Cassidina typa Milne Edwards, 1840 (Fig. 65)

Cassidina typa (or *typus*) Milne Edwards, 1840: 224, pl. 32, figs 10–16. Stebbing, 1900: 559–62. Hansen, 1905: 129–31, pl. 7 fig. 6a. Nierstrasz, 1917: 109, fig. 41. Tattersall, 1921: 226–7. Thomson & Anderton, 1921: 114. Nierstrasz, 1931: 219. Hurley, 1957: 13; 1961: 271.

Cassidina neo-zealanica Thomson, 1889: 264, pl. 14 figs 1–4. Hutton, 1904: 263. Thomson, 1913: 247.

DIAGNOSIS

Cassidina with regular, broad, oval, smooth body, only slightly vaulted in middle. Antenna I short, not longer than peduncle of antenna 2. Pleotelson triangular with blunt, rounded apex.

TYPE LOCALITY: "New Zealand" (*see* Hansen 1905: 130), from Quoy & Gaimard material.

MATERIAL EXAMINED

Off Raglan: [C344] 4 juvs (6 mm), 4♀♀ (6–7 mm), 1♂ (9 mm); [C291] 1 sp.
Off Napier: [22] 8 juvs (5 mm), 1♀ (6 mm), 2♂♂ (5–7 mm).
Wellington: [Cop. 16] spp.
Cook Strait: [VUZ 98] 1♀ (8 mm), 1♂ (8 mm); [VUZ 99] 1 juv. (7 mm), 2♂♂ (8–9 mm); [VUZ 101] 1 juv (6 mm), 2♂♂ (7–9 mm).
Pelorus Sound: [C921] 2♀♀ (6 mm).
Tasman Bay: [24] 2♂♂ (11–12 mm).
Cape Campbell: [35] 9♀♀ (6–8 mm), 2♂♂ (7–11 mm).
Kaikoura: [117] 5 juvs (2–7 mm), 78♀♀ (7–9 mm), 45♂♂ (6–12 mm); [104] 6 spp.
Oamaru: [128] 1♂ (5 mm).
Otago: [Z2285] 21 juvs (3–7 mm), 19♂♂ (7–12 mm); [Z2314] 1 juv. (6 mm), 4♂♂ (9–12 mm).
Foveaux Strait: [B262] 1 juv. (7 mm), 1♂ (9 mm).

OTHER RECORDS: Bay of Islands (Thomson 1889, Nierstrasz 1917); Akaroa (Hansen 1905); North Cape (Tattersall 1921; Nierstrasz 1931).

HABITAT: On kelp, shells, stones. "Usually found creeping on seaweed where its flat form and protective colouring make it somewhat inconspicuous" (Thomson & Anderton 1921).

DEPTH RANGE: 18–1000 m. The three records of over 110 m (VUZ 98, 99, 101) are from deep water in Cook Strait, very close to the shelf, and are probably anomalous on this account, although true.

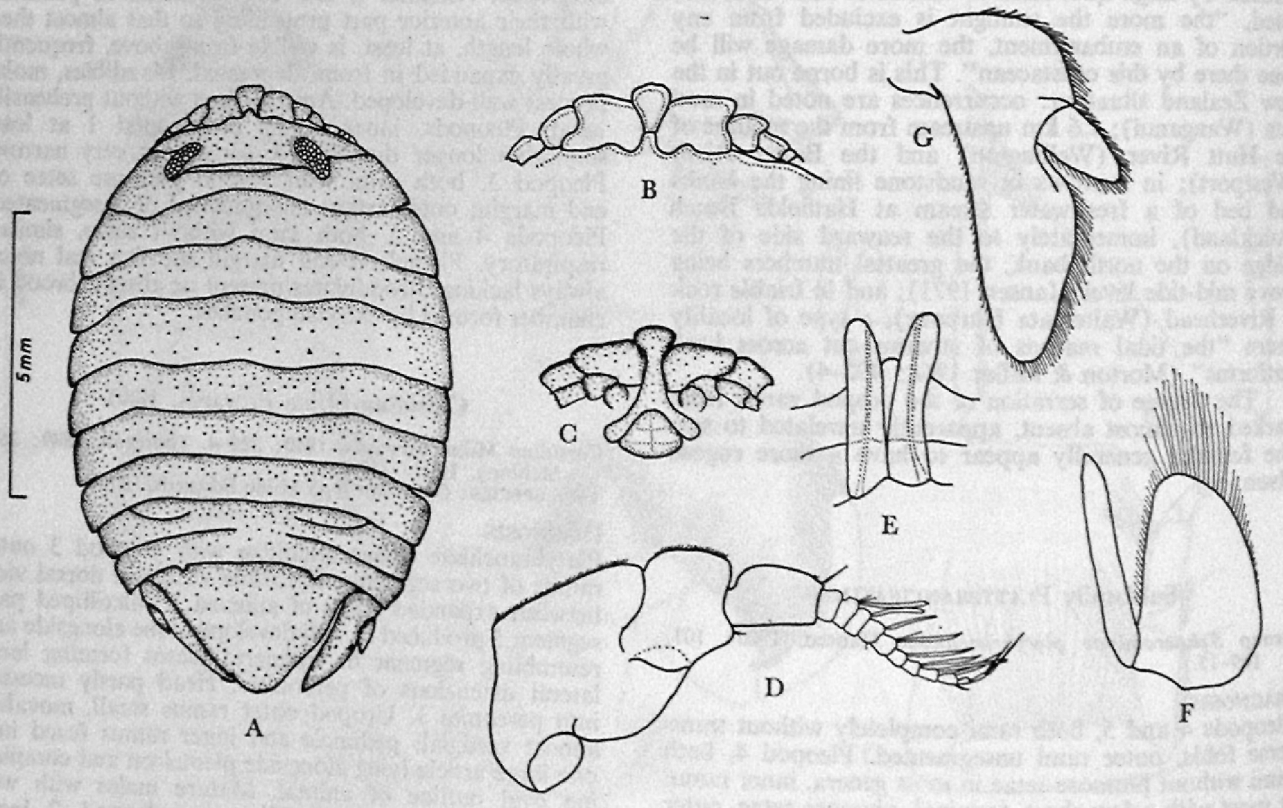

FIG. 65. *Cassidina typa* Milne Edwards, mature ♂: A, whole animal; B, frontal margin of head, epistome and antenna I peduncles from above; C, epistome and antenna I peduncles from below; D, antenna I; E, penes; F, pleopod 2, inner ramus; G, uropod.

GEOGRAPHICAL DISTRIBUTION

The geographical distribution of the 37 shallow-water species of Sphaeromatidae shows some recognisable patterns (Figs 66–69; Plates 1–11).

Only two species, *Exosphaeroma obtusum* and *Pseudosphaeroma campbellensis*, have been recorded from Campbell Island. This represents 5% of the total New Zealand fauna, and seems remarkably meagre, but probably reflects a trend for fewer species the farther south one goes, since only eight (21%) of the New Zealand species are recorded from the Auckland Islands, and 11 (30%) from The Snares.

Antipodes Island also has only two known species. This probably reflects not only its distance from New Zealand but also the small size of the island, making it a very small target in a wide sea; its position south-east of the current system which bathes New Zealand proper (*see* Burling 1961); and especially its lack of suitable niches. Almost all of the expeditions to the Antipodes have landed on the rocky Reef Point or near-by boulder beaches, and we have not had access to any collections from the southern beaches (a useful map is given in Cullen 1969, fig. 1), so it would be unwise to place much emphasis on the extremely limited collections at our disposal. However, it is worth noting that there are no sandy beaches as such. Much of the island is cliffed. There are rock platforms and kelp boulder beaches to the north and east, and there may be restricted patches of coarse gravel in some small coves. Rock pools on the platforms should provide an algal substrate for sphaeromatids, and there are one or two small, rocky beaches on the west coast, but according to Mr R. A. Taylor of Ecology Division, DSIR, who spent some weeks on the island and worked his way around it looking for seal colonies, the overall picture is one of rugged and restricted habitats.

Stewart Island, with 13 species (35% of the total fauna), compares favourably with the 18 species (49%) found south of Kaikoura on the mainland, and can be considered a faunal extension of New Zealand.

The main break in faunal continuity occurs about the Kaikoura region, and the Chatham Islands fauna shows stronger affinities with central and northern New Zealand faunas than with that south of Kaikoura. Fifteen species (31% of the total fauna) have been found on the Chathams; eight of these are also found throughout the North and South Islands, two more are found in both North and South or Stewart Island. Four species (*Isocladus dulciculus, Amphoroidea media, Sphaeroma quoyanum*, and *Dynamenoides decima*) are found north of Kaikoura and on the Chathams, but not south of Kaikoura; *Isocladus inaccuratus* has been found only on the Chathams.

This fits the picture of the Chathams as having a mixed fauna with stronger northern than southern affinities, attributed to the position of these islands in the Subtropical Convergence Region (*see* Burling 1961). Dell (1960) found the Chatham Islands Mollusca "overwhelmingly similar to Cook Strait forms".

While there are insufficient collections of critical species between Wellington and Auckland to allow more than a general statement, two species (*Isocladus calcareus* and *Dynamenella insulsa*) have not been found north of Hawke Bay on the east coast or Wellington on the west. Likewise, two northern species (*Cymodopsis montis* and *Isocladus reconditus*) appear to be absent south of these points.

Finally, there is some indication of a break between the fauna of the far north and of the Auckland–Bay of Plenty region. Four species (*Exosphaeroma falcatum, Pseudosphaeroma callidum, Cymodocella capra*, and *Dynamenella mortenseni*) have not been found south of the Bay of Islands, while seven species, present more or less throughout the rest of New Zealand, are absent north of Hauraki Gulf (*Pseudosphaeroma campbellensis, Dynamenella condita, Exosphaeroma chilensis, Cassidinopsis admirabilis, Dynamenoides vulcanata, Sphaeroma laurensi*, and *Cilicaea angustispinata*).

DEPTH DISTRIBUTION

Most of the New Zealand Sphaeromatidae occur in the intertidal zone. Thus, 24 of the 48 species for which there are data are found in less than 5 m (Fig. 67), a further 9 in less than 100 m, and only 15 species are found deeper. Of these 15, *Cilicaea dolorosa* ranges from 0 to 115 m, *Cymodocella tubicauda* from 0 to 245 m, and *Cymodoce allegra* and *Cymodoce australis* from 0 to 615 m. Two records of these *Cymodoce* species in less than 20 m are of specimens from sponges found in rock pools in the *Durvillea* zone, and these may have been washed up from deeper water; the true range could hence be 20–615 m. (It may also be significant in this connection that *Cymodoce* females and juveniles are often difficult to identify with accuracy.)

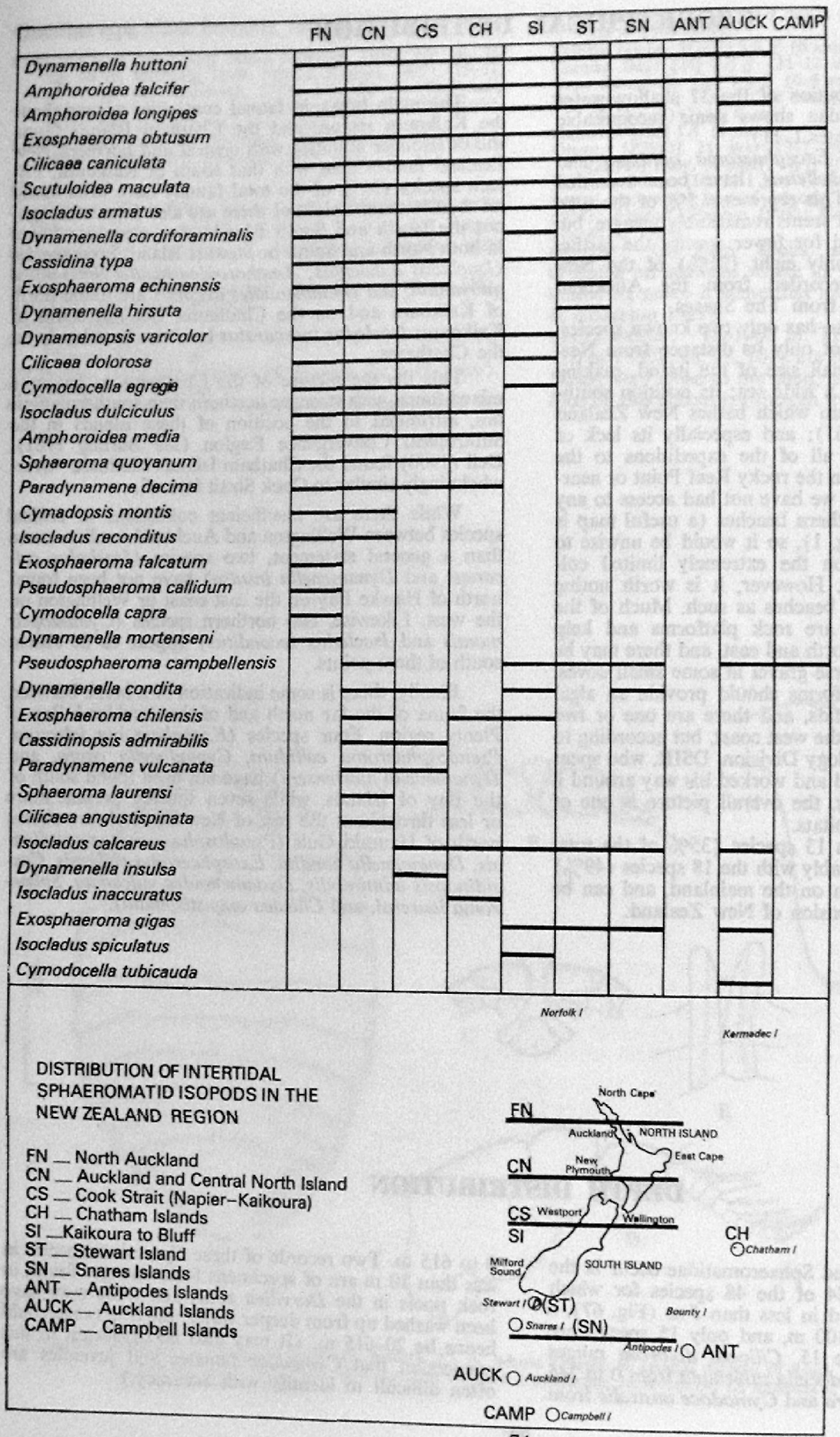

FIG. 66. New Zealand Sphaeromatidae. Distribution of intertidal species.

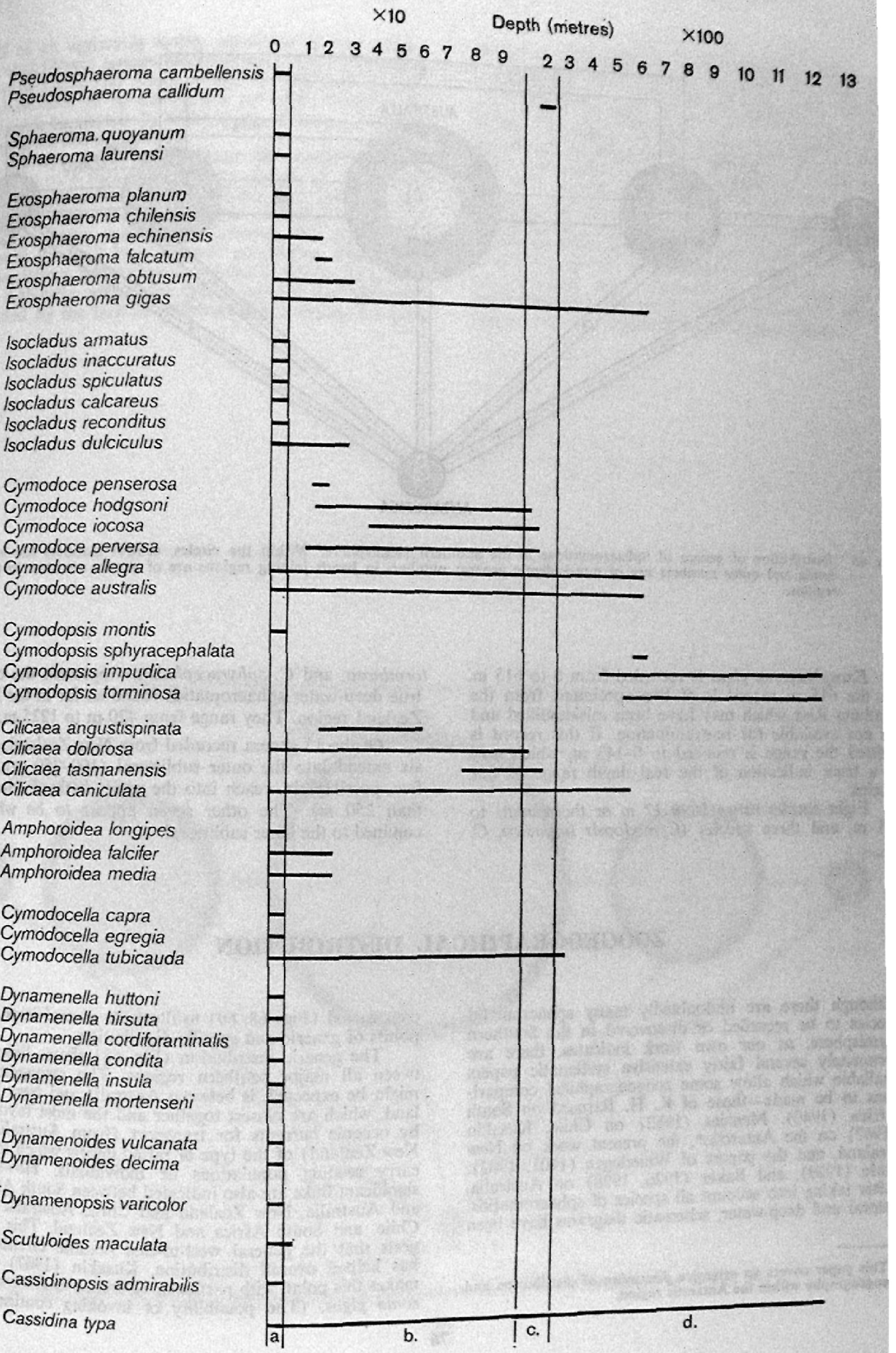

FIG. 67. New Zealand Sphaeromatidae. Depth distribution.
a, lower littoral; b, inner sublittoral; c, outer sublittoral; d, upper bathyal.

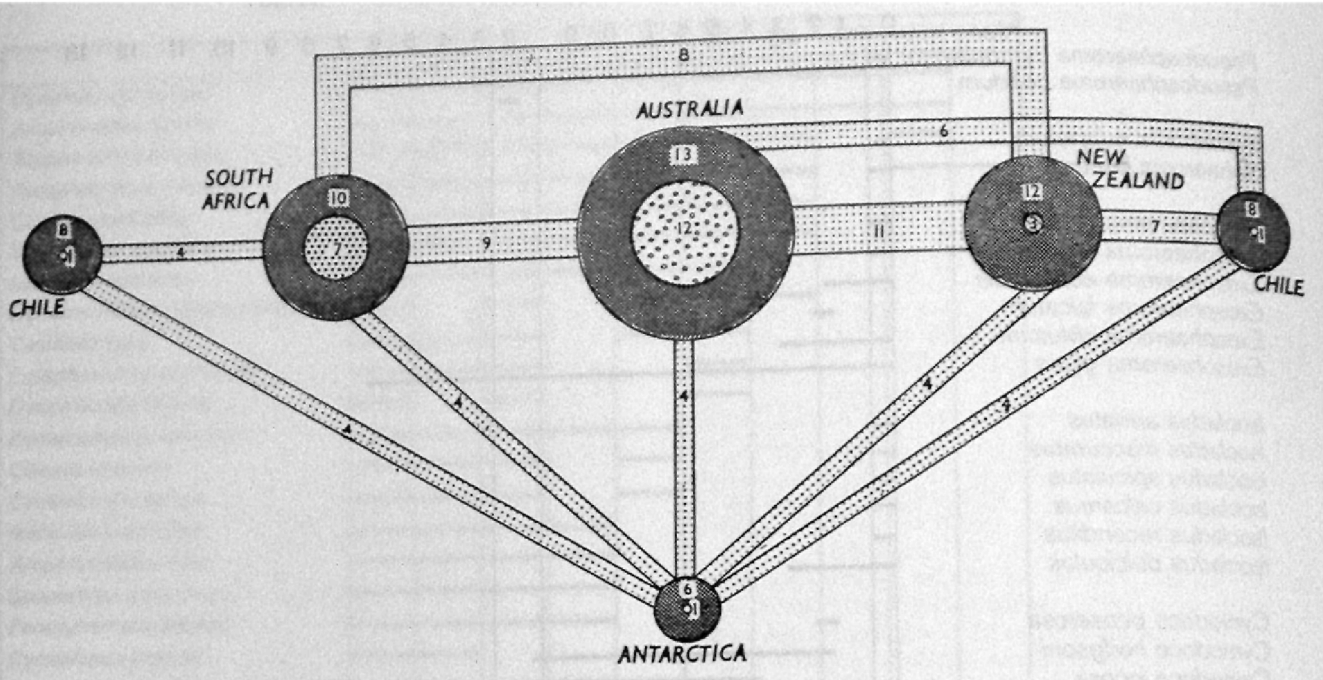

FIG. 68. Distribution of genera of Sphaeromatidae in the Southern Hemisphere. Within the circles, central numbers are of endemic and outer numbers are of non-endemic genera; numbers in bands joining regions are of genera common to those regions.

Exosphaeroma gigas is recorded from 0 to 615 m, but the 615 m record is of two specimens from the Chatham Rise which may have been misidentified and are not available for re-examination. If this record is omitted the range is reduced to 0–143 m, which may be a truer indication of the real depth range of this species.

Eight species range from 17 m or thereabouts to 205 m, and three species (*Cymodopsis impudica, C. torminosa,* and *C. sphyracephalata*) represent the only true deep-water sphaeromatids found so far in the New Zealand region. They range from 420 m to 1225 m.

Of the 15 genera recorded from New Zealand, only six extend into the outer sublittoral (100–250 m), but five, possibly six, reach into the upper bathyal (deeper than 250 m). The other seven appear to be wholly confined to the inner sublittoral.

ZOOGEOGRAPHICAL DISTRIBUTION

Although there are undoubtedly many sphaeromatid species to be recorded or discovered in the Southern Hemisphere, as our own work indicates, there are fortunately several fairly extensive systematic papers available which allow some zoogeographical comparisons to be made—those of K. H. Barnard on South Africa (1940), Menzies (1962) on Chile, Kusakin (1967) on the Antarctic*, the present work on New Zealand, and the papers of Whitelegge (1901, 1902), Hale (1929), and Baker (1926, 1928) on Australia. After taking into account all species of sphaeromatids, littoral and deep-water, schematic diagrams have been constructed (Figs 68, 69) to illustrate several important points of generic and specific distribution.

The generic distribution (Fig. 68) shows links between all major southern regions. The strongest, as might be expected, is between Australia and New Zealand, which are closest together and the most favoured by oceanic currents for transport (from Australia to New Zealand) of the type of rafted debris which might carry seeding populations or individuals. However, significant links are also indicated between South Africa and Australia, New Zealand and Chile, Australia and Chile, and South Africa and New Zealand. This suggests that the general west-to-east oceanic circulation has helped overall distribution. Kusakin (1967) also makes this point, with particular reference to *Exosphaeroma gigas*. (The possibility of invoking continental

*This paper covers an extensive discussion of distribution and zoogeography within the Antarctic region.

drift as an agency is hardly necessary in view of the fact that littoral species are involved.) Weaker affinities between Chile and South Africa (as also the smaller total number of sphaeromatids recorded from Chile) may well be altered by more comprehensive collection in southern South America.

Perhaps the most significant and immediate point is that in each region the endemic genera are the minor proportion. In Australia, it is true, they reach almost 50%, but elsewhere they are less significant. When we turn to species distribution, however, the remarkable point is the very *high* endemic proportion. Except for Chile, where non-endemics represent about 38%, and the Antarctic, where the sphaeromatids are obviously affected by the lack of suitable littoral shores, the proportion of non-endemics is not more than 12%.

Likewise, links between countries are weak. The strongest is that between South Africa and Australia (five species in common, one involving different subspecies). Australia and New Zealand have three species in common. Chile and Antarctica also have three, which is not surprising in view of their closeness to each other.

This suggests that, while there has been sufficient sphaeromatid interchange for genera to become established widely throughout the Southern Hemisphere, this has not been frequent enough to allow the establishment of identical species from country to country. At most it has provided initial representatives of most genera, which have then diversified within each region, giving a remarkably high proportion of endemic species.

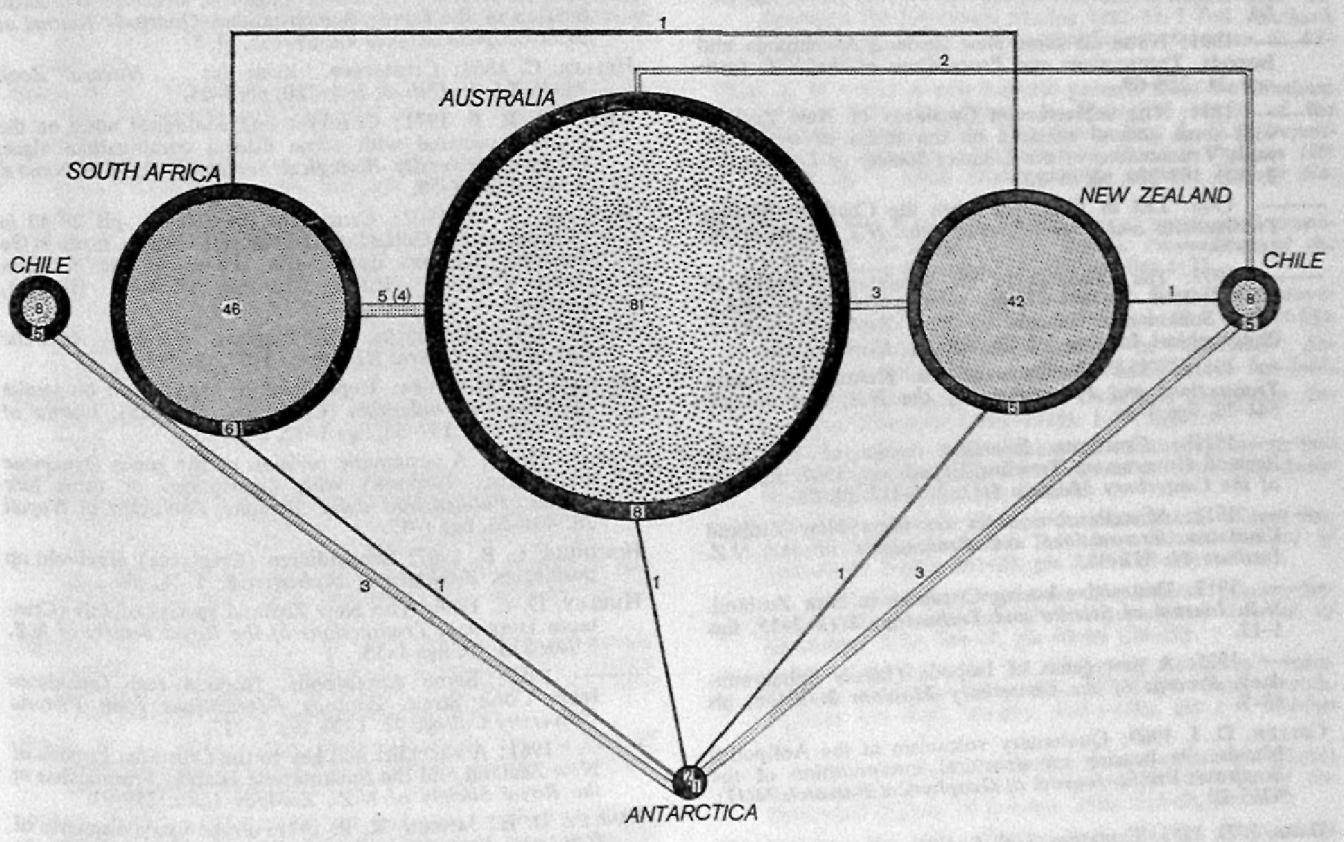

FIG. 69. Distribution of species of Sphaeromatidae in the Southern Hemisphere. Conventions as in Fig. 68.