FISHES OF THE KOSI SYSTEM

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INTRODUCTION

The Kosi system consists of four distinct but connected basins which drain to the sea through a usually permanently open estuary (Fig. 1). The southernmost lake, Amanzimnyama, is always fresh but the remainder are dominated by a euryhaline fauna of estuarine and marine origin. The topography, bathymetry and physics and chemistry of the Kosi lakes have been studied (Broekhuysen and Taylor, 1959; Hill, 1969; Allanson and Van Wyk, 1969) and the benthic fauna investigated (Boltt and Allanson, 1975).

The different physical characteristics of the lakes, together with the proximity of the estuary to the Agulhas current, tropical waters and the absence of local silt-laden river systems result in a very diverse fish fauna. A number of surveys of this fauna have been undertaken (Campbell and Allanson, 1952; Broekhuysen and Taylor, 1959; Pike, 1967, 1968, 1969, 1971; Wallace *et al.,* 1971) but most have been non-quantitative with limited sampling. This report details the results of a study undertaken during 1975, 1976 and 1977 in which five samplings per annum were conducted with the aim of establishing the important characteristics and seasonal variations of the fish fauna of each part of the system. The importance of the fish of the Kosi system to the indigenous people, together with its possible conservation value, necessitated a study of this nature upon which more detailed investigations can be based.

MATERIALS AND METHODS

Sampling of fish was undertaken at 2 to 3 monthly intervals from January 1975 until September 1977. Sampling stations are shown in Figure 1. Fish were captured using a fleet of gill nets (stretch mesh sizes: 35, 55, 75, 90, 110, 125, 145 mm), a large seine net (110 m long 2 m deep with a 12 mm bar mesh), a small seine net (10 m long, 1,5 m deep with a 4 mm bar mesh), a fry net (3 m long, 1 m deep with a 1,5 mm mesh) and an open water trawl with a mouth 2 m wide and 1 m deep (4 mm bar mesh). Gill nets were usually surface set but were also set on the bottom and in mid-water in the deep areas of the lakes. Fish were observed using SCUBA in the channel between Lakes Nillange and Sifungwe and around the reef in the estuary (Fig. 1).

Salinity was measured with a Goldberg optical salinometer, temperatures with a standard thermometer and current speeds with an Ott water current meter.

PHYSICAL CHARACTERISTICS IMPORTANT TO FISH POPULATIONS

Tides

Due to the shallow nature of most of the estuary (Fig. 1) about 70 % of its surface area is exposed at low tide, at which time water is present only in the main channel and isolated pools among the mangroves on the east side of the tidal basin. Although tidal exchange does not

directly affect the salinity of the lakes, back-up of water at high tide causes changes in water level. This back-up of water is greater at spring than neap tides and has important effects on the two channels between Mpungwini and Sifungwe (Fig. 1). At neap tides during the dry season (winter) when there is little or no outflow of freshwater, these channels seldom exceed 30 mm in depth and the substrate may even become exposed. At spring tides the depth in the channels rises to about 0,6 m.

Figure 1. Kosi system showing gill netting (G) and seine netting (S) sites. (Bathymetry after Hill, 1967.) 5 m depth contour shown.

Current speeds

Current speed was measured in four parts of the system and the results are shown in Table 1. Evidently outflow from various parts of the system towards the sea is greater during the wet season (summer) than in winter. Water movement during winter is mainly due to tidal effects. The outflow speed in all cases exceeded any inflow speeds. The possible effects of current speeds on various species of fish are discussed in the next section.

TABLE 1. Current speeds (km/h) in various parts of the Kosi system during summer and winter.

	Summer	(February)	Winter	(July)
Locality	Max	Min	Max	Min
Reed channel (Fig. 1)	2,2	0,11	0,1	0
Sifungwe — Mpungwini	0,97	0	0,85	0,25
Mpungwini — Estuary	0,83	0	0,13	0
Estuary — sea	1,3	0,81		0,81

Salinity

The salinity regime of the tidal basin is typical of an open estuary with a reduction in salinities at low tide and at high tide a "salt-wedge" reaches as far as the north entrance to Mpungwini. Relatively stable salinities (25-35 /oo) occur in the lower reaches around the reef (Fig. 1). The salinity regimes of the lakes are complex. Amanzimnyama is always fresh. Fortunately the physics and chemistry of Nhlange and Sifungwe have been described by Allanson and Van Wyk (1969) and it is only necessary here to point out that Nhlange ranges from fresh (in times of flood) to 5 °/oo, usually remaining stable at about 3 °/oo. Salinities in Sifungwe and Mpungwini are not usually of an order which will affect euryhaline fish.

Temperatures

Water temperatures in the chenels of the estuary do not fall below 20 °C in winter and attain 30 C in summer, although in the shallow margins summer temperatures of 39 °C have been recorded (Blaber, 1973). The temperature regimes of the lakes have been described by Allanson and Van Wyk (1969). The lowest recorded in the present study was 18 °C (Nhlange in July) and the highest 28 °C (Nhlange in January), although in marginal areas of the lakes greater extremes can be expected.

Substrate

The substrate in the estuary is primarily sandy (particle sizes: 125-355 pm). (Blaber, 1977), although a rocky outcrop on the east side of the lower reaches forms a small reef. In the lakes sandy substrates also predominate in water less than 8 m deep, hard substrates are few and the only silt is found in deeper waters and as a thin layer overlying sand in certain shallow areas.

Detritus

Large quantities of plant detritus enter the system as a result of floods with deeper areas of the lakes and quiet areas of the reed channel (Fig. 1) containing large concentrations of decomposing plant material.

RESULTS AND DISCUSSION

Marine fishes occurring in the various regions of the Kosi system are listed in Appendix 1. Amanzimnyama is not included as it was not sampled regularly, mainly due to a resident herd of *Hippopotamus amphibius.*

A total of 124 species (not including freshwater species) has been recorded (Appendix 1) of which 85 (70 %) are restricted to the estuary

and the reef within the estuary. The remainder consists of estuarine resident species, such as Ambassidae, *Gilchristella aestuarius* and Hyporhamphidae, together with euryhaline marine species which penetrate the system to a varying extent (Table 2 and Appendix 1).

Table 2 lists the common species which penetrate beyond the estuary, in terms of their abundance in summer (October to March) and winter (April to September). This table combines the results obtained during 1975, 1976 and 1977. It was necessary to separate the seine net results from those of gill nets (Table 2) as the two catching methods are not comparable. Although the classification of the species in Table 2 into *present, common* or *abundant* is somewhat arbitrary it is the clearest way to illustrate seasonal trends and changes in species density from one region to another.

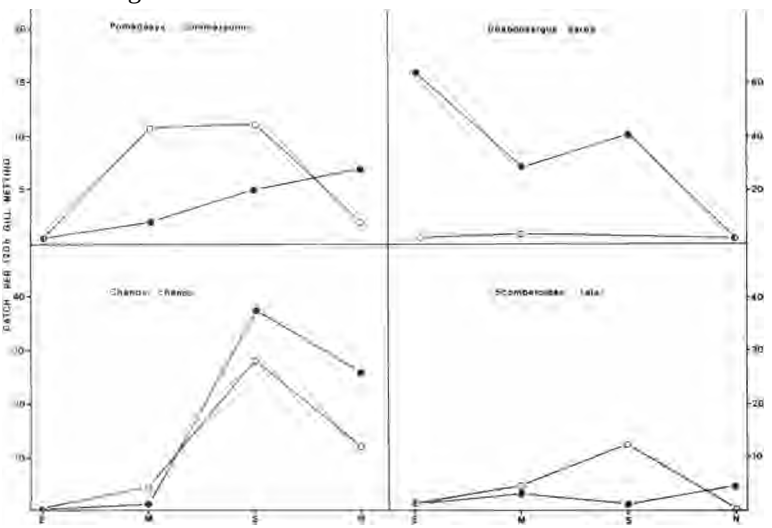

Figure 2. Catch per unit effort (expressed per 120 h gill netting) of *Chanos chanos, Scomberoides tala, Pomadasys commersonni and Rhabdosargus sarba in* four regions of Kosi. (E: estuary; M: Mpungwini; S: Sifungwe; N: Nhlange) (●—● : summer o—o : winter). Total number of hours fished = 1800).

Seasonal characteristics of the populations of euryhaline marine species (no data from Amanzimnyama)

Elops machnata: the tenpounder or springer is present throughout the system for the whole year, but is not common except in Nhlange in summer (Table 2). The scarcity of this species is probably due to the low numbers of suitable pelagic prey species. In Lake St Lucia *E. machnata* feeds mainly on *Thryssa vitrirostris, Gilchristella aestuarius* and to a lesser extent *Hyporhamphus knysnaensis* (Whitfield, 1977). *T vitrirostris* is absent from Kosi, *G. aestuarius* is uncommon and *H. knysnaensis* is only common in Nhlange.

Chanos chanos: the milkfish is one of the most abundant large fish (often exceeding 1 m standard length) in Nhlange and Sifungwe, is less common in Mpungwini and has never been caught in the estuary (Table 2 & Fig. 2). It is probable that large shoals of this fast swimming, detritus feeding species enter the system irregularly, not remaining in the estuary but moving to the lakes which provide a large source of

TABLE 2. Relative abundance of marine species in the Kosi System during summer and winter (G. = Gill nets; S. = seine nets
+++ = present in more than 80 % of catches
++ = present in more than 30 % of catches
+ = present in less than 30 % of catches).

Species	Nhlange				Sifungwe				Mpungwini				Estuary			
	Summer		Winter		Summer		Winter		Summer		Winter		Summer		Winter	
	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S
Elops machnata	+1-		+						+		+		+		+	
Chanos chanos	+++		+++		+++		+++		+		+					
Hyporhamphus knysnaensis	++	++		++		+		+								
Terapon jarbua	+++	+++		+++		+		+		+				++		++
Caranx ignobilis	+				+				+				+			
Caranx sexfasciatus	+				+				+				+			
Scomberoides tala	+				+	+	++		+	++	+		++	+	+	+
Mondactylus argenteus	+				++		+		+++							
Mondactylus fakiformis													+		+	
Gerres acinaces	++				++	+++	+		++	+++	+	+	++	+	+	+
Gerres punctatus										+		++		++		++
Gerres rappi	+++		+			++		++	+++	+	+			+	+	+
Ambassis commersoni	+++	+++	+++			++		++		++		++		++		++
Pomdasys commersonni	++		++		++		++		+	+	+++	+	++		+	
Acanthopagrus berda	+	+		+						+		+				
Rhabdosargus holubi					+					++		++				+
Rhabdosargus sarba	+		+		++	+++	++		+	+++	+	++	+	+++	+	++
Liza alata	+				++						+					
Liza dumerili							+						+	+	+	+
Liza macrolepis		+				+	++			+		+	+++	+++	+++	++
Mugil cephalus	+	+++		+++		+	++	+	++	+++	+++	+	+++	+	+++	++
Valamugil buchanani					++				+++		++		++	+++	+++	+++
Valamugil robustus						++	+			++			+	+++	+	++
Sphyraena jello	+						+		+	+	+	+			+	

detritus. In St Lucia *Chanos chanos* occurs as a summer visitor (Whitfield, pers. comm.), possibly competing with Mugilidae for food.

Carangidae: the queenfish *scomberoides tala* is the most commonly occurring carangid in Kosi. Juveniles and adults occur throughout the system at all times of the year but are absent from Nhlange in winter (Table 2). The catch per unit effort of *S. tala* in summer and winter is shown in Figure 2.

Adults of the kingfishes *Caranx ignobilis* and *C. sexfasciatus* are found in all the lakes and estuary in small numbers in the summer, and juveniles occur in the estuary and Mpungwini throughout the year. Other carangids have been recorded at various times in the estuary, for example C *melampygus* occurs regularly, but most should be considered as casual visitors from the *sea.*

Gerreidae: five closely related species of *Gerres* have been recorded but only three are common : *G. acinaces* which is common throughout; *G. punctatus* which is plentiful at the estuary but becomes progressively more scarce further from the mouth, and *G. rappi* which is abundant in the lakes but less so in the estuary. All occur over shallow sandy areas, often in mixed species shoals. They form an important component of the native fish traps. A more detailed study of their biology is in progress.

Pomadasys commersonni : the spotted grunter occurs commonly throughout the system in both summer and winter (Table 2). Juveniles, sub-adults and adults have been recorded at all times of the year although juveniles were never captured in Nhlange. This species is an important part of the catch in native fish traps. The catch per unit effort of *P. commersonni* in various parts of Kosi in summer and winter is shown in Figure 2.

Acanthopagrus berda : the river or sly bream is probably present throughout Kosi in small numbers but has only been captured in Nhlange and Mpungwini. It is a wary species (Smith, 1965) and seldom netted in any numbers. It is however commonly caught in native fish traps. Juveniles and adults were captured at all times of the year.

Rhabdosargus holubi : the Cape stumpnose is uncommon at Kosi but juveniles have been captured from the estuary to Sifungwe in summer and winter (Table 2). It is at the northern extremity of its range at Kosi where its distribution is probably limited by temperature (Blaber, 1973).

Rhabdosargus sarba : the Natal stumpnose is abundant in the estuary and common in the lakes during summer (Table 2, Fig. 2). Adults and juveniles were captured during winter but both were less numerous than in summer (Fig. 2). Juveniles occur over shallow sandy areas often in association with *R. holubi* and *Gerres* spp. The bigeye stumpnose *(R. ? thomei)* is found at the estuary and in Mpungwini but is uncommon.

Mugilidae : the complex distribution and feeding ecology of grey mullet at Kosi has been reported previously (Blaber, 1977; Blaber and Whitfield, 1977). All species are common at the estuary with the exception of *Liza alata. Mugil cephalus* is the only species occurring in any numbers in Nhlange; large shoals have been observed moving through

the reed channel from Sifungwe to Nhlange in summer and winter.

Sphyraena jello : immature barracuda were present throughout the system but the results do not show any seasonal pattern (Table 2). Juveniles of *c.* 250 mm occur in small numbers in the estuary and Mpungwini in spring and winter.

Characteristics of the estuarine species

Included in this category are those species which complete their life-cycle in the system. They form a relatively insignificant proportion of the fish fauna and are all small species

Ambassis commersoni and *A. natalensis* occur throughout, but the former is more abundant, especially in Nhlange. *Hyporhamphus knysnaensis,* the halfbeak, is found in the lakes and most common in Nhlange.

TABLE 3. The distribution of freshwater fish in the Kosi system

Species	Amanzimnyama	Nhlange	Sifungwe	Mpungwini	Estuary
Barbus paludinosus	X				
Clarias gariepinus	X	X			
Aplocheilichthys johnstonii	X				
Aplocheilichazys katangae	X				
Aplocheilichthys myaposae	X	X			
Pseudocrenilabrus philander	X	X			
Sarotherodon mossambicus	X	X		X	X+
Tilapia rendalli	X				
Tilapia sparmanii	X	X			

Only at the outflow of the Kukalwe River

Freshwater species

Freshwater fishes are listed in Table 3, together with their distribution within the Kosi system. This list is not exhaustive because very limited sampling was undertaken in Amanzimnyama. Nevertheless it is evident that freshwater fishes are not an important component of the fauna except in Amanzimnyama. Of the species occurring in Nhlange only *Sarotherodon mossambicus* can be considered common but it is restricted to the fringing areas of *Phragmites* where it breeds. It penetrates the reed channel between Nhlange and Sifungwe but has not been recorded in either Sifungwe or Mpungwini, despite extensive searches. Nests of this species were observed in quiet areas of the reed channel during SCUBA dives. Although salinity probably restricts the distribution of most of the species listed in Table 3, *S. mossambicus* is euryhaline and perhaps limited by either competition with marine species or by the physical nature of the system.

Fishes occurring only in the estuary

These can be divided into two groups, firstly the species associated with the reef, and secondly those distributed generally throughout the estuary.

Reef species : **Twenty per cent of** the species recorded in the Kosi

system are found only around the reef about 300 m inside the estuary mouth. They represent an extension of a marine reef fauna into the relatively quiet water of the estuary. The absence of rocky substrates in most southern African estuaries therefore makes this an unusual estuarine community. These reef fish are not however subject to many of the physical variations typical of estuaries. The salinity around the reef does not fall below 25 /oo; the water is clear and largely of oceanic origin except during periods of very heavy flooding, and even then it is clear on the flowing tide; temperatures are stable and controlled by the prevailing sea temperature; and finally the reef is too large and high to become inundated by sand or mud.

The fish fauna of the reef is diverse and typical of the western Indian Ocean. It is numerically dominated by species of the families Acanthuridae (surgeonfishes), Pomacentridae (damselfishes), Chaetodontidae (butterflyfishes) and Labridae (wrasses). Moray eels (Muraenidae), stonefish *Synanceja verrucosa* and scorpionfishes *(Scorpaenidae)* occur in crevices and caves in the reef. Larger teleosts typical of rocky areas frequent the edges of the reef in the main channel, for example : *Sarpa salpa, Diplodus sargus, Lutjanus fulviflamma, Coracinus capensis, Neoscorpis lithophilus* and *Monodactylus falciformis.* Predatory fish such as kingfish (Carangidae) and shoals of Mugilidae are always present in the vicinity of the reef.

Species not associated with the reef : Most of the non-reef species listed in Appendix 1 o ;cur in the estuary, but other than those which penetrate beyond the estuary, (Table 2) the following are noteworthy : Two zooplankton feeding Clupeidae, *Sardinella melanura* and *Spratelloides delicatulus,* are common summer visitors; *Lethrinus nebulosus* (Mata-Hari) juveniles enter the estuary basin in large numbers in summer; *Tylosurus crovdylus* (Crocodile needlefish) is the most abundant piscivorous fish in the estuary throughout the year, feeding on a wide variety of prey including Mugilidae; finally the atherinid *Pranesus pinguis* (hardyhead silv rside), which feeds by ingesting sand grains together with small invertebrates, is extremely abundant over shallow banks in summer but is absent in winter.

GENERAL DISCUSSION

Three physical factors are important to the movement of fish in the Kosi system. Firstly, t,le virtual separation of Sifungwe and Mpungwini by low water levels during neap tides and droughts. This particularly restricts the migration of large fish such as Carangids, *C. chanos* and Mugilidae between the lakes and the estuary. Secondly, the current speeds in the reed channel between Sifingwe and Nhlange may exceed those at the estuary mouth during the rainy season (summer) (Table 1), and may inhibit upstream movement of slow-swimming species such as *Rhabdosargus sarba,* the numbers of which fall off significantly between Sifungwe and Nhlange (Table 2, Fig. 2). Thirdly, a combination of low salinities (3-4 'too at most) and low temperatures in Lake Nhlange in winter may adversely affect the osmoregulation of marine species. The mass mortality of *P. commersonni* in Nhlange in July 1975 recorded by Jackson (Blaber and Whitfield, 1976) was probably the result of such a lethal combination.

Very few fish were captured in water deeper than 6 m and few were caught at the surface over water deeper than 6 m. The deep basin of

Sifungwe is anoxic for most of the year (Allanson and Van Wyk, 1969), which explains the absence of fish from this part of the lake. The large areas of shallow water in all parts of the system (Fig. 1) are those most favoured by nearly all species. In Nhlange the standing stock of benthos is highest on the shelf and declines with depth (Boltt and Allanson, 1975) and in both Sifungwe and Mpungwini vast numbers of spotted grunter *P. commersonni,* are present in the shallows. It is likely that most of the benthic invertebrate feeding fish obtain their food in the shallow areas, and the piscivores will also therefore show a preference for these regions. Movement of fish, particularly juveniles, from one part of the Kosi system to another, evidently takes place via the shallow margins and fish seldom move across the central portions of the lakes.

TABLE 4. Occurrence of juveniles and/or adults of marine species occurring throughout the system.

Species	Juveniles	Adults
Chanos chanos		X
Elops machnata		X
Caranx ignobilis	X	X
Caranx sexfasciatus	X	X
Scomberoides tala	X	X
Pomadasys commersonni	X	X
Rhabdosargus holubi	X	
Rhabdosargus sarba	X	X
Sphyraena jello	X	X
Mugilidae	X	X

TABLE 5. Occurrence of juveniles and/or adults of marine species not penetrating beyond estuary.

Species	Juveniles	Adults
Tylosurus crocodylus		X
Caranx spp.	X	X
Argyrosomus hololepidotus		X
Coracinus capensis		X
C. multifasciatus		X
Neoscorpis lithophilus		X
Lutjanus fulviflamma	X	
Gaterin niger		X
Lethrinus nebulosus	X	
Diplodus sargus	X	
Lithognathus mormyrus	X	
Sarpa salpa	X	

In Table 4 those species which occur throughout Kosi are compared in terms of their utilisation of the system, either as juveniles (seeking quiet water and suitable food: nursery function of estuary) or as adults (seeking food). It is perhaps significant that both juveniles and adults of most piscivorous species enter Kosi. In Table 5 those species which only utilise the estuary are compared in a similar way and it is evident that with the exception of the Carangidae these species are present either as feeding adults or as juveniles. As suggested by Whitfield (1977) this phenomenon may be involved with a strategy on the part of piscivores

to avoid cannibalism. Even among the carangids at Kosi, where both adults and juveniles enter the estuary, the juveniles are only present in shallow water while the adults are restricted to the deeper channels and basins. The dominance of marine species in the Kosi system is demonstrated in Table 6 where the percentage contribution of marine, estuarine and freshwater species to the fauna of each basin is shown. Small estuarine species form a relatively similar proportion of the fauna in each lake. The number of estuarine species in the estuary is also similar to that in the lakes, but they represent a smaller percentage of the total due to a large increase in the number of marine species.

The Kosi lakes form part of the chain of south east African coastal lakes stretching from Lagoa Poelela in the north to St Lucia in the south. The composition of the fish fauna of these lakes (Table 7) reflects their degree of isolation from the sea. Although Nhlange has at present a constant connection to the Kosi system, small changes in drainage patterns could lead to its isolation. Increased siltation due to changes in land use in the catchment could radically alter the degree of isolation from the sea of all the Kosi lakes.

TABLE 6. The percentage of marine, estuarine and freshwater fish species in four parts of the Kosi system.

Fish origin	Nhlange	Sifungwe	Mpungwini	Estuary
Marine	73	81	81	96
Estuarine	12	19	19	4
Freshwater	15	0	0	0
	34	26	32	116

TABLE 7. The degree of the isolation from the sea and the composition of the fish fauna of four south east African coastal lakes.

Lake	Degree of isolation	Fish fauna
Poelela	75 km tenuous connection with sea	Marine fish present but fauna dominated by freshwater Cichlidae
Nhlange	Connected to sea via Kosi lakes and estuary	Freshwater fish present but fauna dominated by marine species
Sibaya	Isolated from sea	Estuarine relict fauna present but dominated by freshwater Cichlidae
St Lucia	Directly connected by estuary to sea	Dominated by marine fish

SUMMARY

Regular quantitative sampling of fish was undertaken in the Kosi system from 1975 to 1977. About one hundred and thirty species of fish were recorded. Seasonal changes in distribution and density are described, and related where necessary to physical characteristics of the different regions. The system is dominated by euryhaline marine

species, but estuarine and freshwater species are present.

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APPENDIX 1. Marine fish recorded from Kosi System (* = not recorded in this survey, 1975–1977). Nomenclature and species numbers after Smith (1975).

No.	Name	Estuary	Reef	Mpungwini	Sifungwe	Nhlange
9& 9A	*Carcharhinus leucas*	X				
100	*Elops machnata*	X		X	X	X
101	*Megalops cyprinoides*			X		
105	*Chanos chanos*	X		X	X	X
108	*Gilchristella aestuarius*			X	X	
113	*Sardinella melanura*	X				
107	*Spratelloides delicatulus*	X				
175	*Saurida gracilis*	X				
218	*Hyporhamphus knysnaensis*	X		X	X	X
220	*Hyporhamphus delagoae*			X		
229	*Tylosurus crocodylus*	X				
228	*Tylosurus leiurus*	X				X
317	*Bothus pantherinus*	X				
361	*Fistularia petimba*	X				
370	*Solenostomus cyanopterus*	X				
401	*Terapon jarbua*	X		X		
413	*Kuhlia rupestris*		X			
412	*Kuhlia taeniurus*		X			
425	*Cephalopholis argus*		X			
446	*Epinephelus areolatus*		X			
435	*Epinephalus guaza*		X			
447	*Epinephalus tauvina*		X			
467	*Sillago sihama*	X				
510	**Atule mate*	X				
507	**Caranx dentex*	X				
520	*Caranx ignobilis*	X		X	X	X
524	*Caranx hippos*	X				
512	**Caranx stellatus*	X				
513	*Caranx melampygus*	X				
511	*Caranx sexfasciatus*	X		X	X	X
546	**Scomberoides commersonianus*	X				
545	**Scomberoides lysan*	X				
544	*Scomberoides tala*	X		X	X	X
552	*Argyrosomus hololepidotus*	X				
561	*Upeneus vittatus*	X				
577	*Platax pinnatus*	X				
580	*Monodactylus fakiformis*	X			X	X
581	*Monodactylus argenteus*	X				X
584	*Pomacanthodes semicirculatus*		X			
592	*Chaetodon auriga*		X			
598	*Chaetodon lunula*		X			
594	*Chaetodon unimaculatus*		X			
599	*Chaetodon vagabundus*		X			

No.	Name	Estuary	Reef	Mpungwini	Sifungwe	Nhlange
590	*Heniochus acuminatus*		X			
611	*Acanthurus fuliginosus*		X			
609	*Acanthurus mata*		X			
608	*Acanthurus trio stegus*		X			
618 & 619	*Zanclus canescens*		X			
631	*Gerres acinaces*	X		X	X	X
633	*Gerres oblongus*	X		X		
629	*Gerres oyena*	X				X
628	*Gerres punctatus*	X		X		X
632	*Gerres rappi*	X		X	X	X
635	*Ambassis commersoni*	X		X	X	X
634	*Ambassis natalensis*	X				
644	*Coracinus capensis*	X				
645	*Coracinus multifasciatus*		X			
646	*Neoscorpis lithophilus*	X				
687	*Caesio caerulaureus*		X			
688	*Diagramma pictum*			X		
664	*Lutjanus argentimaculatus*	X		X	X	X
659	*Lutjanus fulviflamma*		X			
669	*Lutjanus vaigiensis*		X			
690	*Gaterin niger*	X				
692	*Gaterin playfairi*		X			
692A	*Gaterin sordidus*		X			
679	*Pomadasys commersonni*	X		X	X	X
702	*Lethrinus nebulosus*	X				
707	*Acanthopagrus berda*	X		X		X
706	*Acanthopagrus bifasciatus*		X			
713	*Diplodus sargus*	X				
727	*Lithognathus mormyrus*	X				
709	*Rhabdosargus holubi*	X		X	X	X
710	*Rhabdosargus sarba*	X		X	X	X
	Rhabdosargus sp.	X		X	X	X
731	*Sarpa salpa*		X			
769	*Abudefduf biocellatus*		X			
761	*Abudefduf saxatilis*		X			
762	*Abudefduf sexfasciatus*		X			
760	*Abudefduf sordidus*		X			
765	*Abudefduf sparoides*		X			
755	*Pomacentrus sindensis*		X			
805	*Labroides dimidiatus*		X			
800 & 802	*Stethojulis albovittata*		X			
778	*Thalassoma hebraicum*		X			
777	*Thalassoma lunare*		X			
824	*Scarus ghobban*		X			
881	*Liza alata*				X	X
884	*Liza dumerili*	X		X	X	X
886	*Liza macrolepis*	X		X	X	X
882	*Liza tricuspidens*	X				
883	**Liza vaigiensis*	X				

No.	Name	Estuary	Reef	Mpungwini	Sifungwe	Nhlange
877	*Mugil cephalus*	X		X	X	X
890	*Myxus capensis*	X				
888	*Valamugil buchanani*	X		X	X	
878	*Valamugil robustus*	X		X	X	X
894	*Pranesus pinguis*	X				
896	**Sphyraena barracuda*	X		X	X	X
897	**Sphyraena flavicauda*			X	X	
895	*Sphyraena jello*					X
901	*Siganus canaliculatus*	X				
902A	*Siganus stellatus*	X				
904A	*Croak mossambica*				X	X
910	*Bathygobius fuscus*	X				
919	*Glossogobius giurus*	X		X	X	X
911	*Monishia william*	X				
936	*Periophthalmus sobrinus*	X		X		
938	*Eleotris fusca*			X		
967	*Antennablennius bifilum*		X			
972	*Istiblennius oryx*		X			
1007	*Enneapterygius obtusirostre*		X			
1047	*Pterois volitans*	X	X			
1050	*Dendrochirus brachypterus*		X			
1052	**Synanceja verrucosa*		X			
1063	*Platycephalus indicus*	X				
1122	*Echidna nebulosa*	X				
1126	*Gymnothorax margaritophorus*		X			
1169	*Rhinecanthus aculeatus*		X			
1178	*Lactoria cornuta*	X				
1198	*Amblyrhynchotes honckenii*	X				
1203	*Arothron immaculatus*	X				
1206	*Arothron aerostaticus*	X				
1207	*Arothron hispidus*	X				
1204	*Arothron nigropunctatus*	X				
1240	*Antennarius striatus*	X				