

# Interactions of fishes with particular reference to coelacanths in the canyons at Sodwana Bay and the St Lucia Marine Protected Area of South Africa

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The deep demersal fish fauna at depths of 100–400 m in canyons off the St Lucia Marine Protected Area along the north coast of KwaZulu-Natal is compared with similar fish communities at the Comoro Islands and in the Indo-Pacific region. Fifty-four fish species were seen or photographed from the submersible *Jago* or by the discovery team of scuba divers in the coelacanth, *Latimeria chalumnae*, habitat of the canyons off Sodwana Bay. An additional 94 fish species known from depths of 100–200 m along the coast of northern KwaZulu-Natal are likely to occur in the canyon habitat. The fish fauna of the Sodwana canyons shares at least 18 species with the deep demersal fish community off tropical coral reefs of the Indo-Pacific region. Thirty-seven of the Sodwana canyon fishes are also known from the coelacanth habitat in the Comoros.

## Introduction

The deep demersal fish fauna of the canyons along the north coast of KwaZulu-Natal, South Africa is poorly known, difficult to sample and not easy to study. Table 1 lists 54 fish species that were seen and photographed from the submersible *Jago* or by the discovery team of scuba divers in the coelacanth habitat of the canyons off Sodwana Bay. An additional 94 fish species that are known in depths of 100 to 359 m along the coast of northern KwaZulu-Natal<sup>1</sup> and are likely to occur in the canyons are also included in the fish fauna of the canyons off the coast of KwaZulu-Natal.

The 54 species identified from video images from 47 *Jago* dives and visual observations by P.C. Heemstra on one dive in South Island Rock Canyon to 198 m are probably less than a third of the fish fauna in the deep demersal ecosystem of the canyon heads along this coast. With such limited information, our picture of this fish fauna is obviously incomplete. We can, however, make some heuristic comparisons with the fish fauna of the *Latimeria* habitat at Grand Comoro (Ngazidja) Island<sup>2</sup> and the shallow coral-reef fish community at Sodwana Bay in the Greater St Lucia Marine Protected Area of KwaZulu-Natal.

## Fish interactions

The fishes that occur in the canyons may interact directly with *Latimeria* as prey, predator or competitor (for food), or (for a few species) they may have no direct interaction with *Latimeria*. Examples of fish that are unlikely to interact directly with coelacanths are the saw shark, *Pliotrema warreni*, the narkid electric ray, *Heteronarce garmani*, and the pineapple fish, *Monocentris japonicus*. Saw sharks are too large at birth to be easily swallowed by *Latimeria*, and the sharp rostral teeth of juvenile sawsharks

would also discourage a hungry coelacanth. And a newborn *Latimeria* is too large to be consumed by a sawshark. The narkid electric ray is a small species, but its electric shocking ability would be an effective deterrent to a coelacanth, with their supposed electro-receptive susceptibility. Juvenile pineapple fish occur on coral reefs, where they are not likely to encounter coelacanths; and the adults, which are common in the coelacanth caves, are equipped with an armour of hard spiny scales and formidable locking fin spines that make them very difficult for a fish to swallow.

## Prey

Prey species for *Latimeria* (indicated with the letters f or F in Table 1) are those fish of similar size, lifestyle and behaviour to the species found in the stomach contents of *Latimeria*.<sup>3</sup> Table 1 lists 124 species as food or potential prey for the coelacanths. Another 4 species are considered dubious food items. With its formidable fin spines and thick prickly scales, even small *Myripristis chryseres* may be rejected as prey. The distasteful mucus of *Aulacocephalus temmincki* is known to deter piscivorous fishes, and the puffers (*Arothron inconditus* and *Canthigaster rivulata*) may also be distasteful to predators.

## Competitors

Fish of moderate (40 cm) to large (2 m) size that are known piscivores are considered competitors of *Latimeria* (designated with the letter C in the first column of Table 1). In the Sodwana canyon habitat, 65 (44%) of the 148 species listed as occurring in the canyons are considered competitors of *Latimeria*. In the Comoran coelacanth habitat, 31% (27 species) of the fishes are thought to be competitors.

## Predators

The only predators of adult *Latimeria* would be large sharks (*Hexanchus griseus*, *Carcharhinus altimus*, and *C. obscurus*). Although the tiger shark, *Galeocerdo cuvier*, is generally found in shallow water (5–50 m), it is known to feed occasionally on deep demersal sharks such as sawsharks (*Pristiophoridae*) and angelsharks (*Squatinae*). It thus seems plausible that a tiger shark might also attack an adult coelacanth. But the occurrence of tiger sharks below 100 m is so rare that it is not considered a member of this deep demersal fish fauna.

Juvenile *Latimeria* would be vulnerable to any piscivore known from their habitat that is large enough to swallow them or equipped with the dentition to bite them into pieces. These supposed predators (see Table 1) would include sharks, conger eels (*Conger* sp.) the pike conger (*Muraenesox* spp.), large rockcods (*Epinephelus* spp), *Scombrops*, and oilfish, *Ruvettus pretiosus*.

## Species comments

The bigeye sixgill shark, *Hexanchus nakamurai* Teng, 1962 (*Hexanchus vitulus* Springer & Waller, 1969 is a synonym), is known from

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KwaZulu-Natal, southern Mozambique, Madagascar, Aldabra, Kenya, Taiwan, Philippines and both sides of the Atlantic Ocean.<sup>4</sup>

*Carcharhinus* sp.: a shark with black tips on the dorsal and pectoral fins and lower caudal fin lobe was seen near the bottom at the head of Jesser and Wright canyons. This could be either the spinner shark, *C. brevipinna*, or the blacktip shark, *C. limbatus*. Neither species is common below 75 m.

Although *Odontaspis ferox* was occasionally encountered in the coelacanth habit at Ngazidja,<sup>2</sup> it was not seen in the Sodwana canyons. Unlike its shallow-water relative, *Carcharias taurus*, which is seasonally common on the coral reefs at Sodwana, *O. ferox* prefers depths of 150–420 m.<sup>2</sup> This shark attains 4.1 m and is a likely predator of juvenile *Latimeria*.

A 48 cm juvenile swell shark, *Cephaloscyllium sufflans*, was found in the stomach of a *Latimeria* caught at Grand Comoro.<sup>3</sup> The species is also known from Kenya and the central coast of KwaZulu-Natal.

Three other sharks may also interact as prey, predator or competitor of *Latimeria*: they are *Heptranchias perlo*, *Dalatius licha* and *Squatina africana*.

The pike conger, *Muraenesox bagio*, attains 180 cm. Small pike conger might be prey of *Latimeria*, and large *Muraenesox* could be predators of small *Latimeria*.

Large monks (*Lophius* spp.) might be predators of small *Latimeria*; small monks (including the genera *Lophiodes* and *Lophiomus*) might be prey of *Latimeria*. These sedentary fish are likely prey for the slow-moving coelacanth.

The sailfin velifer, *Velifer hypselopterus*, was photographed in ~30 m on a reef at Sodwana Bay. This species is usually found below 100 m.

A 42 cm alfonso, *Beryx decadactylus*, was reported from the stomach of a Comoran *Latimeria*.<sup>3</sup> Depth range 200–805 m.

Species of the trachichthyid genus *Hoplostethus* are common on continental slopes worldwide. At least 7 species are known from southern Africa.

Although the trumpetfish, *Aulostomus chinensis*, which is common on coral reefs, is listed as a transient species in the canyons, it is often seen with *Latimeria* at Grand Comoro.

Several specimens of the blacklash scorpionfish, *Pontinus nigerimum*, were recently collected in a trawl off southern Mozambique.<sup>2</sup> The tentacle above the eye may be long or short, black and white, or white, or absent.

Large (80–100 cm TL) yellow-belly grouper, *Epinephelus marginatus*, were seen on Jago dives. On several occasions, this bold, inquisitive grouper approached the submersible, stopped close to the front viewing port and spent several minutes scrutinizing the inhabitants of the sub. As in many fishes, the eyes can

**Table 1.** Preliminary list of fishes seen or photographed in canyons<sup>1</sup> near Sodwana Bay and known from depths of 100–200 m along the north coast of KwaZulu-Natal.

Family: Species (interaction)	Status/number	Comments/depth range
Hexanchidae: <i>Heptranchias perlo</i> (f, P, C)	Transient?/Nil	Known in area; 10–1000 m
Hexanchidae: <i>Hexanchus griseus</i> (P, C)	Resident?/Nil	Known in area; size 5+ m; 0–1875 m
Hexanchidae: <i>Hexanchus nakamurai</i> (f, P, C)	Resident/Nil	Known in area; size 1.8 m; 90–600 m
Squalidae: <i>*Centrophorus granulosus</i> (P, C)	Resident/Nil	Known in area; size 1.5 m; 274–457 m
Squalidae: <i>*Cirrhigaleus asper</i> (C)	Resident/Nil	Known in area; 214–600 m
Squalidae: <i>Squalus megalops</i> (C)	Resident/Nil	Known in area; 50–732 m
Squalidae: <i>Squalus mitsukurii</i> (C)	Resident/Nil	Known in area; 50–740 m
Dalatiidae: <i>Dalatius licha</i> (f, P, C)	Resident?/Nil	Known in area; 37–1800 m
Carcharhinidae: <i>Carcharhinus albimarginatus</i> (P, C)	Transient?/3	Filmed by scuba divers; 5–120 m
Carcharhinidae: <i>Carcharhinus altimus</i> (P, C)	Transient/Nil	Known in area; 25–430 m
Carcharhinidae: <i>Carcharhinus</i> sp (P, C)	Transient/0–1	Jesser Canyon
Carcharhinidae: <i>Carcharhinus obscurus</i> (P, C)	Transient/Nil	Known in area; 0–400 m
Odontaspidae: <i>*Odontaspis ferox</i> (P, C)	Resident/Nil	Known in area; 13–420 m
Scyliorhinidae: <i>*Cephaloscyllium sufflans</i> (F, C)	T/R/Nil	Known in area; 40–440 m
Pristiophoridae: <i>Pliotrema warreni</i> (X)	Resident/Nil	Known in area; 60–430 m
Squatinae: <i>Squatina africana</i> (f, P, C)	Resident/Nil	Known in area; 50–400 m
Rhinobatidae: <i>Rhinobatos annulatus</i> (f)	Resident/0–1	South Island Rock, 118 m
Narkidae: <i>Heteronarce garmani</i> (X)	Resident/Nil	Known in area; 73–329 m
Dasyatidae: <i>Dasyatis thetidis</i> (P, C)	Resident/Nil	Known in area; 2–366 m
Latimeriidae: <i>*Latimeria chalumnae</i>	Resident/0–7	Jesser & Wright; 110–130 m
Muraenesocidae: <i>*Muraenesox bagio</i> (f, P, C)	Resident/Nil	Known in area; size 180 cm ; 2–100 m
Ophichthidae: <i>Xyrias revulsus</i> (f, C)	Resident/Nil	Known in area; size 88 cm ; 146–209 m
Synphobranchidae: <i>Ilyophis brunneus</i> (F, C)	Resident/Nil	Stomach contents; 1,500 m
Chlorophthalmidae: <i>Chlorophthalmus punctatus?</i> (f)	Resident 0–1	Wright Canyon; 130–439 m
Paralepididae: species not determined (f)	Resident/Nil	Known in area; 50–1000 m
Synodontidae: <i>Saurida undosquamis</i> (f, C)	Transient/Nil	Known in area; 2–200 m
Synodontidae: <i>Synodus indicus</i> (f)	Transient/Nil	Known in area; 20–100 m
Synodontidae: <i>Trachinocephalus myops</i> (f, C)	Transient/Nil	Known in area; 2–200 m
Ophidiidae: <i>*Brotula multibarata</i> (f, C)	Transient/Nil	Known in area; 2–200 m
Lophiidae: <i>Lophiodes insidiator</i> (f, C)	Resident/Nil	Known in area; 200–600 m
Lophiidae: <i>Lophiomus setigerus</i> (f, C)	Resident/Nil	Known in area; 70–250 m
Lophiidae: <i>Lophius vomerinus</i> (f, P, C)	Resident/Nil	Size 100 cm ; 70–400 m
Chaunacidae: <i>*Chaunax</i> sp (f)	Resident 0–1	Red and tawny (no spots); 70–300 m
Ogcocephalidae: <i>Haliutaea hancocki</i> (f)	Resident/Nil	Known in area; 120–200 m
Ogcocephalidae: <i>*Haliutaea coccinea</i> (f)	Resident/Nil	Known in area; 162–200 m
Veliferidae: <i>Velifer hypselopterus</i> (f)	Resident/Nil	Known in area; 25–120 m
Berycidae: <i>*Beryx splendens</i> (f)	Resident/Nil	Known in area; 160–800 m
Trachichthyidae: <i>*Gephyroberyx darwini</i> (C)	Resident/Nil	Known in area; 130–240 m
Trachichthyidae: <i>Hoplostethus</i> sp (f)	Resident/Nil	Known in area; 100–700 m
Monocentridae: <i>*Monocentris japonicus</i> (X)	T/R/0–2	Common at Comoros; 5–125 m
Holocentridae: <i>*Myripristis chryseres</i> (f?)	Resident/0–6	Common at Comoros; 20–200 m
Polymixiidae: <i>*Polymixia</i> sp (F)	Resident/Nil	Stomach contents; 300–500 m
Zeidae: <i>Zenopsis conchifer</i> (f, C)	Resident/Nil	Not at Comoros? 90–360 m
Zeidae: <i>*Zeus faber</i> (f, C)	Resident/0–1	60–360 m
Grammicolepidae: <i>Xenolepidichthys dalgleishi</i> (f)	Resident/Nil	Known in area; 127 m
Aulostomidae: <i>*Aulostomus chinensis</i> (f, C)	Transient/0–1	Common at Comoros; 5–225 m
Macroramphosidae: <i>Macroramphosus scolopax</i> (f)	Resident/Nil	Known in area; 50–350 m
Scorpaenidae: <i>Neomerinthe nielseni</i> (f)	Resident/Nil	Known in area; 100–405 m
Scorpaenidae: <i>Pontinus nigerimum</i> (f)	Resident/Nil	Known in area; 146–200 m
Scorpaenidae: <i>Scorpaena scrofa</i> (f, C)	Resident/Nil	Known in area; 20–500 m
Scorpaenidae: <i>Scorpaenopsis</i> sp (f)	Resident?/0–1	Depth ?–130 m
Bembridae: <i>Parabembras robinsoni</i> (f)	Resident/Nil	Known in area; 200–600 m
Platycephalidae: <i>Cociella punctata</i> (f, C)	Transient/Nil	Known in area; 1–100 m
Platycephalidae: <i>Cociella heemstrai</i> (f, C)	Transient/Nil	Known in area; 2–150 m

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be moved independently. This species is common in the Mediterranean and Eastern Atlantic from France, Azores, Madeira, Canary Islands, Cape Verde Islands and along the coast of West Africa to South Africa; also in the western Atlantic from Recife, Brazil to Argentina; reported from Oman, but not caught or seen at the Comoros. Attains at least 1.2 m.

Several red-tipped grouper, *Epinephelus retouti* (Fig. 1A), were seen on videotapes of dives in Jesser and Wright canyons. A new record for South Africa, previously known from Bassas da India, Madagascar, Réunion, Mauritius, Chagos and various localities in the west-central Pacific.<sup>5</sup>

The royal anthiine, *Odontanthias borbonius*, is a common resident in both (canyon and Comoran) coelacanth habitats. Like most anthiine fish, it feeds mainly on zooplankton. A deep-water species rarely seen on the coral reefs at Sodwana. *Pseudanthias fasciatus* (Fig. 1B,C) is common in the canyons at Sodwana.

A yellow fish recorded on videotape was recognizable as a species of *Liopropoma*, but it was not seen well enough to identify which species this might be. It is probably the same species photographed by Peter van Niekerk in a canyon 10 km south of Sodwana Bay in February 1988.<sup>6</sup>

A small *Plectranthias* was seen on the dive in South Island Rock Canyon. It was not any of the three species known from South Africa (*Plectranthias longimanus*, *P. morgani*, and *P. winniensis*).<sup>1</sup>

A species of *Serranus* with ~6–8 red bars on dorsal half of body; was videotaped on the South Island Rock dive; this may be the undescribed species collected off Mozambique on a previous *Algoa* cruise by R. Leslie.

*Symphysanodon* sp.: probably the same species seen at Grand Comoro and found in the stomach of Comoran *Latimeria*. See Fig. 7G in ref. 2. Not seen on coral reefs.

The occurrence of *Paracaesio sordida* was expected in the canyons, as it is a deep-reef planktivorous species that is seen on the coral reefs at Sodwana Bay. New record for South Africa.

The oblique-banded butterflyfish, *Chaetodon mitratus* Günther, 1860, is known from Mauritius, Madagascar and the Maldives. It has also been photographed off Mozambique and at 54 m on a reef where a coelacanth was found south of Sodwana Bay.

## Comparisons

The fish fauna of the Sodwana canyons in depths of 100–359 m shares at least 18 species with the deep demersal fish community off tropical, coral reefs of the Indo-Pacific region.<sup>2,7,8</sup> Thirty-nine (26%) of the species listed in Table 1 are also known from the coelacanth habitat in the Comoros.<sup>2</sup> A major difference

Table 1 (continued)

Family: Species (interaction)	Status/number	Comments/depth range
Hoplichthyidae: <i>Hoplichthys acanthopleurus</i> (f)	Resident/Nil	Known in area; 120–300 m
Triglidae: <i>Chelidonichthys capensis</i> (f, C)	Transient/Nil	Known in area; 10–390 m
Triglidae: <i>Chelidonichthys kumu</i> (f, C)	Transient/Nil	Known in area; 1–200 m
Triglidae: <i>Chelidonichthys queketti</i> (f)	Transient/Nil	Known in area; 1–150 m
Triglidae: <i>Lepidotrigla faurei</i> (f)	Resident/Nil	Known in area; 70–130 m
Triglidae: <i>Lepidotrigla multispinosa</i> (f)	Resident/Nil	Known in area; 200–295
Peristediidae: <i>Peristedion weberi</i> (f)	Resident/Nil	Known in area; 170–200 m
Peristediidae: <i>Satyrichthys adeni</i> (f)	Resident/Nil	Known in area; 58–295 m
Dactylopteridae: <i>Dactyloptera peterseni</i> (f)	Resident/Nil	Known in area; 50–200 m
Caproidae: * <i>Antigonia indica</i> (f)	Resident/Nil	Known in area; 50–600 m
Polyprionidae: <i>Polyprion americanus</i>	Resident/0–1	50–300 m
Serranidae: * <i>Aulacocephalus temmincki</i> (C)	Resident/0–4	20–120 m
Serranidae: * <i>Cephalopholis spiloparaea</i> (f)	Resident/0–1	10–140 m
Serranidae: <i>Dermatolepis striolata</i> (f, C)	Transient/0–2	20–130 m
Serranidae: <i>Epinephelus magniscuttis</i> (f, P, C)	Resident/Nil	Size 1.5 m; 128–300 m
Serranidae: <i>Epinephelus marginatus</i> (f, P, C)	T/R/0–6	Size ~1.2 m; depth 1–150 m.
Serranidae: * <i>Epinephelus morrhua</i> (f, C)	Resident/0–2	Size ~90 cm; 80–370 m
Serranidae: * <i>Epinephelus multinotatus</i> (f, P, C)	Resident/0–1	Size 1.0 m; 40–90 m
Serranidae: * <i>Epinephelus poecilnotus</i> (f, C)	Resident/0–6	Size ~70 cm; 45–375 m
Serranidae: <i>Epinephelus retouti</i> (f, C)	T/R/0–6	70–220 m
Serranidae: <i>Epinephelus rivulatus</i> (f, C)	T/R/Nil	10–150 m
Serranidae: * <i>Epinephelus tukula</i> (f, P, C)	Transient/0–1	Size ~1.7 m; 10–230 m
Serranidae: * <i>Odontanthias borbonius</i> (f)	Resident/4–20	Seen in 5 canyons; common at Comoros
Serranidae: <i>Odontanthias caudicinctus</i> (f)	Resident?/Nil	Known from 100–300 m
Serranidae: <i>Odontanthias natalensis</i> (f)	Resident?/Nil	Known from 150–200 m
Serranidae: * <i>Liopropoma</i> sp (f)	Resident/0–2	Rare at Comoros; 25–230 m
Serranidae: <i>Plectranthias</i> sp (f)	Resident/0–1	South Id Rock; 190 m
Serranidae: <i>Pseudanthias fasciatus</i> (f)	Resident/10–100	All canyons; depth 30–150 m
Serranidae: <i>Serranus</i> sp (f)	Resident 0–3	South Id Rock; 130 m
Priacanthidae: * <i>Cookeolus japonicus</i> (f, C)	Resident/Nil	Known in area; 100–400 m
Priacanthidae: * <i>Pristigenys nipponia</i> (f)	Resident/0–1	80–200 m
Apogonidae: <i>Apogon</i> sp (f)	Transient?/0–1	Black spot at base of tail fin
Acropomatidae: <i>Neoscombrops cynodon</i> (f)	Resident/Nil	Known in area; 100–500 m
Scombropidae: <i>Scombrops boops</i> (f, P, C)	Resident/Nil	Known in area; size 1.5 m; 20–400 m
Haemulidae: <i>Pomadasy stridens</i> (f)	Transient/0–4	Known in area; 2–110 m
Lutjanidae: * <i>Aphareus furca</i> (f, C)	Transient/Nil	Known in area; 6–122 m
Lutjanidae: * <i>Aphareus rutilans</i> (f, C)	Transient/Nil	Known in area; 100–300 m
Lutjanidae: <i>Aprion virescens</i> (f, C)	Transient/Nil	Known in area; 10–180 m
Lutjanidae: * <i>Etelis coruscans</i> (f, C)	Transient/0–1	Known in area; 100–400 m
Lutjanidae: <i>Lutjanus sebae</i> (f, C)	Transient/Nil	Known in area; 5–180 m
Lutjanidae: <i>Paracaesio sordida</i> (f)	Resident/2–6	Occurs on Sodwana coral reefs; 20–250 m
Lutjanidae: * <i>Paracaesio xanthura</i> (f)*	Resident/0–20	Known in area; 5–150 m
Lutjanidae: <i>Pristipomoides filamentosus</i> (f, C)	Resident/0–2	Known in area; 40–180 m
Lutjanidae: <i>Pristipomoides zonatus</i> (f, C)*	Resident/0–2	40–270 m
Caesionidae: <i>Caesio caeruleaurea</i> (f)	Transient/0–20	Known in area; 20–110 m
Caesionidae: <i>Pterocaesio</i> sp (f)	Transient/0–30	Known in area; 10–120 m
Symphysanodontidae: <i>Symphysanodon</i> sp (F)*	Resident/0–4	Undescribed species; Comoros
Sparidae: <i>Argyrops spinifer</i> (f)	Transient/0–2	Not at Comoros; 20–150 m
Sparidae: <i>Cheimerius nufar</i> (f, C)	Transient/0–1	Known in area; 1–130 m
Sparidae: <i>Chrysolephus anglicus</i> (f)	Transient/0–6	Not at Comoros; 20–150 m
Sparidae: <i>Chrysolephus puniceus</i> (f, C)	T/R/5–50	Not at Comoros; 20–150 m
Sparidae: <i>Diplodus cervinus</i> (f)	Transient/0–7	Not at Comoros; 1–120 m
Sparidae: <i>Polysteganus coeruleopunctatus</i> (f, C)	Resident/0–20	Apparently not at Comoros; 30–400 m
Sparidae: <i>Polysteganus praeorbitalis</i> (f, C)	Resident/0–10	Not at Comoros; 20–150 m
Centracanthidae: <i>Spicara australis</i> (f)	Resident/Nil	Known in area; 20–160 m
Mullidae: <i>Parupeneus rubescens</i> (f)	Transient/0–2	5–200 m; not at Comoros
Sciaenidae: <i>Argyrosomus japonicus</i> (f, C)	Transient/0–10	A group of ~10 seen on one dive
Pentaceroptidae: * <i>Histioporus typus</i> (f)	Resident/Nil	Rare in Comoros; 40–400 m
Chaetodontidae: <i>Chaetodon dolosus</i> (f)	Transient/Nil	Known in area; 8–200 m
Chaetodontidae: <i>Chaetodon marleyi</i> (f)	Transient/0–4	Not at Comoros; 2–120 m
Chaetodontidae: <i>Chaetodon mitratus</i> (f)	Transient/ 0–1	Not at Comoros; 50–120 m

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between the fish fauna of the Sodwana canyons and that of the coelacanth habitat of the Comoros is the much greater abundance of large, shallow-water (transient) and resident fishes in the Sodwana canyons. The abundance of the royal anthiine (*Odontanthias borbonius*) and schools of other planktivorous fish, e.g. redstripe anthiine (*Pseudanthias fasciatus*), yellowtail fusilier-snapper (*Paracaesio xanthura*), the dusky fusilier-snapper (*Paracaesio sordida*) and various fusiliers (*Caesio* and *Pterocaesio* spp.) implies an ample amount of zooplankton in this habitat. Large schools or loose (disorganized) aggregations of redstripe anthiine (*P. fasciatus*) (Fig. 1B,C), lined piggy (*Pomadasys stridens*), fusilier-snappers (*Paracaesio xanthura*, *Paracaesio sordida*), *Symphysanodon* sp., royal anthiine (*Odontanthias borbonius*), fusiliers (*Pterocaesio* and *Caesio*), slinger (*Chrysoblephus puniceus*) and blueskin (*Polysteganus coeruleopunctatus*) comprising 10–50 fish were often seen in the canyons. In the Comoran habitat, the only species that occurred in groups were *Odontanthias borbonius*, *Symphysanodon* sp., cardinalfish (family Apogonidae, 3 species, including *Coranthus polyacanthus*), deep cardinalfish (family Epigonidae) and *Chromis* spp. (family Pomacentridae). These groups usually comprised fewer than 10 fish, but were sometimes seen in groups of 10–20 small fish at the mouth of caves occupied by the Comoran coelacanths.<sup>2</sup> Judging from videotapes of the canyon fishes and the fish fauna of the Comoran coelacanth habitat, there is about 3 or 4 times greater fish biomass in the Sodwana canyon habitat than that of the Comoran coelacanth habitat.

Based on our limited observations, it appears the Sodwana coelacanths are similar to Comoran coelacanths in that they are lethargic fish that rest (or hide) under ledges and in or near caves during the day. In the Sodwana canyons, suitable caves are restricted to depths of 100–130 m, whereas at Grand Comoro (Ngazidja) Island, most caves are in depths of 180–230 m. The daytime habitat of the Sodwana coelacanths is, therefore, only about half as deep and much closer to the nearest coral reefs, which are located in depths of 10–30 m.

Although the Sodwana canyon fish fauna and the Comoran deep demersal fauna have similar proportions of transient (mainly coral reef) fish species (31% and 34%, respectively) the greater proximity of the coral reefs at Sodwana, which are about 140 m from the canyon habitat (versus ~250 m from the Comoran coelacanth habitat) is one factor that contributes to the greater fish abundance in the Sodwana canyon ecosystem.

Another factor that contributes to the greater fish abundance

Table 1 (continued)

Family: Species (interaction)	Status/number	Comments/depth range
Carangidae: <i>Seriola lalandi</i> (P, C)	Transient/0–4	Size 2 m; not at Comoros; 20–110 m
Carangidae: ? <i>Seriola rivoliana</i> (P, C)	Transient/0–2	Size 1.5 m; 10–120 m
Labridae: ? <i>Bodianus trilineatus</i> (f, C)	Transient/0–2	Rear half of tail fin black
Labridae: <i>Suezichthys</i> (?) sp (f)	Resident/0–3	South Island Rock
Uranoscopidae: <i>Uranoscopus archionema</i> (f)	Resident/Nil	Known in area; 20–300 m
Percophidae: <i>Bembrops nematopterus</i> (f)	Resident/Nil	Known in area; 200–300 m
Percophidae: <i>Osopsaron natalensis</i> (f)	Resident/Nil	Known in area; 100 m
Percophidae: <i>Pteropsaron heemstrai</i> (f)	Resident/Nil	Known in area; 100 m
Pinguipedidae: <i>Parapercis maritzi</i> (f)	Resident/Nil	Known in area; 150–196 m
Callionymidae: <i>Callionymus gardineri</i> (f)	Resident/Nil	Known in area; 30–180 m
Callionymidae: <i>Paracallionymus costatus</i> (f)	Resident/Nil	Known in area; 55–400 m
Gempylidae: * <i>Neopinnula orientalis</i> (f, C)	Resident/Nil	Known in area; 200–570 m
Gempylidae: * <i>Ruvettus pretiosus</i> (f, P, C)	Resident/Nil	Known in area; size 2 m; 100–700 m
Gempylidae: * <i>Promethichthys prometheus</i> (f, C)	Resident/Nil	Known in area; 100–750 m
Gempylidae: <i>Rexea prometheoides</i> (f)	Resident/Nil	Known in area; 135–540 m
Gempylidae: <i>Thyrsooides marleyi</i> (f, C)	Resident/Nil	Known in area; 120–200 m
Trichiuridae: <i>Bethodesmus tenuis</i> (f, C)	Resident/Nil	Known in area; 200–850 m
Trichiuridae: <i>Trichiurus lepturus</i> (f, C)	Resident?/Nil	Known in area; 1–350 m
Priacanthidae: * <i>Pristigenys nipponia</i> (f.)	Resident/0–1	80–200 m
Apogonidae: <i>Apogon</i> sp (f)	Transient?/0–1	Black spot at base of tail fin
Acropomatidae: <i>Neoscombrops cynodon</i> (f)	Resident/Nil	Known in area; 100–500 m
Scombroptidae: <i>Scombrops boops</i> (f, P, C)	Resident/Nil	Known in area; size 1.5 m; 20–400 m
Haemulidae: <i>Pomadasys stridens</i> (f)	Transient/0–4	Known in area; 2–110 m
Lutjanidae: * <i>Aphareus furca</i> (f, C)	Transient/Nil	Known in area; 6–122 m
Lutjanidae: * <i>Aphareus rutilans</i> (f, C)	Transient/Nil	Known in area; 100–300 m
Lutjanidae: <i>Aprion virescens</i> (f, C)	Transient/Nil	Known in area; 10–180 m
Lutjanidae: * <i>Etelis coruscans</i> (f, C)	Transient/0–1	Known in area; 100–400 m
Lutjanidae: <i>Lutjanus sebae</i> (f, C)	Transient/Nil	Known in area; 5–180 m
Lutjanidae: <i>Paracaesio sordida</i> (f)	Resident/2–6	Occurs on Sodwana coral reefs; 20–250 m
Lutjanidae: * <i>Paracaesio xanthura</i> (f)*	Resident/0–20	Known in area; 5–150 m

\*Canyons surveyed: Jesser, Wright, Diepgat, Chaka, Mabibi, South Island Rock, and White Sands. The Status/number column refers to a depth preference for a species and how often it was seen or photographed on video tape in the canyons. Based on depth preferences and frequency of occurrence in the canyons, we posit two broad niches (resident and transient) for members of this deep demersal fish community. A species that was seen in the canyons commonly (10–20 sightings) or often (>20 sightings) or in groups of six or more individuals is considered a resident member of this community, and it is more common (more often seen or more abundant) below 50 m than it is at lesser depths. A species that was seen occasionally (6–10 sightings) commonly or often, but is more common above 50 m is considered a transient member of this community. Some species may be transient as juveniles and resident as adults (T/R).

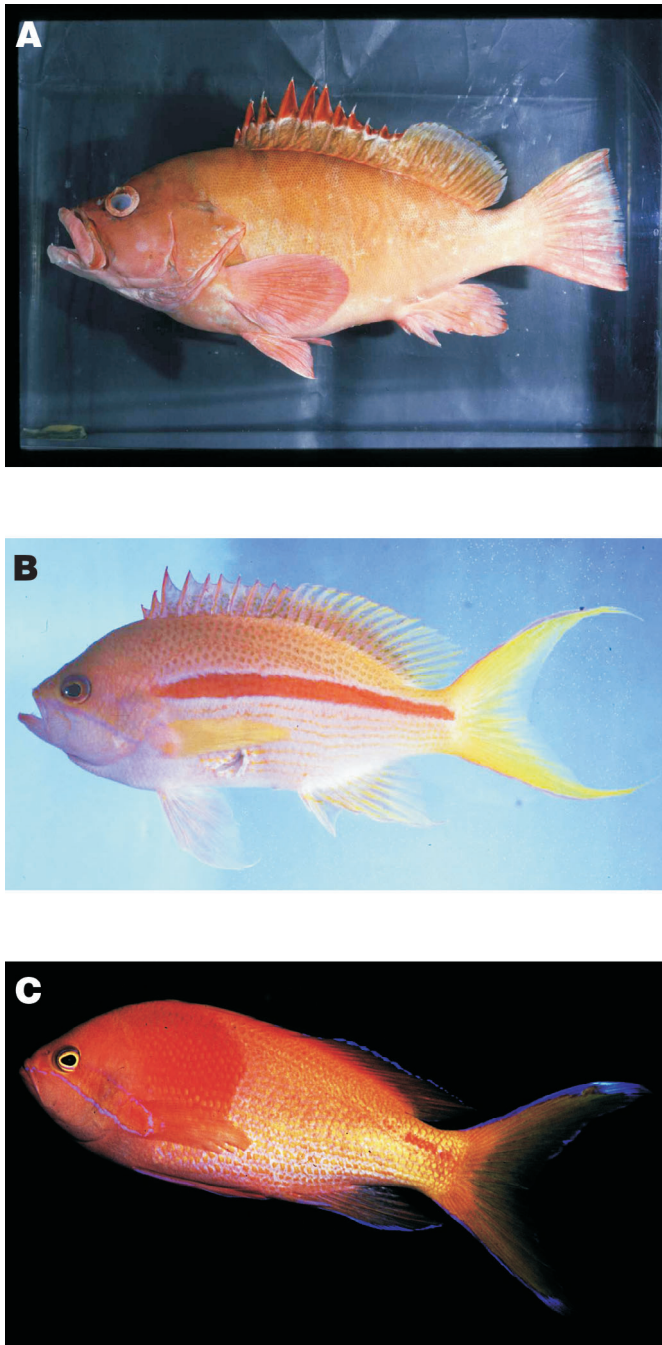
The number of individuals seen on video tapes per 4-hour dive during 13 survey dives from February 31 to April 19, 2002 is given after the status.

Interactions of species with *Latimeria chalumnae* are designated as potential food (f), known food (F), potential predator (P), potential competitor (C), and no known direct interaction (X).

Species with an asterisk (\*) are also known in the coelacanth habitat at the Comoro Islands.

in the Sodwana canyons is the much larger area of coral reefs, estuaries and shallow-water rock and sand habitat that occurs along the coast of northern KwaZulu-Natal and southern Mozambique, compared to the extremely narrow (mainly 50–200-m-wide) fringing coral reef and dearth of estuaries at Ngazidja. The biomass of the canyon habitat is ultimately sustained by the primary productivity of the adjacent shallow-water ecosystem. Although the coral reef ecosystem of the Greater St Lucia Marine Protected Area is the southern end of the vast Indo-Pacific coral reef system, it is still a viable coral reef habitat, high in productivity, with a typical large, diverse fish fauna.

Fricke and Hissmann show a significant increase in *Latimeria* prey density with increasing depth from 200–400 m at Grand Comoro.<sup>9</sup> And their acoustic tracking studies show that Comoran coelacanths spend 90% of their nocturnal foraging time below 200 m, with occasional excursions to 700 m. The greater accessibility and abundance of prey fish in the Sodwana coelacanth habitat, and the decrease in fish abundance with



**Fig. 1.** (A) Red-tipped grouper, *Epinephelus retouti*, 34 cm SL, SAIAB 21168, Bassas da India, Mozambique Channel. (B) Red-banded anthias, *Pseudanthias fasciatus* female, 115 cm SL, Landers Reef, KwaZulu-Natal; photograph P.C.H.; (C), *Pseudanthias fasciatus* male, Landers Reef, photograph Dennis King.

depth in the Sodwana canyons may preclude the nightly vertical migrations that are typical of Comoran coelacanths.<sup>10</sup>

In the four Comoro Islands, only Ngazidja (Grand Comoro) and Anjouan support populations of coelacanths. Both of these volcanic islands are relatively young, perhaps only two to four million years old; and the fringing reefs along their coasts are narrow, because of the steep (23–45°) slope of their rocky shores.

The Comoran coelacanths spend the daylight hours resting in caves between 164 and 243 m, and there are no suitable caves at greater depths.<sup>9</sup> Owing to the oceanographic conditions at Ngazidja, the caves are located in an oxygen minimum region between 150 and 300 m and a temperature range of 18–22°C. This oxygen minimum region in the vicinity of the Comoran caves may be another factor contributing to the low fish populations in this region. Forster reported exceptionally low fish catches in coelacanth depths at Grand Comoro Island, compared to similar depths at nearby Indian Ocean islands.<sup>11</sup> The extremely low resting metabolism for coelacanths estimated by Hughes (1976, 1995) from the unusually small area of *Latimeria* gill lamellae and the oxygen dissociation curve for coelacanth haemoglobin with a high affinity for O<sub>2</sub> at 15°C<sup>12</sup> indicate that *Latimeria* is specially adapted for its barren habitat with low prey biomass and low oxygen levels. Coelacanth predators (large sharks) and competitors (other large active piscivores such as rock cods, carangids, lutjanids, and sharks) would probably avoid this low-energy habitat, as it would be 'unprofitable' or 'inefficient' for these more active fish to forage in this region.

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