siganus rivulatus*	Marbled spinefoot	MS					+	
Sillaginidae	*Sillago sihama*	Silver sillago	MI	+	+			+	+
Soleidae	*Solea turbynei*	Blackhand sole	MI					+	+
Solenostomidae	*Solenostomus cynopterus*	Ghost pipefish	MS					+	
Sparidae	*Acanthopagrus vagus*	Estuarine bream	MI	+				+	+
Sparidae	*Argyrops spinifer*	King soldierbream	MS					+	
Sparidae	*Crenidens crenidens*	Karanteen seabream	MI					+	
Sparidae	*Diplodus capensis*	Blacktail	MI						+
Sparidae	*Rhabdosargus holubi*	Cape stumpnose	MI						+
Sparidae	*Rhabdosargus sarba*	Tropical stumpnose	MI					+	+
Sphyraenidae	*Sphyraena acutipinnis*	Sharpfin barracuda	MI					+	
Sphyraenidae	*Sphyraena barracuda*	Great barracuda	MI						+
Sphyraenidae	*Sphyraena jello*	Pickhandle barracuda	MI					+	+
Sphyraenidae	*Sphyraena pinguis*	Yellowstripe barracuda	MS	+					
Syngnathidae	*Acentronura tentaculata*	Shortpouch pipehorse	MS					+	
Syngnathidae	*Hippichthys cynospilos*	Blue-spotted pipefish	EM					+	
Syngnathidae	*Hippichthys heptagonus*	Belly pipefish	EM						+
Syngnathidae	*Hippichthys spicifer*	Bellybarred pipefish	EM	+					
Syngnathidae	*Hippocampus camelopardalis*	Giraffe seahorse	MI					+	
Syngnathidae	*Hippocampus kuda*	Spotted seahorse	MS					+	
Syngnathidae	*Syngnathoides biaculeatus*	Alligator pipefish	MS						
Synodontidae	*Saurida gracilis*	Gracile lizardfish	MI	+				+	
Terapontidae	*Pelates quadrilineatus*	Fourlined terapon	MI					+	+
Terapontidae	*Terapon jarbua*	Thornfish	MI	+				+	+
Tetraodontidae	*Amblyrhynchote honckenii*	Evileye pufferfish	MI	+					
Tetraodontidae	*Arothron hispidus*	Whitespotted pufferfish	MI					+	
Tetraodontidae	*Arothron immaculatus*	Blackedged pufferfish	MI						+
Tetraodontidae	*Canthigaster solandri*	False-eye toby	MS						
Tetraodontidae	*Chelonodontops laticeps*	Bluespotted pufferfish	MI	+					+
Tetraodontidae	*Chelonodontops patoca*	Milkspotted pufferfish	MS						+
Tetraodontidae	*Lagocephalus guentheri*	Blackback pufferfish	MS	+					
Tetraodontidae	*Torquigener hyselogeneion*	Orange-spotted toadfish	MS					+	
Tetrarogidae	*Ablabys binotatus*	Redskinfish	MS					+	
Trichiuridae	*Trichiurus lepturus*	Cutlass fish	MS	+					

Table 2. Categorization of the major fish guilds utilizing Mozambique estuaries (modified from Whitfield, 1999).

Fish guilds	Description of categories
Marine immigrants (MI)	Marine fish species that usually breed at sea with the juveniles and/or adults making use of the estuarine environment. The juveniles of many of these species show varying degrees of association with estuaries as nursery areas.
Marine stragglers (MS)	Marine fish species that breed at sea, with only a small proportion of the overall population ever entering or making use of estuaries. Most marine stragglers are confined to the lower estuarine reaches where they occur in very low numbers.
Estuarine residents (ER)	Fish species, usually of marine origin, that breed and are able to conduct their life cycle within the estuarine environment. Some estuarine resident species may also have marine or freshwater breeding populations.
Estuarine migrants (EM)	Fish species, usually of marine origin, that breed in estuaries but have a marine or freshwater aspect to their life cycle. Estuarine migrants often have marine or freshwater breeding populations.
Freshwater immigrants (FI)	Freshwater fish species that are often recorded in estuaries, retreating into catchment rivers when conditions become unfavourable. Some of these species may also breed in estuaries when conditions are suitable.
Freshwater stragglers (FS)	Freshwater fish species that sometimes enter estuaries when conditions are favourable. Freshwater stragglers are usually confined to the low salinity upper estuarine reaches where they occur in low numbers.
Catadromous migrants (CM)	Species that spawn at sea but use freshwater catchment areas during the juvenile and subadult life stages.

Table 3. The 10 most species rich fish families recorded in the estuaries of Mozambique compared to those of South Africa. The numbers in brackets refer to the number of species documented for each of the families.

Estuary-associated fish families in Mozambique	Estuary-associated fish families in South Africa
Gobiidae (23)	Gobiidae (24)
Carangidae (13)	Mugilidae (14)
Mugilidae (11)	Sparidae (13)
Tetraodontidae (8)	Carangidae (9)
Haemulidae (7)	Syngnathidae (8)
Syngnathidae (7)	Clupeidae (5)
Blenniidae (6)	Gerreidae (5)
Engraulidae (6)	Haemulidae (5)
Sparidae (6)	Engraulidae (4)
Eleotridae (5)	Tetraodontidae (4)

composition (Fig. 2). Marine immigrants (40 %) and marine stragglers (34 %) were dominant in Mozambique estuaries, with marine immigrants (52 %) and marine stragglers (16 %) also dominant in South African estuaries but showing a different proportional representation. The other major guilds in the estuaries of both Mozambique and South Africa were estuarine species. In the former country, estuarine migrants comprised 11 % of the species richness and estuarine residents 8 %. These proportions were the reverse for South African estuaries, with estuarine residents comprising 16 % and estuarine migrants 8 % (Fig. 2).

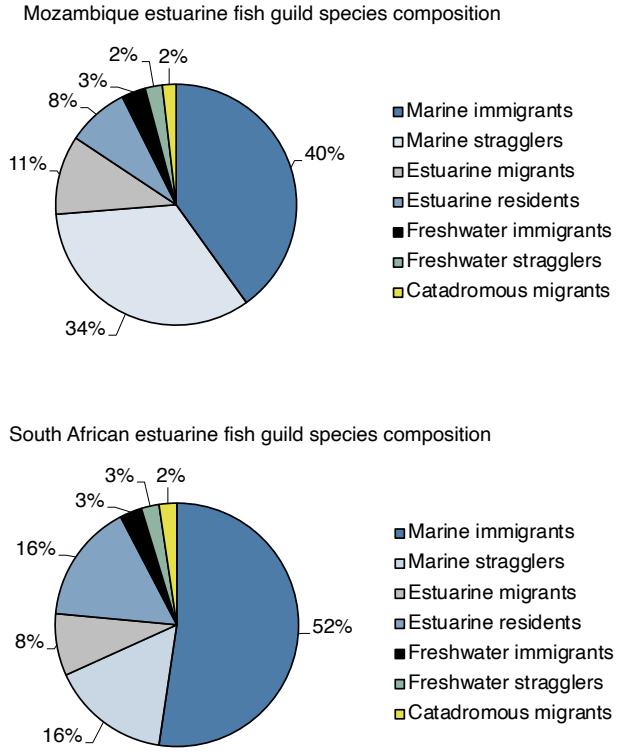

Figure 2. Estuarine fish guild composition in Mozambique and South African estuaries based on number of species. For a description of the guild categories, refer to Table 2.

Considering actual rather than relative number of species in different fish guilds, the most striking difference between the two countries was in the markedly higher numbers of marine stragglers reported from Mozambique systems, 73 species in Mozambique compared to 35 in South African estuaries.

Discussion

In terms of species richness, the dominant fish family found in both Mozambique and South African estuaries was the Gobiidae, with more than 22 species from each country. This statistic reflects the diverse nature of this taxon, with representatives from marine, estuarine and freshwater goby species. Mugilidae ranked second in South African estuaries (14 species) and third in Mozambique estuaries (11 species). The higher species richness in the south can be attributed to the additional presence of three endemic taxa (*Chelon richardsonii*, *Chelon tricuspidens* and *Pseudomyxus capensis*) in temperate and sub-tropical but not tropical estuaries. Similarly, the Sparidae were more diverse (13 species) in South Africa than Mozambique (6 species), primarily due to the absence of temperate members of this family from the more tropical northern estuaries (Whitfield and Mann, 2023). Conversely, the tropical Carangidae were more diverse in Mozambique (13 species) than the more temperate South African (9 species) estuaries (Table 3).

This latitudinal diversity gradient is reflected in the total number of species. Altogether 170 species were recorded in South African and 217 species in Mozambique estuaries. The higher species richness

in the latter systems is because of the exclusive tropical nature of estuaries in Mozambique, which conforms to temperate/tropical global trends recorded for estuary-associated fish diversity (Harrison and Whitfield, 2022). In addition, a number of Mozambique estuaries have broad and deep mouths that promote the occurrence of marine stragglers within these systems, particularly during flood tides. The Morrumbene is an example, with a mouth 3 km wide at high tide, and the fish data of Day (1974) showed it to be a system very rich in marine stragglers (Table 2). Added to this is the scale and diversity of tropical habitats such as coral reefs and seagrasses in the adjacent nearshore waters. Large areas of coral reef and seagrass occur adjacent to the Morrumbene, and species with known affinities with these habitats are a source of larvae and juveniles in estuarine waters (e.g., Mocuba *et al*., 2023). This accounts for the higher abundance of Lutjanidae, Tetraodontidae, Sphyraenidae, Syngnathidae, Scorpaenidae, Scaridae, Pomacentridae and Labridae species in Mozambique estuaries such as Morrumbene.

The fish species richness in coastal habitats adjacent to Mozambique estuaries is considerably higher than in the estuarine waters, even where similar habitats are present in both systems, e.g. seagrass beds. For example, 249 species from 62 fish families were identified from seagrass beds in the Quirimano Archipelago of northern Mozambique but only one of the six dominant species (*Gerres oyena*) was abundant in both estuaries and the coastal zone in that region (Gell and Whittington, 2002). A similar major differential between the South African coastal fish assemblage species richness off the Maputaland coast and the adjacent estuarine systems was recorded by Whitfield (1980). A good example of marine stragglers entering estuaries from the species rich tropical Delagoa Bioregion is provided by the Kosi estuarine system. More than 150 coastal fish species that are normally absent from estuaries have been reported from a small beachrock reef inside the mouth of this system (Blaber and Cyrus, 1981; Dennis King, unpublished fish photographs).

The influence of poor marine connectivity is also well illustrated in Mozambique estuarine fish assemblages. The origins and morphologies of many estuarine and coastal lakes and lagoons in Mozambique stem from long term sea level transgression in southeastern Africa (Miguel *et al*., 2019). The evolution of fish assemblages in these systems follows a series of characteristic changes as the system becomes increasingly isolated from the sea. Initially, the estuarine lake or lagoon may have a permanent and strong connection to the sea, and the ichthyofauna will reflect a dominance of marine estuarine-opportunist and marine estuarine-dependent fish species. As the link with the ocean becomes intermittent due to the temporary closure of the mouth by a sand berm, the number of marine species found in the estuary declines but the number of freshwater species increases (Whitfield *et al*., 2017). Estuarine resident species representation remains the same and may even dominate the fish assemblage in temporarily isolated estuarine lakes or lagoons that have been isolated from the sea for extended periods (Schutte *et al*., 2020). Once these systems become permanently cut-off from the sea, the salinity declines considerably, marine species disappear after two decades of closure, and freshwater fish species then dominate the newly created coastal lake or lagoon, with some estuarine resident fish species also remaining relatively abundant in the now isolated coastal water body (Allanson *et al*., 1966).

An example of a lake system that is only marginally estuarine due to very infrequent linkages with the sea is the oligohaline Lagoa Piti. Few, if any, marine fish species are present within this lake but there is still a strong representation of estuarine fish species such as *Awaous aeneofuscus*, *Croilia mossambica*, *Eleotrus fusca*, *Gilchristella aestuaria*, *Hyporhamphus affinis*, *Hyporhamphus capensis*, *Redigobius dewaali* and *Silhouettea sibayi*. Conversely, freshwater fish species such as *Clarias gariepinus*, *Enteromius paludinosus*, *Enteromius viviparus*, *Lacustricola katangae*, *Lacustricola myaposae*, *Micropanchax johnstoni, Oreochromis mossambicus*, *Pseudocrenilabrus philander* and *Tilapia sparrmanii* are in the process of becoming completely dominant in this increasingly isolated coastal lake system (Bills, 2001).

Estuarine lagoon or lake systems that have long channels linking the major water body to the sea are also dominated by freshwater fish species. For example, the mesohaline Lagoa Poelela has a 75 km long channel linking it to the Indian Ocean and is therefore dominated by freshwater cichlid fish species, primarily *Coptodon rendalli*, although some estuarine resident fish species were also recorded (Hill *et al*., 1975). In Lagoa Quissico and Massava, which are part of the same overall segmented lake system but closer to the sea, juvenile marine mugilids (e.g. *Planiliza macrolepis*) were abundant and freshwater fish species scarce (Hill *et al*., 1975).

A comparative fish guild analysis between the species composition in Mozambique and South Africa showed that estuaries in both countries were dominated by marine taxa but the proportions differed, i.e. 47 % of the fish species in South African estuaries were marine immigrants wereas this figure was 40 % for Mozambique (Fig. 2). Conversely marine stragglers were 20 % of the fish species in South Africa and 34 % in Mozambique, with the high representation in the latter region an indication of the broad mouths and strong influence of macrotidal conditions on some estuaries in this region (Whitfield *et al*., 2023). These conditions may also have contributed to the higher representation of estuarine migrants in Mozambique estuaries when compared to estuarine residents (Fig. 2).

There is no doubt that the fish faunas, and indeed other biological components in Mozambique estuaries are undersampled and understudied. Estuaries here are subject to different driving forces than the well studied systems of South Africa, especially with respect to tidal regimes, which range from micro- to macrotidal. There are also the issues relating to global warming and sea level rise that will impact the fish fauna of Mozambique in various ways, e.g. higher estuarine water temperatures, increased river flooding due to more extreme cyclonic precipitation events, and erosion of coastal dune systems that presently isolate certain systems from the sea. Little attention is being paid to the plight and conservation measures required for certain overexploited fish species in Mozambique estuaries. All the above knowledge gaps currently present a significant constraint to current undertanding of the ecological functioning of these systems. Given the importance of estuaries in the region to sustaining coastal livelihoods, these gaps should be addressed as a matter of urgency. The current review presents a first attempt to compile a list of fish species and families found in Mozambique estuaries and therefore lays a foundation for more detailed ichthyological studies in the future.

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Appendix

Table A.1. Fish species recorded from South African estuarine systems. For a description of the fish guild categories used, please see Table 2.

Fish families	Species names	Common names	Fish guilds
Ambassidae	*Ambassis ambassis*	Longspine glassy	ER
Ambassidae	*Ambassis dussumieri*	Malabar glassy	EM
Ambassidae	*Ambassis natalensis*	Slender glassy	EM
Anguillidae	*Anguilla bicolor*	Shortfin eel	CM
Anguillidae	*Anguilla labiata*	African mottled eel	CM
Anguillidae	*Anguilla marmorata*	Giant mottled eel	CM
Anguillidae	*Anguilla mossambica*	Longfin eel	CM
Antennariidae	*Antennarius striatus*	Striped angler	MS
Ariidae	*Galeichthys feliceps*	White sea catfish	MI
Atherinidae	*Atherina breviceps*	Cape silverside	ER
Atherinidae	*Atherinomorus duodecimalis*	Tropical silverside	MS
Atherinidae	*Atherinomorus lacunosus*	Hardyhead silverside	MS
Belonidae	*Strongylura leiura*	Banded needlefish	MI
Blenniidae	*Omobranchus woodi*	Kappy blenny	EM
Blenniidae	*Parablennius pilicornis*	Ringneck blenny	ER
Bothidae	*Bothus pantherinus*	Leopard flounder	MS
Carangidae	*Caranx heberi*	Blacktip kingfish	MS
Carangidae	*Caranx ignobilis*	Giant kingfish	MI
Carangidae	*Caranx melampygus*	Bluefin kingfish	MI
Carangidae	*Caranx papuensis*	Brassy kingfish	MI
Carangidae	*Caranx sexfasciatus*	Bigeye trevally	MI
Carangidae	*Lichia amia*	Leervis	MI
Carangidae	*Scomberoides commersonnianus*	Talang queenfish	MI
Carangidae	*Scomberoides lysan*	Doublespotted queenfish	MI
Carangidae	*Scomberoides tala*	Barred queenfish	MI
Carcharinidae	*Carcharinus leucas*	Zambezi shark	MI
Chanidae	*Chanos chanos*	Milkfish	MI
Cichlidae	*Coptodon rendalli*	Redbreast tilapia	FI
Cichlidae	*Oreochromis mossambicus*	Mozambique tilapia	FI
Cichlidae	*Pseudocrenilabrus philander*	Southern mouthbrooder	FI
Cichlidae	*Tilapia sparrmanii*	Banded tilapia	FS
Clariidae	*Clarias gariepinus*	Sharptooth catfish	FI
Clinidae	*Clinus spatulatus*	Estuary klipfish	ER
Clinidae	*Clinus superciliosus*	Super klipfish	EM
Clupeidae	*Etrumeus whiteheadi*	Redeye roundherring	MS
Clupeidae	*Gilchristella aestuaria*	Estuarine roundherring	ER
Clupeidae	*Hilsa kelee*	Kelee shad	MI
Clupeidae	*Herklotsichthys quadrimaculatus*	Blueline herring	MS
Clupeidae	*Sardinops ocellatus*	South African pilchard	MS
Dasyatidae	*Dasyatis chrysonata*	Blue stingray	MS
Dasyatidae	*Gymnura natalensis*	Backwater butterflyray	MS
Dasyatidae	*Himantura uarnak*	Reticulate whipgray	MI
Drepanidae	*Drepane longimana*	Concertina fish	MS
Eleotridae	*Butis butis*	Duckbill sleeper	ER
Eleotridae	*Eleotris fusca*	Dusky sleeper	ER
Eleotridae	*Eleotris mauritiana*	Widehead sleeper	ER
Eleotridae	*Eleotris melanosoma*	Broadhead sleeper	ER
Elopidae	*Elops machnata*	Skipjack	MI
Engraulidae	*Engraulis capensis*	Cape anchovy	MI
Engraulidae	*Stolephorus holodon*	Thorny anchovy	MI
Engraulidae	*Thryssa setirostris*	Longjaw glassnose	MI
Engraulidae	*Thryssa vitrirostris*	Orangemouth glassnose	MI
Epinephelidae	*Epinephelus andersoni*	Catface rockcod	MS

Fish families	Species names	Common names	Fish guilds
Epinephelidae	*Epinephelus malabaricus*	Malabar rockcod	MS
Epinephelidae	*Epinephelus marginatus*	Yellowbelly rockcod	MS
Fistulariidae	*Fistularia commersonii*	Smooth flutemouth	MS
Galaxiidae	*Galaxias zebratus*	Cape galaxias	FS
Gerreidae	*Gerres filamentosus*	Threadfin pursemouth	MI
Gerreidae	*Gerres longirostris*	Strongspine pursemouth	MI
Gerreidae	*Gerres methueni*	Evenfin pursemouth	MI
Gerreidae	*Gerres oblongus*	Slender pursemouth	MI
Gerreidae	*Gerres oyena*	Slenderspine pursemouth	MI
Gobiidae	*Awaous aeneofuscus*	Freshwater goby	FI
Gobiidae	*Caffrogobius gilchristi*	Prison goby	EM
Gobiidae	*Caffrogobius natalensis*	Baldy	EM
Gobiidae	*Caffrogobius nudiceps*	Barehead goby	EM
Gobiidae	*Croilia mossambica*	Naked goby	ER
Gobiidae	*Favonigobius melanobranchus*	Blackthroat goby	ER
Gobiidae	*Favonigobius reichi*	Spotted sandgoby	ER
Gobiidae	*Glossogobius callidus*	River goby	ER
Gobiidae	*Glossogobius giuris*	Tank goby	FM
Gobiidae	*Oligolepis acutipennis*	Sharptail goby	ER
Gobiidae	*Oxyurichthys keiensis*	Kei goby	ER
Gobiidae	*Oxyurichthys ophthalmonema*	Eyebrow goby	EM
Gobiidae	*Pandaka silvana*	Dwarf goby	EM
Gobiidae	*Paratrypauchen microcephalus*	Comb goby	ER
Gobiidae	*Periophthalmus argentilineatus*	Barred mudskipper	ER
Gobiidae	*Psammogobius biocellatus*	Sleepy goby	ER
Gobiidae	*Psammogobius knysnaensis*	Speckled sandgoby	ER
Gobiidae	*Redigobius bikolanus*	Bigmouth goby	ER
Gobiidae	*Redigobius dewaali*	Checked goby	ER
Gobiidae	*Silhouettea sibayi*	Barebreast goby	ER
Gobiidae	*Stenogobius polyzona*	Chinestripe goby	ER
Gobiidae	*Taenioides esquivel*	Bulldog eelgoby	ER
Gobiidae	*Trypauchenopsis intermedia*	Bearded eelgoby	ER
Gobiidae	*Yongeichthys nebulosus*	Shadow goby	ER
Haemulidae	*Plectorhinchus gibbosus*	Harry hotlips	MS
Haemulidae	*Pomadasys commersonnii*	Spotted grunter	MI
Haemulidae	*Pomadasys kaakan*	Javelin grunter	MI
Haemulidae	*Pomadasys multimaculatus*	Cock grunter	MI
Haemulidae	*Pomadasys olivaceus*	Piggy	MI
Hemiramphidae	*Hemiramphus far*	Spotted halfbeak	MI
Hemiramphidae	*Hyporhamphus capensis*	Cape halfbeak	EM
Kuhliidae	*Kuhlia mugil*	Barred flagtail	MS
Kuhliidae	*Kuhlia rupestris*	Rock flagtail	MI
Leiognathidae	*Leiognathus equula*	Slimy	MI
Lethrinidae	*Lethrinus nedulosus*	Blue emperor	MS
Lobotidae	*Lobotes surinamensis*	Tripletail	MI
Lutjanidae	*Lutjanus argentimaculatus*	Mangrove snapper	MI
Lutjanidae	*Lutjanus fulviflamma*	Dory snapper	MI
Megalopidae	*Megalops cyprinoides*	Oxeye tarpon	MI
Monocanthidae	*Stephanolepis aurata*	Porky	MI
Monodactylidae	*Monodactylus argenteus*	Round moony	MI
Monodactylidae	*Monodactylus falciformis*	Oval moony	MI
Mugilidae	*Chelon dumerili*	Grooved mullet	MI
Mugilidae	*Chelon melinopterus*	Giant-scale mullet	MI
Mugilidae	*Chelon richardsonii*	Southern mullet	MI
Mugilidae	*Chelon tricuspidens*	Striped mullet	MI
Mugilidae	*Crenimugil buchanani*	Bluestail mullet	MI
Mugilidae	*Crenimugil crenilabis*	Fringelip mullet	MS
Mugilidae	*Crenimugil seheli*	Bluespot mullet	MI
Mugilidae	*Moolgarda cunnesius*	Longarm mullet	MI
Mugilidae	*Mugil cephalus*	Flathead mullet	MI

Fish families	Species names	Common names	Fish guilds
Mugilidae	*Osteomugil robustus*	Robust mullet	MI
Mugilidae	*Planiliza alata*	Diamond mullet	MI
Mugilidae	*Planiliza macrolepis*	Large-scale mullet	MI
Mugilidae	*Planiliza subviridis*	Greenback mullet	MI
Mugilidae	*Pseudomyxus capensis*	Freshwater mullet	MI
Muraenesocidae	*Muraenesox bagio*	Pike conger	MI
Muraenidae	*Strophidon sathete*	Slender giant moray	MI
Myliobatidae	*Myliobatis aquila*	Eagleray	MI
Opichthidae	*Ophisurus serpens*	Sand snake-eel	MI
Opichthidae	*Pisodonophis boro*	Estuary snake-eel	MI
Paralichthyidae	*Pseudorhombus arsius*	Largetooth flounder	MS
Platycephalidae	*Platycephalus indicus*	Bartail flathead	MI
Polynemidae	*Polydactylus plebeius*	Striped threadfin	MI
Polynemidae	*Polydactylus sextarius*	Sixfinger threadfin	MI
Pomatomidae	*Pomatomus saltatrix*	Elf	MI
Priacanthidae	*Priacanthus hamrur*	Moontail bullseye	MS
Pristidae	*Pristis zijsron*	Longcomb sawfish	MI
Pseudochromidae	*Pseudochromis natalensis*	Natal dottyback	MI
Rhinobatidae	*Acrotariobatus annulatus*	Lesser guitarfish	MS
Sciaenidae	*Argyrosomus japonicus*	Dusky kob	MI
Sciaenidae	*Johnius dorsalis*	Small croaker	MI
Sciaenidae	*Otolithes ruber*	Tigertooth croaker	MI
Scorpaenidae	*Pterois volitans*	Red lionfish	MS
Siganidae	*Siganus sutor*	Whitespotted rabbitfish	MS
Sillaginidae	*Sillago sihama*	Silver sillago	MI
Soleidae	*Solea turbynei*	Blackhand sole	MI
Sparidae	*Acanthopagrus vagus*	Estuarine bream	MI
Sparidae	*Crenidens crenidens*	Karanteen seabream	MI
Sparidae	*Diplodus capensis*	Blacktail	MI
Sparidae	*Diplodus hottentotus*	Zebra	MI
Sparidae	*Lithognathus lithognathus*	White steenbras	MI
Sparidae	*Lithognathus mormyrus*	Sand steenbras	MI
Sparidae	*Rhabdosargus globiceps*	White stumpnose	MI
Sparidae	*Rhabdosargus holubi*	Cape stumpnose	MI
Sparidae	*Rhabdosargus sarba*	Tropical stumpnose	MI
Sparidae	*Rhabdosargus thorpei*	Bigeye stumpnose	MI
Sparidae	*Sarpa salpa*	Strepie	MI
Sparidae	*Sparodon durbanensis*	White musselcracker	MI
Sparidae	*Spondyliosoma emarginatum*	Steentjie	MI
Sphyraenidae	*Sphyraena barracuda*	Great barracuda	MI
Sphyraenidae	*Sphyraena jello*	Pickhandle barracuda	MI
Syngnathidae	*Acentronura tentaculata*	Shortpouch pygmy pipehorse	MS
Syngnathidae	*Hippichthys heptagonus*	Belly pipefish	EM
Syngnathidae	*Hippichthys spicifer*	Bellybarred pipefish	EM
Syngnathidae	*Hippocampus capensis*	Knysna seahorse	ER
Syngnathidae	*Microphis brachyuras*	Short-tail pipefish	FS
Syngnathidae	*Microphis fluviatilis*	Freshwater pipefish	FS
Syngnathidae	*Syngnathus temmincki*	Longsnout pipefish	EM
Syngnathidae	*Syngnathus watermeyeri*	Estuarine pipefish	EM
Terapontidae	*Pelates quadrilineatus*	Fourlined terapon	MI
Terapontidae	*Terapon jarbua*	Thornfish	MI
Tetraodontidae	*Amblyrhynchote honckenii*	Evileye pufferfish	MI
Tetraodontidae	*Arothron hispidus*	Whitespotted pufferfish	MI
Tetraodontidae	*Arothron immaculatus*	Blackedged pufferfish	MI
Tetraodontidae	*Chelonodontops laticeps*	Bluespotted pufferfish	MS
Torpedinidae	*Torpedo fuscomaculata*	Blackspotted electric ray	MI
Torpedinidae	*Torpedo sinuspersici*	Marbled electric ray	MI
Trichiuridae	*Trichiurus lepturus*	Cutlass fish	MS