Antarctic Science 5 (4): 377–378 (1993)

Short note
Nearshore population characteristics of the circumpolar Antarctic scallop *Adamussium colbecki* (Smith, 1902) at Terra Nova Bay (Ross Sea)

MARCO NIGRO

Dipartimento di Biomedicina Sperimentale, sez. Biologia e Genetica, Universitá di Pisa, Via A. Volta 4, 56126 Pisa, Italy
Accepted 30 June 1993

Introduction

Adamussium colbecki is one of the dominant members of the nearshore benthic community around Antarctica (Nicol 1966, Dell 1974). It has been studied from a systematic and biogeographic point of view since the beginning of this century (Smith 1902, Pelseneer 1903). However, detailed knowledge of its biology and ecology has been only acquired during the last decade (Stockton 1984, Berkman 1990, Berkman *et al.* 1991, Mauri *et al.* 1990, Nigro *et al.* 1992, Nakajima *et al.* 1982).

Due to its circumpolar distribution *A. colbecki* could be profitably used as a bioindicator for interpreting environmental variability (Berkman & Nigro 1992) and provide a useful focus for coordinating and comparing research between countries involved in Antarctic marine biological research (Berkman 1990).

In the present study the distribution, density and size structure of a population of *A. colbecki* have been studied, by SCUBA diving, at Terra Nova Bay in the north-west Ross Sea, during the summer season 1991–92.

Materials and methods

The density of scallops was estimated by randomly placing 1 m^2 quadrats on the bottom in the area of interest and counting the specimens *in situ* from 3 m downward to 30 m, at depth increments of 5 m. Six quadrats were counted at each depth. The size frequency distribution was investigated for 138 scallops collected at 25 m depth. Shell size was measured by a caliper along the height axis.

Results and discussion

At depths greater than 12–15 m, *Adamussium colbecki* appeared on the bottom as free-living or byssally attached to rocky substrates. At 15 m, the density was very low, averaging 2.3 specimens m^{-2} (sd = 1.9), but increased rapidly moving downwards, reaching a mean value of 58.8 specimens m^{-2} (sd = 13.4) at 30 m (Table I). Testing the variance/mean ratio, after convertion to the statistic Index of Dispersion $I=(s^2/\bar{x})(n-1)$, it appeared that the distribution of the Antarctic scallops was aggregated at 20, 25 and 30 m ($P<0.01$, d.f.= 5). The index was not calculated for the sample collected at 15 m due to the small sample size (between 0 and 5).

A. colbecki showed an opposite distribution in western McMurdo Sound, being most abundant on shallow benches (4–6 m deep) and decreasing in density moving downward (Stockton 1984, Berkman 1990). Stockton (1984) suggests that the distribution pattern occurring in the western McMurdo Sound would imply a significant local heterogeneity in trophic resources and particularly that the high density of scallops nearshore may partly be due to the utilization of a locally restricted production associated with the summer development of intertidal and nearshore moat systems.

The absence of scallops above 12–15 m and the trend of increasing density with depth, observed at Terra Nova Bay, might be due to local physical phenomena, such as the wave exposure and/or the nature of the substrate, rather than to a local heterogeneity in trophic resources. In fact, the strong wave action occurring after sea-ice melting, and the prevalence of rocky substrate might inhibit the presence of scallops in the shallowest portions of the investigated area.

The size frequency distribution showed that more than 70% of *A. colbecki* were adults (60–80 mm in shell height). The mean size of scallops was 69.4 mm (Fig. 1). Juvenile scallops were rare and occurred byssally attached to adult specimens.

A comparison with data reported by Berkman (1990) indicated that the population size structure at Terra Nova Bay was not significantly different from that observed at McMurdo Sound when compared by Kolmogorov-Smirnov two sample test ($D = 0.126$; $P>0.05$).

Berkman *et al.* (1991) suggested that along the west side of McMurdo Sound, which is oligotrophic and generally covered by multi-year sea ice, the recruitment may be episodic and influenced by pulses of organic matter that would occur when first-year sea ice is present. Otherwise, the vicinity of Terra Nova Bay Station is usually characterized by the presence of first-year sea ice and by the occurrence of intense algal blooms in summer (Innamorati *et al.* 1990). Moreover, scallops

Table I. Depth distribution of *A. colbecki* at Terra Nova Bay.

depth (m)	mean (n = 6)	variance	var./mean
15	2.33	3.87	1.66
20	43.33	1334.67	30.80
25	51.17	378.27	7.39
30	58.83	179.77	3.06

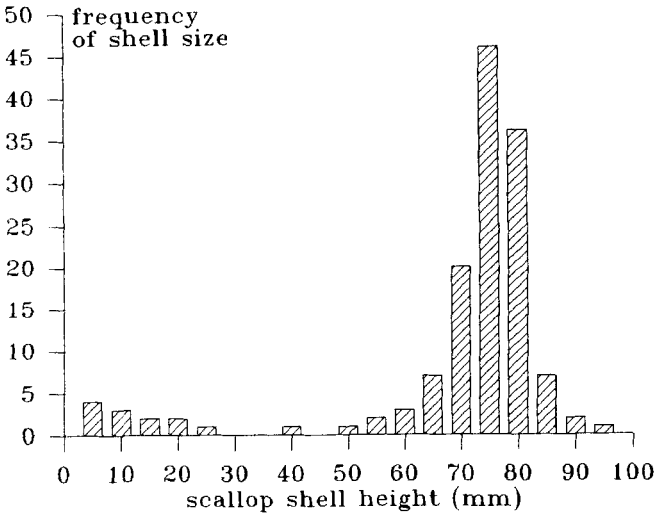

Fig. 1. Size frequency distribution of *Adamussium colbecki* at Terra Nova Bay based on 138 scallops.

ranging from very small to adult size were occasionally found in samples collected at depths of 70–80 m by dredging in the vicinity of the area investigated (Nigro, unpublished observation). Similarly, Di Geronimo & Rosso (1990) reported that juvenile *A. colbecki* were present only in the deep subtidal populations. Therefore, as a working hypothesis, it might be suggested that settlement and first growth stages occur in deeper areas, while movement toward shallow waters would take place after reaching adult size.

Acknowledgements

This study has been performed within the framework of the Italian National Antarctic Research Programme (PNRA).

References

Berkman, P.A. 1990. The population biology of the Antarctic scallop *Adamussium colbecki* (Smith, 1902) at New Harbor, Ross Sea. *In* Kerry, K.R. & Hempel G., *eds Antarctic Ecosystems. Ecological change and conservation. Proceedings of the 5th SCAR Symposium on Antarctic Biology*. Berlin: Springer-Verlag, 281-288.

Berkman, P.A. & Nigro, M. 1992. Trace metal concentrations in scallops around Antarctica: extending the Mussel Watch Program to the Southern Ocean. *Marine Pollution Bulletin*, **24**, 322-323.

Berkman, P.A., Waller, T.R. & Alexander, S.P. 1991. Unprotected larval development in the Antarctic scallop *Adamussium colbecki* (Mollusca: Bivalvia: Pectinidae). *Antarctic Science*, **3**, 151-157.

Dell, R.K. 1974. Antarctic benthos. *Advances in Marine Biology*, **10**,1-216.

Di Geronimo, I. & Rosso, A. 1990. First Italian Oceanographic Expedition in the Ross Sea, Antarctica. Benthos: a preliminary report. *National Scientific Commission for Antarctica. Oceanographic Campaign 1987-88, Data Report*, part 1, 407-421.

Innamorati, M., Mori, G., Lazzara, L. & Vannucci, S. 1990. Eutrofia e oligotrofia nell'Oceano Antartico. *Oebalia Suppl.*, **16**(1),153-162.

Mauri, M., Orlando E., Nigro, M. & Regoli, F. 1990. Heavy metals in the Antarctic mollusc *Adamussium colbecki*. *Marine Ecology Progress Series*, **74**, 219-224.

Nakajima, Y., Watanabe, K. & Naito, Y. 1982. Diving observations of the marine benthos at Syowa Station, Antartica. *In* Hoshiai, T. & Naito,Y *eds Proceedings of the Fifth Symposium on Antarctic Biology*. Tokyo: National Institute of Polar Research, 44-54.

Nicol, D. 1966. Description, ecology and geographic distribution of some Antarctic pelecypods. *Bulletin of American Paleontology*, **51**, 1-102.

Nigro, M., Orlando, E. & Regoli, F. 1992. Ultrastructural localization of metal binding sites in the kidney of the Antarctic scallop *Adamussium colbecki*. *Marine Biology*, **113**, 637-643.

Pelseneer, P. 1903. Mollusques (Anphineura, Gastropods et Lamellibranches). *Results. Voyage du S.Y. Belgica 1897-1899*, 85pp.

Smith, E.A. 1902. Mollusca. *Report on the Collections of Natural History, made in the Antarctic Region during the voyage of the "Southern Cross"*. London: British Museum (Natural History), 201-213.

Stockton, W.L. 1984. The biology and ecology of the epifaunal scallop *Adamussium colbecki* on the west side of McMurdo Sound, Antarctica. *Marine Biology*, **78**, 171-178.