hooks Peraeonal somite 4 overlapping the border of somite 3 but overlapped by the border of the fifth somite, peraeonal setae moderately developed. Inferior claw of dactyl of peraeopods one to seven simple, not bifid. Lateral subapical processes of sympod of male first pleopod not diverging laterally, lateral margins smooth, medial processes subtriangulate, provided with 5 marginal setae, Pleotelson wider than long, posterior border medially produced into a lobe. Uropod slightly more than one-half as long as pleotelson; rami subequal in length, twice as long as peduncle. Operculum of female wide, with a small rounded medial process on distal margin."

MATERIAL EXAMINED. Numerous specimens from *Sphaeroma quoyana* Milne Edwards (cf. Chilton, 1912: 134) found eroding a large trunk of matai (*Podocarpus spicatus*) The wood was jammed against the upstream side of the railroad bridge about a mile from the Hutt River mouth. The *Sphaeroma* were numerous, each packed into a shallow open pit or short groove. There were no concealed tunnels in the wood Associated with the isopods were a species of *Elminius* and a marine polyzoan. Most of the *Sphaeroma* carried from three to twelve or more *Iais* Collected by E M. Sladden, 14/9/54

REMARKS The above description is that given by Menzies and Barnard for *I californica* and must be modified in view of the proposed synonymy The New Zealand specimens were identical with the Californian ones except for possessing only two coupling hooks on the maxilliped This distinction was the decisive one accepted by Menzies and Barnard in separating *Iais singaporensis* from *I californica* The remarkable coincidence of morphological details, apart from this one character, casts doubt on its validity as a specific criterion, and this doubt is further strengthened by the discovery that the New Zealand host, attributed to *Sphaeroma quoyana*, is identical with the Californian host, *S pentodon* Richardson. It is not appropriate to pursue the identity of the hosts further in this paper, but it should be remarked that there are two possibilities. The New Zealand specimens may be wrongly attributed to Milne Edwards' *S. quoyana*, which is the older species, or *S pentodon* may be a synonym of *S. quoyana*.

Granted that the New Zealand and Californian specimens are conspecific, it becomes much more difficult to accept *Iais singaporensis* as a valid species There are few qualitative differences of great import between the New Zealand specimens and the specimens from Singapore and the Philippines which Menzies and Barnard described The one possible exception to this is the uropod of the Philippine material.

Menzies and Barnard suggest the possible existence of a "rassenkreis" involving two or possibly more subspecies to explain the slight differences between their Singapore and Philippine material. The above information tends to support this, but on the present material I do not feel it appropriate to establish subspecies on either morphological or geographical grounds. It is worth noting, however, that the hosts concerned in the Singapore and Philippine localities appear to belong to a distinct and different species in each country.

The specific diagnosis may be easily emended by the following changes: "First antenna from one-fifth to one-sixth the length of the body, about one-third the length of the second antenna Second antenna about six-tenths the length of the body, flagellum of up to 24 articles Maxilliped has two or three coupling hooks. . . . Lateral subapical processes of sympod of male first pleopod not diverging laterally, medial processes have rounded, slightly acute apices;

each has 5 to 8 marginal setae. . . . Uropod one-half to one-third the length of pleotelson; rami subequal in length, longer than peduncle. Female operculum wide, with small to pronounced rounded apical lobe."

Species Inquirendae

Menzies and Barnard list as "species inquirendae" a number of records of specimens from New Zealand. As this brief resume suggests, there appear to be at least two species concerned, one of which is almost certainly *Iais californica.* Some of the records which speak of *Iais* found free-living may refer to other genera.

1. **Jaera novae-zealandiae** Chilton, 1883: 189.

Lyttelton Harbour, host unknown. This differs from *I. californica* in having unequal uropod rami. In a later paper (1892: 266), Chilton explains that the specimen "was not taken directly from a Sphaeromid but was found in a bottle with other Crustacea from Lyttelton Harbour, though I do not know the exact circumstances of its capture."

2. **Iais neo-zealanica** (Chilton). Thomson, 1889: 265.

"Numerous specimens . . . taken . . . between tidemarks in Auckland Harbour." No further information is given.

3. **Jais pubescens** (Dana). Thomson, 1893: 59.

"I have gathered this species at Auckland and Dunedin, and Mr. Chilton has recorded it from Lyttelton. . . . Mr. Chilton described his specimens under the name *Jaera novae-zealandiae* . . . We have since, however, discovered that our New Zealand form agrees with Dana's, and it therefore comes under Bovallius' genius *Jais,* the most distinctive character of which is the tri-unguiculate dactyli of the walking-legs."

4. **Iais pubescens** (Dana).

Chilton, 1892: 266–267

Akaroa, creeping freely on seaweed. Also, "on a large *Sphaeroma* (probably *S. obtusata,* Dana) in Port Chalmers"

Chilton, 1906: 271.

On *Exosphaeroma gigas* (Leach) from the Chatham Islands

Chilton, 1909: 649–650.

Numerous specimens from *Exosphaeroma gigas* taken both at Auckland Islands and at Campbell Island. "Many were collected at Campbell Island creeping freely on the under-surface of stones in places where the *Exosphaeroma* was abundant."

Also taken in "the Sounds on the west coast of New Zealand . . . I seldom failed to find it at the head of each Sound, creeping freely on the surface of stones at the mouths of the fresh-water streams; at low tide these stones would be washed with fresh water only, and some were above the reach of ordinary high tides. . . . In most of these localities I did not see any Sphaeromid from which the animal could have escaped."

Chilton, 1925: 319

Chatham Islands. "Okawa, in rock pools; on *Isocladus armatus,* found also on various other Sphaeromids."

5. **Iais pubescens** (Dana) var. **longistylis** Chilton. Chilton, 1912. 132, 134

"On *Sphaeroma quoyana,* Marlborough Sounds and Hawke's Bay . The difference between it and the typical form of the species is sometimes so distinct that I have at times almost been inclined to give it a different specific name, especially as it appears to be always associated with a different species of *Sphaeroma* "

The description of the uropods and the host mentioned leave little doubt in my mind that this reference is to *Iais californica* as figured above

Of the other specimens mentioned, four distinct categories seem to demand further investigation—those found on *Exosphaeroma gigas,* those on *Isocladus armatus,* those found on seaweed, and those found under stones at the mouths of freshwater streams.

LITERATURE CITED

CHILTON, C. 1883 On two new isopods *Trans N Z. Inst* 15: 188–190, Pl XXIIa

——— 1892. Notes on some New Zealand Amphipoda and Isopoda *Trans. N.Z. Inst.* 24: 258–269

——— 1906. List of Crustacea from the Chatham Islands. *Trans. N.Z Inst.* 38: 269–273.

——— 1909 The Crustacea of the Subantarctic Islands of New Zealand *Subantarctic Islands of New Zealand.* pp. 600–671, Text-figs. 1–19 Wellington, New Zealand.

——— 1912 Miscellaneous notes on some New Zealand Crustacea. *Trans N Z. Inst* 44: 128–135

——— 1925. Some Amphipoda and Isopoda from the Chatham Islands *Rec. Canterbury Mus* 2: 317–320

MENZIES R J and BARNARD J LAURENS, 1951 The Isopodan Genus *Iais* (Crustacea). *Bull. South Calif Acad. Sci.* 50 (3): 136–151, Pls 42–50

THOMSON, G. M. 1889. Notes on, and recent additions to, the New Zealand crustacean fauna. *Trans. N.Z. Inst.* 21: 259–268, Pls 13–14.

——— 1893 Notes on Tasmanian Crustacea, with descriptions of new species *Proc Roy. Soc. Tasmania,* 1892. 45–76, Pls. 1–6

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The Vascular and Nervous Systems of *Struthiolaria* (Prosobranchia, Mesogastropoda)

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Abstract

A detailed description is given of the arterial and venous systems, and of the nervous system of the mesogastropod prosobranch, *Struthiolaria*. Special attention is paid to modifications of the vascular system of functional importance in relation to the mode of life, and an account is presented of the arrangement of "phagocytic depots" in the neighbourhood of the alimentary canal. The nervous system is compared with that of *Aporrhais* and *Strombus*, and its value and limitations as an indication of phylogeny are discussed

Most of the recent contributions to our knowledge of the anatomy of gastropods have been in the field of "functional morphology," concentrating especially upon the pallial cavity, and the digestive and reproductive systems. Here a valuable picture has been built up of the relation of structure to function. The more favoured systems of the classical morphologists—the vascular and nervous—do not, however, lend themselves so easily to functional treatment, and have come to receive much less emphasis Though the older accounts of these systems—often in minute detail—fill many pages in Bronn's Tierreichs and other textbooks, there have of recent years been few good accounts of a prosobranch nervous or blood system. One of the most well known is that of Crofts (1929) on *Haliotis.*

Yet in soft-bodied animals like the Mollusca, in which the form of the body may be constantly changing, the distribution of blood in the haemocoele plays an important role in movements, and in changes of size and shape of the various organs Especially in sedentary or slow-moving gastropods, which do not perform rapid muscular movements, we may think of the blood in the haemocoelic spaces as forming a "fluid skeleton", and the pattern of the vascular system and the blood lacunae may have an adaptive importance entirely apart from the normal physiological role of the blood It is therefore necessary to consider the "haemodynamics", or the role played by the movements of large volumes of blood, for a full understanding of the mode of functioning of the various parts of the animal.

In the same way, the trend of recent discussions on the nervous system has moved away from the classical studies of the relative positions and degree of concentration of the ganglia. As Fretter and Graham have pointed out (1949) there can be euthyneurous "streptoneura" and streptoneurous "euthyneura"; and it is in general realised that concentration of the nervous system must have taken place many times by parallel evolution in different groups The usefulness of the nervous system as a character in major taxonomy is thus likely to be much more limited than was once thought. Functional studies on the nervous system are of course best advanced in the cephalopods, following upon the work of Young; but already studies of nervous control of muscular systems in gastropods,

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