Studies on the New Zealand Amphipodan Fauna.
No. 10. A New Species of Cacao*

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Summary
Cacao sanguineus n sp. is described from Otago waters.

Introduction and Acknowledgments

Through the interest and generosity of Mr. A. J. Black of the Dunedin vessel "Alert," it has recently been possible for the Portobello Marine Biological Station to undertake a programme of dredging in the deep-water canyons of the Otago Coast. Amongst material already collected are specimens of the genus Cacao of which only one species has previously been discovered. This was Cacao lacteus Barnard, 1932, from Discovery Station 273 in the East Mid-Atlantic off Portuguese West Africa.

I wish to express my gratitude to Mr. Black, and also to Dr. E. J. Batham of the Portobello Marine Biological Station, for their kind assistance.

Family Tironidae Stebbing.


"Pleon well developed. Head usually produced into a deflexed rostrum. Sideplate 4 (except in Argissa) not conspicuously large, often smaller than 3rd. Eyes of various characters. Antenna 1 with accessory flagellum, peduncle longer, flagellum shorter in female than in male; antenna 2 little or not longer than antenna 1 in female, considerably longer in male. Lower lip with inner lobes. Mandible robust, but palp slight, usually with a very short 3rd joint. Maxilla 1, inner plate with several setae, outer with (so far as known) 11 spines, 2nd joint of palp long. Maxilla 2, inner plate rather the broader, fringed on inner margin. Maxillipeds normal. Gnathopods 1 and 2 feeble, slender, not very unequal, 5th joint long, 6th shorter, subchelate or simple. Peraeopods 1 and 2 slight. Peraeopod 5 usually the longest. Uropods 1 and 2, outer ramus the shorter; uropod 3, rami subequal. Telson long, cleft (except in Bruzelia)."—Stebbing, 1906

As will be seen from the generic and specific descriptions which follow, there is considerable discrepancy between the genus Cacao and the Family Tironidae in which it has been placed. For the present, I consider it of some value to give the family description here, even though Cacao may well be transferred at some later date to a different family.

Barnard places Cacao in the Tironidae with the comment that its place here may be debated Using Stebbing's key to the families of Gammaridea (1906),

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the genus keys out in the Laphystiopsidae (= Lafystiidae, cf. Barnard, 1930: 342) or possibly, depending on one’s interpretation of “maxilliped normal” in one dichotomy, into the Calliopiidae where Walker (1909) provisionally placed the genus Chagosia with which this genus may be identical. (Walker gives insufficient details to clarify this point). Barnard’s own key (1940), which does not include the Lafystiidae, keys out Cacao into the Oechselidae or again, depending on interpretation, into the Calliopiidae. (In this key, Colomastigidae and Oechselidae appear to have been accidentally transposed.) In neither key does the Tironidae appear a possible conclusion.

It would seem that in placing the genus in the Tironidae, Barnard has followed the lead given by Chevreux (1912) when he placed the closely allied Alexandrella in this family. Rather than confuse the issue by further conjectures on the family relationship at this stage, I prefer to leave Cacao, at least temporarily, in the Tironidae although it does demand a certain liberality of interpretation.

Genus Cacao Barnard, 1932
Barnard, 1931: 427.

“Rostrum minute. Eyes very large and prominent. Side-plate 1 large, as deep as sideplate 2, triangularly produced forwards; sideplate 3 shallower than 2. 4 shallower than any of the preceding; sideplates 5–7 feebly bilobed. Telson entire, apically emarginate.

“Antenna 1 without accessory flagellum. Upper lip bilobed. Mandible with smooth cutting edge, large dentate secondary cutting plate in left only, no spine row or molar, palp 3-jointed, 3rd joint shorter than 2nd. Lower lip without inner lobes, outer lobes acuminate. Maxilla 1, inner lobe horizontally projecting inwards, much smaller than outer lobe which has 15 spines on inner margin, palp with 2nd joint enormously enlarged to form a curved plate. Maxilla 2, both lobes projecting inwards. Maxilliped, outer plate not greatly exceeding inner plate and placed laterally to it, not overlapping it, palp well developed, extending beyond apex of outer plate.

“Gnathopods 1 and 2 simple, 5th and 6th joints broad.

“Peraeopods 3–5, 2nd joint not strongly expanded.”

—Barnard. 1932

This is a slightly expanded diagnosis on the original 1931 paper.

The species described below differs from the above only slightly in that maxilla 1 outer lobe has more than 15 spines, and the first four sideplates do not differ anywhere near the extent described by Barnard for C. lacteus in degree of shallowness.

The specimens were taken in a beam trawl so there is no indication of the nature of the bottom although other dredgings in this region (54/13) have yielded both coarse shell-gravel (54/12) and mud (54/14). They are probably, as Barnard suggests for C. lacteus, free-swimming and pelagic or bathypelagic. They were taken at a depth of ± 275 fathoms; Barnard’s at 200–230 (~0) metres.

Cacao sanguineus n.sp.

Figs. 1–35.

Eyes salmon pink and covered by dome on cephalon. Stomach region light yellow (or grey-brown), gonads slightly orange; brood-pouch, gnathopods and
1st 2 peraeopods a deep blood-red colour. This vivid colouration of the ventral thoracic portion is very distinctive and persistent.

Sideplate of gnathopod 1 covers head to just below eyes; the antennae are very long, the 2nd the longest; the 1st uroscope segment has a distinct keel preceded by a notch.

Length 21 mm., depth 6 mm., width 5 mm.

Antennae. First: Peduncle short, 1st segment stout, as wide as long, 3 times length 2nd segment, 4 times 3rd, these last 2 narrower; 1st strongly setose on inferior and inferodistal margins; 2nd and 3rd inferiorly setose and spine-setose. Flagellum of about 40 segments, proximal ones short and wide, distal ones long and narrow, superiorly naked; inferior margins of 1st 12 are strongly setose and spine-setose, the setae becoming less profuse until the 12th which has 4 long spine-setae only, the next 4 segments have small tufts of short setae on angle, the last of the 4 has a strong spine; setae less obvious on rest of segments and absent from most. Second: Peduncle 2nd segment has accompanying gland cone which reaches past end of 3rd; 2nd and 3rd segments much wider than long, 3rd has strong setae and long spine-setae superodistally; 4th nearly as wide as long, 5 long slender spine-setae on surface proximally, superior margin has shorter but quite profuse setae; inferodistal angle has single long spine-seta; superodistal angle produced a little past 5th, 5th slightly longer, width 1/2 length; numerous short fine setae on superior margin, inferior has 9–10 short fine plumose setae; flagellum of about 60 segments, distally filiform, each segment has short tuft of setae superodistally.

Mouthparts. Upper Lip: Asymmetrical, distally rounded with slight notch, the left side the longer. Lower Lip: Outer plates long, not very wide, margins finely bristled especially end and inner; inner distal angle has slight spur projection; mandibular process strong and acute, not strongly curved. First Maxillae: Inner plate short and conical with strong distal tuft of finely plumose long spine-setae, superior margin finely bristled; outer an expanded wide plate with 17 stout teeth on end margin, a very thick brush of fine bristles across inferodistal angle. Palp 1st segment small and subrectangular; 2nd quickly expanded into wide ovate fan with strongly concave margin armed with about 20 very small single spines, merging into more or less straight end margin which is crenulate and coarsely toothed, defined from inner by small strong spine inferodistally; the segment has a blunt somewhat thumb-like process proximally on the inner surface near the outer margin forming a protective pocket and guard which overlaps and protects the outer plate. Second Maxillae: Plates large, flat and ovate; outer arising above inner and facing inwards so it overlaps inner somewhat; inner the wider with strongly spine-setose margins; outer distally spine-setose, inner lateral margin has about 17 strong spines, 1 or 2 short setae between bases of each pair of spines. Maxillipeds: Plates large, flat; inner subrectangular, reaching about 1/4 along outer, long spine-setae down cleft margin especially proximally, fringe of short spine-setae along end margin; outer plates ovate, reaching as far as propod base, fringed with long fine spine-setae, distal ones especially long. Basos, ischium and merus outer margins strongly fringed with long setae, a few long setae on merus inner margin; merus width 3/4 length, about 1/2 carpus length. Carpus width 3/4 length, inner margin more or less straight with about 16 long setae; outer convex with about 5 strong finely-combed spines marginally, 1 on mid-surface, 5 on outer distal angle. Propod as long, greatest width at 3/4 is about
Text-fig. 1.—Caecu sanguineus n.sp. Female. 1—Adult. 2—Antenna 1. 3—Antenna 2. 4—Plumose seta from inferior margin of antenna 2, 5th peduncle segment. 5—Upper lip. 6—Lower lip. 7—Maxilla 1. 8—9—Marginal portions of maxilla 1 palp. 10—Maxilla 2. 11—Maxilliped, right half. 12—Uropod 2.
TEXT-FIG. 2.—Cacao sanguineus n.sp. Female. 13—Keel on 1st urosome segment. 14—Left mandible 15—Right mandible 16—Gnathopod 1 17—Gnathopod 1, propod and dactylos 18—Gnathopod 1, portion of propod anterior margin. 19—Gnathopod 1, fine-combed spine. 20—Gnathopod 2 21—Peraeopod 2 22—Peraeopod 5 23—Peraeopod 5 propod anterior margin. 24—Peraeopod 5 propod tip.
\( \frac{2}{3} \) length, distally narrowing to dactylos, inner margin has about 6 fine-combed spines, inner distal angle has 3 strong spines and outer about 6, convex outer margin has 4 sets of 2–4 spines. Dactylos a short slightly curved spike with 1 or 2 fine setae near tip. Mandibles. Wide, flat, end margin a strong adze-like cutting edge with slightly produced outer distal angle, small notch near inner distal angle separating off a blunt tooth; left has strong fan-shaped accessory plate with several strong teeth, a distinct condyle above palp base (this may be present on right but damaged in my specimen); right lacks accessory. Palp very slender, 1st segment small, subrectangular, 2nd about 3 times as long, width \( \frac{1}{3} \) length, fine-combed spines along most of superior margin especially distally, some bristles;

**Text-fig 3.** *Cacoa sanguineus* n sp. Female. 25—Pereopod 1. 26—Pereopod 1 propod posterior margin 27—Pereopod 3. 28—Pereopod 3 propod anterior margin 29—Pereopod 4 sideplate and basos 30—Epimeral plates 31—Uropod 1 32—Uropod 1, pectinate ramus margin and spines. 33—Uropod 3 34—Uropod 3, fine-combed ramus margin and spines. 35—Telson.
3rd about ⅔ length 2nd, narrower, blunt-ended with spines all along superior margin.

Gnathopods. First: Sideplate expanded somewhat fan-wise; proximal width barely more than ¾ length but expanded strongly below basos insertion so distally as wide as long, angles rounded, margins naked except for setose portion above basos insertion on posterior; anterior concave, others slightly convex. Basos about ⅓ sideplate length, margins strongly setose, sinuous especially anterior, widening somewhat distally to ⅔ length. Ischium wide and short, about ¼ basos length, setose and spine-setose posteriorly; merus ¼ basos length, width not ⅔ length, subrectangular, distal angles slightly bluntly produced, long spine-setae and setae posteriorly. Carpus ovate, margins strongly convex, ⅔ basos length, width ⅔ length, strongly spine-setose inferiorly, spine-setae have finely-combed margins, 4 spines on anterior margin, several on surface and anterior ⅔ of distal margin. Propod ovate, narrowing to dactylus, greatest width ⅔ length, length ⅔ basos, strong fine-combed spines along posterior margin, on anterior ⅔ of distal margin, most of way across surface from anterior margin in 4 distinct rows. Dactylus a short stout spike, ¼ propod length. Second: Sideplate subrectangular, long and narrow with characteristic crook and slight widening above basos insertion, distal width not ¾ length, margins parallel; 1 or 2 short fine setae above rounded anterodistal angle, posterior margin has 6 or 7 long fine setae below basos, angles rounded. Rest generally like Gn 1; basos not quite ⅔ sideplate length, width ⅔ length; ischium about ⅔ basos, merus ¾ basos, width ⅔ length, carpus slightly more than ⅔ basos, width ⅔ length; propod width ⅔ length, length ⅔ basos; the difference in carpus the most noticeable. Gills as long, twice as wide as basos.

Peraeaxopods First: Sideplate as in Gn. 2, proximal width ¾ length, distal width not ⅔ length. Basos about ⅔ sideplate length, fine setae anteroprostomally, long setae on posterior margin, 2 long spine-setae on posterodistal angle. Ischium subrectangular, slightly longer than wide, nearly ⅔ basos, 4 or 5 spine-setae posterodistally. Merus somewhat piriform, ⅔ basos length, width ⅔ length, slightly convex anterior margin has 5 or 6 short spines, 3 or 4 on slightly produced angle, posterior has 4 groups of 1–3 spine-setae; 2 on angle, row of 3 or 4 on posterior surface. Carpus as long, width nearly ⅔ length, subrectangular, spines much as in merus but more on them on surface and posterodistal angle, spines fine-combed. Propod slightly longer, not as wide, narrowing to dactylus, slightly convex anterior margin has about 5 small spines, long strong spine on distal angle; about 3 down mid-surface, about 12 sets of 1 to mostly 4 spines on posterior margin; dactylus quite stout, slightly curved, not long. Second: Sideplate anterior ⅓ has parallel margins, posterior then widens to distinct rounded tooth medially, distal ⅔ of posterior truncate and slightly concave, plate narrowing obliquely to rounded anterodistal angle; proximal length ⅔ length, width at tooth level ⅔ length; surface below basos insertion quite strongly setose. Otherwise like Pr 1. Third: Sideplate wider than deep, posterior lobe only slightly the larger. Basos slightly longer, width ⅔ length, margins subparallel, anterior has long setae proximally, shorter spine-setae distally, posterior naked; 7–8 spines on flange arising medially above ischium posteroproximal insertion. Ischium subrectangular, longer than wide, ⅔ basos length, 3 short spines on anterior margin. Merus ⅔ basos length, width ⅔ length, somewhat piriform, anterior margin has 5 fine spines, posterior 7 or 8 short spines, 2 on posterodistal angle. Carpus as long, slightly narrower, anterior margin has 6 sets of 1–2 spines, 3
or 4 spines about distal angle; posterior margin naked. Propod linear, twice carpus length, width less than 1/10th length, about 6 short spines on posterior margin, about 24 sets of 1 or 2 spines along anterior. Daectylos a slender slightly curved spike, a few very fine setae on anterior margin. Fourth: Sideplate a little deeper posteriorly; basos median flange has about 12 distinct spines reaching ⅔ up basos, setae right along anterior margin, quite profuse proximally. Fifth: Sideplate small. Basos ovate-rectangular, width ⅔ length of anterior margin, strongly setose anteriorly; spined distally and on anterodistal surface; posterior margin has several very minute setae; posterior surface distally expanded past merus base, margins only slightly convex. Ischium about ⅔ basos length, slightly wider than long; anterior margin has 3 spines, distal angle a row of about 5; merus width ¾ length, almost as long as basos, 6 spines on proximal ¼ of slightly convex posterior margin, about 12 sets of 1–4 spines on straight anterior margin. Carpus as long as basos anterior margin, width ¼ length, margins straight and parallel, anterior has 6 sets of 6–8 fine-combed spines each, posterior a few very small setae. Propod as wide, slightly longer than basos and ischium combined, margins straight and parallel, anterior has 6 or 7 rows of 5–8 spines proximally, tailing distally into numerous single and paired marginal spines; posterior naked. Daectylos modified to substanteolate basos-length segment, almost as wide as propod for most of length, posterior margin naked except for about 4 minute setae near tip, anterior has about 12 stout spines, 4 or 5 setae near blunt tip, the margin alongside spines finely combed.

Epimeral Plates. First: More or less ovate with parallel lateral margins, 2 long fine setae posterodistally. Second: Subrectangular, deeper than wide, ventral margin slightly concave, lateral ones sinuous and parallel; the posterior proximally convex, distally concave; posterodistal angle very sharp and slightly produced, a diagonal suture running across plate from it; very long fine setae on anterior margin. Third: Wider than deep, widening considerably distally, anterior margin proximally concave, distally convex, with long fine setae proximally, ventral margin more or less straight, posterior straight and oblique so posterodistal angle acute but not produced except in very general way. Pleopods normal.

Uropods Biramous, rami lanceolate, inner ramus has median ridge ventrally which forms pocket with outer margin to receive base of outer ramus, the rami thus imbricating. First. Rami and peduncle subequal, 20–30 short stout spines along margins of each; those on inner margin of inner ramus longer than rest, especially proximally, outer margin of same very finely pectinate. Second. Rami longer than peduncle, outer the shorter, has about 20 spines on each margin, inner margin finely combed; inner has about 30 spines on each margin, outer margin finely pectinate; peduncle has about 12 long spines on inner dorsal margin, 10 shorter spines on distal ⅔ of outer. Third. Rami subequal, 3 times peduncle length, about 16 long spine-setae on peduncle inner margin; inner ramus has about 30 short spines on inner margin, 20 on outer; outer ramus has about 35 spines on inner margin, 30 on outer, margins distally pectinate except inner margin of outer ramus which is finely combed most of length. Telson. Narrows distally, slightly longer than basal width; end margin slightly concave.

Type. Slides P.111, ovigerous female. Paratypes: Female in Portobello Marine Biological Station Collection; female in personal collection.
LOCALITY. "Alert" Station 54/13, ± 275 fathoms Canyon "A" north of Otago Heads ("North Reef"), 171°3'E, 45°38'S. Three ovigerous females taken in beam trawl.

DISCUSSION

This species is very close to Cacao lacteus Barnard, and there are few points on which a separation can be based. The most important point is the lack of a guard process in the 1st maxilla palp of C. lacteus. Barnard does not mention or figure such a feature and it is sufficiently obvious and important to consider this omission significant. The 1st-4th sideplates as figured for C. lacteus decrease rapidly in length and this is noted in the generic diagnosis; it is not so markedly the case in C. sanguineus. The 1st sideplate seems to be distinctly more enlarged in C. sanguineus, the 4th not so squarish. The lower lip mandibular processes are straight, not downwardly curved. Peraeopod 5 is considerably longer than Pr. 3 and 4 in my specimens; Barnard speaks of it as being "as long as pereaeopods 3 and 4" in C. lacteus.

The colouration is also important. C. lacteus has thoracic segments "chocolate," the colouring extending to the head and dorsal portions as well as the ventral aspect and being sufficiently important to suggest the generic name. One of the three specimens of C. sanguineus has a grey-brown thoracic dorsal region, the other two being white. It may be that this grey-brown was due to death before fixation. However, the ventral aspect is distinctly blood-red in all three, the redness being the immediately striking feature of the animal. Furthermore, it persists in formalin and in polyvinyl alcohol mounting medium. It extends in places into spines and setae and is contained in the strongly ramifying and easily visible chromatophores.

LITERATURE CITED


