Episodic recruitment of the rock oyster *Saccostrea cucullata* (Born, 1778) on the Transkei coast

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An exceptionally good recruitment of the rock oyster *Saccostrea cucullata* is reported from the Transkei coast. Prior to 1989 individuals smaller than 20 mm accounted for less than 3% of the population. New recruits now account for between 25% and 48% of standing stock. This single recruitment, which is 6 to 31 times the annual mean recorded over the last 6 to 7 years, represents 5 to 37 individuals m^{-2}. The variable nature of recruitment in this species is discussed in relation to its resistance to exploitation.

'n Buitengewone aanwerwing van die oester *Saccostrea cucullata* langs die kus van Transkei word berig. Voor 1989 het indiwidue wat kleiner as 20 mm was minder as 3% van die bevolking verteenwoordig. Na die huidige aanwerwing verteenwoordig hierdie groep tussen 25% en 48% van die bevolking. Hierdie aanwerwing, wat 6 tot 31 keer groter as die jaarlikse gemiddeld van die vorige 6 tot 7 jaar is, verteenwoordig 5 tot 37 indiwidue m^{-2}. Die wisselende aard van aanwerwing in die spesie word bespreek met betrekking tot weerstand teen ontginning.

The indigenous coastal people of Transkei are noted for their shellfish-gathering activities (Bigalke 1973; Derricourt 1977). One of the most heavily exploited species is the rock oyster *Saccostrea cucullata* (Born, 1778), which forms a distinct band in the mid- to upper balanoid zone. A recent study of the population dynamics of this species on the east coast revealed that most populations had a unimodal size distribution with few individuals smaller than 20 mm (Dye 1989). Long-term monitoring at several sites revealed that annual recruitment was low (1 – 3 m^{-2}) and rarely exceeded 3% of standing stock. In the Dwesa and Mkambati nature reserves natural mortality tended to balance recruitment resulting in stable populations, whereas up to 37% of standing stock was removed annually from exploited areas (Dye 1988).

Individual growth, while rapid in the first year after settlement, was generally slow and large individuals (90 mm) were approximately 20 years old. To account for this irregular size structure Dye (1989) postulated that *S. cucullata* experiences periods of unusually high recruitment separated by several years during which few new individuals appear. Owing to their longevity the resulting cohorts accumulate to form the population structure characteristic of this species. Between 1982 and 1988, however, no periods of exceptional recruitment had been recorded at any of the monitoring sites. In this paper evidence for a pulse of recruitment which was first detected during routine monitoring in June 1989 is presented.

Methods

In August and September 1989 the dorso-ventral height of between 300 and 450 rock oysters was measured to the nearest 0,5 mm at three sites on the Transkei coast. These were Nqabara, an exploited site approximately 2 km south of the Dwesa Nature Reserve, Dwesa South, and Mkambati, a game reserve on the north Pondoland coast. The population size structure at these sites was compared with earlier data obtained in 1987/88 (Dye 1989) and from a long-term monitoring programme which began in 1982 (Dye 1988).

Results and Discussion

Figure 1 compares the population size structure of *S. cucullata* as it was in 1988 with that in 1989 at the three study sites. Prior to 1989 the populations were unimodal in character with few small individuals. The situation changed dramatically in 1989 with the appearance of an additional mode between 15 and 20 mm at all sites. This cohort represents 48%, 25% and 29% of standing stock at Nqabara, Dwesa and Mkambati respectively. The actual recruitment at these sites was 5, 7 and 37 individuals m^{-2} respectively.

Figure 2 shows the mean annual recruitment of *S. cucullata* over six years at Dwesa and five years at Mkambati compared with the 1989 recruitment. Between 1982 and 1988 a total of nine individuals m^{-2} recruited to the shore at Dwesa, whereas a total of only six animals m^{-2} recruited at Mkambati in the five-year period between 1983 and 1988. The intensity of recruitment in 1989, however, represented a six-fold increase in the annual mean at Dwesa and a 31-fold increase at Mkambati.

The data in Figures 1 and 2 show that periods of unusually high recruitment of *S. cucullata* can occur along the Transkei coast. Such episodes must contribute significantly to the maintenance of the species. *S. cucullata* reaches the southern limit of its distribution in Transkei (Kilburn & Rippey 1982) and is therefore subject to frequent recruitment failure (Lewis 1986). It is noteworthy that the abundance of rock oysters at Nqabara declined by 50% between early 1988 and mid 1989. At present the mean density (including new recruits) is 11,5 individuals m^{-2}. Without the latest recruitment this species would have become rare, if not locally extinct, at this site. In contrast the populations in nature reserves have remained stable over this period.

Despite the relatively good recruitment it is clear that

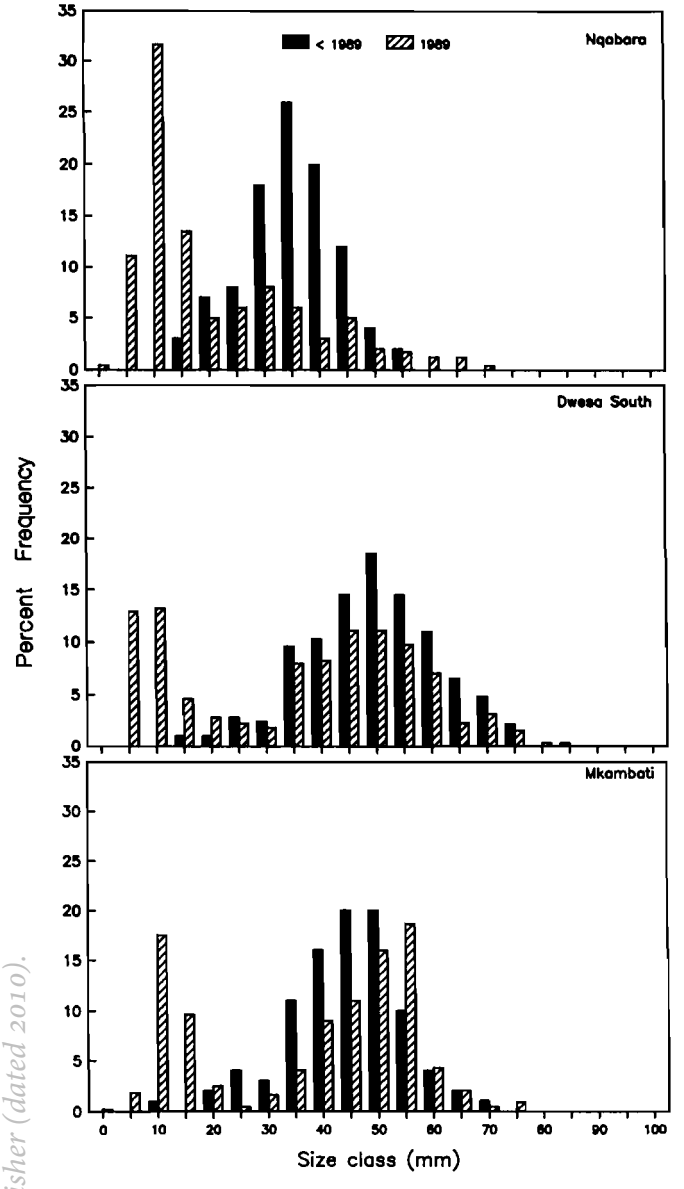

Figure 1 A comparison of the population size structure of *S. cucullata* at three sites on the Transkei coast before and after the 1989 recruitment.

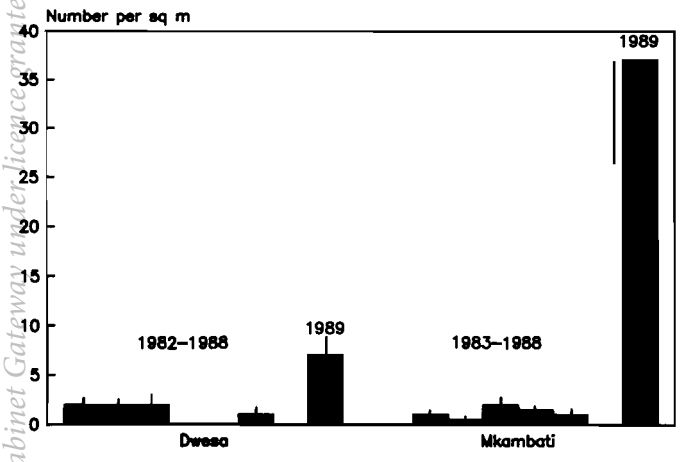

Figure 2 Mean annual recruitment (± *SD*) of *S. cucullata* up to 1988 at Dwesa and Mkambati compared with recruitment in 1989.

the 1989 cohort on its own is insufficient to replace the existing populations. It is estimated that, if exploitation were to cease, about three years of recruitment at 1989 levels would be needed to replace exploited populations, and it remains to be seen whether such recruitment will be sustained over this period. Based on growth rates and the median size of populations, Dye (1989) estimated that the median age of the Transkei rock oysters was about eight years in 1987, implying that the last good recruitment occurred around 1979. If this is so then the population dynamics of this species may be characterized by lengthy periods of poor recruitment punctuated by shorter periods of good recruitment.

As far as resistance to exploitation is concerned, the rate of removal of animals (9–11 m^{-2} y^{-1}) (Dye 1989) still greatly exceeds the contribution of new individuals and recruitment would have to be consistently high to maintain a sustainable yield. The conclusion reached by Dye (1989), that *S. cucullata* has a low resistance to exploitation, therefore remains valid.

The question remains as to what causes periods of relatively good recruitment. Dye (1989) concluded that high post-settlement mortality, resulting from harsh physical factors, such as adverse temperatures and desiccation, were the most probable reasons for low recruitment. The rough seas and relatively wet conditions that prevailed along the Transkei coast in 1989 may have contributed to enhanced post-settlement survival. The degree to which the populations respond to favourable conditions may also be a function of standing stock, as indicated by the relatively large number of recruits at Mkambati where there are between 130 and 200 individuals m^{-2} compared to a density of less than 20 m^{-2} at the southern sites. This implies that recruitment at exploited sites will be low even under favourable physical conditions. It should be pointed out, however, that long-term recruitment patterns of *S. cucullata* in Transkei show no consitstent relationship with standing stock (Dye 1989).

Whatever the ultimate cause, events such as these illustrate the importance of long-term monitoring as a management tool. A knowledge of trends in recruitment, and insight gained from episodic events, may take some of the guesswork out of intertidal resource management.

Acknowledgements

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