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A PRELIMINARY INVESTIGATION OF THE MARINE ICHTHYOFAUNA IN THE TSITSIKAMMA COASTAL NATIONAL PARK

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Abstract — Sixty-five species representing 29 families were recorded in a survey of the marine ichthyofauna of the Tsitsikamma Coastal National Park. Visual assessments of the composition of the fish communities at three inshore reef types indicated differences in the species composition and size of fishes present. Areas which are closed to fishing protect many species important to the South African linefishery whereas a recent seaward extension of the park boundary in 1983 will also include areas inhabited by species important to the demersal trawl fishery.

Introduction

The Tsitsikamma Coastal National Park (TCNP) situated on the southern Cape coast between Nature's Valley (34°59′S, 23°34′E) and Oubosstrand (34°04′S, 24°12′E), covers approximately 60 km of coastline. For the duration of this study the marine sanctuary extended 0,8 km offshore but in September 1983, except for a short section on the western side, this boundary was increased to 5,6 km offshore (Fig. 1). Within this area public fishing is prohibited except for a 2 km stretch close to the rest camp where shore fishing is allowed.

Published ichthyological research relating to the TCNP includes analyses of handline and demersal catches (Crawford & Crous 1982; Crawford 1982) and notes on sex reversal in the Roman *Chrysoblephus laticeps* (Penrith 1972) and the dageraad *C. cristiceps* (Robinson 1976). In addition a guide to the marine fishes of the park has been published (Smith & Smith 1966).

This paper presents a checklist of marine species recorded in the park and preliminary observations on the distribution and abundance of some suprabenthic species, especially those of commercial importance. The study forms part of a long-term investigation of the ichthyofauna aimed at a better understanding of the role of reserves as a means of conserving marine fish.

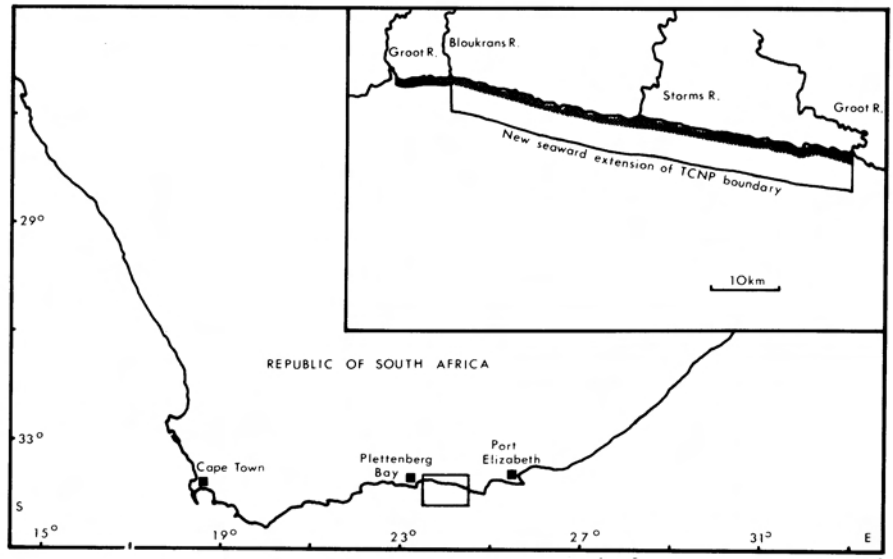

Fig. 1. Map of the Tsitsikamma Coastal National Park.

Study Area

The geology of TCNP is characterised by a large sandstone syncline with an east-west axis. Steeply dipping beds in the southern limb of this fold have produced the cliffs characteristic of the shoreline (Toerien 1976) while subtidally, they provide a series of parallel reefs separated by sand filled valleys. A detailed side-scan survey of the whole park shows that most of the reefs are of sandstone origin with the exception of a series of reefs on the eastern border which may be aeolianite deposits similar to those occurring off the Wilderness (Flemming, Eagle, Fricke, Hunter, Martin, Schumann, Swart & Zoutendyk 1983; B.W. Flemming, National Research Institute of Oceanography, *pers. comm.)*.

Fig. 2. Shallow inshore zone dominated by macroalgae.

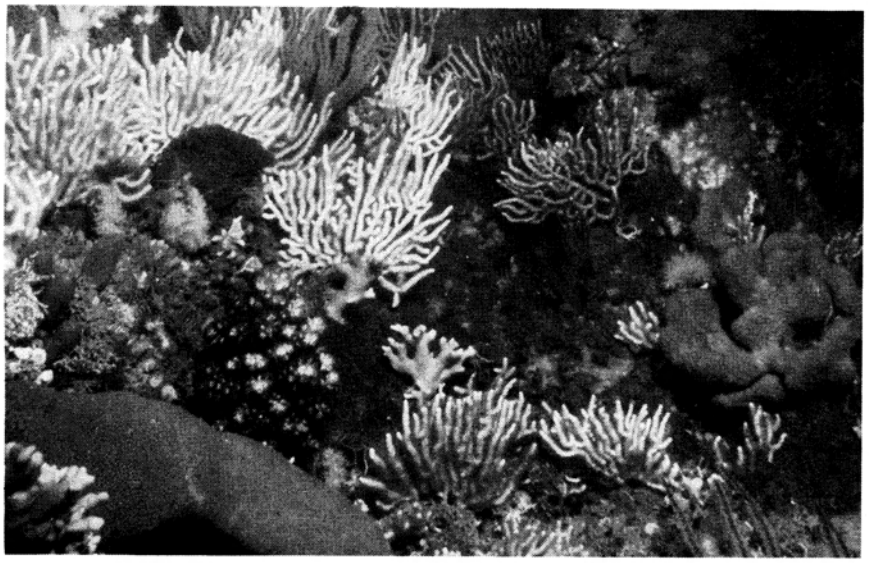

Fig. 3. Reef type 2 found between 10 and 25 m showing the dominance of filter-feeders.

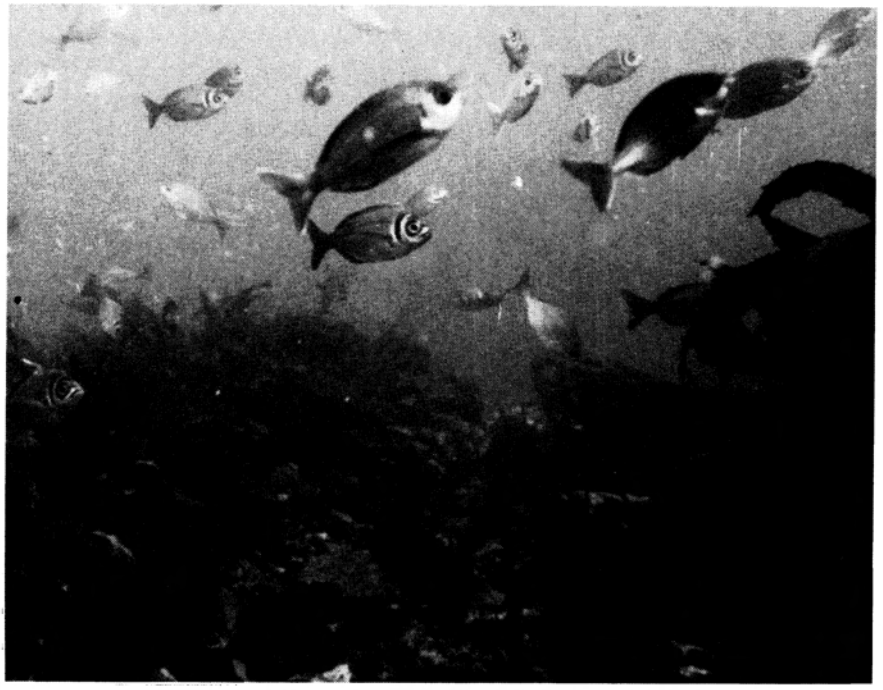

Fig. 4. Deep reef type 3 found below 25 m.

To date underwater observations have been restricted to accessible reefs approximately 5 km on either side of the Storms River mouth. Although detailed benthic surveys have not been undertaken in the TCNP, for the purposes of this study three distinct reef types were recognised. The first, a shallow inshore zone extending subtidally from the coastline to about 10 m, consists of low reefs interspersed by extensive sandy flats. The reefs appear to be dominated by calcareous algae, with only few echinoderms, octocorals, poriferans and ascidians present (Fig. 2).

The second reef type found in water between 10 and 25 m, is characterised by a rugged relief. Macroalgae typical of TYPE 1 reef are absent, but microalgal cover is evident (N. Jarman, Sea Fisheries Research Institute, *pers. comm.)*. The benthic fauna is rich in ascidians (particularly the redbait *Pyura stolonifera* on the reef crests), poriferans, octocorals, echinoderms and reef-building and encrusting bryozoans (Fig. 3). The relief, incorporating overhangs, caves and cracks, provides shelter for associated fish species.

A third reef type is found in water below 25 m. Similar in appearance to the TYPE 2 reef, but not as rugged, it differs mainly in depth, the absence of *Pyura,* and the presence of large stands of kelp *Ecklonia bisperforata* (Fig. 4).

Sampling methods

Information on the fish species composition was obtained from visual observations and rotenone collections accumulated between June 1980 and July 1982 and was supplemented by handline fishing. The use of visual techniques for assessing fish populations has been well documented (Russel 1977; Keast & Harker 1977; Bohnsack & Talbot 1980; Craik 1981). These techniques have the advantage of providing a non-destructive method of sampling. This was particularly attractive in the marine reserve context where killing of fish was avoided as far as possible. Fish were identified and counted on a 10 m wide transect by two divers swimming from opposite ends of a 30 m line. Total fish lengths were estimated by comparison with a ruler and limited spearing of representative species. After each dive observations were pooled and averaged for each species. The method has disadvantages, including avoidance of SCUBA divers by certain species (Chapman, Johnstone, Dunn & Creasy 1974), under-estimation of the abundance of cryptic species (Brock 1982) and inability to sample at depths greater than 30 m using SCUBA. Four rotenone stations were carried out between 10 and 30 m by releasing 2-4 litres of solution underwater in calm conditions. Dead fish were then collected by divers using hand-nets. The rotenone was made up from a solution of acetone, 400 ml of dry rotenone resin powder and 500 ml of teepol. Handline fishing was done over a variety of depth and substrate types using a number of baits including squid, pilchard, reef fish and redbait. Most of the fishing took place over reefs as part of an ongoing investigation into the biology of reef fish important to the South African linefishery.

Table 1

Species of fish recorded in the Tsitsikamma Coastal National Park with a classification of prefered habit and sampling methods (C-cryptic, E-exposed, T-transect, R-rotenone, L-linefishing)

Scientific Name	Common Name	Sample Method and Habitat
CHONDRICHTHYES		
Odontaspidae		
Eugomphodus taurus (Rafinesque, 1810)	spotted ragged-tooth	T E
Scyliorhinidae		
Poroderma africanum (Gmelin, 1789)	striped catshark	R T L E
Poroderma pantherinum (Muller & Henle, 1841)	leopard catshark	R E
OSTEICHTHYES		
Ariidae		
Galeichthys feliceps (Valenciennes, 1840)	sea-catfish	R T C
Gadidae		
Gaidropsarus capensis (Kaup, 1858)	Cape rockling	R C
Ophidiidae		
Bidenichthys capensis Barnard, 1934	freetail brotula	R C
Congrogadidae		
Halidesmus scapularis Gunther, 1871	snakelet	R C
Trachichthyidae		
Trachichthodes spinosus Gilchrist, 1903	spiny slimehead	R C
Cheilodactylidae		
Cheilodactylus fasciatus Lacepede, 1803	red fingers	R T E
Cheilodactylus pixi Smith, 1980	barred fingerfin	R T E
Chirodactylus brachydactylus (Cuvier, 1830)	twotone fingerfin	R T E
Chirodactylus grandis (Gunther, 1860)	bank steenbras	T E
Serranidae		
Acanthistius sebastoides (Castelnau, 1861)	koester	R T L E
Epinephelus gauza (Linnaeus, 1758)	yellowbelly rockcod	R T E
Oplegnathidae		
Oplegnathus conwayi Richardson, 1840	Cape knifejaw	R T E
Carangidae		
Seriola lalandi Valenciennes, 1833	Cape yellowtail	T E
Pomatomidae		
• *Scombrops dubius* Gilchrist, 1922	gnomefish	T E
Pomatomus saltatrix (Linnaeus, 1766)	elf	L E
Sciaenidae		
Argyrosomus hololepidotus (Lacepede, 1802)	kob	T E
Mullidae		
Pseudopeneus pleurotaenia (Playfair, 1866)	red mottled goatfish	R E
Monodactylidae		
Monodactylus falciformis (Lacepede, 1801)	Cape moony	T E
Chaetodontidae		
Chaetodon marleyi (Regan, 1921)	double sash butterflyfish	T E
Coracinidae		
Coracinus capensis (Cuvier, 1829)	galjoen	T E
Pomadasyidae		
Pomadasys olivaceum Day, 1875	piggy	T E
Rhonciscus striatus (Gilchrist & Thompson, 1908)	striped grunter	R T E

Table 1 *(cont.)*

Scientific Name	Common Name	Sample Method and Habitat
Sparidae		
Argyrozona argyrozona (Valenciennes, 1830)	carpenter	R T L E
Boopsoidea inornata Castelnau, 1861	fransmadam	R T L E
Chrysoblephus cristiceps (Cuvier, 1830)	dageraad	T L E
Chrysoblephus gibbiceps (Cuvier, 1830)	red stumpnose	T L E
Chrysoblephus laticeps (Cuvier, 1829)	roman	R T L E
Cymatoceps nasutus (Castelnau, 1861)	poenskop	T E
Diplodus cervinus (Valenciennes, 1843)	zebra	T E
Diplodus sargus Linnaeus, 1758	blacktail	R T E
Gymnocrotaphus curvidens Gunther, 1859	janbruin	T E
Lithognathus lithognathus (Cuvier, 1830)	white steenbras	T E
Lithognathus mormyrus (Linnaeus, 1758)	sandsteenbras	T E
Pachymetopon aeneum (Gilchrist & Thompson, 1908)	blue hottentot	R T L E
Pachymetopon grande Gunther, 1859	bronze bream	T E
Pagellus natalensis Steindachner, 1902	red tjor-tjor	T E
Petrus rupestris (Valenciennes, 1830)	red steenbras	T L E
Porcostoma dentata (Gilchrist & Thompson, 1908)	dane	R E
Pterogymnus laniarius (Cuvier, 1830)	panga	T L E
Rhabdosargus globiceps (Cuvier, 1830)	white stumpnose	T E
Rhabdosargus holubi (Steindachner, 1881)	Cape stumpnose	T E
Sarpa salpa (Linnaeus, 1766)	strepie	T E
Sparodon durbanensis (Castelnau, 1861)	musselcracker	T E
Spondyliosoma emarginatum (Cuvier, 1830)	steentjie	T E
Mugilidae	mullet	T
Gobiidae		
Gobius sp.	goby	R C
Nematogobius agulhensis (Barnard, 1927)	Agulhas goby	R C
Blenniidae		
Parablennius pilicornis (Cuvier, 1829)	blenny	R C
Blennius sp.	blenny	R C
Chalaroderma ocellata (Gilchrist & Thompson, 1908)	two-eyed blenny	R C
Clinidae		
Clinus striatus Gilchrist & Thompson, 1908	striped klipfish	R C
Clinus sp.	klipfish	R C
Cremnochorites capensis (Gilchrist & Thompson, 1908)	false triplefin	R C
Pavoclinus laurentii (Gilchrist & Thompson, 1908)	rippled klipfish	R C
Pavoclinus pavo (Gilchrist & Thompson, 1908)	peacock klipfish	R C
Pavoclinus profundus Smith, 1960	deepwater klipfish	R C
Xenopoclininae		
Xenopoclinus leprosus Smith, 1961	leprous platannaklipfish	R C
Xenopoclinus (spp.nov.)	klipfish	R C
Scorpaenidae		
Coccotropsis gynnoderma (Gilchrist, 1906)	smoothskin scorpionfish	R C
Triglidae		
Trigloporus africanus Smith, 1934	African gurnard	R C
Gobiesocidae		
Diplecogaster megalops Briggs, 1955	bigeye clingfish	R C
Congridae		
Conger sp.	conger eel	R C

Table 1 *(cont.)*

Scientific Name	Common Name	Sample Method and Habitat	
Batrachoididae			
Tharbacus vanecki Smith, 1952	toadfish	R	C

Results and Discussion

A total of 65 species representing 29 families were recorded in the TCNP during this study (Table 1). On the basis of habit and colouration the fish were subjectively classified as being cryptic or exposed. Although no attempt was made to quantify rotenone collections by encircling the reef with nets (Russel, Talbot, Anderson & Goldman 1978) it is clear that most of the cryptic species sampled using rotenone (95%) were overlooked during visual census. Conversely, many of the more mobile species, particularly sparids, were able to escape the effects of rotenone. Some 153 species representing 64 families thought to occur in the TCNP (Smith & Smith 1966) were not recorded during this survey. This discrepency may be partially explained by the fact that depth limitations of this study (<30m) omitted the many demersal trawl species associated with the area. These include the sole *Austroglossus pectoralis,* gurnards *Chelidonichthys capensis* and *C. kumu,* hake *Merluccius capensis,* kingklip *Xiphiurus capensis,* monk *Lophius piscatorus* and snoek *Thrysites atun* (Crawford 1982). Most are associated with deep water (Botha 1980; Hatanka, Sato, Augustyn, Payne & Leslie 1983) and probably did not contribute to the ichthyofauna associated with the TCNP prior to the extension of the seaward boundary. In addition many of the inclusions in Smith's reference were based on the known distributional ranges of species which would not normally be found in the park. These include the devilfish *Manta birostris,* pompano *Trachinotus blochii,* marlins and other tropical vagrants.

Visual assessment of the suprabenthic species composition suggested differences between the ichthyofauna of the three reef types studied. The relative abundance of species found in shallow subtidal areas (TYPE 1) is summarised in Table 2. Although size at sexual maturity for most of these species is unknown, they were separated into small and large sizes with the inference that small fish represented juveniles of the species. The area supported three distinct groups of fish. The first, typically shallow water species, included zebra *Diplodus cervinus,* blacktail *D. sargus,* mullet *Mugil* spp., bronze bream *Pachymetopon grande,* Cape stumpnose *Rhabdosargus holubi,* strepie *Sarpa salpa* and musselcracker *Sparadon durbanensis.* Both large and small specimens were present. Studies on these fish suggest that their distribution may be attributed to feeding preferences (Christensen 1978; Blaber 1974; Joubert 1981; Lasiak 1982; Buxton & Kok 1983). The second group were represented mainly by juveniles of species more common in deeper water including fransmadam *Boopsoidea inornata,* dageraad *Chrysoblephus cristiceps,* Roman *C. laticeps,* poenskop *Cymatoceps nasutus,* blue hottentot *Pachymetopon aeneum,* red steenbras *Petrus rupestris* and steentjie *Spondyliosoma emarginatum.* These fish were only present between December and

Table 2

Visual assessment of species found in shallow subtidal areas in the TCNP (xxx – abundant, xx – common, x – uncommon). *Approximate sizes (total length in mm) of small fish are given and species important to the linefishery are asterisked*

Species	Relative Abundance small	(mm)	large
Boopsoidea inornata	xxx	<50	x
Chaetodon marleyi	x	<50	x
Cheilodactylus fasciatus	xxx	<50	xxx
Cheilodactylus pixi	x	<50	x
Chirodactylus brachydactylus	xxx	<75	xxx
**Chrysoblephus cristiceps*	x	<100	
**Chrysoblephus laticeps*	xx	<75	x
**Cymatoceps nasutus*	x	<100	
Diplodus cervinus	xxx	<75	xx
**Diplodus sargus*	xxx	<75	xx
Gymnocrotaphus curvidens			x
Lithognathus lithognathus	x	<75	x
Lithognathus mormyrus	x	<50	xx
Monodactylus falciformis			x
Mugil spp.	xx	<100	xxx
Oplegnathus conwayi	x	<100	xx
**Pachymetopon aeneum*	x	<50	
**Pachymetopon grande*			x
Pagellus natalensis			x
**Petrus rupestris*	x	<300	
Pomadasys olivaceum			xx
Rhabdosargus holubi			xx
Rhonciscus striatus			x
Sarpa salpa	xxx	<100	xxx
**Sparadon durbanensis*	xx	<150	x
Spondyliosoma emarginatum	x	<75	

Total observation time = 460 minutes.

April suggesting an influx of recruits over a short period of time and hence a restricted breeding season for the species. The third group including white and sand steenbras *Lithognathus lithognathus* and *L. mormyrus,* moony *Monodactylus falciformis,* red tjor-tjor *Pagellus natalensis* and piggy *Pomadasys olivaceum* are species associated with sandy substrates (Mehl 1973; Joubert & Hanekom 1980; Buxton, Smale, Wallace & Cockroft 1984).

The composition of suprabenthic species found on reefs at depths between 10 and 25 m (TYPE 2) is summarised in Table 3. The results show that *Sarpa salpa, B. inornata, Pachymetopon aeneum* and *Spondyliosoma emarginatum* were the most numerous (93%) of the 27 species recorded. Significantly 15 of the remaining species were also of the family Sparidae, which therefore forms 70% of the species found over reef TYPE 2. This domination by a single family differs considerably from the diversity found on tropical reefs

Table 3

Percentage contribution of species to all fish observed on underwater transects and approximate total length ranges of fish observed on reef types 2 and 3. Species important to the handline fishery are asterisked

Species	TYPE 2 Reef		TYPE 3 Reef	
	%contribution	Length range (mm)	%contribution	Length range (mm)
Acanthistius sebastoides	0,05	125-200		
**Argyrozona argyrozona*			13,82	275-400
Boopsoidea inornata	31,02	75-250	27,28	175-200
Chaetodon marleyi	0,01	75-100		
Cheilodactylus fasciatus	0,34	75-300	0,38	225-250
Cheilodactylus pixi	0,24	75-150	0,03	100-125
**Cheimerius nufar*	0,03	200-250		
Chirodactylus brachydactylus	1,05	125-350	0,06	225-250
Chirodactylus grande	0,02	650-700		
**Chrysoblephus cristiceps*	0,43	125-550		
**Chrysoblephus gibbiceps*	0,05	75-350	0,55	225-450
**Chrysoblephus laticeps*	1,95	75-400	1,12	125-350
Coracinus capensis	0,04	275-300		
**Cymatoceps nasutus*	0,01	650-700		
Diplodus cervinus	0,34	125-350		
**Diplodus sargus*	0,25	125-300		
**Epinephelus guaza*	0,04	275-450	0,06	300-400
Gymnocrotaphus curvidens	0,44	125-350	0,19	275-300
Oplegnathus conwayi	0,77	75-550		
**Pachymetopon aeneum*	17,44	75-350	15,84	125-300
Pachymetopon grande	0,03	300-350		
Pagellus natalensis	0,02	150-175		
**Petrus rupestris*	0,88	175-700	0,27	225-900
Rhabdosargus holubi	0,57	75-300	0,06	200-250
Rhonsiscus striatus	0,01	75-100		
Sarpa salpa	32,88	75-150		
Scombrops dubius			16,38	150-200
**Sparadon durbanensis*	0,13	250-450		
Spondyliosoma emarginatum	10,86	75-200	23,99	125-200
Sharks	0,11		0,03	
Number of transects	20		4	
Total number of fish	10 378		3 669	

(Risk 1972; Alevizon & Brooks 1975; Brock, Lewis & Wass 1979; Bohnsack & Talbot 1980). Observations on reefs in other areas of the southern Cape (Zoutendyk 1982 and personal observations in Algoa Bay) confirm the dominance of sparids on temperate reefs in this region. Although many of the species found on TYPE 1 and TYPE 2 reefs were similar, observations showed that fewer juveniles were present on the deeper reefs. This was particularly true for important linefish species with the exception of *Petrus rupestris*, juveniles of which were more common in this depth range.

Depth, bottom time and poor visibility imposed severe restrictions on the visual assessment of deep reefs (TYPE 3) and as a result only 4 transects were successfully completed during the study period. Combining these results with incidental observations showed that these areas had a lower suprabenthic species diversity than shallower reefs. *Boopsoidea inornata, S. emarginatum* and *Pachymetopon aeneum* were still numerically important whereas *Sarpa salpa* were not recorded at all. Silverfish *Argyrozona argyrozona* and gnomefish *Scombrops dubius,* species not recorded on shallower reefs, were important. Red stumpnose *Chrysoblephus gibbiceps* were seen in greater numbers on these reefs compared to the shallower study sites. Although the absence of many species may be explained by their preference for shallower water, the lack of *C. cristiceps* was unexpected as they are caught on line at this depth. This may be attributed to a tendancy to avoid divers, aggravated by poor visibility. This behaviour is also thought to bias the shallow water results as the ratio of *C. cristiceps* to *C. laticeps* is far greater in line catches than in the visual assessments.

The results presented in this study show that a wide variety of important commercial species are afforded protection by the TCNP. Prior to the extension of the seaward boundary, the majority of the protected fishes were important to the linefishery. Clearly, the extended boundary will incorporate areas inhabited by a number of important trawl species (Crawford 1982), but whether this extention will afford significant protection to trawl species needs further investigation. Shallow water trawling surveys (<50 m) off the Cape south coast provided little evidence of an inshore nursery for the target species of the demersal trawl fishery (Wallace, Kok, Buxton & Bennet 1984; Smale 1984), whereas Hatanka *et al.*(1983) demonstrated that both adults and juveniles of species important to the demersal trawl fishery were most abundant on the Agulhas bank west of Mossel Bay well outside the TCNP.

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