AMERICAN MUSEUM NOVITATES

Number 956 Published by THE AMERICAN MUSEUM OF NATURAL HISTORY New York City Nov. 1, 1937

A GATUN OSTRACODE FAUNA FROM CATIVA, PANAMA

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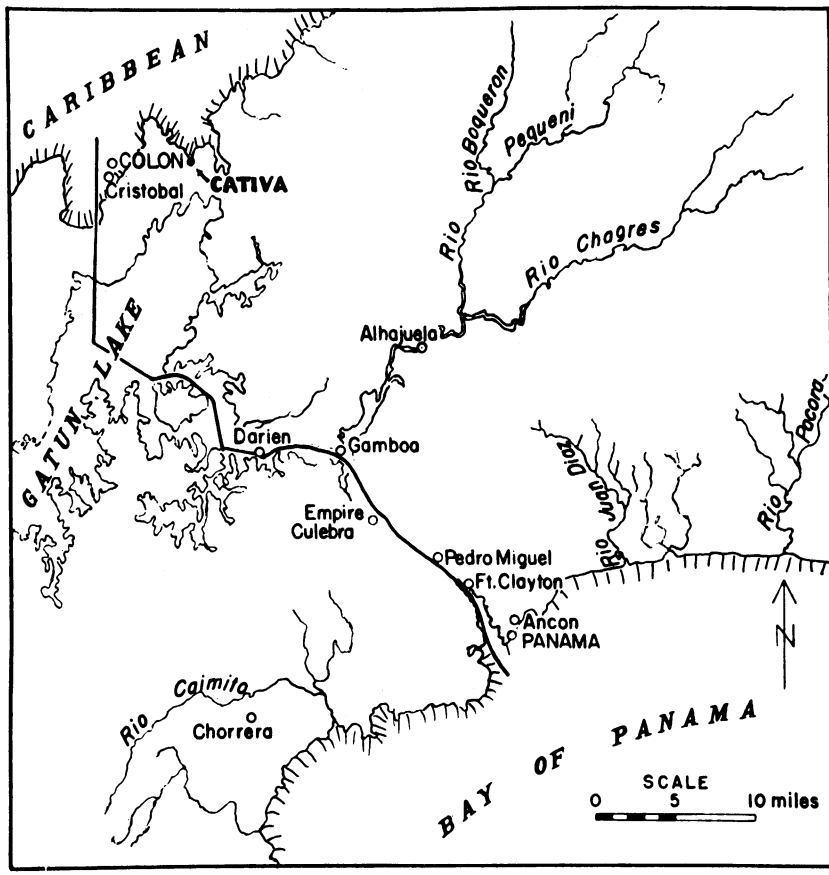
The material from which this fauna is described was collected by Captain John Embich during September, 1934, from a marl formation in the town of Cativa, located five miles east of Colon, on a small inlet of the Caribbean sea. The beds dip gently to the north at an angle of 10°–12°. They are very fossiliferous. The fauna consists of gastropods, cephalopods, pelecypods and bryozoa as the macrofossils with many foraminifera and ostracoda as the microfossils. The determination of the age of this marl as Lower Gatun is on the basis of specimens identified as *Clementia dariena* (Conrad), which, in the opinion of Woodring, is confined to the Lower Zone of the Gatun formation.

The fauna, itself, is noteworthy because of the occurrence in it of many new specimens with very definite recent affinities. The less ornamented and smooth shelled forms are much like living ostracodes, both in hinge structure and in the features of the inner lamella. Specialization is evidenced by the extremely ornate specimens, and the presence of similar ornamentation in unlike forms such as *Cativella naves* and *Navecythere delicata*. The definite appearance of modernistic trends and the occurrence of such a high degree of ornamentation indicate that in the Caribbean region rapidly changing environmental conditions accompanied the diastrophic movements which were in progress at that time.

The following table shows the position of the Cativa marl formation in the geological classification.

MIOCENE		
Upper	Middle	Lower
Toro limestone	Gatun formation	Emperador limestone
	Upper	Upper Culebra formation
	Middle	
	Lower—*Cativa marls*	
	Vamos-a-vamos	



Map of Panama Canal Zone showing the location of the Cativa collecting locality.

CLASSIFICATION AND DESCRIPTION OF THE OSTRACODA

PLATYCOPA SARS, 1865 (1866)

Cytherellidae Sars, 1865 (1866)

CYTHERELLOIDEA ALEXANDER, 1929

Cytherelloidea leonensis Howe, 1934

Figures 1a, b, c, d

HOWE, H. V., 1934, Jour. Paleo., Vol. 8, No. 1, p. 34, Pl. v, fig. 9.
MORPHOTYPES.—A. M. N. H. Cat. No. 24885.

The specimens of this species vary in the posterior thickness. This difference is interpreted as a sexual characteristic.

PLATELLA, NEW GENUS

GENOTYPE.—*Platella gatunensis*, new species.

Carapace small, thin-shelled, pellucid, subquadrate, ornamented with numerous pits and a median, subdorsal shallow sulcus. Right valve receives left in a shallow groove and overlaps it on the dorsal and ventral margins. Groups of irregular shaped muscle scars are located on the interior surface of the sulcus.

The thin-shelled feature and the ornamentation distinguishes this genus from *Cytherella* and *Cytherelloidea.*

Platella gatunensis, new species

Figures 2a, 2b

Carapace small, thin-shelled, subquadrate to broadly ovate; greatest thickness near the center of the posterior half. The convexity of the valve is ornamented by numerous pits that show some alignment near the ventral border and about the shallow, median, subdorsal sulcus. Within the shallow valves and upon the lower extension of the sulcus are four groups of muscle scars. The inner margin of the right valve is grooved to receive the slightly flanged margin of the left valve. The flange is widest and the groove deepest in the mid-dorsal portion.

LENGTH.—0.42 mm. HEIGHT.—0.2 mm.

TYPES.—A. M. N. H. Cat. No. 24886.

PODOCOPA SARS, 1865 (1866)

Cypridae Baird, 1846 (1849)

Macrocyprinae Müller, 1912

MACROCYPRIS BRADY, 1867 (1868)

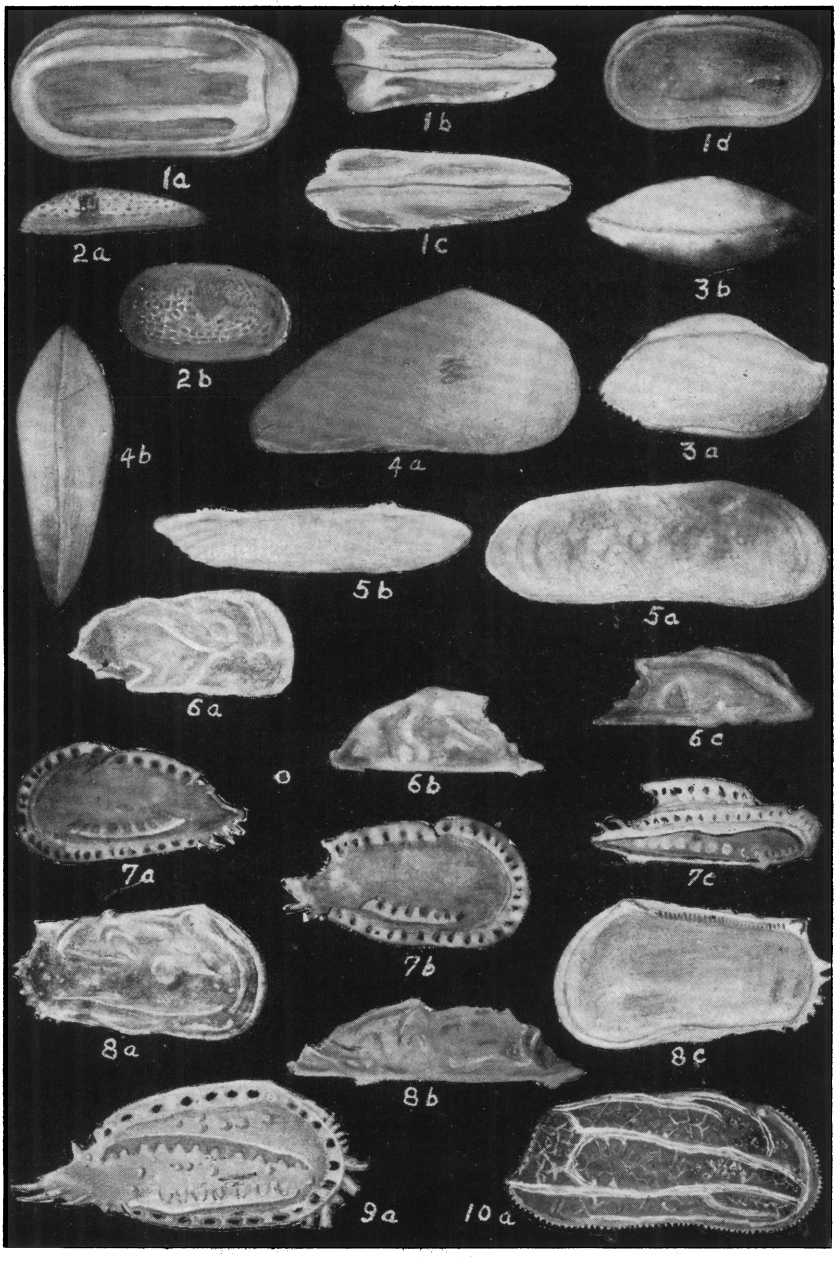
Macrocypris dreikanter, new species

Figures 4a, 4b

Carapace elongate, small, smooth, pellucid, thin-shelled; broadly rounded anterior margin; ventral margin nearly straight; dorsal margin obtusely angulated with a long posterior slope extending to the subacute posterior border. Greatest height in anterior half; greatest thickness anterior to the greatest height and near the mid-line. The length is more than twice the height. Right valve overlaps the left along the dorsal and midventral borders. The ventral overlap forms a wide cuneate flange. Three elongate parallel muscle scars occur just posterior to the position of greatest thickness.

LENGTH.—0.65 mm.. HEIGHT.—0.32 mm.

TYPES.—A. M. N. H. Cat. No. 24887.



See opposite page for captions:

Bairdiidae Sars, 1887

Bairdiinae Sars, 1923

BAIRDIA McCOY, 1844

Bairdia colonensis, new species

Figures 3a, 3b

Carapace small, translucent; finely perforated by pore canals; greatest height slightly anterior to the center of the valve. The dorsal margin is broadly arched; the ventral nearly straight; the posterior margin is acuminate below the angulation

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(Captions for Figures 1–10)

Fig. 1. *Cytherelloidea leonensis* Howe, ×75.
- a. Left valve of Morphotype, lateral view.
- b. Ventral view of female.
- c. Dorsal view of male.
- d. Interior, right valve.

Fig. 2. *Platella gatunensis*, n. gen., n. sp., ×65.
- a. Dorsal view of left valve.
- b. Lateral view, left valve.

Fig. 3. *Bairdia colonensis*, n. sp., ×85.
- a. Lateral view, left valve.
- b. Dorsal view.

Fig. 4. *Macrocypris dreikanter*, n. sp., ×65.
- a. Lateral view, left valve.
- b. Dorsal view.

Fig. 5. (?)*Cythere mylonita*, n. sp., ×110.
- a. Lateral view, right valve.
- b. Dorsal view of right valve.

Fig. 6. *Paracytheridea clara*, n. sp., ×70.
- a. Lateral view, right valve.
- b. Dorsal view of right valve.
- c. Ventral view of right valve.

Fig. 7. *Navecythere delicata*, n. gen., n. sp., ×65.
- a. Lateral view, left valve.
- b. Lateral view of a right valve.
- c. Ventral view of right valve, showing dentition.

Fig. 8. *Favella puella*, n. gen., n. sp., ×70.
- a. Lateral view, right valve.
- b. Dorsal view of right valve.
- c. Interior of right valve.

Fig. 9. *Cativella navis*, n. gen., n. sp., ×100.
- a. Lateral view, right valve.

Fig. 10. *Cythereis vaughani* (Ulrich and Bassler), ×60.
- a. Lateral view, right valve.

where the valves gape slightly; the anterior, gently curved below and straight above. The dorsal view presents a regular spindle shape.

LENGTH.—0.41 mm. HEIGHT.—0.2 mm.

TYPES.—A. M. N. H. Cat. No. 24888.

Cytheridae Baird, 1850

Cytherideinae Sars, 1925

CYTHERE MÜLLER, 1785

? Cythere mylonita, new species

Figures 5a, b

Carapace small, extremely elongate, somewhat reniform, and pellucid. Dorsal margin straight and slightly depressed; anterior margin broadly rounded dorsally and more narrowly rounded ventrally; posterior margin more narrowly rounded at the mid-height; ventral margin slightly concave near the central portion where the left valve slightly overlaps the right. A narrow rim borders the free margin. The greatest height is near the anterior cardinal angle; greatest thickness is near the middle of the line of greatest height. The convexity of the valve is marked by three or more low transverse ridges that parallel the posterior margin and a lesser number that parallel the anterior margin; low papillae, shallow depressions, numerous small, shallow pits, and openings to pore canals ornament the surface. These outside features are also distinguishable upon the inside of the valve.

A recumbent marginal area is present within the valves. It is broad in the anterior and much less developed along the ventral and posterior.

The hingement of the right valve consists of a narrow bar near each cardinal angle; the anterior bar is divided into four blunt cusps and the posterior into six. The two bars are connected by a line-like pitted groove, which lies near the slightly flanged dorsal margin. The hingement of the left valve consists of elongate terminal pitted sockets connected by a finely crenulated bar as complements of the structures in the right valve.

LENGTH.—0.42 mm. HEIGHT.—0.12 mm.

TYPES.—A. M. N. A. Cat. No. 24889.

PARACYTHERIDEA MÜLLER, 1894

Paracytheridea clara, new species

Figures 6a, b, c

Carapace elongate-quadrate, small, thin, translucent, irregularly alate. The straight dorsal and ventral margins converge distinctly posteriorly; greatest height near anterior cardinal angle; anterior margin broadly rounded; posterior margin dorsally and ventrally truncated, ending medially in a blunt flattened spine. The convexity of the valves is greatest ventrally where it is mounted with an alational ridge that is terminated in the posterior half by a spine, below which the surface slopes perpendicularly to the ventral contact. Transverse shallow depressions and ridge-like flexures ornament the surface above the alation. Posteriorly the con-

vexity is irregularly depressed, converging into the terminal spine; in the anterior half is a median horizontal ridge that bifurcates at a subcentral node, the ventral branch joining the alaial carinae near its mid-point, the dorsal branch cutting obliquely across the shell to the posterior cardinal angle. The entire surface of the valve is perforated by numerous openings of minute canals. The ventral margin of the right valve is flanged, and sinuous just anterior to the middle.

Within, the valves are deep and irregular. A narrow marginal area is present along the anterior margin. The hingement of the right valve consists of a shallow, pitted groove adjacent and parallel to the dorsal margin, with a long, narrow, curved tooth at each end. The hinge structure of the left valve complements that of the right.

LENGTH.—0.40 mm. HEIGHT.—0.2 mm.

TYPES.—A. M. N. H. Cat. No. 24890.

NAVECYTHERE, NEW GENUS

GENOTYPE.—*Navecythere delicata*, new species.

Carapace, small, thin, subtriangular; highest anteriorly; ventral overlap consists of alternate projections with the right valve possessing the median flange. Ornamentation is of delicate submarginal perforated keels and conical spines. The hinge pattern of the right valve consists of terminal, cardinal, blade-like, crenulated teeth, with a narrow pitted groove that opens interiorly at its posterior end, lying between the teeth. The left valve possesses complementary structures of sockets and marginal crenulated ridge.

This genus differs from *Cythereis* in the extreme thinness of the shell material, absence of the interior marginal area, the characteristic hingement, and peculiar ornamentation.

Navecythere delicata, new species

Figures 7a, b, c

Carapace thin, translucent, subtriangular, highest at the anterior cardinal angle, thickest in the posterior half; the dorsal contact is straight; the ventral marginal contact is sinuous about the alternate projection of the left, right, and then left valves, which arrangement forms the ventral overlap feature; the anterior margin is broadly rounded; the posterior margin is acuminate. A submarginal, rather irregularly perforated flange ornaments the surface, except along the dorsal posterior where it is absent, and along the ventral posterior, where a few curved, conical spines are present. This flange is interrupted in *en echelon* manner near the median dorsal; its posterior dorsal portion is located slightly more ventrally than the anterior portion. A short, perforated flange rises from the surface of the valve in the ventral half; it lies parallel to the ventral margin and ends posteriorly in a spine-like projection. Minute openings of pore canals are abundant over the convexity of the valve.

The hingement of the right valve consists of an anterior cardinal, long, blade-like, crenulated tooth on the dorsal margin, and a posterior cardinal, triangular tooth that extends a short distance down the posterior slope, with a narrow, finely

pitted groove between the teeth which opens interiorly at its posterior end. The hingement structure in the left valve consists of complementary cardinal socket-pits and a crenulated dorsal shell margin to fit the structures of the right valve.

LENGTH.—0.38 mm. HEIGHT.—0.22 mm.

TYPES.—A. M. N. H. Cat. No. 24891.

This species is common in the Gatun.

FAVELLA, NEW GENUS

GENOTYPE.—*Favella puella*, new species.

Carapace small, thin, translucent, subquadrate, with straight dorsal margin; greatest height near the anterior cardinal angle. Interior marginal area narrow, with short radial pore canals along the anterior border.

Hingement of right valve consists of terminal, long, blade-like teeth at the cardinal angles, connected by a narrow pitted groove parallel and adjacent to the dorsal margin. The hinge structures of the left valve are complements of the right; the terminal sockets are formed by the dorsal margin curving upward over the teeth of the right valve. The crenulated dorsal margin serves as a ridge to fit into the groove.

The surface is moderately ornamented with spines, nodes and irregular ridges.

Favella puella, new species

Figures 8a, b, c

Carapace small, subquadrate, thin, translucent, moderately ornamented; greatest height at the anterior cardinal angle, greatest thickness through the subcentral node. Dorsal margin almost straight; anterior margin broadly rounded, slightly flattened in the upper half; ventral margin concave anterior to the middle, otherwise nearly straight; posterior margin is broadly rounded and is marked by four or five short, blunt spines. The free margin is bordered by a narrow rim, parallel to which in the anterior, there is a narrow sharp flange. Parallel to the ventral margin on the lower half of the shell is a ridge, above which there are three short ridges in the anterior part of the valve that converge on the subcentral node, while a single ridge continues backward from the node along the mid-line. The anterior half of the surface of the valve is additionally ornamented by a fine, line-like reticulation; the posterior is ornamented by irregularly placed small knobs and spines. Many minute pores puncture the surface.

An interior marginal area occurs within the anterior end with a few short radial pore canals. The free margin of the left valve bears a groove, deepest at the mid-ventral area; the right valve possesses a flanged panel which fits into the groove.

The hingement of the right valve consists of a long, blade-like anterior cardinal tooth that is raised above the dorsal margin, and a posterior cardinal, flattened, angled, tooth that extends a short distance down the posterior slope. Between the teeth is a narrow pitted groove. The left valve has complementary hinge structure, with cardinal sockets formed by the outward curving of the dorsal margin, and, between the sockets, the finely crenulated dorsal margin arranged to fit into the groove of the right valve.

LENGTH.—0.49 mm. HEIGHT.—0.25 mm.
TYPES.—A. M. N. H. Cat. No. 24892.

This species is very common in the Gatun.

Cytherinae Dana, 1852

CATIVELLA, NEW GENUS

GENOTYPE.—*Cativella navis*, new species.

Carapace medium sized, subtriangular, thick-shelled, with anterior end broadly rounded and posterior end acuminated with marginal spines. Hinge structure is similar to that of the genus *Cythereis*. The surface of the valve is ornamented with conspicuous, perforated, submarginal and other longitudinally arranged flanges; inner marginal area and platform are present with unequally distributed radial pores. The inequality of the valves shows externally where the mid-ventral flange of the right valve fits into the rabbeted edge of the left.

The ornamentation of this genus presents an illustration of the principle of parallelism when it is compared to the genus *Navecythere*. The hinge structures of the two genera are quite different.

Cativella navis, new species

Figure 9a

Carapace subtriangular, thick, medium sized with the greatest height at the anterior cardinal angle; anterior end broadly rounded; posterior end acuminate and with an extended appearance; the contact margin is characteristically denticulate; the ventral posterior margin bears three or four long, conical, curved spines; the dorsal posterior possesses a single, short, stout spine. A submarginal rather regularly perforated, keeled flange is present on the dorsal, anterior, and ventral borders; two similar short flanges rise near the ventral anterior, one paralleling the ventral border flange ending in a spinous termination, and the other extending across the convexity of the valve near to the dorsal posterior; a few low, rounded knobs occur over the surface. The hingement is typical of the genus *Cythereis;* a well-developed eye spot is present; the marginal area is moderately broad, with the line of concrescence parallel to and near the inner margin. Radial pores are short, straight, but numerous only in the anterior end. The ventral overlap consists of the curved flange of the right valve fitting into the rabbeted mid-ventral margin of the left valve.

LENGTH.—0.56 mm. HEIGHT.—0.19 mm.
TYPES.—A. M. N. H. Cat. No. 24893.

This species is quite common in the Gatun.

CYTHEREIS JONES, 1849

Cythereis vaughani (Ulrich and Bassler), 1904

Figure 10a

Cythere vaughani ULRICH AND BASSLER, 1904, Md. Geol. Surv., Miocene, p. 109, Pl. XXXVIII, figs. 25–27.

Cythereis vaughani Howe (and students), 1935, Fla. Geol. Surv., Bull. XIII, p. 25, Pl. III, figs. 24–26; Pl. IV, fig. 13.

Morphotype.—A. M. N. H. Cat. No. 24894.

This Gatun specimen differs in no important way from those described by both Howe and Ulrich and Bassler, which suggests the rather wide distribution of the species. Such forms as this suggust the correlation of the lower bed of the Gatun with the Choctawhatchee of Florida and the Chesapeake of Maryland.

Cythereis rugipunctata gatunensis, new variety

Figure 11a

Carapace is small, thick-shelled, elongate, quadrate, transparent; greatest height at anterior cardinal angle; greatest thickness at subcentral node; anterior margin broadly and obliquely rounded with small denticulations along the ventral portion; the ventral margin is nearly straight in the posterior three-fourths and broadly convex in the anterior one-fourth; the posterior margin is marked by four or five distinct blunt spines; the dorsal margin is nearly straight. The surface is ornamented by a subcentral node; a submarginal rim borders the anterior edge and the anterior ventral margin; a short rib rises near the anterior rim near the mid-line and trends backward upon the node where it trifurcates; many irregularly placed knobs are present on the anterior and posterior convexity of the valve. In places on the posterior these nodes are aligned transversely forming a pattern clearly related to *Cythereis rugipunctata.* The eye spot is marked by a translucent knob near the cardinal end of the anterior rim.

The inner marginal area is moderately broad, widest along the posterior ventral; the line of concrescence almost coincides with the inner margin; the platform is widest in the anterior ventral. The free contact border of the right valve is marked with a groove into which a panel on the left valve fits. Radial pore canals are found on the anterior, ventral and posterior borders.

The hingement is typical for the genus.

Length.—0.60 mm. Height.—0.18 mm.

Types.—A. M. N. H. Cat. No. 24895.

Caudites, new genus

Genotype.—*Caudites medialis,* new species.

Carapace small, thick-shelled, translucent, subtriangular in side view, a thickened marginal rim and a ventral posterior caudal projection. Hingement structure in right valve consists of a high anterior knob-like tooth behind which is a deep socket which becomes narrower and shallower posteriorly, trending obliquely toward the dorsal margin near the mid-point of the hinge where the shallow socket disappears; a narrow groove continues backward parallel and below the dorsal margin to the posterior cardinal angle. The socket and narrow groove are both pitted. The dorsal margin is slightly flanged. In the posterior cardinal angle the dorsal margin is occupied by a large flat, triangular tooth which extends some distance down the posterior slope.

The hingement of the left valve is a complement of the right. A large eye spot is present anterior to and below the anterior dentition. The inner marginal area and radial pore canals are present.

It is believed that *Hemicythere sellardsi* Howe and Neill is a member of this genus.

Caudites medialis, new species

Figures 12a, b, c, d

Carapace small, thick-shelled, elongate, subtriangular in side view; dorsal margin convexly sinuous; ventral margin concave anterior to the middle, otherwise straight; anterior end broadly rounded; posterior end obliquely truncated above and produced to a blunt caudal projection below; greatest height at the anterior cardinal angle; left valve overlaps the right on the ventral margin in the concave portion.

The ornamentation consists of two ridges paralleling the ventral margin; the inner one continues forward and becomes the marginal anterior ridge; it ends in the posterior quarter of the valve; the marginal one of the two rises in the ventral anterior, extends around the caudal projection, and ends in a blunt spine near the dorsal cardinal angle; an anteriorly curved transverse ridge crosses the valve below the posterior cardinal angle; a median longitudinal ridge rises from the posterior transverse one just above the middle and extends toward the anterior marginal ridge, bifurcating near the middle of the anterior half, one limb extending slightly upward to the anterior margin and the other, which is larger, extending to the anterior ventral curvature of the submarginal ridge.

Within, the valves are shallow and smooth, with a moderately broad marginal area, a narrow platform, and many short straight radial pore canals. The free contact of the valves is rabbeted; the right valve bears a sharp ridge near the center of the marginal area, which is developed into a prominent flange that curves inward just anterior to the middle of the ventral margin with a sharply defined narrow groove below it.

The hinge structure in the right valve consists of a high, knob-like anterior tooth, behind which a deep, oblique socket extends near to the middle of the valve where it gradually narrows to an incised groove that extends to the posterior cardinal tooth. The socket and groove are finely pitted. The dorsal margin of the valve is flanged above the groove. The posterior cardinal tooth is a large, flattened, triangular one that extends some distance down the posterior slope. The hingement of the left valve is a complement of the right.

An eye spot occurs below the anterior dentition.

LENGTH.—0.45 mm. HEIGHT.—0.20 mm.

TYPE.—A. M. N. H. Cat. No. 24896.

BASSLERITES HOWE, 1937, NEW NAME

The generic name *Basslerites* is presented at the suggestion of Dr. Howe to replace his generic name *Basslerella* which was used previously by Betty Kellett Nadeau in March, 1935, to designate a group of Ostracoda, quite different from the Miocene forms.

Basslerites miocenicus (Howe), 1935

Figures 13a, b

Basslerella miocenica Howe, 1935, Fla. Geol. Surv., Bull. XIII, pp. 30–31, Pl. 1, figs. 19, 24–26.

Morphotypes.—A. M. N. H. Cat. No. 24897.

This species is relatively common in the Gatun localities of Panama.

Cytherurinae Müller, 1894

Cytherura Sars, 1865 (1866)

Cytherura bananaformis, new species

Figures 14a, b, c, d

Carapace small, thin-shelled, highly translucent; the length is almost three times the height; dorsal margin is gently arched; anterior margin narrowly curved, especially near the ventral margin; ventral margin is convex anteriorly and posteriorly, and distinctly concave medially where the left valve overlaps the right; posterior margin borders the laterally compressed, nasute, downwardly curved, caudal termination of the valves. Two broad, shallow, transverse depressions cross the valves on each side of the mid-area; seven or more distinct, narrow, longitudinally arranged, raised striae converge somewhat near the anterior and posterior ends, the border ones joining around the crest of the abrupt posterior slope; numerous small pits are irregularly distributed over the surface of the valve; other smaller openings to pore canals dot the surface.

The hinge structure is delicate, and consists, in the right valve of an elongate anterior curved socket which parallels the dorsal margin and opens posteriorly into the interior cavity of the valve; the post-dorsal margin is slightly flanged; the hingement of the left valve consists of an anterior tooth, long, narrow, and blade-like, which continues posteriorly as the dorsal margin; immediately below and parallel to this margin is a narrow groove which opens to the interior at the posterior cardinal angle; the inner marginal area is very broad in the anterior and posterior areas, very narrow near the mid-ventral margin and absent along the dorsal border. The inner platform lies close to the shell in the posterior portion, and rather widely separated from it in the anterior ventral portion; the inner margin is sinuous.

Length.—0.34 mm. Height.—0.14 mm.

Type.—A. M. N. H. Cat. No. 24898.

Loxoconchinae Sars, 1926

Kangarina, new genus

Genotype.—*Kangarina quellita,* new species.

Carapace small, pellucid, thick-shelled, subquadrate, with a subdorsal caudal projection; dorsal margin straight, shorter than the ventral margin, but almost parallel to it; anterior margin extends most in the ventral half; the valves are flattened along the ventral area. The ornamentation consists of a marginal ridge

and an open loop in the ventral half, with a restricted distribution of surface pits. The inner marginal area is conspicuously developed, with a variable arrangement of pore-canals; an interior tunnel structure is present. The hingement of the left valve consists of a median, crenulated bar with a single, long, narrow, obliquely arranged, crenulated tooth at each end. A narrow abutment is developed above and below the bar. The hingement of the right valve consists of structural complements of the left with the inner wall of the groove, narrow and bearing coarse terminal crenulations, and the dorsal wall formed into a heavy bar that rests against the abutment in the left valve.

This genus is separated from *Cythere* by the longer and greater development of the hinge teeth, the presence of both groove and sockets in the left valve, and the peculiar exterior ornamentation. Two species of this genus have been recognized, one of which is described here. The forms are quite rare in the Gatun material.

Kangarina quellita, new species

Figures 15a, b, c

Carapace small, translucent, thick-shelled, with a blunt, subdorsal caudal projection; anterior margin truncated dorsally and narrowly rounded ventrally; dorsal margin straight and much shorter than the ventral margin; ventral margin almost straight with the ventral surface of the valve flattened; posterior margin is truncated ventrally and dorsally, both borders curving posteriorly to form the caudal projection in the dorsal half. A marginal rim borders the valve, less prominent on the posterior margin than elsewhere. A loop-shaped ridge, that opens forward into an extended channel occurs in the posterior ventral one-fourth; posterior to the middle a transverse ridge extends from the dorsal margin to the upper edge of the loop; the surface of the valve is marked by irregular reticulations except within the loop where it is relatively smooth.

The inner marginal area is broadly developed as an inner lamella, leaving only an oval area in the posterior part of the anterior half uncovered; in the anterior the line of concrescence parallels the border with several radial pore canals present; the inner extension of the lamellar platform rises sufficiently above the surface of the valve in the posterior ventral area to form a tunnel-like structure that opens anteriorly into the lower portion of the uncovered oval area.

The hingement of the left valve consists of a short, thin, crenulated bar with single, long, narrow, obliquely arranged, crenulated tooth at each end; a narrow abutment lies above the bar and parallel to the dorsal margin; the right valve hinge structure consists of terminal pitted sockets and a connecting groove with a lower wall that is very narrow and that bears coarse terminal crenulations, and a dorsal wall that is much heavier and formed to meet the abutment in the left valve.

LENGTH.—0.36 mm. HEIGHT.—0.18 mm.

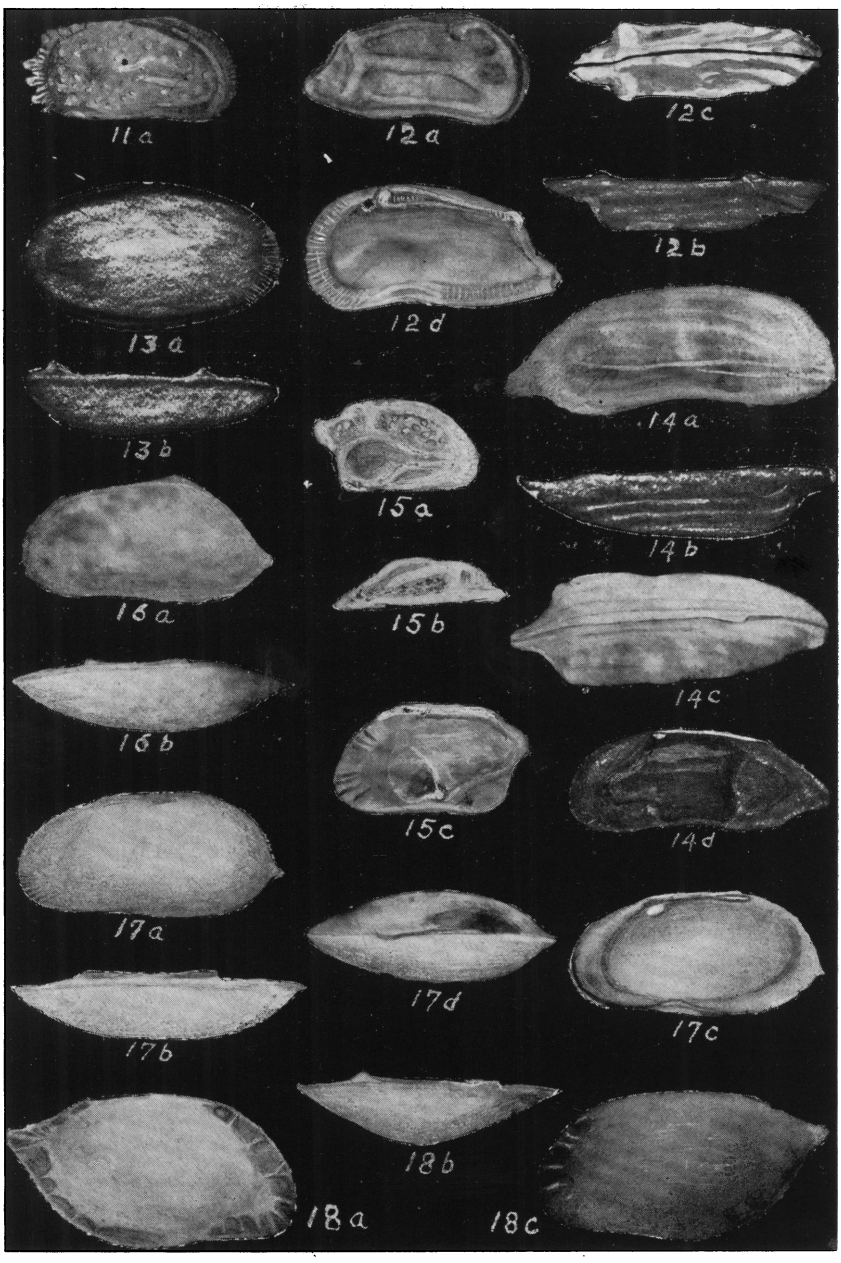
TYPE.—A. M. N. H. Cat. No. 24899.

Bythocytherinae Sars, 1926

LUVULA, NEW GENUS

GENOTYPE.—*Luvula palmerae,* new species.

Carapace thin-shelled, pellucid, somewhat bairdioid; the inner lamella is



See opposite page for captions.

variably developed with a distinct line of concrescence and few to numerous radial canals where the inner marginal area is well developed.

The hinge of the left valve consists of an anterior and a posterior blade-like tooth connected by a narrow bar. The hingement of the right valve consists of a shallow anterior and posterior socket formed by extensions of the inner surface shell below the cardinal angles. The posterior cardinal area is slightly enlarged outwardly to receive the posterior tooth of the left valve.

The muscle scars are arranged in groups of irregular ovals in the dorsal half of the interior surface posterior to the middle, and, in the lower half of the valve, just

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(Captions for Figures 11–18)

Fig. 11. *Cythereis rugipunctata gatunensis*, n. var., ×70.
a. Lateral view, right valve.

Fig. 12. *Caudites medialis*, n. gen. n. sp., ×65.
a. Lateral view, right valve.
b. Dorsal view of right valve.
c. Ventral view.
d. Interior of a right valve.

Fig. 13. *Basslerites miocenica* (Howe), ×75.
a. Lateral view, right valve.
b. Dorsal view of right valve.

Fig. 14. *Cytherura bananaformis*, n. sp., ×115.
a. Lateral view, right valve.
b. Dorsal view of left valve.
c. Dorsal view.
d. Interior of right valve.

Fig. 15. *Kangarina quellita*, n. gen., n. sp., ×75.
a. Lateral view, right valve.
b. Dorsal view of right valve.
c. Interior of right valve.

Fig. 16. *Luvula palmera*, n. gen., n. sp., ×100.
a. Lateral view, left valve.
b. Dorsal view of left valve.

Fig. 17. *Macrocytherina gatunensis*, n. gen., n. sp., ×70.
a. Lateral view, left valve.
b. Dorsal view of left valve.
c. Interior of right valve.
d. Dorsal view.

Fig. 18. *Pellucistoma howei*, n. gen., n. sp., ×75.
a. Lateral view, right valve.
b. Dorsal view of left valve.
c. Lateral view, left valve.

anterior to these is a group of crescentic scars with the concave side toward the ventral margin.

Luvula palmerae, new species

Figures 16a, b

Carapace thin-shelled, somewhat bairdioid; dorsal margin straight; ventral margin concave in the anterior half and distinctly convex in the posterior where it curves upward to the posterior ventral acumination; the posterior margin above the caudal projection is only slightly convex as it rises steeply upward and forward to the posterior cardinal angle where the greatest height is located.

The inner lamella is broad along the anterior end and the posterior ventral area; the line of concrescence lies close to the ventral margin and in the anterior part of the valve it is near the inner margin of the lamella. The radial pore canals are numerous around the anterior end, and occur much less frequently in other areas. The muscle scars are arranged in two groups: four irregularly oval scars posterior to the middle in the dorsal half, and three somewhat parallel, crescentic scars in the lower half of the ventral area of the valve, just below and anterior to the mid-point of the valve.

The hinge structure is characteristic of the genus.

LENGTH.—0.50 mm. HEIGHT.—0.16 mm.

TYPES.—A. M. N. H. Cat. No. 24900.

Specimens of this species occur quite commonly in the material from the Gatun formation in Panama.

MACROCYTHERINA, NEW GENUS

GENOTYPE.—*Macrocytherina gatunensis*, new species.

Carapace thin-shelled, small, translucent; anterior margin broadly and somewhat obliquely rounded; posterior margin broadly curved except just below the mid-point where a small sharp caudal spine projects. The hinge structural elements are similar to those in *Luvula*, except much more strongly developed, and located farther toward the posterior; the dorsal margin is approximately parallel to the general trend of the ventral margin, which is concave slightly anterior to the middle and convex near its terminals; the anterior end is more protruding than in *Luvula* leaving the anterior cardinal angle quite far behind. The muscle scars are arranged in groups of fours in two somewhat oblique lines across the valve near the posterior of the anterior third of the valve.

Macrocytherina gatunensis, new species

Figures 17a, b, c, d

Carapace small, thin-shelled, reniform; dorsal margin nearly straight; anterior margin broadly, but somewhat obliquely rounded, the ventral portion extending farther forward; the posterior margin is broadly rounded above and below the caudal process that occurs a little below the mid-point.

Radial pore canals are well developed in the anterior inner marginal area; the

interior margin lies nearer the anterior ventral area than elsewhere. The right valve overlaps the left on the anterior cardinal angle and forms the sinuousness of the outer dorsal contact.

The hingement is characteristic of the genus.

The interior bears the two rows of muscle scars in an obliquely transverse arrangement. The individual muscle scars are small, irregular, oval-shaped, and occur in sets of fours.

LENGTH.—0.46 mm. HEIGHT.—0.22 mm.

TYPE.—A. M. N. H. Cat. No. 24901.

This species is quite abundant in the Gatun material from Cativa, Panama.

Paradoxostominae Müller, 1894

PELLUCISTOMA, NEW GENUS

GENOTYPE.—*Pellucistoma howei*, new species.

Carapace small, translucent, subovate, finely perforated surface, with a subdorsal posterior caudal projection; dorsal hinge line straight; anterior end obliquely and broadly curved. The marginal area is well developed, with few radial pore canals.

The hingement of the left valve consists of an anterior long blade-like triangular tooth, from which a long serrated bar extends backward and terminates at the posterior cardinal angle; above this bar and parallel to it is a narrow incised line-like groove. The hinge structure of the left valve fits into an anterior socket and crenulated groove of the right valve; the socket is formed by a tooth-like structure projecting from the inner surface just below the anterior cardinal angle, leaving the cavity open anteriorly and posteriorly; the posterior cardinal area of the right valve is somewhat angulated by the development, on the dorsal margin, of a sharp, small hook which receives the posterior end of the bar of the left valve.

The valves are apparently equal except in the mid-ventral margin where the valves are rabbeted.

A muscle scar pattern is distinguishable.

Pellucistoma howei, new species

Figures 18a, b, c

Carapace small, subovate, translucent, thin-shelled, finely perforated; with a subdorsal caudal projection that is well developed; dorsal margin short and straight; anterior end broadly round, projecting more forward near the ventral border than elsewhere; the free margin has apparently an equally formed contact, except along the concave portion of the ventral border where a panel flange of the right valve fits into the groove of the left valve; the posterior margin is broadly arched below the subdorsal projection and concave above it.

The inner marginal area is broad with fine, long, occasionally branching radial pore canals; the line of concrescence is quite irregular, approaching more closely to the outer margin at every pore canal, and lying near the inner margin elsewhere

forming a scalloped trace in complete outline. The hingement of the right and left valves is characteristic of the genus.

The muscle scar pattern lies in the anterior half of the valve and consists of a large round scar behind which lies a transverse irregular line of oval scars. Other irregular scars are found surrounding these well-developed ones.

LENGTH.—0.48 mm. HEIGHT.—0.27 mm.

TYPE.—A. M. N. H. Cat. No. 24902.