A comparative study of collections from the S.W. Pacific (Saipan to Tonga), with the descriptions of Gambiella caudata (Brady, 1890) and a new species of Pterobairdia (Ostracoda)

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ABSTRACT—Gambiella caudata (Brady, 1890) and Pterobairdia briggsae sp. nov. are described from collections made in the S.W. Pacific (Saipan, Onotoa, Ontong-Java/Kula Gulf, Noumea, Cook Islands, Fiji, Samoa, Tonga); and the lectotypes of several species described in a major early paper by Brady (1890) are illustrated. The carbonate compensation depth in this region lies at around 4500m. Comparison of the Ontong-Java in Kula Gulf samples reinforces consideration of depth as a factor of ecological importance. A similarity matrix for the several faunas shows factors in common at species level ranging from 22% (Onotoa/Noumea) to nearly 60% (Samoa/Onotoa); while endemism ranges from 8.5% (Samoa) to nearly 33% (Tonga). Most endemic species belong in a limited number of podocopid families, in particular Bairdiidae, Trachyleberididae, Paradoxostomatidae and Leptocytheridae. These results appear consistent with an hypothesis that continued tectonics-driven changes in the regional marine topography and sedimentation, i.e. niche development, could have triggered speciation along the regional plate margins.

INTRODUCTION
A study of Ostracoda and other microfauna from the S.W. Pacific commenced in 1980. It is based on material sampled during a number of cruises coordinated by CCOP/SOPAC (Committee for Coordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas). These hereafter-called SOPAC Cruises included collections from the Cook Islands (CK-76), Western Samoa (WS-76), Tonga (76, 77, 78), and Solomon Islands (SI-81). Work on the collections is part of a United Nations Development Programme (UNDP) which is monitored by a Project Office in Fiji, presently under the supervision of Dr. Cruz Matos. The SOPAC Cruise Reports and a number of Technical Reports relative to the projects can be obtained from his office. They include preliminary comments on the ostracod assemblages (McKenzie, 1981).

Most of the SOPAC offshore work between 1976-1981 was directed towards the investigation of manganese nodules, phosphorites and precious corals and to this purpose a variety of sampling devices were used. They included: free fall corer; free fall grab, Van Veen grab, gravity corer, tangle nets, rock dredge, wire lowered grab, pipe dredge, pipe and rock dredge. Often, the sediments collected were too coarse, finer material being lost as a grab was winched up. Nevertheless, much suitable material remains, particularly for stations where cores were taken or large samples were dredged up. Of the several hundred samples which have been collected, around 60 were prepared for this on-going study. They are scattered over the entire region but have the potential to provide much useful data for an area which is still relatively unknown in terms of its Ostracoda (Brady, 1890 remains the major taxonomic reference) although recently this undesirable situation has begun to improve (Whatley, 1983).

SAMPLE DESCRIPTIONS
Preliminary sample descriptions of washings provided to the author, and mostly prepared at the UNDP Project Office in Fiji, are given in Appendix A. They relate to materials recovered in the Cook Islands (CK-76), Western Samoa (WS-76) and Tonga (76, 77, 78) cruises. The ostracod taxonomic work on these samples is in progress.

OSTRACODA
Ostracods are relatively abundant in the washings examined. Fig. 1 indicates the relative diversity (genera and species) of the samples which contained ostracods as well as providing a record of the samples which lacked ostracods, both as a function of depth (see also Appendix A). The figure makes it clear that ostracods are most diverse in relatively shallow water and that they are absent from samples taken at depths greater than 5000m. In fact, the greatest depth at which ostracods were obtained in these collections was 4534m This result is interpreted as confirming that the carbonate compensation depth in the southwest Pacific occurs at slightly more than 4500m. The data set provides a fair test on which to base such an interpretation because out of the total of 54 samples, 25 were collected at depths of 4500 m or greater.

Further, in the three samples from 4534m depth (WS-76, Station 2 – of Appendix A) which carried Ostracoda, the assemblage included at least three genera...
which were probably allochthonous — *Tenedocythere, Parakrithella (?)*, *Xestoleberis* — plus a single indeterminate juvenile right valve (RV) fragment, also probably allochthonous. Thus, the likely biocenose in these samples is restricted to *Krithe, Bradleya, Echinocythereis (?)*, a large indeterminate trachyleberidid and *Cytheropteron*. Such low diversities are typical of deep water sediments and the generic composition likewise is typical. Fig. 1 confirms that diversity is much greater (over 50 species in more than 40 genera) in water 500 m or less deep.

Table 1 is a comparative analysis which gives the generic composition of two shallower water samples collected during the Solomon Islands cruise (SI-81) at 34 m and 405 m respectively. The qualitative differences between these samples are evaluated later (cf. Associated Fauna, under Systematic Descriptions, herein). Here it is stressed that there is little in common between these samples and those from 4534 m in both the genus and species levels; and the commonality at the family level is only 5 out of 15. When all shallower water (500 m depth or less) samples are considered, the familial commonality rises to 6 out of 15, or 20% — *krithiids* occurring in two samples from Western Samoa (at 176 m and 159 m depth respectively) and in a single dredged sample from Tonga, at 180–174 m depth (Appendix A).

One of the taxa from these shallower water samples is the spectacular bairdiid genus, *Pterobairdia* (McKenzie & Keij, 1977) for which this paper represents only the second published record. S.E.M. micrography of the specimens shows enough variation from the previously described type species to justify description of a new species.

Several shallow water collections of S.W. Pacific Ostracoda are available for comparison with the Ontong-Java and Kula Gulf assemblages (Fig. 2). These are: firstly, the collections made by H. B. Brady in the late 19th century from Noumea, Fiji and Samoa (Brady, 1890); secondly, collections made at Onotoa, Gilbert and Ellice Islands, on behalf of the Pacific Science Board (Cloud, 1952); thirdly, collections made at Saipan, Marianas Islands, by the United States Geological Survey (Cloud, 1956); fourthly, a small collection made by the author at Fiji; and, finally, shallow water samples from Tonga and Samoa in the SOPAC material. The first-named set is part of the Brady Collection, in the Hancock Museum, Newcastle-upon-Tyne; the Onotoa and Saipan Ostracoda were picked by the author from samples held at the Smithsonian Institution, Washington, D.C.; the Fiji collection is retained by the author. The Tonga and Samoa samples were picked for ostracods by the author at SOPAC’s Fiji office in 1981. Table 2 records the results as a similarity matrix.

**SYSTEMATIC DESCRIPTIONS**

Order Podocopida G. W. Mueller, 1894

Suborder Podocopida Sars, 1866

Family Bairdiidae Sars, 1888

Genus *Pterobairdia* McKenzie & Keij, 1977

Type species. *Pterobairdia maddocksae* McKenzie & Keij, 1977

**Diagnosis.** A bairdiid genus characterised by heavy valves ornamented with prominent pustolose beaked alae, pitted surfaces and flat topped marginal spines.

**Stratigraphic range.** Holocene.

*Pterobairdia briggsae* sp. nov.

(Pl. 1, figs. 1–7)

**Derivation of name.** For Dr W. M. Briggs, Jnr. United States Geological Survey, Colorado, who worked years ago on Samoan material of the genus.

**Description.** Shell of medium size; dorsal margin more or less regularly bowshaped in the right valve (RV) and also in the distinctly overlapping left valve (LV); ventral margin inflexed medially, broadly rounded anteriorly and posteriorly and spinose at both regions, the posteroventral spines being specially large, broad and flat topped; posterior terminating in a subtruncate cauda; greatest height medial and rather more than half the length. Dorsal view dominated by the backswept alae which give the genus its name, greatest width posteromedial and about 4/3 the length.
Ostracods from the S.W. Pacific

| Genera                        | VVG 12 % (34 m) | VVG 20B % (405 m) |
|-------------------------------|-----------------|--------------------|
| Neonesidea                    | 16.0            | 31.2               |
| Paranesidea                   | 0.6             | 27.1               |
| Triebelia                     |                 | 3.4                |
| Pterobairdia                  | 0.6             | 0.7                |
| Bythocypris                   |                 | 12.4               |
| Anchistrocheles               |                 | 0.7                |
| Saipanaeta                    |                 | 0.7                |
| Marocyprina                   |                 | 4.0                |
| Propontocypris                | 1.2             | 2.0                |
| Paijenborahella               |                 | 0.7                |
| Keijia                        | 0.6             | —                  |
| Morkhovenia                   | 6.5             | —                  |
| Callistocythere               | 11.2            | —                  |
| Aurila                        | 2.4             | —                  |
| Mutilus                       | 27.2            | —                  |
| Trachyleberis                 |                 | 0.7                |
| Trachyleberid indet. 1        | 1.2             | 0.7                |
| Trachyleberid indet. 2        |                 | 1.4                |
| Ponticocythereis              | 6.5             | —                  |
| Tenedocythere                 | 11.2            | 5.4                |
| Quasibradleya                 | 0.6             | —                  |
| Xestoileberis                 | 8.3             | 0.7                |
| Loxocorniculum                | 5.9             | —                  |
| Loxoconcha                    |                 | 4.7                |
| Sclerochilus                  |                 | 1.4                |
| Paracytheros                  |                 | 0.7                |
| Cytherelloidea                |                 | 1.4                |

Table 1. Comparative ostracod analysis from Ontong-Java (VVG 12) and Kula Gulf (VVG 20B), Solomon Islands, in genera percentages.

The table indicates a generic commonality of only 6 out of 27 (22.2%) and a family commonality of 5 out of 15 (40%). There is one common species, *Pterobairdia briggsae* sp. nov.

Each valve is ornamented overall by fine pittings (often obscured by aggraded calcite in the available material). The large alae are hollow and occupy about half valve length; they are coarsely pustulose, as indicated in Pl. 1 which also shows that smaller pustules ring individual muscle scars and are scattered rather generally over the valve surface especially in the dorsal region. They tend to be absent from the (anterior) leading edge of each valve. There is no trace of any eye tubercle.

The inner lamella is broad and the line of concrescence is broadly and regularly curved. Radial port canals are relatively numerous, long and flexuous. A vestibule is lacking but the marginal selvage is distinct.

The hinge as in most bairdiids is simple comprising a straight narrow RV ridge and corresponding accommodation groove in the LV. The central (adductor) muscle scar pattern is a rosette of scars, most of them ringed by small pustules as noted earlier. Normal pore canals are scattered, small, simple and unrimmed. As both available specimens are adult females no comment can be made on sexual dimorphism or on the juveniles of this taxon. Likewise, the soft part morphology and ontogeny are unknown.

**Dimensions.** Holotype: NMV Reg. No. J11198 (adult female: RV length = 0.65 mm, height = 0.35 mm; LV length = 0.65 mm, height = 0.38 mm; carapace breath = 0.87 mm).

Paratype: Aust. Mus. Reg. No. (adult female): LV length = 0.65 mm, height = 0.38 mm.

**Material.** Two female adult individuals, one carapace and one LV.

**Locality data.** Holotype: SOPAC Cruise SI-81(2), Sample VVG 12 Ontong-Java Lagoon, water depth 34 m, substrate coarse, mainly *Halimeda* debris deposited on a flat basinal floor, Lat. 5°29.6'S, Long. 159°37.1'E.

Paratype: SOPAC Cruise SI-81(2), Sample VVG 20B, Kula Gulf, water depth 405 m, substrate of silty sand with medium – coarse *Halimeda* debris and about 5% brown calcareous crusts deposited on an oceanic slope, Lat. 7°12.4'S, Long. 158°33.9'E.

**Associated fauna.** In the Ontong-Java Lagoon, the associated ostracods include *Neonesidea, Callistocythere, Mutilus, Ponticocythereis, Tenedocythere, Loxocorniculum* and *Xestoileberis*; other microfossils include foraminifera, bryozoans, echinoid spines, small gastropods, coral and pelecypod fragments. In Kula Gulf, the associated fauna is distinctly different. The ostracods include *Neonesidea, Paranesidea, Triebelia, Bythocypris, Macrocyprina, Propontocypris, Quasibradleya, Loxoconcha, Sclerochilus* and *Cytherelloidea*; the other microfauna includes foraminifera (dominantly planktic), bryozoans, small gastropods, pteropods, and radiolarians (mainly spongiodiscids).

Because of the associated *Halimeda* debris (*Halimeda* is a photophilic shallow water alga) it is likely that the Kula Gulf sample is mixed and includes allochthonous elements that have moved downslope. However, this sample could not be wholly transported. Table 1 indicates that the two samples have little in common at both generic and family levels. It also shows the restriction of such shallow water taxa as *Keijia, Morkhovenia, Callistocythere, Ponticocythereis, Tenedocythere, Aurila, Mutilus, Loxocorniculum* to Ontong-Java Lagoon (VVG 12) whereas such typical deep water taxa as *Bythocypris, Macrocyprina* and *Paijenborchella* are restricted to the Kula Gulf sample (VVG 20B). Since both samples were collected using a Van Veen Grab and were prepared identically by 'floating' the material, the differences cannot be attributed to the sampling and preparation techniques. At least in part, they reflect real environmental variation attributable to difference in
Explanation of Plate 1

Figs. 1–7. *Pterobairdia briggsae* sp. nov. [figs. 1–5, adult female holotype NMV Reg. No. J11198; figs. 6, 7, adult female paratype Aust. Mus. Reg. No. P35590]: fig. 1, internal view RV (×63); fig. 2, external view carapace showing LV overlap over RV (×58); fig. 3, external view RV (×63); fig. 4, detail of pustules in muscle scar region (×260); fig. 5, external view RV (×55); fig. 6, dorsal view LV (×55); fig. 7, oblique internal view LV (×55): Localities given in text.

Fig. 8. *Cytherelloidea fijiensis* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B455]: external view RV (×63), Vuna Point, Taviuni, Fiji.

Fig. 9. *Cyprideis consobrina* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B457]: external view RV (×32), shore sand Artillery Point, Noumea.

Fig. 10. *?Thalmannia scotti* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B448]: slightly oblique external view RV of carapace (×33), Banc de l’aiguille, Noumea.

Fig. 11. *?Pseudaurilia guttata* (Brady, 1890) [holotype, Hancock Mus. Reg. No. B465]: external view RV (×63), Ile Porcheron’s Beach, New Caledonia.

Fig. 12. *Triebelina truncata* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B441]: slightly oblique external view RV of carapace (×65), Apia, Upolu, Samoa.

Fig. 13. *Loxocorniculum marcida* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B460]: external view RV (×60), Apia, Upolu, Samoa.

Fig. 14. *Loxoconcha gracilis* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B458]: external view RV (×62), Porcheron’s Beach, Noumea.

Fig. 15. *Paracytheridea trilobites* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B467]: external view LV (×64), Banc de l’aiguille, New Caledonia.

Fig. 16. *Callistocythere crenata* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B443]: external view LV (×67), Porcheron’s Beach, Noumea.

Fig. 17. *?Tanella ochracea* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B444]: external view RV (×66), Porcheron’s Beach, Noumea.

Fig. 18. *Paranesidea ventricosa* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B440]: external view LV (×65), shore sand, Artillery Point, Noumea.

Fig. 19. *Paracytheridea longicaudata* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B466]: external view LV (×63), Sava-Sava Bay, Vanua Levu, Fiji.

Fig. 20. *Ishizakiella inflata* (Brady, 1890) [paralectotype female, Hancock Mus. Reg. No. B445b]: dorsal view (×71), shore sand, Lufi-Lufi, Upolu, Samoa.

Fig. 21. *Paranesidea nodulifera* (Brady, 1890) [holotype, Hancock Mus. Reg. No. B442]: external view RV (×67), Levuka, Fiji.

Fig. 22. *Tenedocythere deltoides* (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B450]: external view RV (×62), Apia, Upolu, Samoa.

Fig. 23. *Ishizakiella inflata* (Brady, 1890) [lectotype male, Hancock Mus. Reg. No. B445a]: external view LV (×68), shore sand, Lufi-Lufi, Upolu, Samoa.
depth (34 m for Ontong-Java lagoon, 405 m for Kula Gulf) and to the fact that Ontong-Java lagoon is a relatively protected environment compared with Kula Gulf.

**Comparison.** The new species differs from the type species, *P. maddocksae* in several shell ornamentation features. *P. maddocksae* is densely and coarsely pitted over the entire surface except for the pustulose alae; in *P. briggsae* this surface pitting is fine. In *P. maddocksae* only the alae and the regions near the base of the alae are pustulose, and the alar pustules are more or less uniformly coarse; but in *P. briggsae* smaller pustules ring the adductor muscle scars (on the alae), and other pustules are scattered rather generally over the valves especially in the dorsal areas, additional to the coarse alar pustules. As far as their respective sizes are concerned, *P. maddocksae* averages about 0.71 mm (range 0.70 - 0.73 mm) in length, based on specimens from Onotoa, and the total material included a single adult valve from the Flores Sea which measured 0.76 mm (McKenzie & Keij, 1977, pp. 371-372). *P. briggsae* is 0.65 mm in length, so is smaller than *P. maddocksae* in this parameter; but it is relatively broader. In *P. briggsae* the carapace width is about 4/3 the length; while in *P. maddocksae* the (inferred) carapace width is about 5/4 the length. Finally, in *P. briggsae* the LV overlap appears to be much more prominent than in the type species.

**Family Leptocytheridae Hanai, 1957**
**Subfamily Pectocytherinae Hanai, 1957**
**Genus Gambiella Witte, 1985**
**Type species.** *Gambiella caleata* Witte, 1985.

**Diagnosis.** A pectocytherine genus, small and subtrapezoidal in lateral view, with LV overlapping RV slightly in anterodorsal region; there is a well defined
Ostracods from the S.W. Pacific

Table 2. Comparative shallow water ostracod assemblages from the S.W. Pacific – similarities.
Total number of species in the analysis is 177. The table records similarities; i.e. of the 44 species from Noumea, 22 also occur in Fiji, 15 in Tonga.

| Location | Noumea | Fiji | Samoa | Tonga | Saipan |
|----------|--------|------|-------|-------|--------|
|          | 44     | 22   | 21    | 15    | 15     |
|          |        | 51   | 22    | 17    | 17     |
|          |        |      | 26    | 61    | 26     |
|          |        |      | 47    | 17    | 47     |
|          |        |      | 47    | 18    | 47     |
|          |        |      | 51    | 21    | 68     |

Gambiella caudata (Brady, 1890)

(Pl. 2, fig. 2; Figs. 3, 4)

**Description.** A species of *Gambiella* characterised by a small (0.44 – 0.45 m in length) subtrapezoidal carapace with the LV overlapping the RV slightly, especially in the anterodorsal region. There is a distinct eye tubercle. The surface ornament consists of numerous deep elongate pits (muri) with microspinose inner margins and a transverse dog-leg posterior ridge, behind which the shell surface is smooth. Dorsal margin straight, anterior broadly rounded, ventral margin inflexed anteromedially, posterior subacuminate. Height is about 45% of the length. In dorsal view, the posterior valve ridges give a weakly subhastate profile but greatest breadth remains medial and is about 1/3 the length. Internally, both anterior and posterior inner lamellae are broad and both have large vestibules; marginal pore canals can be short or flexuous and tend to be branched; normal pore canals are sieve-type; the central muscle scars are small and comprise 4 adductors, a frontal scar and at least one mandibular scar (the shell surface in the central muscle scars region is non-pitted); the hinge is typically pentodont consisting in the LV of a relatively large anterior socket and smaller posterior socket with a crenulate ridge in between the termini of which are

![Fig. 3. Internal lateral view of adult female LV of *Gambiella caudata* (Brady, 1890) lectotype, Hancock Mus. Reg. No. B447a (Brady Collection). Camera lucida drawing of valve immersed in glycerin (×200).](image-url)
Explanation of Plate 2

Fig. 1. Cytheropteron rude Brady, 1890 [lectotype, Hancock Mus. Reg. No. B464]: external view LV (× 130), Sava-Sava Bay, Vanua Levu, Fiji.

Fig. 2. Gambiella caudata (Brady, 1890) [lectotype adult female, Hancock Mus. Reg. No. B447a]: external view RV (× 130), Sava-Sava Bay, Vanua Levu, Fiji.

Fig. 3. Sarsiella rudis Brady, 1890 [lectotype, Hancock Mus. Reg. No. B481]: external view RV (× 32), Rambe Island, Fiji.

Fig. 4. Neomonoceratina entomon (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B461]: slightly oblique external view RV of carapace (× 127), Port of Noumea, 3–4 fathoms.

Fig. 5. Rutiderma (Alternatochelata) sp. [non Sarsiella sculpta Brady, 1890]: external view RV (× 32), off Cap Bon Louis, 4 fathoms, near Noumea.

Fig. 6. Sarsiella joveata Brady, 1890 [lectotype, Hancock Mus. Reg. No. B482]: external view RV (× 32), Banc de l’aiguille, Noumea.

Fig. 7. Hemicytherura scutellata (Brady, 1890) [holotype, Hancock Mus. Reg. No. B462]: external view RV (× 127), Levuk., Fiji.

Fig. 8. Morkhovenia cuneola (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B446]: external view RV (× 134), Loma-Loma, Vanua Mbalavu, Fiji.

Fig. 9. Alatahermanites infundibulata (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B451]: external view RV (× 65), Vuna Point, Fiji.

Fig. 10. Sarsiella sculpta Brady, 1890 [lectotype, Hancock Mus. Reg. No. B479]: external view RV (× 33), off Cap Bon Louis, 4 fathoms, near Noumea.

Fig. 11. “Cythere”’ torticollis Brady, 1890 [lectotype, Hancock Mus. Reg. No. B449]: external view RV (× 61), Banc de l’aiguille, Noumea.

Fig. 12. ?Ponticocythereis labiata (Brady, 1890) [holotype, Hancock Mus. Reg. No. B452]: slightly oblique external view RV carapace (× 64), Levuka, Fiji.

Fig. 13. Ponticocythereis quadrirerialis (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B454]: external view RV (× 64), shore sand, Artillery Point, Noumea.

Fig. 14. Ponticocythereis ichthyoderma (Brady, 1890) [lectotype, Hancock Mus. Reg. No. B453]: external view LV (× 64), Sava-Sava Bay, Vanua Levu, Fiji.

Fig. 15. Streptoleberis crenulata Brady, 1890 [lectotype juvenile, Hancock Mus. Reg. No. B478]: external view RV anterior end uppermost (× 64), off Cap Bon Louis, 4 fathoms, near Noumea.
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Fig. 4. Gambiella caudata (Brady, 1890). Adult male, paralectotype, Hancock Museum Reg. No. B447b (Brady Collection): A, Dorsal view LV; B, Ventral view RV ($\times$200).

**McKenzie**

strengthened into knob-like projections. Sexual dimorphism distinct with females relatively higher than males.

**Dimensions.** Lectotype, Hancock Mus. Reg. No. B447a (Brady Collection), adult female carapace separated for SEM micrography and illustration of the internal features.

LV length = 0.45 mm, $h = 0.20$ mm; RV length = 0.44 mm, $H = 0.20$ mm Paralectotype, Hancock Mus. Reg. No. B447b (Brady Collection), adult male carapace $L = 0.44$ mm, $H = 0.20$ mm, $B = 0.15$ mm.

**Material.** 2 adult carapaces, 1 male the other female (both separated into LV and RV for illustration purposes).

**Type locality.** Savu-Savu Bay, Vanua Levu, Fiji (Brady, 1890).

**Comparison.** Gambiella caudata is readily distinguished from an as yet undescribed species from Darwin because the latter has rounded rather than elongate deep pits.

**Stratigraphic Range.** Holocene.

**Distribution.** G. caudata is known only from shallow water environments of Fiji (Brady, 1890) and Manila Bay (Keij, 1954).

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**DISCUSSION**

The explanation for the occurrence of a second species of Pterobairdia within the known range of P. maddockssae, which extends from Sipura Island, off Sumatra, to Eniwetok and Samoa (cf. Fig. 2) may well lie in an appreciation of the regional tectonics. The localities for P. briggsae lie immediately east of the small Solomon Plate, which formed during the Early Tertiary and has been active especially from Miocene - Quaternary (Davies, Symonds and Ripper, 1984). It seems likely that continued tectonics-driven changes in the regional marine topography and sedimentation, i.e. niche development, could have triggered speciation at the developing plate margins. A similar idea was put forward to account for the evolution of a new paracypridid subfamily in the same regional setting (McKenzie, 1980).

An independent indication of the plausibility of the hypothesis is provided by Whatley (1983). The author’s data were obtained from many regional D.S.D.P. sites, including three from the Ontong-Java Plateau of which one (D.S.D.P. 288) is close to the P. briggsae localities. One of the aspects considered was the common occurrence of species at several sites for Miocene, Pliocene or Quaternary ostracod faunas. The results show that the Ontong-Java Plateau sites were faunally more similar to each other than to sites from other areas to the south and that their commonality with these other
areas was 1–3 species in the Miocene (out of 22 Ontong-Java species), 3–8 species in the Pliocene (out of 46 Ontong-Java species), and 7–18 species in the Quaternary (again out of 46 Ontong-Java species).

Further, to the north of the Ontong-Java Plateau, the ostracod fauna of the Ita Mai Tai guyot (D.S.D.P. 200) is distinguished by greater than 80% endemism at the species level (Whatley, 1983, figs. 10–13). Unfortunately, all these faunas are deep water ones from the bathyal and abyssal zones. A test for depths from 0–500 m remains desirable (Table 2).

The first point to be made in discussion of Table 2 is that the sample sets are not equivalent at all locations. Thus, Ontong-Java and Tonga are represented by only two samples each whereas the Onotoa and Saipan collections each comprise over 50 samples. The sampling at other locations is more equitable: seven samples for Noumea, 10 at Fiji and six for Samoa. Secondly, the environments represented by these sample sets are mainly nearshore – tide pools, beaches, mangroves, shallow lagoonal. Exceptions to this generalisation are the sets from Tonga and Ontong-Java/Kula Gulf which were collected at depths from about 35–400 m. This environmental factor accounts satisfactorily for the diversity difference between Tonga and the other locations represented by small sample sets (55 and 58 samples respectively). A third important factor to be considered is that each of the locations cited is separated from the others by intervening abyssal and bathyal deeps, as Fig. 2 makes clear.

Inspection of the similarity matrix (Table 2) indicates that Ontong-Java/Kula Gulf has about 45% similarity with Onotoa, about 40% similarity with Saipan, Samoa and Tonga, and is least similar to Fiji and Noumea (somewhat more than 25%).

Table 3 records the obverse aspect of the relationships between these shallow water assemblages i.e. the number of species exclusive to each. While recorded as “endemics” in the table, it is not implied that they all evolved at the particular locations because sampling is clearly incomplete, both with respect to environments and to a sufficiency of samples. But, when analysed in greater detail, some patterns of distinctiveness emerge that are worth further comment. It is known that certain families are prone to more rapid speciation (greater diversity) than others; these include Cytherellidae, Bairdiidae, Leptocytheridae, Cytheruridae, Paradoxostomatidae, Hemicytheridae and Trachyleberididae. For Ontong-Java/Kula Gulf, the sample depths are too great for much diversity in Leptocytheridae, Cytheruridae here excluding Cytheropteroninaceae. Further, Cytherellidae and Hemicytheridae are minor groups in the total species list (seven and five species respectively in a total of 177). But, out of 27 bairdiids, five are exclusive to Ontong-Java/Kula Gulf; and of 29 trachyleberidids (including thaecocytherines) six are exclusive to Ontong-Java/Kula Gulf. For Bairdiidae and Trachyleberididae at least, Table 4 indicates that, given the sampling constraints, the families are more distinctive at the margins of the Solomons Plate than elsewhere in the southwest Pacific.

Other work in progress on the shallow water benthic ostracods of the Solomon Islands also supports an hypothesis of considerable endemicity in the area of the Solomons Plate. In a preliminary study, Whatley & Titterton (1981) note that they are working on a very large fauna of around 160 species – but do not specify the number of samples from which this fauna was recovered, although they tabulate or refer to 21 samples (op. cit., p. 158). These authors estimate that there are about 130 new species, i.e. 75% of the fauna. This estimate is much greater than that recorded in Table 3 (based on only two samples). Possibly, some of their new species will turn out to be already described, e.g. *Ponticocythereis spinosa* Whatley & Titterton, 1981 is a junior synonym of *Ponticocythereis quadrirerialis* (Brady, 1890) and *Alatahermanites* sp. Whatley & Titterton, 1981 is the same species as *Alatahermanites infundibulata* (Brady, 1890). On the other hand, my species determinations

|     | CL | BA | LE | CR | PA | TR | HE |
|-----|----|----|----|----|----|----|----|
| Noumea | 44 |    |    | 10 |    |    |    |
| Fiji   | 51 | 14 |    |    |    |    |    |
| Tonga  | 61 | 20 |    |    |    |    |    |
| Samoa  | 47 |    | 4  |    |    |    |    |
| Ontong-Java | 47 |    | 14 |    |    |    |    |
| Onotoa | 68 | 14 |    |    |    |    |    |
| Saipan | 58 | 16 |    |    |    |    |    |

Table 3. Comparative shallow water ostracod assemblages from the S.W. Pacific – distinctiveness.

|     |     |     |     |
|-----|-----|-----|-----|
|     | CL  | BA  | LE  | CR  | PA  | TR  | HE |
| Noumea | −   | 1   | 2   | −   | 1   | 4   | −  |
| Fiji   | −   | 1   | 1   | 1   | −   | 2   | 1  |
| Tonga  | 1   | 1   | 2   | 1   | 1   | 4   | −  |
| Samoa  | −   | −   | 1   | −   | 1   | −   | −  |
| Ontong-Java | 1   | 5   | −   | −   | 1   | 6   | −  |
| Onotoa | 2   | 2   | 2   | 1   | 2   | 2   | −  |
| Saipan | 1   | 2   | 2   | 1   | 1   | 2   | 2  |

Table 4. Assemblage distinctiveness at the species level for selected ostracod families.

*CL* = Cytherellidae; *BA* = Bairdiidae; *LE* = Leptocytheridae; *CR* = Cytheruridae; *PA* = Paradoxostomatidae; *TR* = Trachyleberididae; *HE* = Hemicytheridae.
may be less narrow than those of Whatley and his colleague. Despite such subjective considerations, however, the Solomons Plate fauna is obviously very distinctive and, as hypothesized here, the regional tectonics since the Miocene affords a convenient and satisfying explanation for that fact.

Indeed, returning to Tables 2 and 3, it seems evident that the pattern of considerable endemicity near plate margins bordered by trenches is a common one in the S.W. Pacific so that the hypothesis put forward here and in McKenzie (1980) could also be used to explain the ostracod faunas of Fiji, Noumea, Tonga and Saipan. Some other factor, possibly isolation, is likely significant for assessing ostracod assemblages from Onotoa; and a paucity of samples allied to restricted environmental sampling probably accounts for lack of distinctiveness in the Samoan fauna.

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APPENDIX A – Description of SOPAC Samples (based on washings)

Cook Islands

CK-76; Station 2; 5010m; Lat. 18° 09.5’S., Long. 159° 38.0’W.; 12.6.’76.

FFC-1B: sediment yellowish-brownish; comprising mainly yellowish or reddish stained small grains (non-quartzose, but calcitic); some larger pieces which are aggregates of small rounded grains cemented by a paler limey clay; manganiferous and haematite-stained grains; pyroxene (olivine-peridot) grains; mica flakes; and small angular quartz grains.

microfauna includes rare globigerine and rotaliform forams; occasional dentiform pieces possibly referable to cephalopods; nil OSTRACODA.

FFG-3A & 3B (2 vials): sediment yellowish-brownish; carrying occasional bipyramids of high-temperature quartz; rare (and larger) grains of frosted quartz; numerous grains of dark-coloured minerals (probably pyroxenes or granules of lava – origin in lahars, lava flows, ash rain, etc); mafics (one part-octahedron of magnetite identified); plus numerous reddish-brown manganiferous grains and granules.

microfauna includes rare globigerine forams (none in 3B); sponge spicules (hyaline); rare nanoplankton, mainly actinommid radiolarians; dentiform pieces possibly representing cuttlefish rostra or cephalopod jaws; nil OSTRACODA.

CK-76, Station 4; 5130m; Lat. 15° 16.0’S., Long. 159° 08.5’W.; 14.6.’76.

FFC-3B: sediment uniformly dark-brownish; comprising mainly a manganiferous clay; pieces of nodular manganese; occasional rounded grains of frosted quartz and some small grains of high temperature quartz; plus an occasional piece of bright greenish glauconitic clay, sometimes with dispersed small manganese granules.

microfauna almost exclusively of dentiform pieces referable to cephalopods; except for a single long, slender, hollow hyaline tube (pteropod); nil OSTRACODA.
FFC-3C: *sediment* brownish, comprising mainly small granules of clay aggregates; many larger manganiferous pieces; some small usually frosted angular quartz grains; rare lime green glauconite granules; and occasional mica flakes. 

*microfauna* exclusively of dentiform pieces referable to cephalopods; *nil* OSTRACODA.

FFC-3D: *sediment* uniformly yellowish-brownish; comprising mainly small clay aggregates, with occasional dark manganiferous pieces, rarely haematite-stained; quartz rare, subangular to angular, occasionally frosted.

*microfauna* not recorded; *nil* OSTRACODA.

FFC-4B: *sediment* similar to that described below for FFC-4D. 

*microfauna* exclusively of dentiform pieces referable to cephalopods; *nil* OSTRACODA.

FFC-4C: *sediment* brownish; consisting of small clay aggregates; some dark manganiferous grains often haematite-stained; a single larger piece of frosted quartz and some pieces of small angular quartz. 

*microfauna* mainly referable to cephalopods but including three small globigerine forams; *nil* OSTRACODA.

FFC-4D: *sediment* brownish to reddish-brownish; comprising small granules of clay aggregates; numerous larger manganiferous pieces, many haematite-stained; small quartz grains, often haematite-stained; rare mica flakes. 

*microfauna* mainly dentiform pieces referable to cephalopods; rare sponge spicules; *nil* OSTRACODA.

FFC-5C: *sediment* uniformly dark-brownish; with many 'granules' composed of compacted clay particles; numerous manganese particles; frequent grains of haematite-stained quartz; very rare flakes of mica; some reddish-brown granules (associated with manganiferous encrustations). 

*microfauna* mostly dentiform pieces referable to cephalopods; and a few sponge spicules; *nil* OSTRACODA.

FFC-5D (2 vials): *sediment* uniformly pale-yellowish; most grains and pieces are clay-coated; frequent grains of dark-coloured minerals – mafics, some pyroxenes (including peridot and one larger, clear clinopyroxene of prismatic habit) – a few reddish-brown granules; many rounded manganiferous granules; abundant crystal aggregates of various types all coated with the pale-yellowish clay. 

*microfauna* rare; of dentiform pieces possibly referable to cephalopods; *nil* nannoplankton, forams, OSTRACODA.

FFC-6B & 6D: *sediment* uniformly pale-yellowish; most grains and pieces are clay-coated; frequent grains of dark-coloured minerals – mafics, some pyroxenes (including peridot and one larger, clear clinopyroxene of prismatic habit) – a few reddish-brown granules; many rounded manganiferous granules; abundant crystal aggregates of various types all coated with the pale-yellowish clay. 

*microfauna* rare; of dentiform pieces possibly referable to cephalopods; *nil* nannoplankton, forams, OSTRACODA.
FFC-9C: sediment as described for this station below (FFC-9D); additionally a few mica flakes and a small angular prismatic fragment of greenish pyroxene (probably olivine) were noted.

*microfauna* usually dentiform and referable to cephalopods; one globorotalid foraminiferal; *nil* OSTRACODA.

FFC-9D: sediment uniformly yellowish-brownish; consisting mainly of small clay aggregates; with occasional manganiferous pieces; some haematite-stained granules; and some small angular quartz grains.

*microfauna* usually dentiform, referable to cephalopods, *nil* OSTRACODA.

**Western Samoa**

**WS-76**: Station 1; 176m; Lat. 13° 46.3’S., Long. 171° 41.1’W.; 15.3.’76.

FFC-1: sediment whitish; predominantly abraded very coarse detritus of organic carbonate; comprising fragments of corals; pelecypods; gastropods (including the egg cowrie); bryozoans; worm tubes; large forams; smaller benthic forams (arenaceous taxa, miliolids, rotalines, textulariids), rare globigerine planktonic forams; occasional holothurian sclerites; echinoid spines; sponge spicules; pteropod tubes; the finer grades in the sample are simply the comminuted debris of such organisms; plus numerous polished brown granules (? phosphatic); OSTRACODA common (especially bairdiids) including Neonesidea (4 spp.); Paranesidea (1 juv. sp.), Parakrithella, Bishopina, Paracytheridea, Keijia, Morkhovenia, Callistocythere, Oclocythere, Propontocypris (juvs.), Pontocythere, Tenedocythere(?), indet. gen. (juv.), Macrocyprina, Loxocorniculum, Loxoconchella, Xestoleberis (2 spp.).

**WS-76**: Station 2; 4534m; Lat. 13° 32.1’S., Long. 171° 27.3’W.; 16.3.’76.

FFC-1B: sediment greyish; a melange of calcareous detritus; angular, frosted quartz grains; and volcanic derived grains (which include green-black volcanic glass, high temperature quartz, pumice, olivine); plus some manganese-rich nodular grains.

*microfauna* rare, mainly of planktonic forams – less common are rotalines, miliolines, Spirillina and an agglutinated taxon –; plus some echinoid spines; *nil* OSTRACODA, except for single indet. juvenile.

FFC-2B: sediment whitish; predominantly a foraminiferal ooze comprising globigerinids and globorotalids with occasional agglutinated forams plus some buliminaceans, miliolaceans, lagenids etc; sponge spicules common; occasional echinoid spines; and circular bryozoans; rare OSTRACODA: *Krithe, Cythereopteron, Echinocythereis, large trachyleberidid, (fragment of juv. RV), Tenedocythere, Parakrithella(?), Xesto-

**WS-76**: Station 7; 2040m; Lat. 14° 07.9’S., Long. 171° 36.5’W.; 18.3.’76.

FFC-7: sediment predominantly microfaunally with a few clasts of blackish vesicular basalt and some olivine grains.

*microfauna* mostly planktonics (globigerinids dominate), plus buliminaceans, miliolaceans, nodosariaceans, rare larger forams; rare gastropods and pelecypods; echinoid spines and shell fragments; sponge spicules; rare pteropods; rare holothurian sclerites; rare OSTRACODA: Poseidonamicus (adult RV), deepsea gen. nov. (adult RV); Echinocythereis(?); Krithe (3 spp.); Xestoleberis (juv.); Neonesidea (juv.); Loxoconcha (juv.); Paracypris (adult RV); Paracythere (juv.); Cardobairdia (juv.). Arglillocia (2 spp.).

FFC-6B: sediment whitish; predominantly abraded, very coarse detritus of organic carbonate; combining fragments of corals; pelecypods; gastropods; bryo-
zoans; worm tubes; coloured and white holothurian sclerites; echinoid spines; large forams, smaller benthic forams (rotalines, textulariids, miliolids, elphidiids, nodosariids etc); rare pteropod fragments; the finer material of the sample being merely a comminuted aggregate of bits of these organisms plus rare grains of volcanic origin (basalt).

*microfauna* as indicated above; OSTRACODA frequent, including Keijia, Callistocythere, Xestoleberis (2 spp.), Neonesidea (2 spp.), Paranesidea, Cleto
cythereis, gen. nov. aff. Cristatella Brady, Anchistocheles, Ponticythereis, Loxocorniculum, Propontocypris, gen.
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nov. pontocypridid, Gambiella caudata (Brady), Para-
cytheridea, Puijenborchella iocosa, Morkhovenia.

FFC-6C: sediment predominantly carbonate detritus; poorly sorted. smaller particles mainly carbonate with some olivines, etc. but land derived material comparatively rare and usually worn.

microfauna of corals; bryozoans; barnacle plates; pelecypods; gastropods; holothurian sclerites; larger forams and small forams (non-planktonic); OSTRACODA frequent, including Morkhovenia inconspicua (Brady), indet. LV, Parakrithella sp., Xestoleberis sp., Puijenborchella iocosa Kingma, Cletocythere is rastro-
marginata (Brady), Callistocythere sp., pontocypridid indet. (juv.). Neonesidea.

WS-76: Station 12; 159m; Lat. 13° 56.1'S., Long. 172° 07.5'W.; 20.3.'76.
FFC-7B: sediment of carbonate detritus; fine-medium grade; predominantly fragmental but including a thanatozoenose of bryozoans; holothurian sclerites; forami-
niferae (mainly benthic families, but with some globigerines); pteropods; pelecypods; gastropods; rare sponge spicules; and brown faecal pellets; and yellow-
globigerines); pteropods; pelecypods; gastropods; rare
microfauna almost exclusively of globigerine forams with rare globorotaliids, nodosariaceans and buliminaceans; nil OSTRACODA.

FFC-8C: sediment black to brownish black; clasts of vesicular basalt (average diameter about 5mm) and grains of olivine, zeolites.

microfauna of corals; bryozoans; barnacle plates; pelecypods; gastropods; holothurian sclerites; larger forams and small forams (non-planktonic); OSTRACODA frequent, including Morkhovenia inconspicua (Brady), indet. LV, Parakrithella sp., Xestoleberis sp., Puijenborchella iocosa Kingma, Cletocythere is rastro-
marginata (Brady), Callistocythere sp., pontocypridid indet. (juv.). Neonesidea.

WS-76: Station 17; 4194m; Lat. 13° 12.3'S., Long. 172° 38.9'W.; 25.3.'76.
FFC-11A: sediment pepper and salt coloured; comprising substantial volcanic debris including volcanic glass, olivine, high temperature quartz.

microfauna globigerine-rich; also with numerous spon-
godiscid radiolarians (looking like 3-bladed aeroplane propellers); OSTRACODA rare, include Zabythocy-
pris (adult ꠢ), Krithe, Echinocythereis(ꠢ) (2 adult valves, 1 juv.), Loxocorniculum, Argilloecia, indet. trachyleberidids (2 spp.).

FFC-11B: sediment similar to previous sample.

microfauna abundant; mainly globigerine forams; with occasional spicules; and echinoid spines; OSTRACO-
DA rare, including Krithe, Cytheropteron, Ambocy-
there, indet. trachyleberidid (all juveniles).

FFC-11C: sediment pepper and salt coloured; comprising volcanic debris and white globigerine forams. the volcanic material including pieces of glass, olivine, zeolites.

microfauna apart from Globigerina, Orbulina, buli-
maceans and others, includes occasional agglutinated forams; also present are a few echinoderm spines; and sponge spicules; nil OSTRACODA, except for a single juvenile valve of Krithe.

FFC-11D: sediment much more freely microfaunal than FFC-11A, B, C and dominated by globigerines; sponge spicules include monaxons, triaxons (anchors) and polyaxons; OSTRACODA rare, including Krithe, Zabythocypris (all juveniles).

Tonga

T-76: Station 7; 956m; Lat. 21° 5.5’S., Long. 174° 49.1’W.; 22.4.'76.
FFC-1A: sediment volcanic detritus; including pumice, vesicular greenish-black basalt, pilli, olivines, high temperature quartz; with an abundant carbonate detri-
tus (incl. microfossils) so that the overall sample colour is pepper and salt-like.

microfauna abundant; gastropods; pelecypod spats; pteropods; echinoid spines; forams, comprising mainly globigerines and globorotaliids; radiolarians, including spongodiscids, actinommds; OSTRACODA rare, in-
cluding Argilloecia (3 spp.), Krithe, Neonesidea, Orlo-
vibairdia, Bythocypris (2 spp. juv.). Cardobairdia

WS-76: Station 15; 3156m; Lat. 13° 36.1’S., Long. 172° 55.1’W.; 24.3.'76.
FFC-8B: sediment greenish-brown to black; dominantly pieces of fresh vesicular basalt.

microfauna of planktonic forams (mainly globigeri-
roids), plus rare buliminaceans; rare sponge spicules; one gastropod fragment; nil OSTRACODA.
(broken valve); Paracythere(1); Propontocypris (3 spp.), Xestoleberis (4 spp.); Microxestoleberis (1 sp.); Ornatoberis (1 sp.); 8 spp. divers (all juvs.); Paracythereis (2 spp.); Roundracythere (adult LV). Abyssocypris (= Australoecia sp. 1 Maddocks); Javanella; Poseidonamicus (juv.); Bythoceratina (adult LV); Pseudocythere (juven. fragment RV).

FFC-1B: sediment volcanic detritus; including pumice, vesicular greenish black basalt, high temperature quartz, olivines; all rather fresh so that the overall colour of the sample (incl. microfauna) remains greenish-black.

microfauna abundant, similar to above sample, plus a few sponge spicules; OSTRACODA rare, including Pseudocythere, Paracythereis (2 spp.); Argilloecia (2 spp.); Abyssocypris (= Australoecia sp. 1 Maddocks) Neonesidea, Kritha (2 juvs.-LV, RV); Polycop (2 spp.); Tenedocythere (juvs.); Xestoleberis (mainly juvs.); indet. spp. (2, both juvs.), Propontocypris, Bradlya.

FFC-1C: sediment volcanic detritus; including pumice, pilli, vesicular basalt (some pieces weathered greenish); high temperature quartz, olivines; plus rare grains of glauconite; sufficient weathered materials occur to give the sample a greenish cast.

microfauna predominantly planktonic foraminifers – globigerines (including Orbulina), globorotaliids – plus other forams as in FFC-1D below; also gastropods; pelecypod spats; pteropods; rare sponge spicules; and radiolarians (actinommids); OSTRACODA: rare, including Xestoleberis, Argilloecia (2 spp.), Bythocypris (2 spp.). Polycop, Microcythere, Poseidonamicus, Kritha, Roundracythere, Microcythereura, Paijenborchella, indet. juv., Atjehella sp. nov., Cytheropteron.

FFC-1D: sediment volcanic detritus; including pumice, vesicular basalt, high temperature quartz, olivines, zeolites, fragments of ignimbrite – mostly fresh but often displaying weathering giving the sample an overall greenish cast.

microfauna abundant; predominantly planktonic foraminifers – globigerines and globorotaliids –, plus other forams – buliminaceans, rotalines, miliolids, nodosariaceans, arenaceous taxa –; also gastropods; rare pelecypod spats; and a variety of pteropods; spongiodisc radiolarians; echinoid spines; and sponge spicules; OSTRACODA rare (single juvenile LV of Xestoleberis and a RV of Loxoconcha).

T-76: Station 7; 2582 m; Lat. 18° 25.4'S., Long. 173° 48.7'W.; 2.5.76.

FFC-6: sediment greenish-greyish; bits of pumice, volcanic pilli, shards, occasional grains of olivine, vesicular basalt.

microfauna predominantly planktonic and globigerine, occasional globorotaliids, miliolaceans and buliminaceans; rare sponge spicules and very rare OSTRACODA: 1 juv. indet. trachyleberidid.

T-76: Station 8; 3281 m; Lat. 18° 47.7'S.; Long. 173° 17.2'W.; 3.5.76.

FFC-5A: sediment volcanic detritus, including straw-greenish particles of pumice, pilli, olivines, ignimbrite, vesicular basalt, plus rare crimson grains (zeolite?); with an abundant carbonate component (microfossils); overall colour pepper and salt.

microfauna abundant; mainly planktonic foraminifera, including Orbulina, other globigerines, globorotaliids, rare miliolids, buliminaceans, arenaceous forms; no other microfaunal groups observed except for rare echinoid spines and radiolarians.

FFC-5B: sediment volcanic detritus; including pumice, pilli, vesicular basalt, olivine crystals, high temperature quartz; mingled with about an equal or slightly smaller quantity of carbonate debris and planktonic forams giving a pepper and salt overall colour.

microfauna mainly planktonic forams (globigerines, globorotaliids) lagenids, miliolids, buliminaceans; rare sponge spicules; numerous theoperid, actinommid and spongiodisc radiolarians.

T-76: Station 10, 4765 m; Lat. 19° 36.4'S., Long. 173° 14.2'W.; 5.5.76.

FFC-7: sediment of volcanic detritus; pumice, pilli, olivine crystals, vesicular basalt – overall greenish black; mixed with the whitish microfauna; some reddish-brown oxidised grains (non-manganiferous, maybe carbonate).
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**microfauna** very small foraminifers, usually planktonic but including polymorphinids, miliolids, nodosariids, textulariids, rotaliids, etc.; spongodiscid radiolarians; OSTRACODA confined to single valve of *Xestoleberis* (probably washed down from shallower water).

**T-76**: Station 12; 4768m; Lat. 19° 29.7'S., Long. 173° 38.4'W.; 8.5 '76.
FFC-9: sediment greenish-black overall; fine volcanic detritus; pumice, pilli, vesicular basalt, olivines; high-temperature quartz; most slightly abraded.

**microfauna** rare, mainly small planktonic foraminifers, but including arenaceous forms, rare elphidids, buhlinaceans, lagenids, miliolids, cibicidids, etc; abundant radiolarians, including numerous detritus; pumice, pilli, vesicular basalt, olivines; high-temperature quartz; most slightly abraded.

**microfauna** of pelecypods; gastropods; pteropods; planktonic and benthic forams; including arenaceous taxa, miliolids, etc; rare echinoid spines. OSTRACODA very rare – lone shell of *Paranesidea* (juv.).

**T-76**: Station 13; 1382m; Lat. 19° 54.2'S., Long. 174° 10.1'W.; 9.5 '76.
FFC-10: sediment predominantly volcanic detritus greenish-greyish to blackish; including pumice, olivines, pyroxenes, high temperature quartz; zeolites(?)

**microfauna** rare: predominantly foraminifers, mostly globigerinids with globorotaliids common, plus occasional miliolaceans, arenaceous forms include textulariids; and rare gastropods; and pteropods; nil OSTRACODA.

**T-77**: Station 11; 1290-1284m; Lat. 17° 29.0'S., Long. 173° 59.0'W.; 24.9. '77.
DRG-7: sediment pepper and salt mixture; of volcanic detritus-pumice, pilli, vesicular basalt, olivines, high temperature quartz; and carbonate detritus.

**microfauna** of pelagic forams, but volcanic pumice are common and also occasional clasts of basalt.

**T-77**: Station 12; 1495-1490m; Lat. 15° 33.9'S., Long. 173° 28.2'W.; 25.9. '77.
DRG-8: sediment predominantly composed of globigerine forams, but volcanic pumice are common and also occasional clasts of basalt.

**microfauna** as indicated above; plus rare OSTRACODA including *Bradleya, Anchistrocheles, Havanardia, Paranesidea* (2 spp.), *Neonesidea* (4 spp.), *Macrocypriina, Tenedocythere, Xestoleberis* (3 spp.), *Microxestoleberis*, *Foveoleberis*, *Paracytheridea* (2 spp.).

**T-77**: Station 6; 1770m; Lat. 19° 35.7'S., Long. 174° 50.7'W.; 19.9. '77.
DRG-4: sediment of volcanic debris and foraminiferal tests; the volcanic material includes a large whitish clast of pumice; plus volcanic glass, zeolites, rare high temperature quartz, numerous fragments of greenish pumice.

**microfauna** abundant; mainly planktonic forams (usually globigerines), also cibicids, miliolids and rotaliids; occasional echinoid spines; and fragments of molluscs, nil OSTRACODA.

**T-77**: Station 9; 1456m; Lat. 18° 48.2'S., Long. 174° 22.8'W.; 22.9. '77.
DRG-6: sediment predominantly greenish-blackish; mainly volcanic detritus, including pumice, ejectamenta, pilli, vesicular basalt, olivine crystals, high temperature quartz (all looking very fresh) – medium sand sized with occasional large clasts.

**microfauna** rather sparse; includes foraminifers, mostly globigerines (e.g. *Orbulina*), globorotaliids, rare arenaceous forams (textulariids, ammodiscids), polymorphinids, miliolids; OSTRACODA very rare, restricted to *Argilloecia*.

**T-77**: Station 15; 125-88m; Lat. 19° 00.1'S., Long. 174° 04.8'W.; 29.9. '77.
DRG-11: sediment yellowish; predominantly an abraded, yellowish carbonate detritus; comprising fragments of pelecypods; gastropods; large forams; bryozoans; sponge spicules; the small forams include miliolids, rotaliines, nodosariaceans, textulariids etc plus some globigerine planktonics; holothurian sclerites; echinoid spines; faecal pellets; associated with whitish organic carbonate detritus and grains of olivine, high temperature quartz and zeolite.

**microfauna** as indicated above; plus rare OSTRACODA including *Bradleya, Anchistrocheles, Havanardia, Paranesidea* (2 spp.), *Neonesidea* (4 spp.), *Macrocypriina, Tenedocythere, Xestoleberis* (3 spp.), *Microxestoleberis*, *Foveoleberis*, *Paracytheridea* (2 spp.).

**T-77**: Station 16; 180-174m; Lat. 18° 59.5'S., Long. 174° 04.6'W.; 29.9. '77.
DRG-12: sediment predominantly a carbonate detritus much of it unidentifiable to group but clearly including fragments of gastropods; pelecypods; fragments of pteropods; bryozoans; and sponge spicules; holothurian sclerites; echinoid spines; small foraminifers
(miliolids, arenaceous taxa, rotaliines, nodosariaceans, elphidids, etc); large foraminiferans; rare planktonic forams (usually broken); actinommid radiolarians; ostracods; plus volcanic detritus including pumice and vesicular basalt and shiny brownish rounded granules.

Microfauna as indicated above. Ostracoda common including Neonesidea (4-5 spp.), Paranesidea (1 sp.), Anchistrocheles, gen. nov. pontocypridid, Propontocypris (2 spp.), Loxocorniculum (2 spp.), Loxochoncha, Rotundacythere, Cytherelloidea, Triebelina, Xestoleberis (4 spp.), Oculocythereopteron (2 spp.), ‘Pterygocythereis’, Mutilus, gen. nov. small bythocytherid, Callistocythere, Ishizakiella, Foveoleberis, Argilloecia, Macrocyprina, Cardobairdia, Tenedocythere (3 spp.). Bradylea, Velibythere velivola (Brady), Bythoceratina, Trachyleberis, Ponticocythereis, myodocapid fragments, Krithe, Sclerochilus, Loxoconchella (bullate), Pseudocythere, Xiphichilus, Polynoepe, indet. spp. (2-3).

T-78(2); Station 4; 3220-3180m; Lat. 18° 44.3’S., Long. 173° 11.8’W.; 9.11’78.
DPP-2: sediment pepper and salt coloured; volcanic detritus including pumice, vesicular basalt, olivine crystals, high temperature quartz, with some large fragments but mostly the same grade as the microfossils.

Microfauna abundant, mainly globigerine planktonic foraminifera, other foram groups include lagenids, miliolids, globorotaliids; rare echinoid spines; plus theoperid, spongiodiscid and actinommid radiolarians; Ostracoda rare including Argilloecia (juv.), Krithe, Poseidonamicus.

T-78(2); Station 7; 4870m; Lat. 19° 40.0’S., Long. 173° 26.9’W.; 12.11.’78.
DPP-3: sediment greenish-black; volcanic detritus mainly pumice and vesicular basalt; the fragments often carrying zeolites, olivine, high temperature quartz.

Microfauna rare consisting of five species of arenaceous foraminifers; plus numerous spongiodiscid, actinommid, coccolidiscid, and theoperid radiolarians; and a few sponge spicules; nil Ostracoda.