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6.2 ROCKY REEFS

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INTRODUCTION

Rocky reefs are found in patches along the entire KZN coast, extending from the intertidal region to greater depth, in places even to the edge of the continental shelf. While intertidal and near subtidal reefs are dealt with in Section 6.1, the focus here is on reefs at greater depth than 5 m. Conspicuous reef formations are found just south of Durban, comprising Aliwal Shoal, Landers Reef and Protea Banks. Similar formations are located to the north in Maputaland, where they are encrusted by coral communities and are dealt with as Coral Reefs (Section 6.1). The rocky reefs are inhabited by a wide diversity of algal and invertebrate life (Jackson 1976, Sink *et al.* 2005, Porter *et al.* 2013) as well as an estimated 500 reef-associated fish species. This highlights the high value of the biodiversity on subtidal rocky reefs along the KZN coast.

It is difficult to isolate suitable indicators of the condition or state of rocky reefs as their morphology and biodiversity are variable; one must thus determine commonalities between them. These are best sought amongst the well-studied resources extracted from this environment. Potential indicators are found amongst the most extracted benthic invertebrates: the oyster, *Striostrea margaritacea*, redbait, *Pyura stolonifera*, and panulirid rock lobsters, principally *Panulirus homarus*. The first two are patchy in distribution, cryptic and difficult to find (Berry 1982) while the last is nearly ubiquitous, is the most sought of KZN's subtidal rocky reef resources (Berry 1971a, b) and has excellent indicator value. While oysters are exploited in a limited commercial fishery (Schleyer 1991, De Bruyn *et al.* 2008), the other two are only harvested recreationally as they are sensitive to overexploitation (Robertson 2002). Limited brown mussels (*Perna perna*) also occur on the rocky reefs in question, but they primarily inhabit the intertidal zone (Berry 1978).

Redbait, *Pyura stolonifera*
Photo: Sean Porter

P. homarus is the prevalent spiny rock lobster on KZN rocky reefs, being found wherever suitable habitat and adequate food are available (Berry 1971a, b). As far as habitat is concerned, it takes refuge in crevices and small caves that are not subject to excessive sand movement or sedimentation during the day. It ventures forth at night to feed, and while it is considered a generalist feeder, it favours molluscs and small crustaceans, particularly barnacles and the mussel, *P. perna*. Both are suspension feeders and *P. homarus* thus feeds at the upper levels of the reef invertebrate food web. This gives the condition of its stock potential indicator value within protected and managed populations, both in terms of the population status of *P. homarus* itself and of reef biodiversity. Furthermore, *P. homarus* can live for approximately eight years, and being a 'top' predator, it probably bioconcentrates pollutants; longevity imparts animals with this attribute. *P. homarus* thus may also have indicator value for this parameter. Little is known of the longevity of redbait, but mussels can live for up to three years, while oysters live for up to 12 years (with few probably doing so). These suspension feeders probably have similar indicator potential for pollution (Section 2.3).

DRIVERS

HABITAT DEGRADATION

The habitat of *P. homarus* comprises crevices and small caves that may be rendered uninhabitable by sedimentation. While the KZN coastline is subjected to considerable natural sediment movement, this can be exacerbated by anthropogenic perturbation (e.g., sand pumping, the construction of berms and piers). The principal habitat of *P. perna* and *P. stolonifera* is accessible at low tides and vulnerable to trampling by anglers and tourists.

REEF DEGRADATION

Episodic storms, which are expected to increase in frequency and intensity with climate change, affect the biodiversity and productivity of reefs through direct damage and increased turbidity. This is exacerbated by degradation of reefs through anthropogenic pressures. These factors, in turn, affect the food supply of *P. homarus*, a top predator dependent on molluscs and small crustaceans.

PRESSURES

EXPLOITATION

The resources in this habitat are vulnerable to exploitation, but apart from *Striostrea margaritacea*, can only be fished recreationally. *P. homarus* and *S. margaritacea* are in demand and are heavily fished; *P. perna* and *P. stolonifera* are most prolific in the intertidal and near-subtidal areas and are thus also subjected to harvesting.

P. homarus is possibly the most ubiquitous of the larger invertebrates on KZN rocky reefs. It is also the most valuable and studied of the reef resources, and population assessments of its KZN stock have, at various times, been undertaken. This is accomplished by diver surveys, the results of which will have indicator value. A considerable wealth of literature is thus available to evaluate and interpret the results of such surveys which, due to their complexity, must be undertaken by experienced scientists.

POLLUTION

The effects of pollution on the environment are well-established, ranging for example from impaired reproduction to stunted growth, increased vulnerability to disease and outright mortality. Preliminary research has shown that OCPs are found in high concentrations in benthic reef organisms collected on South Africa's coral

reefs (Porter *et al.* 2018b) and an ORI proposal is under consideration to expand this research to KZN's rocky reefs where these substances also constitute a problem (Greyling 2018). *P. homarus* will be a good candidate for this research, as well as *P. perna*, *P. stolonifera* and *S. margaritacea* within their patchy distribution.

STATE

As stated, *P. homarus* is one of the most intensely studied marine invertebrates in KZN; this research has been ongoing since the late 60s in the last century and has covered the taxonomy, biology, behaviour and genetics of this species (Berry 1970, 1971a, b, 1974, Smale 1978, Steyn and Schleyer 2011, Reddy *et al.* 2014). Much of this information was summarised by Steyn and Schleyer (2009) in a document that focused on management of the resource.

Ongoing invertebrate catch statistics monitoring (Steyn and Schleyer 2014) provides background information on trends in the harvest of this valuable resource, thereby revealing levels of exploitation (Steyn *et al.* 2008, Steyn and Schleyer 2009). This shows where the harvest is sustainable, and where *P. homarus* retains indicator value, or where regulation of fishing is needed to prevent over-exploitation of the stock. An indication of the extent of the harvest of this resource, mostly by divers (Figure 6.3), and the other target species in KZN is presented in Table 6.1.

Perna perna, *P. stolonifera* and *S. margaritacea* have been subjects of both harvest monitoring (Table 6.1; Steyn and Schleyer 2014) and research in KZN, and this includes a limited amount of information on their bioconcentration of pollutants and metals.

Table 6.1: Representative data on the annual *P. homarus*, *P. perna*, *P. stolonifera* and *S. margaritacea* harvest (tonnes) in KZN. All are for landed weight except for *S. margaritacea*, which is for shelled weight (flesh only).

Year	*Panulirus homarus*	*Perna perna*	*Pyura stolonifera*	*Striostrea margaritacea*
2003	51.2	44.2	2.45	0.015
2005	52.6	43.9	1.47	0.42
2006	53.9	34.9	2.87	0.67
2007	25.9	20.8	1.54	0.19
2008	47.0	32.8	2.47	0.05
2009	31.7	37.6	3.05	0.17
2010	24.7	19.11	0.94	0.20
2011	49.3	48.6	2.60	0.12
2012	40.3	24.8	9.42	0.88

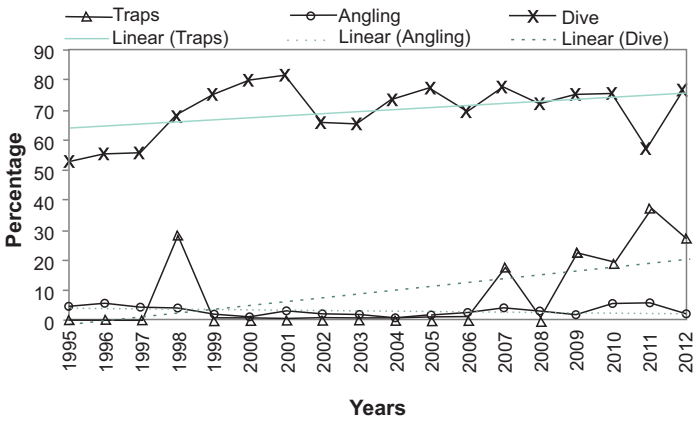

Figure 6.3: Comparative percentage of rock lobster harvesters employing the various collecting methods: snorkel diving, traps and angling (Steyn and Schleyer 2014).

IMPACT

Reef habitats are biologically productive and provide multiple resources and ecosystem services of benefit to humankind. Impacts of reduced reef biodiversity and productivity affect reef community structure, and in consequence, their economic value. In all these respects, the rocky reefs of KZN provide benefits to its coastal communities and support ecotourism, diving and angling.

RESPONSE

Ongoing invertebrate catch statistics monitoring will provide background information on trends in the harvest of these valuable resources, thereby revealing the levels of exploitation. This will provide management recommendations for refinement of management protocols to ensure their sustainable harvest. Additional funding is required for long-term monitoring of the marine invertebrate resources on the KZN coast for this purpose.

Data Requirements

Diver surveys are conducted by experienced rock lobster fishers in timed dives. The fishers bag their catch for on-shore measurement that yields size and catch-per-unit-effort data. Thereafter, the catch is released back into the environment. These data provide a measure of the 'health' and abundance of the lobster stock, providing an indirect measure, or indicator of reef health (in localities that are not over-harvested).

Extracts from field-collected samples are subjected to sophisticated gas chromatography and mass spectrometry to measure pesticide residues in the samples relative to recognised standards; the process is thus costly. The results are subjected to statistical analysis to establish their significance.

Toxicological tests on living material in aquaria will be needed to establish cause and effect of the consequences of any high levels detected. Ongoing monitoring of their levels is essential to determine their upward or downward trend, and to predict the consequences and possible avenues for mitigation of their effects.

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Close-up of a bed of *Perna perna*
Photo: Sean Porter

Panulirus homarus clustered in a reef crevice
Photo: SAAMBR