MEMOIRS OF THE AUSTRALIAN MUSEUM

VOL. 18, 1983

BIOGEOGRAPHICAL RELATIONSHIPS OF SOME SOUTHERN AFRICAN BENTHIC CRUSTACEA

BRIAN KENSLEY

Smithsonian Institution Washington, D.C. 20560, U.S.A.

SUMMARY

A brief discussion of benthic amphipods, isopods, and decapods deals with the distribution of the Atlantic, Indo-Pacific, and endemic components of each group around the southern African coastline. This distribution is related to faunal provinces of the area. It is concluded that for the two peracaridan groups, the South Coast Warm Temperate province was an evolutionary centre. Although there is a considerable number of endemic species in the decapods, recruitment from the Indo-Pacific accounts for the major component of this group.

INTRODUCTION

Although the southern African marine region has received considerable attention from zoogeographers (see Ekman, 1967, and Briggs, 1974, for references), seldom have either the Crustacea as a whole or any section of them been dealt with from a zoogeographical point of view. Ortmann (1896) was one of the exceptions. In his "Grundzüge der marinen Tiergeographie", Ortmann used the Decapod Crustacea as the basis for his ideas. Hartmann-Schröder and Hartmann (1974) have dealt briefly with the zoogeography of southern African Ostracoda. But even K.H. Barnard with his unsurpassed knowledge of the southern African crustacean fauna ventured few opinions on the distribution and affinities of this group. Several of the southern African crustacean groups have reached a point of taxonomic maturity where zoogeographic speculation can begin to have meaning. These groups include the Cumacea, Amphipoda, Isopoda, and Decapoda. I shall concentrate on the latter three groups, the raw data for these being relatively easily accessible.

Data sources and limitations.

Raw data for the gammarid and caprellid Amphipoda used in this paper come from Griffiths (1973, 1974a, 1974b, 1974c, 1975, 1976a, 1976b); for the Isopoda, Kensley (1978); for the Decapoda, Kensley (1981, in press).

In the following discussion, I have limited myself to animals occurring above the 200 m line, so little being known about the fauna beyond that depth. Also, amongst the decapods, the true pelagic forms such as the sergestids, aristeids, and the oplophorids have been excluded.

DISCUSSION

The geographic area under discussion stretches from the Kunene River on the west coast to Vilanculos on the east (Fig. 1) and is dominated by two major current systems. On the west, the Benguela system flows northwards and is characterised by strong upwelling of cold Subantarctic water. On the east coast the Agulhas current sweeps down the Mozambique Channel, at varying distances from the coast depending on the width of the continental shelf.

The question of faunal provinces is a contentious one, but for the purposes of this paper, I shall follow Brown and Jarman (1978). If we superimpose the various faunal provinces of the area on the coastline (Fig. 2) we see that five provinces are involved: (1) Tropical West African (2) Cold Temperate Namaqua (3) Warm Temperate South Coast (4) Subtropical East Coast (5) Tropical East Coast.

The overall composition of the amphipod, isopod, and decapod fauna (as circumscribed above) may be represented in Table 1.

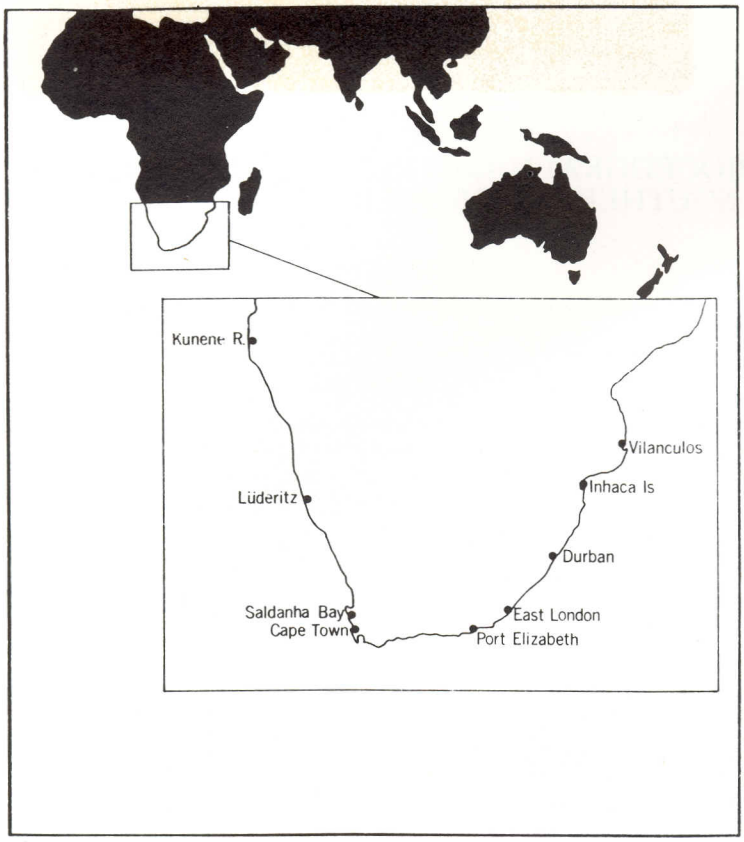

Fig. 1. Locality map of area discussed.

Table 1. Overall composition of southern African Decapoda, Isopoda, and Amphipoda from less than 200 m.

	Decapoda	Isopoda	Amphipoda
Families	62	26	34
Genera	234	105	144
Species	494	266	297

If the total numbers of species for these groups are represented in bar graphs (Fig. 3), and the major components of each is indicated, we see that the Indo-Pacifics form the most important segment of the decapods, while the endemics form the major components for the two peracarid groups. (The 'other' component represents those species which are either 'cosmopolitan' or austral in distribution, or of uncertain affinity.)

Taking these three major components and looking at their distribution around the coastline, some interesting patterns emerge. The number of species of each component at eight localities around the coast is given as a percentage of the total for that component. The eight localities, chosen because of good collecting data, are the Kunene River Mouth, Lüderitz, Saldanha Bay, False Bay, Port Elizabeth, East London, Durban, and Inhaca Island.

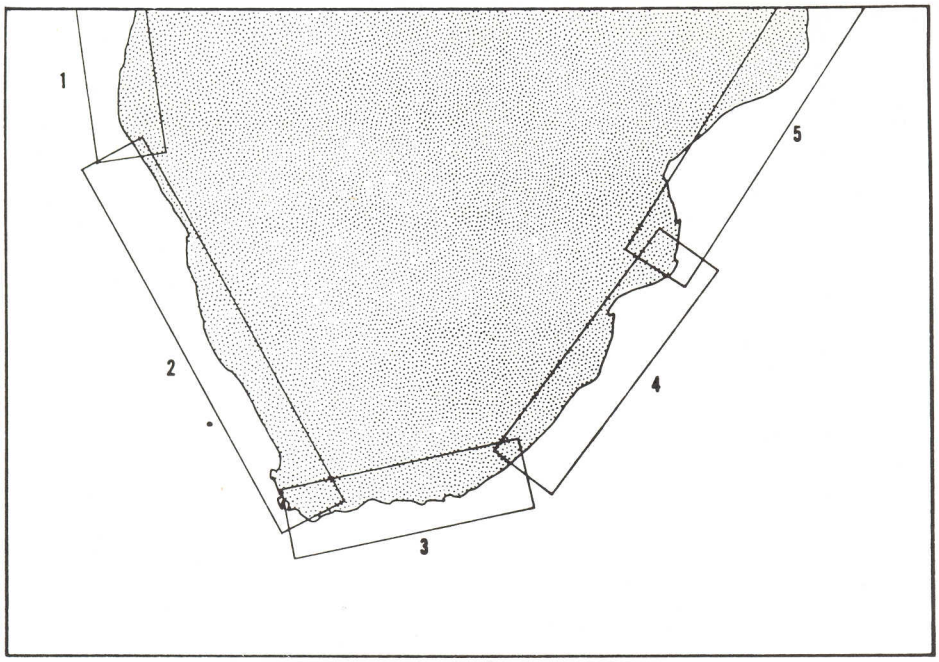

Fig. 2. Faunal provinces along the southern African coastline: 1 Tropical West African; 2 Cold Temperate Namaqua; 3 Warm Temperate South Coast; 4 Subtropical East Coast; 5 Tropical East Coast. (After Brown & Jarman, 1978).

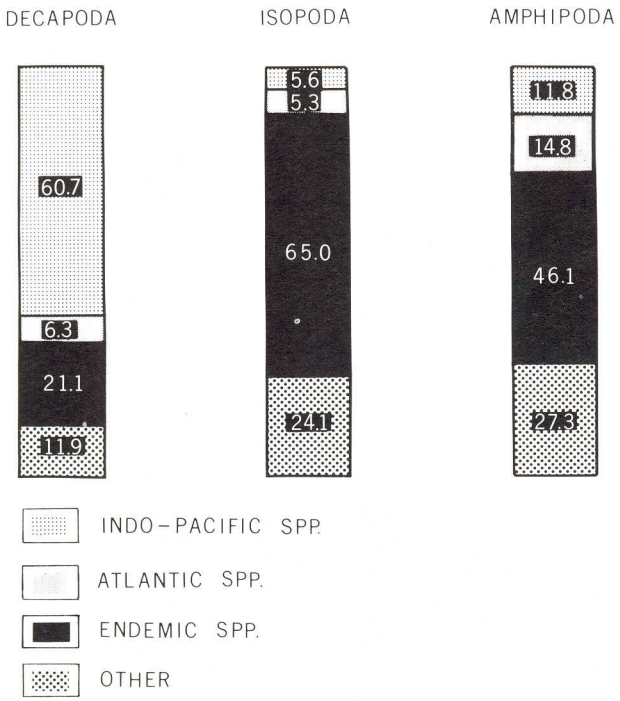

Fig. 3. Faunal components in percentages.

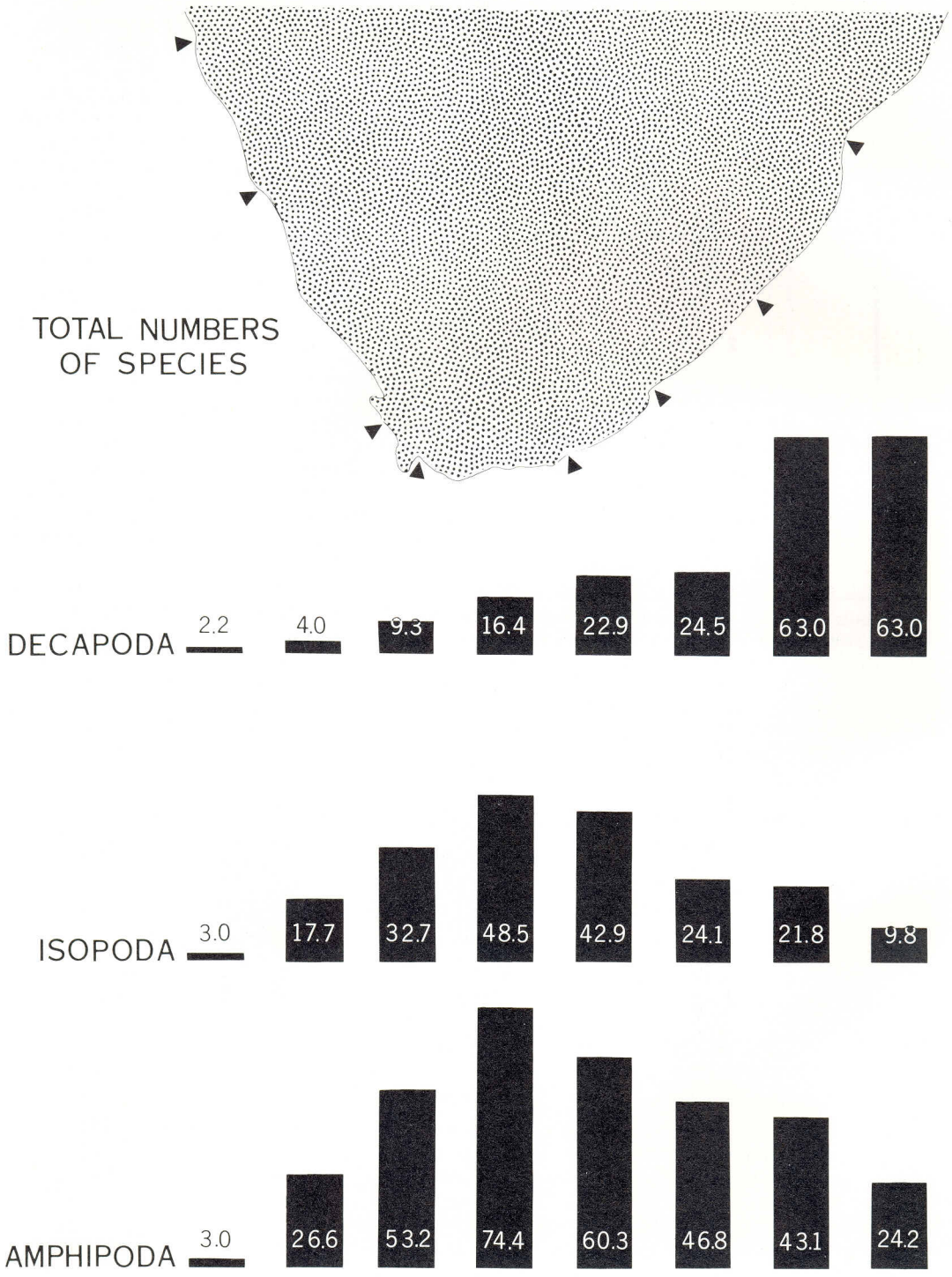

Fig. 4. Distribution of species around the southern African coastline (figures in percentages of total number of species).

For total number of species, (Fig. 4) we find, not surprisingly, that the decapods increase in number as we move into the subtropical east coast Indo-West-Pacific region. Both the amphipods and isopods reach peaks in the Agulhas Bank area, perhaps confirming the reality of the Warm Temperate South Coast Province. Looking at the distribution of Indo-Pacific species (Fig. 5), this trend in the decapods is even more marked, with very few species reaching the west coast. For the isopods and amphipods there is a fairly even spread, with a small percentage reaching as far as Lüderitz on the west coast. Even though several Atlantic species penetrate as far as Mozambique, for all three groups the Atlantic species reach a peak in the South Coast Agulhas Bank area. (Fig 6). This may be explained by regarding these south coast forms as relicts from warmer conditions on the west coast during the Quarternary, or we may regard the south coast as closer to the optimum conditions for the Atlantic species, with the upwelling of cold water on the west coast exercising a limiting effect on some species.

The distribution of the endemic component (Fig. 7) is perhaps the most interesting pattern. High endemism for the isopods and amphipods occurs in the Agulhas Bank area, again confirming the reality of the Warm Temperate South Coast Province. These species concentrations probably indicate a centre of evolutionary radiation, the basic stock of which was derived from less well-adapted species of both Atlantic and Indo-Pacific origin. Day (1978) came to a similar conclusion with regard to the cumaceans. As the eggs and larval stages of peracaridans are retained in a brood pouch, and thus lack a planktonic stage, these groups would need to resort to a slow step-by-step invasion of new territory. This reduced dispersal rate would perhaps predispose populations to becoming better adapted to the habitats into which they were moving than if they were relying on repeated waves of pioneer larval forms. The decapods show a less marked peak in the Agulhas area, to some extent reflecting the role of planktonic larvae in being able to populate an area, and another peak in the Durban area. It may be argued that this latter peak reflects concentrated collecting: alternatively, this may be a real peak, representing well-adapted species of the subtropical east coast province, derived from Indo-Pacific ancestors. (Almost all the endemic species of decapods from this area belong to Indo-Pacific genera.)

It is difficult to make any comparison of southern African amphipods, isopods, or decapods with the faunas of other southern hemisphere regions, because of lack of data. However, comparison of two well documented decapod groups—the Majidae (Griffin, 1966) and the Thalassinidae (Poore & Griffin, 1979)—from Australia and South Africa may reflect the overall situation: see Table 2. (It is of interest to note here that the Australian decapod fauna, which is basically Indo-Pacific in nature, is over twice the size of that of southern Africa.) Not surprisingly in the light of length of coastline and proximity to the tropics, both in overall numbers and in percentage endemism the Australian fauna is significantly richer than the southern African.

Table 2. Comparison of Majidae and Thalassinidea from southern Africa and Australia.

	MAJIDAE			
	Genera	Species	Endemic	Species
Southern Africa	28	42	11	(26%)
Australia	45	95	37	(39%)

(Australian figures from Griffin, 1966)

	THALASSINIDEA			
	Families	Genera	Species	Endemic Species
Southern Africa	3	7	18	10 (55%)
Australia	6	10	40	28 (70%)

(Australian figures from Poore and Griffin, 1979)

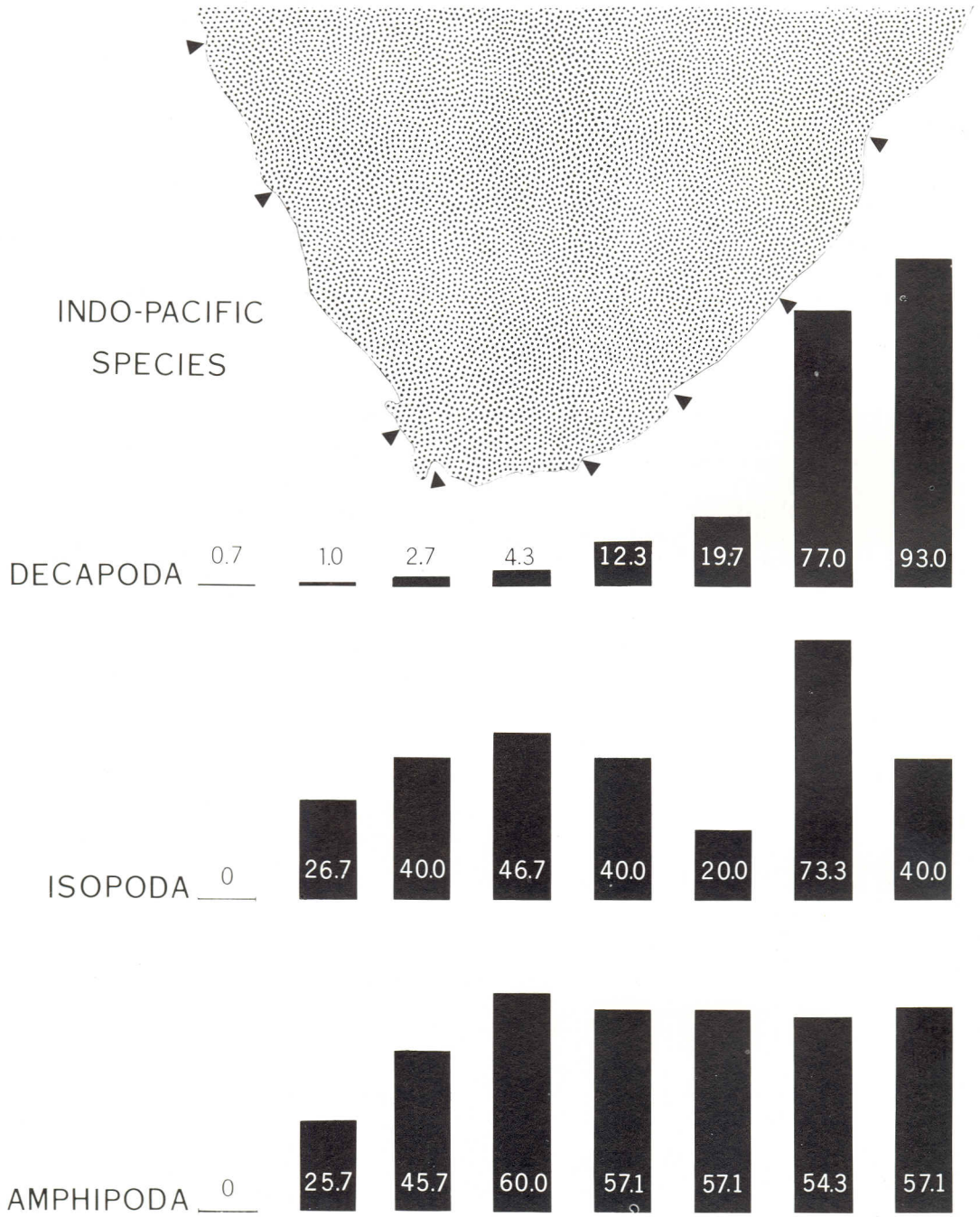

Fig. 5. Distribution of Indo-Pacific species around the southern African coastline (figures in percentages of total number of species).

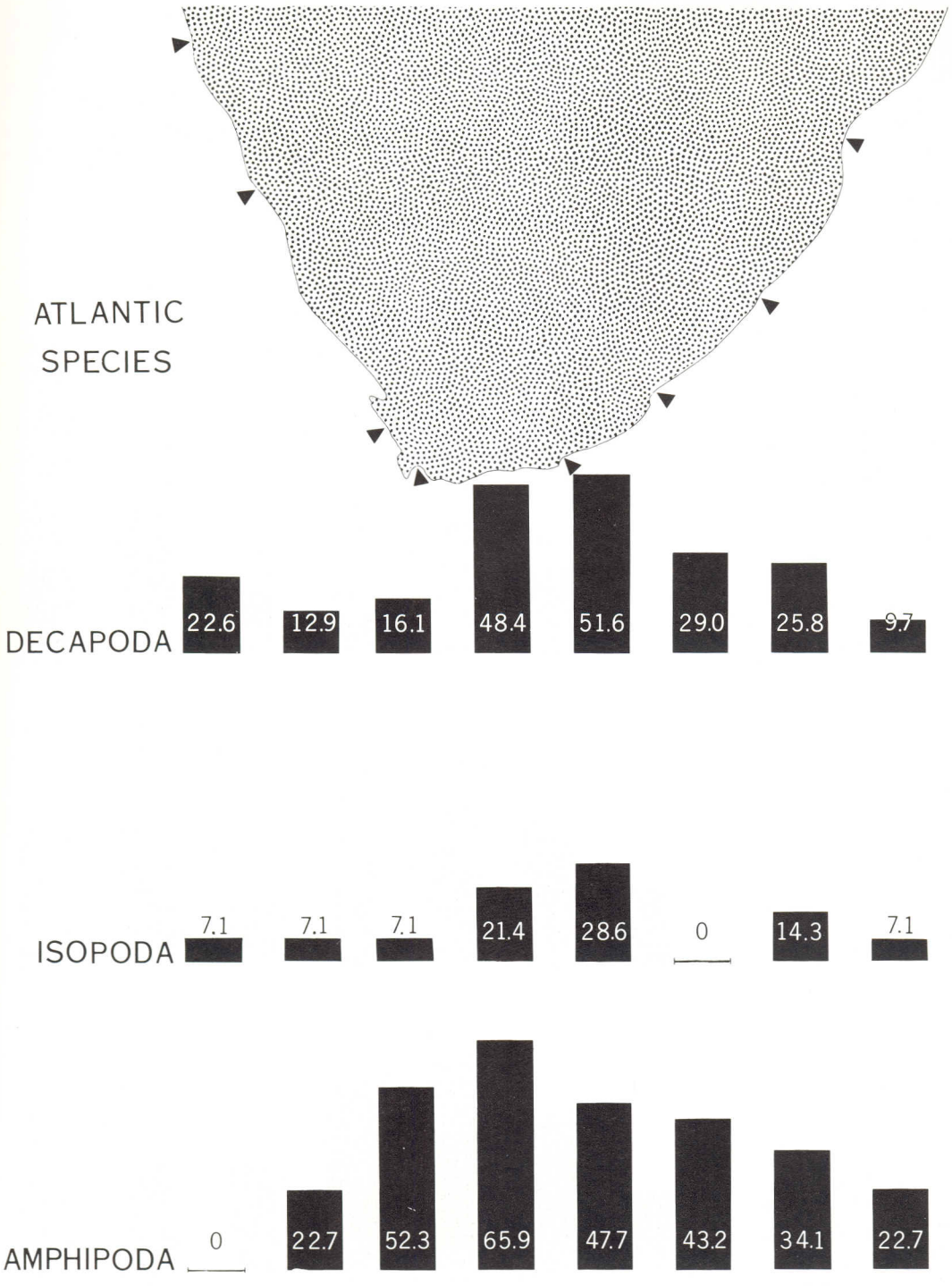

Fig. 6. Distribution of Atlantic species around the southern African coastline (figures in percentages of total number of species).

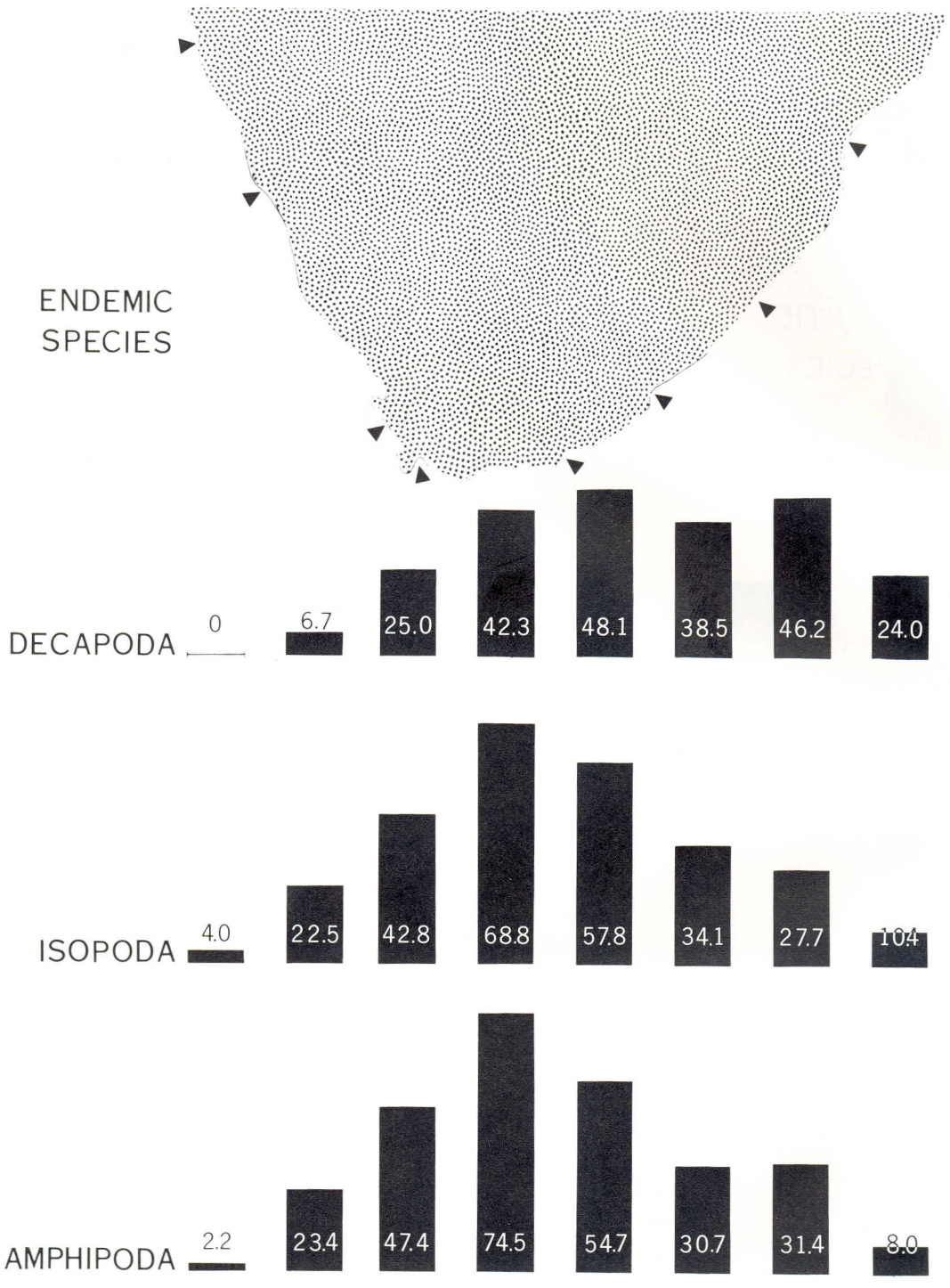

Fig. 7. Distribution of endemic species around the southern African coastline (figures in percentages of total number of species).

REFERENCES

Briggs, J.C., 1974. Marine Zoogeography. New York: McGraw-Hill.

Brown, A.C. and Jarman, N., 1978. Coastal Marine Habitats. In M.J.A. Werger (ed.) 'Biogeography and Ecology of Southern Africa'. Lochem, Holland: Junk.

Day, J.A., 1978. Southern African Cumacea, Part 5. Aspects of Cumacean Biology. University of Cape Town: Unpublished Ph.D Thesis.

Ekman, S., 1967. Zoogeography of the Sea. London: Sidgwick and Jackson.

Griffin, D.J.G., 1966. A Review of the Australian Majid Spider Crabs (Crustacea, Brachyura). *Aust. Zool.* 13: 259-298.

Griffiths, C.L., 1973. The Amphipoda of Southern Africa. Part 1. The Gammaridea and Caprellidea of southern Mozambique. *Ann. S. Afr. Mus.* 60: 265-306.

———— 1974a. The Amphipoda of Southern Africa. Part 2. The Gammaridea and Caprellidea of South West Africa south of 20°S. *Ann. S. Afr. Mus.* 62: 169-208.

———— 1974b. The Amphipoda of Southern Africa, Part 3. The Gammaridea and Caprellidea of Natal. *Ann. S. Afr. Mus.* 62: 209-264.

———— 1974c. The Amphipoda of Southern Africa. Part 4. The Gammaridea and Caprellidea of the Cape Province east of Cape Agulhas. *Ann. S. Afr. Mus.* 65: 251-336.

———— 1975. The Amphipoda of Southern Africa. Part 5. The Gammaridea and Caprellidea of the Cape Province west of Cape Agulhas. *Ann. S. Afr. Mus.* 67: 91-181.

———— 1976a. Some New and Notable Amphipoda from Southern Africa. *Ann. S. Afr. MMus.* 72: 11-35.

———— 1976b. Guide to the Benthic Marine Amphipods of Southern Africa. Cape Town: South African Museum.

Hartmann-Schröder, G. and Hartmann, G., 1974. Zur Kenntnis des Eulitorals des afrikanischen Westküste zwischen Angola und Kap der Guten Hoffnung und der afrikanischen Ostküste von Südafrika und Moçambique unter besonder Berücksichtigung der Polychaeten und Ostracoden. Teil 1. Beschreibung der Lebensraüme, Ökologie und Zoogeographie. *Mitt. hamb. zool. Mus. Inst.* 69: 5-94.

Kensley, B.F., 1978. Guide to the Marine Isopods of Southern Africa. Cape Town: South African Museum.

———— 1981. On the Zoogeography of Southern African Decapod Crustacea, with a Distributional List of the Species. *Smithson. Contr. Zool.* (in press).

Ortmann, A.E., 1896. Grundzüge der marinen Tiergeographie. Jena: Gustave Fischer.

Poore, G.C.B., and Griffin, D.J.G., 1979. The Thalassinidea (Crustacea: Decapoda) of Australia. *Rec. Aust. Mus.* 32: 217—321.