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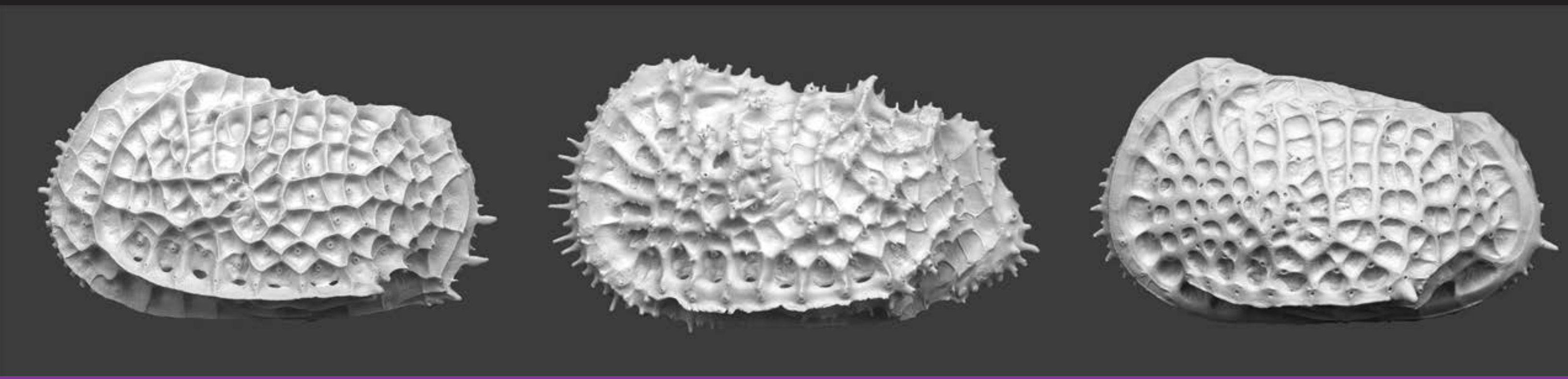

Taxonomy of Deep-Sea Trachyleberidid, Thaerocytherid, and Hemicytherid Genera (Ostracoda)

Moriaki Yasuhara, Gene Hunt, Hisayo Okahashi, and Simone N. Brandão

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ABSTRACT

Yasuhara, Moriaki, Gene Hunt, Hisayo Okahashi, and Simone N. Brandão. Taxonomy of Deep-Sea Trachyleberidid, Thaerocytherid, and Hemicytherid Genera (Ostracoda). *Smithsonian Contributions to Paleobiology*, number 96, xii + 216 pages, 95 figures, 3 tables, 2015.—We conducted a comprehensive systematic revision of deep-sea Trachyleberididae, Thaerocytheridae, and Hemicytheridae (Ostracoda, Crustacea) covering almost all Cenozoic genera using high-resolution scanning electron microscopy. Trachyleberididae, our main focus, is one of the most diverse and abundant ostracod families, but its genus-level taxonomy is still confusing. Approximately 700 specimens from 177 species from 47 genera were examined. The studied samples range in age from the Cretaceous to the present day and cover all major oceans in the world, including the Atlantic, Pacific, Indian, and Southern Oceans, the Mediterranean Sea, and the Gulf of Mexico. Five new genera and 45 new species are described: *Bensonodutoitella* gen. nov., *Hornibrookoleberis* gen. nov., *Croninocythereis* gen. nov., *Bensonocosta* gen. nov., *Ryugucivis* gen. nov., *Abyssocythere scotti* sp. nov., *Ambocythere tomocaudata* sp. nov., *Ambocythere whatleyi* sp. nov., *Ambocythere hyakunome* sp. nov., *Atlanticythere bensoni* sp. nov., *Atlanticythere oculi* sp. nov., *Dutoitella cronini* sp. nov., *Dutoitella symmetrica* sp. nov., *Dutoitella mazziniae* sp. nov., *Dutoitella paradinglei* sp. nov., *Dutoitella ayressi* sp. nov., *Dutoitella colesi* sp. nov., *Dutoitella spinosa* sp. nov., *Dutoitella whatleyi* sp. nov., *Dutoitella atlantiformis* sp. nov., *Bensonodutoitella bicornigeri* sp. nov., *Oligocythereis sylvesterbradleyi* sp. nov., *Cythereis guerneti* sp. nov., *Cythereis johnnealei* sp. nov., *Cythereis parajohnnealei* sp. nov., *Cythereis neoanteplana* sp. nov., *Cythereis sylvesterbradleyi* sp. nov., *Cythereis bensoni* sp. nov., *Cythereis purii* sp. nov., *Cythereis fungina* sp. nov., *Cythereis tomcronini* sp. nov., *Cythereis legitimoformis* sp. nov., *Cythereis richardbensoni* sp. nov., *Cythereis dinglei* sp. nov., *Cythereis ovi* sp. nov., *Cythereis swansoni* sp. nov., *Croninocythereis tridentiferi* sp. nov., *Croninocythereis cronini* sp. nov., *Bensonocosta bensoni* sp. nov., *Ayressoleberis colesi* sp. nov., *Leguminocythereis? buzasi* sp. nov., *Legitimocythere tomi* sp. nov., *Ryugucivis jablonskii* sp. nov., *Ryugucivis acuminata* sp. nov., *Ryugucivis obtusa* sp. nov., *Phacorhabdotus mazzinireticulatus* sp. nov., *Phacorhabdotus nudus* sp. nov., *Phacorhabdotus slipperi* sp. nov., *Taracythere ayressoabyssora* sp. nov., and *Taracythere thalassoformis* sp. nov. Emended concepts are proposed for several important genera to better stabilize their taxonomy. This study considerably reduces taxonomic uncertainty of this important component of the modern and fossil deep-sea ostracod community and provides a robust taxonomic baseline for deep-sea ostracod-based paleoceanographic, paleoecological, and macroevolutionary research.

KEY WORDS: Deep sea, Ostracoda, taxonomy, Trachyleberididae, Thaerocytheridae, Hemicytheridae.

Cover images: Scanning electron micrographs of fossil and modern ostracods. For image details, see captions (from left to right, respectively) for Figures 94A (*Bradleya dictyon*), 16K (*Agrenocythere hazelae*), and 94R (*Poseidonamicus pintoi*).

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Taxonomy of Deep-Sea Trachyleberidid, Thaerocytherid, and Hemicytherid Genera (Ostracoda)

Moriaki Yasuhara,[1] Gene Hunt,[2] Hisayo Okahashi,[1] and Simone N. Brandão[3]*

INTRODUCTION

The exceptional fossil record of deep-sea ostracods has been used successfully to explore macroecological and macroevolutionary phenomena (Cronin and Raymo, 1997; Hunt and Roy, 2006; Liow, 2007; Webb et al., 2009; Yasuhara et al., 2009b, 2012a, 2012b). Multimillenial- to centennial-scale faunal and diversity dynamics are well understood, especially in the North Atlantic Ocean (Yasuhara and Cronin, 2008; Yasuhara et al., 2008; Alvarez Zarikian et al., 2009; Yasuhara et al., 2014). Evolutionary dynamics in body size and other features have been investigated using Cenozoic and Mesozoic fossil records (Hunt and Roy, 2006; Liow, 2007; Hunt et al., 2010).

The family Trachyleberididae is one of the most diverse and abundant marine ostracod families (Hazel, 1967; Liow, 2006, 2007). However, the taxonomy of trachyleberidid genera has often been confusing, in part because of the lack of comprehensive taxonomic revisions of trachyleberidid genera for the last ~50 years following the publication of old, but still standard, textbooks for ostracod taxonomy, the *Treatise on Invertebrate Paleontology, Part Q* (Moore, 1961) and *Post-Palaeozoic Ostracoda* (van Morkhoven, 1963), although a landmark paper by Joseph E. Hazel (1967) covers North American shallow marine genera and there are several syntheses of the higher classification (Hartmann and Puri, 1974; Horne et al., 2002; Liebau, 2005). Here we conduct a taxonomic revision of deep-sea trachyleberidid genera to provide a robust baseline for generic assignment of species in this family. We treat almost all trachyleberidid genera that have any deep-sea species and also discuss some shallow marine genera for comparison. Additionally, we included all thaerocytherid and hemicytherid genera found in the deep sea. The samples used for the present study range in age from the Cretaceous to the present day and cover most of the major oceans in the world.

Compared to those of some other ostracod taxa, the carapaces of trachyleberidids and their relatives can be quite feature rich, often bearing ridges, spines, reticulation, nodes, and other ornaments that can help distinguish closely related species. Although helpful in demarcating phylogenetic units, these features can also obscure relationships through convergence and evolutionary reversals. Strong differences in ornament exist even among groups of species that seem to be closely related. In *Dutoitella*, for example, the dominant form of ornament can be spines, nodes, primary reticulation, or secondary reticulation, depending on the species. Moreover, several genera that are typically reticulate or spiny have independently evolved smooth or nearly smooth forms (e.g., *Dutoitella*,

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Poseidonamicus, *Bradleya*). Because of the seeming ease with which many features of ornament can change, we have placed greater weight on muscle scar features for delimiting genera. This emphasis has been traditional in the taxonomy of trachyleberidids and allied groups, although opinions have differed somewhat about its merit (Pokorný, 1964a; Hazel, 1967). Nevertheless, it is clear that no single character or suite of characters will suffice for reliable taxonomy, and even with our emphasis on muscle scars, we still employ features from all aspects of the carapace form.

We present here a taxonomic framework for deep-sea Trachyleberididae, Thaerocytheridae, and Hemicytheridae. Soft anatomy has been useful in resolving taxonomic difficulties in ostracods (e.g., Jellinek and Swanson, 2003 and Brandão, 2008, 2010 for deep-sea ostracods), and molecular approaches have helped resolve relationships among cytheroid families (Yamaguchi, 2003; Yamaguchi and Endo, 2003). Although we would not be able to incorporate molecular or anatomic information directly for many of the species that we consider here because they are extinct, integrating these species into a broader phylogenetic framework would provide a firmer basis for the taxonomy of even fossil members of this group. Such an integrated phylogenetic analysis, although clearly desirable, is not yet feasible given the state of the knowledge of this group. Accordingly, we emphasize here the documentation of morphological features so that they may be fruitfully incorporated into future efforts. We also present numerous high-resolution images; for some taxa, these images represent the first published documentation of internal, hinge, and muscle scar features.

Sample Details and Abbreviations

Core samples are specified by standard Ocean Drilling Program (ODP) notation (core/section/interval) or depth interval in centimeters. All specimens with a USNM number were digitally imaged uncoated in low-vacuum mode with a Philips XL-30 environmental scanning electron microscope (SEM) with LaB6 electron source. Additional SEM images were provided courtesy of several ostracod experts, including M. A. Ayress, E. K. Kempf, and I. Mazzini. Figured specimens were deposited in the National Museum of Natural History (Washington, D.C., catalog numbers USNM 607200–USNM 607866 and USNM 608273) unless they were already deposited elsewhere. Both formal catalog numbers and Yasuhara's personal catalog numbers are shown. Localities of specimens used for the current study are shown in Figures 1–4. Figure 5 summarizes the morphological characters and their terminology. Detailed information about the specimens

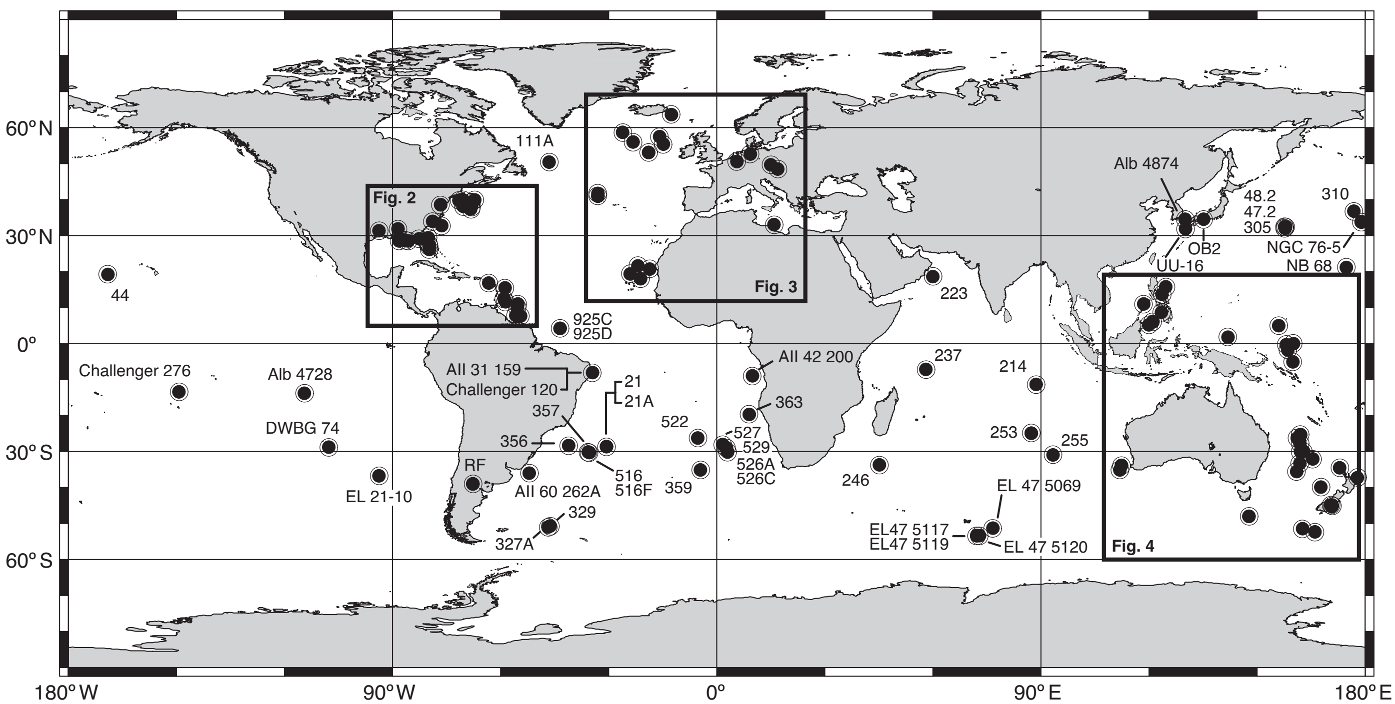

FIGURE 1. Map showing locations of samples included in the present study. For Ocean Drilling Program and Deep Sea Drilling Project sites, only numeric station codes are shown. Some locality names are sampling stations of the following oceanographic research vessels: *Albatross* (Alb), *Atlantis II* (AII), *Eltanin* (EL), and *Knorr* (KN). Woods Hole Oceanographic Institution (WHOI) samples were collected as a part of the U.S. Geological Survey/WHOI Continental Margin (CONMAR) Program. RF, Rocca Formation. See Appendix (Table A1) for detailed locality information. The map was created using Ocean Data View (http://odv.awi.de/).

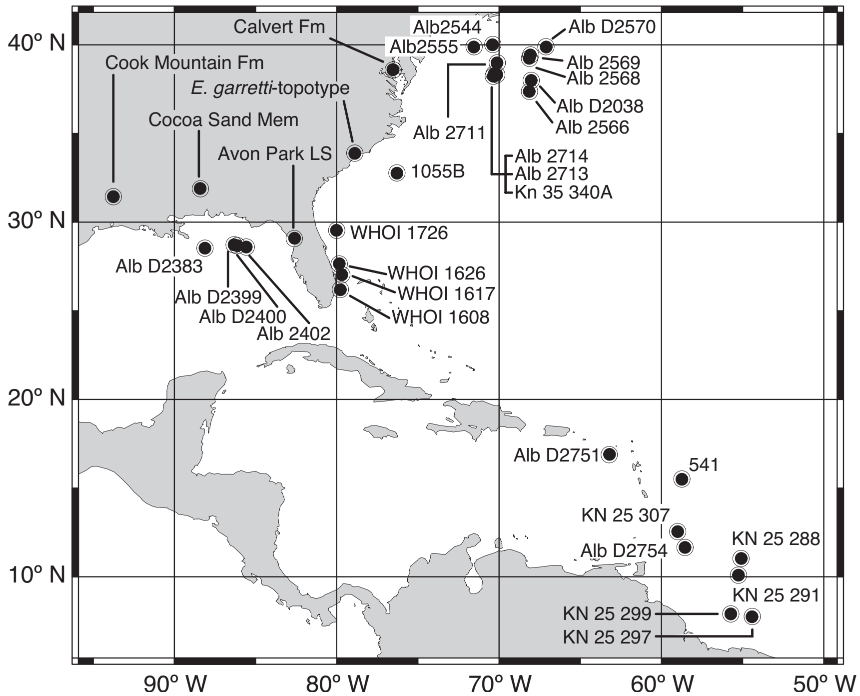

FIGURE 2. Northwestern Atlantic section map, as indicated on Figure 1.

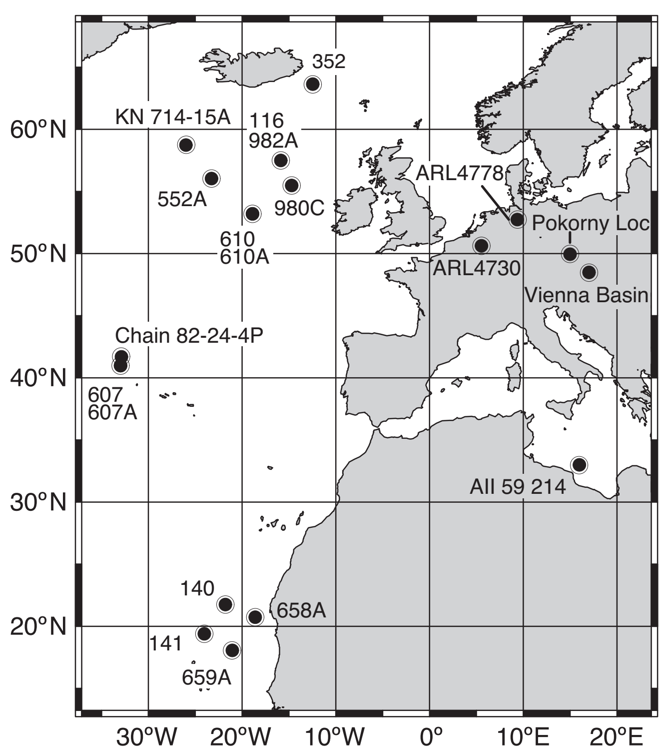

FIGURE 3. Northeastern Atlantic section map, as indicated on Figure 1.

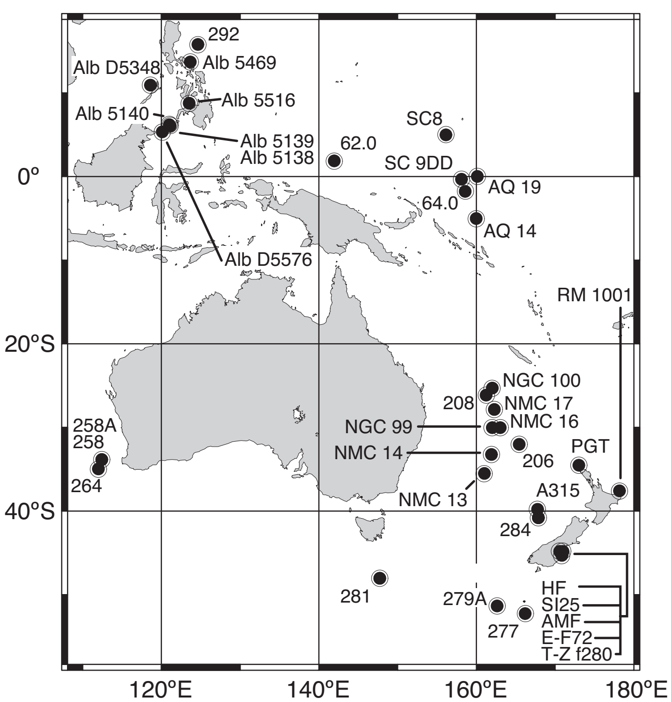

FIGURE 4. Western Pacific section map, as indicated on Figure 1. Abbreviations: AMF, Ashley Mudstone Formation; E-F72, Earthquakes f72; HF, Hampden Formation; PGT, *Philoneptunus gravezia* topotype; T-Z f280, Trig Z f280.

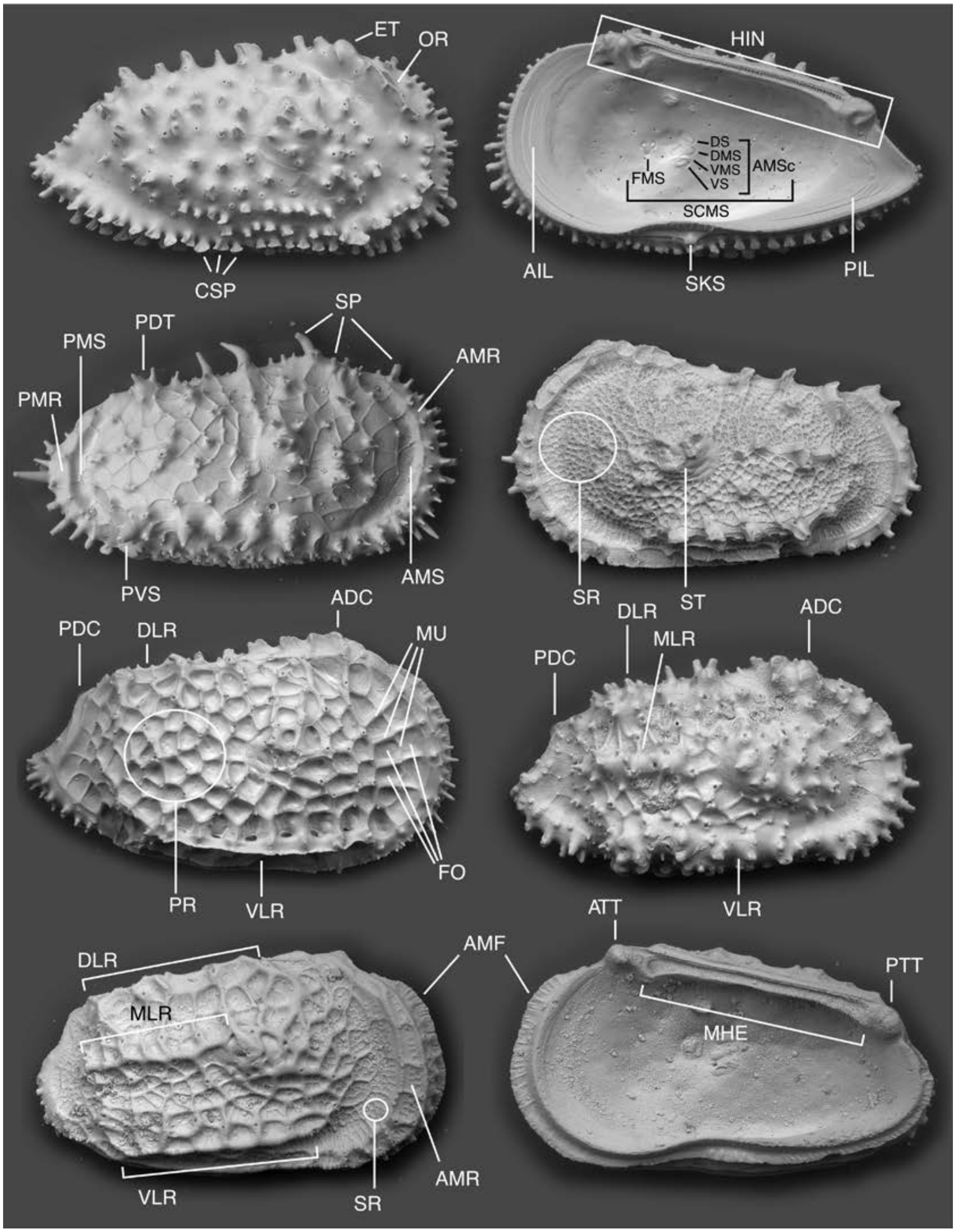

FIGURE 5. Morphology of trachyleberidid ostracods. Abbreviations: ADC, anterodorsal corner; AIL, anterior inner lamella; AMF, anterior marginal frill; AMR, anterior marginal rim; AMS, anterior marginal sulcus; AMSc, adductor muscle scars; ATT, anterior terminal tooth; CSP, clavate spines; DLR, dorsolateral ridge; DMS, dorsomedian scar; DS, dorsal scar; ET, eye tubercle; FMS, frontal muscle scar; FO, fossae; HIN, hingement; MHE, median hinge element; MLR, median lateral ridge; MU, muri; OR, ocular ridge; PDC, posterodorsal corner; PDT, posterodorsal tubercle; PIL, posterior inner lamella; PMR, posterior marginal rim; PMS, posterior marginal sulcus; PR, primary reticulation; PVS, posteroventral spine; PTT, posterior terminal tooth; SCMS, subcentral muscle scars; SKS, snap-knob structure ("additional closing mechanism" sensu Mazzini, 2005); SP, spines; SR, secondary reticulation; ST, subcentral tubercle; VLR, ventrolateral ridge; VMS, ventromedian scar; VS, ventral scar.

used for the present study is found in the Appendix, and the dimensions of selected specimens are shown in Table 1. All genera treated in the present study are listed in Table 2 with information about their subcentral muscle scars. We follow the higher classification scheme of the World Ostracoda Database (Brandão et al., 2014) with some modifications. High-resolution figures of ostracod SEM images (Figures 6–95) are available from Dryad (http://datadryad.org/; http://doi.org/10.5061/dryad.rd234), except the copyrighted ones (Figures 23A–C, 43I–K). Abbreviations used throughout are as follows: LV, left valve; RV, right valve; A-1, last juvenile instar (adult minus one).

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TABLE 1. List of specimens used for the present study, with dimensions provided for selected specimens.

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607200	TRA1109	*Trachyleberis scabrocuneata*	0.905	0.469		R	A	F	JP	Holocene	21.91	6	A
USNM 607201	TRA1113	*Trachyleberis scabrocuneata*	—	—		R	A	F	JP	Holocene	21.91	6	B, E–F, I
USNM 607202	TRA1110	*Trachyleberis scabrocuneata*	0.981	0.472		L	A	M	JP	Holocene	21.91	6	C
USNM 607203	TRA1112	*Trachyleberis scabrocuneata*	—	—		L	A	F	JP	Holocene	21.91	6	D, G–H
USNM 607204	TRA219	*Abrocythereis malaysiana*	0.883	0.524		L	A	?	NWP	Modern	900	7	A–B
USNM 607205	TRA220	*Abrocythereis malaysiana*	0.872	0.513		R	A	?	NWP	Modern	900	7	C–D
USNM 607206	RB314	*Abyssocythere atlantica*	1.043	0.652		L	A	?	NWA	Modern	3865	7	E
USNM 607207	RB315	*Abyssocythere atlantica*	1.056	0.569		R	A	?	NWA	Modern	3865	7	F–G
USNM 607208	RB317	*Abyssocythere atlantica*	1.020	0.589		R	A	?	NWA	Modern	3865	7	H–I
USNM 607209	RB316	*Abyssocythere atlantica*	1.070	0.695		L	A	?	NWA	Modern	3865	7	J
USNM 607210	RB330	*Abyssocythere atlantica*	—	—		L	A	?	NWA	Modern	4425	7	K
USNM 607211	RB331	*Abyssocythere atlantica*	—	—		R	A	?	NWA	Modern	4425	7	L
USNM 607212	TRA121	*Abyssocythere diagrenona*	0.971	0.573		L	A	?	SEA	Late Eocene	1054	7	M–N
USNM 607213	TRA122	*Abyssocythere diagrenona*	0.903	0.551		L	A	?	SEA	Late Eocene	1054	7	O
USNM 607214	TRA123	*Abyssocythere diagrenona*	0.948	0.521		R	A	?	SEA	Late Eocene	1054	7	P–Q
USNM 607215	TRA236	*Abyssocythere diagrenona*	1.047	0.551		R	A	?	SEA	Early Oligocene	4441	7	R–S
USNM 607216	TRA762	*Abyssocythere scotti*	0.919	0.533	P	L	A	?	SWA	Late Campanian	2400	7	T–U
USNM 607217	TRA309	*Abyssocythere scotti*	0.872	0.457	P	R	A	?	SWA	Late Miocene	1519	9	A–B
USNM 607218	TRA312	*Abyssocythere scotti*	0.938	0.579	P	L	A	?	SWA	Late Miocene	1519	9	C–D
USNM 607219	TRA747	*Abyssocythere scotti*	0.846	0.457	H	R	A	?	SWA	Maastrichtian	2400	9	E–F
USNM 607220	RB186	*Protocythere vitjasi*	1.463	0.928		L	A	?	NWP	Pliocene	2903	9	G–H
USNM 607221	RB187	*Protocythere vitjasi*	1.386	0.819		R	A	?	NWP	Pliocene	2903	9	I–J
USNM 607222	GSM244	*Protocythere sulcatoperforata*	1.363	0.774		R	A	?	NWA	Pliocene	4940	9	K–L
USNM 607223	USGSD149	*Protocythere sulcatoperforata*	1.397	0.971		L	A	?	NA	Late Pliocene	3427	9	M–N
USNM 607224	TRA854	*Acanthocythereis araneosa*	0.799	0.405		L	A	M	NAM	Eocene	OC	12	A–B
USNM 607225	TRA856	*Acanthocythereis araneosa*	0.767	0.391		R	A	M	NAM	Eocene	OC	12	C–D
USNM 607226	TRA861	*Acanthocythereis araneosa*	0.763	0.455		L	A	F	NAM	Eocene	OC	12	E
USNM 607227	TRA862	*Acanthocythereis araneosa*	0.718	0.394		R	A	F	NAM	Eocene	OC	12	F–G
USNM 607228	TRA858	*Acanthocythereis cf. araneosa*	0.633	0.337		L	A	?	NAM	Eocene	OC	12	H
USNM 607229	TRA859	*Acanthocythereis cf. araneosa*	0.612	0.335		R	A	?	NAM	Eocene	OC	12	I
USNM 607230	TRA860	*Acanthocythereis cf. araneosa*	—	—		R	A	?	NAM	Eocene	OC	12	J
USNM 607231	TRA855	*Acanthocythereis stenzeli*	0.692	0.405		L	A	?	NAM	Eocene	OC	12	K
USNM 607232	TRA857	*Acanthocythereis stenzeli*	0.708	0.390		R	A	?	NAM	Eocene	OC	12	L–M
USNM 607233	TRA842	*Actinocythereis exanthemata*	0.875	0.464		L	A	F	NAM	Miocene	OC	12	N–O
USNM 607234	TRA841	*Actinocythereis exanthemata*	0.904	0.432		L	A	M	NAM	Miocene	OC	12	P
USNM 607235	TRA843	*Actinocythereis exanthemata*	0.892	0.472		L	A	F	NAM	Miocene	OC	12	Q
USNM 607236	TRA844	*Actinocythereis exanthemata*	0.881	0.449		R	A	F	NAM	Miocene	OC	12	R–S
USNM 607237	TRA845	*Actinocythereis exanthemata*	0.845	0.432		R	A	F	NAM	Miocene	OC	12	T

USNM 607238	TRA221	*Actinocythereis vineyardensis*	0.862	0.448		L	A	M	NWA	Modern	244	14	A–B
USNM 607239	TRA222	*Actinocythereis vineyardensis*	0.839	0.448		R	A	M	NWA	Modern	244	14	C–D
USNM 607240	TRA223	*Actinocythereis vineyardensis*	0.881	0.491		L	A	F	NWA	Modern	235	14	E
USNM 607241	TRA224	*Actinocythereis vineyardensis*	0.871	0.473		R	A	F	NWA	Modern	235	14	F
USNM 607242	TRA903	*Actinocythereis purii*	0.979	0.461		R	A	M?	NAM	Late Eocene	OC	14	G
USNM 607243	TRA863	*Actinocythereis texana*	0.938	0.516		L	A	M?	NAM	Eocene	OC	14	H
USNM 607244	TRA864	*Actinocythereis texana*	0.902	0.552		L	A	F?	NAM	Eocene	OC	14	I
USNM 607245	TRA865	*Actinocythereis texana*	0.945	0.473		R	A	M?	NAM	Eocene	OC	14	J
USNM 607246	TRA866	*Actinocythereis texana*	0.826	0.444		R	A	F?	NAM	Eocene	OC	14	K–L
USNM 607247	TRA901	*Actinocythereis purii*	0.919	0.518		L	A	F?	NAM	Late Eocene	OC	14	M
USNM 607248	TRA902	*Actinocythereis purii*	0.881	0.497		R	A	F?	NAM	Late Eocene	OC	14	N
USNM 607249	TRA201	*Actinocythereis? scutigera*	1.081	0.606		L	A	M	NWP	Modern	686	14	O–P
USNM 607250	TRA202	*Actinocythereis? scutigera*	1.081	0.606		R	A	M	NWP	Modern	686	14	Q–R
USNM 607251	TRA203	*Actinocythereis? scutigera*	1.009	0.633		L	A	F	NWP	Modern	686	14	S
USNM 607252	TRA204	*Actinocythereis? scutigera*	1.009	0.590		R	A	F	NWP	Modern	686	14	T
USNM 607253	SIMY0026	*Agrenocythere hazelae*	1.507	0.867		L	A	F	EWP	Modern	2230	16	A
USNM 607254	POS1220	*Agrenocythere hazelae*	1.477	0.830		R	A	F	EWP	Modern	2230	16	B
USNM 607255	RB107	*Agrenocythere hazelae*	1.242	0.692		L	A	M	SEA	Early Pliocene	1054	16	C–D
USNM 607256	RB108	*Agrenocythere hazelae*	—	—		R	A	F	SEA	Early Pliocene	1054	16	E–F
USNM 607257	USGSD141	*Agrenocythere hazelae*	—	—		L	A	F	NA	Late Pliocene	3427	16	G–H
USNM 607258	RB431	*Agrenocythere hazelae*	—	—		L	A	M	NWA	Modern	1256	16	I
USNM 607259	RB432	*Agrenocythere hazelae*	—	—		R	A	M	NWA	Modern	1256	16	J
USNM 607260	RB433	*Agrenocythere hazelae*	1.235	0.701		L	A	F	NWA	Modern	1256	16	K
USNM 607261	RB434	*Agrenocythere hazelae*	—	—		R	A	F	NWA	Modern	1256	16	L
USNM 607262	POS966	*Agrenocythere?* sp.	—	—		L	A-1?		NEA	Late Oligocene	1151	16	M
USNM 607263	POS965	*Agrenocythere?* sp.	—	—		R	A	M	NEA	Early Oligocene	1151	16	N
USNM 607264	ODP982012	*Ambocythere caudata*	0.651	0.330		L	A	F	NEA	Pleistocene	1135.3	17	A
USNM 607265	ODP982013	*Ambocythere caudata*	—	—		R	A	M	NEA	Pleistocene	1135.3	17	B–C
USNM 607266	ODP982014	*Ambocythere caudata*	—	—		R	A	F	NEA	Pleistocene	1135.3	17	D–E
USNM 607267	ODP982015	*Ambocythere caudata*	—	—		R	A	F	NEA	Pleistocene	1135.3	17	F
USNM 607268	ODP982016	*Ambocythere caudata*	0.738	0.338		L	A	M	NEA	Pleistocene	1135.3	17	G
USNM 607269	ODP982017	*Ambocythere caudata*	—	—		L	A	M	NEA	Pleistocene	1135.3	17	H
USNM 607270	GSM103	*Ambocythere tomocaudata*	0.617	0.295	H	R	A	?	NWA	Modern	584	17	I
USNM 607271	GSM105	*Ambocythere tomocaudata*	0.625	0.306	P	L	A	?	NWA	Modern	549	17	J
USNM 607272	GSM104	*Ambocythere tomocaudata*	—	—	P	R	A	?	NWA	Modern	584	17	K
USNM 607273	USGSD201	*Ambocythere* cf. *ramosa*	0.598	0.322		L	A	?	NEA	Pliocene	2301	17	L–M
USNM 607274	USGSD202	*Ambocythere* cf. *ramosa*	0.597	0.312		R	A	?	NEA	Pliocene	2301	17	N–O
USNM 607275	ODP982018	*Ambocythere ramosa*	0.564	0.306		L	A	F	NEA	Pleistocene	1135.3	17	P
USNM 607276	ODP982019	*Ambocythere ramosa*	—	—		R	A	F	NEA	Pleistocene	1135.3	17	Q–R
USNM 607277	ODP982020	*Ambocythere ramosa*	0.636	0.298		L	A	F	NEA	Pleistocene	1135.3	17	S
USNM 607278	ODP982021	*Ambocythere ramosa*	—	—		R	A	M	NEA	Pleistocene	1135.3	17	T–U
USNM 607279	GSM214	*Ambocythere whatleyi*	0.724	0.357	H	R	A	?	NEA	Quaternary	2598	18	A–B

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607280	GSM237	*Ambocythere whatleyi*	—	—	P	R	A	?	NEA	Quaternary	2598	18	C, E
USNM 607281	GSM236	*Ambocythere whatleyi*	—	—	P	L	A	?	NEA	Quaternary	2598	18	D
USNM 607282	GSM213	*Ambocythere whatleyi*	—	—	P	L	A	?	NEA	Quaternary	2598	18	F–G
USNM 607283	ODP980078	*Ambocythere whatleyi*	—	—	P	L	A	?	NEA	Pleistocene	2168	18	H–I
USNM 607284	RB411	*Ambocythere whatleyi*	0.721	0.363	P	R	A	?	NWA	Modern	2983	18	J–K
USNM 607285	RB435	*Ambocythere hyakunome*	0.721	0.376	H	R	A	F	NWA	Modern	1256	18	L–M
USNM 607286	RB438	*Ambocythere hyakunome*	0.791	0.363	P	R	A	M	NWA	Modern	1256	18	N–O
USNM 607287	RB459	*Ambocythere hyakunome*	0.787	0.410	P	L	A	F	NWA	Modern	1584	18	P
USNM 607288	POS1244	*Ambocythere* sp.1	0.670	0.348		R	A	?	EWP	Quaternary	1716	18	Q–R
USNM 607289	TRA342	*Anebocythereis reticulata*	1.086	0.611		R	A	?	IO	Pleistocene	2793	20	A–B
USNM 607290	TRA343	*Anebocythereis reticulata*	1.174	0.645		L	A	?	IO	Pleistocene	2793	20	C
USNM 607291	TRA344	*Anebocythereis reticulata*	—	—		R	A	?	IO	Pleistocene	2793	20	D–E
USNM 607292	TRA538	*Anebocythereis reticulata*	0.898	0.523		R	A	?	IO	Late Eocene	1655	20	F–G
USNM 607293	TRA543	*Anebocythereis reticulata*	1.000	0.629		L	A	?	IO	Early Eocene	1655	20	H–I
USNM 607294	TRA544	*Anebocythereis reticulata*	—	—		R	A	?	IO	Early Eocene	1655	20	J–K
USNM 607295	TRA835	*Marwickcythereis marwicki*	0.929	0.539		R	A	?	NZ	Late Eocene	OC	20	L–M
USNM 607296	TRA1028	*Marwickcythereis marwicki*	0.867	0.532		L	A	?	NZ	Middle Eocene	OC	20	N–O
USNM 607297	TRA1029	*Marwickcythereis marwicki*	0.878	0.526		R	A	?	NZ	Middle Eocene	OC	20	P–Q
USNM 607298	TRA826	*Anebocythereis hostizea*	1.244	0.699		L	A	?	NZ	Late Eocene	OC	21	A
USNM 607299	TRA827	*Anebocythereis hostizea*	1.204	0.699		R	A	?	NZ	Late Eocene	OC	21	B–C
USNM 607300	TRA833	*Anebocythereis hostizea*	—	—		R	A	?	NZ	Late Eocene	OC	21	D
USNM 607301	TRA130	*Anebocythereis reticulata*	1.093	0.690		L	A	?	SEA	Early Miocene	3043	21	E–F
USNM 607302	TRA131	*Anebocythereis reticulata*	1.140	0.629		R	A	?	SEA	Early Miocene	3043	21	G–H
USNM 607303	TRA132	*Anebocythereis reticulata*	1.045	0.633		R	A	?	SEA	Early Miocene	3043	21	I–J
USNM 607304	TRA237	*Anebocythereis reticulata*	—	—		L	A	?	SEA	Early Oligocene	4441	21	K–L
USNM 607305	TRA552	*Anebocythereis reticulata*	—	—		L	A	?	IO	Late Eocene	1655	21	M–N
USNM 607306	TRA1014	*Anebocythereis reticulata*	1.088	0.624		L	A	?	IO	Late Oligocene	1962	21	O
USNM 607307	TRA1015	*Anebocythereis reticulata*	—	—		R	A	?	IO	Late Oligocene	1962	21	P
USNM 607308	TRA341	*Anebocythereis reticulata*	1.029	0.633		L	A	?	IO	Pliocene	1144	21	Q–R
USNM 607309	TRA702	*Atlanticythere maestrichtia*	1.002	0.510		R	A	?	SWA	Campanian–Maastrichtian	2113	24	A
USNM 607310	TRA703	*Atlanticythere maestrichtia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	24	B
USNM 607311	TRA706	*Atlanticythere maestrichtia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	24	C–D
USNM 607312	TRA712	*Atlanticythere maestrichtia*	0.983	0.486		R	A	?	SWA	Campanian–Maastrichtian	2113	24	E–F
USNM 607313	TRA704	*Atlanticythere maestrichtia*	—	—		L	A	?	SWA	Campanian–Maastrichtian	2113	24	G–H

USNM 607314	TRA721	*Atlanticythere maestrichtia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	24	I
USNM 607315	TRA720	*Atlanticythere maestrichtia*	0.994	0.507		L	A	?	SWA	Campanian–Maastrichtian	2113	24	J
USNM 607316	TRA723	*Atlanticythere maestrichtia*	0.887	0.469		R	A	?	SWA	Campanian–Maastrichtian	2113	24	K–L
USNM 607317	TRA632	*Atlanticythere bensoni*	—	—	P	L	A	?	SWA	Paleocene to early Eocene	2113	24	M
USNM 607318	TRA633	*Atlanticythere bensoni*	0.893	0.486	H	L	A	?	SWA	Paleocene to early Eocene	2113	24	N–O
USNM 607319	TRA634	*Atlanticythere bensoni*	0.810	0.443	P	R	A	?	SWA	Paleocene to early Eocene	2113	24	P–Q
USNM 607320	TRA635	*Atlanticythere bensoni*	—	—	P	L	A	?	SWA	Paleocene to early Eocene	2113	24	R
USNM 607321	TRA705	*Atlanticythere bensoni*	0.863	0.469	P	L	A	?	SWA	Campanian–Maastrichtian	2113	24	S
USNM 607322	TRA641	*Atlanticythere murareticulata*	—	—		L	A	?	SWA	Middle Eocene	2113	26	A
USNM 607323	TRA642	*Atlanticythere murareticulata*	—	—		R	A	?	SWA	Middle Eocene	2113	26	B
USNM 607324	TRA643	*Atlanticythere murareticulata*	0.840	0.413		R	A	?	SWA	Middle Eocene	2113	26	C–D
USNM 607325	TRA630	*Atlanticythere murareticulata*	—	—		L	A	?	SWA	Paleocene to early Eocene	2113	26	E
USNM 607326	TRA631	*Atlanticythere murareticulata*	—	—		L	A	?	SWA	Paleocene to early Eocene	2113	26	F
USNM 607327	TRA639	*Atlanticythere murareticulata*	—	—		L	A	?	SWA	Early Eocene	2113	26	G–H
USNM 607328	TRA640	*Atlanticythere murareticulata*	—	—		R	A	?	SWA	Early Eocene	2113	26	I–J
USNM 607329	TRA103	*Atlanticythere murareticulata*	0.813	0.428		L	A	?	SEA	Early Miocene	1054	26	K
USNM 607330	TRA104	*Atlanticythere murareticulata*	—	—		R	A	?	SEA	Early Miocene	1054	26	L
USNM 607331	TRA105	*Atlanticythere murareticulata*	—	—		L	A	?	SEA	Early Miocene	1054	26	M–N
USNM 607332	TRA106	*Atlanticythere murareticulata*	—	—		R	A	?	SEA	Early Miocene	1054	26	O–P
USNM 607333	TRA332	*Atlanticythere murareticulata*	0.858	0.465		L	A	?	SWA	Middle Miocene	2086	26	Q–R
USNM 607334	TRA333	*Atlanticythere murareticulata*	0.822	0.423		R	A	?	SWA	Middle Miocene	2086	27	A–B
USNM 607335	TRA126	*Atlanticythere murareticulata*	0.810	0.432		L	A	?	SEA	Late Eocene	1054	27	C–D
USNM 607336	TRA127	*Atlanticythere murareticulata*	—	—		R	A	?	SEA	Late Eocene	1054	27	E
USNM 607337	TRA128	*Atlanticythere murareticulata*	—	—		L	A	?	SEA	Late Eocene	1054	27	F
USNM 607338	TRA129	*Atlanticythere murareticulata*	—	—		R	A	?	SEA	Late Eocene	1054	27	G
USNM 607339	TRA124	*Atlanticythere murareticulata*	—	—		L	A	?	SEA	Late Eocene	1054	27	H
USNM 607340	TRA125	*Atlanticythere murareticulata*	0.697	0.383		R	A	?	SEA	Late Eocene	1054	27	I–J
USNM 607341	TRA724	*Atlanticythere prethalassia*	0.877	0.476		L	A	?	SWA	Campanian–Maastrichtian	2113	27	K–L
USNM 607342	TRA319	*Atlanticythere oculi*	0.792	0.462	P	L	A	?	SEA	Late Eocene	1655	27	M
USNM 607343	TRA320	*Atlanticythere oculi*	0.792	0.389	H	R	A	?	SEA	Late Eocene	1655	27	N–O
USNM 607344	TRA707	*Atlanticythere prethalassia*	—	—		L	A	?	SWA	Campanian–Maastrichtian	2113	28	A

(*continued*)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607345	TRA708	*Atlanticythere prethalassia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	28	B–C
USNM 607346	TRA709	*Atlanticythere prethalassia*	—	—		L	A	?	SWA	Campanian–Maastrichtian	2113	28	D
USNM 607347	TRA713	*Atlanticythere prethalassia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	28	E
USNM 607348	TRA719	*Atlanticythere prethalassia*	0.996	0.503		R	A	?	SWA	Campanian–Maastrichtian	2113	28	F–G
USNM 607349	TRA730	*Atlanticythere prethalassia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	28	H
USNM 607350	TRA731	*Atlanticythere prethalassia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	28	I–J
USNM 607351	TRA732	*Atlanticythere prethalassia*	0.836	0.452		R	A	?	SWA	Campanian–Maastrichtian	2113	28	K–L
USNM 607352	TRA735	*Atlanticythere prethalassia*	0.927	0.510		L	A	?	SWA	Campanian–Maastrichtian	2113	28	M
USNM 607353	TRA736	*Atlanticythere prethalassia*	—	—		L	A	?	SWA	Campanian–Maastrichtian	2113	28	N
USNM 607354	TRA737	*Atlanticythere prethalassia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	28	O–P
USNM 607355	TRA743	*Atlanticythere prethalassia*	0.864	0.426		L	A	?	SWA	Campanian–Maastrichtian	2113	28	Q
USNM 607356	TRA744	*Atlanticythere prethalassia*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	28	R–S
USNM 607357	TRA802	*Dutoitella atlantiformis*	0.778	0.426	P	L	A	?	IO	Santonian	2793	28	T
USNM 607358	TRA803	*Dutoitella atlantiformis*	0.883	0.418	H	R	A	?	IO	Santonian	2793	28	U–V
USNM 607359	RB532	*Bathycythere vanstraateni*	1.172	0.729		L	A	?	MED	Modern	1500	29	A–B
USNM 607360	RB533	*Bathycythere vanstraateni*	1.122	0.729		R	A	?	MED	Modern	1500	29	C–D
USNM 607361	GSM155	*Bathycythere vanstraateni*	1.190	0.729		L	A	?	NA	Holocene	3427	29	E
USNM 607362	USGSD151	*Bathycythere vanstraateni*	1.152	0.747		L	A	?	NA	Late Pliocene	3427	29	F–G
USNM 607363	TRA850	*Cletocythereis scutulata*	0.721	0.364		L	A	?	NAM	Middle Eocene	OC	29	H
USNM 607364	TRA851	*Cletocythereis scutulata*	0.724	0.381		L	A	?	NAM	Middle Eocene	OC	29	I
USNM 607365	TRA852	*Cletocythereis scutulata*	0.743	0.367		R	A	?	NAM	Middle Eocene	OC	29	J–K
USNM 607366	TRA853	*Cletocythereis scutulata*	—	—		R	A	?	NAM	Middle Eocene	OC	29	L
USNM 607367	TRA846	*Hirsutocythere hornotina*	0.860	0.487		L	A	?	NAM	Middle Eocene	OC	29	M
USNM 607368	TRA847	*Hirsutocythere hornotina*	—	—		L	A	?	NAM	Middle Eocene	OC	29	N
USNM 607369	TRA848	*Hirsutocythere hornotina*	0.825	0.457		R	A	?	NAM	Middle Eocene	OC	29	O
USNM 607370	TRA849	*Hirsutocythere hornotina*	—	—		R	A	?	NAM	Middle Eocene	OC	29	P

USNM 607371	TRA212	“*Echinocythereis* cf. *melobesioides*”	0.875	0.440		L	A	?	NWP	Modern	137	29	Q
USNM 607372	TRA214	“*Echinocythereis* cf. *melobesioides*”	0.823	0.453		R	A	?	NWP	Modern	137	29	R
USNM 607373	TRA215	“*Echinocythereis* cf. *melobesioides*”	—	—		L	A	?	NWP	Modern	36	29	S
USNM 607374	TRA216	“*Echinocythereis* cf. *melobesioides*”	—	—		R	A	?	NWP	Modern	34	29	T
USNM 607375	ODP982068	*Buntonia textilis*	0.575	0.362		L	A	?	NEA	Pleistocene	1135.3	31	A
USNM 607376	ODP982069	*Buntonia textilis*	0.604	0.339		R	A	?	NEA	Pleistocene	1135.3	31	B
USNM 607377	ODP982070	*Buntonia textilis*	—	—		L	A	?	NEA	Pleistocene	1135.3	31	C–D
USNM 607378	ODP982071	*Buntonia textilis*	—	—		R	A	?	NEA	Pleistocene	1135.3	31	E–F
USNM 607379	TMC355	*Buntonia textilis*	—	—		L	A	?	NEA	Middle Miocene	2417	31	G
USNM 607380	TMC364	*Buntonia textilis*	—	—		L	A	?	NEA	Middle Miocene	2417	31	H
USNM 607381	TMC365	*Buntonia textilis*	0.551	0.348		R	A	?	NEA	Middle Miocene	2417	31	I
USNM 607382	TMC254	*Buntonia radiatopora*	1.251	0.769		L	A	?	NA	Early Pleistocene	3427	31	J
USNM 607383	RB536	*Buntonia radiatopora*	1.170	0.751		L	A	?	SEA	Modern	2700	31	K–L
USNM 607384	RB537	*Buntonia radiatopora*	1.066	0.699		R	A	?	SEA	Modern	2700	31	M–N
USNM 607385	GSM246	*Buntonia radiatopora*	—	—		L	A	?	NEA	Late Pliocene	2263.5	31	O
USNM 607386	GSM245	*Buntonia radiatopora*	—	—		L	A	?	NEA	Pliocene	3071.2	31	P
USNM 607387	USGSD152	*Buntonia radiatopora*	—	—		L	A	?	NA	Early Pleistocene	3427	31	Q
USNM 155077	TRA1024	*Cythereis ornatissima*	0.895	0.524	L	C	A	?	EUR	Coniacian, Upper Cretaceous	OC	49	A
USNM 607388	TRA810	*Cythereis* cf. *ornatissima*	0.795	0.444		L	A	?	EUR	Late Cretaceous, Santonian	OC	49	B–C
USNM 607389	TRA811	*Cythereis* cf. *ornatissima*	0.765	0.425		R	A	?	EUR	Late Cretaceous, Santonian	OC	49	D–E
USNM 607390	TRA816	*Cythereis ornatissima*	0.972	0.573		L	A	?	EUR	Campanian?	OC	49	F–G
USNM 607391	TRA817	*Cythereis ornatissima*	—	—		R	A	?	EUR	Campanian?	OC	49	H
USNM 607392	TRA818	*Cythereis ornatissima*	—	—		R	A	?	EUR	Campanian?	OC	49	I–J
USNM 607393	TRA819	*Cythereis ornatissima*	1.030	0.562		R	A	?	EUR	Campanian?	OC	49	K
USNM 607394	TRA820	*Cythereis ornatissima*	—	—		L	A	?	EUR	Campanian?	OC	49	L
USNM 607395	TRA821	*Cythereis ornatissima*	0.921	0.508		R	A	?	EUR	Campanian?	OC	49	M
USNM 607396	TRA822	*Cythereis ornatissima*	—	—		R	A	?	EUR	Campanian?	OC	49	N
USNM 607397	TRA768	*Cythereis* sp. 1	0.974	0.628		L	A	?	NA	Campanian	1797	49	O–P
USNM 607398	TMC242	*Dutoitella cronini*	1.005	0.628	P	R	A	?	NA	Late Pliocene	3427	32	A–B
USNM 607399	RB322	*Dutoitella cronini*	1.106	0.661	H	R	A	?	NWA	Modern	3865	32	C–D
USNM 607400	RB265	*Dutoitella cronini*	—	—	P	L	A	?	NWA	Modern	3300	32	E
USNM 607401	RB328	*Dutoitella cronini*	—	—	P	L	A	?	NWA	Modern	4425	32	F
USNM 607402	RB329	*Dutoitella cronini*	—	—	P	R	A	?	NWA	Modern	4425	32	G
USNM 607403	RB412	*Dutoitella cronini*	1.088	0.621	P	R	A	?	NWA	Modern	2983	32	H
USNM 607404	RB415	*Dutoitella cronini*	—	—	P	R	A	?	NWA	Modern	3346	32	I–J

(*continued*)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607405	GSM149	*Dutoitella cronini*	—	—	P	L	A	?	NA	Pleistocene	3427	32	K
USNM 607406	GSM173	*Dutoitella cronini*	1.172	0.700	P	L	A	?	NA	Pleistocene	3427	32	L
USNM 607407	GSM626	*Dutoitella cronini*	1.063	0.619	P	L	A	?	NWA	Modern	3659	32	M–N
USNM 607408	GSM627	*Dutoitella cronini*	1.072	0.598	P	R	A	?	NWA	Modern	3659	32	O–P
USNM 607409	TRA533	*Dutoitella spinaplana*	0.968	0.612		R	A	?	SWP	Early Pliocene	3196	32	Q–R
USNM 607410	TRA327	*Dutoitella praesuhmi*	0.853	0.537		L	A	?	SWA	Late Eocene	2086	34	A–B
USNM 607411	TRA328	*Dutoitella praesuhmi*	0.838	0.508		R	A	?	SWA	Late Eocene	2086	34	C–D
USNM 607412	TRA964	*Dutoitella cf. praesuhmi*	1.043	0.612		R	A	?	EWP	Quaternary	1716	34	E–F
USNM 607413	SIMY0031	*Dutoitella cf. praesuhmi*	1.034	0.627		L	A	?	EWP	Quaternary	1716	34	G–H
USNM 607414	TRA109	*Dutoitella crassinodosa*	0.942	0.552		L	A	?	SEA	Late Eocene	1054	34	I–J
USNM 607415	TRA111	*Dutoitella crassinodosa*	0.917	0.565		L	A	?	SEA	Late Eocene	1054	34	K
USNM 607416	TRA112	*Dutoitella crassinodosa*	0.908	0.537		R	A	?	SEA	Late Eocene	1054	34	L–M
USNM 607417	TRA113	*Dutoitella crassinodosa*	—	—		L	A	?	SEA	Late Eocene	1054	34	N
USNM 607418	TRA114	*Dutoitella crassinodosa*	—	—		R	A	?	SEA	Late Eocene	1054	34	O
USNM 607419	TRA110	*Dutoitella crassinodosa*	0.930	0.518		R	A	?	SEA	Late Eocene	1054	34	P
USNM 607420	TRA553	*Dutoitella symmetrica*	0.806	0.435	P	L	A	?	IO	Late Eocene	1655	35	A
USNM 607421	TRA554	*Dutoitella symmetrica*	0.825	0.452	H	R	A	?	IO	Late Eocene	1655	35	B–C
USNM 607422	TRA326	*Dutoitella neogenica*	0.814	0.448		L	A	?	SWA	Middle Eocene	2086	35	D–E
USNM 607423	TRA133	*Dutoitella mazziniae*	0.896	0.510	P	L	A	?	SWA	Late Miocene	2086	35	F–G
USNM 607424	TRA134	*Dutoitella mazziniae*	0.923	0.503	H	R	A	?	SWA	Late Miocene	2086	35	H–I
USNM 607425	TRA243	*Dutoitella mazziniae*	0.915	0.507	P	R	A	?	SEA	Late Miocene	1054	35	J
USNM 607426	TRA244	*Dutoitella mazziniae*	0.964	0.501	P	R	A	?	SEA	Late Miocene	1054	35	K–L
USNM 607427	TRA410	*Dutoitella paradinglei*	0.927	0.514	P	L	A	?	SO	Middle Miocene	1591	35	M–N
USNM 607428	TRA411	*Dutoitella paradinglei*	0.919	0.497	H	R	A	?	SO	Middle Miocene	1591	35	O–P
USNM 607429	TRA412	*Dutoitella paradinglei*	0.942	0.514	P	L	A	?	SO	Middle Miocene	1591	35	Q
USNM 607430	TRA413	*Dutoitella paradinglei*	0.942	0.540	P	R	A	?	SO	Middle Miocene	1591	35	R–S
USNM 607431	TRA321	*Dutoitella ayressi*	0.951	0.507	P	L	A	?	SEA	Miocene	1655	37	A–B
USNM 607432	TRA322	*Dutoitella ayressi*	0.955	0.495	H	R	A	?	SEA	Miocene	1655	37	C–D
USNM 607433	TRA1005	*Dutoitella mazziniae*	0.864	0.435	P	R	A	?	SEA	Early Pliocene	1655	37	E–F
USNM 607434	TRA240	*Dutoitella mazziniae*	1.009	0.586	P	L	A	?	SEA	Early Pliocene	1054	37	G–H
USNM 607435	TRA241	*Dutoitella mazziniae*	1.021	0.527	P	L	A	?	SEA	Early Pliocene	1054	37	I
USNM 607436	TRA242	*Dutoitella mazziniae*	0.989	0.540	P	R	A	?	SEA	Early Pliocene	1054	37	J
USNM 607437	TRA338	*Dutoitella* sp. 1	1.087	0.524		R	A	?	IO	Early Pliocene	1030	37	K–L
USNM 607438	TRA339	*Dutoitella* sp. 2	1.004	0.554		R	A	?	IO	Early Pliocene	1030	37	M–N
USNM 607439	TRA101	*Dutoitella* cf. *mazziniae*	1.060	0.548		L	A	?	SEA	Early Miocene	1054	37	O–P
USNM 607440	TRA102	*Dutoitella* cf. *mazziniae*	1.026	0.514		R	A	?	SEA	Early Miocene	1054	38	A–B
USNM 607441	TRA317	*Dutoitella mimica*	0.879	0.527		L	A	?	SEA	Late Eocene	1655	38	C–D
USNM 607442	TRA318	*Dutoitella mimica*	0.891	0.488		R	A	?	SEA	Late Eocene	1655	38	E–F

USNM 607443	TRA308	*Dutoitella* sp. 3	0.936	0.580		L	A	?	SWA	Late Miocene	1519	38	G–H
USNM 607444	TRA756	*Dutoitella colesi*	0.810	0.439	P	L	A	?	SWA	Late Campanian	2400	38	I–J
USNM 607445	TRA757	*Dutoitella colesi*	0.738	0.450	P	L	A	?	SWA	Late Campanian	2400	38	K
USNM 607446	TRA758	*Dutoitella colesi*	0.732	0.407	H	R	A	?	SWA	Late Campanian	2400	38	L–M
USNM 607447	TRA761	*Dutoitella spinosa*	0.923	0.544	P	R	A	?	SWA	Late Campanian	2400	38	N–O
USNM 607448	TRA307	*Dutoitella spinosa*	0.915	0.548	H	R	A	?	SWA	Late Miocene	1519	38	P–Q
USNM 607449	TRA806	*Dutoitella whatleyi*	0.755	0.437	P	R	A	?	SEA	Middle Paleocene	2248	38	R–S
USNM 607450	TRA759	*Dutoitella whatleyi*	0.844	0.492	H	L	A	?	SWA	Late Campanian	2400	40	A–B
USNM 607451	TRA336	*Dutoitella whatleyi*	0.870	0.505	P	L	A	?	SWA	Middle Paleocene	3175	40	C–D
USNM 607452	TRA760	*Bensonodutoitella* sp. 1	0.836	0.488		R	A	?	SWA	Late Campanian	2400	40	E–F
USNM 607453	TRA311	*Bensonodutoitella bicornigeri*	0.768	0.412	P	R	A	?	SWA	Late Miocene	1519	40	G–H
USNM 607454	TRA310	*Bensonodutoitella bicornigeri*	0.768	0.422	H	R	A	?	SWA	Late Miocene	1519	40	I–J
USNM 607455	GSM320	*Henryhowella evax*	0.876	0.482		L	A	M	NAM	Miocene	OC	40	K–L
USNM 607456	GSM321	*Henryhowella evax*	0.874	0.467		R	A	M	NAM	Miocene	OC	40	M–N
USNM 607457	GSM322	*Henryhowella evax*	0.725	0.463		L	A	F	NAM	Miocene	OC	40	O–P
USNM 607458	TRA430	*Henryhowella asperrima*	0.812	0.448		R	A	?	SO	Early Oligocene	1214	40	Q–R
USNM 607459	TRA962	*Henryhowella asperrima*	0.883	0.529		L	A	?	SEA	Late Miocene	1054	40	S–T
USNM 607460	TRA963	*Henryhowella asperrima*	0.853	0.493		R	A	?	SEA	Late Miocene	1054	40	U
USNM 607461	GSM628	*Henryhowella asperrima*	0.983	0.591		L	A	?	GOM	Modern	2160	42	B–C
USNM 607462	GSM629	*Henryhowella asperrima*	—	—		R	A	?	GOM	Modern	2160	42	D–E
USNM 607463	GSM630	*Henryhowella asperrima*	—	—		L	A	?	GOM	Modern	2160	42	F–G
USNM 607464	GSM631	*Henryhowella asperrima*	0.904	0.546		R	A	?	GOM	Modern	2160	42	H–I
USNM 607465	TRA616	*Henryhowella asperrima*	0.724	0.437		R	A	?	SWA	Oligocene	1313	42	J–K
USNM 607466	TRA516	*Henryhowella asperrima*	1.158	0.711		L	A	?	NEA	Early Pleistocene	4148	42	L–M
USNM 607467	TRA517	*Henryhowella asperrima*	1.138	0.616		R	A	?	NEA	Pliocene	4483	42	N–O
No number	K&N 1993	*Henryhowella asperrima*	0.898	0.474		R	A	M	EUR	Miocene, Badenian	OC?	43	A
No number	K&N 1993	*Henryhowella asperrima*	—	—		R	A	M	EUR	Miocene, Badenian	OC?	43	B
No number	K&N 1993	*Henryhowella asperrima*	0.861	0.485		L	A	M	EUR	Miocene, Badenian	OC?	43	C
No number	K&N 1993	*Henryhowella asperrima*	—	—		L	A	M	EUR	Miocene, Badenian	OC?	43	D
No number	K&N 1993	*Henryhowella asperrima*	0.801	0.488		R	A	F	EUR	Miocene, Badenian	OC?	43	E
No number	K&N 1993	*Henryhowella asperrima*	0.837	0.518		L	A	F	EUR	Miocene, Badenian	OC?	43	F
No number	K&N 1993	*Henryhowella asperrima*	—	—		R	A	F	EUR	Miocene, Badenian	OC?	43	G
No number	K&N 1993	*Henryhowella asperrima*	—	—		L	A	F	EUR	Miocene, Badenian	OC?	43	H
NHM 80.38.58	No number	*Henryhowella circumdentata*	—	—	L	L	A?	M?	SP	Modern	4298	43	I–K
USNM 607468	TRA513	*Henryhowella* sp. 1	1.014	0.619		L	A	?	NEA	Late Pliocene	4148	42	P
USNM 607469	TRA514	*Henryhowella* sp. 1	1.011	0.603		R	A	?	NEA	Late Pliocene	4148	42	Q–R
USNM 607470	TRA907	*Henryhowella argentinensis*	0.900	0.495		L	A	M	SAM	Early Paleocene	OC	44	A–B
USNM 607471	TRA913	*Henryhowella argentinensis*	—	—		L	A	M	SAM	Early Paleocene	OC	44	C
USNM 607472	TRA908	*Henryhowella argentinensis*	1.075	0.544		R	A	M	SAM	Early Paleocene	OC	44	D
USNM 607473	TRA911	*Henryhowella argentinensis*	—	—		L	A	M	SAM	Early Paleocene	OC	44	E
USNM 607474	TRA912	*Henryhowella argentinensis*	1.132	0.595		R	A	M	SAM	Early Paleocene	OC	44	F–G
USNM 607475	TRA927	*Henryhowella argentinensis*	—	—		L	A	M	SAM	Early Paleocene	OC	44	H

(*continued*)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607476	TRA928	*Henryhowella argentinensis*	0.970	0.512		R	A	M	SAM	Early Paleocene	OC	44	I
USNM 607477	TRA932	*Henryhowella argentinensis*	—	—		L	A	M	SAM	Early Paleocene	OC	44	J
USNM 607478	TRA914	*Henryhowella argentinensis*	0.902	0.563		L	A	F	SAM	Early Paleocene	OC	44	K
USNM 607479	TRA921	*Henryhowella argentinensis*	—	—		R	A	F	SAM	Early Paleocene	OC	44	L–M
USNM 607480	TRA923	*Henryhowella meridionalis*	0.911	0.559		L	A	F	SAM	Early Paleocene	OC	44	N
USNM 607481	TRA931	*Henryhowella argentinensis*	—	—		R	A	F	SAM	Early Paleocene	OC	44	O
USNM 607482	TRA929	*Henryhowella argentinensis*	—	—		L	A	F	SAM	Early Paleocene	OC	44	P–Q
USNM 607483	TRA930	*Henryhowella argentinensis*	0.785	0.454		R	A	F	SAM	Early Paleocene	OC	44	R
USNM 607484	TRA904	*Henryhowella nascens*	0.878	0.539		L	A	F	SAM	Early Paleocene	OC	45	A–B
USNM 607485	TRA905	*Henryhowella nascens*	0.866	0.516		R	A	F	SAM	Early Paleocene	OC	45	C
USNM 607486	TRA906	*Henryhowella nascens*	—	—		R	A	F	SAM	Early Paleocene	OC	45	D
USNM 607487	TRA915	*Henryhowella nascens*	1.041	0.557		L	A	M	SAM	Early Paleocene	OC	45	E
USNM 607488	TRA916	*Henryhowella meridionalis*	0.966	0.493		R	A	M	SAM	Early Paleocene	OC	45	F
USNM 607489	TRA910	*Henryhowella meridionalis*	—	—		R	A	M	SAM	Early Paleocene	OC	45	G–H
USNM 607490	TRA922	*Henryhowella meridionalis*	1.117	0.571		L	A	M	SAM	Early Paleocene	OC	45	I–J
USNM 607491	TRA909	*Henryhowella meridionalis*	0.846	0.508		L	A	F	SAM	Early Paleocene	OC	45	K–L
USNM 607492	TRA917	*Henryhowella meridionalis*	—	—		L	A	F	SAM	Early Paleocene	OC	45	M
USNM 607493	TRA918	*Henryhowella meridionalis*	0.842	0.490		R	A	F	SAM	Early Paleocene	OC	45	N–O
USNM 607494	TRA924	*Henryhowella meridionalis*	0.925	0.527		R	A	F	SAM	Early Paleocene	OC	45	P–Q
USNM 607495	TRA448	Tongacythere sp. 1	0.944	0.486		R	A	?	SO	Early Eocene	1214	46	A–B
USNM 607496	TRA834	*Tongacythere* sp. 2	0.815	0.424		R	A	?	NZ	Late Eocene	OC	46	C–D
USNM 607497	TRA938	*Tongacythere* sp. 3	0.930	0.495		L	A	?	SWP	Modern	1299	46	E–F
USNM 607498	TRA534	*Oligocythereis sylvesterbradleyi*	0.853	0.426	P	R	A	M	IO	Middle Eocene	1623	46	G–H
USNM 607499	TRA535	*Oligocythereis sylvesterbradleyi*	0.866	0.448	H	R	A	F	IO	Middle Eocene	1623	46	I–J
USNM 607500	TRA626	*Toolongella* sp. 1	0.635	0.324		R	A	?	SWA	Middle Eocene	2113	46	K–L
USNM 607501	TRA919	*Henryhowella meridionalis*	0.821	0.537		L	A	F	SAM	Early Paleocene	OC	46	M–N
USNM 607502	TRA920	*Henryhowella meridionalis*	0.793	0.492		R	A	F	SAM	Early Paleocene	OC	46	O–P
USNM 607503	TRA925	*Henryhowella meridionalis*	0.787	0.478		L	A	F	SAM	Early Paleocene	OC	46	Q–R
USNM 607504	TRA926	*Henryhowella meridionalis*	—	—		R	A	F	SAM	Early Paleocene	OC	46	S–T
USNM 607505	TMC149	*Echinocythereis echinata*	1.278	0.796		L	A	?	NA	Pleistocene	3427	48	A
USNM 607506	TMC150	*Echinocythereis echinata*	1.312	0.790		R	A	?	NA	Pleistocene	3427	48	B
USNM 607507	TMC153	*Echinocythereis echinata*	—	—		R	A	?	NA	Pleistocene	3427	48	C
USNM 607508	TMC218	*Echinocythereis echinata*	—	—		R	A	?	NA	Pleistocene	3427	48	D
USNM 607509	TMC234	*Echinocythereis echinata*	—	—		R	A	?	NA	Pleistocene	3427	48	E
USNM 607510	TMC378	*Echinocythereis echinata*	—	—		L	A	?	NEA	Middle Miocene	2417	48	F
USNM 607511	RB356	*Echinocythereis echinata*	1.150	0.776		L	A	?	NWA	Modern	3263	48	G
USNM 607512	RB357	*Echinocythereis echinata*	1.142	0.731		R	A	?	NWA	Modern	3263	48	H
USNM 607513	TMC130	*Echinocythereis echinata*	—	—		R	A	?	NA	Pleistocene	3427	48	I

USNM 607514	TMC131	*Echinocythereis echinata*	—	—		R	A	?	NA	Pleistocene	3427	48	J
USNM 607515	GSM202	*Echinocythereis echinata*	—	—		R	A	?	NA	Early Pleistocene	3427	48	K
USNM 607516	GSM624	*Echinocythereis echinata*	—	—		L	A	?	NWA	Modern	3659	48	L
USNM 607517	GSM625	*Echinocythereis echinata*	—	—		R	A	?	NWA	Modern	3659	48	M
USNM 607518	USGSD157	*Echinocythereis echinata*	—	—		R	A	?	NA	Late Pliocene	3427	48	N
USNM 607519	USGSD159	*Echinocythereis echinata*	—	—		L	A	?	NA	Early Pleistocene	3427	48	O
USNM 607520	TRA960	*Echinocythereis margaritifera*	1.023	0.697		R	A	?	GOM	Modern	304	48	P
USNM 608273	TRA961	*Echinocythereis margaritifera*	—	—		R	A	?	GOM	Modern	304	48	Q
USNM 607521	TRA959	*Echinocythereis margaritifera*	1.006	0.703		L	A	?	GOM	Modern	304	48	R–S
USNM 607522	TRA1026	*Echinocythereis margaritifera*	0.879	0.552		L	A	?	NAM	Middle Miocene?	OC	48	T
USNM 607523	TRA1027	*Echinocythereis margaritifera*	—	—		L	A	?	NAM	Middle Miocene?	OC	48	U
USNM 607524	RB455	*Marwickcythereis ericea*	—	—		L	A	?	NWA	Modern	1584	22	A–B
USNM 607525	RB456	*Marwickcythereis ericea*	—	—		R	A	?	NWA	Modern	1584	22	C–D
USNM 607526	TRA601	*Marwickcythereis ericea*	1.047	0.646		L	A	?	SWA	Early Pliocene	1313	22	E–F
USNM 607527	TRA602	*Marwickcythereis ericea*	1.063	0.646		R	A	?	SWA	Early Pliocene	1313	22	G–H
USNM 607528	RB534	*Marwickcythereis ericea*	1.307	0.856		R	A	?	SWA	Modern	2500	22	I–J
USNM 607529	RB535	*Marwickcythereis ericea*	1.352	0.867		L	A	?	SWA	Modern	2500	22	K–L
USNM 607530	RB332	*Marwickcythereis ericea*	—	—		L	A	?	SWA	Modern	834–939	22	M
NHM 80.38.76	No number	*Marwickcythereis ericea*	—	—	L	R	A	?	SWA	Modern	1234	23	A–C
USNM 607531	TRA135	*Cythereis guerneti*	0.945	0.541	P	L	A	F	SWA	Late Oligocene	2086	50	A–B
USNM 607532	TRA136	*Cythereis guerneti*	0.921	0.492	H	R	A	F	SWA	Late Oligocene	2086	50	C, F
USNM 607533	TRA329	*Cythereis guerneti*	1.006	0.515	P	R	A	M	SWA	Late Eocene	2086	50	D
USNM 607534	TRA330	*Cythereis guerneti*	—	—	P	R	A	M	SWA	Late Eocene	2086	50	E
USNM 607535	TRA405	*Cythereis parajohnnealei*	1.043	0.560	H	L	A	?	SO	Early Oligocene	1214	50	G–H
USNM 607536	TRA434	*Cythereis johnnealei*	0.861	0.461	H	R	A	F	SO	Early Oligocene	1214	50	I–J
USNM 607537	TRA428	*Cythereis johnnealei*	0.949	0.498	P	L	A	M	SO	Early Oligocene	1214	50	K–L
USNM 607538	TRA407	*Cythereis parajohnnealei*	0.774	0.457	P	R	A	?	SO	Middle Eocene	1214	50	M–N
USNM 607539	TRA323	*Cythereis neoanteplana*	1.184	0.662	H	L	A	?	SEA	Miocene	1655	50	O–P
USNM 607540	TRA324	*Cythereis neoanteplana*	1.220	0.605	P	R	A	?	SEA	Miocene	1655	53	A–B
USNM 607541	TRA345	*Cythereis* sp. 2	1.344	0.664		L	A	?	IO	Late Miocene	2793	53	C–D
USNM 607542	TRA406	*Cythereis zululandensis*	1.143	0.641		L	A	?	SO	Middle Eocene	1214	53	E–F
USNM 607543	TRA624	*Cythereis neoanteplana?*	1.053	0.558		R	A	?	SWA	Middle Eocene	2113	53	G–H
USNM 607544	TRA837	*Cythereis neoanteplana?*	1.205	0.654		R	A	?	NZ	Late Eocene	OC	53	I–J
USNM 607545	TRA425	*Cythereis* sp. 3	0.867	0.427		R	A	?	SO	Early Oligocene	1214	53	K–L
USNM 607546	TRA829	*Hornibrookoleberis thomsoni*	1.137	0.549		R	A	?	NZ	Modern	?	55	A–B
USNM 607547	TRA828	*Hornibrookoleberis lytteltonensis*	1.195	0.536		R	A	?	NZ	Modern	?	55	C–D
USNM 607548	TRA540	*Cythereis sylvesterbradleyi*	0.893	0.504	H	L	A	F	IO	Late Eocene	1655	55	E–F
USNM 607549	TRA541	*Cythereis sylvesterbradleyi*	0.964	0.532	P	R	A	F	IO	Early Oligocene	1655	55	G–H
USNM 607550	TRA555	*Cythereis sylvesterbradleyi*	1.145	0.562	P	L	A	M	IO	Early Miocene	1655	55	I–J
USNM 607551	TRA1008	*Cythereis sylvesterbradleyi*	0.992	0.523	P	L	A	M	IO	Early Miocene	1962	55	K
USNM 607552	TRA1009	*Cythereis sylvesterbradleyi*	1.008	0.494	P	R	A	M	IO	Early Miocene	1962	55	L
USNM 607553	TRA1010	*Cythereis sylvesterbradleyi*	—	—	P	R	A	M	IO	Early Miocene	1962	55	M

(*continued*)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607554	TRA346	*Cythereis sylvesterbradleyi*	1.055	0.570	P	L	A	M	IO	Late Miocene	2793	55	N–O
USNM 607555	TRA520	*Cythereis ayressi*	0.853	0.451		R	A	?	SWP	Pleistocene	1545	56	A–B
USNM 607556	TRA526	*Cythereis ayressi*	—	—		R	A	?	SWP	Late Pliocene	1545	56	C–D
USNM 607557	TRA954	*Cythereis ayressi*	0.778	0.438		L	A	?	SWP	Modern	1158	56	E
USNM 607558	TRA955	*Cythereis ayressi*	0.812	0.406		R	A	?	SWP	Modern	1158	56	F–G
USNM 607559	TRA956	*Cythereis ayressi*	0.857	0.445		L	A	?	SWP	Modern	1224	56	H–I
USNM 607560	TRA958	*Cythereis ayressi*	—	—		R	A	?	SWP	Modern	1224	56	J
USNM 607561	TRA957	*Cythereis ayressi*	—	—		R	A	?	SWP	Modern	1224	56	K
USNM 607562	SIMY0025	*Cythereis ayressi*	—	—		L	A	?	SWP	Modern	1158	56	L–M
USNM 607563	TRA401	*Cythereis bensoni*	0.786	0.464	P	L	A	?	SO	Early Oligocene	1214	56	N
USNM 607564	TRA402	*Cythereis bensoni*	0.759	0.423	P	R	A	?	SO	Early Oligocene	1214	56	O–P
USNM 607565	TRA403	*Cythereis bensoni*	—	—	P	L	A	?	SO	Early Oligocene	1214	56	Q
USNM 607566	TRA404	*Cythereis bensoni*	—	—	P	R	A	?	SO	Early Oligocene	1214	56	R
USNM 607567	TRA421	*Cythereis bensoni*	0.797	0.419	P	L	A	?	SO	Early Oligocene	1214	56	S–T
USNM 607568	TRA422	*Cythereis bensoni*	0.786	0.398	H	R	A	?	SO	Early Oligocene	1214	56	U–V
USNM 607569	TRA423	*Cythereis bensoni*	—	—	P	L	A	?	SO	Early Oligocene	1214	56	W
USNM 607570	TRA424	*Cythereis bensoni*	—	—	P	R	A	?	SO	Early Oligocene	1214	56	X
USNM 607571	TRA414	*Cythereis bensoni*	0.923	0.509	P	R	A	?	SWP	Late Miocene	1066	56	Y–Z
USNM 607572	TRA830	*Cythereis ulcus*	0.898	0.498		L	A	?	SWP	Modern	1148.5	57	A
USNM 607573	TRA831	*Cythereis ulcus*	0.863	0.474		R	A	?	SWP	Modern	1148.5	57	B
USNM 607574	TRA832	*Cythereis ulcus*	—	—		R	A	?	SWP	Modern	1148.5	57	C
USNM 607575	TRA951	*Cythereis bensoni*	0.868	0.481	P	L	A	?	SWP	Modern	1160	57	D–E
USNM 607576	TRA1011	*Cythereis purii*	0.897	0.462	H	L	A	?	IO	Early Miocene	1962	57	F
USNM 607577	TRA1012	*Cythereis purii*	0.874	0.466	P	R	A	?	IO	Early Miocene	1962	57	G
USNM 607578	TRA1013	*Cythereis purii*	—	—	P	R	A	?	IO	Early Miocene	1962	57	H
USNM 607579	TRA547	*Cythereis orientalis*	0.964	0.492		R	A	M	IO	Early Eocene	1655	57	I–J
USNM 607580	TRA548	*Cythereis orientalis*	0.855	0.447		R	A	F	IO	Early Eocene	1655	57	K
USNM 607581	TRA549	*Cythereis orientalis*	0.825	0.459		R	A	F	IO	Early Eocene	1655	57	L–M
USNM 607582	TRA435	*Cythereis fungina*	0.983	0.521	P	L	A	?	SO	Early Miocene	3341	57	N
USNM 607583	TRA436	*Cythereis fungina*	0.940	0.547	P	L	A	?	SO	Early Miocene	3341	57	O
USNM 607584	TRA437	*Cythereis fungina*	0.923	0.492	H	R	A	?	SO	Early Miocene	3341	57	P–Q
USNM 607585	TRA438	*Cythereis fungina*	—	—	P	R	A	?	SO	Early Miocene	3341	57	R
USNM 607586	TRA417	*Cythereis fungina*	0.953	0.492	P	R	A	?	SWP	Late Miocene	1066	57	S–T
USNM 607587	TRA426	*Cythereis fungina*	0.776	0.410	P	R	A	?	SO	Early Oligocene	1214	59	A
USNM 607588	TRA427	*Cythereis fungina*	0.836	0.415	P	R	A	?	SO	Early Oligocene	1214	59	B–C
USNM 607589	TRA418	*Cythereis* sp. 4	1.081	0.603		R	A	?	IO	Middle Eocene	2876	59	D–E
USNM 607590	TRA415	*Cythereis* sp. 5	0.780	0.421		R	A	?	SWP	Late Miocene	1066	59	F–G
USNM 607591	TRA840	*Cythereis* sp. 6	0.814	0.442		R	A	?	NZ	Late Eocene	OC	59	H–I

USNM 607592	TRA619	*Cythereis* sp. 7	1.378	0.789		R	A	?	SWA	Early Miocene	3175	59	J–K
USNM 607593	TRA838	*Cythereis* sp. 8	1.201	0.645		R	A	?	NZ	Late Eocene	OC	59	L–M
USNM 607594	TRA839	*Cythereis* sp. 9	1.233	0.686		R	A	?	NZ	Late Eocene	OC	59	N–O
USNM 607595	TRA502	*Cythereis tomcronini*	1.355	0.715	P	R	A	?	NWP	Oligocene	2943	60	A–B
USNM 607596	TRA325	*Cythereis tomcronini*	1.353	0.695	P	R	A	?	SEA	Miocene	1655	60	C–D
USNM 607597	TRA944	*Cythereis legitimoformis*	1.423	0.683	P	R	A	?	NP	Quaternary	2505	60	E
USNM 607598	TRA945	*Cythereis legitimoformis*	—	—	P	R	A	?	NP	Quaternary	2505	60	F
USNM 607599	POS1257	*Cythereis legitimoformis*	1.364	0.731	H	R	A	?	NP	Quaternary	2505	60	G–H
USNM 607600	TRA943	*Cythereis legitimoformis*	1.387	0.760	P	L	A	?	NP	Quaternary	2505	60	I–J
USNM 607601	TRA331	*Cythereis tomcronini*	1.127	0.663	P	L	A	?	SWA	Middle Miocene	2086	60	K–L
USNM 607602	TRA334	*Cythereis tomcronini*	1.165	0.600	P	R	A	?	SWA	Early Miocene	2086	60	M–N
USNM 607603	TRA335	*Cythereis tomcronini*	1.215	0.657	P	L	A	?	SWA	Late Oligocene	2086	61	A–B
USNM 607604	TRA137	*Cythereis tomcronini*	1.164	0.633	H	R	A	?	SWA	Late Miocene	2086	61	C–D
USNM 607605	TRA801	*Cythereis* sp. 10	0.955	0.550		L	A	?	IO	Santonian	2793	61	E–F
USNM 607606	TRA306	*Croninocythereis* cf. *tridentiferi*	1.044	0.610		L	A	?	SWA	Late Miocene	1519	61	G–H
USNM 607607	TRA452	*Croninocythereis tridentiferi*	0.938	0.512	P	R	A	?	NWP	Early Oligocene	2903	61	I–J
USNM 607608	TRA603	*Cythereis richardbensoni*	1.118	0.663	P	L	A	?	SWA	Early Pliocene	1313	51	A–B
USNM 607609	TRA604	*Cythereis richardbensoni*	—	—	P	R	A	?	SWA	Early Pliocene	1313	51	C
USNM 607610	TRA605	*Cythereis richardbensoni*	—	—	H	R	A	?	SWA	Early Pliocene	1313	51	D–E
USNM 607611	TRA606	*Cythereis richardbensoni*	1.081	0.600	P	R	A	?	SWA	Early Pliocene	1313	51	F–G
USNM 607612	TRA607	*Cythereis richardbensoni*	1.199	0.661	P	R	A	?	SWA	Late Miocene	1313	51	H
USNM 607613	TRA608	*Cythereis richardbensoni*	—	—	P	R	A	?	SWA	Late Miocene	1313	51	I
USNM 607614	TRA316	*Cythereis richardbensoni*	1.133	0.672	P	R	A	?	SWA	Pliocene	2086	51	J–K
USNM 607615	TRA609	*Cythereis dinglei*	0.983	0.504	P	R	A	?	SWA	Middle Miocene	1313	51	L–M
USNM 607616	TRA610	*Cythereis dinglei*	0.887	0.491	H	R	A	?	SWA	Early Miocene	1313	51	N–O
USNM 607617	TRA618	*Cythereis guerneti*	0.853	0.468	P	R	A	?	SWA	Oligocene	1313	51	P–Q
USNM 607618	TRA617	*Cythereis guerneti*	0.974	0.513	P	L	A	?	SWA	Oligocene	1313	51	R–S
USNM 607619	TRA238	*Croninocythereis tridentiferi*	1.020	0.582	P	L	A	?	SEA	Late Oligocene	4428	67	A–B
USNM 607620	TRA239	*Croninocythereis tridentiferi*	0.846	0.472	H	R	A	?	SEA	Early Miocene	3043	67	C–D
USNM 607621	TRA625	*Croninocythereis tridentiferi*	0.673	0.380	P	R	A	?	SWA	Middle Eocene	2113	67	E–F
USNM 607622	TRA701	*Croninocythereis presequenta*	0.832	0.509		L	A	?	SWA	Late Paleocene	2113	67	G–H
USNM 607623	TRA542	*Croninocythereis* cf. *presequenta*	0.750	0.449		L	A	?	IO	Early Oligocene	1655	67	I–J
USNM 607624	TRA139	*Croninocythereis cronini*	1.136	0.726	P	L	A	?	SO	Modern	3277	68	A–B
USNM 607625	TRA140	*Croninocythereis cronini*	1.084	0.658	P	R	A	?	SO	Modern	3277	68	C–D
USNM 607626	RB318	*Croninocythereis cronini*	—	—	P	L	A	?	NWA	Modern	3865	68	E
USNM 607627	RB319	*Croninocythereis cronini*	1.034	0.613	P	R	A	?	NWA	Modern	3865	68	F
USNM 607628	RB345	*Croninocythereis cronini*	—	—	P	R	A	?	NWA	Modern	3200	68	G
USNM 607629	RB346	*Croninocythereis cronini*	—	—	P	R	A	?	NWA	Modern	3200	68	H
USNM 607630	RB413	*Croninocythereis cronini*	—	—	P	L	A	?	NWA	Modern	3346	68	I
USNM 607631	RB414	*Croninocythereis cronini*	—	—	P	L	A	?	NWA	Modern	3346	68	J
USNM 607632	TRA228	*Croninocythereis cronini*	1.084	0.672	P	L	A	?	NWP	Late Miocene	2689	68	K–L
USNM 607633	TRA229	*Croninocythereis cronini*	—	—	P	R	A	?	NWP	Late Miocene	2689	68	M–N

(*continued*)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607634	TRA230	*Croninocythereis cronini*	—	—	P	R	A	?	NWP	Late Miocene	2689	68	O–P
USNM 607635	TRA231	*Croninocythereis cronini*	—	—	P	L	A	?	NWP	Late Miocene	2619	68	Q
USNM 607636	TRA940	*Croninocythereis cronini*	—	—	P	L	A	?	NP	Quaternary	2182	63	A–B
USNM 607637	TRA941	*Croninocythereis cronini*	—	—	H	R	A	?	NP	Quaternary	2182	63	C–D
USNM 607638	TRA501	*Croninocythereis cronini*	1.007	0.588	P	R	A	?	NWP	Middle Miocene	2903	63	E–F
USNM 607639	TRA218	*Croninocythereis* sp. 1	0.814	0.511		L	A	?	NWP	Modern	119	63	G–H
USNM 607640	TRA449	*Croninocythereis cronini*	—	—	P	L	A	?	NP	Pliocene	3516	63	I–J
USNM 607641	TRA614	*Cythereis ovi*	0.861	0.508	P	R	A	?	SWA	Oligocene	1313	63	K–L
USNM 607642	TRA612	*Cythereis ovi*	0.870	0.490	H	L	A	?	SWA	Oligocene	1313	63	M–N
USNM 607643	TRA613	*Cythereis ovi*	0.000	0.000	P	R	A	?	SWA	Oligocene	1313	63	O
USNM 607644	TRA611	*Cythereis ovi*	0.928	0.518	P	R	A	?	SWA	Early Miocene	1313	63	P–Q
USNM 607645	TRA536	*Legitimocythere acanthoderma* s.l.	1.373	0.805		L	A	?	IO	Early Pleistocene	3633	63	R
USNM 607646	TRA537	*Legitimocythere acanthoderma* s.l.	1.342	0.778		R	A	?	IO	Early Pleistocene	3633	63	S
USNM 607647	TRA217	*Cythereis* sp. 11	1.034	0.674		L	A	?	NWP	Modern	119	64	A–B
USNM 607648	TRA408	*Cythereis swansoni*	1.288	0.729	P	R	A	?	SO	Late Miocene	1591	64	C–D
USNM 607649	TRA409	*Cythereis swansoni*	1.288	0.709	H	R	A	?	SO	Middle Miocene	1591	64	E–F
USNM 607650	TRA305	*Bensonocosta bensoni*	1.271	0.653	H	R	A	?	SWA	Late Miocene	1519	64	G–H
USNM 607651	TRA750	*Bensonocosta bensoni*	1.297	0.658	P	R	A	?	SWA	Maastrichtian	2400	64	I–J
USNM 607652	TRA749	*Bensonocosta* sp. 1	0.838	0.433		R	A	?	SWA	Maastrichtian	2400	64	K–L
USNM 607653	TRA942	*Ayressoleberis* cf. *colesi*	1.237	0.684		R	A	?	EWP	Quaternary	2230	64	M–N
USNM 607654	TRA234	*Ayressoleberis* cf. *colesi*	1.294	0.712		L	A	?	EWP	Late Miocene	2602	64	O–P
USNM 607655	TRA235	*Ayressoleberis* cf. *colesi*	1.117	0.640		R	A	?	EWP	Late Miocene	2060	64	Q–R
USNM 607656	TRA146	*Ayressoleberis* cf. *bathymarina*	1.111	0.637		R	A	F?	SO	Modern	915	71	A–B
USNM 607657	TRA515	*Ayressoleberis* sp. 1	1.305	0.734		L	A	?	NEA	Late Pliocene	4148	71	C–D
USNM 607658	TRA532	*Ayressoleberis colesi*	1.257	0.702	P	R	A	F	SWP	Early Pliocene	3196	71	E–F
USNM 607659	TRA521	*Ayressoleberis colesi*	1.370	0.695	P	R	A	M	SWP	Pleistocene	1545	71	G–H
USNM 607660	TRA939	*Ayressoleberis colesi*	1.409	0.677	H	R	A	M	SWP	Modern	1299	71	I–J
USNM 607661	TRA528	*Ayressoleberis colesi*	1.260	0.664	P	R	A	M	SWP	Late Miocene	1545	71	K–L
USNM 607662	TRA115	*Leguminocythereis? buzasi*	0.972	0.486	P	L	A	M	SEA	Late Eocene	1054	72	A
USNM 607663	TRA116	*Leguminocythereis? buzasi*	1.000	0.488	H	R	A	M	SEA	Late Eocene	1054	72	B–C
USNM 607664	TRA117	*Leguminocythereis? buzasi*	0.913	0.492	P	L	A	F	SEA	Late Eocene	1054	72	D
USNM 607665	TRA118	*Leguminocythereis? buzasi*	0.966	0.501	P	R	A	F	SEA	Late Eocene	1054	72	E–F
USNM 607666	TRA119	*Leguminocythereis? buzasi*	—	—	P	L	A	?	SEA	Late Eocene	1054	72	G
USNM 607667	TRA120	*Leguminocythereis? buzasi*	—	—	P	R	A	?	SEA	Late Eocene	1054	72	H
USNM 607668	TRA420	*Oertliella* cf. *semivera*	0.989	0.610		L	A	?	SO	Early Oligocene	1214	72	I–J
USNM 607669	TRA836	*Oertliella semivera*	1.158	0.691		R	A	?	NZ	Late Eocene	OC	72	K–L

USNM 607670	TRA1031	*Oertliella semivera*	1.266	0.761		R	A	?	NZ	Late Eocene	OC	72	M–N
USNM 607671	TRA1030	*Oertliella semivera*	1.205	0.718		L	A	?	NZ	Late Eocene	OC	72	O–P
USNM 607672	TRA537	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	IO	Early Pleistocene	3633	74	A
USNM 607673	TRA525	*Legitimocythere acanthoderma* s.l.	1.310	0.753		L	A	?	SWP	Late Pliocene	1545	74	B–C
USNM 607674	TRA529	*Legitimocythere tomi*	1.068	0.679	P	L	A	?	GOM	Modern	352	74	D–E
USNM 607675	TRA530	*Legitimocythere tomi*	1.079	0.674	P	R	A	?	GOM	Modern	352	74	F–G
USNM 607676	RB439	*Legitimocythere tomi*	—	—	P	L	A	?	NWA	Modern	1256	74	H–I
USNM 607677	RB440	*Legitimocythere tomi*	—	—	P	R	A	?	NWA	Modern	1256	74	J–K
USNM 607678	RB451	*Legitimocythere tomi*	—	—	P	L	A	?	NWA	Modern	1584	74	L
USNM 607679	RB452	*Legitimocythere tomi*	1.274	0.790	P	L	A	?	NWA	Modern	1584	74	M–N
USNM 607680	RB453	*Legitimocythere tomi*	1.222	0.758	P	R	A	?	NWA	Modern	1584	74	O–P
USNM 607681	GSM165	*Legitimocythere acanthoderma* s.l.	1.260	0.740		L	A	?	NA	Pleistocene	3427	74	Q
USNM 607682	RB305	*Legitimocythere tomi*	1.267	0.753	P	L	A	?	NWA	Modern	2005	75	A
USNM 607683	RB306	*Legitimocythere tomi*	1.222	0.742	H	R	A	?	NWA	Modern	2005	75	B–C
USNM 607684	RB307	*Legitimocythere tomi*	—	—	P	L	A	?	NWA	Modern	515	75	D
USNM 607685	SIMY0011	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	SWP	Quaternary	3167	75	E–F
USNM 607686	TRA138	*Legitimocythere acanthoderma* s.l.	1.367	0.871		L	A	?	SO	Modern	3277	75	G–H
USNM 607687	RB340	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NWA	Modern	4700	75	I–J
USNM 607688	TRA518	*Legitimocythere acanthoderma* s.l.	1.260	0.690		L	A	?	SWP	Pleistocene	1545	75	K–L
USNM 607689	TRA522	*Legitimocythere acanthoderma* s.l.	1.143	0.701		R	A	?	SWP	Late Pliocene	1545	75	M–N
USNM 607690	GSM166	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	NA	Pleistocene	3427	76	A
USNM 607691	GSM233	*Legitimocythere acanthoderma* s.l.	1.294	0.796		L	A	?	NEA	Quaternary	2598	76	B
USNM 607692	USGSD126	*Legitimocythere acanthoderma* s.l.	1.052	0.676		R	A	?	NA	Late Pliocene	3427	76	C
USNM 607693	USGSD158	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NA	Early Pleistocene	3427	76	D
USNM 607694	RB347	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NWA	Modern	3200	76	E
USNM 607695	RB355	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	NWA	Modern	3263	76	F–G
USNM 607696	RB403	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NWA	Modern	2779	76	H–I

(*continued*)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607697	RB320	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	NWA	Modern	3865	76	J–K
USNM 607698	RB321	*Legitimocythere acanthoderma* s.l.	1.505	0.921		L	A	?	NWA	Modern	3865	76	L
USNM 607699	TMC202	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NA	Pleistocene	3427	76	M
USNM 607700	TMC216	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	NA	Pleistocene	3427	65	A–B
USNM 607701	TMC217	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NA	Pleistocene	3427	65	C
USNM 607702	TMC221	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NA	Pleistocene	3427	65	D
USNM 607703	TMC225	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	NA	Pleistocene	3427	65	E
USNM 607704	TMC314	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	NA	Late Pliocene	3427	65	F
USNM 607705	ODP980065	*Legitimocythere acanthoderma* s.l.	1.267	0.792		L	A	?	NEA	Pleistocene	2168	65	G
USNM 607706	ODP980071	*Legitimocythere acanthoderma* s.l.	1.224	0.744		R	A	?	NEA	Pleistocene	2168	65	H–I
USNM 537187	SIMY0301	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	NWA	Pleistocene	1797.7	65	J
USNM 607707	TRA340	*Cythereis* sp. 12	0.863	0.525		R	A	?	IO	Early Pliocene	1030	65	K–L
USNM 607708	ODP925150	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	EWA	Pleistocene	3040.5	77	A
USNM 607709	ODP925160	*Legitimocythere acanthoderma* s.l.	572	0.896		L	A	?	EWA	Pleistocene	3040.6	77	B
USNM 607710	ODP925161	*Legitimocythere acanthoderma* s.l.	1.543	0.907		R	A	?	EWA	Pleistocene	3040.6	77	C
USNM 607711	ODP925162	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	EWA	Pleistocene	3040.5	77	D
USNM 607712	ODP925163	*Legitimocythere acanthoderma* s.l.	—	—		R	A	?	EWA	Pleistocene	3040.5	77	E
USNM 607713	SIMY0029	*Legitimocythere acanthoderma* s.l.	1.233	0.740		L	A	?	EWP	Quaternary	1716	77	F, H
USNM 607714	SIMY0030	*Legitimocythere acanthoderma* s.l.	—	—		L	A	?	EWP	Quaternary	1716	77	G, I
USNM 607715	SIMY0010	*Legitimocythere audax*	1.636	0.982		L	A	?	SWP	Quaternary	3167	77	J–K

USNM 607716	TRA638	*Herrigocythere cretacea*	0.802	0.495		L	A	?	SWA	Campanian	2113	11	A–B
USNM 607717	TRA637	*Herrigocythere cenozoica*	0.810	0.420		R	A	?	SWA	Paleocene to early Eocene	2113	11	C–D
USNM 607718	TRA733	*Herrigocythere cretacea*	0.794	0.479		L	A	?	SWA	Campanian–Maastrichtian	2113	11	E–F
USNM 607719	TRA734	*Herrigocythere cretacea*	0.819	0.426		R	A	?	SWA	Campanian–Maastrichtian	2113	11	G–H
USNM 607720	TRA738	*Herrigocythere cretacea*	—	—		R	A	?	SWA	Campanian–Maastrichtian	2113	11	I
USNM 607721	TRA739	*Herrigocythere cretacea*	—	—		L	A	?	SWA	Campanian	2113	11	J
USNM 607722	TRA805	*Herrigocythere cenozoica*	0.810	0.407		R	A	?	SEA	Middle Paleocene	2248	11	K–L
USNM 607723	TRA651	*Abyssocythere* sp. 1	0.881	0.539		L	A	?	NP	Middle Eocene	1478	11	M–N
USNM 607724	TRA755	*Herrigocythere* sp. 1	0.815	0.501		L	A	?	SWA	Late Campanian	2400	11	O–P
USNM 607725	TRA767	*Herrigocythere* sp. 2	0.791	0.458		L	A	?	NA	Late Maastrichtian	1797	11	Q–R
USNM 607726	TRA812	*Herrigocythere* sp. 3	0.664	0.363		L	A	?	EUR	Late Cretaceous, Santonian	OC	11	S
USNM 558059	SIMY0014	*Rugocythereis horrida*	—	—		R	A	?	SWP	Modern	1471	79	A–B
USNM 557980	ODP982009	*Pennyella rexi*	—	—	P	R	A	?	NEA	Late Pleistocene	1135.3	79	C–D
USNM 607727	TRA711	*Ryugucivis jablonskii*	0.769	0.434	H	R	A	?	SWA	Campanian–Maastrichtian	2113	80	A–B
USNM 607728	TRA722	*Ryugucivis jablonskii*	—	—	P	R	A	?	SWA	Campanian–Maastrichtian	2113	80	C
USNM 607729	TRA729	*Ryugucivis jablonskii*	0.739	0.456	P	L	A	?	SWA	Campanian–Maastrichtian	2113	80	D
USNM 607730	TRA745	*Ryugucivis jablonskii*	0.730	0.446	P	L	A	?	SWA	Campanian–Maastrichtian	2113	80	E
USNM 607731	TRA746	*Ryugucivis jablonskii*	0.733	0.398	P	R	A	?	SWA	Campanian–Maastrichtian	2113	80	F–G
USNM 607732	TRA710	*Ryugucivis acuminata*	0.686	0.401	H	L	A	?	SWA	Campanian–Maastrichtian	2113	80	H–I
USNM 607733	TRA714	*Ryugucivis acuminata*	0.695	0.383	P	R	A	?	SWA	Campanian–Maastrichtian	2113	80	J–K
USNM 607734	TRA740	*Ryugucivis acuminata*	—	—	P	R	A	?	SWA	Campanian	2113	80	L
USNM 607735	TRA725	*Ryugucivis acuminata*	0.673	0.367	P	R	A	?	SWA	Campanian–Maastrichtian	2113	80	M–N
USNM 607736	TRA313	*Ryugucivis obtusa*	0.829	0.518	P	L	A	?	SWA	Late Miocene	1519	80	O–P
USNM 607737	TRA314	*Ryugucivis obtusa*	0.789	0.446	H	R	A	?	SWA	Late Miocene	1519	80	Q–R
USNM 607738	TRA315	*Ryugucivis obtusa*	0.757	0.473	P	L	A	?	SWA	Late Miocene	1519	80	S–T
USNM 607739	TRA450	*Ryugucivis* sp. 1	0.698	0.373		L	A?	?	NWP	Late Albian	2903	82	A–B
USNM 607740	TRA754	*Ryugucivis* sp. 2	0.760	0.427		L	A	?	SWA	Late Campanian	2400	82	C–D
USNM 607741	TRA147	*Phacorhabdotus mazzinireticulatus*	0.878	0.471	H	L	A	?	SEP	Modern	1899	83	A–B

(continued)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607742	TRA948	*Phacorhabdotus mazzinireticulatus*	0.883	0.443	P	R	A	?	NWP	Quaternary	3600	83	C
USNM 607743	TRA303	*Phacorhabdotus anteronudus*	0.757	0.456		L	A	?	SWA	Late Miocene	1519	83	D–E
USNM 607744	TRA304	*Phacorhabdotus anteronudus*	0.804	0.427		R	A	?	SWA	Late Miocene	1519	83	F–G
USNM 607745	TRA337	*Phacorhabdotus anteronudus*	0.616	0.390		L	A	?	SWA	Early Paleocene	3175	83	H–I
USNM 607746	TRA752	*Phacorhabdotus anteronudus*	0.648	0.390		L	A	?	SWA	Late Campanian	2400	83	J–K
USNM 607747	TRA753	*Phacorhabdotus anteronudus*	0.646	0.350		R	A	?	SWA	Late Campanian	2400	83	L–M
USNM 607748	TRA727	*Phacorhabdotus* sp. 1	0.806	0.475		L	A	?	SWA	Campanian–Maastrichtian	2113	83	N
USNM 607749	TRA726	*Phacorhabdotus subtridentus*	0.785	0.461		L	A	?	SWA	Campanian–Maastrichtian	2113	83	O
USNM 607750	TRA728	*Phacorhabdotus* sp. 1	0.851	0.471		L	A	?	SWA	Campanian–Maastrichtian	2113	83	P
USNM 607751	TRA741	*Phacorhabdotus subtridentus*	0.738	0.424		R	A	?	SWA	Campanian	2113	83	Q–R
USNM 607752	TRA742	*Phacorhabdotus subtridentus*	0.795	0.443		R	A	?	SWA	Campanian	2113	83	S–T
USNM 607753	TRA809	*Phacorhabdotus slipperi*	0.623	0.347	H	R	A	?	SEA	Middle Paleocene	2248	83	U–V
USNM 607754	TRA807	*Phacorhabdotus slipperi*	0.637	0.397	P	L	A	?	SEA	Middle Paleocene	2248	83	W
USNM 607755	TRA808	*Phacorhabdotus slipperi*	—	—	P	L	A	?	SEA	Middle Paleocene	2248	83	X
USNM 607756	TRA715	*Phacorhabdotus nudus*	0.853	0.507	P	L	A	?	SWA	Campanian–Maastrichtian	2113	84	A–B
USNM 607757	TRA716	*Phacorhabdotus nudus*	0.874	0.463	P	R	A	?	SWA	Campanian–Maastrichtian	2113	84	C
USNM 607758	TRA717	*Phacorhabdotus nudus*	0.797	0.452	H	R	A	?	SWA	Campanian–Maastrichtian	2113	84	D–E
USNM 607759	TRA718	*Phacorhabdotus nudus*	—	—	P	R	A	?	SWA	Campanian–Maastrichtian	2113	84	F
USNM 607760	TRA814	*Veenia* sp. 1	0.787	0.437		R	A	?	EUR	Campanian?	OC	84	G–H
USNM 607761	TRA813	*Veenia* sp. 1	0.804	0.499		L	A	?	EUR	Campanian?	OC	84	I–J
USNM 607762	TRA815	*Veenia* sp. 1	—	—		R	A	?	EUR	Campanian?	OC	84	K
USNM 607763	TRA770	*Phacorhabdotus* cf. *subtridentus*	0.793	0.412		R	A	?	NA	Campanian	1797	84	L–M
USNM 607764	TRA769	*Phacorhabdotus* cf. *subtridentus*	0.757	0.463		L	A	?	NA	Campanian	1797	84	N–O
USNM 607765	TRA1102	*Bicornucythere bisanensis*	0.855	0.452		R	A	F	JP	Holocene	21.91	84	P
USNM 607766	TRA1103	*Bicornucythere bisanensis*	0.851	0.443		L	A	M	JP	Holocene	21.91	84	Q
USNM 607767	TRA1105	*Bicornucythere bisanensis*	—	—		L	A	M	JP	Holocene	21.91	84	R
USNM 607768	TRA1106	*Bicornucythere bisanensis*	—	—		R	A	F	JP	Holocene	21.91	84	S
USNM 607769	TRA1049	*Pistocythereis bradyi*	0.729	0.407		R	A	F	JP	Modern	28.3	84	T, W
USNM 607770	TRA1117	*Pistocythereis bradyi*	0.881	0.473		L	A	M	JP	Holocene	21.91	84	U
USNM 607771	TRA1107	*Pistocythereis bradyi*	—	—		L	A	F	JP	Holocene	21.91	84	V

USNM 607772	TRA1042	*Philoneptunus gravezia*	1.165	0.655		L	A	?	NZ	Late Oligocene to early Miocene	OC	86	A–B
USNM 607773	TRA1043	*Philoneptunus gravezia*	1.038	0.558		R	A	?	NZ	Late Oligocene	OC	86	C–D
OP 1154	No number	*Philoneptunus gravezia*	1.100	0.605		L	A	?	NZ	NA	NA	82	P
No number	No number	*Philoneptunus gravezia*	1.044	0.537		R	A	?		NA	NA	82	Q
USNM 607774	TRA143	*Philoneptunus cassidyi*	1.291	0.828		L	A	F	SO	Modern	1045	86	E–F
USNM 607775	TRA142	*Philoneptunus cassidyi*	—	—		R	A	F	SO	Modern	747	86	G
USNM 607776	TRA144	*Philoneptunus cassidyi*	1.362	0.797		R	A	F	SO	Modern	1045	86	H
USNM 607777	TRA145	*Philoneptunus cassidyi*	1.322	0.797		L	A	M	SO	Modern	915	86	I
USNM 607778	TRA441	*Philoneptunus paragravezia*	0.912	0.542		L	A	M	SO	Early Miocene	3341	86	J
USNM 607779	TRA442	*Philoneptunus paragravezia*	0.935	0.537		R	A	M	SO	Early Miocene	3341	86	K
USNM 607780	TRA443	*Philoneptunus paragravezia*	0.851	0.564		L	A	F	SO	Early Miocene	3341	86	L
USNM 607781	TRA444	*Philoneptunus paragravezia*	0.865	0.519		R	A	F	SO	Early Miocene	3341	86	M–N
USNM 607782	TRA419	*Philoneptunus paeminosus* s.l.	1.229	0.678		L	A	M?	SO	Early Oligocene	1214	86	O
USNM 607783	TRA439	*Philoneptunus paeminosus* s.l.	1.084	0.716		L	A	F?	SO	Early Miocene	3341	86	P
USNM 607784	TRA440	*Philoneptunus paeminosus* s.l.	1.133	0.628		R	A	F?	SO	Early Miocene	3341	86	Q–R
USNM 607785	SIMY0007	*Philoneptunus* sp. 1	1.446	0.703		R	A	?	SWP	Modern	1224	86	S–T
USNM 607786	SIMY0012	*Philoneptunus gigas*	1.152	0.686		L	A-1	?	SWP	Modern	1224	82	O
USNM 607787	GSM113	*Pterygocythereis americana*	1.229	0.669	P	L	A	?	NWA	Modern	229	88	A–B
USNM 607788	GSM114	*Pterygocythereis americana*	1.280	0.599	H	R	A	?	NWA	Modern	229	88	C–D
USNM 607789	TRA751	*Pterygocythere* sp. 1	1.155	0.638		R	A	?	SWA	Late Campanian	2400	88	E–F
USNM 607790	SIMY0015	*Pterygocythere nobilis*	1.460	0.788		R	A	?	EWP	Quaternary	2881	88	G
USNM 607791	TMC203	*Pterygocythere nobilis*	—	—		R	A	?	NA	Pleistocene	3427	88	H–I
USNM 607792	TMC204	*Pterygocythere nobilis*	1.407	0.915		L	A	?	NA	Pleistocene	3427	88	J–K
USNM 607793	RB261	*Pterygocythere nobilis*	1.427	0.929		L	A	?	NWA	Modern	3300	88	L
USNM 607794	RB262	*Pterygocythere nobilis*	1.322	0.766		R	A	?	NWA	Modern	3300	88	M
USNM 607795	RB301	*Pterygocythere nobilis*	—	—		L	A	?	NWA	Modern	3850	88	N
USNM 607796	RB302	*Pterygocythere nobilis*	—	—		R	A	?	NWA	Modern	3850	88	O
USNM 607797	RB351	*Pterygocythere nobilis*	—	—		L	A	?	NWA	Modern	3200	88	P
USNM 607798	RB352	*Pterygocythere nobilis*	—	—		R	A	?	NWA	Modern	3200	88	Q
USNM 607799	RB353	*Pterygocythere nobilis*	1.384	0.895		L	A	?	NWA	Modern	3200	88	R
USNM 607800	RB354	*Pterygocythere nobilis*	—	—		R	A	?	NWA	Modern	3200	88	S
USNM 607801	TRA1032	*Taracythere proterva*	0.906	0.543		L	A	?	NZ	Late Eocene	OC	89	A
USNM 607802	TRA1033	*Taracythere proterva*	0.905	0.543		R	A	?	NZ	Late Eocene	OC	89	B–C
USNM 607803	TRA1034	*Taracythere conjunctispinosa*	0.769	0.489		L	A	?	NZ	Late Eocene	OC	89	D–E
USNM 607804	TRA1035	*Taracythere conjunctispinosa*	—	—		R	A	?	NZ	Late Eocene	OC	89	F–G
USNM 607805	TRA1036	*Taracythere conjunctispinosa*	0.769	0.436		R	A	?	NZ	Late Eocene	OC	89	H–I
USNM 607806	TRA523	*Taracythere ayressoabyssora*	0.769	0.481	P	L	A	?	SWP	Late Pliocene	1545	89	J–K
USNM 607807	TRA524	*Taracythere ayressoabyssora*	—	—	P	L	A	?	SWP	Late Pliocene	1545	89	L–M
USNM 607808	TRA527	*Taracythere ayressoabyssora*	0.795	0.505	H	R	A	?	SWP	Late Pliocene	1545	89	N–O
USNM 607809	TRA952	*Taracythere ayressoabyssora*	0.792	0.501	P	R	A	?	SWP	Modern	1158	90	A
USNM 607810	TRA953	*Taracythere ayressoabyssora*	—	—	P	R	A	?	SWP	Modern	1158	90	B

(*continued*)

TABLE 1. (*Continued*)

Catalog No.	MY No.[a]	Species	Length[b] (mm)	Height[b] (mm)	T[a]	V[a]	Instar[a]	Sex[a]	Region[c]	Age	WD[a] (m)	Figure No.	Figure Part
USNM 607811	TRA141	*Taracythere abyssora*	0.817	0.507		R	A	?	SO	Modern	3277	90	C–D
USNM 607812	TRA503	*Taracythere thalassoformis*	0.839	0.466	P	L	A	?	NWP	Oligocene	2943	90	E–F
USNM 607813	TRA504	*Taracythere thalassoformis*	0.810	0.451	H	R	A	?	NWP	Oligocene	2943	90	G–H
USNM 607814	TRA210	*Taracythere* sp. 1	0.902	0.471		L	A	?	NWP	Modern	507	90	I–J
USNM 607815	TRA211	*Taracythere* sp. 2	0.715	0.459		R	A	?	NWP	Modern	315	90	K–L
USNM 607816	TRA225	*Trachyleberidea mammidentata*	0.762	0.445		L	A	F	GOM	Modern	200	70	A–B
USNM 607817	TRA226	*Trachyleberidea mammidentata*	0.748	0.457		L	A	F	GOM	Modern	200	70	C–D
USNM 607818	TRA227	*Trachyleberidea mammidentata*	0.762	0.457		R	A	F	GOM	Modern	200	70	E–F
USNM 607819	GSM112	*Trachyleberidea mammidentata*	0.950	0.502		L	A	M	NWA	Modern	494	70	G–H
USNM 607820	TRA539	*Trachyleberidea elegans*	0.673	0.353		R	A	F	IO	Late Eocene	1655	70	I–J
USNM 607821	TRA545	*Trachyleberidea elegans*	0.596	0.353		L	A	F	IO	Early Eocene	1655	70	K
USNM 607822	TRA546	*Trachyleberidea elegans*	0.585	0.317		R	A	F	IO	Early Eocene	1655	70	L–M
USNM 607823	RB211	*Trachyleberidea elegans*	0.750	0.365		L	A	M	IO	Late Eocene	1655	82	E
USNM 607824	RB212	*Trachyleberidea elegans*	0.750	0.347		R	A	M	IO	Late Eocene	1655	82	F
USNM 607825	RB217	*Trachyleberidea elegans*	—	—		L	A	M	IO	Early Oligocene	1655	82	G
USNM 607826	RB218	*Trachyleberidea elegans*	—	—		R	A	M	IO	Early Oligocene	1655	82	H
USNM 607827	RB213	*Trachyleberidea elegans*	0.668	0.382		L	A	F	IO	Late Eocene	1655	82	I
USNM 607828	RB214	*Trachyleberidea elegans*	0.682	0.348		R	A	F	IO	Late Eocene	1655	82	J
USNM 607829	RB215	*Trachyleberidea elegans*	—	—		L	A	F	IO	Late Eocene	1655	82	K
USNM 607830	RB216	*Trachyleberidea elegans*	—	—		R	A	F	IO	Late Eocene	1655	82	L
USNM 607831	RB219	*Trachyleberidea elegans*	0.626	0.348		L	A-1	?	IO	Early Oligocene	1655	82	M
USNM 607832	RB220	*Trachyleberidea elegans*	0.662	0.338		R	A-1	?	IO	Early Oligocene	1655	82	N
USNM 607833	TRA636	*Trachyleberidea geinitzi*	0.686	0.368	P	L	A	?	SWA	Paleocene to early Eocene	2113	70	N–O
USNM 607834	TRA627	*Trachyleberidea geinitzi*	0.736	0.367	H	R	A	?	SWA	Middle Eocene	2113	70	P–Q
USNM 607835	TRA804	*Bensonocosta* sp. 2	0.704	0.345		R	A	?	IO	Santonian	2793	70	R–S
USNM 607836	RB148	*Muellerina abyssicola*	0.736	0.424		L	A	M	NEA	Pleistocene	990	93	A
USNM 607837	RB149	*Muellerina abyssicola*	0.757	0.439		L	A	M	NEA	Pleistocene	990	93	B
USNM 607838	RB150	*Muellerina abyssicola*	0.793	0.466		L	A	F	NEA	Pleistocene	990	93	C
USNM 607839	RB151	*Muellerina abyssicola*	0.778	0.406		R	A	M	NEA	Pleistocene	990	93	D
USNM 607840	RB142	*Muellerina abyssicola*	—	—		L	A	M	NEA	Pleistocene	990	93	E
USNM 607841	RB143	*Muellerina abyssicola*	—	—		R	A	M	NEA	Pleistocene	990	93	F
USNM 607842	RB144	*Muellerina abyssicola*	—	—		L	A	F	NEA	Pleistocene	990	93	G
USNM 607843	RB145	*Muellerina abyssicola*	—	—		R	A	F	NEA	Pleistocene	990	93	H
USNM 607844	RB152	*Muellerina abyssicola*	0.790	0.463		R	A	F	NEA	Pleistocene	990	93	I
USNM 607845	RB153	*Thaerocythere crenulata*	0.801	0.508		L	A	F	NEA	Pleistocene	990	93	J
USNM 607846	RB154	*Thaerocythere crenulata*	0.810	0.477		R	A	F	NEA	Pleistocene	990	93	K
USNM 607847	RB155	*Thaerocythere crenulata*	0.790	0.466		L	A	M	NEA	Pleistocene	990	93	L

USNM 607848	RB156	*Thaerocythere crenulata*	0.796	0.445		R	A	M	NEA	Pleistocene	990	93	M
USNM 607849	RB158	*Thaerocythere crenulata*	—	—		R	A	M	NEA	Pleistocene	990	93	N
USNM 607850	RB157	*Thaerocythere crenulata*	—	—		L	A	F	NEA	Pleistocene	990	93	O
USNM 607851	RB436	*Bradleya dictyon*	—	—		L	A	F?	NWA	Modern	1256	94	A
USNM 607852	RB437	*Bradleya dictyon*	—	—		R	A	F?	NWA	Modern	1257	94	B
USNM 607853	RB449	*Bradleya dictyon*	1.149	0.667		L	A	M?	NWA	Modern	1258	94	C
USNM 607854	RB450	*Bradleya dictyon*	—	—		R	A	F?	NWA	Modern	1259	94	D
USNM 607855	GSM306	*Bradleya dictyon*	—	—		L	A	F?	NEA	Late Pliocene	1260	94	E–F
USNM 607856	GSM313	*Bradleya dictyon*	—	—		R	A	F?	NEA	Late Pliocene	2417	94	G–H
USNM 607857	GSM5087	*Bradleya dictyon*	1.088	0.588		R	A	F?	NEA	Pliocene	2301	94	I
USNM 607858	GSM5091	*Bradleya dictyon*	0.948	0.541		L	A	M?	NEA	Pliocene	2301	94	J
USNM 607859	GSM615	*Bradleya dictyon*	—	—		L	A	M?	NEA	Pliocene	2301	94	K
USNM 607860	TMC385	*Bradleya dictyon*	—	—		R	A	F?	NEA	Middle Miocene	2417	94	L
USNM 607861	USGSD241	*Bradleya dictyon*	—	—		L	A	M?	NEA	Pliocene	2301	94	M
USNM 607862	USGSD245	*Bradleya dictyon*	1.038	0.541		R	A	M?	NEA	Pliocene	2301	94	N
USNM 607863	GSM174	*Bradleya* cf. *mesembrina*	—	—		L	A	?	NA	Pleistocene	3427	94	O
USNM 188561	TRA1020	*Poseidonamicus minor*	1.004	0.588	P	R	A	?	SEP	Modern	3137	94	P
USNM 174357	TRA1025	*Poseidonamicus minor*	1.030	0.582	H	L	A	?	SEP	Modern	3220	94	Q
USNM 607864	TMC103	*Poseidonamicus pintoi*	1.000	0.571		L	A	?	NA	Pleistocene	3427	94	R
USNM 607865	TRA1006	*Poseidonamicus anteropunctatus*	0.819	0.437		L	A	?	IO	Early Miocene	1962	94	S
USNM 607866	TRA1007	*Poseidonamicus anteropunctatus*	0.810	0.407		R	A	?	IO	Early Miocene	1962	94	T

[a] Abbreviations: MY No.: Moriaki Yasuhara's personal catalog number. T: type (P, paratype; H, holotype; L, lectotype). V: valve (C, carapace; L, left; R, right). Instar: A, adult; A-1, last juvenile instar (adult minus one). Sex: F, female; M, male; ?, sex not certain; F?, likely female; M?, likely male. WD: water depth (OC, outcrop; ?, depth unknown).

[b] A dash indicates measurement not reported.

[c] Region codes: EUR, Europe; EWA, equatorial western Atlantic; EWP, equatorial western Pacific; GOM, Gulf of Mexico; IO, Indian Ocean; JP, Japan; MED, Mediterranean; NA, North Atlantic; NAM, North America; NEA, northeastern Atlantic; NP, North Pacific; NWA, northwestern Atlantic; NWP, northwestern Pacific; NZ, New Zealand; SAM, South America; SEA, southeastern Atlantic; SEP, southeastern Pacific; SO, Southern Ocean; SP, South Pacific; SWA, southwestern Atlantic; SWP, southwestern Pacific.

TABLE 2. List of the genera treated in the present study (see also Figure 95) and summary of subcentral muscle scars.

Genus	Frontal scar	Adductor scars: Dorsal scar	Adductor scars: Dorsomedian scar	Adductor scars: Ventromedian scar	Adductor scars: Ventral scar	Notes[a]
Trachyleberis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Abrocythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Abyssocythere	V-shaped	Undivided	Undivided	Undivided	Undivided	VMS–VS horizontal
Protocythere	V-shaped	Undivided	Undivided	Undivided	Undivided	
Acanthocythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Actinocythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Agrenocythere	V-shaped	Undivided	Undivided	Undivided	Undivided	
Ambocythere	Hook or V-shaped	Undivided	Undivided	Undivided	Undivided	
Anebocythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	VMS and VS close
Marwickcythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	VMS and VS close
Atlanticythere	Divided	Undivided	Divided	Undivided	Undivided	
Dutoitella	Divided	Undivided	Divided	Undivided	Undivided	
Bathycythere	Divided	Undivided	Divided?	Divided?	Undivided	
Cletocythereis	Divided	Undivided	Undivided	Undivided	Undivided	FS posterodorsal part severed
Hirsutocythere	V-shaped	Undivided	Undivided	Undivided	Undivided	
Buntonia	Hook- or V-shaped	Undivided	Undivided	Undivided	Undivided	
Cythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Bensonodutoitella	V-shaped	Undivided	Undivided	Undivided	Undivided	
Henryhowella	V-shaped	Undivided	Undivided	Undivided	Undivided	
Tongacythere	Divided	Undivided	Undivided	Undivided	Undivided	
Oligocythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Toolongella[b]	V-shaped	?	?	?	?	Based on Bate (1972)
Echinocythereis	Divided	Undivided	Undivided	Undivided	Undivided	
Hornibrookoleberis	Elongate	Undivided	Undivided	Undivided	Undivided	
Croninocythereis	V-shaped	Undivided	Divided	Undivided	Undivided	
Legitimocythere	Oval-shaped, small	Undivided	Undivided	Undivided	Undivided	
Bensonocosta	V-shaped	Undivided	Undivided	Undivided	Undivided	
Ayressoleberis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Leguminocythereis?	Divided?	Undivided	Undivided	Undivided	Undivided	
Oertliella	V-shaped	Undivided	Undivided	Undivided	Undivided	
Herrigocythere	V-shaped	Undivided	Divided?	Undivided	Undivided	
Rugocythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Pennyella	V-shaped	Undivided	Undivided	Undivided	Undivided	
Ryugucivis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Phacorhabdotus	V-shaped	Divided?	Divided?	Undivided	Undivided	VNS and VS close
Veenia	V-shaped	Undivided	Undivided	Undivided	Undivided	
Bicornucythere	V-shaped	Undivided	Undivided	Undivided	Undivided	VMS–VS horizontal
Pistocythereis	Rounded, not V-shaped	Undivided	Undivided	Undivided	Undivided	
Philoneptunus	V-shaped	Undivided	Undivided	Undivided	Undivided	
Pterygocythereis	V-shaped	Undivided	Undivided	Undivided	Undivided	
Pterygocythere	V-shaped	Undivided	Undivided	Undivided	Undivided	
Taracythere	Divided	Undivided	Undivided	Undivided	Undivided	FS, one elongate and one small
Trachyleberidea	V-shaped	Undivided	Undivided	Undivided	Undivided	
Muellerina	Divided	Undivided	Divided	Divided	Undivided	
Thaerocythere	Divided	Undivided	Undivided	Undivided	Undivided	
Bradleya	Divided	Undivided	Undivided	Undivided	Undivided	
Poseidonamicus	Divided	Undivided	Undivided	Undivided	Undivided	

[a] Abbreviations: FS = frontal scar; VMS = ventromedian scar; VS = ventral scar.

[b] A question mark (?) indicates that we have no information on how or whether these scars are divided.

Systematic Paleontology

CLASS OSTRACODA LATREILLE, 1802

SUBCLASS PODOCOPA MÜLLER, 1894

ORDER PODOCOPIDA SARS, 1866

SUBORDER CYTHEROCOPINA GRÜNDEL, 1967

SUPERFAMILY CYTHEROIDEA BAIRD, 1850

FAMILY TRACHYLEBERIDIDAE SYLVESTER-BRADLEY, 1948

Genus *Trachyleberis* Brady, 1898

TYPE SPECIES. *Cythere scabrocuneata* Brady, 1880.

EMENDED DIAGNOSIS. Trachyleberidids characterized by (1) subtriangular or subtrapezoidal outline, (2) presence of an ocular ridge, (3) inconspicuous ventrolateral ridge, (4) absence of median lateral ridge, (5) absence of anterior and posterior marginal rims, (6) subdued subcentral tubercle, (7) numerous spines on the lateral surface, (8) V-shaped frontal muscle scar, (9) a vertical row of four adductor muscle scars, (10) holamphidont hinge, (11) internal snap-knob structure present at midlength ventrally ("additional closing mechanism" sensu Mazzini, 2005), and (12) absence of anterior marginal frill in internal view. See Brandão et al. (2013) for full emended diagnosis.

REMARKS. Brandão et al. (2013) emended the generic concept of *Trachyleberis* Brady, 1898, and this genus is now restricted to species with an ocular ridge that occur only in shallow marine areas of midlatitude northwestern Pacific (~20°N–40°N). The distinction between *Trachyleberis* and *Cythereis* Jones, 1849 has been confusing because many authors tentatively put any uncertain trachyleberidid species in these genera without careful consideration of generic concepts. However, under the revision by Brandão and others (2013), the distinction between these two genera is clear: *Trachyleberis* bears an ocular ridge and internal snap-knob structure, whereas *Cythereis* lacks both. In addition, *Cythereis* bears a distinct ventrolateral ridge continuing into the anterior marginal rim, distinct anterior and posterior marginal rims, a generally well developed subcentral tubercle, and, in most species, median and dorsolateral ridges.

There are no certain *Trachyleberis* in the deep sea. In our opinion, all deep-sea species assigned to *Trachyleberis* are not actually *Trachyleberis*, and many of them are reassigned to *Cythereis* in this work.

Trachyleberis scabrocuneata (Brady, 1880)

FIGURE 6

LOCALITY AND AGE OF SPECIMENS EXAMINED. OB2, Holocene, Osaka Bay, Japan.

DIMENSIONS. See Table 1.

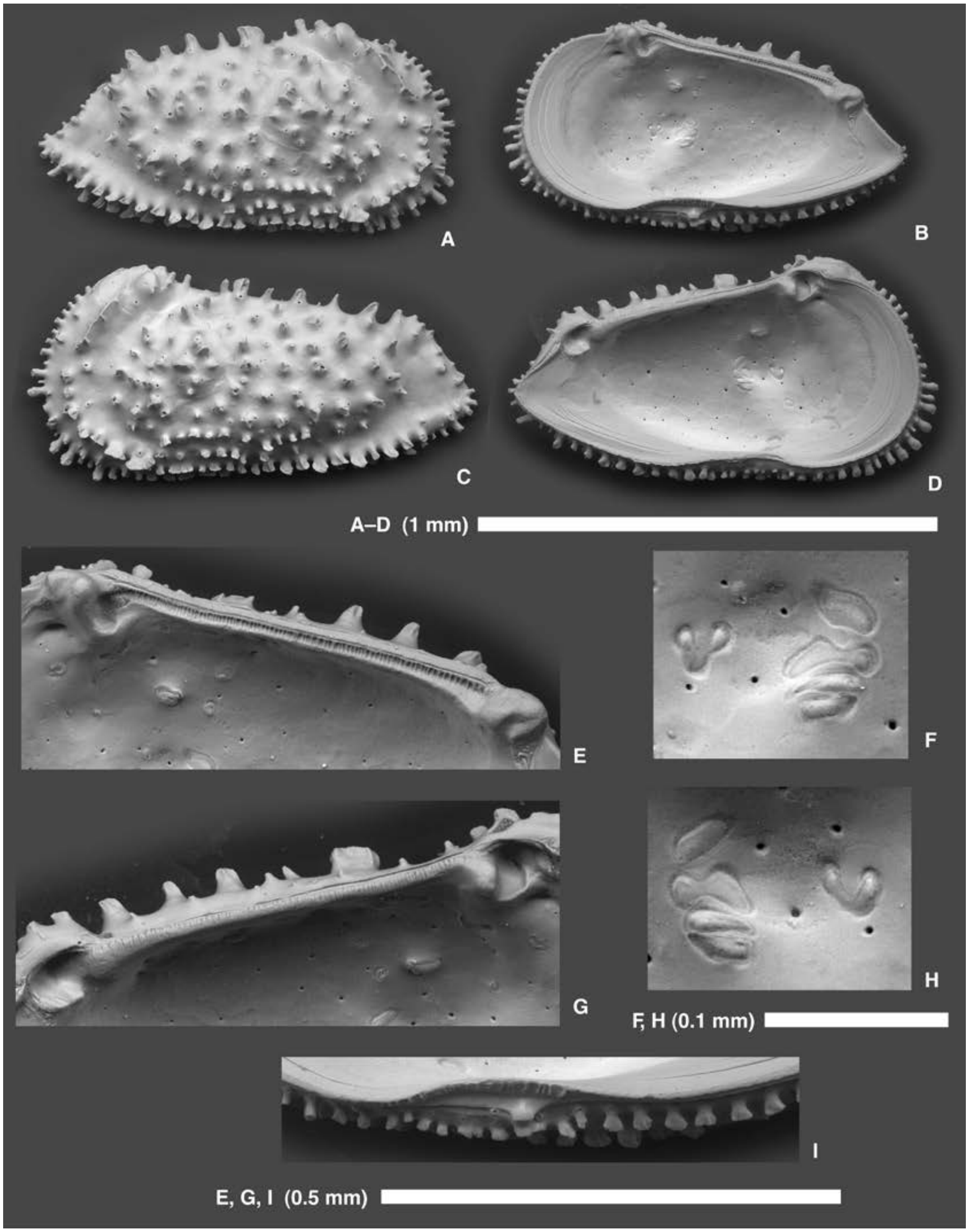


FIGURE 6. Scanning electron microscope images of *Trachyleberis scabrocuneata* (Brady, 1880). All specimens are from OB2, Holocene, Osaka Bay (Japan). A, C, lateral views; B, D–I, internal views. A, TRA1109 (USNM 607200), adult RV. B, TRA1113 (USNM 607201), adult RV. C, TRA1110 (USNM 607202), adult LV. D, TRA1112 (USNM 607203), adult LV. E–I, internal details. E, TRA1113 (USNM 607201), adult RV, hingement. F, TRA1113 (USNM 607201), adult RV, subcentral muscle scars. G, TRA1112 (USNM 607203), adult LV, hingement. H, TRA1112 (USNM 607203), adult LV, subcentral muscle scars. I, TRA1113 (USNM 607201), adult RV, ventromarginal area showing snap-knob structure. Scale bars represent 1 mm for A–D, 0.1 mm for F and H, and 0.5 mm for E, G, and I.

Remarks. This is the type species of the genus. The identity of this species has been confused but has been clarified by Brandão et al. (2013).

Genus *Abrocythereis* Gou in Gou, Zheng, and Huang, 1983

Type Species. *Abrocythereis guangdongensis* Gou, 1983 (in Gou et al., 1983).

Remarks. *Abrocythereis* Gou, 1983 is similar to *Herrigocythere* Gründel, 1973, but the latter has a much more nodose/spinous carapace, and the former has much deeper and more regular primary reticulation and a carina-like short and continuous ventrolateral ridge. More than 10 *Abrocythereis* species are known (including those in open nomenclature), and their distribution is restricted to the tropical-temperate northwestern Pacific region (Malz and Tabuki, 1988; Hou and Gou, 2007).

Abrocythereis malaysiana Malz and Tabuki, 1988

FIGURES 7A–D, 8A–E

?Abrocythereis guangdongensis Gou; Whatley and Zhao, 1988:7, pl. 6, figs. 10–13.

Abrocythereis malaysiana Malz and Tabuki, 1988:161, pl. 1, figs. 2–4; pl. 4, figs. 22–23; text-figs. 2a, 3.

Locality and Age of Specimens Examined. ALB5469, Modern, northwestern Pacific

Dimensions. See Table 1.

Remarks. The specimens illustrated here are a new record of this species from the Philippines.

Genus *Abyssocythere* Benson, 1971

Type Species. *Abyssocythere casca* Benson, 1971.

Remarks. *Abyssocythere* Benson, 1971 (especially *Abyssocythere diagrenona* (Guernet, 1985) and *Abyssocythere scotti* sp. nov.) is very similar to *Batavocythere* Kemper, 1971 but may be distinguished by its amphidont-type hinge. According to the plates showing *Batavocythere* in Kemper (1971), the median hinge bar of this taxon appears to lack an anterior tooth and thus should be of merodont type, but these images are not conclusive. If *Batavocythere* hingement proves to be amphidont, this genus may be a junior synonym of *Abyssocythere*, given its otherwise very similar morphology and the publication date of Benson (1971) on 11 August 1971 (according to the DSpace Repository of the Smithsonian Libraries, https://repository.si.edu/), which is earlier than that of Kemper (1971) on 15 December 1971 (according to the paper itself). *Golcocythere* Gründel, 1968 is also very similar to *Abyssocythere,* and these two genera share almost all diagnostic characters in lateral view, although the median lateral ridge may be longer in *Golcocythere*. Although the internal features are poorly known in *Golcocythere*, Pokorný (1983) stated that the frontal scar of the type species (*Golcocythere costanodulosa* Gründel, 1968) is roughly elliptical and the dorsal and dorsomedian adductor scars are larger than the ventral and ventromedian adductor scars, and Gründel (1968) suggested that the hinge is "*Idiocythere*-like" (holamphidont according to Moore, 1961). Although Gründel (1968) also suggested that the inner lamella of *Golcocythere* is narrower than that of *Idiocythere* Triebel, 1958, Gründel (1978) showed fairly broad inner lamella in *Golcocythere ptygmata* (Triebel and Malz, 1969), and the status of the inner lamella in this genus is unclear. Its only distinct internal feature is the frontal scar, although no image of internal features was shown in Pokorný (1983). *Golcocythere* is known as a shallow marine genus (Ohmert, 1970, 1973; Pokorný, 1983; Tesakova, 2010), and *Abyssocythere* is a typical abyssal genus. Therefore, we tentatively consider that these two genera are independent, but reexamination of the internal details of the type species of *Golcocythere* is needed. *Golcocythere* seems to be a member of the Cytherettidae and a close relative of *Paracytheretta* Triebel, 1941, not Trachyleberididae (e.g., see Pokorný, 1983). However, the structure of the inner lamella should be confirmed because a very broad inner lamella is an important character of cytherettid ostracods.

Synonymized Genus. *Batavocythere* Kemper, 1971?

Abyssocythere atlantica Benson, 1971

FIGURES 7E–L, 8F–K

Abyssocythere atlantica Benson, 1971:13, fig. 10; pl. 3, fig. 1.

Abyssocythere atlantica Benson; Whatley and Coles, 1987, pl. 6, fig. 10.

?Abyssocythere trinidadensis (van den Bold); Steineck, Dehler, Hoose, and McCalla, 1988, pl. 1, fig. 11.

Abyssocythere atlantica Benson; Guernet and Moullade, 1994:263, pl. 2, fig. 8 (fig. 6?).

Locality and Age of Specimens Examined. KN 25 sta 288, KN 25 sta 291, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Remarks. Apart from the original description (Benson, 1971), only a few specimens have been illustrated (Whatley and Coles, 1987; Guernet and Moullade, 1994). The SEM images of well-preserved specimens from the tropical northwestern Atlantic are shown herein.

Abyssocythere diagrenona (Guernet, 1985)

FIGURES 7M–S, 8L–Q

Bradleya (*Quasibradleya*)*? diagrenona* Guernet, 1985:293, pl. 4, figs. 12, 14.

"*Cythereis*" cf. *klingeri* Dingle; Majoran and Dingle, 2001:211, pl. 1, fig. 1.

"*Cythereis*" cf. *klingeri* Dingle; Majoran and Dingle, 2002:148, fig. 3.7.

Dutoitella sp. 2 Bergue and Govindan, 2010:754, fig. 4.1.

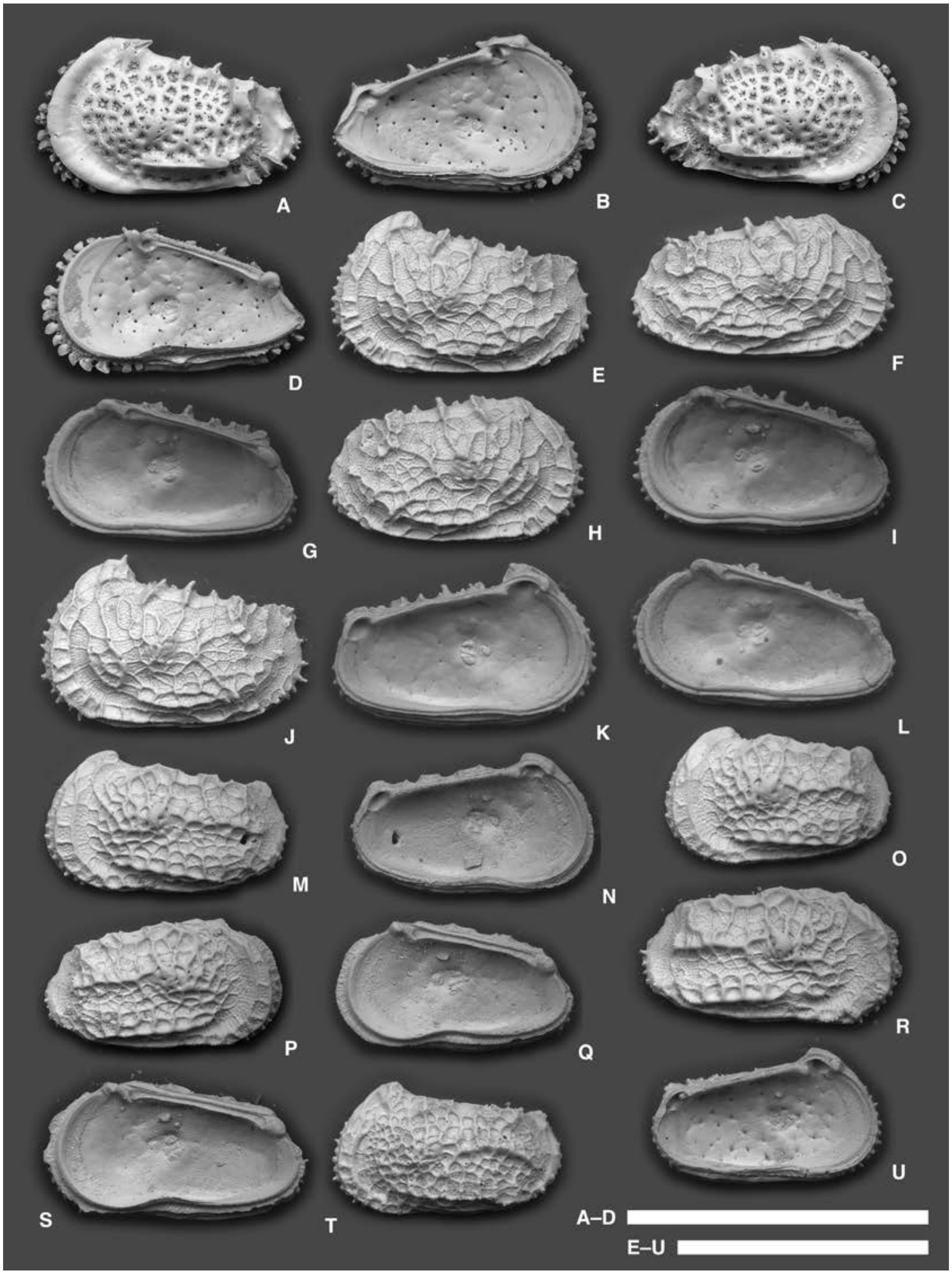


FIGURE 7. Scanning electron microscope images of *Abrocythereis malaysiana* Malz and Tabuki, 1988, *Abyssocythere atlantica* Benson, 1971, *Abyssocythere diagrenona* (Guernet, 1985), and *Abyssocythere scotti* sp. nov. A, C, E–F, H, J, M, O–P, R, T, lateral views; B, D, G, I, K–L, N, Q, S, U, internal views. **A–D,** *Abrocythereis malaysiana* Malz and Tabuki, 1988. A–B, TRA219 (USNM 607204), adult LV from Alb5469, Modern, northwestern Pacific. C–D, TRA220 (USNM 607205), adult RV from Alb5469, Modern, northwestern Pacific. **E–L,** *Abyssocythere atlantica* Benson, 1971. E, RB314 (USNM 607206), adult LV from KN 25 sta 291, Modern, northwestern Atlantic. F–G, RB315 (USNM 607207), adult RV from KN 25 sta 291, Modern, northwestern Atlantic. H–I, RB317 (USNM 607208), adult RV from KN 25 sta 291, Modern, northwestern Atlantic. J, RB316 (USNM 607209), adult LV from KN 25 sta 291, Modern, northwestern Atlantic. K, RB330 (USNM 607210), adult LV from KN 25 sta 288, Modern, northwestern Atlantic. L, RB331 (USNM 607211), adult RV from KN 25 sta 288, Modern, northwestern Atlantic. **M–S,** *Abyssocythere diagrenona* (Guernet, 1985). M–N, TRA121 (USNM 607212), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. O, TRA122 (USNM 607213), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. P–Q, TRA123 (USNM 607214), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. R–S, TRA236 (USNM 607215), adult RV from DSDP 522, 34/1/113–120, early Oligocene, southeastern Atlantic. **T–U,** *Abyssocythere scotti* sp. nov., TRA762 (USNM 607216), adult LV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. Scale bars represent 1 mm.

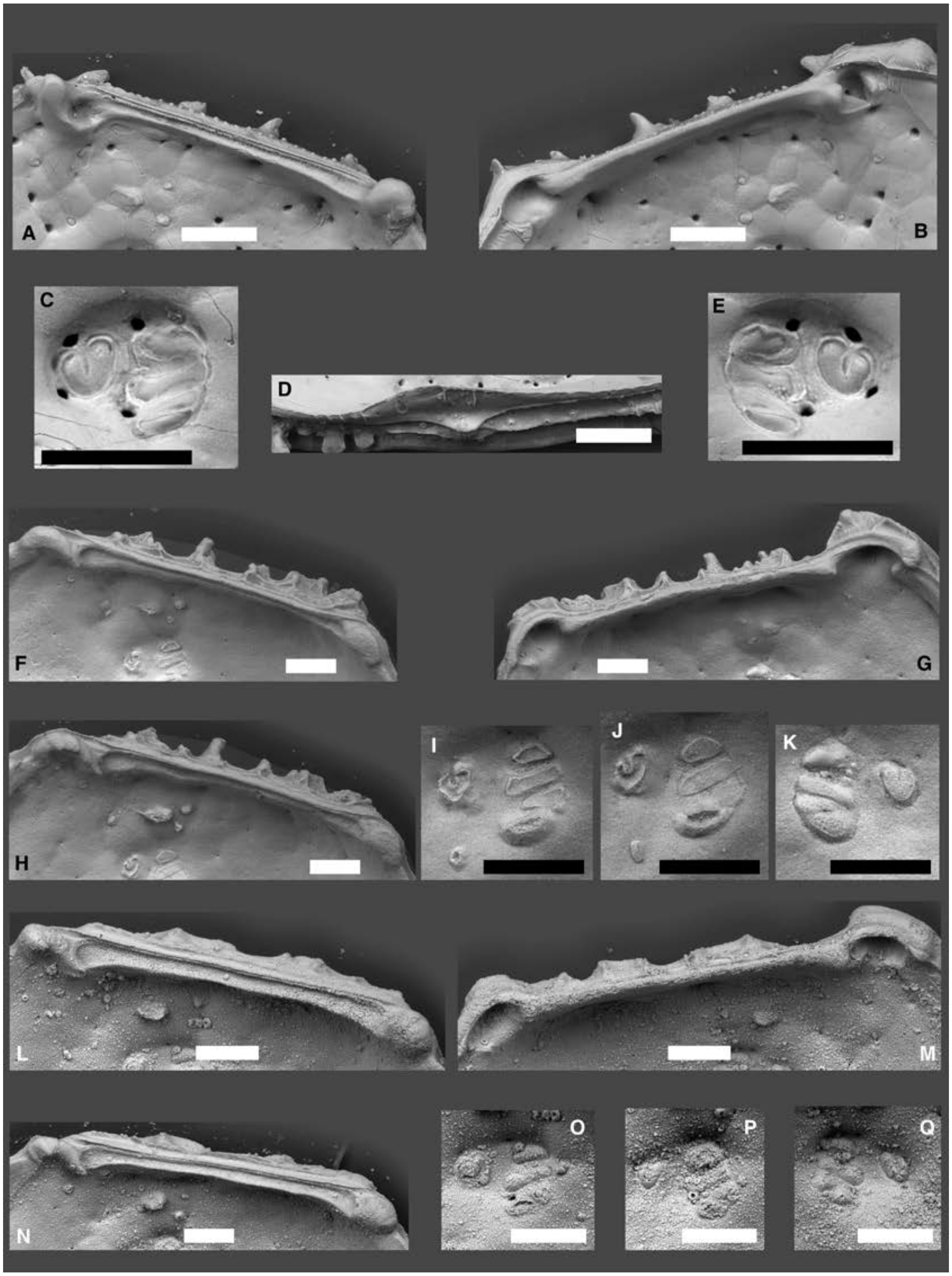


FIGURE 8. Internal details of *Abrocythereis malaysiana* Malz and Tabuki, 1988, *Abyssocythere atlantica* Benson, 1971, and *Abyssocythere diagrenona* (Guernet, 1985). **A–E,** *Abrocythereis malaysiana* Malz and Tabuki, 1988. A, TRA220 (USNM 607205), adult RV, hingement. B, TRA219 (USNM 607204), adult LV, hingement. C, TRA220 (USNM 607205), adult RV, subcentral muscle scars. D, TRA220 (USNM 607205), adult RV, ventromarginal area showing snap-knob structure. E, TRA219 (USNM 607204), adult LV, subcentral muscle scars. **F–K,** *Abyssocythere atlantica* Benson, 1971. F, RB315 (USNM 607207), adult RV, hingement. G, RB330 (USNM 607210), adult LV, hingement. H, RB317 (USNM 607208), adult RV, hingement. I, RB315 (USNM 607207), adult RV, subcentral muscle scars. J, RB317 (USNM 607208), adult RV, subcentral muscle scars. K, RB330 (USNM 607210), adult LV, subcentral muscle scars. **L–Q,** *Abyssocythere diagrenona* (Guernet, 1985). L, TRA123 (USNM 607214), adult RV, hingement. M, TRA121 (USNM 607212), adult LV, hingement. N, TRA236 (USNM 607215), adult RV, hingement. O, TRA123 (USNM 607214), adult RV, subcentral muscle scars. P, TRA236 (USNM 607215), adult RV, subcentral muscle scars. Q, TRA121 (USNM 607212), adult LV, subcentral muscle scars. Scale bars represent 0.1 mm.

Abyssocythere sp. Hunt, Wicaksono, Brown, and MacLeod, 2010, text-fig. 2A.
Abyssocythere diagrenona (Guernet); Bergue and Nicolaidis, 2012:53, fig. 3.17–3.18.

Locality and Age of Specimens Examined. DSDP 522, 526C, late Eocene to early Oligocene, southeastern Atlantic.

Dimensions. See Table 1.

Remarks. The specimens shown in this work are very similar to the original SEM images of *Abyssocythere diagrenona* (Guernet, 1985).

Abyssocythere scotti sp. nov.

FIGURES 7T–U, 9A–F, 10A–F

Derivation of Name. In honor of Scott Whittaker, manager of the SEM laboratory of the Smithsonian Institution. His continuous efforts are invaluable for Smithsonian scientists and visitors who want to produce high-quality SEM images.

Holotype. Adult RV, USNM 607219 (TRA747; Figures 9E–F, 10C, 10E).

Paratypes. USNM 607216, 607217, 607218 (TRA762, TRA309, TRA312).

Type Locality and Horizon. DSDP 327A, 12/3/50–55, Maastrichtian, 50.8713°S, 46.7837°W, 2,400 m water depth, southwestern Atlantic.

Other Localities. DSDP 327A, 329, late Campanian and late Miocene, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Abyssocythere* species characterized by curved median lateral ridge and weakly developed dorsolateral ridge.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular in lateral view; anterior margin evenly rounded especially in RV, with a marginal frill (only in RV) and spines; posterior margin upturned, with spines especially in its ventral half; dorsal margin almost straight; ventral margin slightly sinuous; ventrolateral ridge well developed and almost straight; median lateral ridge curved, dorsolateral ridge weakly developed; subcentral tubercle weakly developed. Anterodorsal corner prominent in LV; posterodorsal corner angular. Lateral surface ornamented with primary and secondary reticulations. Anterior marginal rim and sulcus well developed. Posterior marginal rim and sulcus present. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of four scars.

Remarks. This species is similar to *Abyssocythere diagrenona* (Guernet, 1985) but can be distinguished by a curved median lateral ridge, weakly developed dorsolateral ridge, and distinct, deep secondary reticulation in the anterior half of the carapace.

Abyssocythere sp. 1

FIGURES 10G–H, 11M–N

Locality and Age of Specimens Examined. DSDP 44, middle Eocene, North Pacific.

Dimensions. See Table 1.

Remarks. This species is very similar to *Abyssocythere paratrinidadensis* Boomer, 1999, but the latter has sharp spines on its dorsolateral ridge and a shorter ventrolateral ridge. This species may be a descendant of the Cretaceous species *Abyssocythere paratrinidadensis*.

Genus *Protocythere* Triebel, 1938

Type Species. *Cytherina triplicata* Roemer, 1841.

Remarks. We consider *Abyssocythereis* Schornikov, 1975 a junior synonym of *Protocythere* Triebel, 1938. "*Abyssocythereis*" is merely a Cenozoic relic of *Protocythere* in the deep sea.

Some species of *Protocythere* are similar to *Phacorhabdotus* Howe and Laurencich, 1958, but the former has a merodont hinge, a vertical row of four adductor scars, and a prominent anterodorsal corner. In *Protocythere*, the ventrolateral, median, and dorsolateral ridges are long, usually continuing into the anterior half or one-third; these ridges are broad with obscure edges (e.g., see Oertli, 1966). In contrast, *Phacorhabdotus* tends to have short, carina-like (i.e., thin and distinct) ventrolateral, median, and dorsolateral ridges. Some *Veenia* species are also very similar to *Protocythere*, but the former have an amphidont hinge.

Synonymized Genus. *Abyssocythereis* Schornikov, 1975.

Protocythere vitjasi (Schornikov, 1975)

FIGURES 9G–J, 10I–L

Abyssocythereis vitjasi Schornikov, 1975:522, figs. 2–3.
?*Protocythere* sp. Cai, 1982, pl. 4 [pl. 3 in caption erroneously], figs. 51–52.
"*Cythere*" *sulcatoperforata* Brady; Ruan, 1989:119, pl. 21, figs. 2–4.
?*Abyssocythereis sulcatoperforata* (Brady); Zhao and Zheng, 1996, pl. 1, fig. 2.
?*Abyssocythereis sulcatoperforata* (Brady); Zhao, 2005, pl. 3, fig. 22.
Abyssocythereis sulcatoperforata (Brady); Hou and Gou, 2007:502, pl. 186, figs. 10–14.

Locality and Age of Specimens Examined. DSDP 305, Pliocene, northwestern Pacific.

Dimensions. See Table 1.

Remarks. *Protocythere vitjasi* (Schornikov, 1975) is very similar to *Protocythere sulcatoperforata* (Brady, 1880) but is distinguished by having intensive secondary reticulation, especially in the area immediately below the dorsolateral ridge and in the anterior field. *Protocythere vitjasi* is also similar to

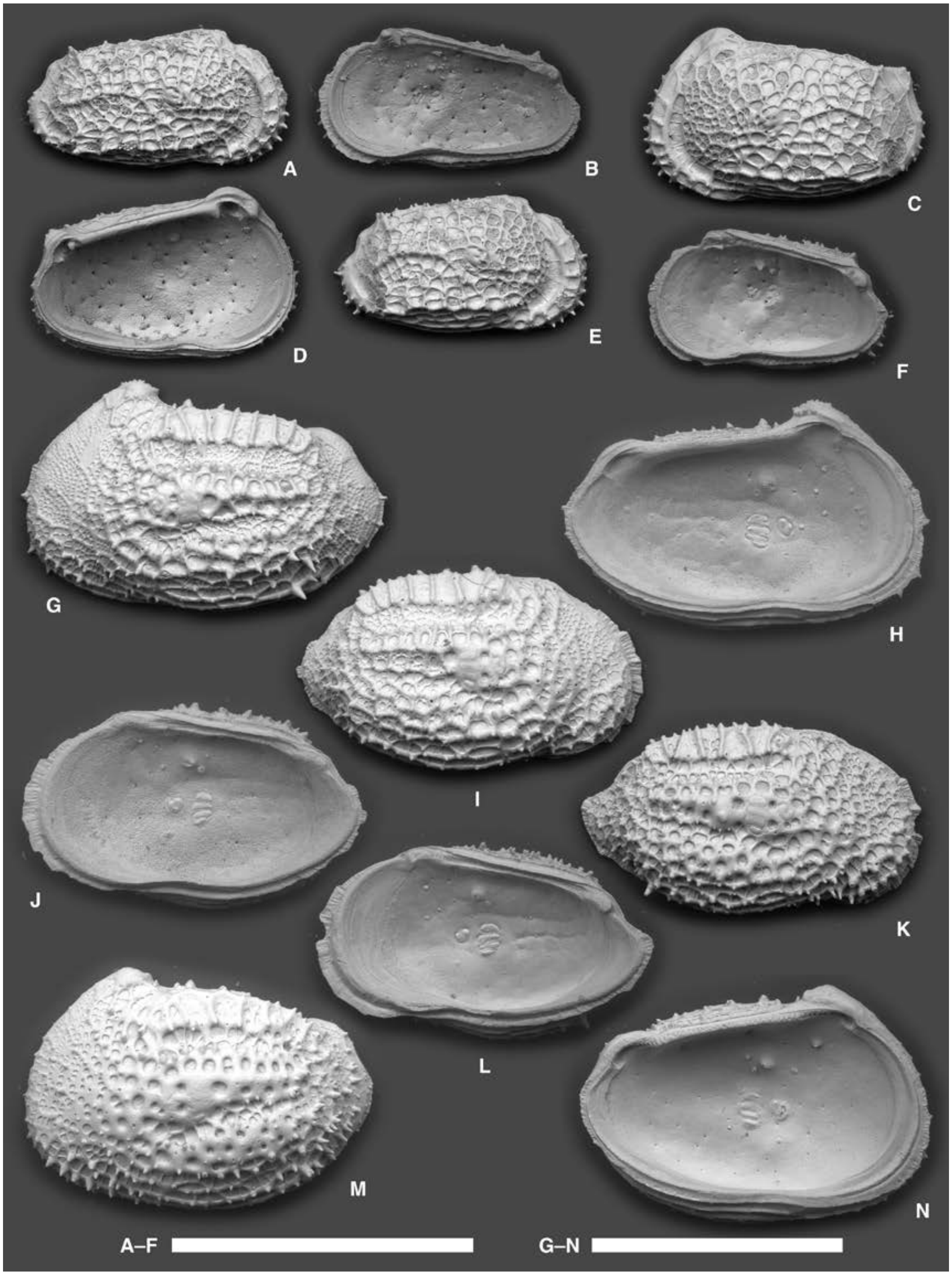


FIGURE 9. Scanning electron microscope images of *Abyssocythere scotti* sp. nov., *Protocythere vitjasi* (Schornikov, 1975), and *Protocythere sulcatoperforata* (Brady, 1880). A, C, E, G, I, K, M, lateral views; B, D, F, H, J, L, N, internal views. **A–F,** *Abyssocythere scotti* sp. nov. A–B, TRA309 (USNM 607217), adult RV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. C–D, TRA312 (USNM 607218), adult LV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. E–F, TRA747 (USNM 607219), adult RV from DSDP 327A, 12/3/50–55, Maastrichtian, southwestern Atlantic. **G–J,** *Protocythere vitjasi* (Schornikov, 1975). G–H, RB186 (USNM 607220), adult LV from DSDP 305, 3/2/50–56, Pliocene, northwestern Pacific. I–J, RB187 (USNM 607221), adult RV from DSDP 305, 3/2/50–56, Pliocene, northwestern Pacific. **K–N,** *Protocythere sulcatoperforata* (Brady, 1880). K–L, GSM244 (USNM 607222), adult RV from DSDP 541, 14/4/36, Pliocene, northwestern Atlantic. M–N, USGSD149 (USNM 607223), adult LV from DSDP 607, 14/5/17–19, late Pliocene, North Atlantic. Scale bars represent 1 mm.

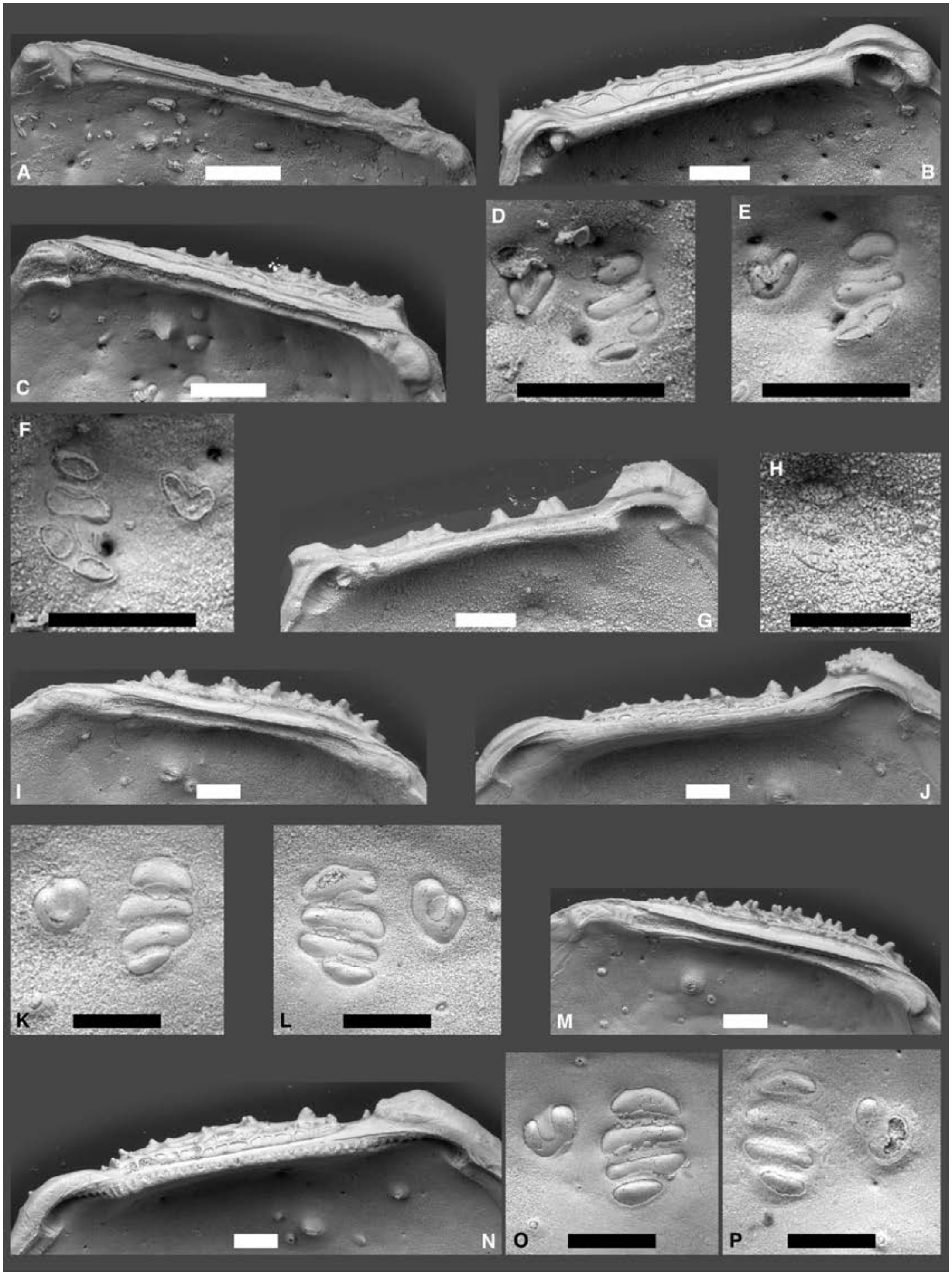


FIGURE 10. Internal details of *Abyssocythere scotti* sp. nov., *Abyssocythere* sp. 1, *Protocythere vitjasi* (Schornikov, 1975), and *Protocythere sulcatoperforata* (Brady, 1880). **A–F,** *Abyssocythere scotti* sp. nov. A, TRA309 (USNM 607217), adult RV, hingement. B, TRA312 (USNM 607218), adult LV, hingement. C, TRA747 (USNM 607219), adult RV, hingement. D, TRA309 (USNM 607217), adult RV, subcentral muscle scars. E, TRA747 (USNM 607219), adult RV, subcentral muscle scars. F, TRA312 (USNM 607218), adult LV, subcentral muscle scars. **G–H,** *Abyssocythere* sp. 1, TRA651 (USNM 607723), adult LV. G, hingement. H, subcentral muscle scars. **I–L,** *Protocythere vitjasi* (Schornikov, 1975). I, RB187 (USNM 607221), adult RV, hingement. J, RB186 (USNM 607220), adult LV, hingement. K, RB187 (USNM 607221), adult RV, subcentral muscle scars. L, RB186 (USNM 607220), adult LV, subcentral muscle scars. **M–P,** *Protocythere sulcatoperforata* (Brady, 1880). M, GSM244 (USNM 607222), adult RV, hingement. N, USGSD149 (USNM 607223), adult LV, hingement. O, GSM244 (USNM 607222), adult RV, subcentral muscle scars. P, USGSD149 (USNM 607223), adult LV, subcentral muscle scars. Scale bars represent 0.1 mm.

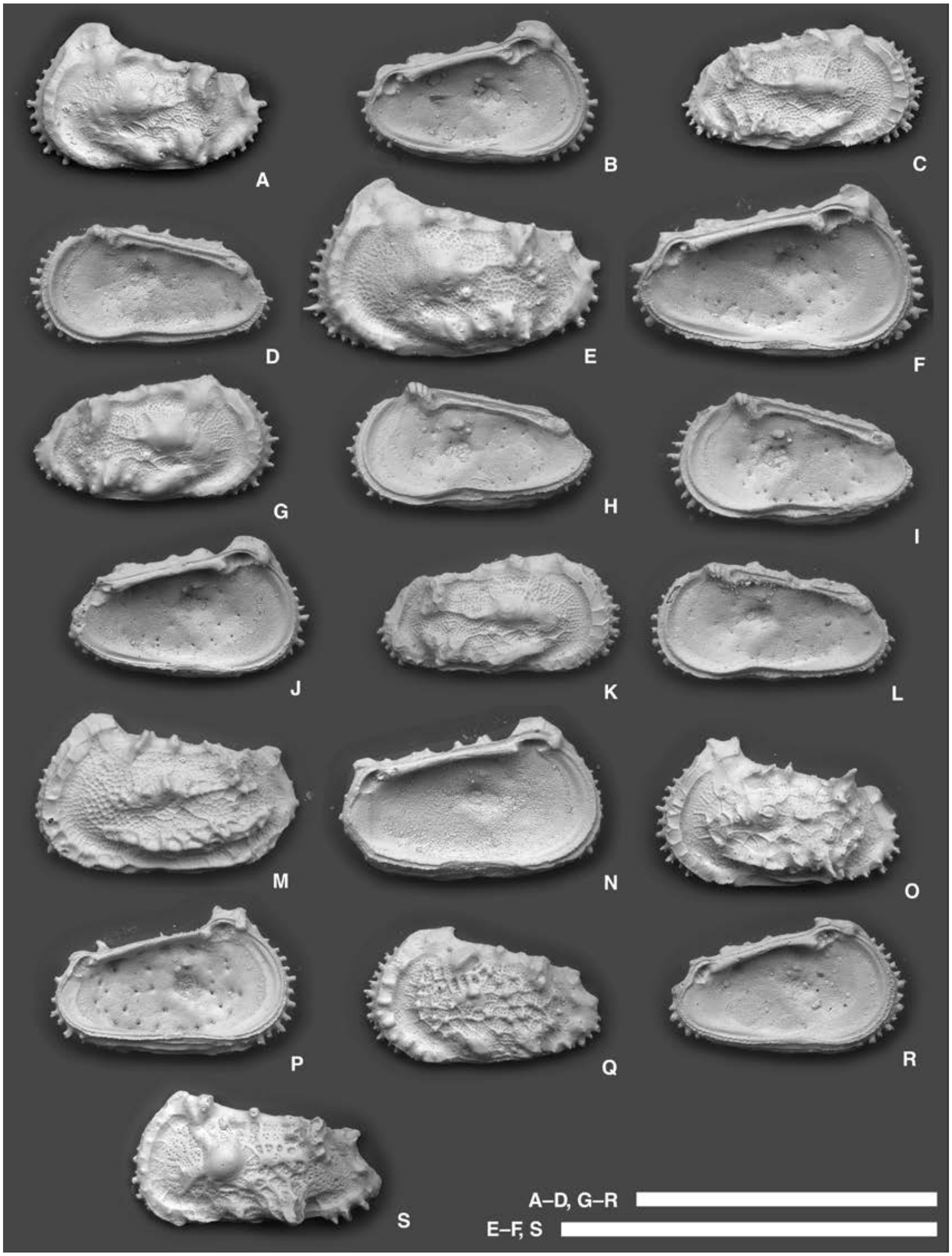


FIGURE 11. Scanning electron microscope images of *Herrigocythere cretacea* (Benson, 1977), *Herrigocythere cenozoica* (Benson, 1977), *Abyssocythere* sp. 1, *Herrigocythere* sp. 1, *Herrigocythere* sp. 2, and *Herrigocythere* sp. 3. A, C, E, G, K, M, O, Q, S, lateral views; B, D, F, H–J, L, N, P, R, internal views. **A–B, E–J,** *Herrigocythere cretacea* (Benson, 1977). A–B, TRA638 (USNM 607716), adult LV from DSDP 21, 7/1/148–150, Campanian, southwestern Atlantic. E–F, TRA733 (USNM 607718), adult LV from DSDP 21, 5/3/50–56, Campanian–Maastrichtian, southwestern Atlantic. G–H, TRA734 (USNM 607719), adult RV from DSDP 21, 5/3/50–56, Campanian–Maastrichtian, southwestern Atlantic. I, TRA738 (USNM 607720), adult RV from DSDP 21, 5/1/31–33, Campanian–Maastrichtian, southwestern Atlantic. J, TRA739 (USNM 607721), adult LV from DSDP 21, 6/6/3–5, Campanian, southwestern Atlantic. **C–D, K–L,** *Herrigocythere cenozoica* (Benson, 1977). C–D, TRA637 (USNM 607717), adult RV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. K–L, TRA805 (USNM 607722), adult RV from DSDP 363, 17/2/71–88, middle Paleocene, southeastern Atlantic. **M–N,** *Abyssocythere* sp. 1, TRA651 (USNM 607723), adult LV from DSDP 44, 5/cc, middle Eocene, North Pacific. **O–P,** *Herrigocythere* sp. 1, TRA755 (USNM 607724), adult LV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. **Q–R,** *Herrigocythere* sp. 2, TRA767 (USNM 607725), adult LV from DSDP 111A, 11/3/50–56, late Maastrichtian, North Atlantic. **S,** *Herrigocythere* sp. 3, TRA812 (USNM 607726), adult LV from ARL 4778, late Cretaceous, Santonian, North Atlantic. Scale bars represent 1 mm.

Protocythere divisa Oertli, 1966, but the latter is more quadrate in shape and has a less developed dorsolateral ridge.

Protocythere sulcatoperforata (Brady, 1880)

FIGURES 9K–N, 10M–P

Cythere sulcatoperforata Brady, 1880:99, pl. 26, fig. la–d.
"*Cythere*" *sulcatoperforata* Brady; Swain, 1971, pl. 36.2, fig. 5a–b; pl. 36.4, fig. 8.
Cythere sulcatoperforata Brady; Puri and Hulings, 1976:291, pl. 17, figs. 1–2; fig. 11.
Abyssocythereis aff. *A. sulcatoperforata* (Brady); Benson and Peypouquet, 1983, pl. 1, fig. 3.
Abyssocythereis sulcatoperforata (Brady); Steineck, Dehler, Hoose, and McCalla, 1988, pl. 1, fig. 8.
Abyssocythereis sulcatoperforata (Brady); Guernet and Moullade, 1994, pl. 3, fig. 16.

Locality and Age of Specimens Examined. DSDP 541, 607, Pliocene, North Atlantic.

Dimensions. See Table 1.

Remarks. This is a poorly known species. Here we show adult left and right valves that allow detailed comparison with *Protocythere vitjasi* (see above). *Protocythere pseudopropria* Bartenstein and Brand, 1959 (in Bartenstein, 1959) and *Protocythere saxonica* Bartenstein and Brand, 1959 (in Bartenstein, 1959) are also similar to *Protocythere sulcatoperforata* (Brady, 1880) but are distinguished by the lack of a horizontal row of well-developed vertical carinae on the dorsolateral ridge.

Genus *Acanthocythereis* Howe, 1963

Type Species. *Acanthocythereis araneosa* Howe, 1963.

Remarks. *Acanthocythereis* Howe, 1963 is generally a shallow marine genus. It is rare in the deep sea and is found only at upper bathyal depths (Rosenfeld and Bein, 1978). *Trachyleberis* Brady, 1898 is similar to *Acanthocythereis* (notably, both of them have internal snap-knob structure and lack anterior marginal frill), but the ocular ridge is present only in *Trachyleberis*. In addition, primary reticulation tends to be more distinct in *Acanthocythereis*. *Cythereis* Jones, 1849 lacks an ocular ridge and internal snap-knob structure. Differences among these three genera are rather subtle, but we prefer to consider all of them valid genera because they are fairly well accepted.

Acanthocythereis araneosa Howe, 1963

FIGURES 12A–G, 13A–H

Acanthocythereis araneosa Howe, 1963:35, pl. 4, figs. 7–10.

Locality and Age of Specimens Examined. Cook Mountain Formation, Eocene, North America.

Dimensions. See Table 1.

Remarks. This is the type species of the genus. Scanning electron microscope images of topotype specimens are shown here.

Acanthocythereis cf. *araneosa* Howe, 1963

FIGURES 12H–J, 13I–K

Locality and Age of Specimens Examined. Cook Mountain Formation, Eocene, North America.

Dimensions. See Table 1.

Remarks. This species may be conspecific with *Acanthocythereis araneosa* Howe, 1963, but it is much smaller and less spinous.

Acanthocythereis stenzeli (Stephenson, 1946) sensu Howe (1963)

FIGURES 12K–M, 13L–N

?*Cythereis stenzeli* Stephenson, 1946:340, pl. 45, fig. 5.
?*Trachyleberis stenzeli* (Stephenson); Swain, 1951:32, pl. 4, figs. 17, 18, 22; pl. 5, fig. 1.
Acanthocythereis? stenzeli (Stephenson); Howe, 1963:37, pl. 4, figs. 11–12.

Locality and Age of Specimens Examined. Cook Mountain Formation, Eocene, North America.

Dimensions. See Table 1.

Remarks. This species is conspecific with the species that Howe (1963) identified as *Acanthocythereis stenzeli*. However, we are not sure that this species can be referred to as *Acanthocythereis stenzeli* because only a sketch of the type specimen is available for comparison.

Genus *Actinocythereis* Puri, 1953b

Type Species. *Cythere exanthemata* Ulrich and Bassler, 1904.

Emended Diagnosis. Trachyleberidid genus characterized by the three distinct horizontal rows of spines and a distinct ocular ridge. Carapace elongate and rectangular. Anterior margin obliquely rounded, strongly denticulate with clavate spines. Posterior margin blunt and upturned (or truncated), with dense spines in its ventral half. Primary reticulation often developed on valve surface. Frontal scar V shaped; adductor muscle scars consisting of an oblique row of four scars, with the second scar from the top elongate and largest. Hingement holamphidont. Internal snap-knob structure present.

Remarks. *Actinocythereis* was erected by Puri (1953b) and is characterized by the three distinct horizontal rows of spines (see also Hazel, 1967). However, this

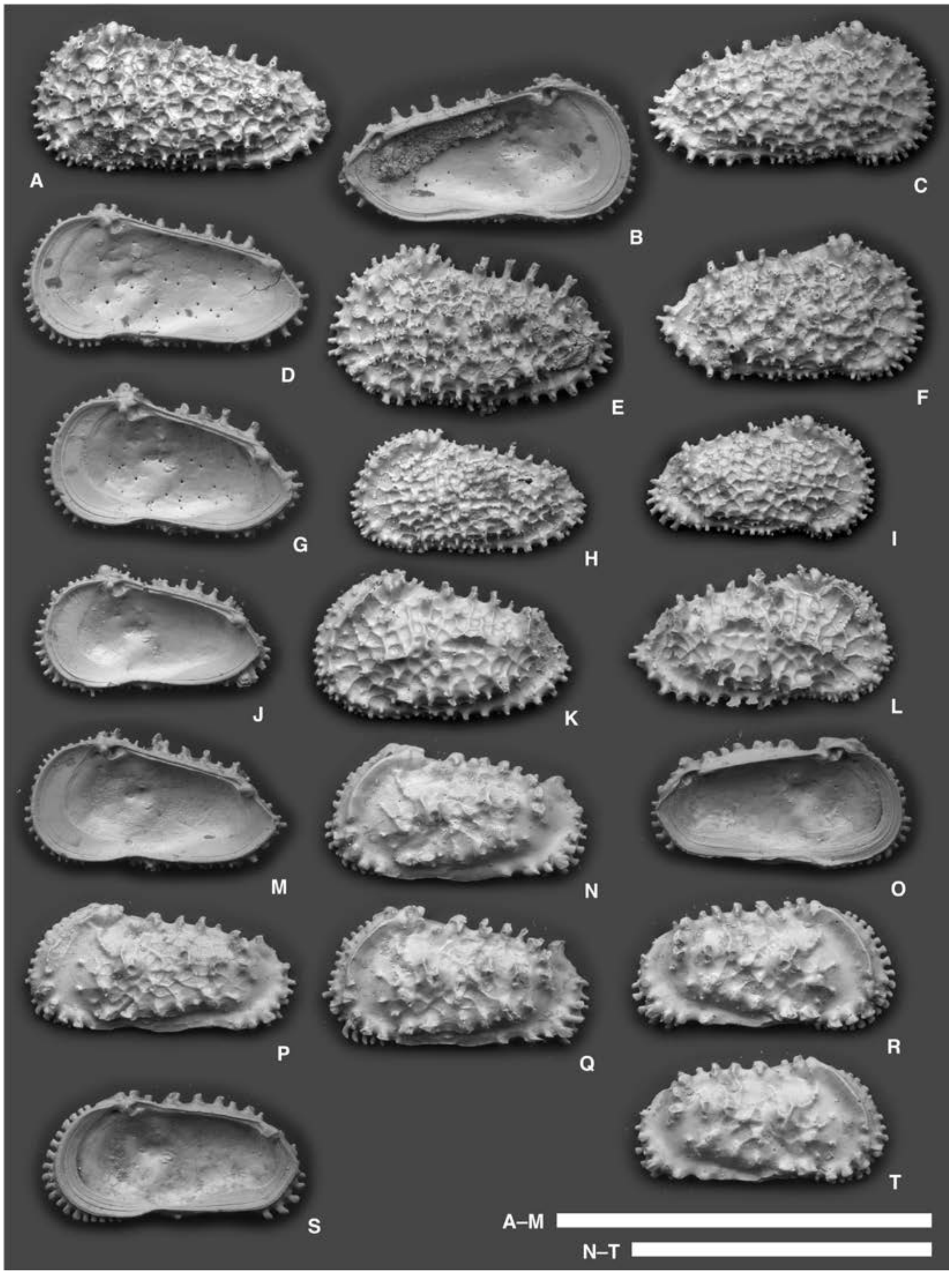


FIGURE 12. Scanning electron microscope images of *Acanthocythereis araneosa* Howe, 1963, *Acanthocythereis* cf. *araneosa* Howe, 1963, *Acanthocythereis stenzeli* (Stephenson, 1946) sensu Howe (1963), and *Actinocythereis exanthemata* (Ulrich and Bassler, 1904). A, C, E–F, H–I, K–L, N, P–R, T, lateral views; B, D, G, J, M, O, S, internal views. **A–G,** *Acanthocythereis araneosa* Howe, 1963. A–B, TRA854 (USNM 607224), adult LV from Cook Mountain Formation, Eocene, USA. C–D, TRA856 (USNM 607225), adult RV from Cook Mountain Formation, Eocene, USA. E, TRA861 (USNM 607226), adult LV from Cook Mountain Formation, Eocene, USA. F–G, TRA862 (USNM 607227), adult RV from Cook Mountain Formation, Eocene, USA. **H–J,** *Acanthocythereis* cf. *araneosa* Howe, 1963. H, TRA858 (USNM 607228), adult LV from Cook Mountain Formation, Eocene, USA. I, TRA859 (USNM 607229), adult RV from Cook Mountain Formation, Eocene, USA. J, TRA860 (USNM 607230), adult RV from Cook Mountain Formation, Eocene, USA. **K–M,** *Acanthocythereis stenzeli* (Stephenson, 1946) sensu Howe (1963). K, TRA855 (USNM 607231), adult LV from Cook Mountain Formation, Eocene, USA. L–M, TRA857 (USNM 607232), adult RV from Cook Mountain Formation, Eocene, USA. **N–T,** *Actinocythereis exanthemata* (Ulrich and Bassler, 1904). N–O, TRA842 (USNM 607233), adult LV from Calvert Formation, Miocene, USA. P, TRA841 (USNM 607234), adult LV from Calvert Formation, Miocene, USA. Q, TRA843 (USNM 607235), adult LV from Calvert Formation, Miocene, USA. R–S, TRA844 (USNM 607236), adult RV from Calvert Formation, Miocene, USA. T, TRA845 (USNM 607237), adult RV from Calvert Formation, Miocene, USA. Scale bars represent 1 mm.

characteristic on its own makes the generic concept too broad. Thus, we consider other fundamental characteristics of this genus: (1) blunt, upturned (or truncated) posterior margin (and resulting rectangular appearance of lateral view of carapace), (2) distinct ocular ridge, (3) lack of sharp spines on the lateral surface (in contrast to, for example, *Trachyleberis* and *Acanthocythereis*), (4) absence of anterior marginal frill in the internal view (in contrast to, for example, *Pennyella*), and (5) presence of internal snap-knob structure. Also, the ventral half of the posterior margin (i.e., caudal process) bears much denser spines than the dorsal half. This revision makes the generic concept narrower and excludes several species previously assigned to *Actinocythereis*. Several researchers assigned several deep-sea species to *Actinocythereis* (Guernet, 1985; Hunt et al., 2010), but all of them belong to other genera in our opinion (see the *Cythereis* section). We consider *Actinocythereis* to be a shallow marine genus.

Actinocythereis exanthemata (Ulrich and Bassler, 1904)

FIGURES 12N–T, 13O–S

Cythere exanthemata Ulrich and Bassler, 1904:117, pl. 36, figs. 1–3, 5 (non fig. 4).
Actinocythereis exanthemata (Ulrich and Bassler); Forester, 1980:11, pl. 3. figs. 7–8.

Locality and Age of Specimens Examined. Calvert Formation, Miocene, North America.

Dimensions. See Table 1.

Remarks. A comprehensive synonymy and the SEM image of the lectotype specimen can be found in Forester (1980). The SEM images of topotype specimens are shown here.

Actinocythereis vineyardensis (Cushman, 1906)

FIGURES 13T–X, 14A–F

Cythereis vineyardensis Cushman, 1906:380, pl. 37, figs. 110–114.
Actinocythereis vineyardensis (Cushman); Hazel, 1967:33, pl. 5, figs. 16, 18; pl. 11, fig. 4.

Locality and Age of Specimens Examined. Alb 2544, Alb 2555, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Remarks. Our identification of *Actinocythereis vineyardensis* is based on the microscopic images shown in Hazel (1967). *Actinocythereis vineyardensis* has slightly more distinct primary reticulation than *Actinocythereis exanthemata*.

Actinocythereis purii Huff, 1970

FIGURES 14G,M–N, 15A–C

Actinocythereis purii Huff, 1970:150, pl. 18, figs. 1–6.

Locality and Age of Specimens Examined. Cocoa Sand Member, late Eocene, North America.

Dimensions. See Table 1.

FIGURE 13. (Opposite page) Internal details of *Acanthocythereis araneosa* Howe, 1963, *Acanthocythereis* cf. *araneosa* Howe, 1963, *Acanthocythereis stenzeli* (Stephenson, 1946) sensu Howe (1963), *Actinocythereis exanthemata* (Ulrich and Bassler, 1904), *Actinocythereis vineyardensis* (Cushman, 1906), and *Actinocythereis texana* (Stadnichenko, 1927). **A–H,** *Acanthocythereis araneosa* Howe, 1963. A, TRA856 (USNM 607225), adult RV, hingement. B, TRA854 (USNM 607224), adult LV, hingement. C, TRA862 (USNM 607227), adult RV, hingement. D, TRA856 (USNM 607225), adult RV, subcentral muscle scars. E, TRA862 (USNM 607227), adult RV, subcentral muscle scars. F, TRA854 (USNM 607224), adult LV, subcentral muscle scars. G, TRA856 (USNM 607225), adult RV, ventromarginal area showing snap-knob structure. H, TRA862 (USNM 607227), adult RV, ventromarginal area showing snap-knob structure. **I–K,** *Acanthocythereis* cf. *araneosa* Howe, 1963, TRA860 (USNM 607230), adult RV. I, ventromarginal area showing snap-knob structure. J, hingement. K, subcentral muscle scars. **L–N,** *Acanthocythereis stenzeli* (Stephenson, 1946) sensu Howe (1963), TRA857 (USNM 607232), adult RV. L, hingement. M, ventromarginal area showing snap-knob structure. N, subcentral muscle scars. **O–S,** *Actinocythereis exanthemata* (Ulrich and Bassler, 1904). O, TRA842 (USNM 607233), adult LV, subcentral muscle scars. P, TRA844 (USNM 607236), adult RV, subcentral muscle scars. Q, TRA844 (USNM 607236), adult RV, ventromarginal area showing snap-knob structure. R, TRA844 (USNM 607236), adult RV, hingement. S, TRA842 (USNM 607233), adult LV, hingement. **T–X,** *Actinocythereis vineyardensis* (Cushman, 1906). T, TRA222 (USNM 607239), adult RV, subcentral muscle scars. U, TRA222 (USNM 607239), adult RV, hingement. V, TRA221 (USNM 607238), adult LV, hingement. W, TRA221 (USNM 607238), adult LV, subcentral muscle scars. X, TRA222 (USNM 607239), adult RV, ventromarginal area showing snap-knob structure. **Y–AA,** *Actinocythereis texana* (Stadnichenko, 1927), TRA866 (USNM 607246), adult RV. Y, hingement. Z, subcentral muscle scars. AA, ventromarginal area showing snap-knob structure. Scale bars represent 0.1 mm for A–C, G–J, L–M, Q–S, U–V, X–Y, AA and 50 µm for D–F, K, N–P, T, W, Z.

Actinocythereis texana **(Stadnichenko, 1927)**

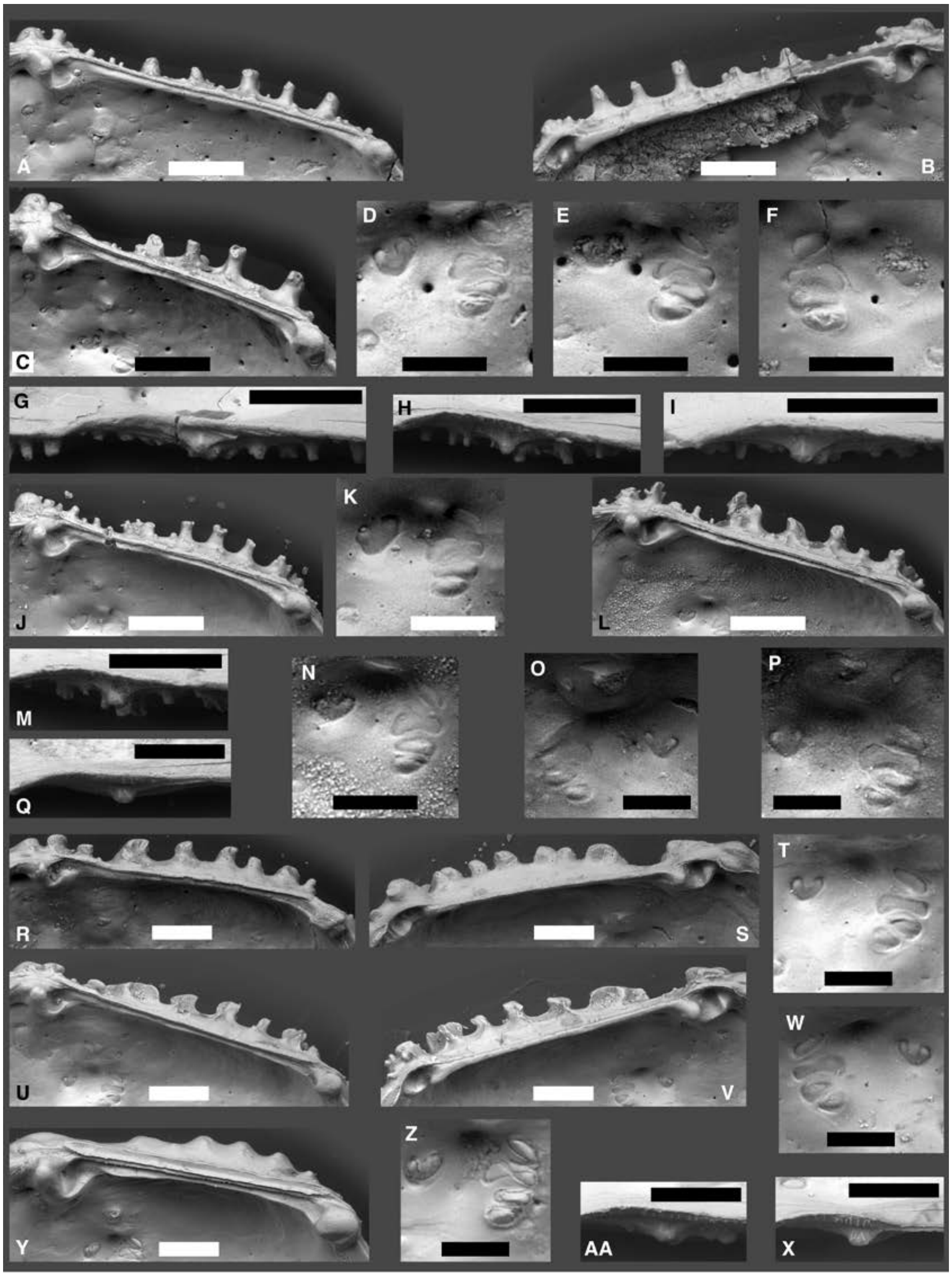
FIGURES 13Y–AA, 14H–L

Cythere texana Stadnichenko, 1927:237, pl. 39, figs. 11–12.
Trachyleberis texana (Stadnichenko); Howe, 1963:33, pl. 4, figs. 1–3.

Locality and Age of Specimens Examined. Cook Mountain Formation, Eocene, North America.

Dimensions. See Table 1.

Remarks. The specimens shown here are from the Cook Mountain Formation. Species assignments of Cenozoic (especially Paleogene) trachyleberidids reported from the



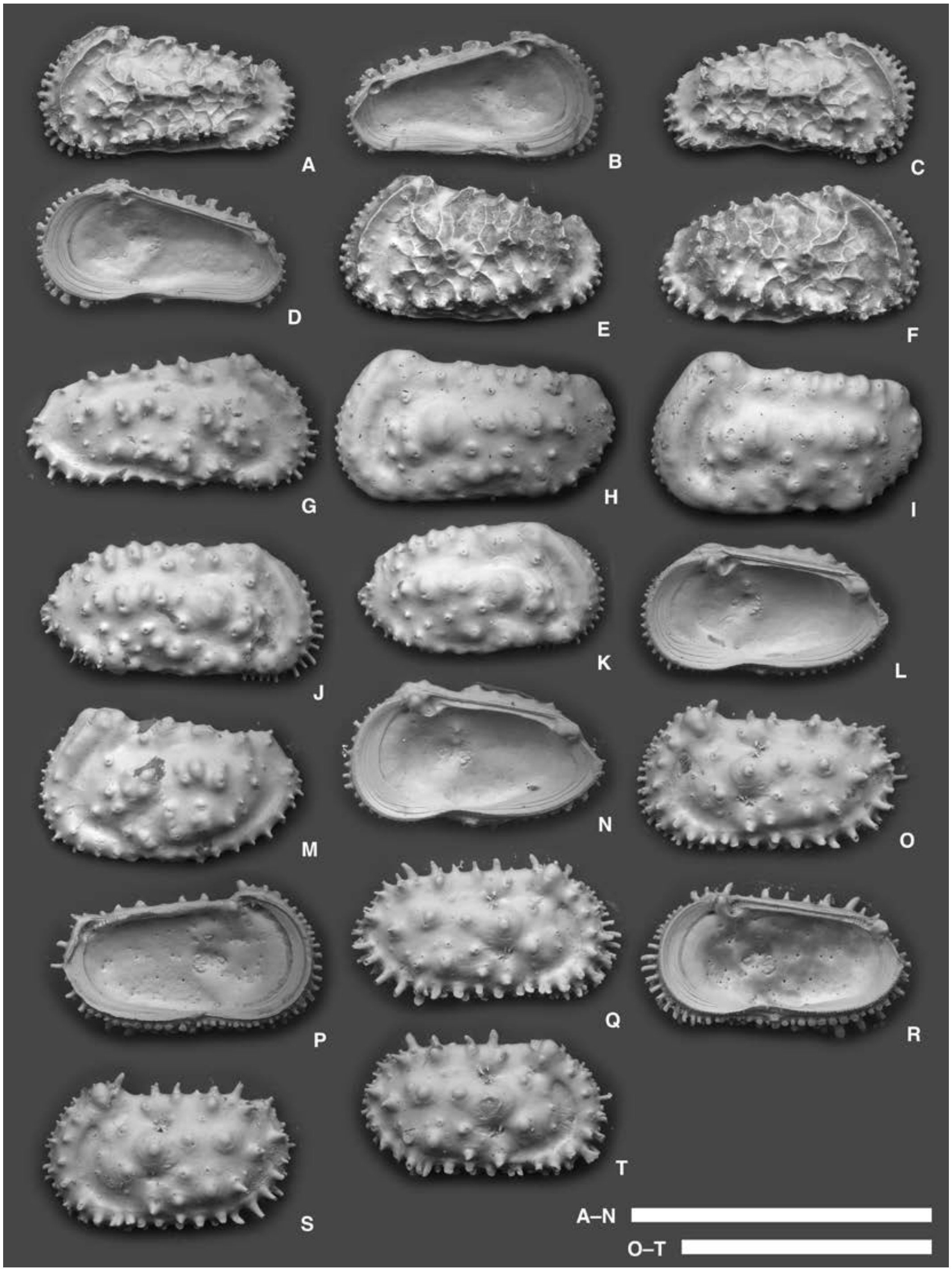


FIGURE 14. Scanning electron microscope images of *Actinocythereis vineyardensis* (Cushman, 1906), *Actinocythereis purii* Huff, 1970, *Actinocythereis texana* (Stadnichenko, 1927), and *Actinocythereis? scutigera* (Brady, 1868). A, C, E–K, M, O, Q, S–T, lateral views; B, D, L, N, P, R, internal views. **A–F,** *Actinocythereis vineyardensis* (Cushman, 1906). A–B, TRA221 (USNM 607238), adult LV from Alb 2555, Modern, northwestern Atlantic. C–D, TRA222 (USNM 607239), adult RV from Alb 2555, Modern, northwestern Atlantic. E, TRA223 (USNM 607240), adult LV from Alb 2544, Modern, northwestern Atlantic. F, TRA224 (USNM 607241), adult RV from Alb 2544, Modern, northwestern Atlantic. **G, M–N,** *Actinocythereis purii* Huff, 1970. G, TRA903 (USNM 607242), adult RV from Cocoa Sand Member, late Eocene, USA. M, TRA901 (USNM 607247), adult LV from Cocoa Sand Member, late Eocene, USA. N, TRA902 (USNM 607248), adult RV from Cocoa Sand Member, late Eocene, USA. **H–L,** *Actinocythereis texana* (Stadnichenko, 1927). H, TRA863 (USNM 607243), adult LV from Cook Mountain Formation, Eocene, USA. I, TRA864 (USNM 607244), adult LV from Cook Mountain Formation, Eocene, USA. J, TRA865 (USNM 607245), adult RV from Cook Mountain Formation, Eocene, USA. K–L, TRA866 (USNM 607246), adult RV from Cook Mountain Formation, Eocene, USA. **O–T,** *Actinocythereis? scutigera* (Brady, 1868). O–P, TRA201 (USNM 607249), adult LV from Alb D5348, Modern, tropical western Pacific. Q–R, TRA202 (USNM 607250), adult RV from Alb D5348, Modern, tropical western Pacific. S, TRA203 (USNM 607251), adult LV from Alb D5348, Modern, tropical western Pacific. T, TRA204 (USNM 607252), adult RV from Alb D5348, Modern, tropical western Pacific. Scale bars represent 1 mm.

southern and eastern United States, including *Actinocythereis texana*, *Actinocythereis purii*, and other species (Howe and Chambers, 1935; Swain, 1951; Puri, 1953b; Howe, 1963; Hazel, 1967; Huff, 1970), are highly confusing because numerous species were described during the early to mid-20th century when the SEM was usually not available for ostracod research, and thus, only sketches or light microscopic photographs are available for comparison in most cases. Thus, revision and reexamination of type specimens are needed, although that is outside the scope of the present work.

Actinocythereis? scutigera (Brady, 1868)

FIGURES 14O–T, 15D–H

Cythere scutigera Brady, 1868:70, pl. 8, figs. 15–16.
Actinocythereis scutigera (Brady); Sylvester-Bradley and Benson, 1971, fig. 15.
?Actinocythereis scutigera (Brady); Whatley and Zhao, 1988:7, pl. 6, fig. 14.
Actinocythereis scutigera (Brady); Dewi, 1997:68, figs. 145–146.

Locality and Age of Specimens Examined. Alb D5348, Modern, northwestern Pacific.

Dimensions. See Table 1.

Remarks. A comprehensive synonymy as well as clear SEM images of the specimens from the topotypic locality can be found in Dewi (1997). In our opinion, *Actinocythereis* is basically a North American genus, and no certain records of this genus from the western Pacific region exist. We include this species in *Actinocythereis* tentatively because it lacks an ocular ridge, an important character of this genus. Otherwise, this species is very similar (e.g., presence of internal snap-knob structure) to *Actinocythereis texana*.

Genus *Agrenocythere* Benson, 1972

Type Species. *Agrenocythere spinosa* Benson, 1972.

Remarks. The generic concept of *Agrenocythere* Benson, 1972 is discussed extensively by Benson (1972). This genus is similar to *Oertliella* Pokorný, 1964b but is distinguished by a set of emphasized muri around and anterior to the muscle scars. In his discussion of these two genera, Benson (1972) suggests that *Agrenocythere* descended from *Oertliella* or a closely related form.

Agrenocythere hazelae (van den Bold, 1946)

FIGURES 15I–L, 16A–L

Cythereis hazeli [*sic*] van den Bold, 1946:92, pl. 10, fig. 4a–c.
"*Bradleya*" *hazelae* (van den Bold); van den Bold, 1968:66, pl. 3, fig. 6.
Agrenocythere hazelae (van den Bold); Benson, 1972:64, figs. 31–38; pl. 4, figs. 1–4; pl. 6, figs. 1–4; pl. 13, figs. 7–11; pl. 14, figs. 7–9.
Agrenocythere hazelae (van den Bold); Benson, 1977, pl. 1, fig. 6.
non *Agrenocythere hazelae* (van den Bold); Benson, 1978, pl. 1, figs. 7–8.
?Agrenocythere hazelae (van den Bold); Steineck, 1981:351, pl. 1, figs. 5–7.
Agrenocythere hazelae (van den Bold); van den Bold, 1981:79, pl. 4, fig. 16.
non *Agrenocythere hazelae* (van den Bold); Steineck, Breen, Nevins, and O'Hara, 1984, fig. 7A,C.
Agrenocythere hazelae (van den Bold); Whatley and Coles, 1987, pl. 6, fig. 7.
Agrenocythere hazelae (van den Bold); Steineck, Dehler, Hoose, and McCalla, 1988, pl. 1, figs. 5, 7.
Agrenocythere hazelae (van den Bold); Malz, 1990, fig. 6.13.
Agrenocythere hazelae (van den Bold); Guernet and Moullade, 1994:264, pl. 1, fig. 7; pl. 3, fig. 3.
Agrenocythere hazelae (van den Bold); Guernet, 1998, pl. 2, fig. 1.
non *Agrenocythere hazelae* (van den Bold); Cronin and Dwyer, 2003, pl. 1b.
non *Agrenocythere hazelae* (van den Bold); Dall'Antonia, 2003, pl. 2, fig. 18.
?Agrenocythere hazelae (van den Bold); Bergue and Govindan, 2010:750, fig. 3.7.

Locality and Age of Specimens Examined. SC 9DD, Modern, western equatorial Pacific; DSDP 526A, early Pliocene, southeastern Atlantic; DSDP 607, late Pliocene, North Atlantic; Alb D2751, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Remarks. The lectotype specimen from the lower Miocene in Cuba has never been illustrated other than in the original sketch, and therefore, the status of this species is uncertain. Our identification is based on van den Bold's papers (van den Bold, 1946, 1968, 1981) and Benson (1972). See Benson (1972) for a comprehensive synonymy of early references.

Agrenocythere? sp.

FIGURES 16M–N

Locality and Age of Specimens Examined. DSDP 116, Oligocene and Pliocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. These specimens are unusual for the genus in that fossae in the anterior field show rounded primary reticulation, similar to *Poseidonamicus*. The distribution of fossae and the presence of lateral spines suggest that this species belongs to *Agrenocythere*, but the paucity of material (two specimens, one of them juvenile) prevents definitive conclusions.

Genus *Ambocythere* van den Bold, 1957a

Type Species. *Ambocythere keiji* van den Bold, 1957a.

Amended Diagnosis. Internal features: anterior inner lamella very broad; hinge amphidont type (holamphidont or hemiamphidont); frontal muscle scar hook shaped or V shaped; a vertical row of four closely spaced, similar-sized

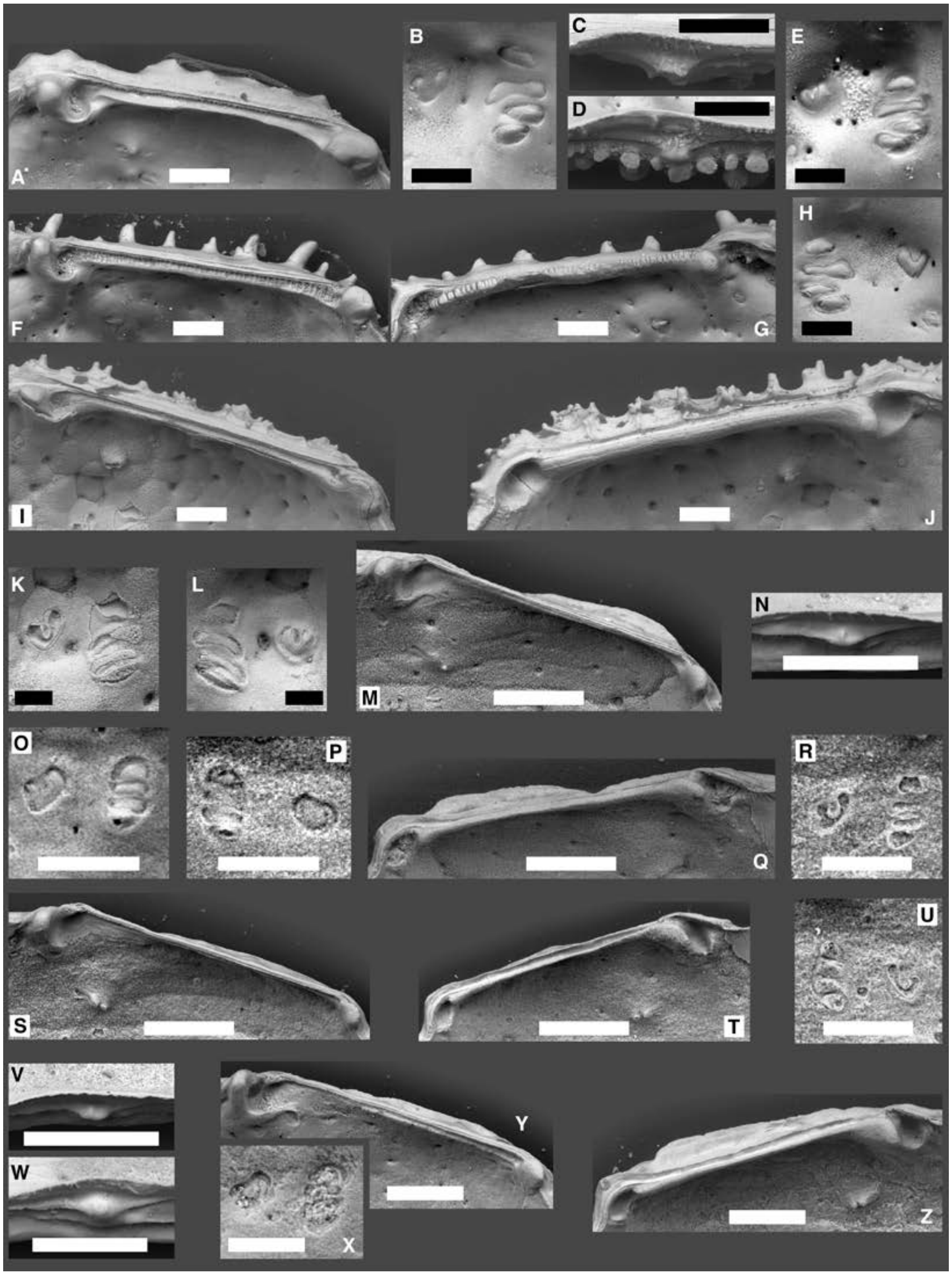


FIGURE 15. Internal details of *Actinocythereis purii* Huff, 1970, *Actinocythereis? scutigera* (Brady, 1868), *Agrenocythere hazelae* (van den Bold, 1946), *Ambocythere caudata* van den Bold, 1965, *Ambocythere ramosa* van den Bold, 1965, and *Ambocythere whatleyi* sp. nov. **A–C,** *Actinocythereis purii* Huff, 1970, TRA902 (USNM 607248), adult RV. A, hingement. B, subcentral muscle scars. C, ventromarginal area showing snap-knob structure. **D–H,** *Actinocythereis? scutigera* (Brady, 1868). D–F, TRA202 (USNM 607250), adult RV. D, ventromarginal area showing snap-knob structure. E, subcentral muscle scars. F, hingement. G–H, TRA201 (USNM 607249), adult LV. G, hingement. H, subcentral muscle scars. **I–L,** *Agrenocythere hazelae* (van den Bold, 1946). I, RB108 (USNM 607256), adult RV, hingement. J, USGSD141 (USNM 607257), adult LV, hingement. K, RB108 (USNM 607256), adult RV, subcentral muscle scars. L, USGSD141 (USNM 607257), adult LV, subcentral muscle scars. **M–Q,** *Ambocythere caudata* van den Bold, 1965. M, ODP982013 (USNM 607265), adult RV, hingement. N–O, ODP982014 (USNM 607266), adult RV. N, ventromarginal area showing snap-knob structure. O, subcentral muscle scars. P–Q, ODP982017 (USNM 607269), adult LV. P, subcentral muscle scars. Q, hingement. **R–V,** *Ambocythere ramosa* van den Bold, 1965. R–S, V, ODP982021 (USNM 607278), adult RV. R, subcentral muscle scars. S, hingement. V, ventromarginal area showing snap-knob structure. T–U, ODP982020 (USNM 607277), adult LV. T, hingement. U, subcentral muscle scars. **W–Z,** *Ambocythere whatleyi* sp. nov. W–Y, RB411 (USNM 607284), adult RV. W, ventromarginal area showing snap-knob structure. X, subcentral muscle scars. Y, hingement. Z, GSM213 (USNM 607282), adult LV, hingement. Scale bars represent 0.1 mm for A, C–D, F–G, I–J, M–N, Q, S–T, V–W, Y–Z and 50 µm for B, E, H, K–L, O–P, R, U, X.

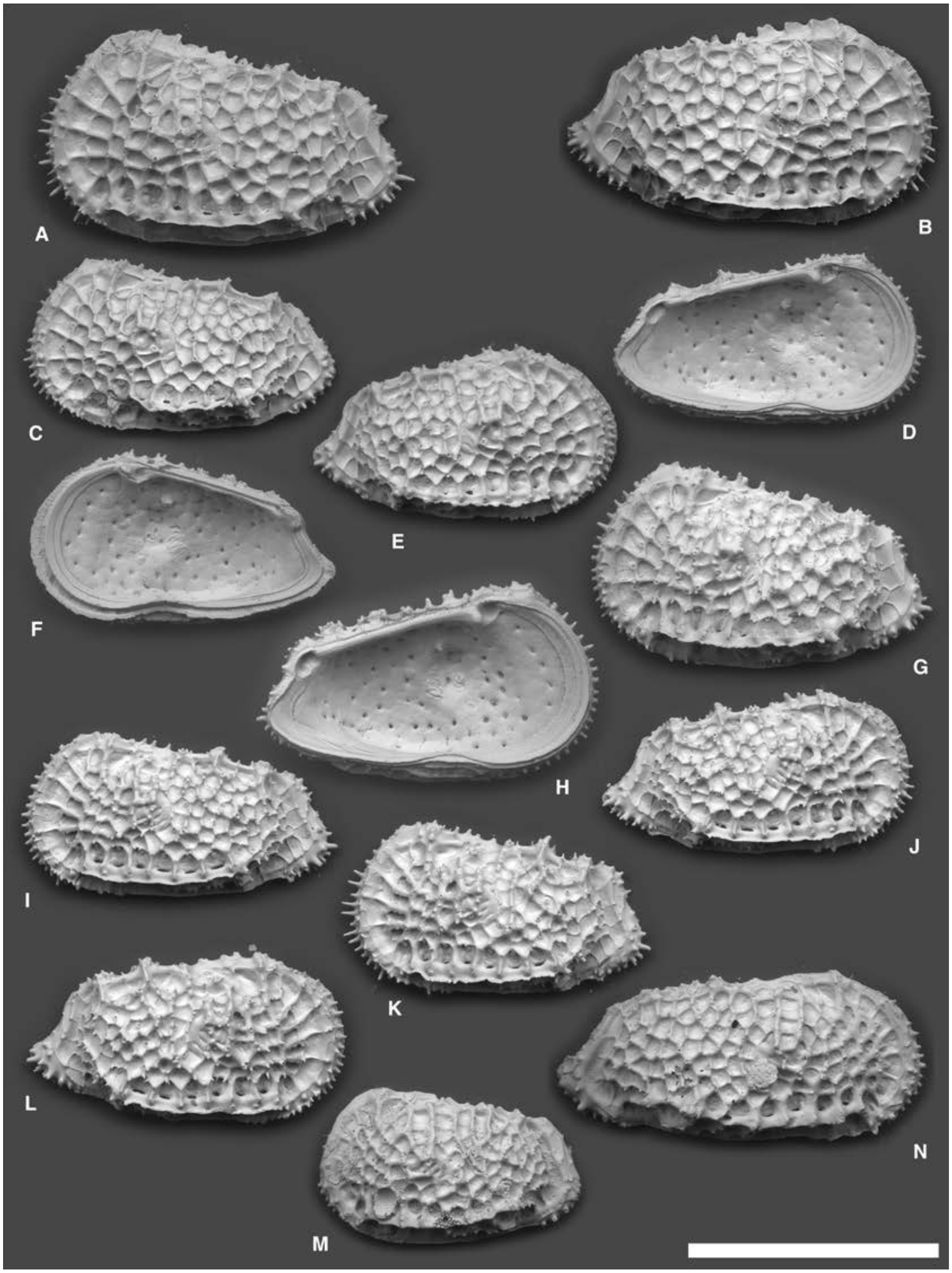


FIGURE 16. Scanning electron microscope images of *Agrenocythere hazelae* (van den Bold, 1946) and *Agrenocythere?* sp. A–C, E, G, I–N, lateral views; D, F, H, internal views. **A–L,** *Agrenocythere hazelae* (van den Bold, 1946). A, SIMY0026 (USNM 607253), adult LV from SC 9DD, Modern, equatorial western Pacific. B, POS1220 (USNM 607254), adult RV from SC 9DD, Modern, equatorial western Pacific. C–D, RB107 (USNM 607255), adult LV from DSDP 526A, 1/1/60–67, early Pliocene, southeastern Atlantic. E–F, RB108 (USNM 607256), adult RV from DSDP 526A, 1/1/60–67, early Pliocene, southeastern Atlantic. G–H, USGSD141 (USNM 607257), adult LV from DSDP 607, 14/3/129, late Pliocene, North Atlantic. I, RB431 (USNM 607258), adult LV from Alb D2751, Modern, northwestern Atlantic. J, RB432 (USNM 607259), adult RV from Alb D2751, Modern, northwestern Atlantic. K, RB433 (USNM 607260), adult LV from Alb D2751, Modern, northwestern Atlantic. L, RB434 (USNM 607261), adult RV from Alb D2751, Modern, northwestern Atlantic. **M–N,** *Agrenocythere?* sp. M, POS966 (USNM 607262), juvenile? LV from DSDP 116, late Oligocene, northeastern Atlantic. N, POS965 (USNM 607263), adult RV from DSDP 116, early Oligocene, northeastern Atlantic. Scale bar represents 1 mm.

adductor muscle scars present (ventral scar smaller); snap-knob structure present at midlength ventrally; anterior marginal frill absent. For external features and other details, see van den Bold (1965).

Remarks. *Ambocythere* van den Bold, 1957a is distinguished from *Falsobuntonia* Malz, 1982 by its amphidont-type hinge (*Falsobuntonia* has an antimerodont hinge) and well-developed lateral ridges. *Pacambocythere* Malz, 1982 is also similar to *Ambocythere*, but the former has a much more robust carapace, more elliptical outline, and truncated posterior margin. *Ambocythere* is very similar to *Phacorhabdotus* Howe and Laurencich, 1958, but the latter lacks a flat anterior marginal rim and internal snap-knob structure, tends to lack reticulation, and has anterior marginal frill. In addition, *Ambocythere* is usually more elongate than *Phacorhabdotus*.

Ambocythere caudata van den Bold, 1965

FIGURES 15M–Q, 17A–H, 18S

Ambocythere caudata van den Bold, 1965:11, pl. 1, figs. 12–13; text-figs. 3–4.

non *Ambocythere* sp. cf. *A. caudata* van den Bold; Whatley and Coles, 1987, pl. 6, fig. 6.

?*Ambocythere* sp. Didié and Bauch, 2000, pl. 3, fig. 26.

Locality and Age of Specimens Examined. ODP 982A, Pleistocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. This species is most similar to *Ambocythere sturgio* Yasuhara et al., 2009c, but the latter has a better-developed caudal process and lacks reticulation on the caudal process.

Ambocythere tomocaudata sp. nov.

FIGURES 17I–K, 18T

Derivation of Name. In honor of Thomas M. Cronin, U.S. Geological Survey, for his outstanding works on deep-sea ostracods and from the similarity to *Ambocythere caudata* van den Bold, 1965.

Holotype. Adult RV, USNM 607270 (GSM103; Figures 17I, 18T).

Paratypes. USNM 607272, 607271 (GSM104, GSM105).

Type Locality and Horizon. WHOI 1608, Modern, 26.2083°N, 79.7667°W, 584 m water depth, northwestern Atlantic.

Other Localities. WHOI 1617, 1608, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Ambocythere* species characterized by well-developed primary reticulation, moderately developed caudal process, and subtriangular outline.

Description. Carapace elongate and moderately calcified. Outline subtriangular in lateral view; anterior margin evenly rounded; caudal process moderately developed and upturned, bearing seven to eight short spines in its ventral half; dorsal margin sinuous; ventral margin slightly sinuous. Anterodorsal corner forms an obtuse angle; posterodorsal corner prominent and angular. Lateral surface ornamented with shallow primary reticulation; two distinct carinae running horizontally; thin and carina-like dorsolateral ridge present; flat and broad anterior marginal rim; a prominent pore conulus at dorsomedian part of caudal process. Internal features as for genus.

Remarks. *Ambocythere tomocaudata* sp. nov. is very similar to *Ambocythere caudata* van den Bold, 1965, but the former is smaller and has only three pores along the carina-like rim in the anterior margin (Figure 18T). In contrast, *Ambocythere caudata* has six pores along this rim (Figure 18S). Furthermore, this new species has a carina on the caudal process that is subvertical and slightly arched, in contrast to the strongly curved carina that follows closely along the posterior margin in *Ambocythere caudata*.

Ambocythere ramosa van den Bold, 1965

FIGURES 15R–V, 17P–U

Ambocythere ramosa van den Bold, 1965:12, pl. 2, fig. 5; text-fig. 5.

non *Ambocythere ramosa* van den Bold; Benson, DelGrosso, and Steineck, 1983, pl. 2, figs. 1–2.

non *Ambocythere* sp. cf. *A. ramosa* van den Bold; Whatley and Coles, 1987, pl. 6, figs. 4–5.

non *Ambocythere ramosa* van den Bold; Maddocks and Steineck, 1987:340, pl. 1, figs. 14, 17; text-fig. 12a–g.

non *Ambocythere ramosa* van den Bold; Alvarez Zarikian, 2009:5, pl. P10, fig. 7.

Locality and Age of Specimens Examined. ODP 982A, Pleistocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. *Ambocythere ramosa* van den Bold, 1965 is very similar to *Ambocythere whatleyi* sp. nov., but the latter is larger and has only one pore along the carina-like rim in the anterior margin. In contrast, *Ambocythere ramosa* has four pores there.

Ambocythere cf. *ramosa* van den Bold, 1965

FIGURE 17L–O

Locality and Age of Specimens Examined. DSDP 552A, Pliocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. This species is similar to *Ambocythere recta* Jellinek and Swanson, 2003 but differs in that *A. recta* has a well-developed dorsolateral ridge and lacks primary reticulation in most of its anterior half. This species is almost identical

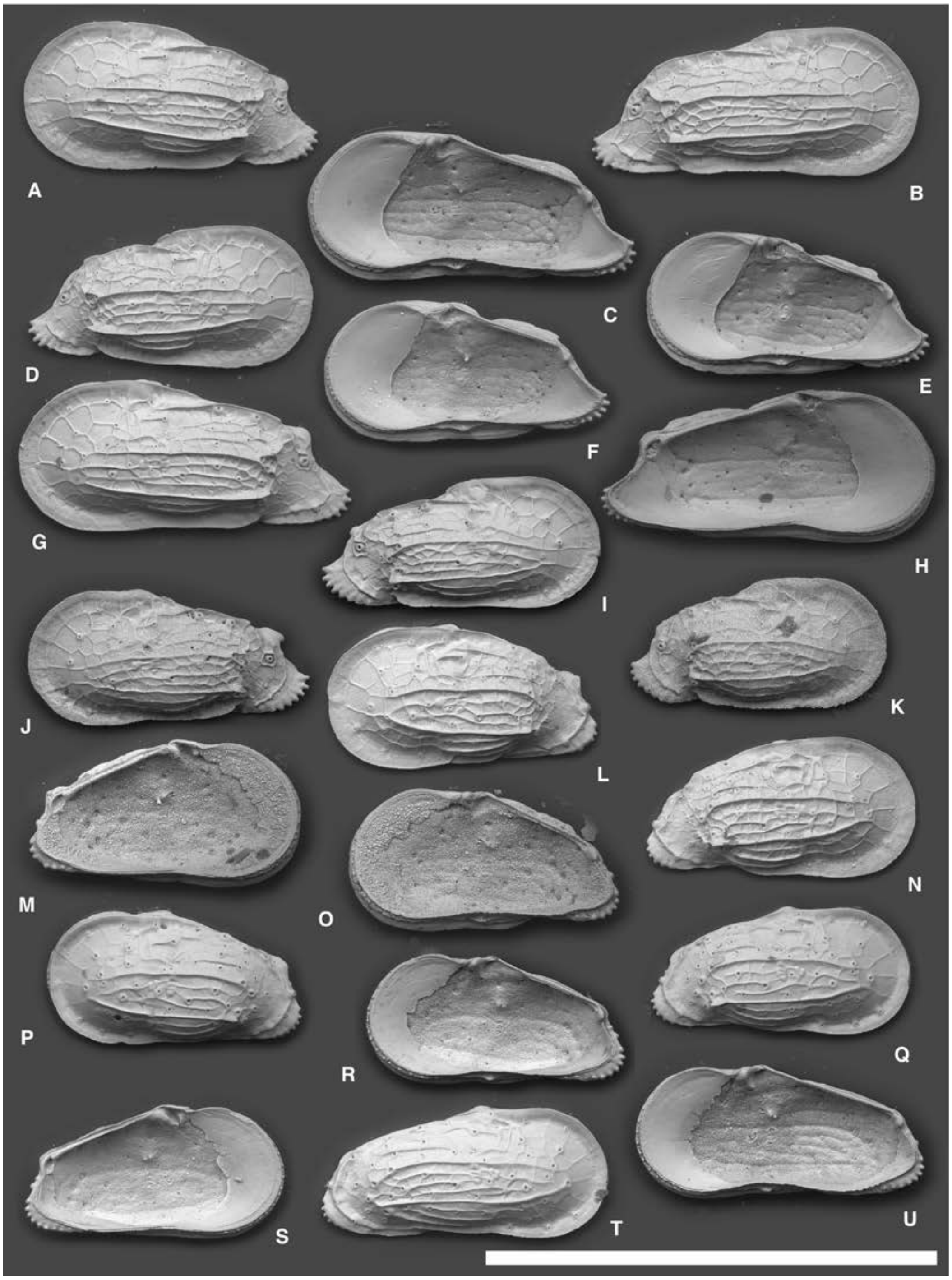


FIGURE 17. Scanning electron microscope images of *Ambocythere caudata* van den Bold, 1965, *Ambocythere tomocaudata* sp. nov., *Ambocythere ramosa* van den Bold, 1965, and *Ambocythere* cf. *ramosa* van den Bold, 1965. A–B, D, G, I–L, N, P–Q, T, lateral views; C, E–F, H, M, O, R–S, U, internal views. **A–H,** *Ambocythere caudata* van den Bold, 1965. A, ODP982012 (USNM 607264), adult LV from ODP 982A, 1/2/47–49, Pleistocene, northeastern Atlantic. B–C, ODP982013 (USNM 607265), adult RV from ODP 982A, 1/2/47–49, Pleistocene, northeastern Atlantic. D–E, ODP982014 (USNM 607266), adult RV from ODP 982A, 1/1/142–144, Pleistocene, northeastern Atlantic. F, ODP982015 (USNM 607267), adult RV from ODP 982A, 1/1/142–144, Pleistocene, northeastern Atlantic. G, ODP982016 (USNM 607268), adult LV from ODP 982A, 1/2/7–9, Pleistocene, northeastern Atlantic. H, ODP982017 (USNM 607269), adult LV from ODP 982A, 1/1/127–129, Pleistocene, northeastern Atlantic. **I–K,** *Ambocythere tomocaudata* sp. nov. I, GSM103 (USNM 607270), adult RV from WHOI 1608, Modern, northwestern Atlantic. J, GSM105 (USNM 607271), adult LV from WHOI 1617, Modern, northwestern Atlantic. K, GSM104 (USNM 607272), adult RV from WHOI 1608, Modern, northwestern Atlantic. **L–O,** *Ambocythere* cf. *ramosa* van den Bold, 1965. L–M, USGSD201 (USNM 607273), adult LV from DSDP 552A, 16/2/88–90, Pliocene, northeastern Atlantic. N–O, USGSD202 (USNM 607274), adult RV from DSDP 552A, 16/2/88–90, Pliocene, northeastern Atlantic. **P–U,** *Ambocythere ramosa* van den Bold, 1965. P, ODP982018 (USNM 607275), adult LV from ODP 982A, 1/2/107–109, Pleistocene, northeastern Atlantic. Q–R, ODP982019 (USNM 607276), adult RV from ODP 982A, 1/2/107–109, Pleistocene, northeastern Atlantic. S, ODP982020 (USNM 607277), adult LV from ODP 982A, 1/2/107–109, Pleistocene, northeastern Atlantic. T–U, ODP982021 (USNM 607278), adult LV from ODP 982A, 1/3/102–104, Pleistocene, northeastern Atlantic. Scale bar represents 1 mm.

to *Ambocythere ramosa* van den Bold, 1965 in regard to normal pore distribution and surface ornamentation, but its primary reticulation and dorsolateral ridge are better developed. In addition, this species is more slender than *Ambocythere ramosa*. This species has three (Figure 17N) or four pores (Figure 17L) along the carina-like rim in the anterior margin. More specimens are needed to confirm the distinctness of this species.

Ambocythere whatleyi sp. nov.

FIGURES 15W–Z, 18A–K

Ambocythere ramosa van den Bold; Benson, DelGrosso, and Steineck, 1983, pl. 2, figs. 1–2.

Ambocythere ramosa van den Bold; Maddocks and Steineck, 1987:340, pl. 1, figs. 14, 17; text-fig. 12a–g.

?*Ambocythere* sp. cf. *A. ramosa* van den Bold, Whatley and Coles, 1987, pl. 6, figs. 4–5.

Ambocythere sp. cf. *A. ramosa* van den Bold; Didié and Bauch, 2000, pl. 3, fig. 25.

Derivation of Name. In honor of Robin C. Whatley, formerly of University College of Wales, Aberystwyth, for his outstanding works on deep-sea ostracod taxonomy.

Holotype. Adult RV, USNM 607279 (GSM214; Figure 18A–B).

Paratypes. USNM 607280, 607281, 607282, 607283, 607284 (GSM237, GSM236, GSM213, ODP980078, RB411)

Type Locality and Horizon. KN 714-15A, 404, Quaternary, 58.7667°N, 25.9500°W, 2,598 m water depth, northeastern Atlantic.

Other Localities. KN 714-15A, ODP 980C, Alb 2714, Quaternary to Modern, northeastern and northwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Ambocythere* species characterized by its subrectangular outline, weakly developed caudal process, and well-developed primary reticulation.

Description. Carapace elongate and moderately calcified. Outline elongate, subrectangular in lateral view; anterior margin evenly rounded; caudal process weakly developed, pointed at subventral, bearing short spines in its ventral half; dorsal margin slightly rounded; ventral margin slightly sinuous. Anterodorsal corner almost absent; posterodorsal corner angular. Lateral surface ornamented with shallow primary reticulation; two distinct carinae running horizontally; flat and broad anterior marginal rim; a prominent pore conulus on dorsal margin of caudal process. Internal features as for genus.

Remarks. *Ambocythere whatleyi* sp. nov. is similar to *Ambocythere hyakunome* sp. nov., but the latter has better-developed carinae and six pores along the carina-like rim in the anterior margin. In contrast, *Ambocythere whatleyi* has only one pore there.

Ambocythere hyakunome sp. nov.

FIGURES 18L–P, 19A–F

Derivation of Name. *Hyakunome* means “hundred eyes” in Japanese. Prominent pore conuli look like numerous eyes.

Holotype. Adult RV, USNM 607285 (RB435; Figures 18L–M, 19A–B,E).

Paratypes. USNM 607286, USNM 607287 (RB438, RB459).

Type Locality and Horizon. Alb D2751, Modern, 16.9°N, 63.2°W, 1,256 m water depth, northwestern Atlantic.

Other Localities. Alb D2751, D2754, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Ambocythere* species characterized by prominent carinae and pore conuli.

Description. Carapace elongate and moderately calcified. Outline elongate, subrectangular in lateral view; anterior margin evenly rounded; caudal process weakly developed and upturned, bearing short spines in its ventral half; dorsal and ventral margins slightly sinuous. Anterodorsal corner slightly angular; posterodorsal corner angular. Lateral surface ornamented with subdued, rather unclear primary reticulation; numerous prominent pore conuli; two long and two short carinae running horizontally; carina-like sinuous dorsolateral ridge; anterior marginal rim; a prominent pore conulus situated on dorsal margin of caudal process and close to apex of caudal process. Internal features as for genus.

Remarks. *Ambocythere hyakunome* sp. nov. is similar to *Ambocythere ramosa* van den Bold, 1965, but the former is larger and has better-developed carinae. The number of pores along the carina-like rim in the anterior margin is also different in these two species (six in *Ambocythere hyakunome* and four in *Ambocythere ramosa*).

Ambocythere sp. 1

FIGURES 18Q–R, 19G–I

Locality and Age of Specimens Examined. AQ 14, Quaternary, equatorial western Pacific.

Dimensions. See Table 1.

Remarks. This species is similar to *Falsobuntonia* sp. 3 of Hou and Gou (2007), but the latter lacks a median lateral ridge.

Genus *Anebocythereis* Bate, 1972

Type Species. *Anebocythereis amoena* Bate, 1972.

Remarks. *Anebocythereis* Bate, 1972 is similar to *Marwickcythereis* Whatley and Millson, 1992, but the latter has

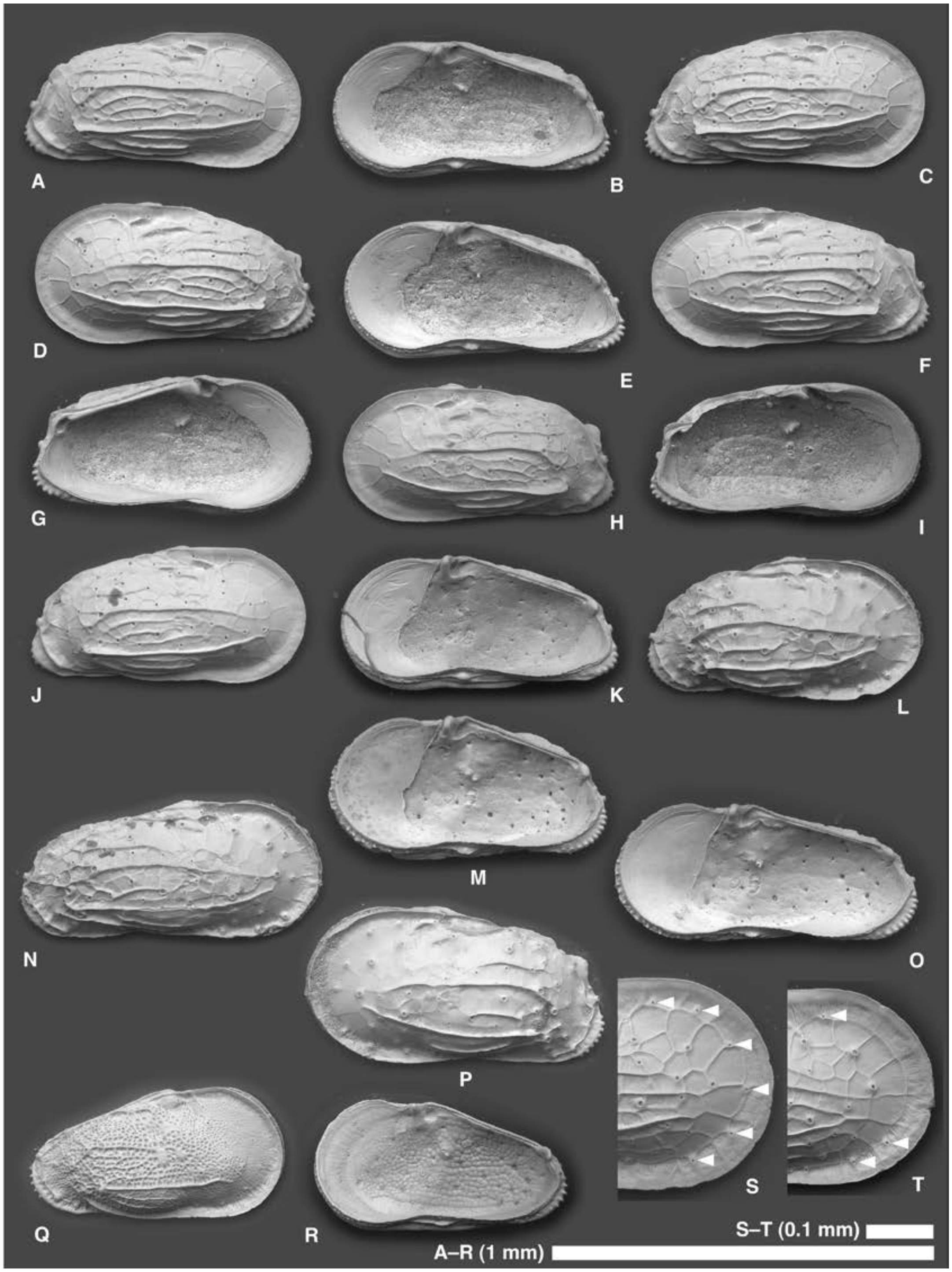


FIGURE 18. Scanning electron microscope images of *Ambocythere whatleyi* sp. nov., *Ambocythere hyakunome* sp. nov., *Ambocythere* sp. 1, *Ambocythere caudata* van den Bold, 1965, and *Ambocythere tomocaudata* sp. nov. A, C–D, F, H, J, L, N, P–Q, S–T, lateral views; B, E, G, I, K, M, O, R, internal views. **A–K,** *Ambocythere whatleyi* sp. nov. A–B, GSM214 (USNM 607279), adult RV from KN 714-15A, 404 cm, Quaternary, northeastern Atlantic. C, E, GSM237 (USNM 607280), adult RV from KN 714-15A, 133, Quaternary, northeastern Atlantic. D, GSM236 (USNM 607281), adult LV from KN 714-15A, 133, Quaternary, northeastern Atlantic. F–G, GSM213 (USNM 607282), adult LV from KN 714-15A, 404, Quaternary, northeastern Atlantic. H–I, ODP980078 (USNM 607283), adult LV from ODP 980C, 2/2/0–2, Pleistocene, northeastern Atlantic. J–K, RB411 (USNM 607284), adult RV from Alb 2714, Modern, northwestern Atlantic. **L–P,** *Ambocythere hyakunome* sp. nov. L–M, RB435 (USNM 607285), adult RV from Alb D2751, Modern, northwestern Atlantic. N–O, RB438 (USNM 607286), adult RV from Alb D2751, Modern, northwestern Atlantic. P, RB459 (USNM 607287), adult LV from Alb D2754, Modern, northwestern Atlantic. **Q–R,** *Ambocythere* sp. 1, POS1244 (USNM 607288), adult RV from AQ 14, 10–20, Quaternary, equatorial western Pacific. **S,** *Ambocythere caudata* van den Bold, 1965, ODP982014 (USNM 607266), close-up of anterior area, normal pores on anterior marginal rim denoted by arrows. **T,** *Ambocythere tomocaudata* sp. nov., GSM103 (USNM 607270), close-up of anterior area, normal pores on anterior marginal rim denoted by arrows. Scale bars represent 1 mm for A–R and 0.1 mm for S–T.

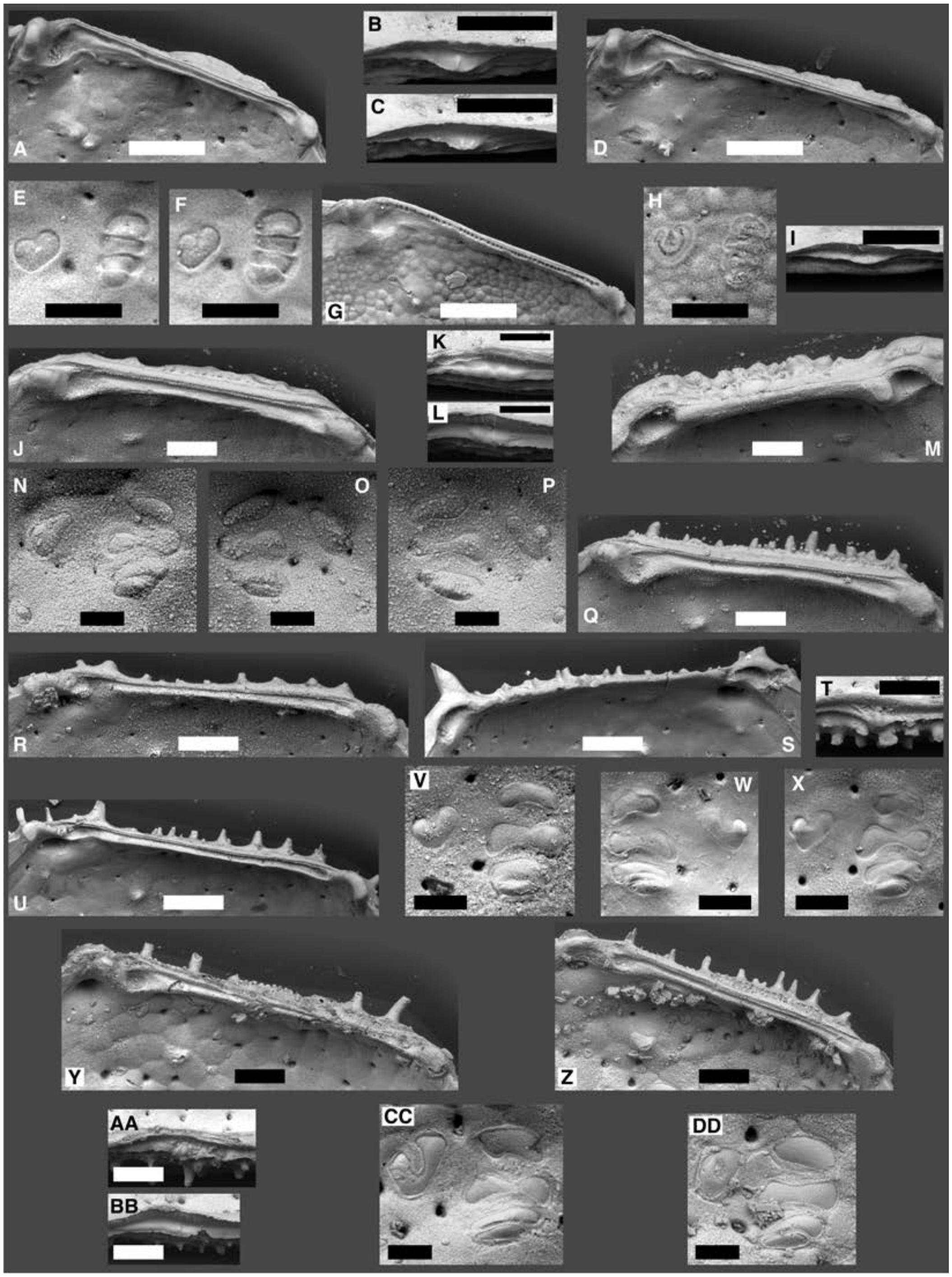


FIGURE 19. Internal details of *Ambocythere hyakunome* sp. nov., *Ambocythere* sp. 1, *Anebocythereis reticulata* (Guernet, 1985), *Marwickcythereis marwicki* (Hornibrook, 1952), and *Anebocythereis hostizea* (Hornibrook, 1952). **A–F,** *Ambocythere hyakunome* sp. nov. A–B, E, RB435 (USNM 607285), adult RV. A, hingement. B, ventromarginal area showing snap-knob structure. E, subcentral muscle scars. C–D, F, RB438 (USNM 607286), adult RV. C, ventromarginal area showing snap-knob structure. D, hingement. F, subcentral muscle scars. **G–I,** *Ambocythere* sp. 1, POS1244 (USNM 607288), adult RV. G, hingement. H, subcentral muscle scars. I, ventromarginal area showing snap-knob structure. **J–Q,** *Anebocythereis reticulata* (Guernet, 1985). J–K, N, TRA342 (USNM 607289), adult RV. J, hingement. K, ventromarginal area (snap-knob structure unclear). N, subcentral muscle scars. L, Q, TRA131 (USNM 607302), adult RV. L, ventromarginal area (snap-knob structure unclear). Q, hingement. M, O, TRA543 (USNM 607293), adult LV. M, hingement. O, subcentral muscle scar. P, TRA341 (USNM 607308), adult LV, subcentral muscle scars. **R–X,** *Marwickcythereis marwicki* (Hornibrook, 1952). R, T, V, TRA835 (USNM 607295), adult RV. R, hingement. T, ventromarginal area showing snap-knob structure. V, subcentral muscle scars. S, W, TRA1028 (USNM 607296), adult LV. S, hingement. W, subcentral muscle scars. U, X, TRA1029 (USNM 607297), adult RV. U, hingement. X, subcentral muscle scars. **Y–DD,** *Anebocythereis hostizea* (Hornibrook, 1952). Y, AA, CC, TRA827 (USNM 607299), adult RV. Y, hingement. AA, ventromarginal area showing snap-knob structure. CC, subcentral muscle scars. Z, BB, DD, TRA833 (USNM 607300), adult RV. Z, hingement. BB, ventromarginal area showing snap-knob structure. DD, subcentral muscle scars. Scale bars represent 0.1 mm for A–D, G, I–M, Q–U, Y–BB and 50 μm for E–F, H, N–P, V–X, CC–DD.

an almost vertically truncated posterior margin. Although Bate (1972) considered the hemimerodont hinge and narrow inner lamella important characters of this genus and the larger specimens that he examined as adults, the SEM images of the specimens shown in Bate (1972) look like typical trachyleberidid juveniles. In fact, no known trachyleberidid species has such a narrow inner lamella in the adult stage. Furthermore, subsequent researchers have assigned species with a paramphidont hinge and wide inner lamella to this genus. In sum, we tentatively consider that the adults of this genus have a paramphidont hinge and wide inner lamella, pending reexamination of the type species from the type locality.

Anebocythereis reticulata (Guernet, 1985)

FIGURES 19J–Q, 20A–K, 21E–R

Wichmannella? reticulata Guernet, 1985:285, pl. 4, figs. 8, 10, 11, 13.
non *Henryhowella? reticulata* (Guernet); Guernet and Galbrun, 1992, pl. 1, fig. 8.
Henryhowella melobesoides [*sic*] (Brady); Guernet, 1993:357, pl. 3, figs. 8, 11, 12.
Rugocythereis multiflora McKenzie, Reyment, and Reyment, 1993:111, pl. 7, figs. 4–6; pl. 8, fig. 18.
Anebocythereis hostizea (Hornibrook); Bergue and Govindan, 2010:751, fig. 3.8–3.12.
Marwickcythereis? aff. *reticulata* (Guernet), Hunt, Wicaksono, Brown, and MacLeod, 2010, text-fig. 2F.
?*Anebocythereis hostizea* (Hornibrook); Bergue and Nicolaidis, 2012:53, fig. 3.10–3.15.

Locality and Age of Specimens Examined. DSDP 214, 253, 255, 258, 522, 529, Eocene–Pleistocene, southeastern Atlantic and Indian Oceans.

Dimensions. See Table 1.

Remarks. We found three morphological forms: the "spinous" form (Figure 21E–P), in which muri throughout the lateral surface are covered by lateral papillate spines and spines growing inward toward the center of fossae; the "smooth" form (Figure 20A–C), in which lateral papillate spines are subdued and ingrowing spines are only very weakly developed; and the "intermediate" form (Figures 20D–K, 21Q,R). We treat these as intraspecific variations because the holotype and paratype specimens are not well preserved (based on SEM images of Guernet, 1985) and it is impossible to determine the form to which the type specimens belong. Further investigation is required to determine the taxonomic status of these morphological variants.

Anebocythereis hostizea (Hornibrook, 1952)

FIGURES 19Y–DD, 21A–D

Cythereis hostizea Hornibrook, 1952:37, pl. 5, figs. 72, 75, 78.
?*Anebocythereis hostizea* (Hornibrook); Ayress, 1993, fig. 9A.
Anebocythereis hostizea (Hornibrook); Ayress, 1995, fig. 9.9.
?*Anebocythereis hostizea?* (Hornibrook); Majoran, 1996, fig. 9S.
non *Anebocythereis hostizea* (Hornibrook); Bergue and Nicolaidis, 2012:53, fig. 3.10–3.15.

Locality and Age of Specimens Examined. SI-25, late Eocene, New Zealand.

Dimensions. See Table 1.

Remarks. *Anebocythereis hostizea* (Hornibrook, 1952) is very similar to the type species *Anebocythereis amoena* Bate, 1972, but the latter is much smaller and has a comparatively triangular shape. These facts support the suggestion that the specimens examined by Bate (1972) are juveniles. Additional specimens from Bate's locality in the Carnarvon Basin would help us to better understand the relationship between these two species. *Anebocythereis hostizea* also has a larger eye tubercle and coarser primary reticulation than *Anebocythereis amoena*.

Genus *Marwickcythereis* Whatley and Millson, 1992

Type Species. *Cythereis marwicki* Hornibrook, 1952.

Remarks. *Marwickcythereis* has a paramphidont hinge, although hingements of our specimens have a very weakly developed tooth at the anterior end of the median hinge bar and thus approach the hemimerodont condition. Whatley and Millson (1992) considered the hingement of this genus hemiamphidont, but both anterior and posterior terminal elements of the hingement appear crenulate in our specimens, indicating the paramphidont condition.

Marwickcythereis marwicki (Hornibrook, 1952)

FIGURES 19R–X, 20L–Q

Cythereis marwicki Hornibrook, 1952:36, pl. 4, figs. 62–64.
Marwickcythereis marwicki (Hornibrook); Whatley and Millson, 1992:42, fig. 1A–D.
?*Marwickcythereis marwicki* (Hornibrook); Ayress, 1995, fig. 10.14.

Locality and Age of Specimens Examined. SI-25, late Eocene, New Zealand; Hampden Formation, middle Eocene, New Zealand.

Dimensions. See Table 1.

Remarks. This is the type species of this genus, and two specimens from the middle Eocene Hampden Formation (from Ayress's [1993] sample) and a specimen from late Eocene New Zealand are shown here.

Marwickcythereis ericea (Brady, 1880)

FIGURES 22–23

Cythere ericea Brady, 1880:107, pl. 17, fig. 1a–d.
non *Cythereis ericea* (Brady); Tressler, 1941:101, pl. 19, fig. 23.

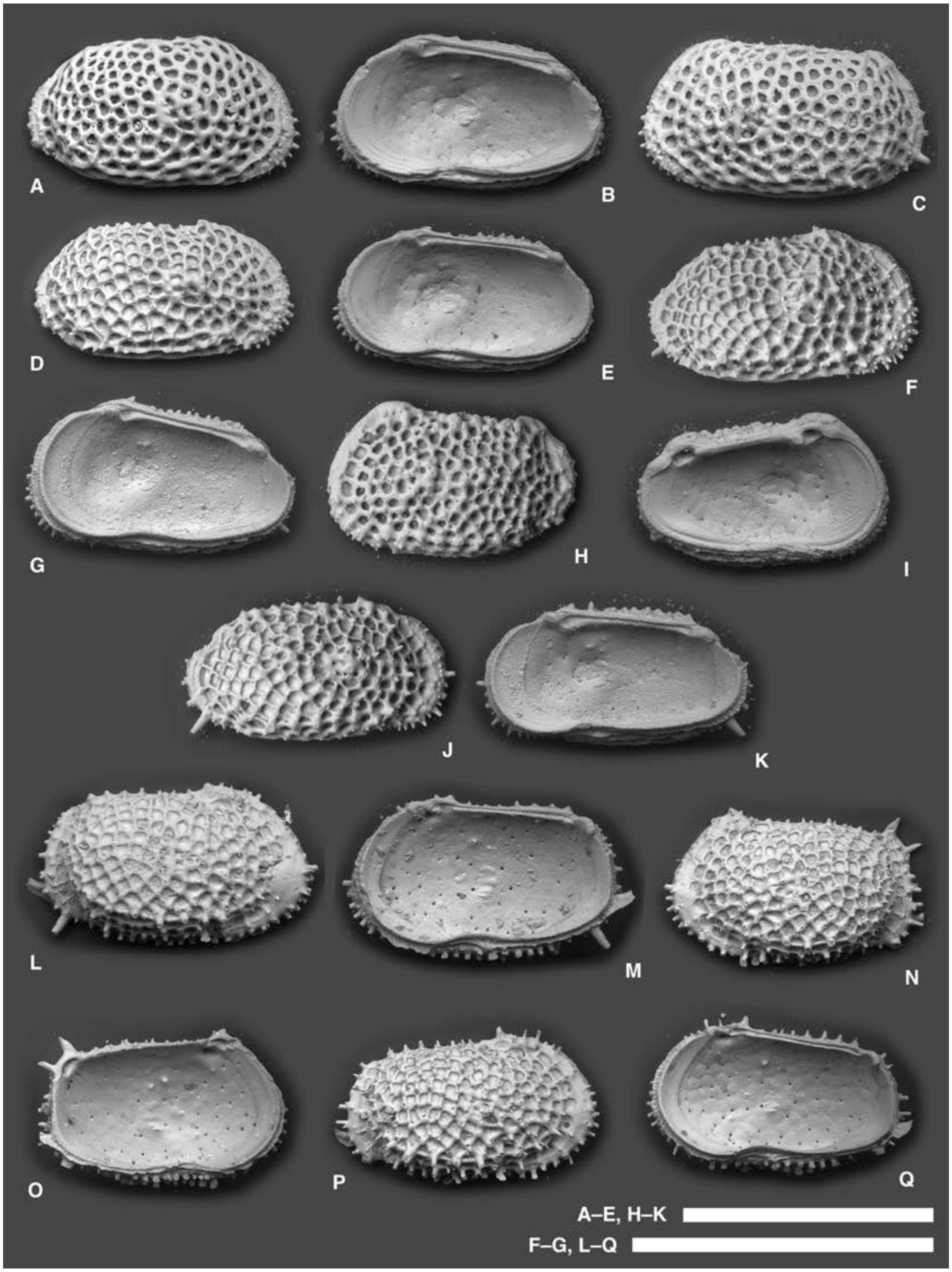


FIGURE 20. Scanning electron microscope images of *Anebocythereis reticulata* (Guernet, 1985) and *Marwickcythereis marwicki* (Hornibrook, 1952). A, C–D, F, H, J, L, N, P, lateral views; B, E, G, I, K, M, O, Q, internal views. **A–K,** *Anebocythereis reticulata* (Guernet, 1985). A–B, TRA342 (USNM 607289), adult RV from DSDP 258, 1/4/100–106, Pleistocene, Indian Ocean. C, TRA343 (USNM 607290), adult LV from DSDP 258, 1/4/100–106, Pleistocene, Indian Ocean. D–E, TRA344 (USNM 607291), adult RV from DSDP 258, 1/4/100–106, Pleistocene, Indian Ocean. F–G, TRA538 (USNM 607292), adult RV from DSDP 214, 27/cc, late Eocene, Indian Ocean. H–I, TRA543 (USNM 607293), adult LV from DSDP 214, 34/4/60–66, early Eocene, Indian Ocean. J–K, TRA544 (USNM 607294), adult RV from DSDP 214, 34/4/60–66, early Eocene, Indian Ocean. **L–Q,** *Marwickcythereis marwicki* (Hornibrook, 1952). L–M, TRA835 (USNM 607295), adult RV from SI-25, outcrop, late Eocene, New Zealand. N–O, TRA1028 (USNM 607296), adult LV from Hampden Formation, outcrop, middle Eocene, New Zealand. P–Q, TRA1029 (USNM 607297), adult RV from Hampden Formation, outcrop, middle Eocene, New Zealand. Scale bars represent 1 mm.

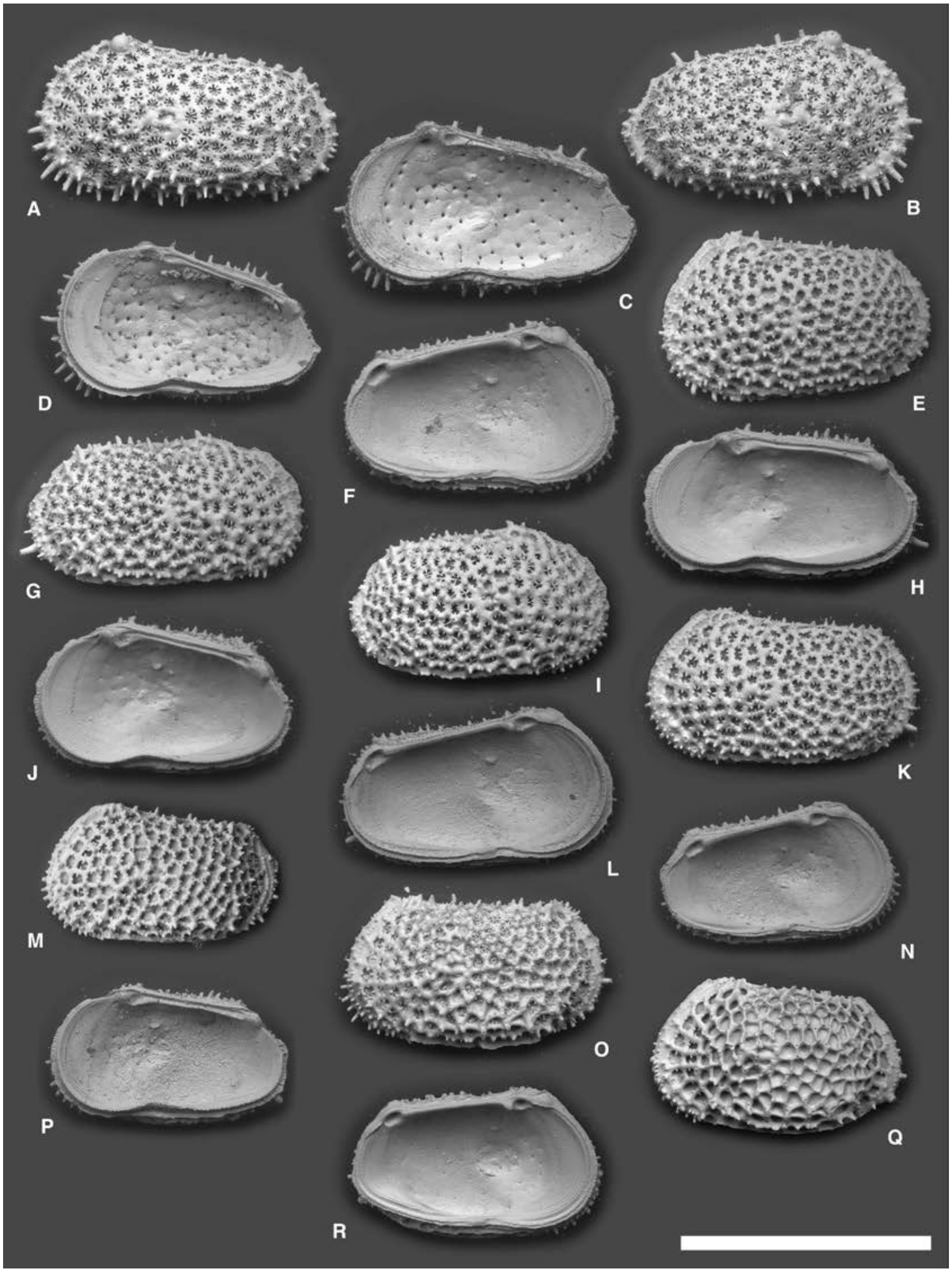


FIGURE 21. Scanning electron microscope images of *Anebocythereis hostizea* (Hornibrook, 1952) and *Anebocythereis reticulata* (Guernet, 1985). A–B, E, G, I, K, M, O, Q, lateral views; C–D, F, H, J, L, N, P, R, internal views. **A–D,** *Anebocythereis hostizea* (Hornibrook, 1952). A, TRA826 (USNM 607298), adult LV from SI-25, outcrop, late Eocene, New Zealand. B–C, TRA827 (USNM 607299), adult RV from SI-25, outcrop, late Eocene, New Zealand. D, TRA833 (USNM 607300), adult RV from SI-25, outcrop, late Eocene, New Zealand. **E–R,** *Anebocythereis reticulata* (Guernet, 1985). E–F, TRA130 (USNM 607301), adult LV from DSDP 529, 9/1/90–97, early Miocene, southeastern Atlantic. G–H, TRA131 (USNM 607302), adult RV from DSDP 529, 12/1/??, early Miocene, southeastern Atlantic. I–J, TRA132 (USNM 607303), adult RV from DSDP 529, 12/1/??, early Miocene, southeastern Atlantic. K–L, TRA237 (USNM 607304), adult LV from DSDP 522, 34/1/113–120, early Oligocene, southeastern Atlantic. M–N, TRA552 (USNM 607305), adult LV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. O, TRA1014 (USNM 607306), adult LV from DSDP 253, 10/3/100–106, late Oligocene, Indian Ocean. P, TRA1015 (USNM 607307), adult RV from DSDP 253, 10/3/100–106, late Oligocene, Indian Ocean. Q–R, TRA341 (USNM 607308), adult LV from DSDP 255, 3/2/70–76, Pliocene, Indian Ocean. Scale bar represents 1 mm.

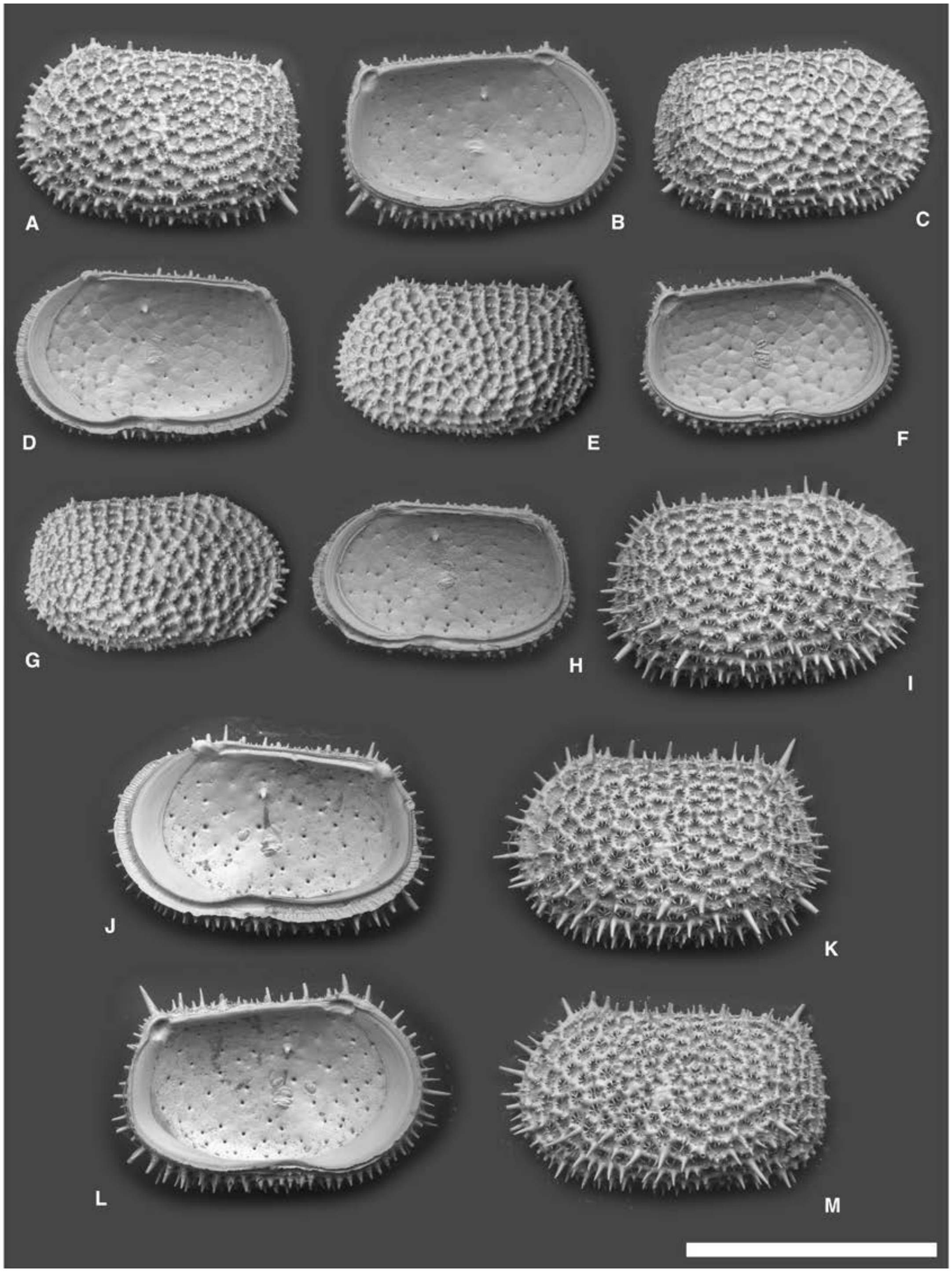


FIGURE 22. Scanning electron microscope images of *Marwickcythereis ericea* (Brady, 1880). A, C, E, G, I, K, M, lateral views; B, D, F, H, J, L, internal views. A–B, RB455 (USNM 607524), adult LV from Alb D2754, Modern, northwestern Atlantic. C–D, RB456 (USNM 607525), adult RV from Alb D2754, Modern, northwestern Atlantic. E–F, TRA601 (USNM 607526), adult LV from DSDP 516, 8/2/40–50, early Pliocene, southwestern Atlantic. G–H, TRA602 (USNM 607527), adult RV from DSDP 516, 8/2/40–50, early Pliocene, southwestern Atlantic. I–J, RB534 (USNM 607528), adult RV from AII 60 sta 262A, Modern, southwestern Atlantic. K–L, RB535 (USNM 607529), adult LV from AII 60 sta 262A, Modern, southwestern Atlantic. M, RB332 (USNM 607530), adult LV from AII 31 sta 159, Modern, southwestern Atlantic. Scale bar represents 1 mm.

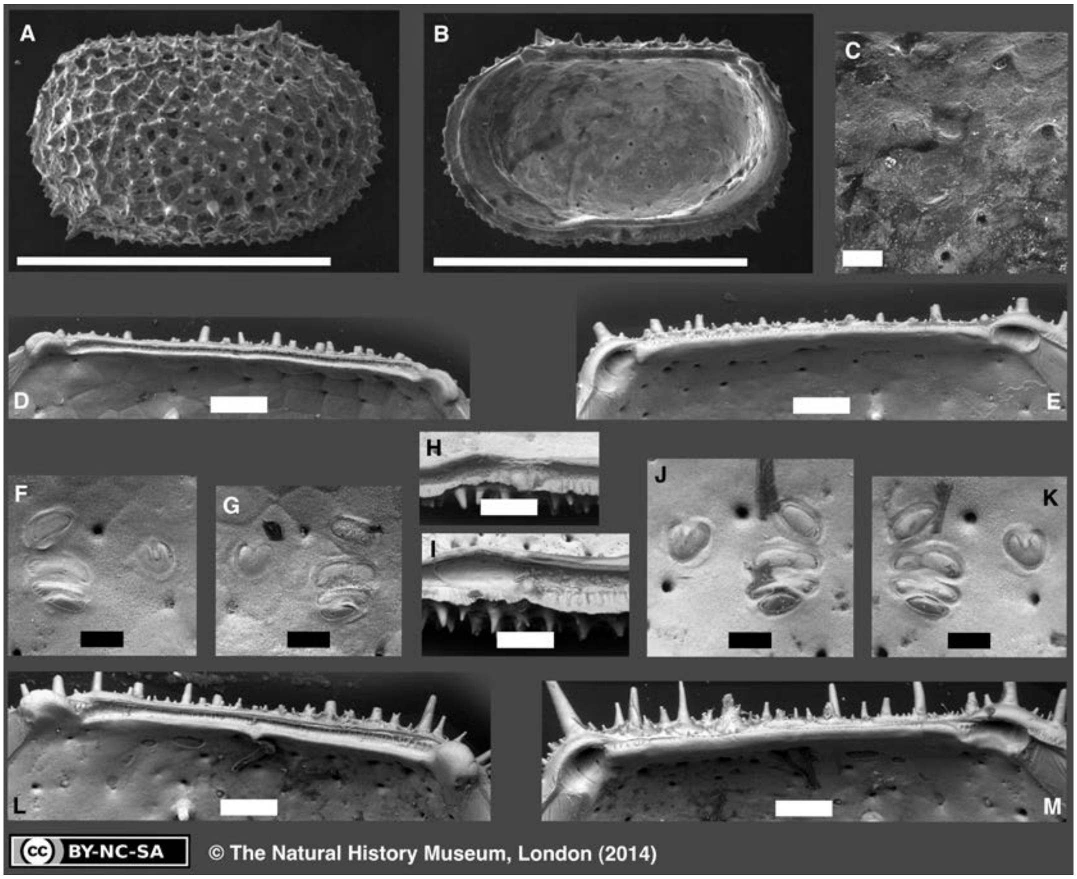


FIGURE 23. Lectotype and internal details of *Marwickcythereis ericea* (Brady, 1880). A–C, lectotype, NHM 80.38.76, adult RV, Challenger station 120, southwestern Atlantic. A, lateral view. B, internal view. C, subcentral muscle scars (not clearly visible). D, G–H, RB456 (USNM 607525), adult RV. D, hingement. G, subcentral muscle scars. H, ventromarginal area showing snap-knob structure. E–F, RB455 (USNM 607524), adult LV. E, hingement. F, subcentral muscle scars. I–J, L, RB534 (USNM 607528), adult RV. I, ventromarginal area showing snap-knob structure. J, subcentral muscle scars. L, hingement. K, M, RB535 (USNM 607529), adult LV. K, subcentral muscle scars. M, hingement. Scale bars represent 1 mm for A–B; 0.1 mm for D–E, H–I, L–M; and 50 μm for C, F–G, J–K. Images A–C under Creative Commons Attribution + Noncommercial + ShareAlike License (CC BY-NC-SA); copyright by The Trustees of The Natural History Museum, London (2014); used with permission.

"*Cythere*" *ericea* Brady; Sylvester-Bradley and Benson, 1971, fig. 32.
Cythere ericea Brady; Puri and Hulings, 1976:275, pl. 10, figs. 14–18.
Echinocythereis ericea (Brady); Benson and Peypouquet, 1983, pl. 1, fig. 8.

Locality and Age of Specimens Examined. Challenger station 120, AII 31 sta 159, AII 60 sta 262A, Alb D2754, DSDP 516, Modern and early Pliocene, northwestern and southwestern Atlantic.

Dimensions. See Table 1.

Remarks. This Brady species was assigned to *Echinocythereis* Puri, 1954 by Benson and Peypouquet (1983). However, in our opinion, this species belongs to *Marwickcythereis* and not *Echinocythereis* because of its V-shaped frontal scar, almost vertically truncated posterior margin, and especially characteristic outline. Although the preservation of the lectotype specimen is not very good and subcentral muscle scars are not clearly visible in the lectotype (Figure 23A–C), our specimens from the southwestern Atlantic Ocean (type locality) are well preserved and provide important details such as the V-shaped frontal scar.

Genus *Atlanticythere* Benson, 1977

Type Species. *Atlanticythere maestrichtia* Benson, 1977.

Remarks. *Atlanticythere* is a Cretaceous and Paleogene genus that has rarely been studied in detail, except for Benson's original studies. *Atlanticythere* is most similar to *Dutoitella* Dingle, 1981, but Dingle (1981) differentiated *Dutoitella* on the basis of its continuous anterior marginal-ventrolateral ridge, much more prominent subcentral tubercle and postadjacent node or nodes, much smaller size, and unevenly rounded anterior and posterior marginal rims. *Atlanticythere* also has well-developed secondary reticulation, which is lacking in most species of *Dutoitella*. However, since the original description of *Dutoitella* by Dingle (1981), many *Dutoitella* species have been described, and many of them have a weakly developed subcentral tubercle and postadjacent node or nodes, large size, and evenly rounded anterior and posterior marginal rims (e.g., Coles and Whatley, 1989; Mazzini, 2005). Furthermore, the well-preserved specimens shown here provide subcentral muscle scar information that was not available in the original description of *Atlanticythere* and *Dutoitella*. Both genera have identical subcentral muscle scars with a divided frontal scar and four rows of adductor scars, with the dorsomedian one divided. In sum, a continuous anterior marginal-ventrolateral ridge (i.e., a ventrolateral ridge that merges with the anterior marginal rim) and, to a lesser degree, secondary reticulation are the only characteristics to distinguish these two genera. Because both of these genera are widely accepted, we consider these two genera to be valid, although the differences are rather subtle and species can have intermediate features (e.g., *Dutoitella atlantiformis* sp. nov.).

We consider *Kefiella* Donze and Said, 1982 (in Donze et al., 1982) a junior synonym of *Atlanticythere*, as the hingement and subcentral muscle scars are the same between these genera (i.e., holamphidont hinge, divided frontal scar, and divided dorsal and/or dorsomedian adductor scars). Donze et al. (1982) considered the much smaller size, presence of a median lateral ridge, and more punctate surface ornamentation diagnostic characters to distinguish *Kefiella* from *Atlanticythere*. However, these characters are not necessarily exclusive to *Kefiella*: the lengths of specimens figured by Donze et al. (1982) range from ~0.7 to 0.85 mm (measured from their plates, assuming the reported magnifications), but this range is within the size variation of *Atlanticythere* species included here. The short median lateral ridge in the posterior half of the type species of *Kefiella* may also be recognized in some species of *Atlanticythere* as a row of spines (e.g., Figure 24N). *Atlanticythere maestrichtia* Benson, 1977 also has a punctate appearance without primary reticulation.

SYNONYMIZED GENUS. *Kefiella* Donze and Said, 1982 (in Donze et al., 1982).

***Atlanticythere maestrichtia* Benson, 1977**

FIGURES 24A–L, 25A–D

Atlanticythere maestrichtia Benson, 1977:877, pl. 2. fig. 4.

?*Atlanticythere maestrichtia*? Benson; Majoran, Kucera, and Widmark, 1998:66, pl. 2, fig. 4.

LOCALITY AND AGE OF SPECIMENS EXAMINED. DSDP 21, Campanian–Maastrichtian, southwestern Atlantic.

DIMENSIONS. See Table 1.

REMARKS. This is the type species of *Atlanticythere* Benson, 1977, and internal details are shown here for the first time.

***Atlanticythere bensoni* sp. nov.**

FIGURES 24M–S, 25E–H

DERIVATION OF NAME. In honor of the late Richard H. Benson, formerly of Smithsonian Institution, for his pioneering work on Paleogene deep-sea ostracods.

HOLOTYPE. Adult LV, USNM 607318 (TRA633; Figures 24N–O, 25F,H).

PARATYPES. USNM 607317, 607319, 607320, 607321 (TRA632, TRA634, TRA635, TRA705).

TYPE LOCALITY AND HORIZON. DSDP 21A, 3/4/50–56, Paleocene to early Eocene, 28.5850°S, 30.5975°W, 2,113 m water depth, southwestern Atlantic.

OTHER LOCALITIES. DSDP 21, 21A, Campanian–Maastrichtian and Paleocene to early Eocene, southwestern Atlantic.

DIMENSIONS. See Table 1.

DIAGNOSIS. *Atlanticythere* species characterized by well-developed secondary reticulation and weakly developed primary reticulation and lateral tubercles.

DESCRIPTION. Carapace moderately calcified, with greatest height at anterodorsal corner. Outline subrectangular in lateral view; anterior margin evenly rounded, bearing marginal frill (seen in internal view) and spines; posterior margin blunt and rounded, bearing spines; dorsal margin almost straight, with four or more clavate spines; ventral margin almost straight; ventrolateral ridge short but well developed, bearing four clavate spines; median lateral ridge weakly developed and composed of a row of small spines; subcentral tubercle well developed. Anterodorsal and posterodorsal corners angular especially in LV. Lateral surface ornamented with weakly developed primary and well-developed secondary reticulation and prominent pore conuli; primary reticulation almost absent in anterior half. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont. Frontal muscle scar present, but details not clearly visible. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

REMARKS. *Atlanticythere bensoni* sp. nov. is similar to *Atlanticythere murareticulata* Benson, 1977 but can be distinguished by its lack of primary reticulation in the anterior half and its less tubercular carapace. *Atlanticythere bensoni* sp. nov. is also similar to *Atlanticythere maestrichtia* Benson, 1977, but the latter lacks primary reticulation, has less developed secondary reticulation and pore conuli, and has anterior and posterior margins that are more equal in size.

***Atlanticythere murareticulata* Benson, 1977**

FIGURES 25I–L,N, 26, 27A–J

Atlanticythere murareticulata Benson, 1977:877, pl. 2. fig. 3.

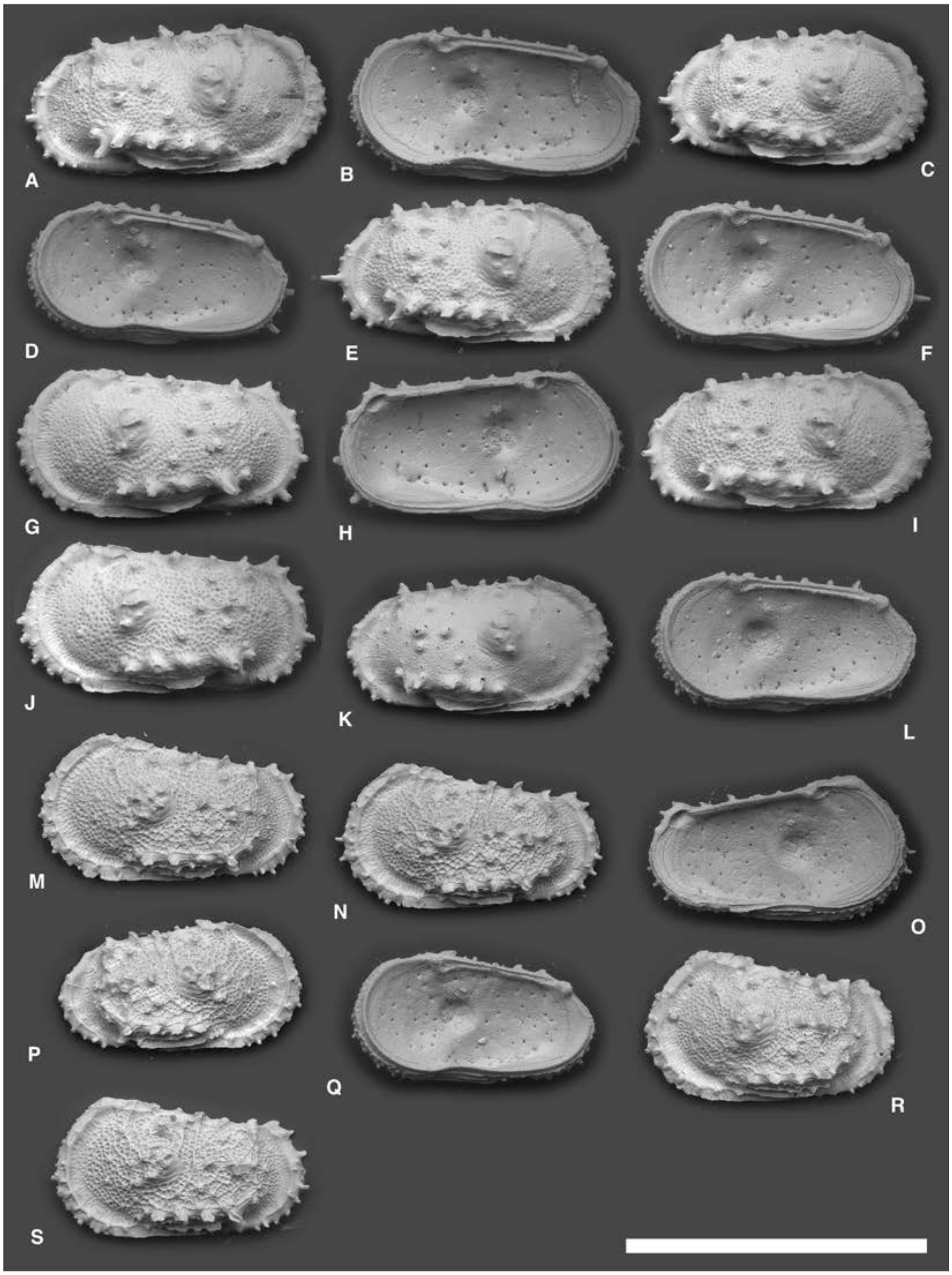


FIGURE 24. Scanning electron microscope images of *Atlanticythere maestrichtia* Benson, 1977 and *Atlanticythere bensoni* sp. nov. A, C, E, G, I–K, M–N, P, R–S, lateral views; B, D, F, H, L, O, Q, internal views. **A–L,** *Atlanticythere maestrichtia* Benson, 1977. A, TRA702 (USNM 607309), adult RV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. B, TRA703 (USNM 607310), adult RV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. C–D, TRA706 (USNM 607311), adult RV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. E–F, TRA712 (USNM 607312), adult RV from DSDP 21, 4/1/148–150, Campanian–Maastrichtian, southwestern Atlantic. G–H, TRA704 (USNM 607313), adult LV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. I, TRA721 (USNM 607314), adult RV from DSDP 21, 4/4/60–66, Campanian–Maastrichtian, southwestern Atlantic. J, TRA720 (USNM 607315), adult LV from DSDP 21, 4/4/60–66, Campanian–Maastrichtian, southwestern Atlantic. K–L, TRA723 (USNM 607316), adult RV from DSDP 21, 4/5/148–150, Campanian–Maastrichtian, southwestern Atlantic. **M–S,** *Atlanticythere bensoni* sp. nov. M, TRA632 (USNM 607317), adult LV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. N–O, TRA633 (USNM 607318), adult LV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. P–Q, TRA634 (USNM 607319), adult RV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. R, TRA635 (USNM 607320), adult LV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. S, TRA705 (USNM 607321), adult LV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. Scale bar represents 1 mm.

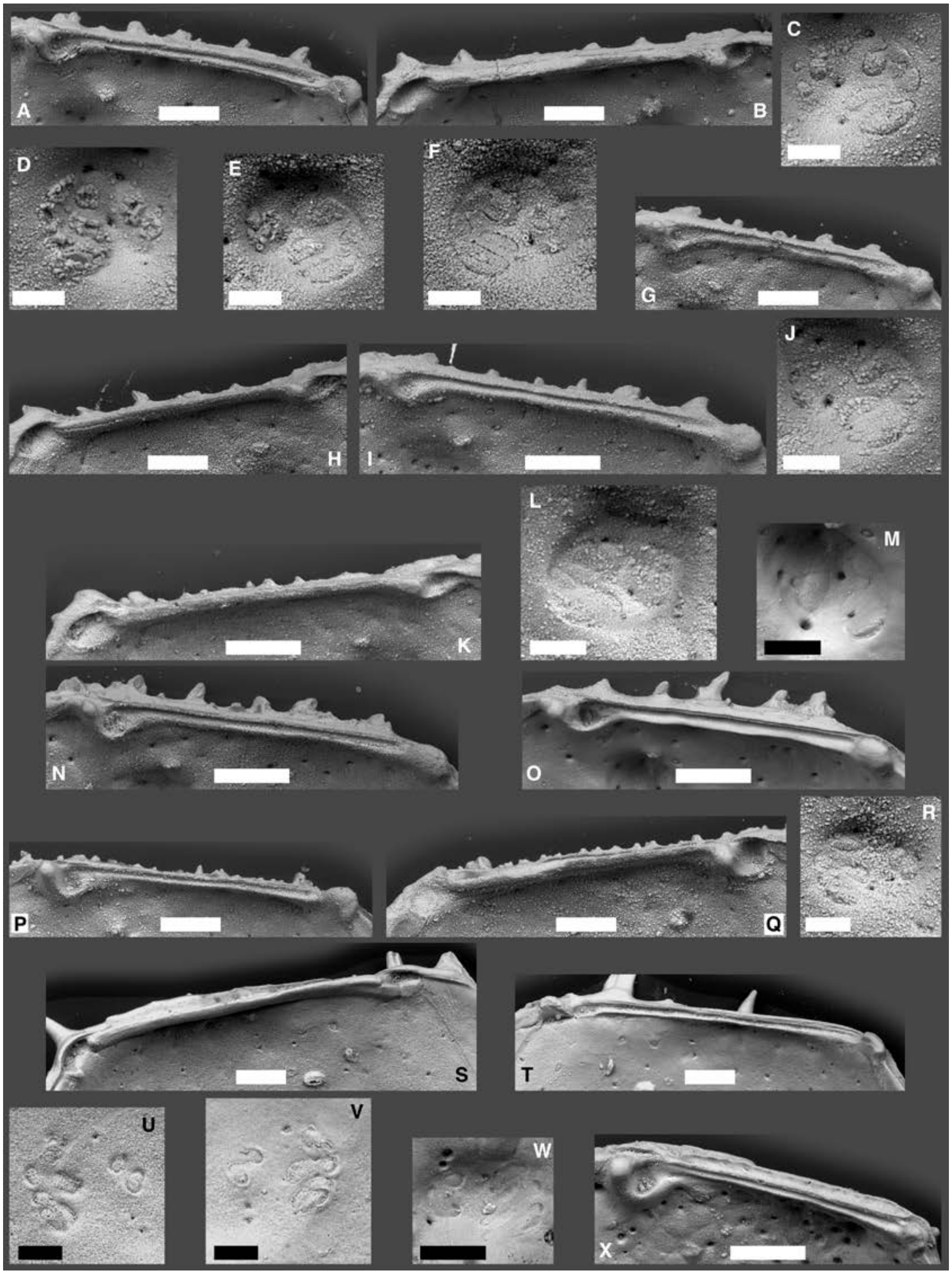


FIGURE 25. Internal details of *Atlanticythere maestrichtia* Benson, 1977, *Atlanticythere bensoni* sp. nov., *Atlanticythere murareticulata* Benson, 1977, *Atlanticythere oculi* sp. nov., *Atlanticythere prethalassia* Benson, 1977, *Bathycythere vanstraateni* Sissingh, 1971, and *Cletocythereis scutulata* (Howe, 1951). **A–D,** *Atlanticythere maestrichtia* Benson, 1977. A, C, TRA712 (USNM 607312), adult RV. A, hingement. C, subcentral muscle scars. B, D, TRA704 (USNM 607313), adult LV. B, hingement. D, subcentral muscle scars. **E–H,** *Atlanticythere bensoni* sp. nov. E, G, TRA634 (USNM 607319), adult RV. E, subcentral muscle scars. G, hingement. F, H, TRA633 (USNM 607318), adult LV. F, subcentral muscle scars. H, hingement. **I–L, N,** *Atlanticythere murareticulata* Benson, 1977. I–J, TRA643 (USNM 607324), adult RV. I, hingement. J, subcentral muscle scars. K–L, TRA631 (USNM 607326), adult LV. K, hingement. L, subcentral muscle scars. N, TRA333 (USNM 607334), adult RV, hingement. **M, O,** *Atlanticythere oculi* sp. nov., TRA320 (USNM 607343), adult RV. M, subcentral muscle scars. O, hingement. **P–R,** *Atlanticythere prethalassia* Benson, 1977. P, TRA713 (USNM 607347), adult RV, hingement. Q–R, TRA709 (USNM 607346), adult LV. Q, hingement. R, subcentral muscle scars. **S–V,** *Bathycythere vanstraateni* Sissingh, 1971. S, U, RB532 (USNM 607359), adult LV. S, hingement. U, subcentral muscle scars. T, V, RB533 (USNM 607360), adult RV. T, hingement. V, subcentral muscle scars. **W–X,** *Cletocythereis scutulata* (Howe, 1951). W, TRA852 (USNM 607365), adult RV, subcentral muscle scars. X, TRA853 (USNM 607366), adult RV, hingement. Scale bars represent 0.1 mm for A–B, G–I, K, N–Q, S–T, X and 50 μm for C–F, J, L–M, R, U–W.

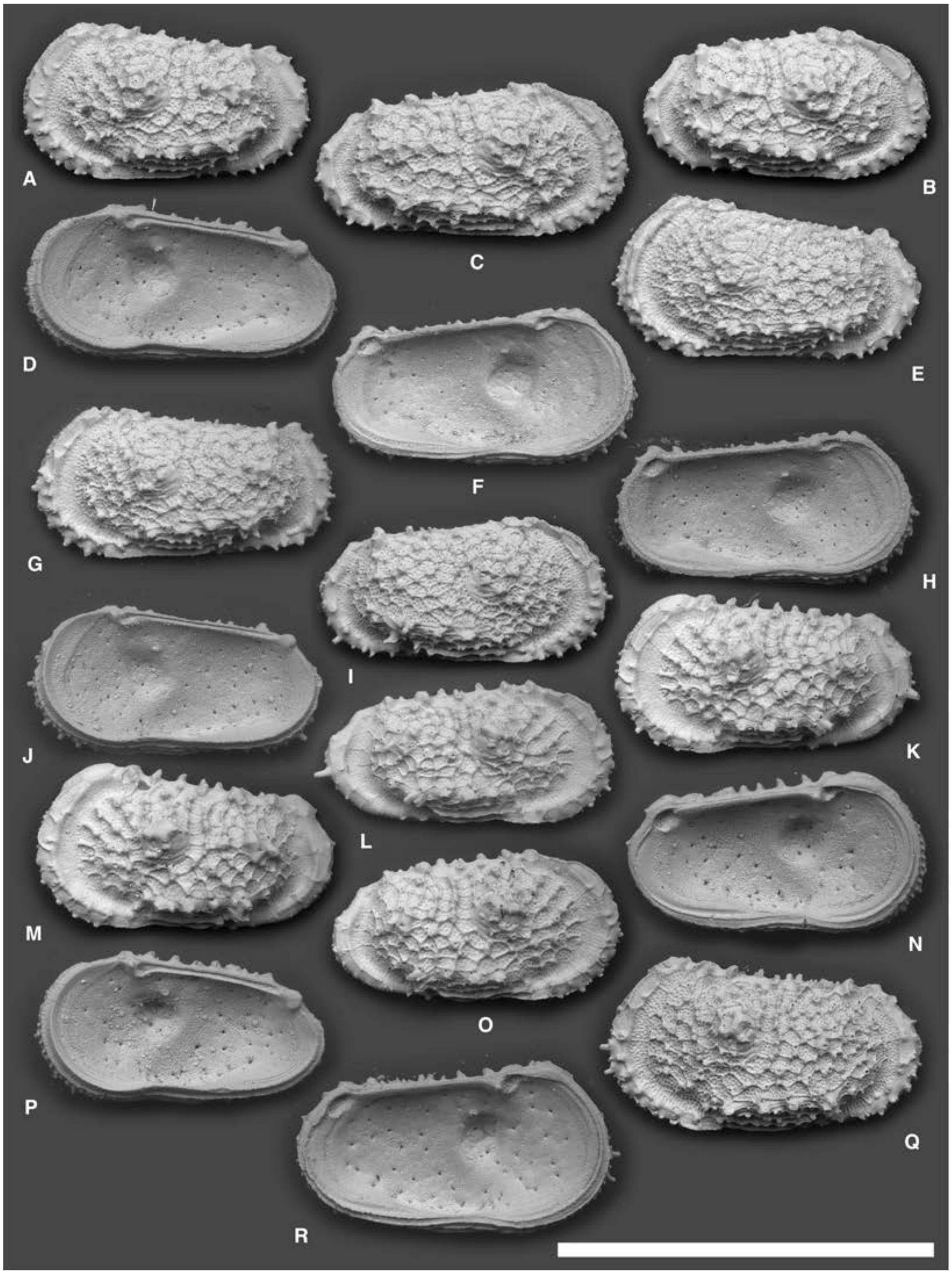


FIGURE 26. Scanning electron microscope images of *Atlanticythere murareticulata* Benson, 1977. A–C, E, G, I, K–M, O, Q, lateral views; D, F, H, J, N, P, R, internal views. A, TRA641 (USNM 607322), adult LV from DSDP 21A, 1/4/50–56, middle Eocene, southwestern Atlantic. B, TRA642 (USNM 607323), adult RV from DSDP 21A, 1/4/50–56, middle Eocene, southwestern Atlantic. C–D, TRA643 (USNM 607324), adult RV from DSDP 21A, 1/4/50–56, middle Eocene, southwestern Atlantic. E, TRA630 (USNM 607325), adult LV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. F, TRA631 (USNM 607326), adult LV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. G–H, TRA639 (USNM 607327), adult LV from DSDP 21A, 2/4/50–56, early Eocene, southwestern Atlantic. I–J, TRA640 (USNM 607328), adult RV from DSDP 21A, 2/4/50–56, early Eocene, southwestern Atlantic. K, TRA103 (USNM 607329), adult LV from DSDP 526A, 22/1/124–131, early Miocene, southeastern Atlantic. L, TRA104 (USNM 607330), adult RV from DSDP 526A, 22/1/124–131, early Miocene, southeastern Atlantic. M–N, TRA105 (USNM 607331), adult LV from DSDP 526A, 22/1/124–131, early Miocene, southeastern Atlantic. O–P, TRA106 (USNM 607332), adult RV from DSDP 526A, 22/1/124–131, early Miocene, southeastern Atlantic. Q–R, TRA332 (USNM 607333), adult LV from DSDP 357, 6/2/50–60, middle Miocene, southwestern Atlantic. Scale bar represents 1 mm.

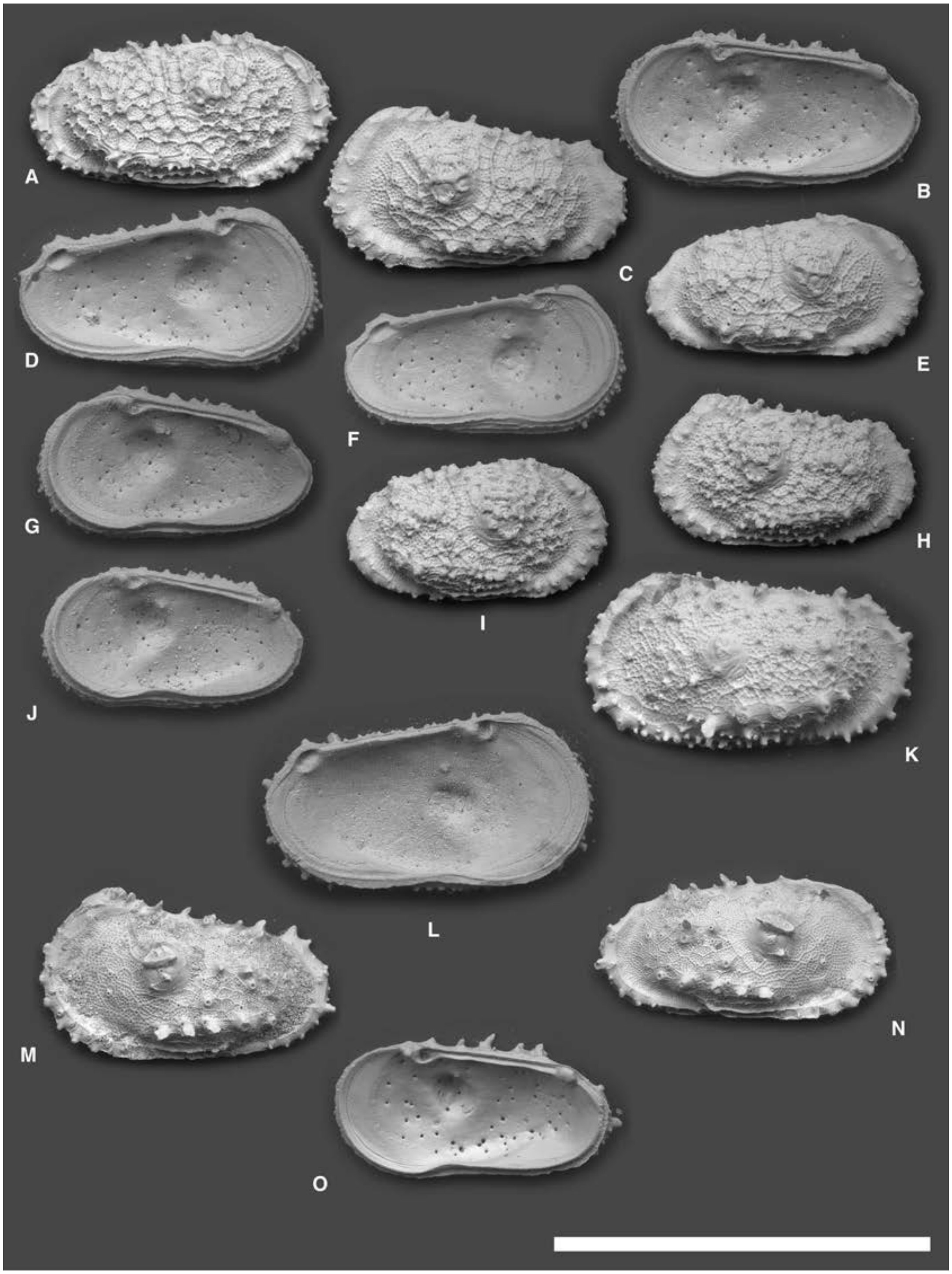


FIGURE 27. Scanning electron microscope images of *Atlanticythere murareticulata* Benson, 1977, *Atlanticythere prethalassia* Benson, 1977, and *Atlanticythere oculi* sp. nov. A, C, E, H–I, K, M–N, lateral views; B, D, F–G, J, L, O, internal views. **A–J,** *Atlanticythere murareticulata* Benson, 1977. A–B, TRA333 (USNM 607334), adult RV from DSDP 357, 6/2/50–60, middle Miocene, southwestern Atlantic. C–D, TRA126 (USNM 607335), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. E, TRA127 (USNM 607336), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. F, TRA128 (USNM 607337), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. G, TRA129 (USNM 607338), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. H, TRA124 (USNM 607339), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. I–J, TRA125 (USNM 607340), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. **K–L,** *Atlanticythere prethalassia* Benson, 1977, TRA724 (USNM 607341), adult LV from DSDP 21, 4/5/148–150, Campanian–Maastrichtian, southwestern Atlantic. **M–O,** *Atlanticythere oculi* sp. nov. M, TRA319 (USNM 607342), adult LV from DSDP 359, 3/2/53–60, late Eocene, southeastern Atlantic. N–O, TRA320 (USNM 607343), adult RV from DSDP 359, 3/2/53–60, late Eocene, southeastern Atlantic. Scale bar represents 1 mm.

Locality and Age of Specimens Examined. DSDP 21A, Paleocene–Eocene, southwestern Atlantic; DSDP 357, middle Miocene, southwestern Atlantic; DSDP 526A, 526C, late Eocene and early Miocene, southeastern Atlantic.

Dimensions. See Table 1.

Remarks. The specimens in Figures 25I–J and 26A–D are from the type locality and horizon.

Atlanticythere prethalassia Benson, 1977

FIGURES 25P–R, 27K–L, 28A–S

Atlanticythere prethalassia Benson, 1977:877, pl. 2, fig.1.

Locality and Age of Specimens Examined. DSDP 21, Campanian–Maastrichtian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. Internal details are shown here for the first time.

Atlanticythere oculi sp. nov.

FIGURES 25M,O, 27M–O

Derivation of Name. From the Latin *oculi* (a noun in the genitive case), meaning "eye," referring to its resemblance to a human eye, with the subcentral tubercle as the pupil and spines on the dorsal margin and ventrolateral ridge as eyelashes.

Holotype. Adult RV, USNM 607343 (TRA320; Figures 25M,O, 27N–O).

Paratype. USNM 607342 (TRA319).

Type Locality and Horizon. DSDP 359, 3/2/53–60, late Eocene, 34.9850°S, 4.4972°W, 1,655 m water depth, southeastern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Atlanticythere* species characterized by a well-developed and very large spatulate spine on the subcentral tubercle.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular-subtriangular in lateral view; anterior margin evenly rounded, bearing weakly developed marginal frill (seen in internal view) and spines; posterior margin blunt, bearing spines; dorsal margin almost straight, bearing four or more clavate spines; ventral margin almost straight; ventrolateral ridge short but well developed, bearing four clavate spines; subcentral tubercle well developed with a very large clavate spine. Anterodorsal corner angular and prominent in LV and almost flat in RV; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with weakly developed primary and secondary reticulation and small pore conuli. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont. Frontal muscle scar present, but details not clearly visible. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

Remarks. *Atlanticythere oculi* sp. nov. is similar to *Atlanticythere maestrichtia* Benson, 1977 but is distinguished by its comparatively triangular and slender outline, primary reticulation, and much larger clavate spine on the subcentral tubercle. *Atlanticythere oculi* sp. nov. is similar to *Atlanticythere bensoni* sp. nov., but it has primary reticulation on its anterior half and a large clavate spine on the subcentral tubercle. *Atlanticythere murareticulata* Benson, 1977 is distinguished from *Atlanticythere oculi* sp. nov. by its much more tuberculate carapace.

Genus *Bathycythere* Sissingh, 1971

Type Species. *Bathycythere vanstraateni* Sissingh, 1971.

Remarks. *Bathycythere* Sissingh, 1971 is similar to *Legitimocythere* Coles and Whatley, 1989 but is distinguished by its subdivided frontal scar and subdivided dorsomedian and/or ventromedian adductor scar(s) and the lack of reticulation. Extensive details for the type species are found in the original description (Sissingh, 1971), Sissingh (1974), and Mazzini (2005). The type species of *Bathycythere vanstraateni* and *Cythere audax* Brady and Norman, 1889 are commonly assigned to *Bathycythere*. However, as discussed in detail in Ayress et al. (2004), *Cythere audax* has a single ovate frontal scar. Furthermore, the original specimen (although a holotype or lectotype has never been designated) illustrated by Brady and Norman (1889) is most likely a juvenile (Ayress et al., 2004), and the adult specimens shown by Ayress et al. (2004) and also here (Figures 77J–K, 78K) clearly show an undivided frontal scar, holamphidont hinge, and spinous carapace with primary reticulation. Thus, *Cythere audax* belongs to *Legitimocythere*, that is, *Legitimocythere audax* (Brady and Norman, 1889). Currently, only two species assignable to *Bathycythere* have been described, *Bathycythere vanstraateni* Sissingh, 1971 and *Bathycythere comitatus* Wouters, 1994.

Bathycythere vanstraateni Sissingh, 1971

FIGURES 25S–V, 29A–G

Bathycythere vanstraateni Sissingh, 1971:410, pls. 1–2; text-figs. 2–4.

"*Xandarosina*" (nomen nudum); Benson and Sylvester-Bradley, 1971:76, fig. 3.3.

Bathycythere vanstraateni Sissingh; Sissingh, 1974:133, pls. 2.22.134, 2.22.136, 2.22.138, 2.22.140.

Bathycythere vanstraateni Sissingh; Mazzini, 2005:48, fig. 25K–N.

Locality and Age of Specimens Examined. AII 59 sta 214, Modern, Mediterranean Sea; Chain 82-24-4P, Holocene, North Atlantic; DSDP 607, late Pliocene, North Atlantic.

Dimensions. See Table 1.

Remarks. Scanning electron microscope images of a paratype as well as comprehensive synonymy and discussion are provided in Mazzini (2005), and extensive SEM images of topotype specimens are shown in Sissingh (1974). The

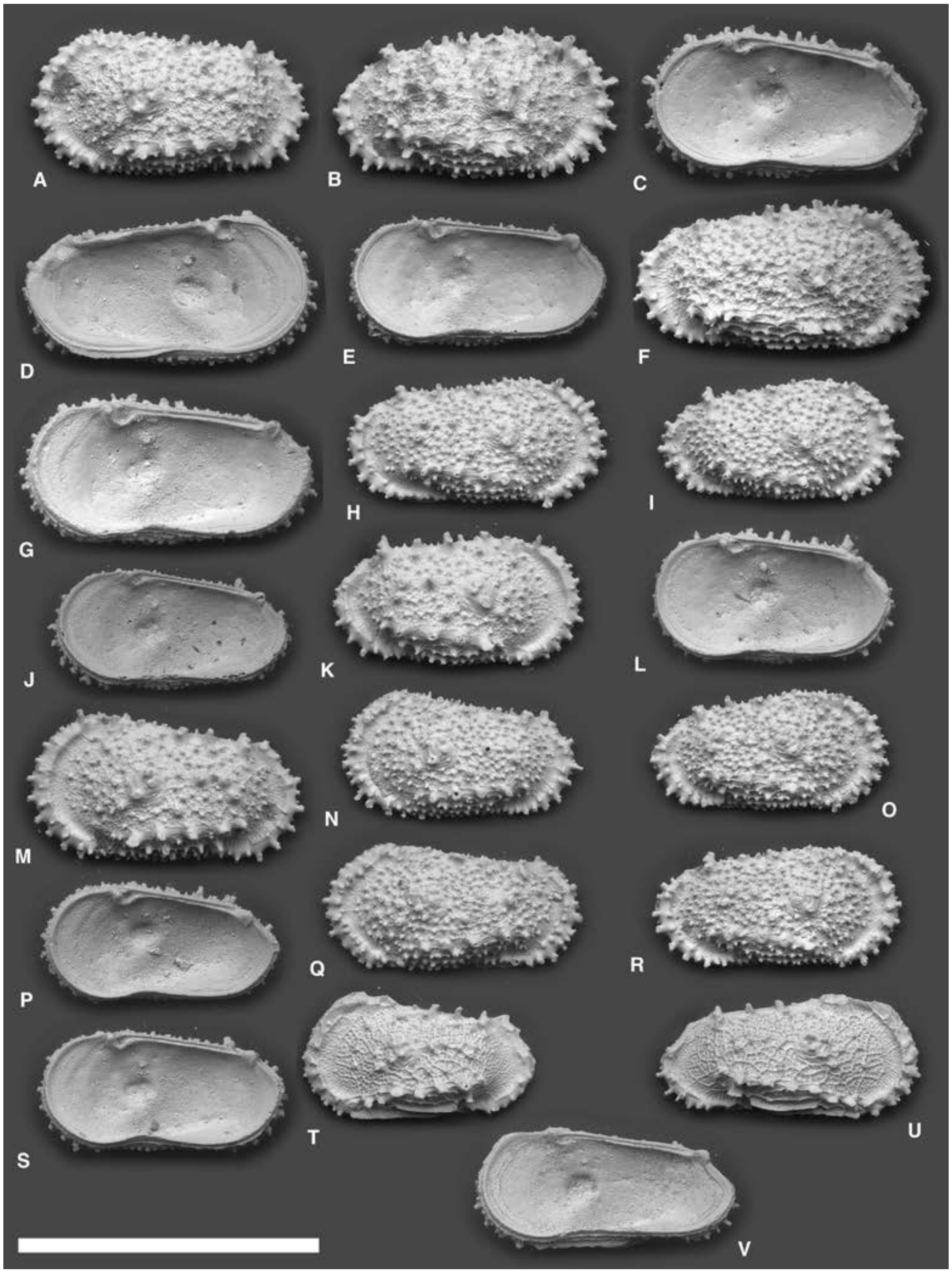


FIGURE 28. Scanning electron microscope images of *Atlanticythere prethalassia* Benson, 1977 and *Dutoitella atlantiformis* sp. nov. A–B, F, H–I, K, M–O, Q–R, T–U, lateral views; C–E, G, J, L, P, S, V, internal views. **A–S,** *Atlanticythere prethalassia* Benson, 1977. A, TRA707 (USNM 607344), adult LV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. B–C, TRA708 (USNM 607345), adult RV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. D, TRA709 (USNM 607346), adult LV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, southwestern Atlantic. E, TRA713 (USNM 607347), adult RV from DSDP 21, 4/1/148–150, Campanian–Maastrichtian, southwestern Atlantic. F–G, TRA719 (USNM 607348), adult RV from DSDP 21, 4/4/13–15, Campanian–Maastrichtian, southwestern Atlantic. H, TRA730 (USNM 607349), adult RV from DSDP 21, 5/1/31–33, Campanian–Maastrichtian, southwestern Atlantic. I–J, TRA731 (USNM 607350), adult RV from DSDP 21, 5/1/31–33, Campanian–Maastrichtian, southwestern Atlantic. K–L, TRA732 (USNM 607351), adult RV from DSDP 21, 5/1/31–33, Campanian–Maastrichtian, southwestern Atlantic. M, TRA735 (USNM 607352), adult LV from DSDP 21, 5/3/50–56, Campanian–Maastrichtian, southwestern Atlantic. N, TRA736 (USNM 607353), adult LV from DSDP 21, 5/3/50–56, Campanian–Maastrichtian, southwestern Atlantic. O–P, TRA737 (USNM 607354), adult RV from DSDP 21, 5/3/50–56, Campanian–Maastrichtian, southwestern Atlantic. Q, TRA743 (USNM 607355), adult LV from DSDP 21, 5/3/??, Campanian–Maastrichtian, southwestern Atlantic. R–S, TRA744 (USNM 607356), adult RV from DSDP 21, 5/3/??, Campanian–Maastrichtian, southwestern Atlantic. **T–V,** *Dutoitella atlantiformis* sp. nov. T, TRA802 (USNM 607357), adult LV from DSDP 258A, 9/4/50–56, Santonian, Indian Ocean. U–V, TRA803 (USNM 607358), adult RV from DSDP 258A, 9/4/50–56, Santonian, Indian Ocean. Scale bar represents 1 mm.

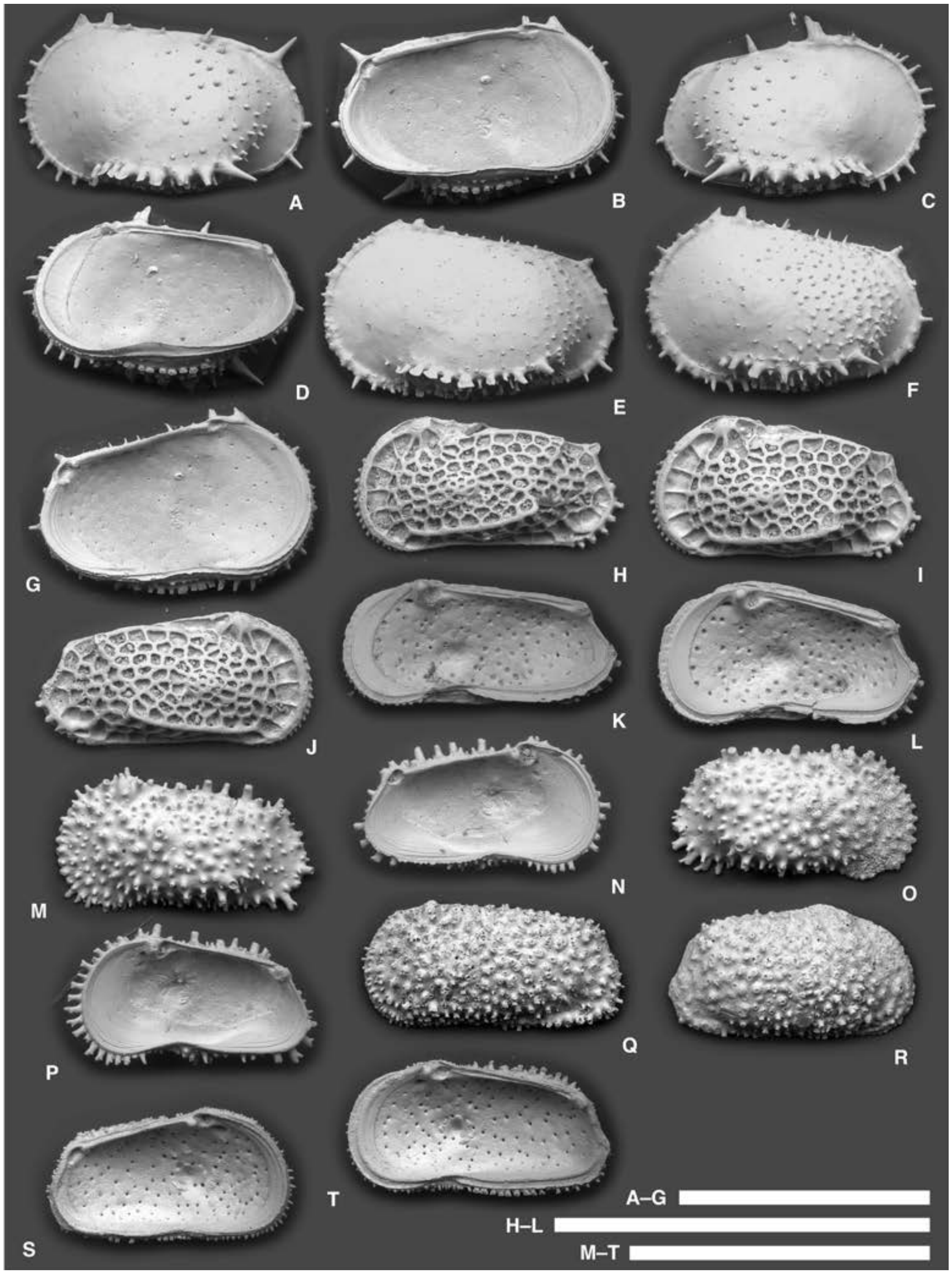


FIGURE 29. Scanning electron microscope images of *Bathycythere vanstraateni* Sissingh, 1971, *Cletocythereis scutulata* (Howe, 1951), *Hirsutocythere hornotina* Howe, 1951, and "*Echinocythereis* cf. *melobesioides*" sensu Yassini and Jones (1995). A, C, E–F, H–J, M, O, Q–R, lateral views; B, D, G, K–L, N, P, S–T, internal views. **A–G,** *Bathycythere vanstraateni* Sissingh, 1971. A–B, RB532 (USNM 607359), adult LV from AII 59 sta 214, Modern, Mediterranean. C–D, RB533 (USNM 607360), adult RV from AII 59 sta 214, Modern, Mediterranean. E, GSM155 (USNM 607361), adult LV from Chain 82-24-4P, 4–7, Holocene, North Atlantic. F–G, USGSD151 (USNM 607362), adult LV from DSDP 607, 15/3/110–112, late Pliocene, North Atlantic. **H–L,** *Cletocythereis scutulata* (Howe, 1951). H, TRA850 (USNM 607363), adult LV from Avon Park Limestone, outcrop, middle Eocene, USA. I, TRA851 (USNM 607364), adult LV from Avon Park Limestone, outcrop, middle Eocene, USA. J–K, TRA852 (USNM 607365), adult RV from Avon Park Limestone, outcrop, middle Eocene, USA. L, TRA853 (USNM 607366), adult RV from Avon Park Limestone, outcrop, middle Eocene, USA. **M–P,** *Hirsutocythere hornotina* Howe, 1951. M, TRA846 (USNM 607367), adult LV from Avon Park Limestone, outcrop, middle Eocene, USA. N, TRA847 (USNM 607368), adult LV from Avon Park Limestone, outcrop, middle Eocene, USA. O, TRA848 (USNM 607369), adult RV from Avon Park Limestone, outcrop, middle Eocene, USA. P, TRA849 (USNM 607370), adult RV from Avon Park Limestone, outcrop, middle Eocene, USA. **Q–T,** "*Echinocythereis* cf. *melobesioides*" sensu Yassini and Jones (1995). Q, TRA212 (USNM 607371), adult LV from Alb 5140, Modern, equatorial western Pacific. R, TRA214 (USNM 607372), adult RV from Alb 5140, Modern, equatorial western Pacific. S, TRA215 (USNM 607373), adult LV from Alb 5139, Modern, equatorial western Pacific. T, TRA216 (USNM 607374), adult RV from Alb 5138, Modern, equatorial western Pacific. Scale bars represent 1 mm.

holotype specimen of this species has never been figured other than in the original sketch. As discussed in Ayress et al. (2004), this species has been confused with *Legitimocythere audax*. Juvenile *Legitimocythere audax* are very similar to adult *Bathycythere vanstraateni*. However, in *Legitimocythere audax*, the posteroventral margin is strongly upturned, resulting in maximum length at the midheight (Ayress et al., 2004), and it is also strongly denticulate. In contrast, *Bathycythere vanstraateni* has a less upturned posteroventral margin with sparse spines and maximum length below the midheight.

Genus *Cletocythereis* Swain, 1963

Type Species. *Cythere rastromarginata* Brady, 1880.

Remarks. The type species of this genus, *Cletocythereis rastromarginata* (Brady, 1880), has been investigated by Benson (1972), Puri and Hulings (1976), Titterton et al. (2001), and others (see Titterton et al., 2001, for comprehensive synonymy). This genus is similar to *Trachyleberidea* Bowen, 1953, and both of them have deep, irregularly shaped primary reticulation with ingrowing spines, a relatively flat carapace, and a holamphidont hinge. However, *Cletocythereis* is distinguished from *Trachyleberidea* by having a V-shaped frontal scar with the posterodorsal part severed (Benson, 1972), a distinct ventrolateral ridge separated from the anterior marginal rim, and a more rectangular outline. In contrast, *Trachyleberidea* has a complete V-shaped frontal scar, continuous anterior marginal-ventrolateral ridge, and triangular outline. *Cletocythereis* is predominantly a shallow marine genus, but it is sometimes reported from bathyal depths (Whatley, 1983; Ayress, 1995).

Cletocythereis scutulata (Howe, 1951)

FIGURES 25W–X, 29H–L

Cythereis? scutulata Howe, 1951:26, pl. 4, figs. 13–16.

Locality and Age of Specimens Examined. Avon Park Limestone, middle Eocene, North America.

Dimensions. See Table 1.

Remarks. This species is reported from middle Eocene Avon Park Limestone. Topotype specimens are shown here. This species belongs to *Cletocythereis* because it has a partly severed V-shaped frontal muscle scar; distinct ventrolateral ridge separated from the anterior marginal rim; rectangular outline; deep, irregularly shaped primary reticulation with ingrowing spines; relatively flat carapace; and holamphidont hinge.

Genus *Hirsutocythere* Howe, 1951

Type Species. *Hirsutocythere hornotina* Howe, 1951.

Remarks. Some researchers have assigned several shelf and deep-sea trachyleberidids to this genus, often with a question mark (e.g., Ishizaki, 1981; Guernet, 1993; Tanaka, 2008), probably because this genus is poorly known. However, here we show high-resolution SEM images of topotype specimens of the type species, and these help to clarify the generic concept. The combination of a V-shaped frontal scar, four rows of adductor scars, a holamphidont hinge, very broad inner lamellae, and the lack of any ridges, reticulation, and marginal rims makes this genus unique. We know of no certain *Hirsutocythere* species other than the type species. All species assigned to *Hirsutocythere* other than the type species should be assigned to *Legitimocythere* Coles and Whatley, 1989; *Cythereis* Jones, 1849; or *Croninocythereis* gen. nov., as far as we know. *Hirsutocythere* may be most similar to *Henryhowella* Puri, 1957, but the former lacks reticulation. The very broad inner lamellae of *Hirsutocythere* suggest that it may be better placed in the Cytherettidae, instead of the Trachyleberididae.

Hirsutocythere hornotina Howe, 1951

FIGURES 29M–P, 30A–E

Hirsutocythere hornotina Howe, 1951:22, pl. 4, figs. 3, 6, 9, 12.

Locality and Age of Specimens Examined. Avon Park Limestone, middle Eocene, North America.

Dimensions. See Table 1.

Remarks. This species is reported from the middle Eocene Avon Park Limestone. Topotype specimens are shown here. A species reported as *Echinocythereis melobesioides* (Brady, 1880) by Yassini and Wright (1988) and as *Echinocythereis* cf. *melobesioides* by Yassini and Jones (1995; Figures 29Q–T, 30F–I) is very similar to this species in external view, but internal characteristics are very different. The species of Yassini and Wright (1988) has a divided frontal scar, relatively narrow inner lamella, and marginal frill in the internal view (Figures 29S–T, 30H–I). In contrast, *Hirsutocythere hornotina* has a V-shaped frontal scar and a very wide inner lamella and lacks marginal frill in the internal view.

Genus *Buntonia* Howe in Howe and Chambers, 1935

Type Species. *Buntonia shubutaensis* Howe, 1935 (in Howe and Chambers, 1935).

Remarks. We consider *Quasibuntonia* Ruggieri, 1958 a junior synonym of *Buntonia* Howe, 1935, following van Morkhoven (1963) and Dingle et al. (1990).

Synonymized Genus. *Quasibuntonia* Ruggieri, 1958.

Buntonia textilis Bonaduce, Ciampo, and Masoli, 1976

FIGURES 30J–M, 31A–I

Buntonia textilis Bonaduce, Ciampo, and Masoli, 1976:55, pl. 33, figs. 1–5.
non *Quasibuntonia* sp. Cronin, 1983:115, pl. 9G.

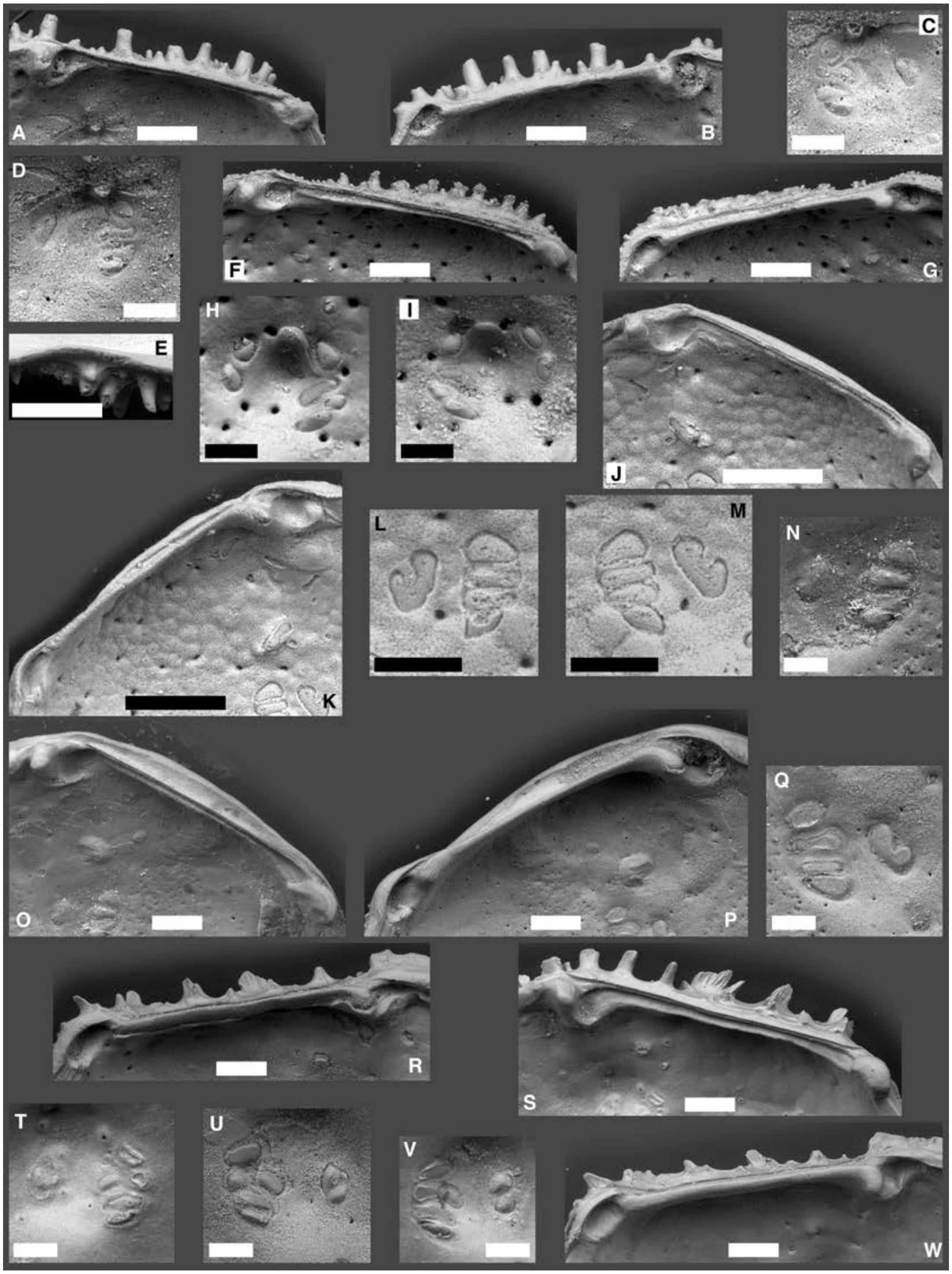


FIGURE 30. Internal details of *Hirsutocythere hornotina* Howe, 1951, "*Echinocythereis* cf. *melobesioides*" sensu Yassini and Jones (1995), *Buntonia textilis* Bonaduce et al., 1976, *Buntonia radiatopora* (Seguenza, 1880), and *Dutoitella cronini* sp. nov. **A–E,** *Hirsutocythere hornotina* Howe, 1951. A, D–E, TRA849 (USNM 607370), adult RV. A, hingement. D, subcentral muscle scars. E, ventromarginal area showing snap-knob structure. B–C, TRA847 (USNM 607368), adult LV. B, hingement. C, subcentral muscle scars. **F–I,** "*Echinocythereis* cf. *melobesioides*" sensu Yassini and Jones (1995). F, H, TRA216 (USNM 607374), adult RV. F, hingement. H, subcentral muscle scars. G, I, TRA215 (USNM 607373), adult LV. G, hingement. I, subcentral muscle scars. **J–M,** *Buntonia textilis* Bonaduce et al., 1976. J, L, ODP982071 (USNM 607378), adult RV. J, hingement. L, subcentral muscle scars. K, M, ODP982070 (USNM 607377), adult LV. K, hingement. M, subcentral muscle scars. **N–Q,** *Buntonia radiatopora* (Seguenza, 1880). N–O, RB537 (USNM 607384), adult RV. N, subcentral muscle scars. O, hingement. P–Q, RB536 (USNM 607383), adult LV. P, hingement. Q, subcentral muscle scars. **R–W,** *Dutoitella cronini* sp. nov. R, U, RB328 (USNM 607401), adult LV. R, hingement. U, subcentral muscle scars. S–T, RB322 (USNM 607399), adult RV. S, hingement. T, subcentral muscle scars. V–W, GSM626 (USNM 607407), adult LV. V, subcentral muscle scars. W, hingement. Scale bars represent 0.1 mm for A–B, E–G, J–K, O–P, R–S, W and 50 μm for C–D, H–I, L–N, Q, T–V.

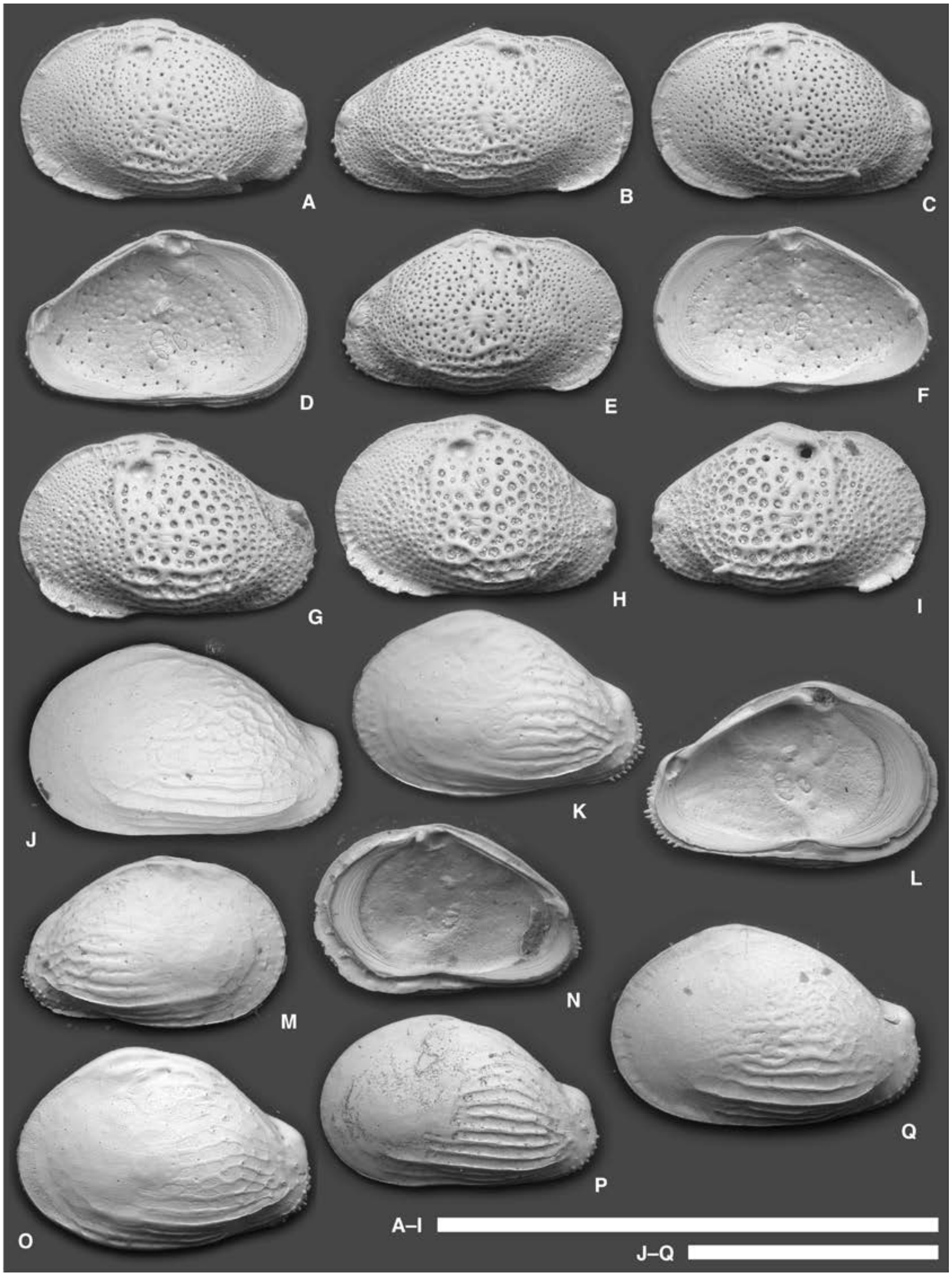


FIGURE 31. Scanning electron microscope images of *Buntonia textilis* Bonaduce et al., 1976 and *Buntonia radiatopora* (Seguenza, 1880). A–C, E, G–K, M, O–Q, lateral views; D, F, L, N, internal views. **A–I,** *Buntonia textilis* Bonaduce et al., 1976. A, ODP982068 (USNM 607375), adult LV from ODP 982A, 1/2/7–9, Pleistocene, northeastern Atlantic. B, ODP982069 (USNM 607376), adult RV from ODP 982A, 1/2/27–29, Pleistocene, northeastern Atlantic. C–D, ODP982070 (USNM 607377), adult LV from ODP 982A, 1/2/87–89, Pleistocene, northeastern Atlantic. E–F, ODP982071 (USNM 607378), adult RV from ODP 982A, 1/2/87–89, Pleistocene, northeastern Atlantic. G, TMC355 (USNM 607379), adult LV from DSDP 610, 17/5/23, middle Miocene, northeastern Atlantic. H, TMC364 (USNM 607380), adult LV from DSDP 610, 17/3/36, middle Miocene, northeastern Atlantic. I, TMC365 (USNM 607381), adult RV from DSDP 610, 17/3/36, middle Miocene, northeastern Atlantic. **J–Q,** *Buntonia radiatopora* (Seguenza, 1880). J, TMC254 (USNM 607382), adult LV from DSDP 607, 13/2/77–79, early Pleistocene, North Atlantic. K–L, RB536 (USNM 607383), adult LV from AII 42 sta 200, Modern, southeastern Atlantic. M–N, RB537 (USNM 607384), adult RV from AII 42 sta 200, Modern, southeastern Atlantic. O, GSM246 (USNM 607385), adult LV from ODP 658A, 25x/4/135, late Pliocene, northeastern Atlantic. P, GSM245 (USNM 607386), adult LV from ODP 659A, 11/4/143, Pliocene, northeastern Atlantic. Q, USGSD152 (USNM 607387), adult LV from DSDP 607, 12/6/120–122, early Pleistocene, North Atlantic. Scale bars represent 1 mm.

Buntonia textilis Bonaduce et al.; Whatley and Coles, 1987:81, pl. 5, fig. 6 (non fig. 5).

Buntonia textilis Bonaduce et al.; Coles, Ainsworth, Whatley, and Jones, 1996:141, pl. 5, figs. 16–17.

Buntonia textilis Bonaduce et al.; Aiello, Barra, and Bonaduce, 2000:100, pl. 4, figs. 6–9; pl. 6, fig. 8.

Buntonia (*B.*) *textilis* Bonaduce et al.; Guernet, 2005:94.

Buntonia textilis Bonaduce et al.; Yasuhara, Okahashi, and Cronin, 2009c:926, pl. 18, figs. 10–12.

LOCALITY AND AGE OF SPECIMENS EXAMINED. ODP 982A, Pleistocene, northeastern Atlantic; DSDP 610, middle Miocene, northeastern Atlantic.

DIMENSIONS. See Table 1.

REMARKS. A comprehensive synonymy can be found in Aiello et al. (2000) and Guernet (2005). Type specimens are slightly more slender than the North Atlantic specimens shown here. In the North Atlantic, Miocene specimens (Figure 31G–I) show coarser reticulation than Pleistocene specimens (Figure 31A–F). We consider this difference intraspecific variation; a detailed discussion of variation within this species can be found in Aiello et al. (2000).

Buntonia radiatopora **(Seguenza, 1880)**

FIGURES 30N–Q, 31J–Q

Cythere radiatopora Seguenza, 1880:289, pl. 16, figs. 48, 48a.

Cythere sulcifer [*sic*] [the binomen was corrected to *Cythere sulcifera* by Brady and Norman, 1889] Brady, 1886:197, pl. 15, figs. 3–4.

Cythere sulcifera Brady; Brady and Norman, 1889:133, pl. 19, figs. 22–23.

Quasibuntonia sulcifera? (Brady); Benson and Sylvester-Bradley, 1971, pl. 1, fig. 3.

Cythere mackenziei Puri and Hulings, 1976:281, pl. 9, figs. 1–4.

Buntonia rosenfeldi Dingle, Lord, and Boomer, 1990:289, figs. 23E,F, 27A–D.

Buntonia rosenfeldi Dingle et al.; Dingle, 1993:124, fig. 69B,C (69D,E?).

Buntonia mackenziei (Puri and Hulings); Guernet, 1998, pl. 3, figs. 1–2.

Buntonia cf. *rosenfeldi* Dingle et al.; Guernet, 1998, pl. 3, fig. 3.

Quasibuntonia radiatopora radiatopora (Seguenza); Aiello, Barra, and Bonaduce, 2000:100, pl. 4, fig. 11.

Buntonia (*Quasibuntonia*) *radiatopora radiatopora* (Seguenza); Guernet, 2005: 94.

Buntonia (*Q.*) *radiatopora sculpta* (Seguenza); Guernet, 2005:94.

LOCALITY AND AGE OF SPECIMENS EXAMINED. DSDP 607, early Pleistocene, North Atlantic; AII 42 sta 200, Modern, southeastern Atlantic; ODP 658A, ODP 659A, Pliocene, northeastern Atlantic.

DIMENSIONS. See Table 1.

REMARKS. Comprehensive synonymy is found in Guernet (2005). As several researchers pointed out, *Buntonia radiatopora* (Seguenza, 1880) has relatively broad intraspecific variation (Aiello et al., 2000; Guernet, 2005). Two subspecies are known, *Buntonia radiatopora radiatopora* (Seguenza, 1880) and *Buntonia radiatopora sculpta* (Seguenza, 1880). We agree with Guernet (2005) and consider these subspecies to be merely morphological variants. In our opinion, *Buntonia sulcifera* (Brady, 1886) and *Buntonia rosenfeldi* Dingle et al., 1990 also fall within intraspecific variation of *Buntonia radiatopora,* and thus, we tentatively consider these junior synonyms of *Buntonia radiatopora*. Type specimens of *Buntonia radiatopora* were not designated, and the original material was lost in an earthquake in 1908 (Ruggieri, 1963; see the note on this species in the Ellis and Messina Catalogue of Ostracoda, http://www.micropress.org/e_m.html). *Buntonia radiatopora* is similar to *Buntonia pyriformis* (Brady, 1880), but the latter has an almost smooth carapace and lacks a ventrolateral ridge according to Brady's original sketch.

Genus *Dutoitella* Dingle, 1981

TYPE SPECIES. *Dutoitella dutoiti* Dingle, 1981.

REMARKS. *Dutoitella* Dingle, 1981 is most similar to *Atlanticythere* Benson, 1977. See the *Atlanticythere* section for distinction. The hingement is hemiamphidont, holamphidont, or paramphidont. Subcentral muscle scars are composed of a divided frontal scar and a row of four adductor scars with the dorsomedian one divided.

Dutoitella suhmi **(Brady, 1880)**

Cythere suhmi Brady, 1880:106, pl. 26, fig. 3a–d (non fig. 3e–h).

Cythere suhmi Brady; Puri and Hulings, 1976: 290, fig. 10; pl. 17, figs. 7–12.

Dutoitella suhmi (Brady); Mazzini, 2005:73, fig. 41.

REMARKS. This species was originally reported from the northwestern Pacific Ocean and is known only from the type locality. A comprehensive synonymy and detailed discussion of this species can be found in Mazzini (2005).

Dutoitella cronini **sp. nov.**

FIGURES 30R–W, 32A–P

"*Suhmicythere*" sp. Benson, DelGrosso, and Steineck, 1983, pl. 1, fig. 8.

"*Suhmicythere*" *suhmi* (Brady); Whatley and Coles, 1987, pl. 6, figs. 18–21.

Dutoitella suhmi (Brady); Dingle, Lord, and Boomer, 1990:293, figs. 27E–F, 30A–B, 31A,C,F.

Dutoitella suhmi (Brady); Alvarez Zarikian, 2009:6, pl. P5, figs. 6–7.

DERIVATION OF NAME. In honor of Thomas M. Cronin, U.S. Geological Survey, for his outstanding work on deep-sea Ostracoda and paleoceanography.

HOLOTYPE. Adult RV, USNM 607399 (RB322; Figures 30S–T, 32C–D).

PARATYPES. USNM 607398, 607400, 607401, 607402, 607403, 607404, 607405, 607406, 607407, 607408 (TMC242, RB265, RB328, RB329, RB412, RB415, GSM149, GSM173, GSM626, GSM627).

TYPE LOCALITY AND HORIZON. KN 25 sta 291, Modern, 10.1017°N, 55.2333°W, 3,865 m water depth, northwestern Atlantic.

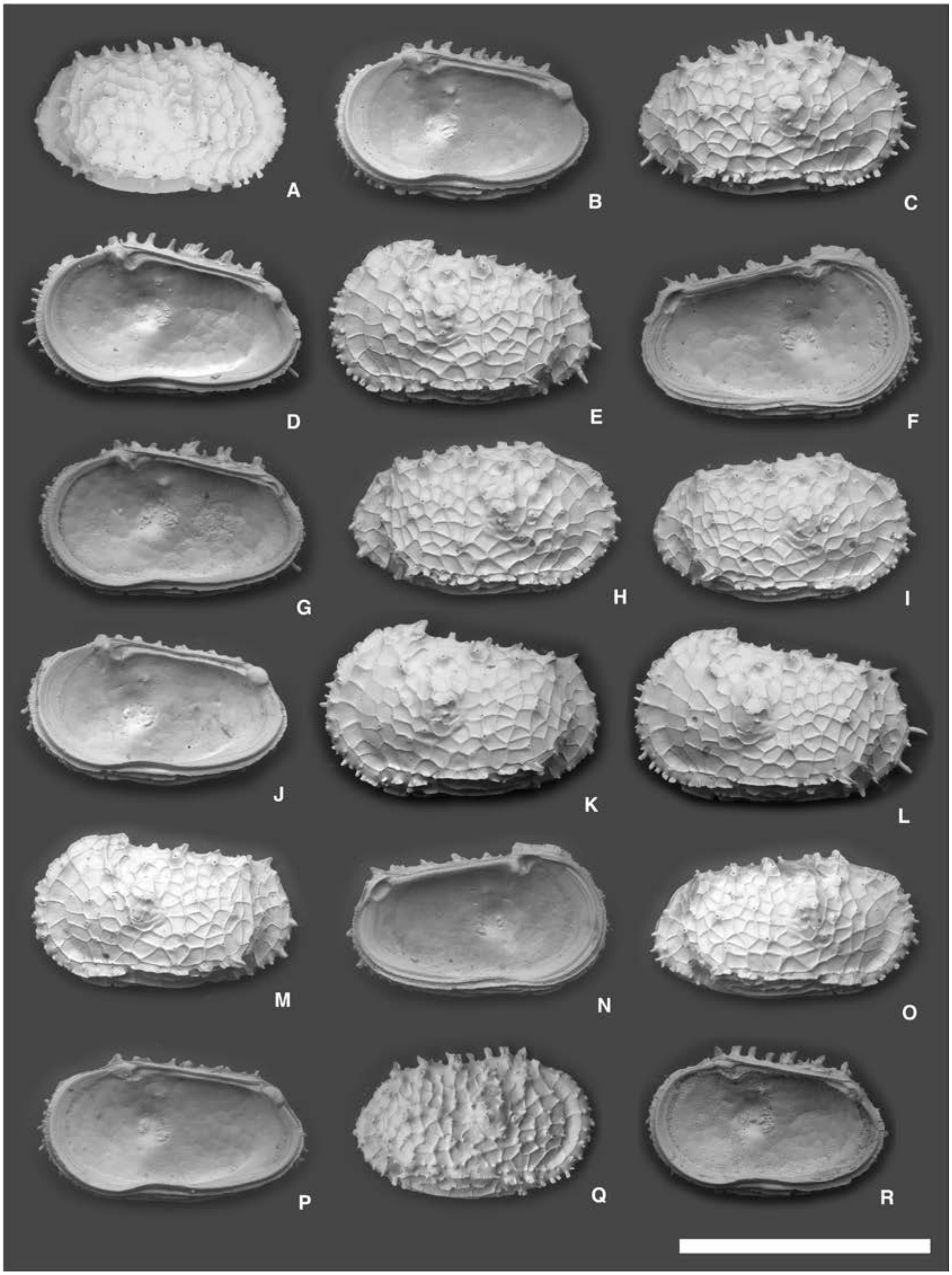


FIGURE 32. Scanning electron microscope images of *Dutoitella cronini* sp. nov. and *Dutoitella spinaplana* Mazzini, 2005. A, C, E, H–I, K–M, O, Q, lateral views; B, D, F–G, J, N, P, R, internal views. **A–P,** *Dutoitella cronini* sp. nov. A–B, TMC242 (USNM 607398), adult RV from DSDP 607, 13/4/135–137, late Pliocene, North Atlantic. C–D, RB322 (USNM 607399), adult RV from KN 25 sta 291, Modern, northwestern Atlantic. E, RB265 (USNM 607400), adult LV from KN 35 sta 340A, Modern, northwestern Atlantic. F, RB328 (USNM 607401), adult LV from KN 25 sta 288, Modern, northwestern Atlantic. G, RB329 (USNM 607402), adult RV from KN 25 sta 288, Modern, northwestern Atlantic. H, RB412 (USNM 607403), adult RV from Alb 2714, Modern, northwestern Atlantic. I–J, RB415 (USNM 607404), adult RV from Alb 2713, Modern, northwestern Atlantic. K, GSM149 (USNM 607405), adult LV from Chain 82-24-4P, 85–87, Pleistocene, North Atlantic. L, GSM173 (USNM 607406), adult LV from Chain 82-24-4P, 184.5–187, Pleistocene, North Atlantic. M–N, GSM626 (USNM 607407), adult LV from Alb D2038, Modern, northwestern Atlantic. O–P, GSM627 (USNM 607408), adult RV from Alb D2038, Modern, northwestern Atlantic. **Q–R,** *Dutoitella spinaplana* Mazzini, 2005, TRA533 (USNM 607409), adult RV from DSDP 206, 19/4/50–56, early Pliocene, southwestern Pacific. Scale bar represents 1 mm.

Other Localities. DSDP 607, Chain 82-24-4P, late Pliocene and Pleistocene, North Atlantic; KN 35 sta 340A, KN 25 sta 288, Alb 2714, Alb 2713, Alb D2038, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Dutoitella* species characterized by relatively high carapace in proportion to its length, well-developed primary reticulation with thin muri, and the absence of both secondary reticulation and a median lateral ridge.

Description. Carapace large, moderately calcified, highest at anterodorsal corner. Outline subrectangular in LV and subrectangular-ovate in RV; anterior margin evenly rounded, bearing weakly developed marginal frill (seen in internal view) and spines; posterior margin blunt bearing spines; dorsal margin almost straight, bearing clavate or spatulate spines; ventral margin slightly curved; ventrolateral ridge well developed and continuous with the anterior marginal rim, bearing clavate spines or frill composed of fused clavate spines; subcentral tubercle present at midheight. Anterodorsal corner prominent in LV and weakly angular in RV; posterodorsal corner angular. Lateral surface ornamented with well-developed primary reticulation with thin muri. Anterior and posterior marginal rims and sulci present. Hingement holamphidont. Frontal muscle scar divided. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

Remarks. *Dutoitella cronini* sp. nov. is very similar to *Dutoitella spinaplana* Mazzini, 2005, but the former has a suppressed subcentral tubercle, and the latter has a median lateral ridge. This species is also similar to *Dutoitella suhmi* (Brady, 1880), but it is distinguished from that species by its lack of secondary reticulation and by the position of the subcentral tubercle. In this species, the subcentral tubercle is at midheight, but in *Dutoitella suhmi*, it is above midheight.

Dutoitella spinaplana Mazzini, 2005

FIGURES 32Q–R, 33A–B

Dutoitella spinaplana Mazzini, 2005:74, fig. 42A–P.

Locality and Age of Specimen Examined. DSDP 206, early Pliocene, southwestern Pacific.

Dimensions. See Table 1.

Remarks. *Dutoitella spinaplana* Mazzini, 2005 is a Pacific species, and its close relative, *Dutoitella cronini* sp. nov., is from the Atlantic Ocean (see *Dutoitella cronini* sp. nov. for a comparison of these two species).

Dutoitella praesuhmi Coles and Whatley, 1989

FIGURES 33C–F, 34A–D

Dutoitella praesuhmi Coles and Whatley, 1989:98, pl. 4, figs. 6–8.

?*Dutoitella eocenica* (Benson); Coles and Whatley, 1989:98, pl. 4, figs. 3–5.

?*Dutoitella eocenica* (Benson); Zhao, 2005, pl. 4, fig. 6.

Locality and Age of Specimens Examined. DSDP 357, late Eocene, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. As seen in the SEM plate of Coles and Whatley (1989), this species encompasses a lot of variation and thus may warrant further examination. This species lacks reticulation on its anterior half but is otherwise similar to *Dutoitella eocenica* (Benson, 1977).

Dutoitella cf. *praesuhmi* Coles and Whatley, 1989

FIGURES 33G–J, 34E–H

Locality and Age of Specimens Examined. AQ 14, Quaternary, equatorial western Pacific.

Dimensions. See Table 1.

Remark. This species is very similar to *Dutoitella praesuhmi* Coles and Whatley, 1989 but lacks a median lateral ridge and is larger.

Dutoitella crassinodosa (Guernet, 1985)

FIGURES 33K–O, 34I–P

"*Cythereis*" *crassinodosa* Guernet, 1985:284, pl. 3, figs. 8–9, 11–12.

Dutoitella mimica Dingle; Majoran and Widmark, 1998:854, fig. 3.9–3.11.

Dutoitella crassinodosa (Guernet); Guernet, Bignot, Colin, and Randriamanantenasoa, 2001, pl. 4, fig. 6.

Dutoitella suhmi (Brady); Bergue and Govindan, 2010:752, fig. 3-20.

Locality and Age of Specimens Examined. DSDP 526C, late Eocene, southeastern Atlantic.

Dimensions. See Table 1.

Remarks. *Dutoitella crassinodosa* (Guernet, 1985) is similar to *Dutoitella suhmi* (Brady, 1880) but is distinguished by the lack of secondary reticulation and the presence of three prominent spines on the dorsal margin and a spinous ventrolateral ridge. *Dutoitella crassinodosa* is very similar to *Dutoitella mimica* Dingle, 1981 but is distinguished by the presence of clear primary reticulation and the lack of secondary reticulation. *Dutoitella crassinodosa* is also very similar to *Dutoitella eocenica* (Benson, 1977), but the latter has three (instead of two) distinct spines on the posterior half of the dorsal margin and a well-developed median lateral ridge. *Dutoitella crassinodosa* was originally reported from the Eocene in the Indian Ocean (Guernet, 1985). Our specimens are from the Eocene in the South Atlantic Ocean. Their outlines are slightly different from Guernet's specimens. We consider this difference intraspecific variation and these three very closely related species, *Dutoitella crassinodosa*, *Dutoitella mimica*, and *Dutoitella*

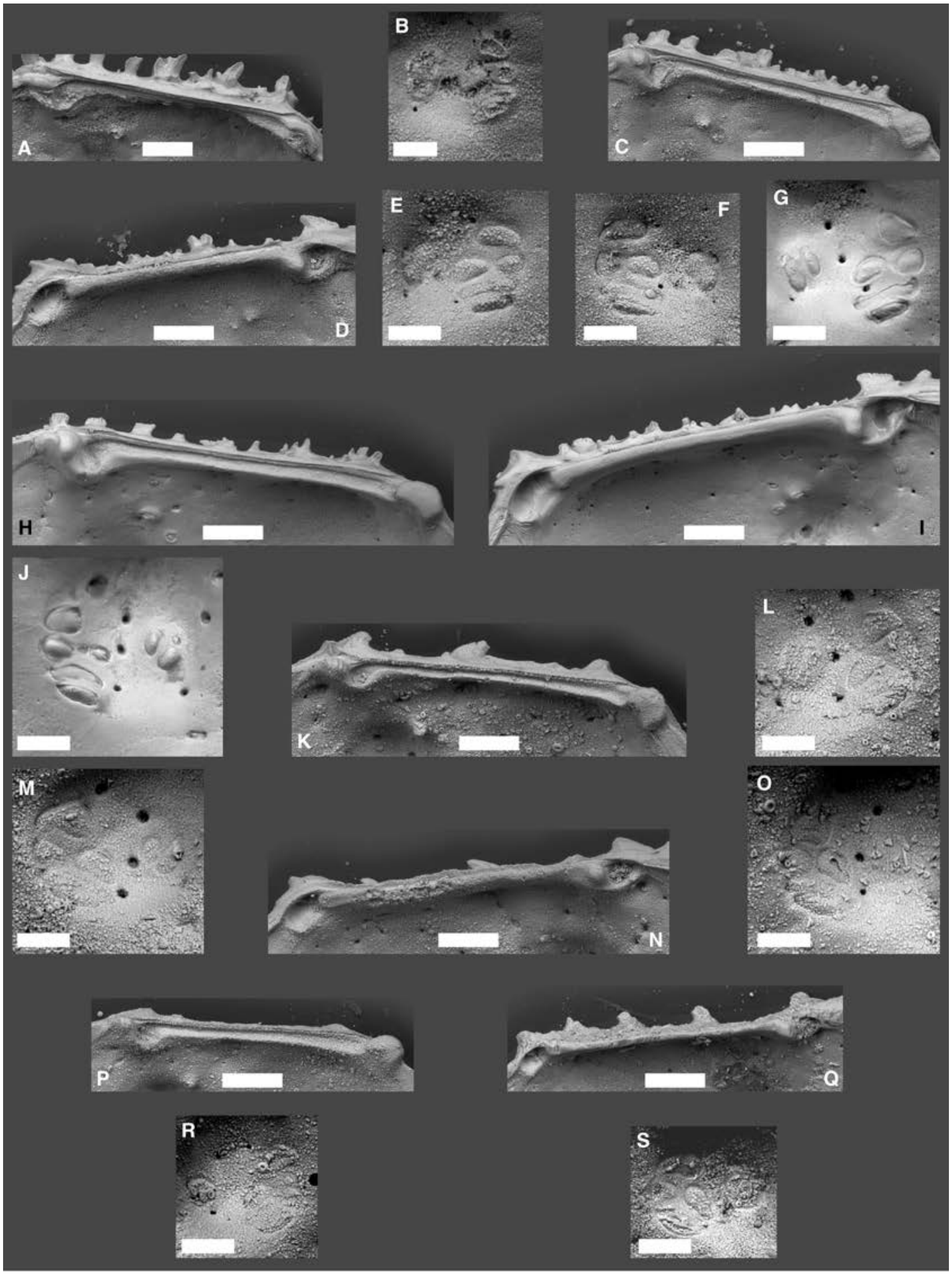


FIGURE 33. Internal details of *Dutoitella spinaplana* Mazzini, 2005, *Dutoitella praesuhmi* Coles and Whatley, 1989, *Dutoitella* cf. *praesuhmi* Coles and Whatley, 1989, *Dutoitella crassinodosa* (Guernet, 1985), *Dutoitella symmetrica* sp. nov., and *Dutoitella neogenica* Benson, 1977. **A–B,** *Dutoitella spinaplana* Mazzini, 2005, TRA533 (USNM 607409), adult RV. A, hingement. B, subcentral muscle scars. **C–F,** *Dutoitella praesuhmi* Coles and Whatley, 1989. C, E, TRA328 (USNM 607411), adult RV. C, hingement. E, subcentral muscle scars. D, F, TRA327 (USNM 607410), adult LV. D, hingement. F, subcentral muscle scars. **G–J,** *Dutoitella* cf. *praesuhmi* Coles and Whatley, 1989. G–H, TRA964 (USNM 607412), adult RV. G, subcentral muscle scars. H, hingement. I–J, SIMY0031 (USNM 607413), adult LV. I, hingement. J, subcentral muscle scars. **K–O,** *Dutoitella crassinodosa* (Guernet, 1985). K–L, TRA112 (USNM 607416), adult RV. K, hingement. L, subcentral muscle scars. M–N, TRA109 (USNM 607414), adult LV. M, subcentral muscle scars. N, hingement. O, TRA113 (USNM 607417), adult LV, subcentral muscle scars. **P, R,** *Dutoitella symmetrica* sp. nov., TRA554 (USNM 607421), adult RV. P, hingement. R, subcentral muscle scars. **Q, S,** *Dutoitella neogenica* Benson, 1977, TRA326 (USNM 607422), adult LV. Q, hingement. S, subcentral muscle scars. Scale bars represent 0.1 mm for A, C–D, H–I, K, N, P–Q and 50 μm for B, E–G, J, L–M, O, R–S.

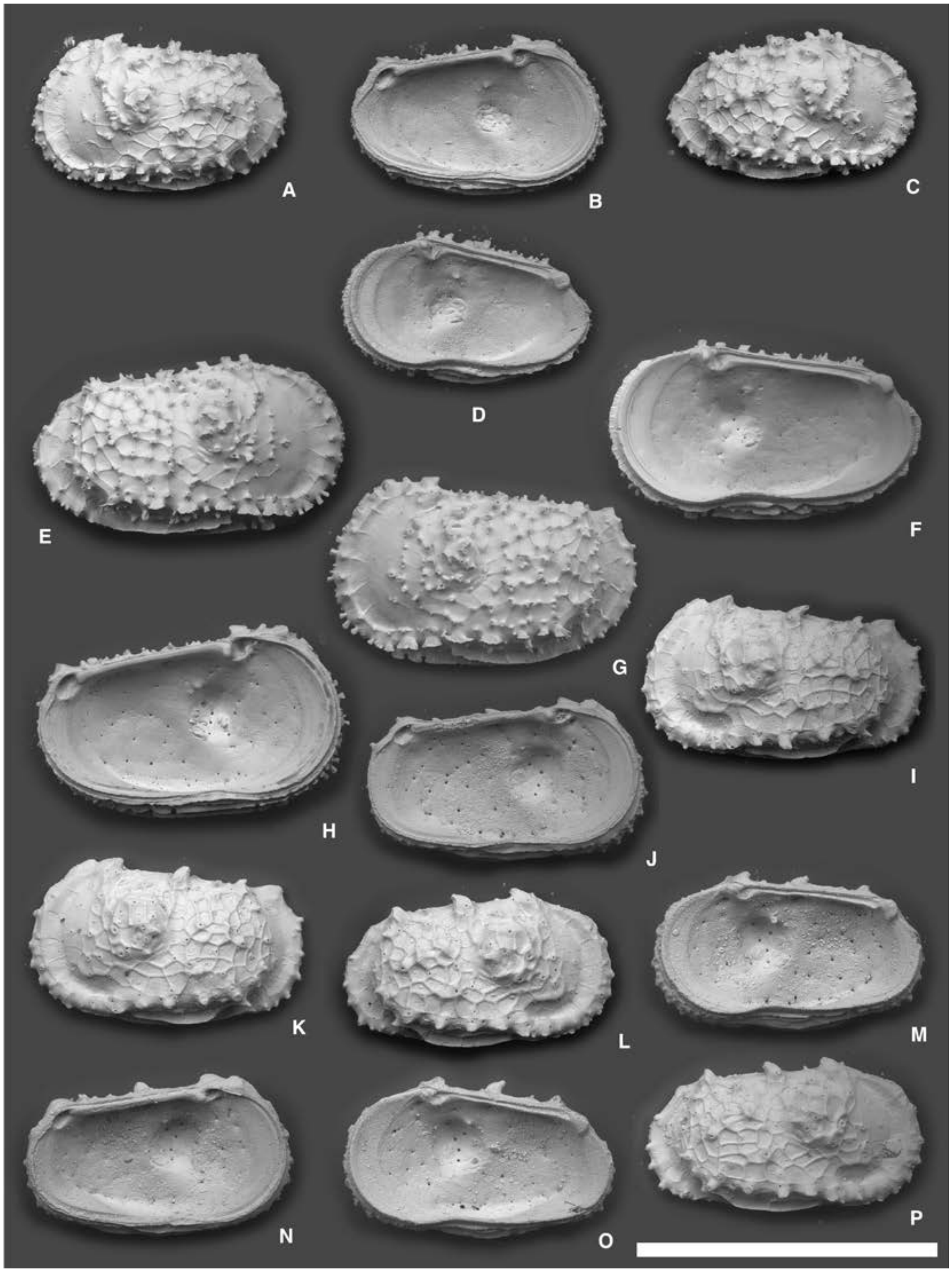


FIGURE 34. Scanning electron microscope images of *Dutoitella praesuhmi* Coles and Whatley, 1989, *Dutoitella* cf. *praesuhmi* Coles and Whatley, 1989, and *Dutoitella crassinodosa* (Guernet, 1985). A, C, E, G, I, K–L, P, lateral views; B, D, F, H, J, M–O, internal views. **A–D,** *Dutoitella praesuhmi* Coles and Whatley, 1989. A–B, TRA327 (USNM 607410), adult LV from DSDP 357, 20/2/106–120, late Eocene, southwestern Atlantic. C–D, TRA328 (USNM 607411), adult RV from DSDP 357, 20/2/106–120, late Eocene, southwestern Atlantic. **E–H,** *Dutoitella* cf. *praesuhmi* Coles and Whatley, 1989. E–F, TRA964 (USNM 607412), adult RV from AQ 14, 5–10, Quaternary, equatorial western Pacific. G–H, SIMY0031 (USNM 607413), adult LV from AQ 14, 20–30, Quaternary, equatorial western Pacific. **I–P,** *Dutoitella crassinodosa* (Guernet, 1985). I–J, TRA109 (USNM 607414), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. K, TRA111 (USNM 607415), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. L–M, TRA112 (USNM 607416), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. N, TRA113 (USNM 607417), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. O, TRA114 (USNM 607418), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. P, TRA110 (USNM 607419), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. Scale bar represents 1 mm.

eocenica, distinct species, but further study is needed to better understand the limits of each.

Dutoitella symmetrica sp. nov.

FIGURES 33P,R, 35A–C

Derivation of Name. From the Latin *symmetrica* (adjective in the nominative singular, feminine), meaning "symmetry," with reference to similar anterior and posterior outlines.

Holotype. Adult RV, USNM 607421 (TRA554; Figures 33P,R, 35B–C).

Paratype. USNM 607420 (TRA553).

Type Locality and Horizon. DSDP 214, 28/3/50–56, late Eocene, 11.3368°S, 88.7180°E, 1,655 m water depth, Indian Ocean.

Dimensions. See Table 1.

Diagnosis. *Dutoitella* species characterized by the lack of primary and secondary reticulation on portions of the carapace, as well as by a concave and smooth dorsal margin, spinose ventrolateral ridge, and the absence of both a posterior marginal rim and a median lateral ridge.

Description. Carapace moderately calcified, its height similar throughout. Outline subrectangular; anterior margin evenly rounded, bearing marginal frill (seen in internal view) and a few spines; posterior margin truncate in LV and blunt and rounded in RV, bearing a large spine and a few small spines in its ventral half; dorsal margin concave and almost smooth; ventral margin slightly curved; ventrolateral ridge well developed and continuous with anterior marginal rim, bearing four spines; subcentral tubercle well developed. Anterodorsal corner forms an obtuse angle; posterodorsal corner prominent and angular in LV and weakly angular in RV. Lateral surface ornamented with primary and secondary reticulation; both primary and secondary reticulation absent in parts of the anterodorsal and posterodorsal areas. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus absent. Hingement holamphidont. Frontal muscle scar present, but details not clearly visible. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

Remarks. *Dutoitella symmetrica* sp. nov. is very similar to *Dutoitella mimica* Dingle, 1981 but can be distinguished by the subdued spines on the dorsal margin and clear primary reticulation. This new species is also very similar to *Dutoitella crassinodosa* (Guernet, 1985) but can be distinguished by the presence of secondary reticulation, a concave dorsal margin, and subdued spines on the dorsal margin.

Dutoitella neogenica Benson, 1977

FIGURES 33Q,S, 35D–E

Atlanticythere? neogenica Benson, 1977:877, pl. 1, fig. 8.

?Dutoitella sp. 1 Hunt, Wicaksono, Brown, and MacLeod, 2010, text-fig. 2H.

Locality and Age of Specimen Examined. DSDP 357, middle Eocene, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. A specimen that is better preserved than the holotype (USNM 190300; Benson, 1977) is shown here. The internal view of this species is shown for the first time. A frontal muscle scar is present, but details are not clearly visible. Adductor muscle scars consist of four adductor scars; the dorsomedian scar is divided.

Dutoitella mazziniae sp. nov.

FIGURES 35F–L, 36A–F,P–S, 37E–J

Derivation of Name. In honor of Ilaria Mazzini, Consiglio Nazionale delle Ricerche, Istituto di Geologia Ambientale e Geoingegneria, Italy, for her contribution to deep-sea ostracod taxonomy.

Holotype. Adult RV, USNM 607424 (TRA134; Figures 35H–I, 36E–F).

Paratypes. USNM 607423, 607425, 607426, 607433, 607434, 607435, 607436 (TRA133, TRA243, TRA244, TRA1005, TRA240, TRA241, TRA242).

Type Locality and Horizon. DSDP 357, 5/3/50–59, late Miocene, 30.0042°S, 35.5598°W, 2,086 m water depth, southwestern Atlantic.

Other Localities. DSDP 357, late Miocene, southwestern Atlantic; DSDP 359, DSDP 526A, early Pliocene and late Miocene, southeastern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Dutoitella* species characterized by distinct primary reticulation without secondary reticulation, a lack of spines on the dorsal margin and ventrolateral ridge, and a lack of a median lateral ridge.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular; anterior margin evenly rounded, bearing marginal frill (seen in internal view) and a few spines; posterior margin blunt, bearing a few small spines in its ventral half; dorsal margin almost straight and smooth; ventral margin slightly sinuous; ventrolateral ridge well developed and continuous with anterior marginal rim, bearing a spine at posterior end; subcentral tubercle well developed. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface with primary reticulation. Anterior marginal rim and sulcus present; posterior marginal rim thin. Hingement paramphidont–holamphidont. Frontal muscle scar divided. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

Remarks. *Dutoitella mazziniae* sp. nov. is similar to *Dutoitella neogenica* Benson, 1977 but can be distinguished by the lack of three distinct spines on the posterior half of the

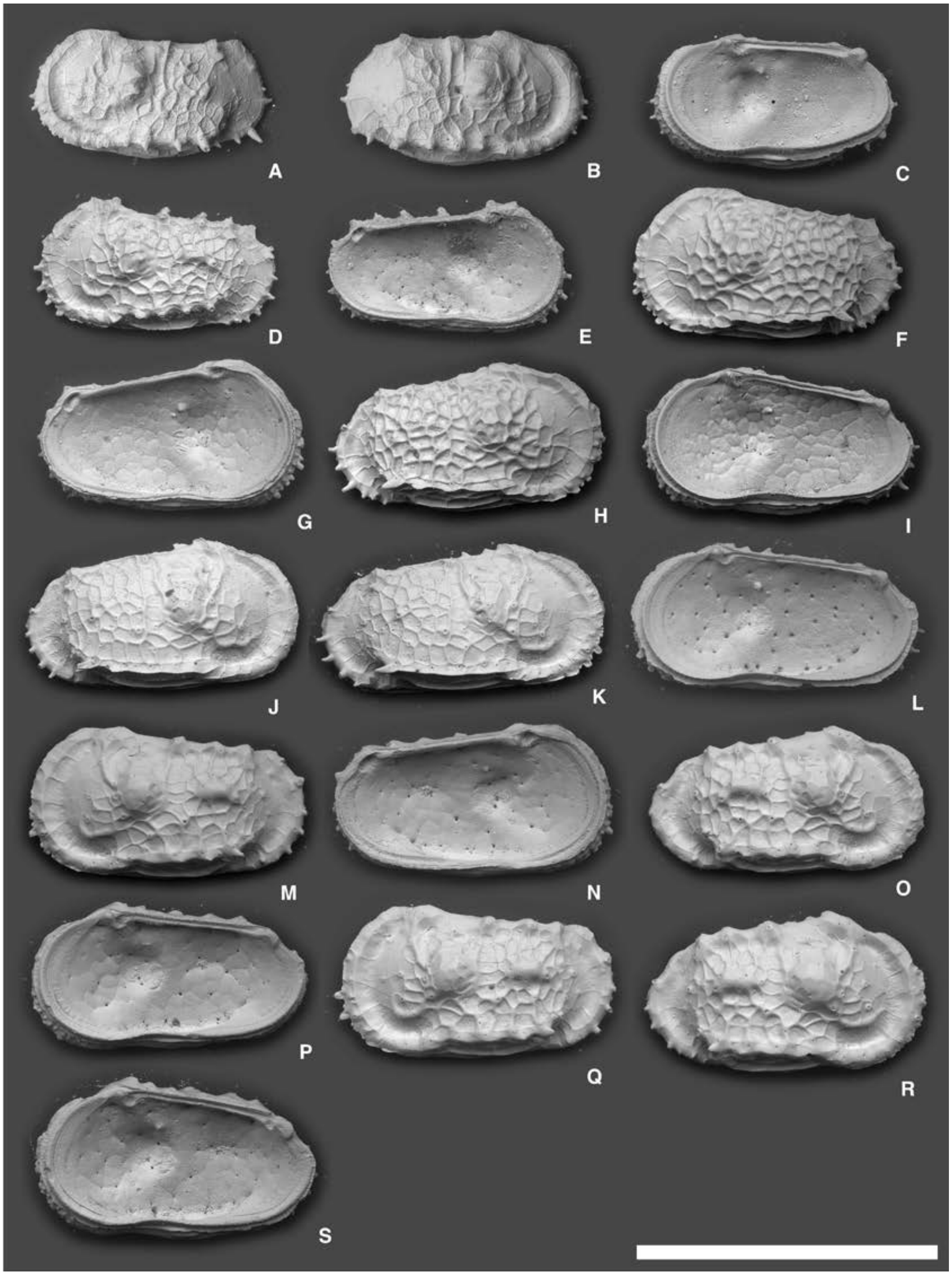


FIGURE 35. Scanning electron microscope images of *Dutoitella symmetrica* sp. nov., *Dutoitella neogenica* Benson, 1977, *Dutoitella mazziniae* sp. nov., and *Dutoitella paradinglei* sp. nov. A–B, D, F, H, J–K, M, O, Q–R, lateral views; C, E, G, I, L, N, P, S, internal views. **A–C,** *Dutoitella symmetrica* sp. nov. A, TRA553 (USNM 607420), adult LV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. B–C, TRA554 (USNM 607421), adult RV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. **D–E,** *Dutoitella neogenica* Benson, 1977, TRA326 (USNM 607422), adult LV from DSDP 357, 22/3/81–83, middle Eocene, southwestern Atlantic. **F–L,** *Dutoitella mazziniae* sp. nov. F–G, TRA133 (USNM 607423), adult LV from DSDP 357, 5/3/50–59, late Miocene, southwestern Atlantic. H–I, TRA134 (USNM 607424), adult RV from DSDP 357, 5/3/50–59, late Miocene, southwestern Atlantic. J, TRA243 (USNM 607425), adult RV from DSDP 526A, 6/1/124–131, late Miocene, southeastern Atlantic. K–L, TRA244 (USNM 607426), adult RV from DSDP 526A, 6/1/124–131, late Miocene, southeastern Atlantic. **M–S,** *Dutoitella paradinglei* sp. nov. M–N, TRA410 (USNM 607427), adult LV from DSDP 281, 10/2/135–142, middle Miocene, Southern Ocean. O–P, TRA411 (USNM 607428), adult RV from DSDP 281, 10/2/135–142, middle Miocene, Southern Ocean. Q, TRA412 (USNM 607429), adult LV from DSDP 281, 10/2/135–142, middle Miocene, Southern Ocean. R–S, TRA413 (USNM 607430), adult RV from DSDP 281, 10/2/135–142, middle Miocene, Southern Ocean. Scale bar represents 1 mm.

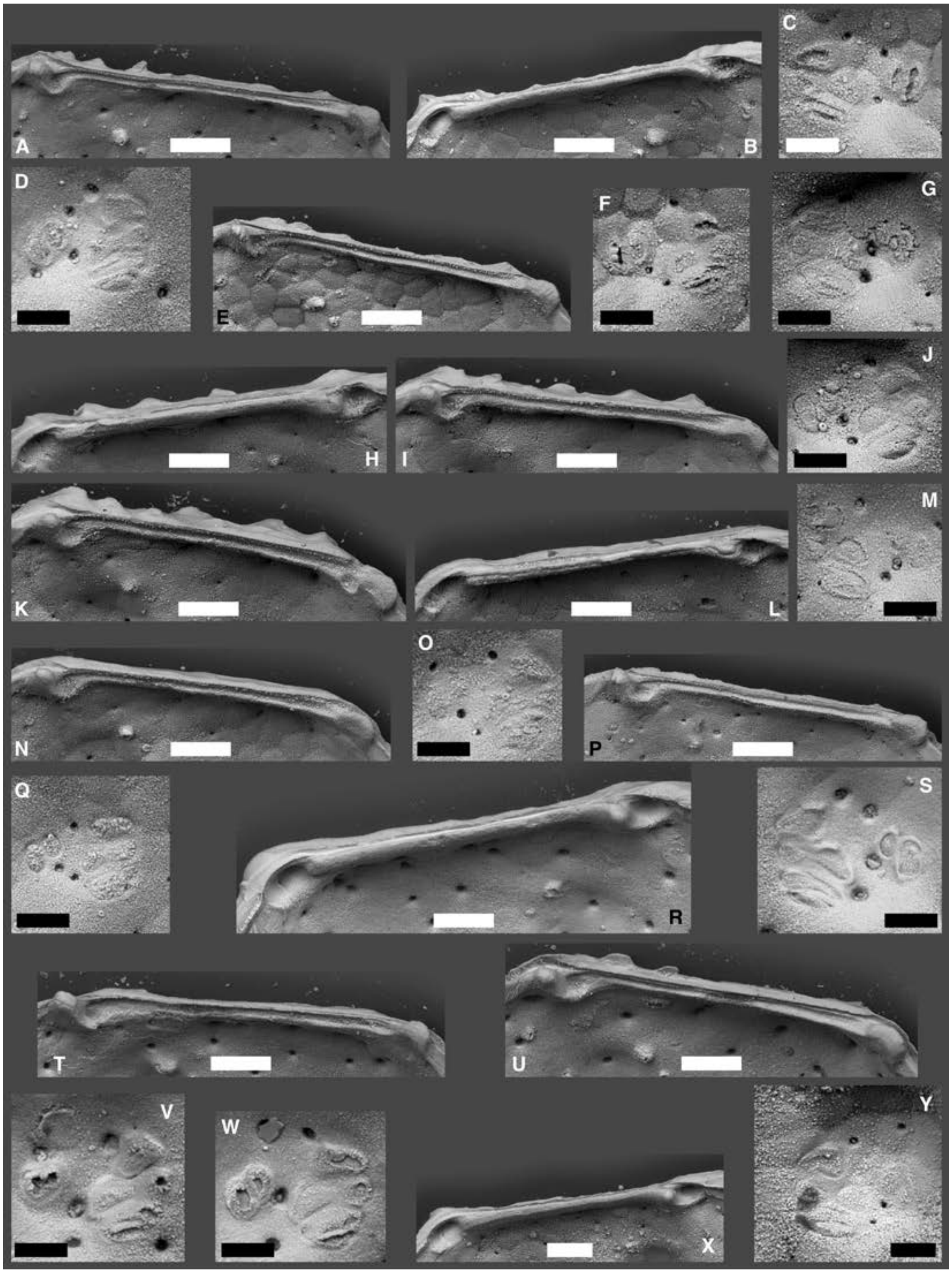


FIGURE 36. Internal details of *Dutoitella mazziniae* sp. nov., *Dutoitella paradinglei* sp. nov., *Dutoitella ayressi* sp. nov., *Dutoitella* sp. 1, *Dutoitella* sp. 2, and *Dutoitella* cf. *mazziniae* sp. nov. **A–F, P–S,** *Dutoitella mazziniae* sp. nov. A, D, TRA244 (USNM 607426), adult RV. A, hingement. D, subcentral muscle scars. B–C, TRA133 (USNM 607423), adult LV. B, hingement. C, subcentral muscle scars. E–F, TRA134 (USNM 607424), adult RV. E, hingement. F, subcentral muscle scars. P–Q, TRA1005 (USNM 607433), adult RV. P, hingement. Q, subcentral muscle scars. R–S, TRA240 (USNM 607434), adult LV. R, hingement. S, subcentral muscle scars. **G–K,** *Dutoitella paradinglei* sp. nov. G–H, TRA410 (USNM 607427), adult LV. G, subcentral muscle scars. H, hingement. I–J, TRA411 (USNM 607428), adult RV. I, hingement. J, subcentral muscle scars. K, TRA413 (USNM 607430), adult RV, hingement. **L–O,** *Dutoitella ayressi* sp. nov. L–M, TRA321 (USNM 607431), adult LV. L, hingement. M, subcentral muscle scars. N–O, TRA322 (USNM 607432), adult RV. N, hingement. O, subcentral muscle scars. **T, V,** *Dutoitella* sp. 1, TRA338 (USNM 607437), adult RV. T, hingement. V, subcentral muscle scars. **U, W,** *Dutoitella* sp. 2, TRA339 (USNM 607438), adult RV. U, hingement. W, subcentral muscle scars. **X–Y,** *Dutoitella* cf. *mazziniae* sp. nov., TRA101 (USNM 607439), adult LV. X, hingement. Y, subcentral muscle scars. Scale bars represent 0.1 mm for A–B, E, H–I, K–L, N, P, R, T–U, X and 50 μm for C–D, F–G, J, M, O, Q, S, V–W, Y.

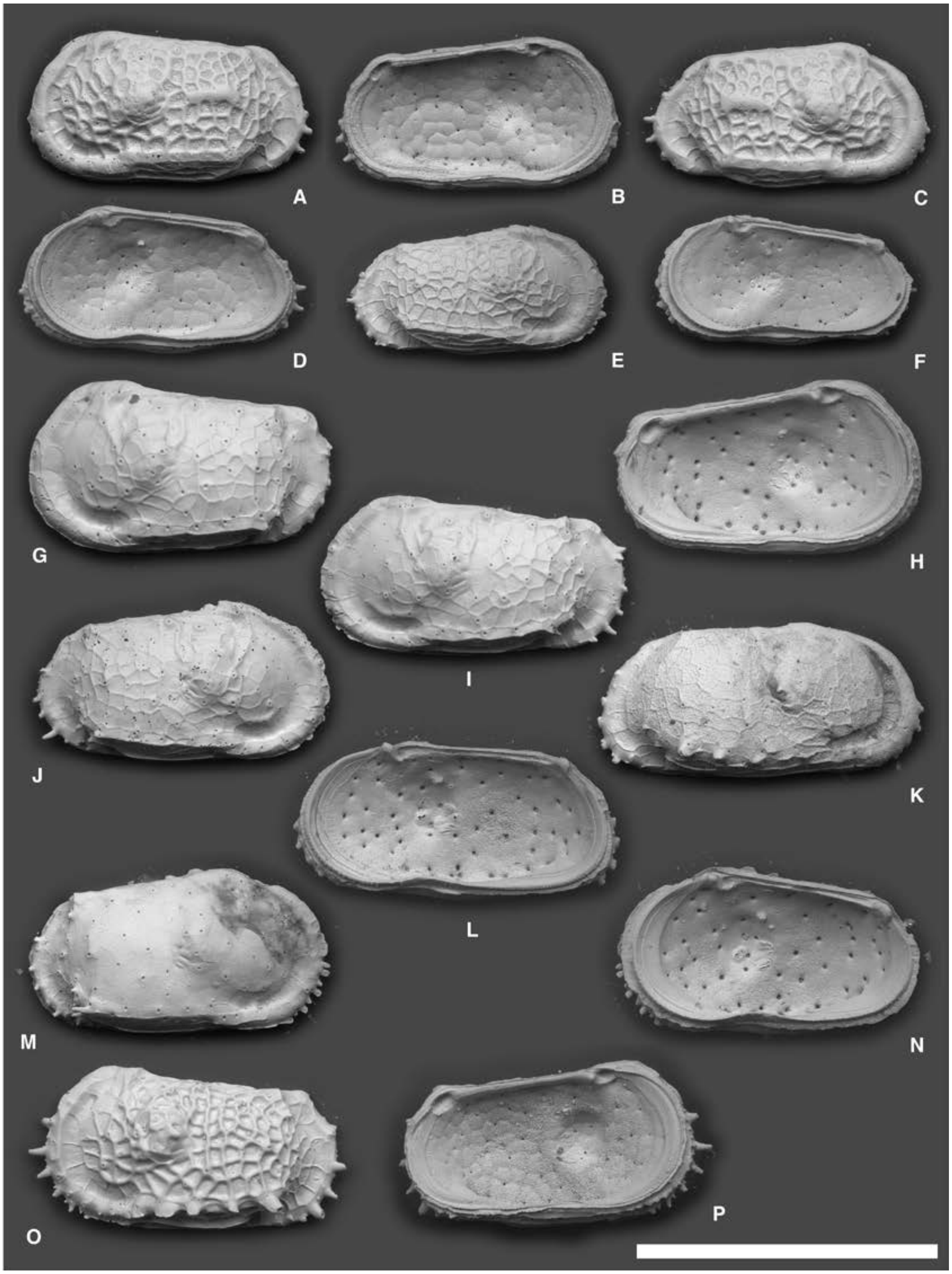


FIGURE 37. Scanning electron microscope images of *Dutoitella ayressi* sp. nov., *Dutoitella mazziniae* sp. nov., *Dutoitella* sp. 1, *Dutoitella* sp. 2, and *Dutoitella* cf. *mazziniae* sp. nov. A, C, E, G, I–K, M, O, lateral views; B, D, F, H, L, N, P, internal views. **A–D,** *Dutoitella ayressi* sp. nov. A–B, TRA321 (USNM 607431), adult LV from DSDP 359, 2/6/85–95, Miocene, southeastern Atlantic. C–D, TRA322 (USNM 607432), adult RV from DSDP 359, 2/6/85–95, Miocene, southeastern Atlantic. **E–J,** *Dutoitella mazziniae* sp. nov. E–F, TRA1005 (USNM 607433), adult RV from DSDP 359, 1/3/42–53, early Pliocene, southeastern Atlantic. G–H, TRA240 (USNM 607434), adult LV from DSDP 526A, 1/1/60–67, early Pliocene, southeastern Atlantic. I, TRA241 (USNM 607435), adult LV from DSDP 526A, 1/1/60–67, early Pliocene, southeastern Atlantic. J, TRA242 (USNM 607436), adult RV from DSDP 526A, 1/1/60–67, early Pliocene, southeastern Atlantic. **K–L,** *Dutoitella* sp. 1, TRA338 (USNM 607437), adult RV from DSDP 246, 2/cc, early Pliocene, Indian Ocean. **M–N,** *Dutoitella* sp. 2, TRA339 (USNM 607438), adult RV from DSDP 246, 2/cc, early Pliocene, Indian Ocean. **O–P,** *Dutoitella* cf. *mazziniae* sp. nov., TRA101 (USNM 607439), adult LV from DSDP 526A, 22/1/124–131, early Miocene, southeastern Atlantic. Scale bar represents 1 mm.

dorsal margin and median lateral ridge. *Dutoitella mazziniae* sp. nov. is also similar to *Dutoitella crassinodosa* (Guernet, 1985) but can be distinguished by the lack of spines on the dorsal margin and ventrolateral ridge. There is considerable variation in the reticulum development that we provisionally consider intraspecific because these forms are almost identical otherwise.

Dutoitella cf. *mazziniae* sp. nov.

FIGURES 36X–Y, 37O–P, 38A–B

LOCALITY AND AGE OF SPECIMENS EXAMINED. DSDP 526A, early Miocene, southeastern Atlantic.

DIMENSIONS. See Table 1.

REMARKS. This species has spines on the ventrolateral ridge but is otherwise very similar to *Dutoitella mazziniae* sp. nov. This difference may be intraspecific variation.

Dutoitella paradinglei sp. nov.

FIGURES 35M–S, 36G–K

DERIVATION OF NAME. With reference to its similarity to *Dutoitella dinglei* Guernet et al., 2001.

HOLOTYPE. Adult RV, USNM 607428 (TRA411; Figures 35O–P, 36I–J).

PARATYPES. USNM 607427, 607429, 607430 (TRA410, TRA412, TRA413).

TYPE LOCALITY AND HORIZON. DSDP 281, 10/2/135–142, middle Miocene, 47.9973°S, 147.7642°E, 1,591 m water depth, Southern Ocean.

DIMENSIONS. See Table 1.

DIAGNOSIS. *Dutoitella* species characterized by primary reticulation and nodose appearance.

DESCRIPTION. Carapace well calcified, highest at anterodorsal corner. Outline subrectangular; anterior margin evenly rounded, bearing weakly developed marginal frill (seen in internal view); posterior margin blunt, bearing a few small spines in its ventral half; dorsal margin almost straight, bearing three nodes; ventral margin slightly sinuous; ventrolateral ridge well developed and continuous with anterior marginal rim, bearing a spine at posterior end; median lateral ridge well developed and node-like; subcentral tubercle well developed. Anterodorsal corner weakly angular in LV and prominent and angular in RV; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface ornamented with primary reticulation. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus present. Hingement holamphidont. Frontal muscle scar divided. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

REMARKS. *Dutoitella paradinglei* sp. nov. is very similar to *Dutoitella dinglei* Guernet et al., 2001, but *D. paradinglei* is distinguished by primary reticulation, a less prominent anterodorsal corner in LV, and a more prominent anterodorsal corner in RV.

Dutoitella ayressi sp. nov.

FIGURES 36L–O, 37A–D

DERIVATION OF NAME. In honor of Michael Ayress, Ichron Limited, for his invaluable contribution to deep-sea ostracod research.

HOLOTYPE. Adult RV, USNM 607432 (TRA322; Figures 36N–O, 37C–D).

PARATYPES. USNM 607431 (TRA321).

TYPE LOCALITY AND HORIZON. DSDP 359, 2/6/85–95, Miocene, 34.9850°S, 4.4972°W, 1,655 m water depth, southeastern Atlantic.

DIMENSIONS. See Table 1.

DIAGNOSIS. *Dutoitella* species characterized by an almost spineless carapace and distinct primary reticulation.

DESCRIPTION. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular; anterior margin evenly rounded, bearing weakly developed marginal frill (seen in internal view); posterior margin blunt, bearing two to three spines in its ventral half; dorsal and ventral margins straight and smooth; ventrolateral ridge smooth, well developed, and continuous with anterior marginal rim; median lateral ridge well developed and node-like; subcentral tubercle well developed. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with well-developed primary reticulation. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus present. Hingement holamphidont. Frontal muscle scar divided. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

REMARKS. *Dutoitella ayressi* sp. nov. is distinguished from all other *Dutoitella* species by the unique combination of an almost spineless carapace (except for the anterior and posterior margins) and primary reticulation that is strongly and evenly developed over nearly the whole lateral carapace surface.

Dutoitella mimica Dingle, 1981

FIGURES 38C–F, 39A–D

LOCALITY AND AGE OF SPECIMENS EXAMINED. DSDP 359, late Eocene, southeastern Atlantic.

DIMENSIONS. See Table 1.

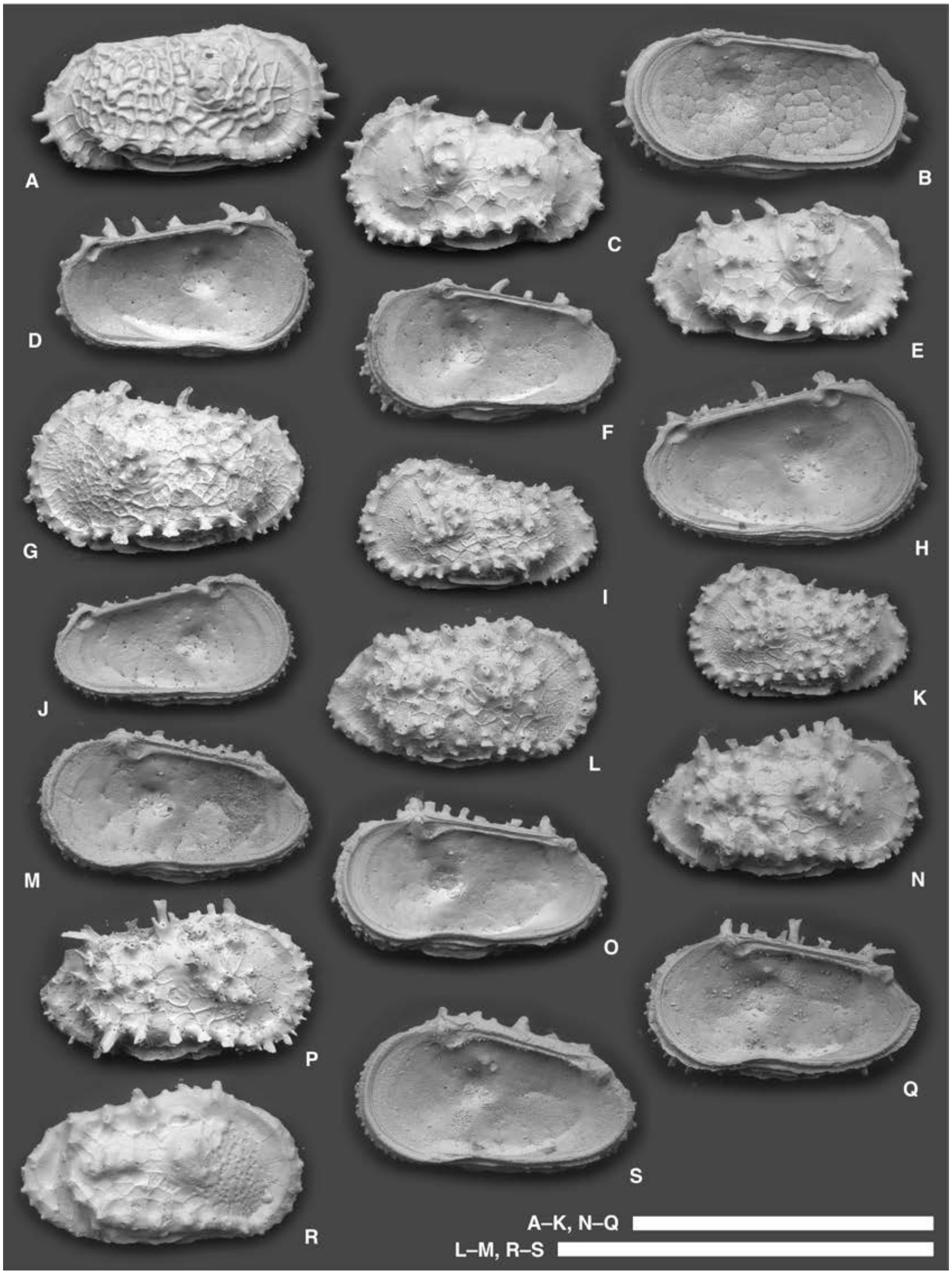
REMARKS. Well-preserved specimens from the Eocene in the South Atlantic are shown here.

Dutoitella colesi sp. nov.

FIGURES 38I–M, 39G–J

DERIVATION OF NAME. In honor of Graham P. Coles, formerly of University College of Wales, Aberystwyth, for his contribution to deep-sea ostracod research.

HOLOTYPE. Adult RV, USNM 607446 (TRA758; Figures 38L–M, 39I–J).



IGURE 38. Scanning electron microscope images of *Dutoitella* cf. *mazziniae* sp. nov., *Dutoitella mimica* Dingle, 1981, *Dutoitella* sp. 3, *Dutoitella colesi* sp. nov., *Dutoitella spinosa* sp. nov., and *Dutoitella whatleyi* sp. nov. A, C, E, G, I, K–L, N, P, R, lateral views; B, D, F, H, J, M, O, Q, S, internal views. **A–B,** *Dutoitella* cf. *mazziniae* sp. nov., TRA102 (USNM 607440), adult RV from DSDP 526A, 22/1/124–131, early Miocene, southeastern Atlantic. **C–F,** *Dutoitella mimica* Dingle, 1981. C–D, TRA317 (USNM 607441), adult LV from DSDP 359, 3/2/53–60, late Eocene, southeastern Atlantic. E–F, TRA318 (USNM 607442), adult RV from DSDP 359, 3/2/53–60, late Eocene, southeastern Atlantic. **G–H,** *Dutoitella* sp. 3, TRA308 (USNM 607443), adult LV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. **I–M,** *Dutoitella colesi* sp. nov. I–J, TRA756 (USNM 607444), adult LV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. K, TRA757 (USNM 607445), adult LV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. L–M, TRA758 (USNM 607446), adult RV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. **N–Q,** *Dutoitella spinosa* sp. nov. N–O, TRA761 (USNM 607447), adult RV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. P–Q, TRA307 (USNM 607448), adult RV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. **R–S,** *Dutoitella whatleyi* sp. nov., TRA806 (USNM 607449), adult RV from DSDP 363, 17/2/71–88, middle Paleocene, southeastern Atlantic. Scale bars represent 1 mm.

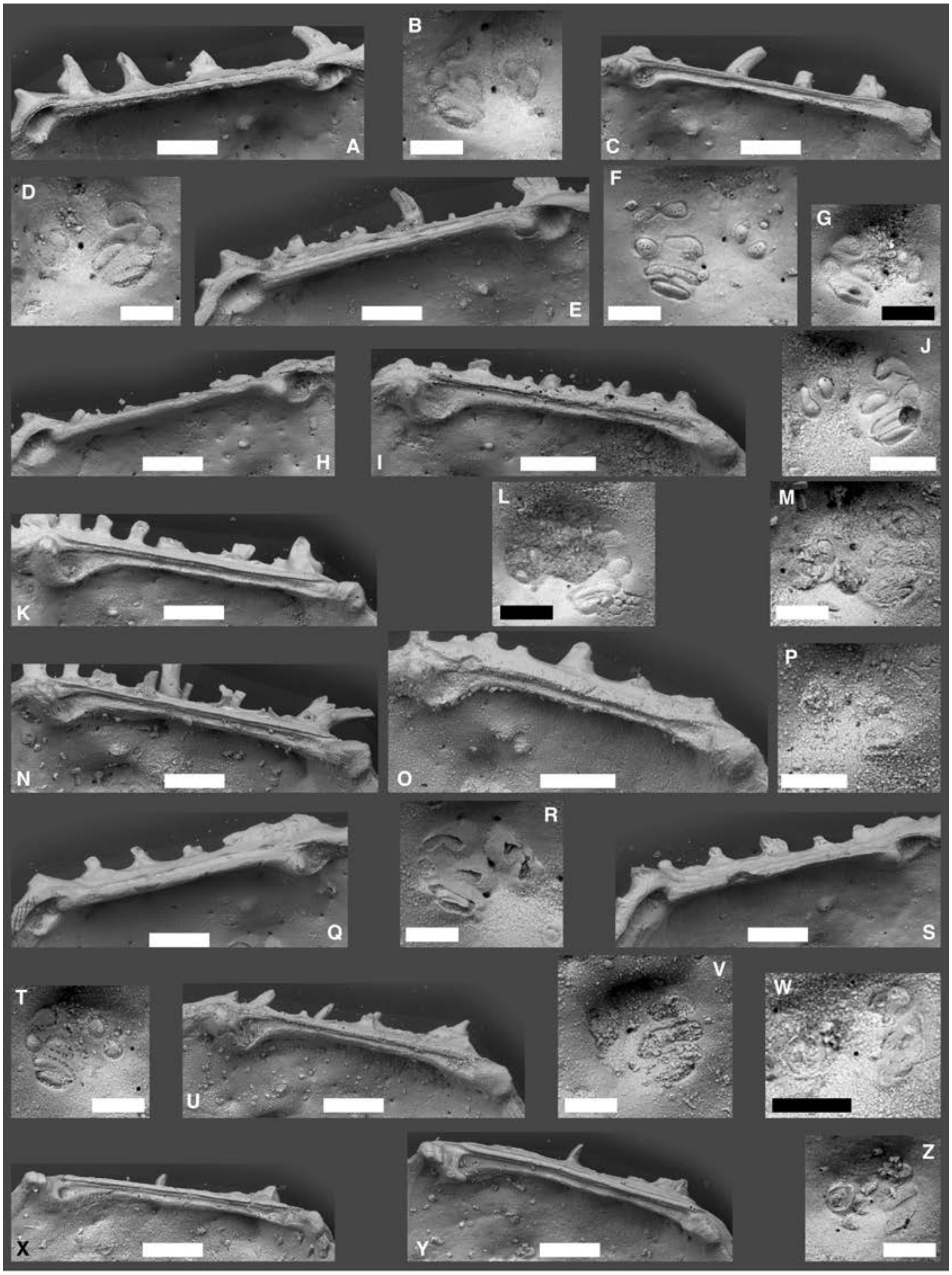


FIGURE 39. Internal details of *Dutoitella mimica* Dingle, 1981, *Dutoitella* sp. 3, *Dutoitella colesi* sp. nov., *Dutoitella spinosa* sp. nov., *Dutoitella whatleyi* sp. nov., *Bensonodutoitella* sp. 1, and *Bensonodutoitella bicornigeri* sp. nov. **A–D,** *Dutoitella mimica* Dingle, 1981. A–B, TRA317 (USNM 607441), adult LV. A, hingement. B, subcentral muscle scars. C–D, TRA318 (USNM 607442), adult RV. C, hingement. D, subcentral muscle scars. **E–F,** *Dutoitella* sp. 3, TRA308 (USNM 607443), adult LV. E, hingement. F, subcentral muscle scars. **G–J,** *Dutoitella colesi* sp. nov. G–H, TRA756 (USNM 607444), adult LV. G, subcentral muscle scars. H, hingement. I–J, TRA758 (USNM 607446), adult RV. I, hingement. J, subcentral muscle scars. **K–N,** *Dutoitella spinosa* sp. nov. K–L, TRA761 (USNM 607447), adult RV. K, hingement. L, subcentral muscle scars. M–N, TRA307 (USNM 607448), adult RV. M, subcentral muscle scars. N, hingement. **O–T,** *Dutoitella whatleyi* sp. nov. O–P, TRA806 (USNM 607449), adult RV. O, hingement. P, subcentral muscle scars. Q–R, TRA759 (USNM 607450), adult LV. Q, hingement. R, subcentral muscle scars. S–T, TRA336 (USNM 607451), adult LV. S, hingement. T, subcentral muscle scars. **U–V,** *Bensonodutoitella* sp. 1, TRA760 (USNM 607452), adult RV. U, hingement. V, subcentral muscle scars. **W–Z,** *Bensonodutoitella bicornigeri* sp. nov. W–X, TRA311 (USNM 607453), adult RV. W, subcentral muscle scars. X, hingement. Y–Z, TRA310 (USNM 607454), adult RV. Y, hingement. Z, subcentral muscle scars. Scale bars represent 0.1 mm for A, C, E, H–I, K, N–O, Q, S, U, X–Y and 50 μm for B, D, F–G, J, L–M, P, R, T, V–W, Z.

Paratypes. USNM 607444, 607445 (TRA756, TRA757).

Type Locality and Horizon. DSDP 327A, 13/2/100–105, late Campanian, 50.8713°S, 46.7837°W, 2,400 m water depth, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Dutoitella* species characterized by primary and secondary reticulation and a spinose appearance.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular; anterior margin evenly rounded, bearing small spines; posterior margin bluntly acuminate, bearing small spines in its ventral half; dorsal margin almost straight, bearing broad frill in anterior half in LV and spines; ventral margin slightly sinuous; ventrolateral ridge well developed, spinose, and continuous with anterior marginal rim; subcentral tubercle with spines. Anterodorsal corner forms an obtuse angle; posterodorsal corner prominent and angular in LV and weakly angular in RV. Lateral surface ornamented with primary and secondary reticulation and spines. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus present. Hingement holamphidont. Frontal muscle scar divided. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

Remarks. *Dutoitella colesi* sp. nov. is very similar to *Dutoitella* sp. 3, but the former has a broad marginal frill along the anterior half of the dorsal margin in LV, much smaller size, and a more spinose carapace. *Dutoitella mimica* Dingle, 1981, is distinguished from this new species by a less spinose carapace and the lack of secondary reticulation.

Dutoitella spinosa sp. nov.

FIGURES 38N–Q, 39K–N

?Dutoitella sp. Majoran, Kucera, and Widmark, 1998:66, pl. 2, fig. 11a–b.

Derivation of Name. From the Latin *spinosa* (adjective in the nominative singular, feminine), meaning "thorny," with reference to the spinose carapace of this species.

Holotype. Adult RV, USNM 607448 (TRA307; Figures 38P–Q, 39M–N).

Paratype. USNM 607447 (TRA761).

Type Locality and Horizon. DSDP 329, 5/6/80–88, late Miocene, 50.6552°S, 46.0955°W, 1,519 m water depth, southwestern Atlantic.

Other Locality. DSDP 327A, late Campanian, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Dutoitella* species characterized by spinose carapace with very large spines on dorsal margin and ventrolateral ridge.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular; anterior margin evenly rounded, bearing marginal frill (seen in internal view) and numerous small spines; posterior margin bluntly acuminate, bearing small spines; dorsal margin straight, bearing large, long spines; ventral margin slightly sinuous; ventrolateral ridge well developed, slightly curved, spinose with six large spines, and continuous with anterior marginal rim; subcentral tubercle with spines. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular. Lateral surface ornamented with spines and primary reticulation. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus present. Hingement paramphidont. Frontal muscle scar divided. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

Remarks. *Dutoitella spinosa* sp. nov. is very similar to *Dutoitella mimica* Dingle, 1981 but is distinguished by a much more spinose carapace, especially in the dorsal margin, and a curved ventrolateral ridge.

Dutoitella whatleyi sp. nov.

FIGURES 38R–S, 39O–T, 40A–D

Derivation of Name. In honor of Robin C. Whatley, formerly of University College of Wales, Aberystwyth, for his outstanding and pioneering works on deep-sea ostracod taxonomy.

Holotype. Adult LV, USNM 607450 (TRA759; Figures 39Q–R, 40A–B).

Paratypes. USNM 607449, 607451 (TRA806, TRA336).

Type Locality and Horizon. DSDP 327A, 13/2/100–105, late Campanian, 50.8713°S, 46.7837°W, 2,400 m water depth, southwestern Atlantic.

Other Localities. DSDP 363, DSDP 356, middle Paleocene, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Dutoitella* species characterized by the punctate appearance of the anterior area of the carapace.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular-subtriangular; anterior margin evenly rounded, bearing weakly developed marginal frill (seen in internal view) and small spines in its ventral half; posterior margin bluntly acuminate, bearing small spines in its ventral half; dorsal margin almost straight, bearing broad frill in anterior half in LV and spines; ventral margin slightly sinuous; ventrolateral ridge well developed, spinose, and continuous with anterior marginal rim; median lateral ridge well developed; subcentral tubercle subdued. Anterodorsal corner forms an obtuse angle; posterodorsal corner prominent and angular in LV and weakly angular in RV. Lateral surface ornamented with primary and secondary reticulation in posterior half; secondary reticulation in anterior half, producing a punctate appearance. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus present. Hingement holamphidont. Frontal muscle scar divided. Adductor muscle scars consist of four adductor scars; dorsomedian scar divided.

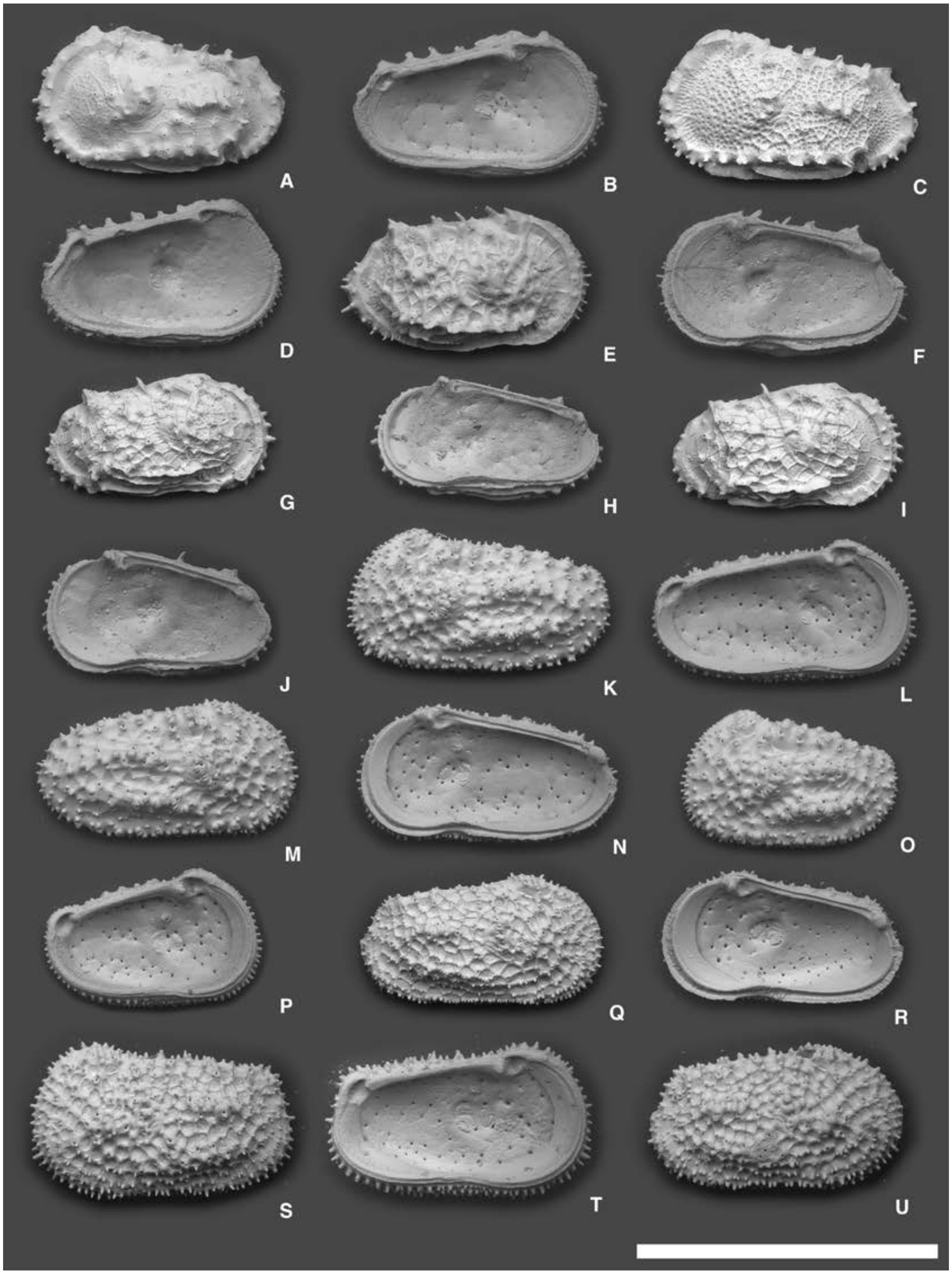


FIGURE 40. Scanning electron microscope images of *Dutoitella whatleyi* sp. nov., *Bensonodutoitella* sp. 1, *Bensonodutoitella bicornigeri* sp. nov., *Henryhowella evax* (Ulrich and Bassler, 1904), and *Henryhowella asperrima* (Reuss, 1850). A, C, E, G, I, K, M, O, Q, S, U, lateral views; B, D, F, H, J, L, N, P, R, T, internal views. **A–D,** *Dutoitella whatleyi* sp. nov. A–B, TRA759 (USNM 607450), adult LV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. C–D, TRA336 (USNM 607451), adult LV from DSDP 356, 25/3/86–88, middle Paleocene, southwestern Atlantic. **E–F,** *Bensonodutoitella* sp. 1, TRA760 (USNM 607452), adult RV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. **G–J,** *Bensonodutoitella bicornigeri* sp. nov. G–H, TRA311 (USNM 607453), adult RV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. I–J, TRA310 (USNM 607454), adult RV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. **K–P,** *Henryhowella evax* (Ulrich and Bassler, 1904). K–L, GSM320 (USNM 607455), adult LV from 75BBC, Calvert Formation, outcrop, Miocene, USA. M–N, GSM321 (USNM 607456), adult RV from 75BBC, Calvert Formation, outcrop, Miocene, USA. O–P, GSM322 (USNM 607457), adult LV from 75BBC, Calvert Formation, outcrop, Miocene, USA. **Q–U,** *Henryhowella asperrima* (Reuss, 1850). Q–R, TRA430 (USNM 607458), adult RV from DSDP 277, 5/1/50–57, early Oligocene, Southern Ocean. S–T, TRA962 (USNM 607459), adult LV from DSDP 526A, 10/1/123–130, late Miocene, southeastern Atlantic. U, TRA963 (USNM 607460), adult RV from DSDP 526A, 10/1/123–130, late Miocene, southeastern Atlantic. Scale bar represents 1 mm.

Remarks. *Dutoitella whatleyi* sp. nov. is very similar to *Dutoitella paradinglei* sp. nov. but is distinguished by its comparatively triangular outline, secondary reticulation, and less developed primary reticulation. *Dutoitella whatleyi* sp. nov. is also similar to *Dutoitella praesuhmi* Coles and Whatley, 1989, but is distinguished by its secondary reticulation, less spinous carapace, and less developed primary reticulation.

Dutoitella atlantiformis sp. nov.

FIGURES 28T–V, 41A–B

Derivation of Name. With reference to its similarity to *Atlanticythere* Benson, 1977.

Holotype. Adult RV, USNM 607358 (TRA803; Figures 28U–V, 41A–B).

Paratype. USNM 607357 (TRA802).

Type Locality and Horizon. DSDP 258A, 9/4/50–56, Santonian, 33.7948°S, 112.4737°E, 2,793 m water depth, Indian Ocean.

Dimensions. See Table 1.

Diagnosis. *Dutoitella* species characterized by slender outline and well-developed secondary reticulation.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular and slender; anterior margin evenly rounded, bearing weakly developed marginal frill (seen in internal view) and small spines; posterior margin bluntly acuminate, bearing spines in its ventral half; dorsal margin straight, bearing three distinct spines; ventral margin almost straight; ventrolateral ridge well developed, spinose with six spines, and continuous with anterior marginal rim; median lateral ridge subdued; subcentral tubercle present, bearing three spines. Anterodorsal and posterodorsal corners prominent and angular in LV and weakly angular in RV. Lateral surface ornamented with weak primary reticulation and well-developed secondary reticulation. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus present. Hingement holamphidont. Frontal muscle scar and adductor muscle scars not well preserved.

Remarks. *Dutoitella atlantiformis* sp. nov. is very similar to *Atlanticythere* species because both have, for example, a slender outline and well-developed secondary reticulation. However, we tentatively place this species in *Dutoitella* Dingle, 1981 because its well-developed ventrolateral ridge is continuous with the anterior marginal rim.

Dutoitella sp. 1

FIGURES 36T,V, 37K–L

Locality and Age of Specimens Examined. DSDP 246, early Pliocene, Indian Ocean.

Dimensions. See Table 1.

Remarks. This species is similar to the less reticulate form of *Dutoitella mazziniae* sp. nov. but has spines on its ventrolateral ridge and secondary reticulation. We found only one specimen of *Dutoitella* sp. 1.

Dutoitella sp. 2

FIGURES 36U,W, 37M–N

Locality and Age of Specimens Examined. DSDP 246, early Pliocene, Indian Ocean.

Dimensions. See Table 1.

Remarks. This species is characterized by a lack of reticulation but is otherwise very similar to less reticulate forms of *Dutoitella mazziniae* sp. nov. We found only one specimen of *Dutoitella* sp. 2.

Dutoitella sp. 3

FIGURES 38G–H, 39E–F

Locality and Age of Specimens Examined. DSDP 329, late Miocene southwestern Atlantic.

Dimensions. See Table 1.

Remarks. This species is similar to *Dutoitella mimica* Dingle, 1981, but that species lacks secondary reticulation.

Genus *Bensonodutoitella* gen. nov.

Type Species. *Bensonodutoitella bicornigeri* sp. nov.

Derivation of Name. In honor of the late Richard H. Benson, formerly of Smithsonian Institution, for his contribution to ostracod paleobiology and with reference to its similarity to *Dutoitella* Dingle, 1981.

Diagnosis. A trachyleberidid genus characterized by a relatively high carapace in proportion to its length; subrectangular outline; evenly rounded anterior margin bearing spines; bluntly acuminate posterior margin bearing spines; dorsolateral ridge bearing spines; distinct ventrolateral ridge separated from anterior marginal rim; lateral surface ornamented with primary and secondary reticulation and pore conuli; moderately developed subcentral tubercle; distinct anterior and posterior marginal sulci and rims; V-shaped frontal scar; a vertical row of four adductor scars; paramphidont hinge; well-developed marginal frill in internal view.

Remarks. *Bensonodutoitella* gen. nov. is similar to *Dutoitella* Dingle, 1981, but the latter has a continuous ventrolateral-anteromarginal ridge, and the former has a ventrolateral ridge separated from the anterior marginal rim. This new genus is also similar to *Atlanticythere* Benson, 1977, but the former has a distinct dorsolateral ridge, and the latter is more nodose and slender. In addition, the internal details of this new genus are distinct from those of *Dutoitella* and *Atlanticythere*; this new genus has an undivided frontal scar and undivided dorsomedian adductor scar. *Bensonodutoitella* gen. nov. shares many diagnostic characters with the type species of *Cuvillierella* Pokorný, 1971, *Cuvillierella jeani* Pokorný, 1971 (see Pokorný, 1971; Whatley and Ballent,

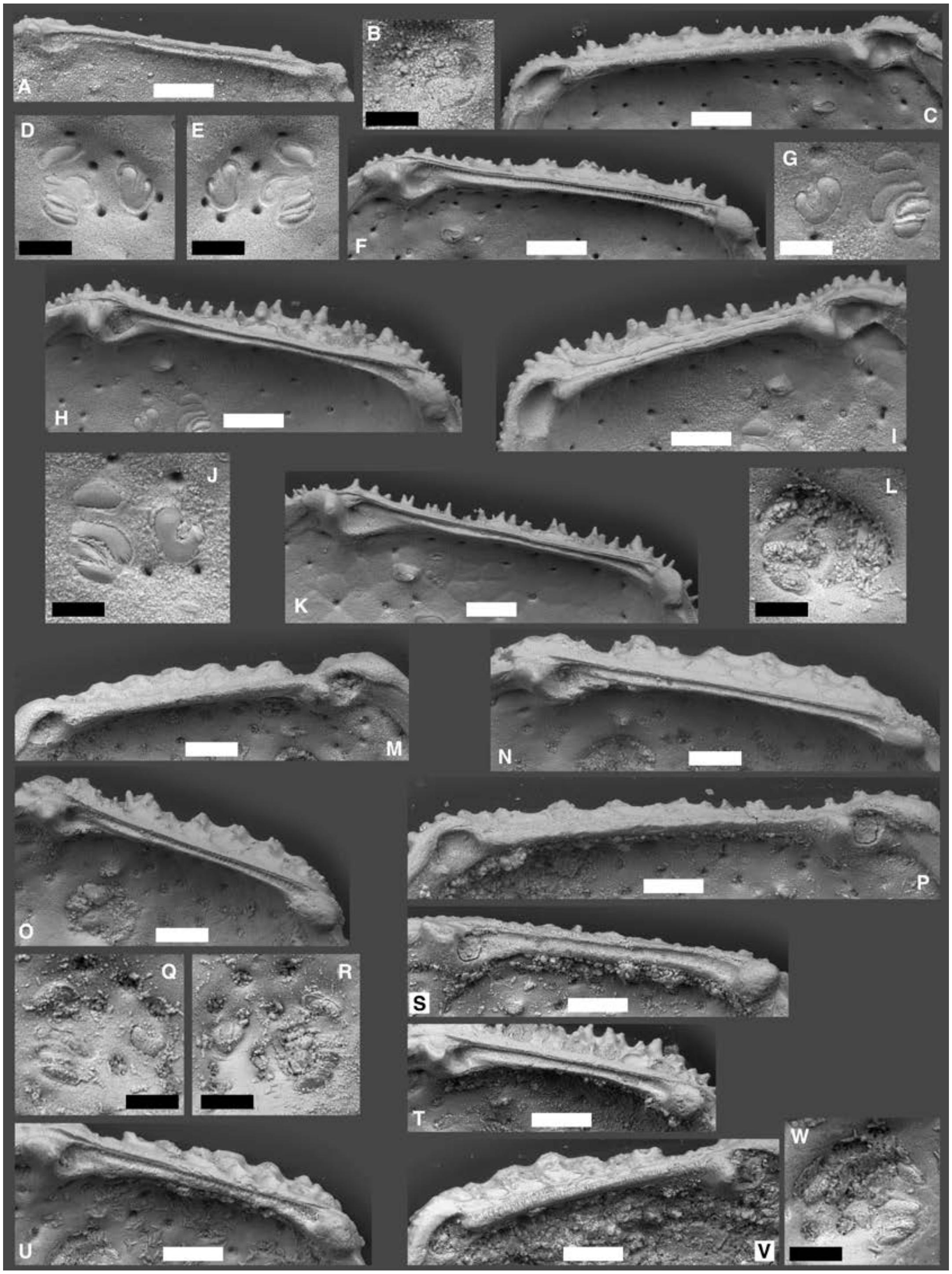


FIGURE 41. Internal details of *Dutoitella atlantiformis* sp. nov., *Henryhowella evax* (Ulrich and Bassler, 1904), *Henryhowella asperrima* (Reuss, 1850), *Henryhowella argentinensis* (Bertels, 1969b), *Henryhowella meridionalis* (Bertels, 1969b), and *Henryhowella nascens* (Bertels, 1969b). **A–B,** *Dutoitella atlantiformis* sp. nov., TRA803 (USNM 607358), adult RV. A, hingement. B, subcentral muscle scars. **C–F,** *Henryhowella evax* (Ulrich and Bassler, 1904). C–D, GSM320 (USNM 607455), adult LV. C, hingement. D, subcentral muscle scars. E–F, GSM321 (USNM 607456), adult RV. E, subcentral muscle scars. F, hingement. **G–K,** *Henryhowella asperrima* (Reuss, 1850). G–H, GSM629 (USNM 607462), adult RV. G, subcentral muscle scars. H, hingement. I–J, GSM630 (USNM 607463), adult LV. I, hingement. J, subcentral muscle scars. K, TRA517 (USNM 607467), adult RV, hingement. **L–O,** *Henryhowella argentinensis* (Bertels, 1969b). L, TRA932 (USNM 607477), adult LV, subcentral muscle scars. M, TRA907 (USNM 607470), adult LV, hingement. N, TRA912 (USNM 607474), adult RV, hingement. O, TRA921 (USNM 607479), adult RV, hingement. **P–T,** *Henryhowella meridionalis* (Bertels, 1969b). P–Q, TRA922 (USNM 607490), adult LV. P, hingement. Q, subcentral muscle scars. R–S, TRA924 (USNM 607494), adult RV. R, subcentral muscle scars. S, hingement. T, TRA920 (USNM 607502), adult RV, hingement. **U–W,** *Henryhowella nascens* (Bertels, 1969b). U, W, TRA906 (USNM 607486), adult RV. U, hingement. W, subcentral muscle scars. V, TRA904 (USNM 607484), adult LV, hingement. Scale bars represent 0.1 mm for A, C, F, H–I, K, M–P, S–V and 50 µm for B, D–E, G, J, L, Q–R, W.

2004), including the general outline, a well-developed ventrolateral ridge separated from the anterior marginal rim, weak primary and secondary reticulation, and a well-developed anterior marginal rim. However, *Cuvillierella* has an entomodont hingement, and its range is restricted to the Jurassic (Pokorný, 1971; Whatley and Ballent, 2004). Currently, two *Bensonodutoitella* species, both from the southwestern Atlantic, are known, as detailed below.

Bensonodutoitella bicornigeri sp. nov.

FIGURES 39W–Z, 40G–J

Derivation of Name. From the Latin *bicornigeri* (a noun in the genitive case), meaning "two-horned," with reference to its dorsal margin bearing two spines.

Holotype. Adult RV, USNM 607454 (TRA310; Figures 39Y–Z, 40I–J).

Paratype. USNM 607453 (TRA311).

Type Locality and Horizon. DSDP 329, 5/6/80–88, late Miocene, 50.6552°S, 46.0955°W, 1,519 m water depth, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Bensonodutoitella* species characterized by dorsal margin with two spines.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular; anterior margin evenly rounded, bearing marginal frill (seen in internal view) and spines; posterior margin bluntly acuminate, bearing small spines; dorsal margin almost straight, bearing two spines; ventral margin slightly sinuous; ventrolateral ridge short but well developed; subcentral tubercle subdued. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with primary and secondary reticulation and pore conuli. Anterior marginal rim and sulcus well developed; posterior marginal rim and sulcus present. Hingement paramphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of four adductor scars.

Remarks. Although this new species is very similar to *Dutoitella colesi* sp. nov., it can be distinguished by the separation of the ventrolateral ridge from the anterior marginal rim and a less spinous lateral surface, as well as the internal details, as discussed in the Remarks section of *Bensonodutoitella* gen. nov.

Bensonodutoitella sp. 1

FIGURES 39U–V, 40E–F

Locality and Age of Specimens Examined. DSDP 327A, late Campanian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. This species is very similar to *Bensonodutoitella bicornigeri* sp. nov. but can be distinguished from it because it has four or more spines on the dorsal margin, an upturned posterior margin, and less developed secondary reticulation.

Genus *Henryhowella* Puri, 1957

Type Species. *Cythere evax* Ulrich and Bassler, 1904.

Remarks. *Henryhowella* Puri, 1957 is similar to *Echinocythereis* Puri, 1954 but is distinguished by a V-shaped frontal scar and distinct primary reticulation. In addition, *Echinocythereis* tends to have a more inflated, oval-shaped carapace that is higher in proportion to its length. *Fallacihowella* Jellinek and Swanson, 2003 is a junior synonym of *Henryhowella* in our opinion because the differences stated in Jellinek and Swanson (2003) and Mazzini (2005) are too subtle. *Apatihowella* Jellinek and Swanson, 2003 is also very similar to *Henryhowella*. Almost the only consistent carapace difference is that *Apatihowella* has a distinct subcentral tubercle and *Henryhowella* does not. Jellinek and Swanson (2003) considered that *Apatihowella* has a paramphidont hinge with an anterior tooth that is not pointed, but the anterior and posterior teeth are only very weakly crenulate. Its difference from *Henryhowella*'s holamphidont hinge (i.e., smooth posterior tooth and smooth and pointed anterior tooth) is subtle. Plication in the posterior half is not a diagnostic character of *Henryhowella* (see also Dingle et al., 1990; Bonaduce et al., 1999) because there is no recognizable morphological difference other than plication between plicate and nonplicate forms (see Figure 40K–U for the plicate form and Figure 42A–R for nonplicate forms). The above-mentioned differences may not be sufficient to divide genera in our opinion. Further splitting *Henryhowella* into several genera without molecular evidence may add further taxonomic confusion.

Neoveenia Bertels, 1969b, *Wichmannella* Bertels, 1969b, and *Rocaleberis* Bertels, 1969b are also very similar to *Henryhowella*, although they are not deep-sea genera. Scanning electron microscope images of type species of *Neoveenia* (Figures 41L–O, 44A–M, 44O–R), *Wichmannella* (Figures 41P–T, 44N, 45F–Q, 46M–T), and *Rocaleberis* (Figures 41U–W, 45A–E) clearly show internal and external features consistent with *Henryhowella*, including a holamphidont hinge, V-shaped frontal muscle scar, spinous carapace with primary reticulation, and the absence of distinctive ridges. Bertels (1969b) considered *Rocaleberis* to be distinguished from *Henryhowella* by the presence of a vestibule and branched marginal pores and by its larger and simple normal pores, although all these differences are subtle; for example, the vestibule is narrow, and only a few marginal pores are branched in *Rocaleberis*. Bertels did not compare the other two genera with *Henryhowella,* and they may also be junior synonyms of *Henryhowella*.

Henryhowella has global distribution and is known from most, if not all, oceans and seas, including the Arctic Ocean. *Henryhowella* may be the only trachyleberidid genus distributed in the modern deep Arctic Ocean (Joy and Clark, 1977; Yasuhara et al., 2014).

Synonymized Genera. *Fallacihowella* Jellinek and Swanson, 2003, *Neoveenia* Bertels, 1969b, *Wichmannella* Bertels, 1969b, *Rocaleberis* Bertels, 1969b, and possibly *Apatihowella* Jellinek and Swanson, 2003.

Henryhowella evax (Ulrich and Bassler, 1904)

FIGURES 40K–P, 41C–F

Cythere evax Ulrich and Bassler, 1904:119, pl. 36, figs. 6–8.
Henryhowella evax (Ulrich and Bassler); Forester, 1980:12, pl. 4, figs. 1–2.
Henryhowella evax (Ulrich and Bassler); Mazzini, 2005, fig. 28.

Locality and Age of Specimens Examined. 75BBC, Calvert Formation, Plum Point, Maryland, Miocene, North America.

Dimensions. See Table 1.

Remarks. Forester (1980) provided a comprehensive synonymy of this species and designated a lectotype. Scanning electron microscope images of topotype specimens are shown here. *Henryhowella evax* (Ulrich and Bassler, 1904) is similar to *Henryhowella asperrima* (Reuss, 1850) but differs in having an upturned posteroventral margin, comparatively oval outline, and strongly developed plication in the posterior half. Although several researchers considered *Henryhowella evax* (Ulrich and Bassler, 1904) a junior synonym of *Henryhowella asperrima* (Reuss, 1850) (e.g., van den Bold, 1957b; Dingle et al., 1990), we second Mazzini (2005) in viewing these as distinct species.

Henryhowella asperrima (Reuss, 1850)

FIGURES 40Q–U, 41G–K, 42A–O, 43A–H

Cypridina asperrima Reuss, 1850:74, pl. 10, fig. 5a–b.
Cypridina hirta Costa, 1853:174, pl. 15, fig. 2a,c.
Cythereis sarsii Müller, 1894:370, pl. 8, fig. 8.
Cythereis dunelmensis Norman; Tressler, 1941:100, pl. 19, fig. 21.
Henryhowella asperrima (Reuss); van den Bold, 1960:169, pl. 4, fig. 10; pl. 8, fig. 2.
Henryhowella ruggierii Oertli, 1961:28, pl. 4, figs. 39–45.
Henryhowella (generic assignment only); Laughton, Berggren, Benson, Davies, Franz, Musich, Perch-Nielsen, Ruffman, van Hinte, and Whitmarsh, 1972, pl. 11, fig. 4.
Henryhowella asperrima (Reuss); Berggren, Benson, Haq, Riedel, Sanfilippo, Schrader, and Tjalsma, 1976, pl. 6, fig. 4.
Henryhowella sarsi (Müller); Bonaduce, Ciampo, and Masoli, 1976:52, pl. 31, figs. 1–7.
Henryhowella asperrima? (Reuss); Benson, 1977, pl. 2, fig. 2.
Echinocythereis dasyderma (Brady); Joy and Clark, 1977:142, pl. 2, figs. 14–17.
Henryhowella asperrima (Reuss); Benson, 1978, pl. 1, fig. 3.
Henryhowella asperrima (Reuss); Rosenfeld and Bein, 1978:18, pl. 1, fig. 23.
Henryhowella asperrima (Reuss); Ducasse and Peypouquet, 1979, pl. 3, fig. 1.
Henryhowella ex. gr. *H. asperrima* (Reuss); Steineck, 1981:346, pl. 2, fig. 1.
Henryhowella asperrima s.l. (Reuss); Uffenorde, 1981:148, pl. 2, figs. 14–15, 17–19.
?Henryhowella asperrima (Reuss); Cronin, 1983, pl. 4, fig. F.
Henryhowella asperrima? (Reuss); Benson and Peypouquet, 1983, pl. 2, figs. 1, 3.
Henryhowella asperrima (Reuss); Malz and Jellinek, 1984, pl. 5, figs. 38–39.
Henryhowella sp. Cronin and Compton-Gooding, 1987, pl. 1, figs. 5–6; pl. 2, fig. 1.
Henryhowella asperrima (Reuss); Whatley and Coles, 1987, pl. 5, figs. 9–11.
Henryhowella cf. *evax* (Ulrich and Bassler); Guernet and Fourcade, 1988, pl. 3, figs. 18–20.
Henryhowella melobesioides (Brady); Dingle, Lord, and Boomer, 1990:311, figs. 42E,F, 43A–F, 44A–D, 47A (non 42C–D).
Henryhowella asperrima (Reuss); Malz, 1990, fig. 6.8.
Henryhowella asperrima (Reuss); Kempf and Nink, 1993:95, figs. 1–30.
Henryhowella cf. *asperrima* (Reuss); Guernet and Moullade, 1994:268, pl. 3, figs. 8–11, 14.
Henryhowella asperrima (Reuss); Cronin, 1996b, fig. 7a.
non *Henryhowella asperrima* (Reuss); Whatley, Staunton, Kaesler, and Moguilevsky, 1996b:67, pl. 3, fig. 8.
Henryhowella gr. *asperrima* (Brady) [*sic*]; Coles, Ainsworth, Whatley, and Jones, 1996, pl. 6, figs. 2–3.
Henryhowella melobesioides (Brady); Guernet, 1998, pl. 2, figs. 4–6.
non *Henryhowella asperrima* (Reuss); Whatley, Moguilevsky, Ramos, and Coxill, 1998b:129, pl. 4, figs. 22–23.
Henryhowella dasyderma (Brady); Whatley, Eynon, and Moguilevsky, 1998a, pl. 3, figs. 20–21.
non *Henryhowella* cf. *H. asperrima* (Reuss); Boomer, 1999:145, pl. 2, figs. 1, 2, 4.
Henryhowella asperrima (Reuss); Bonaduce, Barra, and Aiello, 1999:60, pl. 1, figs. 1–2.
Henryhowella? asperrima (Reuss); Bonaduce et al., 1999:61, pl. 1, figs. 3–4.
Henryhowella sarsii sarsii (Müller); Bonaduce et al., 1999:64, pl. 2, figs. 1–10; pl. 3, fig. 12; pl. 4, figs. 9–10; pl. 5, figs. 1–2, 6–8, 11.
Henryhowella sarsii profunda Bonaduce et al., 1999:68, pl. 1, figs. 5–12; pl. 4, figs. 1–8.
Henryhowella sp. Guernet and Bellier, 2000:267, pl. 4, figs. 12, 15.
Henryhowella sp. cf. *H. dasyderma* (Brady); Didié and Bauch, 2001, pl. 1, figs. 1–2.
Henryhowella sarsii profunda Bonaduce et al.; Barra and Bonaduce, 2001:64, pl. 4, fig. 8.
Henryhowella asperrima (Reuss); Dall'Antonia and Bossio, 2001:418, pl. 5, figs. 3–7.
Henryhowella asperrima (Reuss); Aiello and Szczechura, 2004:26, pl. 4, figs. 12–14.
Henryhowella asperrima (Reuss); Mazzini, 2005:50, figs. 26A–I, 27B.
Fallacihowella sp. B Mazzini, 2005:57, fig. 32A–Q.
Henryhowella dasyderma (Brady); Alvarez Zarikian, 2009:6, pl. 9, figs. 6–8.
Henryhowella cf. *asperrima* (Reuss); Yasuhara, Okahashi, and Cronin, 2009c:926, pl. 20, fig. 7; pl. 21, figs. 1–4.
Henryhowella asperrima (Reuss); Bergue and Govindan, 2010:751, fig. 3.14.
Henryhowella sp. 1; Bergue and Govindan, 2010:752, fig. 3.15.
Henryhowella asperrima (Reuss); Pirkenseer and Berger, 2011:54, pl. 7, figs. 6a–c, 7a–c; pl. 8, figs. 1a–c, 2a–c, 3a–c.
Henryhowella ex *H. hirta* (Costa) group; Sciuto, 2014:6, pl. 1H.
Henryhowella ex *H. profunda* Bonaduce et al. group; Sciuto, 2014:8, pl. 1I.

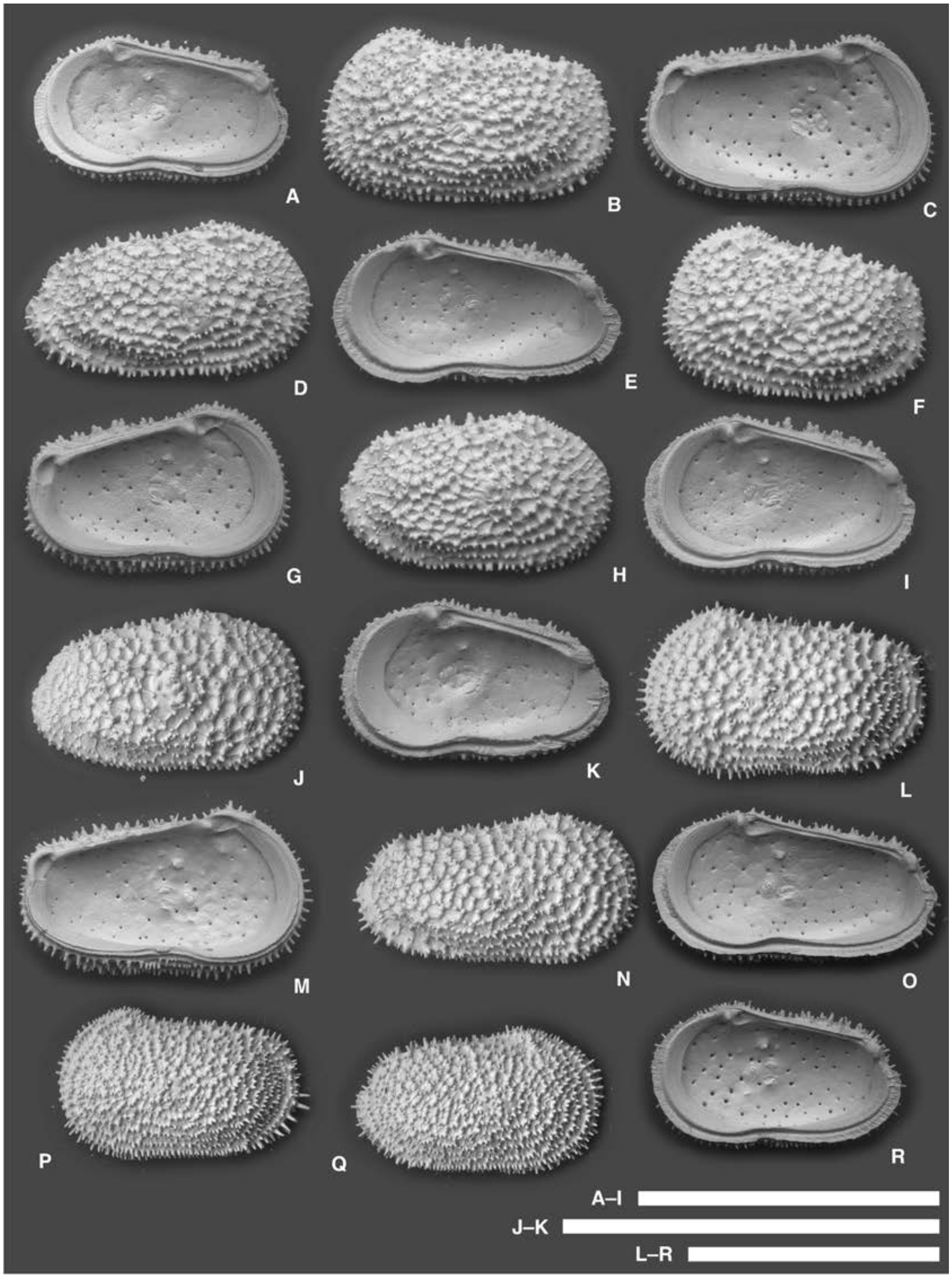


FIGURE 42. Scanning electron microscope images of *Henryhowella asperrima* (Reuss, 1850) and *Henryhowella* sp. 1. B, D, F, H, J, L, N, P–Q, lateral views; A, C, E, G, I, K, M, O, R, internal views. **A–O,** *Henryhowella asperrima* (Reuss, 1850). A, TRA963 (USNM 607460), adult RV from DSDP 526A, 10/1/123–130, late Miocene, southeastern Atlantic. B–C, GSM628 (USNM 607461), adult LV from Alb D2383, Modern, Gulf of Mexico. D–E, GSM629 (USNM 607462), adult RV from Alb D2383, Modern, Gulf of Mexico. F–G, GSM630 (USNM 607463), adult LV from Alb D2383, Modern, Gulf of Mexico. H–I, GSM631 (USNM 607464), adult RV from Alb D2383, Modern, Gulf of Mexico. J–K, TRA616 (USNM 607465), adult RV from DSDP 516F, 30/2/59–64, Oligocene, southwestern Atlantic. L–M, TRA516 (USNM 607466), adult LV from DSDP 141, 1/3/50–56, early Pleistocene, northeastern Atlantic. N–O, TRA517 (USNM 607467), adult RV from DSDP 140, 1/2/50–56, Pliocene, northeastern Atlantic. **P–R,** *Henryhowella* sp. 1. P, TRA513 (USNM 607468), adult LV from DSDP 141, 2/3/50–56, late Pliocene, northeastern Atlantic. Q–R, TRA514 (USNM 607469), adult RV from DSDP 141, 2/3/50–56, late Pliocene, northeastern Atlantic. Scale bars represent 1 mm.

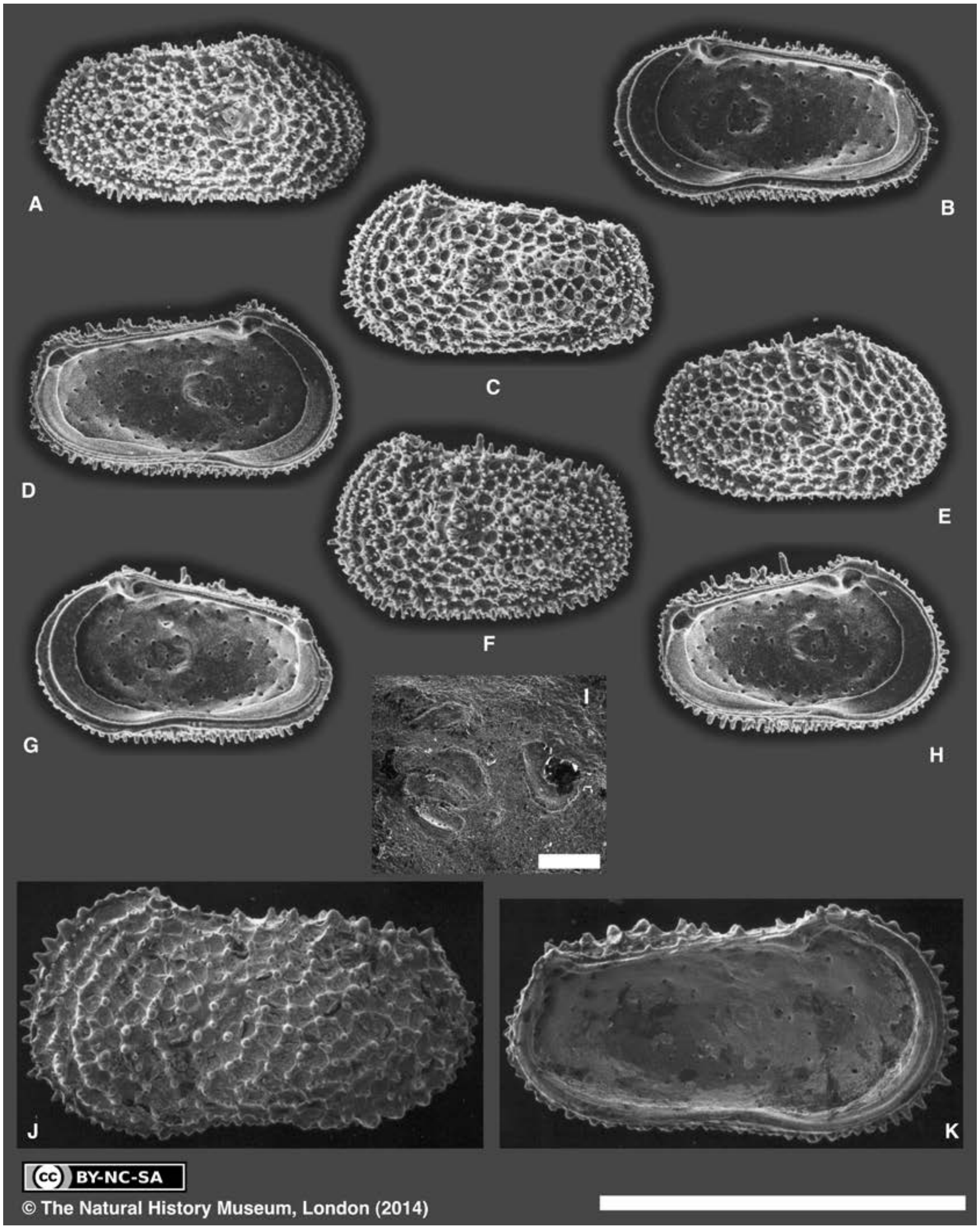


FIGURE 43. Scanning electron microscope images of topotype specimens of *Henryhowella asperrima* (Reuss, 1850) and the lectotype of *Henryhowella circumdentata* (Brady, 1880). **A–H,** *Henryhowella asperrima* (Reuss, 1850). All specimens from Vienna Basin, Miocene, Badenian, Europe; images from original negatives for Kempf and Nink (1993), provided by E. K. Kempf, used with permission. A, C, E–F, lateral views; B, D, G–H, internal views. A–B, E, G, adult RV; C–D, F, H, adult LV. **I–K,** *Henryhowella circumdentata* (Brady, 1880), NHM 80.38.58, adult? LV from Challenger station 276, Modern, South Pacific; images provided by I. Mazzini, under Creative Commons Attribution + Noncommercial + ShareAlike License (CC BY-NC-SA); copyright by The Trustees of The Natural History Museum, London (2014), used with permission. I, subcentral muscle scars. J, lateral view. K, internal view. Scale bars represent 1 mm for A–H, J–K (only one bar is shown at the bottom right for all of these subfigures) and 50 µm for I.

Locality and Age of Specimens Examined. DSDP 277, early Oligocene, Southern Ocean; DSDP 526A, late Miocene, southeastern Atlantic; Alb D2383, Modern, Gulf of Mexico; DSDP 516F, Oligocene, southwestern Atlantic; DSDP 140, DSDP 141, Pliocene and early Pleistocene, northeastern Atlantic; Vienna Basin, Miocene, Badenian, Europe.

Dimensions. See Table 1.

Remarks. For additional synonymy, see Uffenorde (1981), Bonaduce et al. (1999), Aiello and Szczechura (2004), and Pirkenseer and Berger (2011). The SEM images of topotype specimens are shown in Figure 43A–H. The plicate form and nonplicate form are almost identical except for the degree of development of plication. Thus, we consider plicate and nonplicate forms to be intraspecific variation. In fact, published SEM images of this species are quite variable in their development of plication, with some bearing rather indistinct plication (e.g., Aiello and Szczechura, 2004, pl. 4, fig. 14).

We agree with van den Bold (1957b), Dall'Antonia and Bossio (2001), and Pirkenseer and Berger (2011) in considering *Henryhowella sarsii* (Müller, 1894), including the two subspecies *Henryhowella sarsii sarsii* (Müller, 1894) and *Henryhowella sarsii profunda* Bonaduce et al., 1999, to be a junior synonym of *Henryhowella asperrima* (Reuss, 1850). Several researchers (Bonaduce et al., 1999; Aiello and Szczechura, 2004) considered an evenly rounded anterior margin to be a diagnostic character to distinguish *Henryhowella asperrima* from *Henryhowella sarsii*. However, as mentioned by Dall'Antonia and Bossio (2001), the shape of the anterior margin is quite variable, from evenly rounded to obliquely rounded, even in Kempf and Nink's (1993) SEM images of topotype specimens. Bonaduce et al. (1999) also mentioned bunches of partially fused spines as a diagnostic character of *Henryhowella sarsii sarsii*, but this characteristic may be related merely to the degree of overall development of spines, which often varies intraspecifically (see Dall'Antonia and Bossio, 2001). We partly agree with Malz and Jellinek (1984), Mostafawi and Matzke-Karasz (2006), and Sciuto (2014) and consider *Henryhowella sarsii* and *Henryhowella hirta* (Costa, 1853) conspecific. In sum, *Henryhowella sarsii*, *Henryhowella hirta*, and *Henryhowella asperrima* are all conspecific, and *Henryhowella sarsii* and *Henryhowella hirta* are junior synonyms of *Henryhowella asperrima* in our opinion. We would also include *Henryhowella asperrima* (Reuss) var. *digitalis* Levinson, 1974 (in LeRoy and Levinson, 1974) within our conception of *Henryhowella asperrima*. In our opinion, all of these morphological differences are subtle and fall enough within intraspecific variation. We consider *Henryhowella parthenopea* (Bonaduce et al., 1999) an independent species because this species has a much more slender and triangular outline, especially in juveniles (Bonaduce et al., 1999; i.e., we do not agree with Mostafawi and Matzke-Karasz, 2006, in this regard).

Considerable taxonomic confusion has existed regarding *Henryhowella asperrima*, which we think has resulted from this species' wide intraspecific variation and broad geographic and stratigraphic distribution. Other species with similar characteristics (i.e., widely known from both European/Mediterranean and Atlantic regions and at least from Miocene to Modern) are known, for example, *Buntonia textilis* Bonaduce et al., 1976, *Buntonia radiatopora* (Seguenza, 1880), and *Rimacytheropteron longipunctatum* (Breman, 1976). *Henryhowella asperrima* is also known from the Arctic Ocean (Joy and Clark, 1977; Cronin, 1996b; Yasuhara et al., 2014) but not from the Southern Ocean (Whatley et al., 1996b, 1998b; see synonym list above).

Henryhowella circumdentata (Brady, 1880)

FIGURE 43I–K

Cythere circumdentata Brady, 1880:106, pl. 26, fig. 2a–c.
Cythere circumdentata Brady; Puri and Hulings, 1976:269, fig. 3; pl. 17, figs. 3–6.

Lectotype. Adult? LV, NHM 80.38.58 (Figure 43I–K).

Type Locality and Horizon. Challenger station 276, Modern, 13.4667°S, 149.5000°W, 4,298 m water depth, South Pacific.

Dimensions. See Table 1.

Remarks. The lectotype specimen is shown in Figure 43I–K. *Henryhowella circumdentata* (Brady, 1880) is similar to *Henryhowella asperrima* (Reuss, 1850), but the former has a more upturned posterior margin, more sinuous ventral margin, nodose lateral appearance, and larger size. Additional specimens are needed for further detailed comparison because only one certain specimen (i.e., the lectotype) of *Henryhowella circumdentata* is known.

Henryhowella argentinensis (Bertels, 1969b)

FIGURES 41L–O, 44A–M,O–R

Neoveenia argentinensis Bertels, 1969b:168, pl. 3, fig. 1a–f; pl. 4, figs. 1a–d, 2a–d; pl. 5, fig. 3a–c.
Neoveenia argentinensis Bertels; Bertels, 1973:325, pl. 5, figs. 3a–b, 4.
Neoveenia argentinensis Bertels; Bertels, 1976, fig. 1; pl. 1, *Wichmannella*-Stock fig. 6.

Locality and Age of Specimens Examined. NR27, NR29, NR30, Rocca Formation, early Paleocene, Argentina, South America (see Bertels, 1973, for the details about these samples).

Dimensions. See Table 1.

Remarks. As discussed in the *Henryhowella* section above, we consider *Neoveenia* Bertels, 1969b to be a junior synonym of *Henryhowella* Puri, 1957. Topotype specimens provided by A. Bertels to R. H. Benson are shown here.

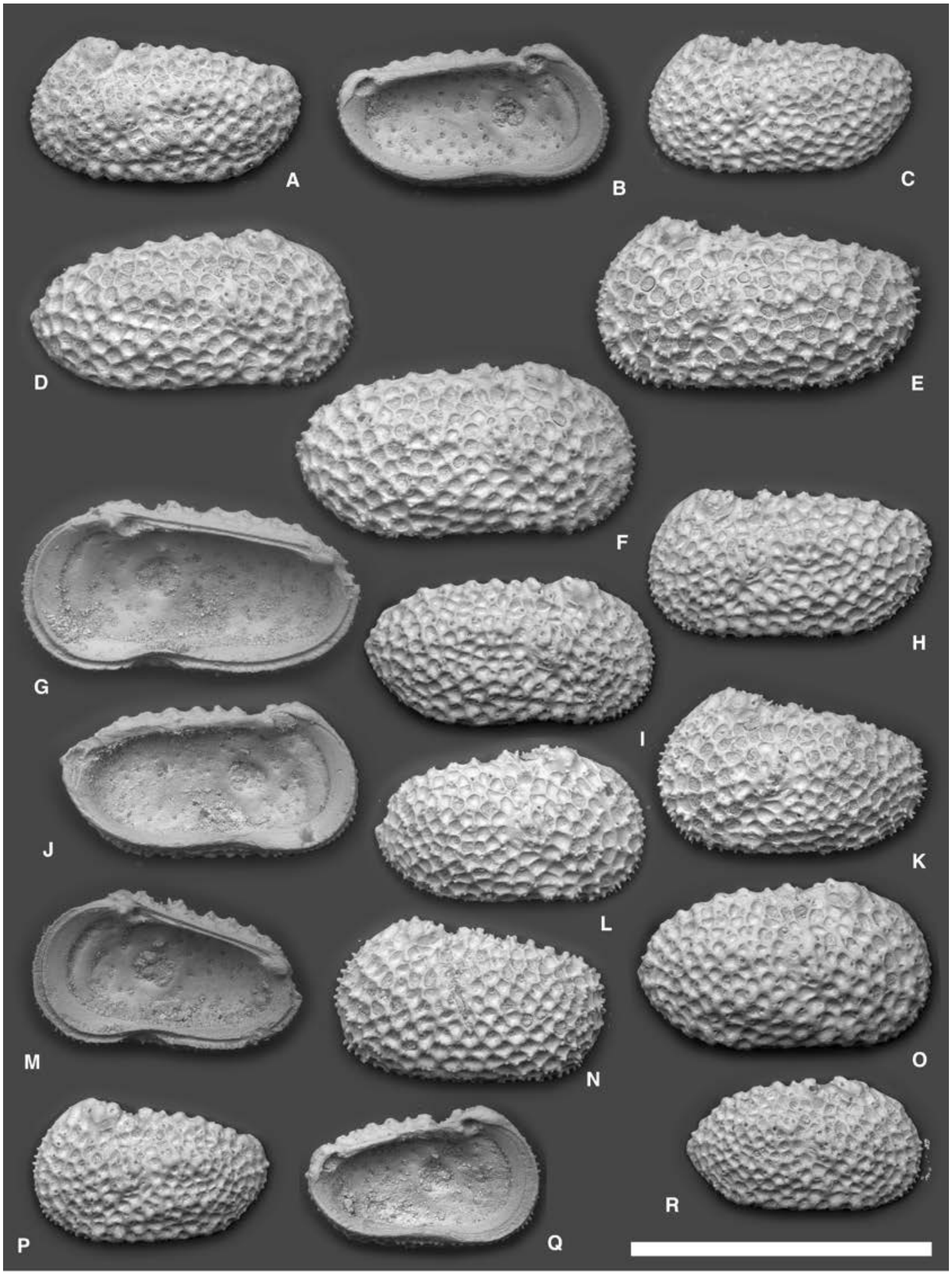


FIGURE 44. Scanning electron microscope images of *Henryhowella argentinensis* (Bertels, 1969b) and *Henryhowella meridionalis* (Bertels, 1969b). A, C–F, H–I, K–L, N–P, R, lateral views; B, G, J, M, Q, internal views. **A–M, O–R,** *Henryhowella argentinensis* (Bertels, 1969b). A–B, TRA907 (USNM 607470), adult LV from NR27. C, TRA913 (USNM 607471), adult LV from NR29. D, TRA908 (USNM 607472), adult RV from NR27. E, TRA911 (USNM 607473), adult LV from NR29. F–G, TRA912 (USNM 607474), adult RV from NR29. H, TRA927 (USNM 607475), adult LV from NR30. I, TRA928 (USNM 607476), adult RV from NR30. J, TRA932 (USNM 607477), adult LV from NR30. K, TRA914 (USNM 607478), adult LV from NR29. L–M, TRA921 (USNM 607479), adult RV from NR29. O, TRA931 (USNM 607481), adult RV from NR30. P–Q, TRA929 (USNM 607482), adult LV from NR30. R, TRA930 (USNM 607483), adult RV from NR30. **N,** *Henryhowella meridionalis* (Bertels, 1969b), TRA923 (USNM 607480), adult LV from NR30. All specimens from Rocca Formation, early Paleocene, Argentina (see Bertels, 1973, for the details of samples NR27, NR29, and NR30). Scale bar represents 1 mm.

Henryhowella meridionalis (Bertels, 1969b)

FIGURES 41P–T, 44N, 45F–Q, 46M–T

Wichmannella meridionalis Bertels, 1969b:166, pl. 2, figs. 1a–e, 2a–c; pl. 5, fig. 2a–c.
Wichmannella meridionalis Bertels; Bertels, 1972, pl. 3, figs. 10–11.
Wichmannella meridionalis Bertels; Bertels, 1973: 325, pl. 5, fig. 2a–b.
Wichmannella meridionalis Bertels; Bertels, 1976, fig. 2; pl. 1, *Wichmannella*-Stock fig. 3.
Wichmannella meridionalis Bertels; Bertels-Psotka, 1995, pl. 2, fig. 12.

Locality and Age of Specimens Examined. NR27, NR29, NR30, Rocca Formation, early Paleocene, Argentina, South America (see Bertels, 1973, for details about these samples).

Dimensions. See Table 1.

Remarks. As discussed in the *Henryhowella* section above, we consider *Wichmannella* Bertels, 1969b a junior synonym of *Henryhowella* Puri, 1957. Topotype specimens provided by A. Bertels to R. H. Benson are shown here.

Henryhowella nascens (Bertels, 1969b)

FIGURES 41U–W, 45A–E

Rocaleberis nascens Bertels, 1969b:164, pl. 1, fig. 1a–d; pl. 5, fig. 1a–c.
Rocaleberis nascens Bertels; Bertels, 1972, pl. 3, fig. 9.
Rocaleberis nascens Bertels; Bertels, 1973:324, pl. 5, fig. 1a–b.
Rocaleberis nascens Bertels; Bertels, 1976, fig. 3; pl. 1, *Rocaleberis*-Stock fig. 3.
Rocaleberis nascens Bertels; Bertels-Psotka, 1995, pl. 2, fig. 14.

Locality and Age of Specimens Examined. NR27, NR29, Rocca Formation, early Paleocene, Argentina, South America (see Bertels, 1973, for details about these samples).

Dimensions. See Table 1.

Remarks. As discussed in the *Henryhowella* section above, we consider *Rocaleberis* Bertels, 1969b a junior synonym of *Henryhowella* Puri, 1957. Topotype specimens provided by A. Bertels to R. H. Benson are shown here.

Henryhowella sp. 1

FIGURES 42P–R, 47A–B

Locality and Age of Specimens Examined. DSDP 359 DSDP 141, late Pliocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. This species is similar to *Henryhowella asperrima* (Reuss, 1850) but is distinguished by shallow and indistinct primary reticulation, well-developed secondary reticulation, and numerous fine spines on the lateral surface.

Genus *Oligocythereis* Sylvester-Bradley, 1948

Type Species. *Cythere fullonica* Jones and Sherborn, 1888.

Remarks. A clear lectotype photograph of the type species is shown in Bate (1969). *Aphrikanecythere* Damotte and Oertli, 1982 (in Donze et al., 1982; type species *Aphrikanecythere phumatoides* Damotte and Oertli, 1982 [in Donze et al. 1982]) and *Peloriops* Al-Abdul-Razzaq, 1979 are, in our opinion, junior synonyms of *Oligocythereis* Sylvester-Bradley, 1948.

Synonymized Genera. *Aphrikanecythere* Damotte and Oertli, 1982 (in Donze et al., 1982), and *Peloriops* Al-Abdul-Razzaq, 1979.

Oligocythereis sylvesterbradleyi sp. nov.

FIGURES 46G–J, 47C–F

Derivation of Name. In honor of the late Peter C. Sylvester-Bradley, formerly of University of Leicester, for his outstanding work on ostracod taxonomy.

Holotype. Adult RV, USNM 607499 (TRA535; Figures 46I–J, 47C–D).

Paratype. USNM 607498 (TRA534).

Type Locality and Horizon. DSDP 237, 24/4/50–56, middle Eocene, 7.0832°S, 58.1247°E, 1,623 m water depth, Indian Ocean.

Dimensions. See Table 1.

Diagnosis. *Oligocythereis* species characterized by a weakly and finely punctate carapace and the lack of an ocular ridge.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular and slender; anterior margin evenly rounded, bearing marginal frill (seen in internal view) and spines; posterior margin acuminate and upturned, bearing small spines; dorsal margin almost straight, bearing one small spine on the middle and one large tubercle on the posterior end; ventral margin slightly sinuous; ventrolateral ridge well developed and composed of two large tubercles; subcentral tubercle subdued. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with weak and fine punctation and pore conuli. Anterior marginal rim and sulcus present; posterior marginal rim and sulcus well developed. Hingement paramphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of four adductor scars, ventromedian scar smaller and positioned posteriorly.

Remarks. *Oligocythereis sylvesterbradleyi* sp. nov. is similar to the type species *Oligocythereis fullonica* (Jones and Sherborn, 1888; see Bate, 1969, for the lectotype SEM image) but differs from it in having punctation and lacking an ocular ridge.

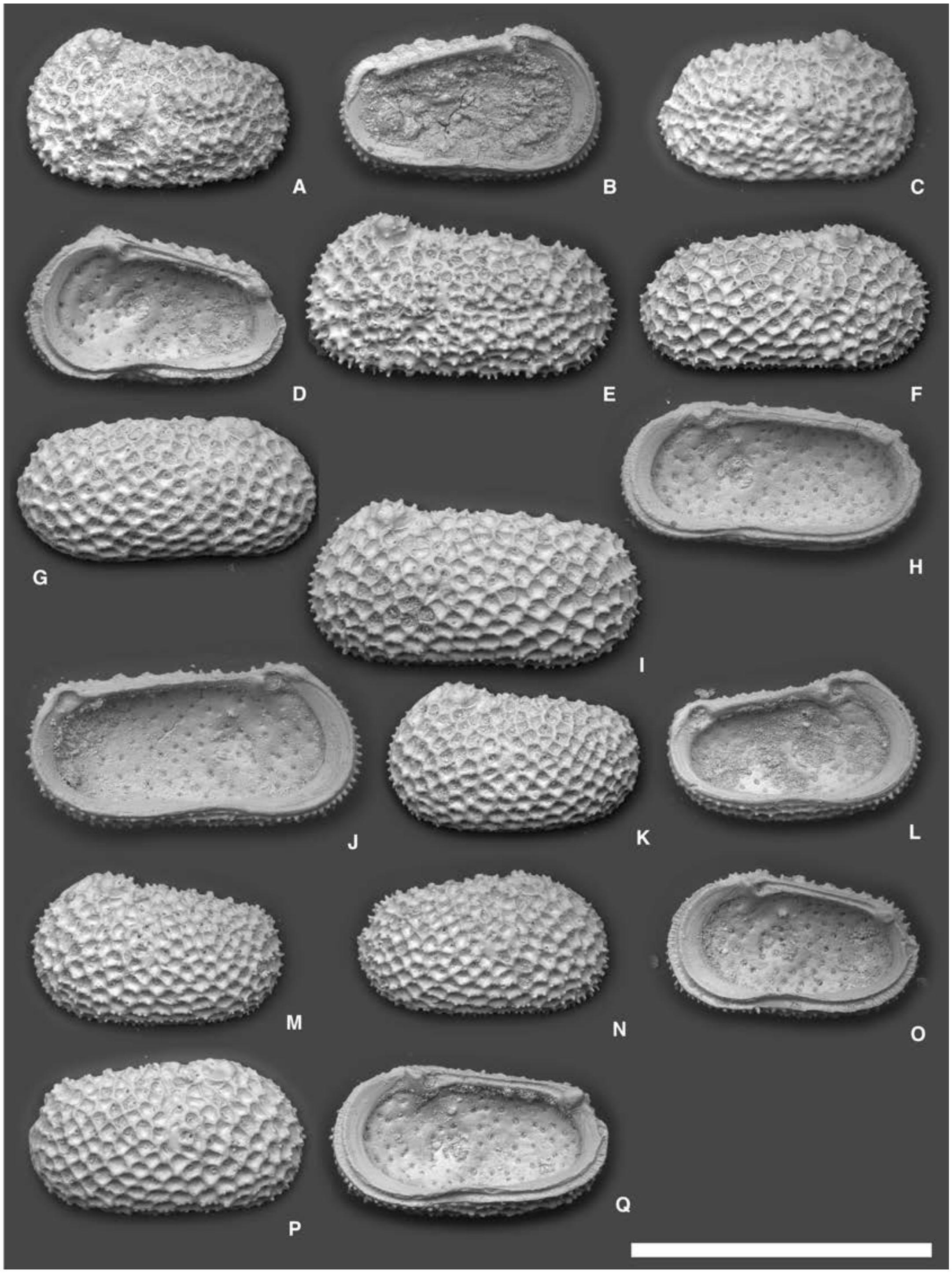


FIGURE 45. Scanning electron microscope images of *Henryhowella nascens* (Bertels, 1969b) and *Henryhowella meridionalis* (Bertels, 1969b). A, C, E–G, I, K, M–N, P, lateral views; B, D, H, J, L, O, Q, internal views. **A–E,** *Henryhowella nascens* (Bertels, 1969b). A–B, TRA904 (USNM 607484), adult LV from NR27. C, TRA905 (USNM 607485), adult RV from NR27. D, TRA906 (USNM 607486), adult RV from NR27. E, TRA915 (USNM 607487), adult LV from NR29. **F–Q,** *Henryhowella meridionalis* (Bertels, 1969b). F, TRA916 (USNM 607488), adult RV from NR29. G–H, TRA910 (USNM 607489), adult RV from NR27. I–J, TRA922 (USNM 607490), adult LV from NR30. K–L, TRA909 (USNM 607491), adult LV from NR27. M, TRA917 (USNM 607492), adult LV from NR29. N–O, TRA918 (USNM 607493), adult RV from NR29. P–Q, TRA924 (USNM 607494), adult RV from NR30. All specimens from Rocca Formation, early Paleocene, Argentina (see Bertels, 1973, for the details of samples NR27, NR29, and NR30). Scale bar represents 1 mm.

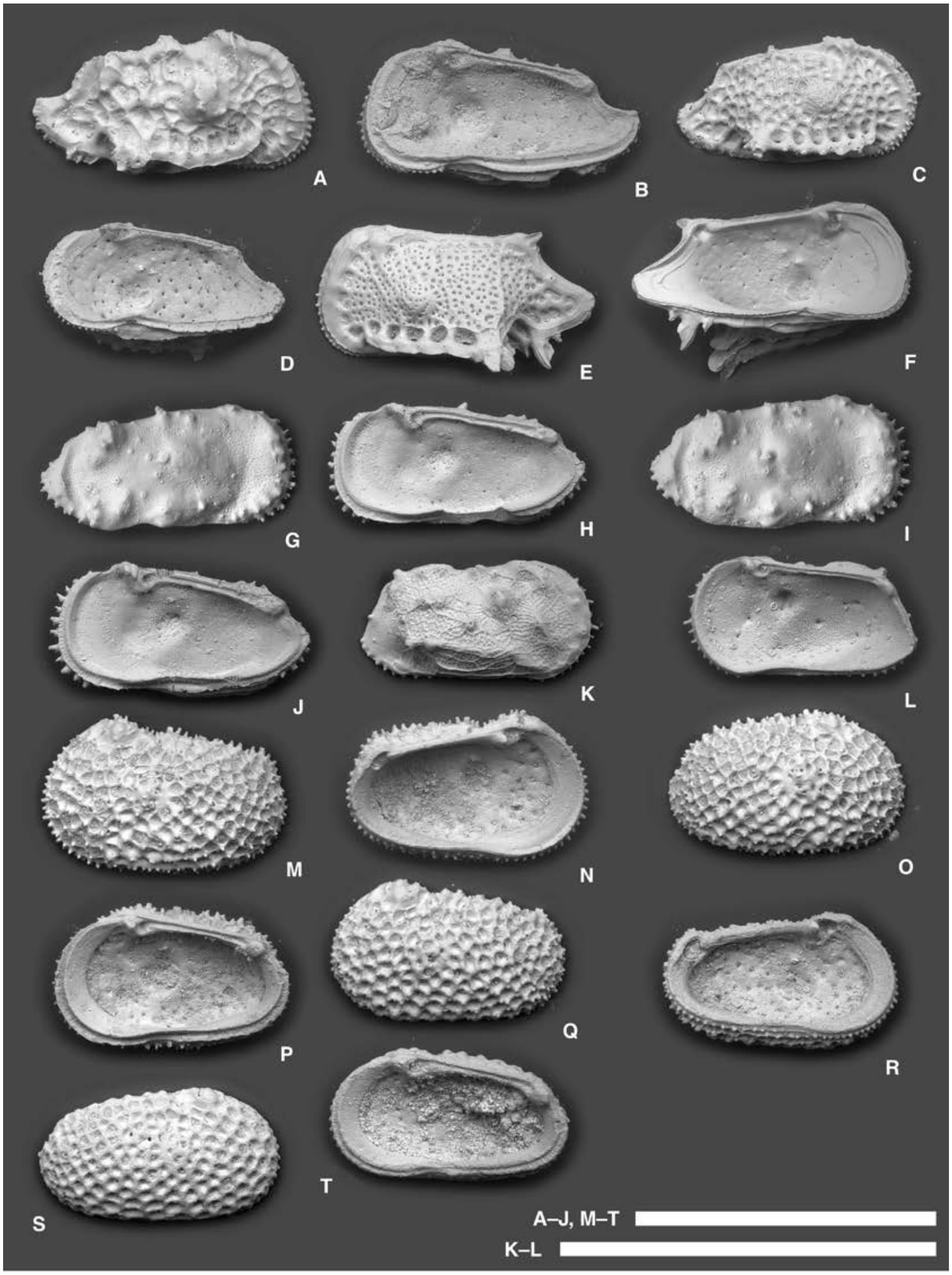


FIGURE 46. Scanning electron microscope images of *Tongacythere* sp. 1, *Tongacythere* sp. 2., *Tongacythere* sp. 3, *Oligocythereis sylvesterbradleyi* sp. nov., *Toolongella* sp. 1, and *Henryhowella meridionalis* (Bertels, 1969b). A, C, E, G, I, K, M, O, Q, S, lateral views; B, D, F, H, J, L, N, P, R, T, internal views. **A–B,** *Tongacythere* sp. 1, TRA448 (USNM 607495), adult RV from DSDP 277, 43/1/40–47, early Eocene, Southern Ocean. **C–D,** *Tongacythere* sp. 2, TRA834 (USNM 607496), adult RV from SI-25, late Eocene, New Zealand. **E–F,** *Tongacythere* sp. 3, TRA938 (USNM 607497), adult LV from NGC 100 pilot, 0–5, Modern, southwestern Pacific. **G–J,** *Oligocythereis sylvesterbradleyi* sp. nov. G–H, TRA534 (USNM 607498), adult RV from DSDP 237, 24/4/50–56, middle Eocene, Indian Ocean. I–J, TRA535 (USNM 607499), adult RV from DSDP 237, 24/4/50–56, middle Eocene, Indian Ocean. **K–L,** *Toolongella* sp. 1, TRA626 (USNM 607500), adult RV from DSDP 21A, 1/4/50–56, middle Eocene, southwestern Atlantic. **M–T,** *Henryhowella meridionalis* (Bertels, 1969b). M–N, TRA919 (USNM 607501), adult LV from NR29, Rocca Formation, early Paleocene, Argentina. O–P, TRA920 (USNM 607502), adult RV from NR29, Rocca Formation, early Paleocene, Argentina. Q–R, TRA925 (USNM 607503), adult LV from NR30, Rocca Formation, early Paleocene, Argentina. S–T, TRA926 (USNM 607504), adult RV from NR30, Rocca Formation, early Paleocene, Argentina. Scale bars represent 1 mm.

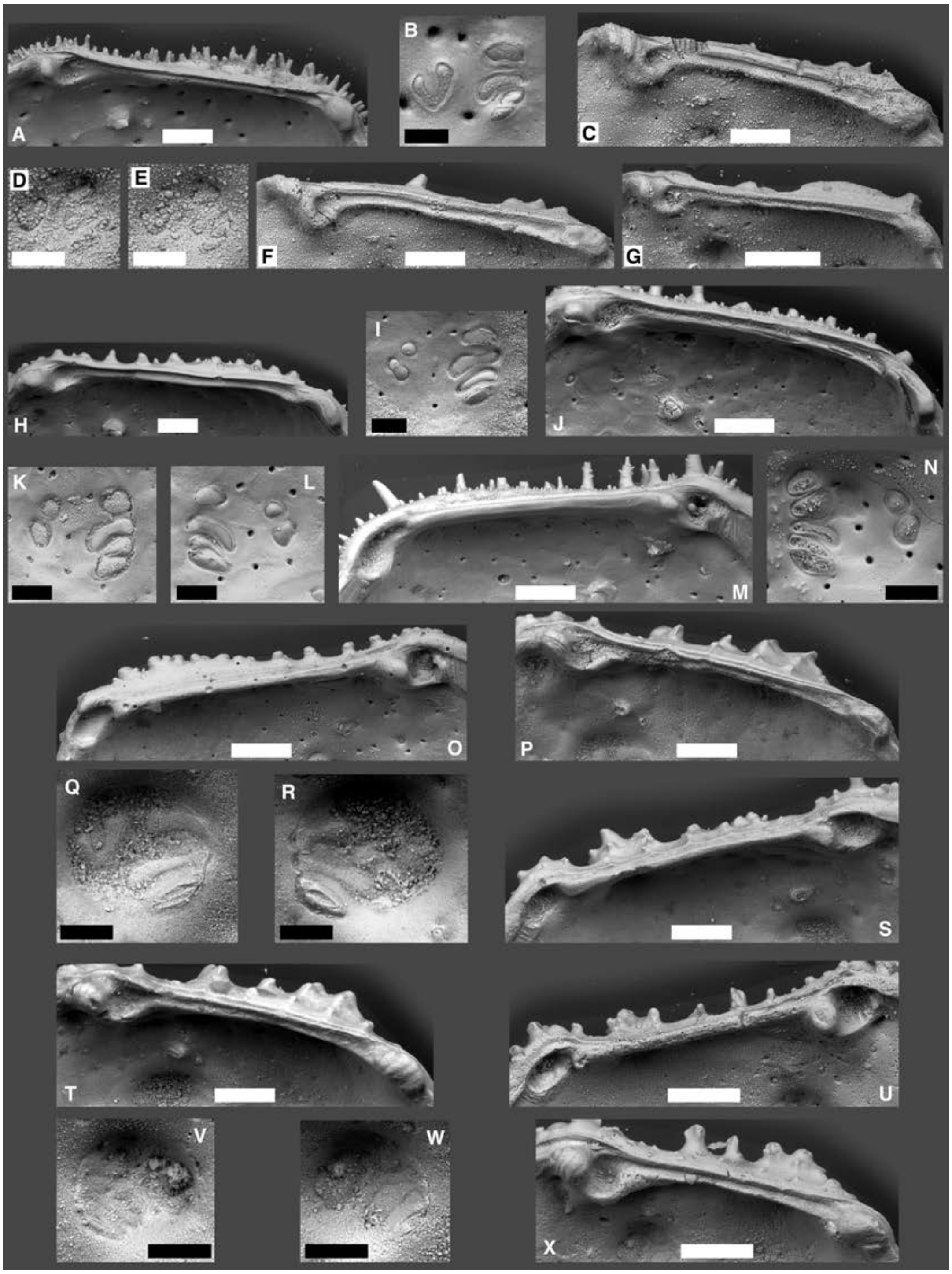


FIGURE 47. Internal details of *Henryhowella* sp. 1, *Oligocythereis sylvesterbradleyi* sp. nov., *Toolongella* sp. 1, *Echinocythereis echinata* (Sars, 1866), *Echinocythereis margaritifera* (Brady, 1870), *Cythereis ornatissima* (Reuss, 1846), and *Cythereis* cf. *ornatissima* (Reuss, 1846). **A–B,** *Henryhowella* sp. 1, TRA514 (USNM 607469), adult RV. A, hingement. B, subcentral muscle scars. **C–F,** *Oligocythereis sylvesterbradleyi* sp. nov. C–D, TRA535 (USNM 607499), adult RV. C, hingement. D, subcentral muscle scars. E–F, TRA534 (USNM 607498), adult RV. E, subcentral muscle scars. F, hingement. **G,** *Toolongella* sp. 1, TRA626 (USNM 607500), adult RV, hingement. **H–I,** *Echinocythereis echinata* (Sars, 1866), TMC131 (USNM 607514), adult RV. H, hingement. I, subcentral muscle scars. **J–O,** *Echinocythereis margaritifera* (Brady, 1870). J–K, TRA961 (USNM 608273), adult RV. J, hingement. K, subcentral muscle scars. L–M, TRA959 (USNM 607521), adult LV. L, subcentral muscle scars. M, hingement. N–O, TRA1027 (USNM 607523), adult LV. N, subcentral muscle scars. O, hingement. **P–T,** *Cythereis ornatissima* (Reuss, 1846). P–Q, TRA818 (USNM 607392), adult RV. P, hingement. Q, subcentral muscle scars. R–S, TRA816 (USNM 607390), adult LV. R, subcentral muscle scars. S, hingement. T, TRA822 (USNM 607396), adult RV, hingement. **U–X,** *Cythereis* cf. *ornatissima* (Reuss, 1846). U–V, TRA810 (USNM 607388), adult LV. U, hingement. V, subcentral muscle scars. W–X, TRA811 (USNM 607389), adult RV. W, subcentral muscle scars. X, hingement. Scale bars represent 0.1 mm for A, C, F–H, J, M, O–P, S–U, X and 50 µm for B, D–E, I, K–L, N, Q–R, V–W.

Genus *Toolongella* Bate, 1972

Type Species. *Toolongella mimica* Bate, 1972.

Remarks. Cenozoic occurrences of *Toolongella mimica* Bate, 1972 are known (e.g., Coles et al., 1990), but no SEM or stereomicroscope images of this genus have been published except for Gen. et sp. A of Zhao (2005).

Toolongella sp. 1

FIGURES 46K–L, 47G

Locality and Age of Specimens Examined. DSDP 21A, middle Eocene, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. This species is very similar to the type species *Toolongella mimica* Bate, 1972, but differs by its better-developed secondary reticulation, much thinner ventrolateral and dorsolateral ridges, and less developed anterior marginal rim.

Genus *Echinocythereis* Puri, 1954

Type Species. *Cythere margaritifera* Brady, 1870 (=*Cythereis garretti* Howe and McGuirt, 1935 [in Howe et al., 1935]; see Hazel, 1967).

Remarks. This genus is similar to *Henryhowella* Puri, 1957 but can be easily distinguished by its divided frontal muscle scar and comparatively ovate and inflated carapace. *Echinocythereis* is presently limited to the Atlantic (excluding the Nordic Seas) and Southern Oceans and the Mediterranean Sea (Whatley and Coles, 1987; Barra and Bonaduce, 2000; Ayress et al., 2004; Yasuhara et al., 2009c). However, a recent study discovered that *Echinocythereis* had inhabited the Arctic Ocean prior to 1 million years ago (Cronin et al., 2014).

Echinocythereis echinata (Sars, 1866)

FIGURES 47H–I, 48A–O

Cythereis echinata Sars, 1866:44.
Cythere irpex Brady, 1880:107, pl. 17, fig. 2a–d.
Cythereis echinata Sars; Tressler, 1941:100, pl. 19, fig. 24.
?*Echinocythereis echinata* (Sars); Hazel, 1967:37, pl. 6, figs. 10–11.
Cythereis echinata (Sars); Elofson, 1969:71.
Echinocythereis echinata (Sars); Whatley and Coles, 1987:95, pl. 5, figs. 7–8.
Echinocythereis whatleyi Dingle, Lord, and Boomer, 1990:303, figs. 35B–F, 36E–G,I–J.
Echinocythereis echinata (Sars); Malz, 1990, fig. 8.8–8.9.
Echinocythereis echinata (Sars); Barra and Bonaduce, 2000:214, pl. 1, figs. 1–10; text-fig. 1.
Echinocythereis echinata (Sars); Didié and Bauch, 2001:104, pl. 1, fig. 3 [as erratum for Didié and Bauch, 2000].
Echinocythereis echinata (Sars); Ayress, De Deckker, and Coles, 2004:35, pl. 3, fig. 9.
Echinocythereis echinata (Sars); Guernet, 2005:99.
Echinocythereis echinata (Sars); Yasuhara, Okahashi, and Cronin, 2009c:926, pl. 21, figs. 6–9.
Echinocythereis echinata (Sars); Alvarez Zarikian, 2009:6, pl. P9, figs. 3–4.

Locality and Age of Specimens Examined. Chain 82-24-4P, DSDP 607, DSDP 607A, Pleistocene and Pliocene, North Atlantic; DSDP 610, middle Miocene, northeastern Atlantic; Alb D2570, Alb D2308, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Remarks. A comprehensive synonymy can be found in Hazel (1967), Elofson (1969), Barra and Bonaduce (2000), and Yasuhara et al. (2009c). In agreement with Ayress et al. (2004), we consider *Echinocythereis whatleyi* Dingle et al., 1990 a juvenile of this species. *Cythere irpex* Brady (1880) is a junior synonym of this species (Ayress et al., 2004; Yasuhara et al., 2009c).

Echinocythereis margaritifera (Brady, 1870)

FIGURES 47J–O, 48P–U

Cythere margaritifera Brady, 1870:192, pl. 27, figs. 3, 4.
Cythereis garretti Howe and McGuirt, 1935 in Howe et al., 1935:20, pl. 3, figs. 17–19; pl. 4, figs. 5, 15.
Echinocythereis margaritifera (Brady); Hazel, 1967:36, pl. 6, figs. 6–7, 9.

Locality and Age of Specimens Examined. Alb D2400, Modern, Gulf of Mexico; "*Echinocythereis garretti* type locality," middle Miocene.

Dimensions. See Table 1.

Remarks. Comprehensive synonymy can be found in Hazel (1967). Hazel (1967) considered *Echinocythereis garretti* (Howe and McGuirt, 1935) a junior synonym of *Echinocythereis margaritifera* (Brady, 1870). We agree with him, and thus, the type species of *Echinocythereis* Puri, 1954 is *Echinocythereis margaritifera* (Brady, 1870). Here we show the modern Gulf of Mexico specimens (Figures 47J–M, 48P–S) and the Miocene topotypic specimens from the National Museum of Natural History collection (slide number P3287, which is labeled as the topotype of *Echinocythereis garretti*; Figures 47N–O, 48T–U).

Genus *Cythereis* Jones, 1849

Type Species. *Cytherina ornatissima* Reuss, 1846.

Other species. Species belonging to *Cythereis* according to our generic concept, focusing mainly on Cenozoic deep-sea species, are as follows:

Cytherina ornatissima Reuss, 1846
Trachyleberis raynerae Neale, 1975
Trachyleberis pennyi Neale, 1975
Trachyleberis anteplana Bate, 1972
Glencoeleberis occultata Jellinek and Swanson, 2003

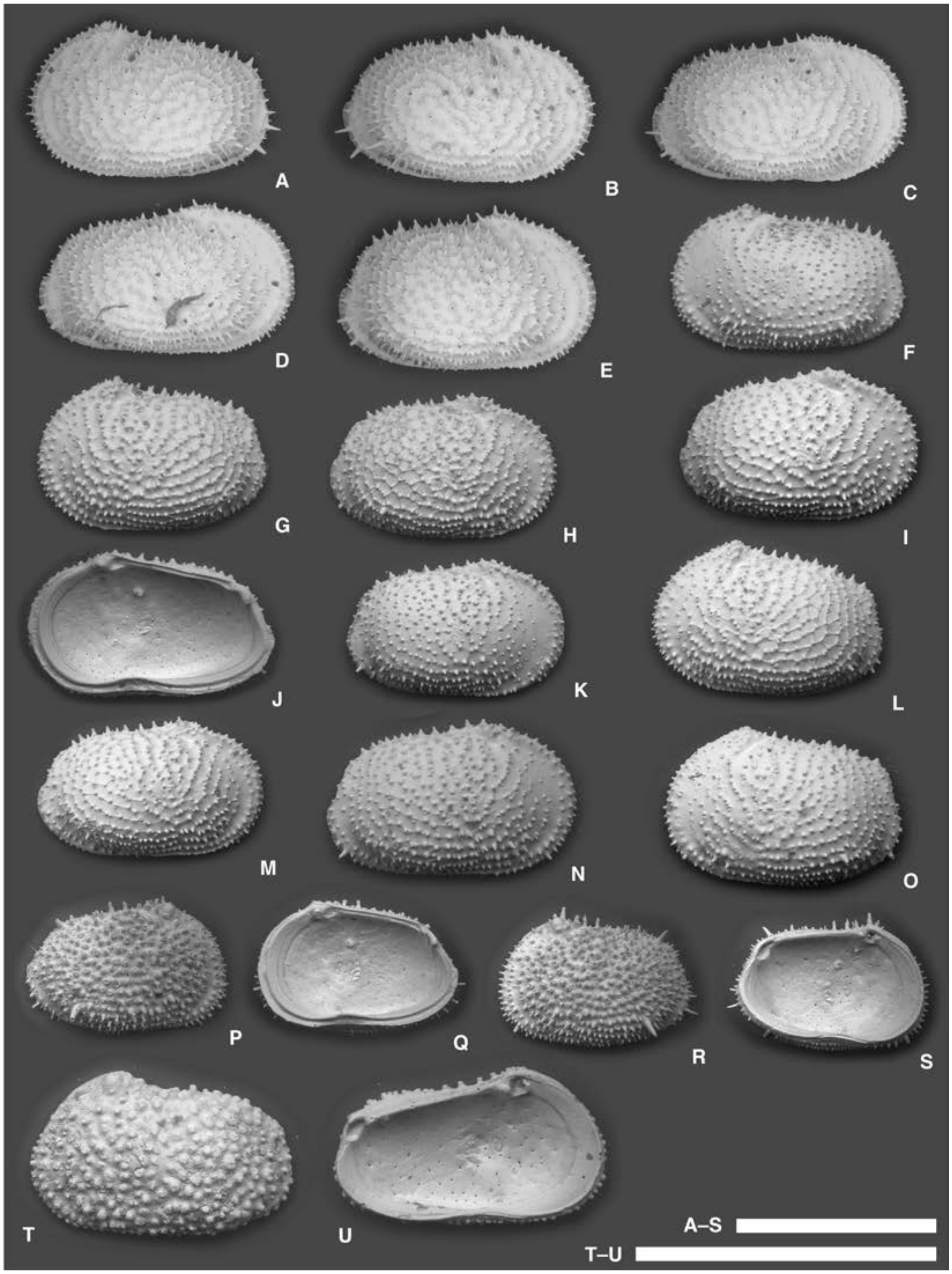


FIGURE 48. Scanning electron microscope images of *Echinocythereis echinata* (Sars, 1866) and *Echinocythereis margaritifera* (Brady, 1870). A–I, K–P, R, T, lateral views; J, Q, S, U, internal views. **A–O,** *Echinocythereis echinata* (Sars, 1866). A, TMC149 (USNM 607505), adult LV from Chain 82-24-4P, 398–400, Pleistocene, North Atlantic. B, TMC150 (USNM 607506), adult RV from Chain 82-24-4P, 398–400, Pleistocene, North Atlantic. C, TMC153 (USNM 607507), adult RV from Chain 82-24-4P, 345–348, Pleistocene, North Atlantic. D, TMC218 (USNM 607508), adult RV from Chain 82-24-4P, 461–464, Pleistocene, North Atlantic. E, TMC234 (USNM 607509), adult RV from Chain 82-24-4P, 660–663, Pleistocene, North Atlantic. F, TMC378 (USNM 607510), adult LV from DSDP 610, 17/4/87, middle Miocene, northeastern Atlantic. G, RB356 (USNM 607511), adult LV from Alb D2570, Modern, northwestern Atlantic. H, RB357 (USNM 607512), adult RV from Alb D2570, Modern, northwestern Atlantic. I, TMC130 (USNM 607513), adult RV from Chain 82-24-4P, 258–260, Pleistocene, North Atlantic. J, TMC131 (USNM 607514), adult RV from Chain 82-24-4P, 263–265, Pleistocene, North Atlantic. K, GSM202 (USNM 607515), adult RV from DSDP 607, 12/3/52–54, early Pleistocene, North Atlantic. L, GSM624 (USNM 607516), adult LV from Alb D2308, Modern, northwestern Atlantic. M, GSM625 (USNM 607517), adult RV from Alb D2308, Modern, northwestern Atlantic. N, USGSD157 (USNM 607518), adult RV from DSDP 607A, 13/4/60–62, late Pliocene, North Atlantic. O, USGSD159 (USNM 607519), adult LV from DSDP 607, 13/1/105–107, early Pleistocene, North Atlantic. **P–U,** *Echinocythereis margaritifera* (Brady, 1870). P, TRA960 (USNM 607520), adult RV from Alb D2400, Modern, Gulf of Mexico. Q, TRA961 (USNM 608273), adult RV from Alb D2400, Modern, Gulf of Mexico. R–S, TRA959 (USNM 607521), adult LV from Alb D2400, Modern, Gulf of Mexico. T, TRA1026 (USNM 607522), adult LV from topotype locality, USA. U, TRA1027 (USNM 607523), adult LV from topotype locality, USA. Scale bars represent 1 mm.

Glencoeleberis armata Jellinek and Swanson, 2003
Taracythere ayressi Jellinek and Swanson, 2003
Taracythere venusta Jellinek and Swanson, 2003
Taracythere ulcus Jellinek and Swanson, 2003
Taracythere rhinoceros Jellinek and Swanson, 2003
Taracythere sp. Jellinek and Swanson, 2003
Trachyleberis paucispinosa McKenzie et al., 1993
Acanthocythereis incerta McKenzie et al., 1991
Glencoeleberis? cf. *G. incerta* of Ayress (2006)
Glencoeleberis cf. *armata* of Ayress (2006)
Glencoeleberis cf. *occultata* of Ayress (2006)
Trachyleberis cf. *careyi* of McKenzie et al. (1993)
Trachyleberis brevicosta australis McKenzie et al., 1991
Trachyleberis brevicosta major McKenzie et al., 1991
Trachyleberis paucispinosa McKenzie et al., 1993
"*Cythereis*" sp. of McKenzie et al. (1993)
Trachyleberis careyi McKenzie et al., 1991
Trachyleberis cf. *probesioides* of McKenzie et al. (1991)
Acanthocythereis incerta McKenzie et al., 1991
Cythereis sp. of Guernet (1982)
Actinocythereis orientalis Guernet, 1985
Actinocythereis sp. 1 of Guernet (1985)
Actinocythereis sp. 2 of Guernet (1985)
Trachyleberis orientalis rete Guernet, 1993
Trachyleberis sp. of Guernet (1993)
Trachyleberis sp. 2 of Guernet (1993)
?Actinocythereis sp. A of Neil (1994)
Trachyleberis sp. of Benson and Peypouquet (1983)
Trachyleberis sp. of Majoran et al. (1998)
Trachyleberis maslinensis (Majoran, 1996)
Actinocythereis cf. *orientalis* of Majoran and Dingle (2002)
Trachyleberis sp. b of Majoran and Dingle (2002)
Cythereis bermudezi van den Bold, 1946
Trachyleberis bermudezi crebripustulosa van den Bold, 1966

Emended Diagnosis. Trachyleberidids characterized by (1) amphidont-type hinge, (2) shallow, often indistinct, primary reticulation (with some exceptions), (3) distinct ventrolateral ridge continuing into the anterior marginal rim, (4) generally well developed subcentral tubercle, (5) distinct anterior and posterior marginal rim, (6) the absence of an ocular ridge, (7) V-shaped frontal scar, (8) lack of internal snap-knob structure at ventral midlength, and (9) subtriangular-subtrapezoidal outline. Most species have median and dorsolateral ridges. Marginal frill in internal view is absent or only weakly developed.

Remarks. A detailed discussion of the type species designation can be found in Pokorný (1963b), Neale (1975), and the *Cythereis* section of the Ellis and Messina Catalogue of Ostracoda (http://www.micropress.org/e_m.html). Figure 49A shows the lectotype of *Cythereis ornatissima* (Reuss, 1846). Hingement has often been considered a key character to distinguish *Cythereis* from "*Trachyleberis*" (i.e., true *Trachyleberis* species plus species that have been assigned to *Trachyleberis* but have no ocular ridge; see Brandão et al., 2013), which have been thought to have paramphidont and holamphidont hingements, respectively. Neale (1975) notes that although Lower Cretaceous *Cythereis* species have a typical paramphidont hinge with crenulate posterior and anterior teeth, Upper Cretaceous species often have smooth or weakly crenulate posterior and anterior teeth (i.e., approaching holamphidont) but are typical *Cythereis* in all morphological features other than hingement. We follow Neale (1975) and include all types of amphidont hingements in the diagnosis of *Cythereis*.

As discussed above, the generic concept of *Cythereis* has historically relied on its hingement, especially the crenulate posterior and anterior teeth (i.e., paramphidont hinge). For example, Sylvester-Bradley's (1948) diagnosis of *Cythereis* is based entirely on hingement. Moore (1961) considered that *Cythereis* includes all reticulate, costate, and spinose trachyleberidids with a paramphidont hinge (as well as typical trachyleberidid muscle scars; i.e., a V-shaped frontal scar and a vertical row of four adductor scars). Although van Morkhoven (1963) described various morphological features of *Cythereis* in detail (and they are generally consistent with our emended diagnosis), he considered the paramphidont hinge condition essential. Neale (1975) broadly suggested shape, eye tubercle, central node, and median rib as the main characteristics of *Cythereis*. Here in our emended diagnosis we follow Neale (1975) and accept all types of amphidont hingement and provide additional diagnostic characters. We do not consider the presence of an eye tubercle a diagnostic character (see the *Oertliella* section).

From its diagnosis, *Glencoeleberis* Jellinek and Swanson, 2003 conforms to our concept of *Cythereis,* and we consider it a junior synonym thereof. True *Trachyleberis* Brady, 1898 (see the *Trachyleberis* section) is easily distinguished from *Cythereis* by the presence of an ocular ridge and internal snap-knob structure and by its lack of a ventrolateral ridge. In most cases, we refer deep-sea species that have been assigned to *Trachyleberis* but lack an ocular ridge to *Cythereis* (see the Other Species section for this genus). *Cythereis* is similar to *Legitimocythere* Coles and Whatley, 1989, but it is distinguished by a V-shaped frontal scar, a distinctive subcentral tubercle, and a carapace that is less spinose, less inflated, and more slender. *Cythereis* also tends to be smaller than *Legitimocythere*. *Cythereis* is also similar to *Agrenocythere* Benson, 1972 and *Oertliella* Pokorný, 1964b, but those genera have deep, distinct primary reticulation. *Cythereis* is also similar to *Acanthocythereis* Howe, 1963, but the latter has much deeper and better-developed primary reticulation, an indistinct ventrolateral ridge, and a much more spinous carapace.

In our generic concept, *Cythereis* is a long-lived, diverse genus known from the Cretaceous to the Holocene, contrary to the well-accepted view of *Cythereis* as a Cretaceous genus (and "*Trachyleberis*" as its Cenozoic descendant; Sylvester-Bradley, 1948; van Morkhoven, 1963). Such long-lived, diverse genera are common in the deep sea (e.g., *Krithe*, *Cytheropteron,* and *Cytherella*; see Moore, 1961); thus, this broader generic concept is not unprecedented. Further phylogenetic work may permit *Cythereis* to be divided into smaller evolutionary units.

As far as we know, Cenozoic *Cythereis* (in our concept herein) has been reported mainly from deep-sea sediments, except for some shallow marine strata in certain regions such as New Zealand in the western South Pacific (Ayress, 2006) and perhaps the Paleogene Gulf Coast of the Unites States, which includes several *Cythereis*-like species awaiting further investigation (Howe and Chambers, 1935; Howe, 1963; Huff, 1970). Thus, *Cythereis* may be an example of a deep-sea relic: a taxon with a formerly broad distribution that lingers (mostly) in the deep sea while becoming extinct in other environments. This idea is consistent with McKenzie's (1991) hypothesis suggesting that deep-sea species of long-ranging genera evolved from shallow-water Cretaceous–Paleocene or earlier ancestors because true deep-water faunas do not antedate the Eocene (Benson, 1975). However, this hypothesis should be critically evaluated because this kind of classic idea of Cenozoic deep-sea evolution through immigration from shelf habitats is challenged by the recent discovery of well-preserved Jurassic deep-sea fauna (Thuy et al., 2014). As seen in the Other Species section, *Cythereis* diversity seems to be high in the western South Pacific, including New Zealand and the eastern margin of Australia, and the same may well be true for deep-sea trachyleberidid in general. The idea of the western South Pacific as a deep-sea trachyleberidid hot spot warrants further examination.

Synonymized Genus. *Glencoeleberis* Jellinek and Swanson, 2003.

Cythereis ornatissima (Reuss, 1846)

FIGURES 47P–T, 49A,F–N

Cytherina ornatissima Reuss, 1846:104, pl. 24, figs. 12, 18.
Cythereis ornatissima ornatissima (Reuss); Pokorný, 1963b:8, text-figs. 3, 4a–b, 5–6; pl. 1, fig. 1; pl. 3, fig. 3; pl. 4, figs. 1–7; pl. 6, figs. 1, 2, 5.
Cythereis ornatissima s.l. (Reuss); Kaye, 1964:64, pl. 8, figs. 1–2, 4, 6.
?*Cythereis ornatissima* (Reuss); Neale, 1978:366, pl. 17, figs. 10–12.

Lectotype. Adult carapace, USNM 155077 (Figure 49A).

Type Locality and Horizon. Pokorný (1963b) locality, Coniacian, Upper Cretaceous, ~50°N, ~15°E, Europe.

Other Localities. ARL 4730, ARL 4778, Campanian? and Santonian, Europe.

Dimensions. See Table 1.

Remarks. The lectotype specimen and comparative European specimens are shown here. A comprehensive synonymy can be found in Pokorný (1963b).

Cythereis cf. *ornatissima* (Reuss, 1846)

FIGURES 47U–X, 49B–E

Locality and Age of Specimens Examined. ARL 4778, late Cretaceous, Santonian, Europe.

Dimensions. See Table 1.

Remarks. This species is very similar to the type species *Cythereis ornatissima* (Reuss, 1846) but is distinguished by its less spinose and less reticulate carapace, more slender outline, and shorter median lateral ridge. These differences are subtle and may represent intraspecific variation.

Cythereis guerneti sp. nov.

FIGURES 50A–F, 51P–S, 52A–J

Derivation of Name. In honor of Claude Guernet, Université Pierre et Marie Curie, for his work on Paleogene deep-sea ostracods.

Holotype. Adult RV, USNM 607532 (TRA136; Figures 50C,F, 52E–F).

Paratypes. USNM 607531, 607533, 607534, 607617, 607618 (TRA135, TRA329, TRA330, TRA618, TRA617).

Type Locality and Horizon. DSDP 357, 16/1/102–113, late Oligocene, 30.0042°S, 35.5598°W, 2,086 m water depth, southwestern Atlantic.

Other Localities. DSDP 357, DSDP 516F, late Eocene and Oligocene, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by weakly developed primary and secondary reticulation, a median lateral ridge, and a well-developed eye tubercle.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing clavate spines; posterior margin acuminate, bearing spines; dorsal margin almost straight, bearing spines; ventral margin straight; ventrolateral ridge well developed, spinose, and continuous with anterior marginal rim; median lateral ridge present and spinose; subcentral tubercle present; eye tubercle well developed. Anterodorsal and posterodorsal corners weakly angular. Lateral surface weakly ornamented with primary and secondary reticulation and with small spines and pore conuli. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars smaller and close to each other.

Remarks. *Cythereis guerneti* sp. nov. is very similar to *Trachyleberis* sp. of Guernet (1993), but the latter lacks primary reticulation on its anterior half and an eye tubercle. This species is also very similar to *Cythereis sylvesterbradleyi* sp. nov. (known as *Actinocythereis?* sp. 4 of Hunt et al., 2010), but that species has better-developed secondary reticulation and lacks an eye tubercle. *Cythereis orientalis* (Guernet, 1985) is distinguished from this species by the lack of reticulation and its nodose appearance. We note that this deep-sea species is rather unusual because it has a well-developed eye tubercle.

Cythereis johnnealei sp. nov.

FIGURES 50I–L, 52K–N

Derivation of Name. In honor of John W. Neale, formerly of University of Hull, for his outstanding work on Cretaceous ostracods, including *Cythereis*.

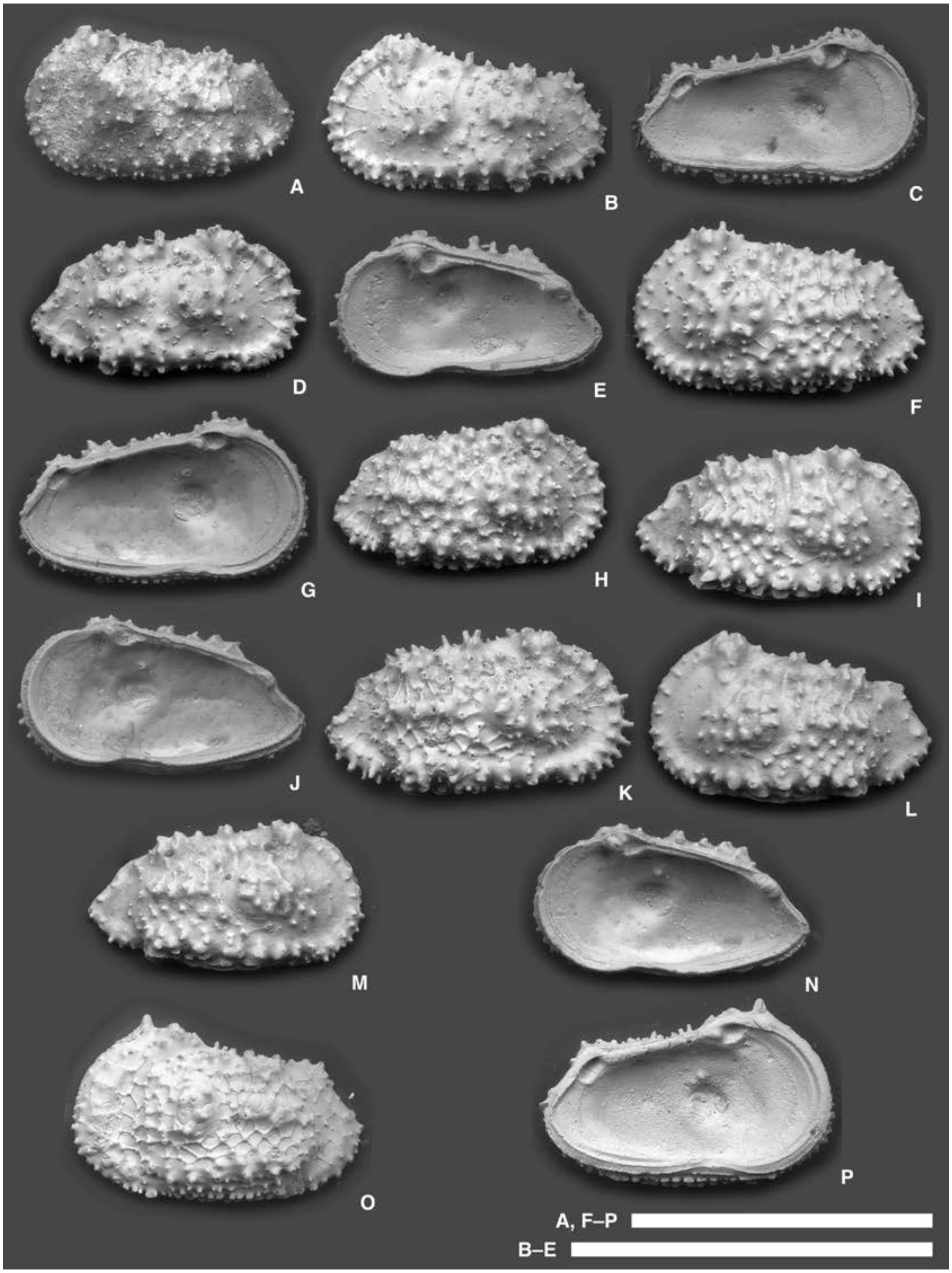


FIGURE 49. Scanning electron microscope images of *Cythereis ornatissima* (Reuss, 1846), *Cythereis* cf. *ornatissima* (Reuss, 1846), and *Cythereis* sp. 1. A–B, D, F, H–I, K–M, O, lateral views; C, E, G, J, N, P, internal views. **A, F–N,** *Cythereis ornatissima* (Reuss, 1846). A, TRA1024 (USNM 155077), adult carapace from Pokorný (1963b) locality, outcrop, Coniacian, Upper Cretaceous, Europe. F–G, TRA816 (USNM 607390), adult LV from ARL 4730, Campanian?, Europe. H, TRA817 (USNM 607391), adult RV from ARL 4730, Campanian?, Europe. I–J, TRA818 (USNM 607392), adult RV from ARL 4730, Campanian?, Europe. K, TRA819 (USNM 607393), adult RV from ARL 4730, Campanian?, Europe. L, TRA820 (USNM 607394), adult LV from ARL 4730, Campanian?, Europe. M, TRA821 (USNM 607395), adult RV from ARL 4730, Campanian?, Europe. N, TRA822 (USNM 607396), adult RV from ARL 4730, Campanian?, Europe. **B–E,** *Cythereis* cf. *ornatissima* (Reuss, 1846). B–C, TRA810 (USNM 607388), adult LV from ARL 4778, late Cretaceous, Santonian, Europe. D–E, TRA811 (USNM 607389), adult RV from ARL 4778, late Cretaceous, Santonian, Europe. **O–P,** *Cythereis* sp. 1, TRA768 (USNM 607397), adult LV from DSDP 111A, 11/6/50–56, Campanian, North Atlantic. Scale bars represent 1 mm.

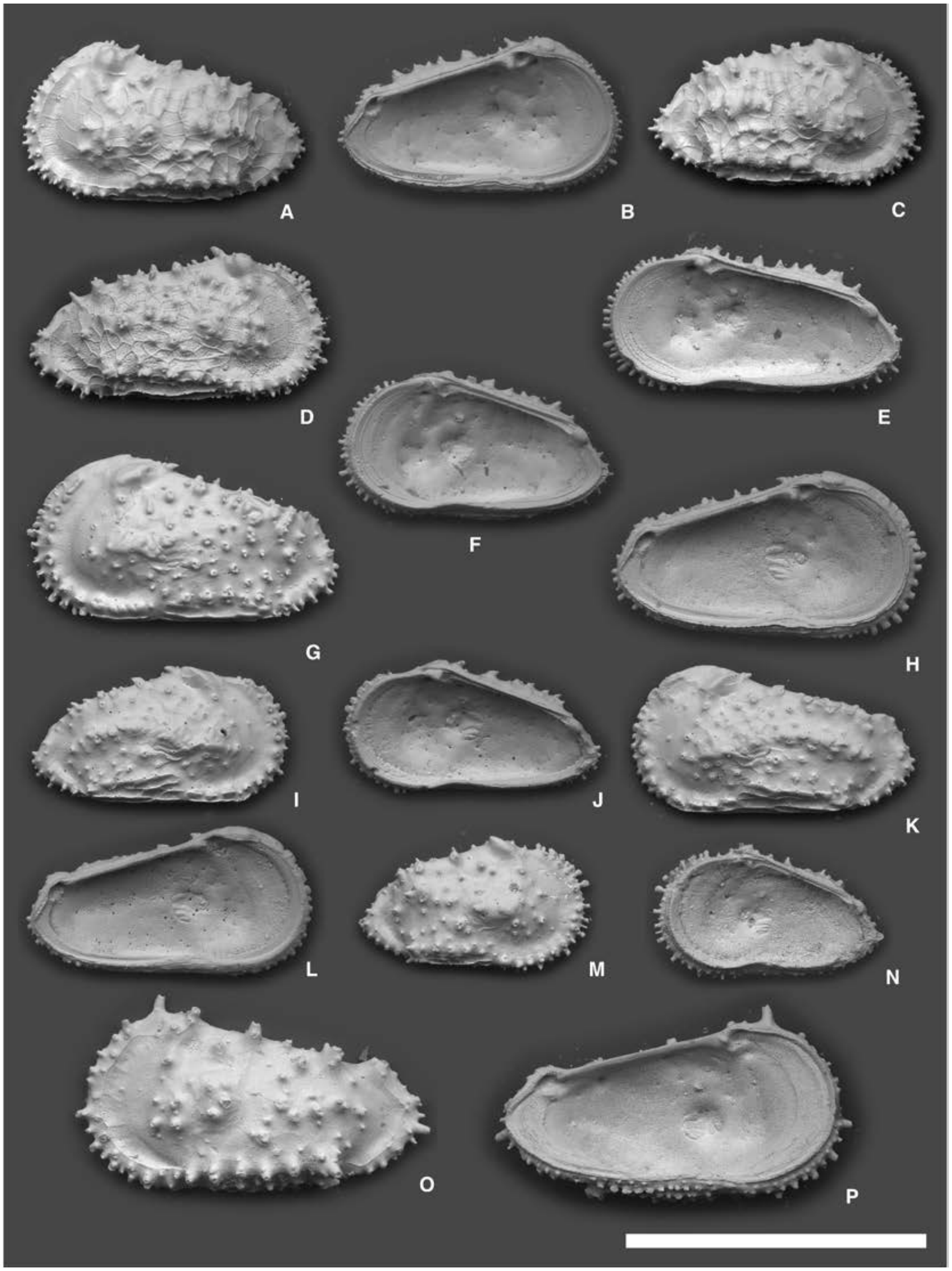


FIGURE 50. Scanning electron microscope images of *Cythereis guerneti* sp. nov., *Cythereis parajohnnealei* sp. nov., *Cythereis johnnealei* sp. nov., and *Cythereis neoanteplana* sp. nov. A, C–D, G, I, K, M, O, lateral views; B, E–F, H, J, L, N, P, internal views. **A–F,** *Cythereis guerneti* sp. nov. A–B, TRA135 (USNM 607531), adult LV from DSDP 357, 16/1/102–113, late Oligocene, southwestern Atlantic. C, F, TRA136 (USNM 607532), adult RV from DSDP 357, 16/1/102–113, late Oligocene, southwestern Atlantic. D, TRA329 (USNM 607533), adult RV from DSDP 357, 20/2/106–120, late Eocene, southwestern Atlantic. E, TRA330 (USNM 607534), adult RV from DSDP 357, 20/2/106–120, late Eocene, southwestern Atlantic. **G–H, M–N,** *Cythereis parajohnnealei* sp. nov. G–H, TRA405 (USNM 607535), adult LV from DSDP 277, 11/2/90–97, early Oligocene, Southern Ocean. M–N, TRA407 (USNM 607538), adult RV from DSDP 277, 30/2/60–67, middle Eocene, Southern Ocean. **I–L,** *Cythereis johnnealei* sp. nov. I–J, TRA434 (USNM 607536), adult RV from DSDP 277, 5/1/50–57, early Oligocene, Southern Ocean. K–L, TRA428 (USNM 607537), adult LV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. **O–P,** *Cythereis neoanteplana* sp. nov., TRA323 (USNM 607539), adult LV from DSDP 359, 2/6/85–95, Miocene, southeastern Atlantic. Scale bar represents 1 mm.

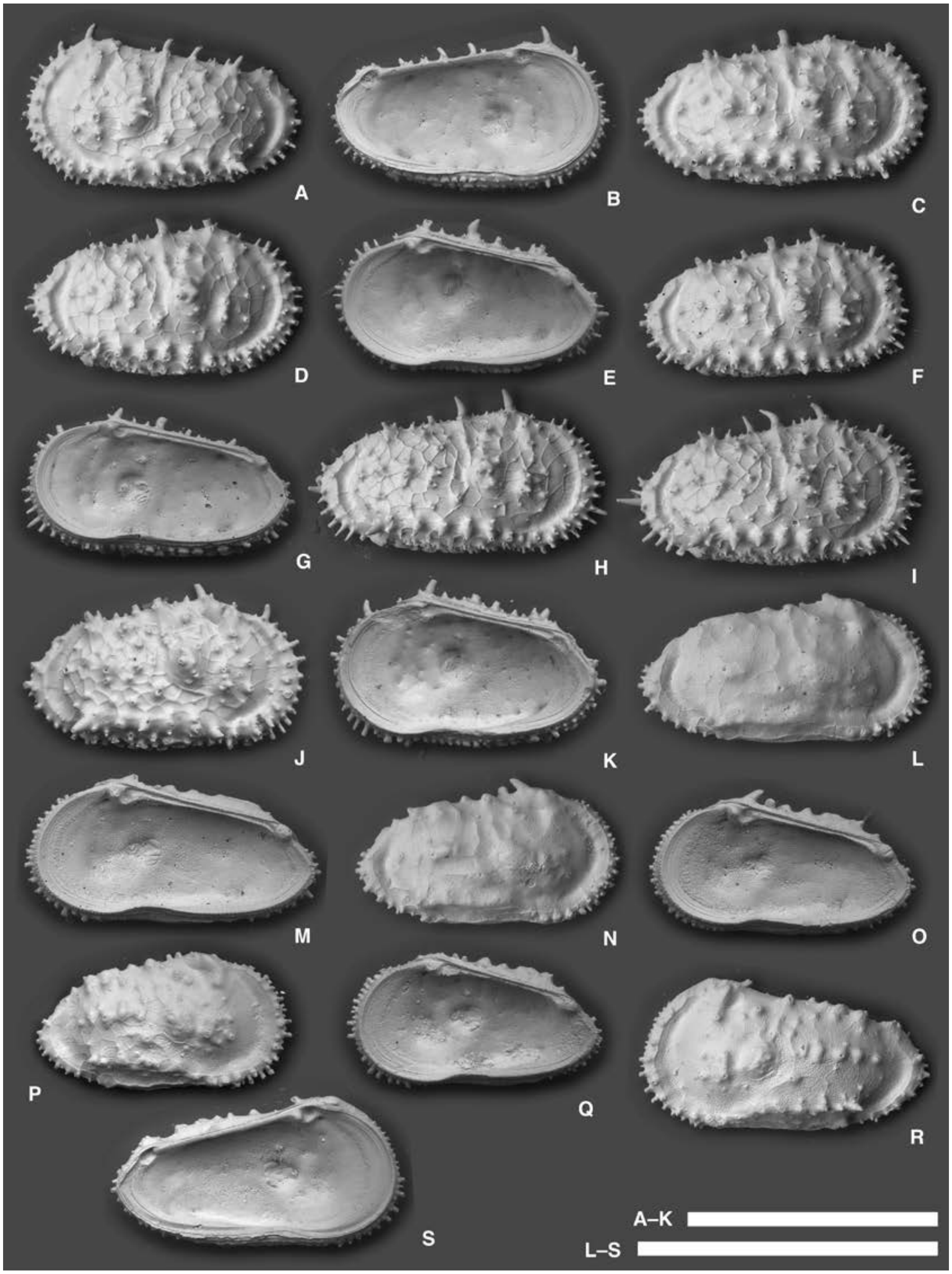


FIGURE 51. Scanning electron microscope images of *Cythereis richardbensoni* sp. nov., *Cythereis dinglei* sp. nov., and *Cythereis guerneti* sp. nov. A, C–D, F, H–J, L, N, P, R, lateral views; B, E, G, K, M, O, Q, S, internal views. **A–K,** *Cythereis richardbensoni* sp. nov. A–B, TRA603 (USNM 607608), adult LV from DSDP 516, 4/2/80–90, early Pliocene, southwestern Atlantic. C, TRA604 (USNM 607609), adult RV from DSDP 516, 4/2/80–90, early Pliocene, southwestern Atlantic. D–E, TRA605 (USNM 607610), adult RV from DSDP 516, 4/2/80–90, early Pliocene, southwestern Atlantic. F–G, TRA606 (USNM 607611), adult RV from DSDP 516, 4/2/80–90, early Pliocene, southwestern Atlantic. H, TRA607 (USNM 607612), adult RV from DSDP 516, 14/2/85–95, late Miocene, southwestern Atlantic. I, TRA608 (USNM 607613), adult RV from DSDP 516, 14/2/85–95, late Miocene, southwestern Atlantic. J–K, TRA316 (USNM 607614), adult RV from DSDP 357, 2/2/51–60, Pliocene, southwestern Atlantic. **L–O,** *Cythereis dinglei* sp. nov. L–M, TRA609 (USNM 607615), adult RV from DSDP 516, 18/2/70–80, middle Miocene, southwestern Atlantic. N–O, TRA610 (USNM 607616), adult RV from DSDP 516, 42/2/55–65, early Miocene, southwestern Atlantic. **P–S,** *Cythereis guerneti* sp. nov. P–Q, TRA618 (USNM 607617), adult RV from DSDP 516F, 31/2/87–91, Oligocene, southwestern Atlantic. R–S, TRA617 (USNM 607618), adult LV from DSDP 516F, 30/2/59–64, Oligocene, southwestern Atlantic. Scale bars represent 1 mm.

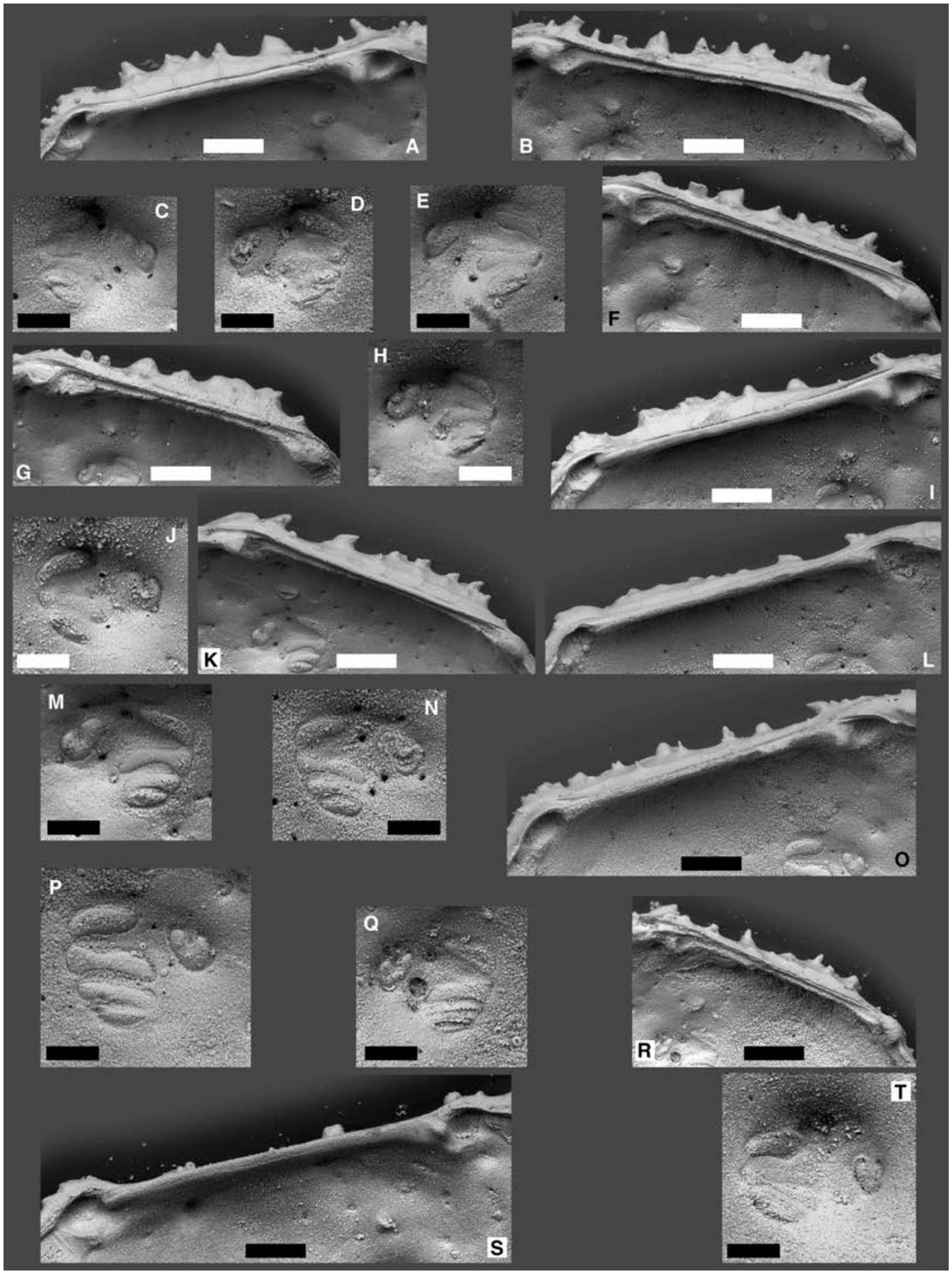


FIGURE 52. Internal details of *Cythereis guerneti* sp. nov., *Cythereis johnnealei* sp. nov., *Cythereis parajohnnealei* sp. nov., *Cythereis neoanteplana* sp. nov. **A–J,** *Cythereis guerneti* sp. nov. A, C, TRA135 (USNM 607531), adult LV. A, hingement. C, subcentral muscle scars. B, D, TRA330 (USNM 607534), adult RV. B, hingement. D, subcentral muscle scars. E–F, TRA136 (USNM 607532), adult RV. E, subcentral muscle scars. F, hingement. G–H, TRA618 (USNM 607617), adult RV. G, hingement. H, subcentral muscle scars. I–J, TRA617 (USNM 607618), adult LV. I, hingement. J, subcentral muscle scars. **K–N,** *Cythereis johnnealei* sp. nov. K, M, TRA434 (USNM 607536), adult RV. K, hingement. M, subcentral muscle scars. L, N, TRA428 (USNM 607537), adult LV. L, hingement. N, subcentral muscle scars. **O–R,** *Cythereis parajohnnealei* sp. nov. O–P, TRA405 (USNM 607535), adult LV. O, hingement. P, subcentral muscle scars. Q–R, TRA407 (USNM 607538), adult RV. Q, subcentral muscle scars. R, hingement. **S–T,** *Cythereis neoanteplana* sp. nov., TRA323 (USNM 607539), adult LV. S, hingement. T, subcentral muscle scars. Scale bars represent 0.1 mm for A–B, F–G, I, K–L, O, R–S and 50 μm for C–E, H, J, M–N, P–Q, T.

Holotype. Adult RV, USNM 607536 (TRA434; Figures 50I–J, 52K,M).

Paratype. USNM 607537 (TRA428).

Type Locality and Horizon. DSDP 277, 5/1/50–57, early Oligocene, 52.2238°S, 166.1913°E, 1,214 m water depth, Southern Ocean.

Other Locality. DSDP 277, early Oligocene, Southern Ocean.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by carapace covered by numerous pore conuli and well-developed sinuous median lateral ridge that extends anteriorly past the subcentral tubercle.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing clavate spines; posterior margin acuminate, bearing small spines; dorsal margin straight, bearing a few spines; ventral margin straight; ventrolateral ridge composed of row of a few thin carinae and continuous with anterior marginal rim; median lateral ridge sinuous and very long; subcentral tubercle present as a part of median lateral ridge; eye tubercle elongate. Anterodorsal corner weakly angular; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface ornamented with very weak primary reticulation and numerous pore conuli. Anterior marginal rim and sulcus subdued; posterior marginal rim and sulcus present. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars smaller and close to each other.

Remarks. *Cythereis johnnealei* sp. nov. is similar to *Cythereis parajohnnealei* sp. nov. but is distinguished by its long median lateral ridge and a ventrolateral ridge composed of a row of a few thin carinae.

Cythereis parajohnnealei sp. nov.

FIGURES 50G–H,M–N, 52O–R

Derivation of Name. With reference to its similarity to *Cythereis johnnealei* sp. nov.

Holotype. Adult LV, USNM 607535 (TRA405; Figures 50G–H, 52O–P).

Paratype. USNM 607538 (TRA407).

Type Locality and Horizon. DSDP 277, 11/2/90–97, early Oligocene, 52.2238°S, 166.1913°E, 1,214 m water depth, Southern Ocean.

Other Locality. DSDP 277, middle Eocene, Southern Ocean.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by an elongate eye tubercle, numerous pore conuli, and the lack of both reticulation and a median lateral ridge.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing clavate spines; posterior margin acuminate, bearing small spines; dorsal margin straight, bearing spines; ventral margin straight; ventrolateral ridge spinose and continuous with anterior marginal rim; subcentral tubercle present; eye tubercle well developed and elongate. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface ornamented with numerous pore conuli. Anterior and posterior marginal rims and sulci subdued. Hingement amphidont type (preservation does not permit finer determination). Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral, ventromedian, dorsomedian scars close to each other.

Remarks. See *Cythereis johnnealei* sp. nov. section. The marked size variation of this species (see Figures 50G–H,M–N) may reflect climate-driven body size evolution, which is known in several deep-sea ostracod genera (Hunt and Roy, 2006; Hunt et al., 2010).

Cythereis neoanteplana sp. nov.

FIGURES 50O–P, 52S–T, 53A–B (53G–J?), 54A,C (54B,D–F?)

Derivation of Name. With reference to its similarity to but younger stratigraphic range than *Cythereis anteplana* (Bate, 1972).

Holotype. Adult LV, USNM 607539 (TRA323; Figures 50O–P, 52S–T).

Paratype. USNM 607540 (TRA324).

Type Locality and Horizon. DSDP 359, 2/6/85–95, Miocene, 34.9850°S, 4.4972°W, 1,655 m water depth, southeastern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by spinose carapace without reticulation, well-developed anterior and posterior marginal rims and sulci, upturned posterior margin, and lack of an eye tubercle.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtriangular and slender; anterior margin evenly rounded, bearing spines; posterior margin acuminate and upturned, bearing spines; dorsal margin slightly concave, bearing a few spines; ventral margin almost straight and spinose; ventrolateral ridge well developed, spinose, straight, parallel with ventral margin, and continuous with anterior marginal rim; subcentral tubercle present. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with spines. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars smaller and close to each other.

Remarks. *Cythereis neoanteplana* sp. nov. is most similar to *Cythereis anteplana* (Bate, 1972), but the

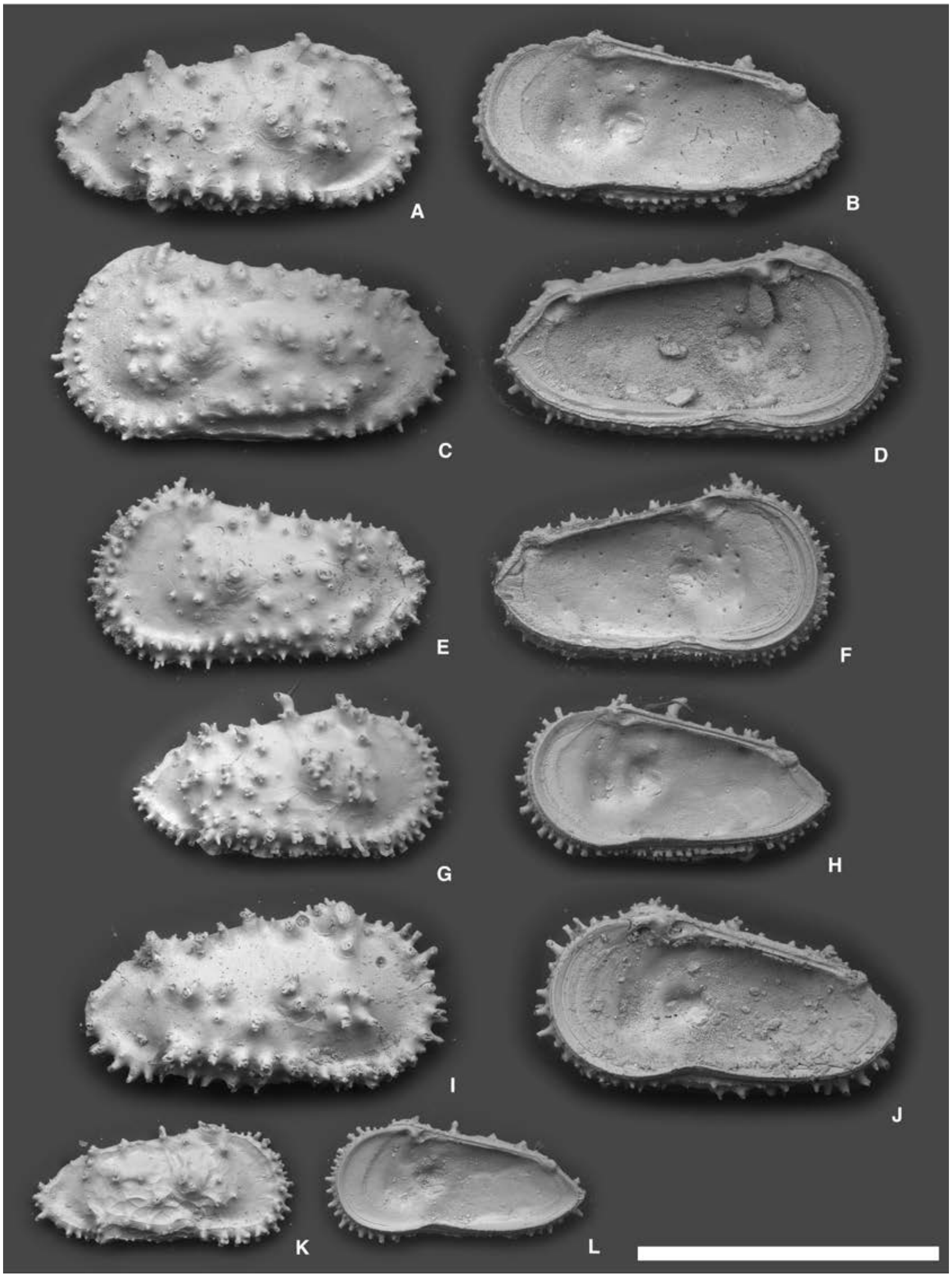


FIGURE 53. Scanning electron microscope images of *Cythereis neoanteplana* sp. nov., *Cythereis zululandensis* (Dingle, 1980), *Cythereis* sp. 2, and *Cythereis* sp. 3. A, C, E, G, I, K, lateral views; B, D, F, H, J, L, internal views. **A–B (G–J?)**, *Cythereis neoanteplana* sp. nov. A–B, TRA324 (USNM 607540), adult RV from DSDP 359, 2/6/85–95, Miocene, southeastern Atlantic. G–H, TRA624 (USNM 607543), adult RV from DSDP 21A, 1/4/50–56, middle Eocene, southwestern Atlantic. I–J, TRA837 (USNM 607544), adult RV from SI-25, late Eocene, New Zealand. **C–D,** *Cythereis* sp. 2, TRA345 (USNM 607541), adult LV from DSDP 258A, 7/4/100–106, late Miocene, Indian Ocean. **E–F,** *Cythereis zululandensis* (Dingle, 1980), TRA406 (USNM 607542), adult LV from DSDP 277, 30/2/60–67, middle Eocene, Southern Ocean. **K–L,** *Cythereis* sp. 3, TRA425 (USNM 607545), adult RV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. Scale bar represents 1 mm.

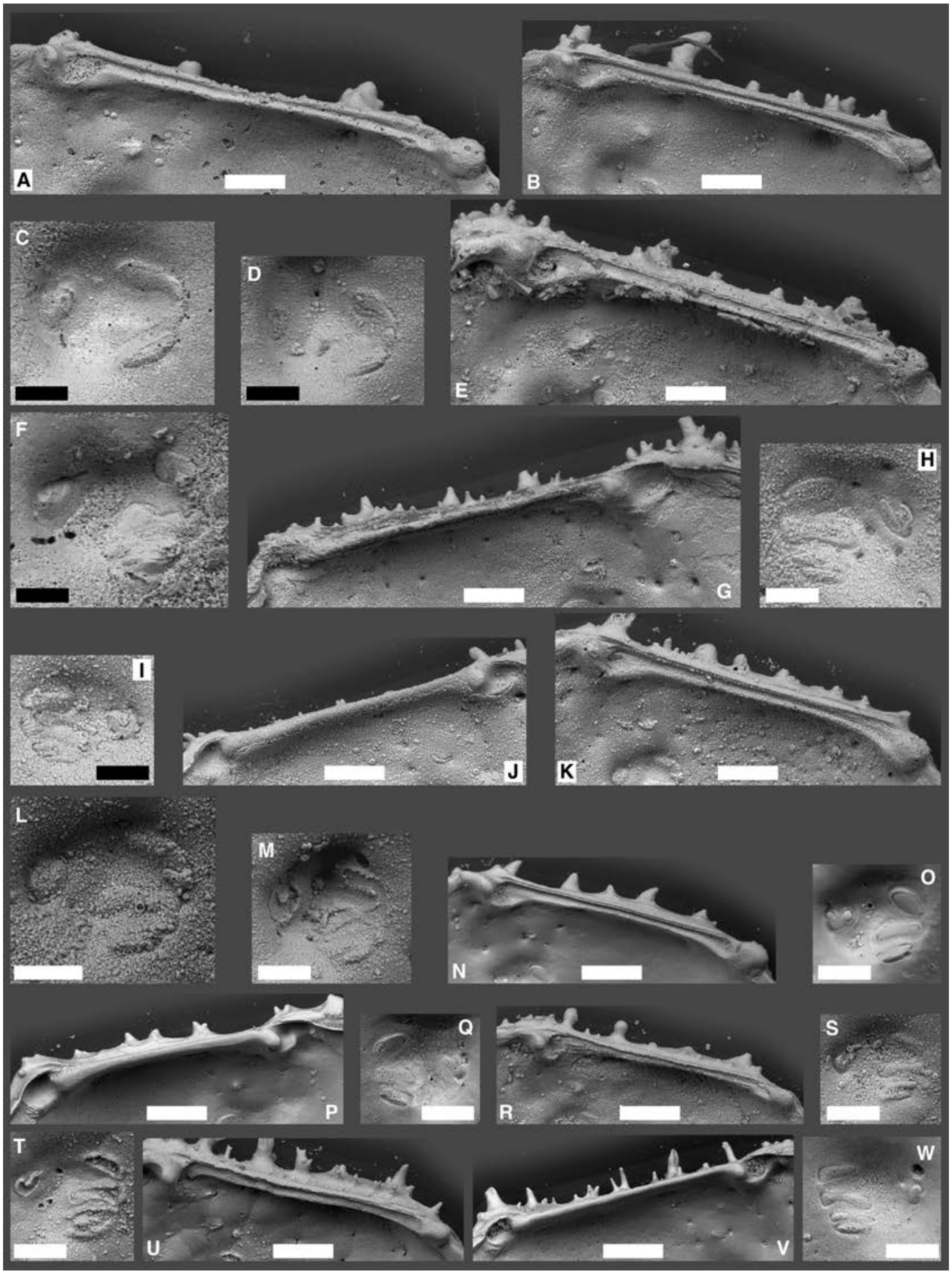


FIGURE 54. Internal details of *Cythereis neoanteplana* sp. nov., *Cythereis zululandensis* (Dingle, 1980), *Cythereis sylvesterbradleyi* sp. nov., *Cythereis ayressi* (Jellinek and Swanson, 2003), and *Cythereis bensoni* sp. nov. **A, C (B, D–F?)**, *Cythereis neoanteplana* sp. nov. A, C, TRA324 (USNM 607540), adult RV. A, hingement. C, subcentral muscle scars. B, D, TRA624 (USNM 607543), adult RV. B, hingement. D, subcentral muscle scars. E–F, TRA837 (USNM 607544), adult RV. E, hingement. F, subcentral muscle scars. **G–H,** *Cythereis zululandensis* (Dingle, 1980), TRA406 (USNM 607542), adult LV. G, hingement. H, subcentral muscle scars. **I–M,** *Cythereis sylvesterbradleyi* sp. nov. I–J, TRA540 (USNM 607548), adult LV. I, subcentral muscle scars. J, hingement. K–L, TRA541 (USNM 607549), adult RV. K, hingement. L, subcentral muscle scars. M, TRA1010 (USNM 607553), adult RV, subcentral muscle scars. **N–Q,** *Cythereis ayressi* (Jellinek and Swanson, 2003). N–O, TRA955 (USNM 607558), adult RV. N, hingement. O, subcentral muscle scars. P–Q, SIMY0025 (USNM 607562), adult LV. P, hingement. Q, subcentral muscle scars. **R–W,** *Cythereis bensoni* sp. nov. R–S, TRA422 (USNM 607568), adult RV. R, hingement. S, subcentral muscle scars. T–U, TRA414 (USNM 607571), adult RV. T, subcentral muscle scars. U, hingement. V–W, TRA951 (USNM 607575), adult LV. V, hingement. W, subcentral muscle scars. Scale bars represent 0.1 mm for A–B, E, G, J–K, N, P, R, U–V and 50 μm for C–D, F, H–I, L–M, O, Q, S–T, W.

latter has an eye tubercle, a curved ventrolateral ridge that is not parallel to the ventral margin in RV, a much more spinose anteroventral margin, two large spines on the posterior end of the dorsal margin (see Neale, 1975), and a less upturned posterior margin. This new species is also similar to *Cythereis weiperti* (Bertels, 1969a) but is distinguished by its less spinose anterodorsal corner and anterior margin, better-developed and straight ventrolateral ridge, more acuminate but less upturned posterior margin, and better-developed posterior and anterior marginal rims and sulci. The specimens in Figures 53G–J and 54B,D–F are questionably identified as this species. The specimen in Figures 53G–H and 54B,D is much smaller, and the specimen in Figures 53I–J and 54E–F has a well-developed eye tubercle.

Cythereis zululandensis (Dingle, 1980)

FIGURES 53E–F, 54G–H

Trachyleberis zululandensis Dingle, 1980:52, fig. 28A–C.

LOCALITY AND AGE OF SPECIMENS EXAMINED. DSDP 277, middle Eocene, Southern Ocean.

DIMENSIONS. See Table 1.

REMARKS. This species is most similar to *Cythereis* sp. 2 but is distinguished by its smaller size, spinose carapace, and lack of a median lateral ridge. This species is also similar to the species that Neil (1997) identifies as *Trachyleberis careyi* McKenzie et al., 1991, but the latter is much more spinose. This species was originally reported from the Cretaceous South Africa (Dingle, 1980, 1981).

Cythereis sylvesterbradleyi sp. nov.

FIGURES 54I–M, 55E–O

Actinocythereis? sp. 4 Hunt, Wicaksono, Brown, and MacLeod, 2010, fig. 2C.

DERIVATION OF NAME. In honor of the late Peter C. Sylvester-Bradley, formerly of University of Leicester, for his outstanding work on taxonomy of *Cythereis* and related genera.

HOLOTYPE. Adult LV, USNM 607548 (TRA540; Figures 54I–J, 55E–F).

PARATYPES. USNM 607549, 607550, 607551, 607552, 607553, 607554 (TRA541, TRA555, TRA1008, TRA1009, TRA1010, TRA346).

TYPE LOCALITY AND HORIZON. DSDP 214, 27/cc, late Eocene, 11.3368°S, 88.7180°E, 1,655 m water depth, Indian Ocean.

OTHER LOCALITIES. DSDP 214, DSDP 253, DSDP 258A, Oligocene and Miocene, Indian Ocean.

DIMENSIONS. See Table 1.

DIAGNOSIS. *Cythereis* species characterized by a slender outline, well-developed secondary reticulation, and the lack of a median lateral ridge and eye tubercle.

DESCRIPTION. Carapace moderately calcified, highest at anterodorsal corner. Outline subtriangular and slender; anterior margin evenly rounded, bearing clavate spines; posterior margin acuminate and upturned, bearing clavate spines; dorsal margin almost straight, bearing spines; ventral margin almost straight; ventrolateral ridge well developed, spinose, curved, and continuous with anterior marginal rim; subcentral tubercle well developed. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular. Lateral surface ornamented with primary and secondary reticulation and small spines. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars smaller and close to each other.

REMARKS. *Cythereis sylvesterbradleyi* sp. nov. is most similar to *Cythereis guerneti* sp. nov. but is distinguished by its better developed secondary reticulation and by its lack of both a median lateral ridge and an eye tubercle.

Cythereis ayressi (Jellinek and Swanson, 2003)

FIGURES 54N–Q, 56A–M

Trachyleberis? sp. Ayress, 1994, fig. 11E.
Taracythere ayressi Jellinek and Swanson, 2003:26, pl. 12, figs. 1–4.

LOCALITY AND AGE OF SPECIMENS EXAMINED. DSDP 208, Pleistocene and late Pliocene, southwestern Pacific; NGC 99 Pilot, NMC 14, Modern, southwestern Pacific.

DIMENSIONS. See Table 1.

REMARKS. Jellinek and Swanson (2003) described a very similar species, *Cythereis venusta* (Jellinek and Swanson, 2003). They differentiated *Cythereis venusta* from *Cythereis ayressi* (Jellinek and Swanson, 2003) by subtle differences, including a more pronounced posterior node at midheight, the presence of four strong dorsal spines (instead of three), a higher number of the marginal pores, and the lack of secondary reticulation on marginal rims.

Cythereis bensoni sp. nov.

FIGURES 54R–W, 56N–Z, 57D–E

DERIVATION OF NAME. In honor of the late Richard H. Benson, formerly of Smithsonian Institution, for his pioneering works on deep-sea ostracods.

HOLOTYPE. Adult RV, USNM 607568 (TRA422; Figures 54R–S, 56U–V).

PARATYPES. USNM 607563, 607564, 607565, 607566, 607567, 607569, 607570, 607571, 607575 (TRA401,

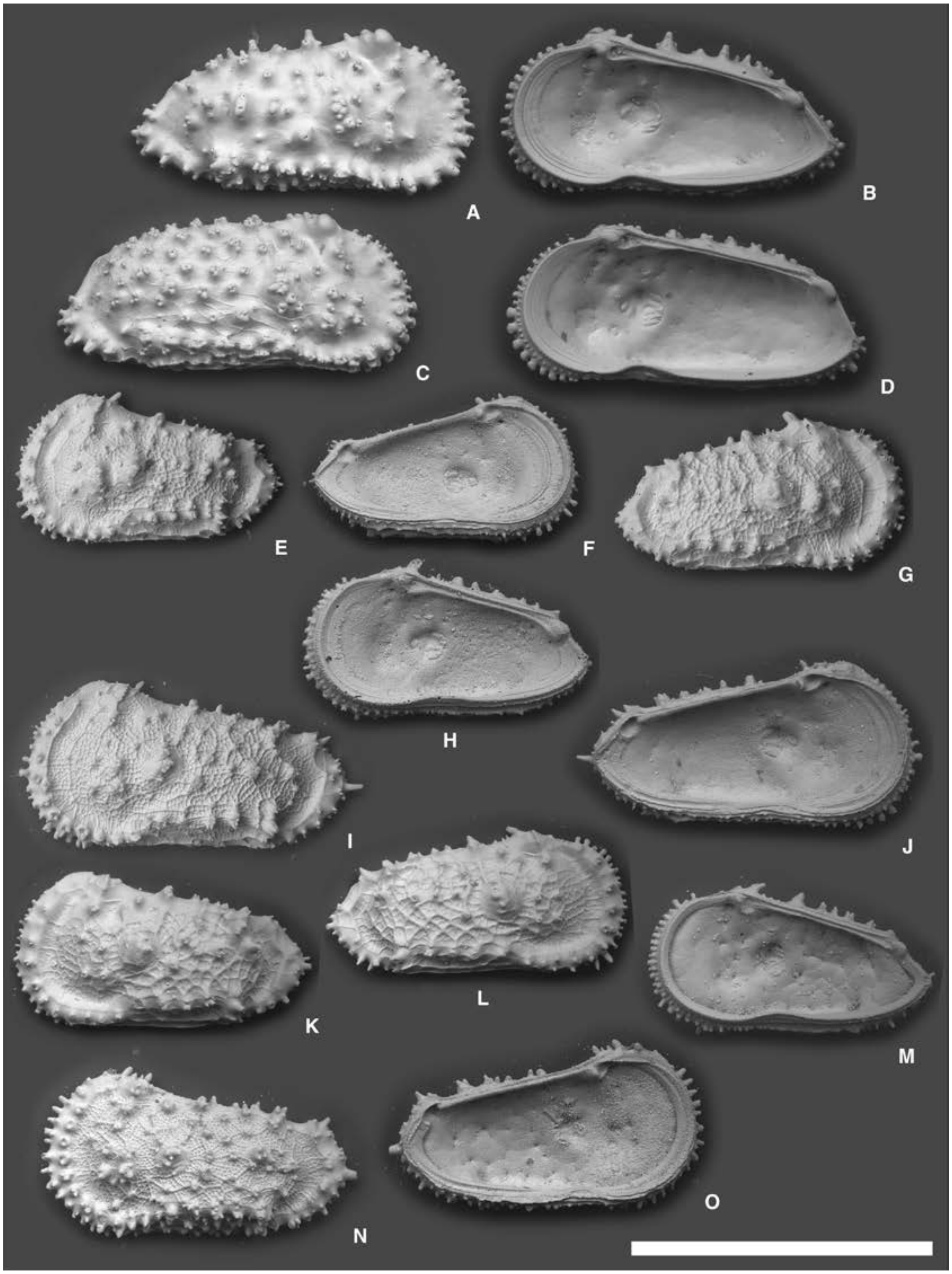


FIGURE 55. Scanning electron microscope images of *Hornibrookoleberis thomsoni* (Hornibrook, 1952), *Hornibrookoleberis lytteltonensis* (Harding and Sylvester-Bradley, 1953), and *Cythereis sylvesterbradleyi* sp. nov. A, C, E, G, I, K–L, N, lateral views; B, D, F, H, J, M, O, internal views. **A–B,** *Hornibrookoleberis thomsoni* (Hornibrook, 1952), TRA829 (USNM 607546), adult RV from RM 1001, Modern, New Zealand. **C–D,** *Hornibrookoleberis lytteltonensis* (Harding and Sylvester-Bradley, 1953), TRA828 (USNM 607547), adult RV from RM 1001, Modern, New Zealand. **E–O,** *Cythereis sylvesterbradleyi* sp. nov. E–F, TRA540 (USNM 607548), adult LV from DSDP 214, 27/cc, late Eocene, Indian Ocean. G–H, TRA541 (USNM 607549), adult RV from DSDP 214, 26/cc, early Oligocene, Indian Ocean. I–J, TRA555 (USNM 607550), adult LV from DSDP 214, 22/5/50–56, early Miocene, Indian Ocean. K, TRA1008 (USNM 607551), adult LV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. L, TRA1009 (USNM 607552), adult RV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. M, TRA1010 (USNM 607553), adult RV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. N–O, TRA346 (USNM 607554), adult LV from DSDP 258A, 7/4/100–106, late Miocene, Indian Ocean. Scale bar represents 1 mm.

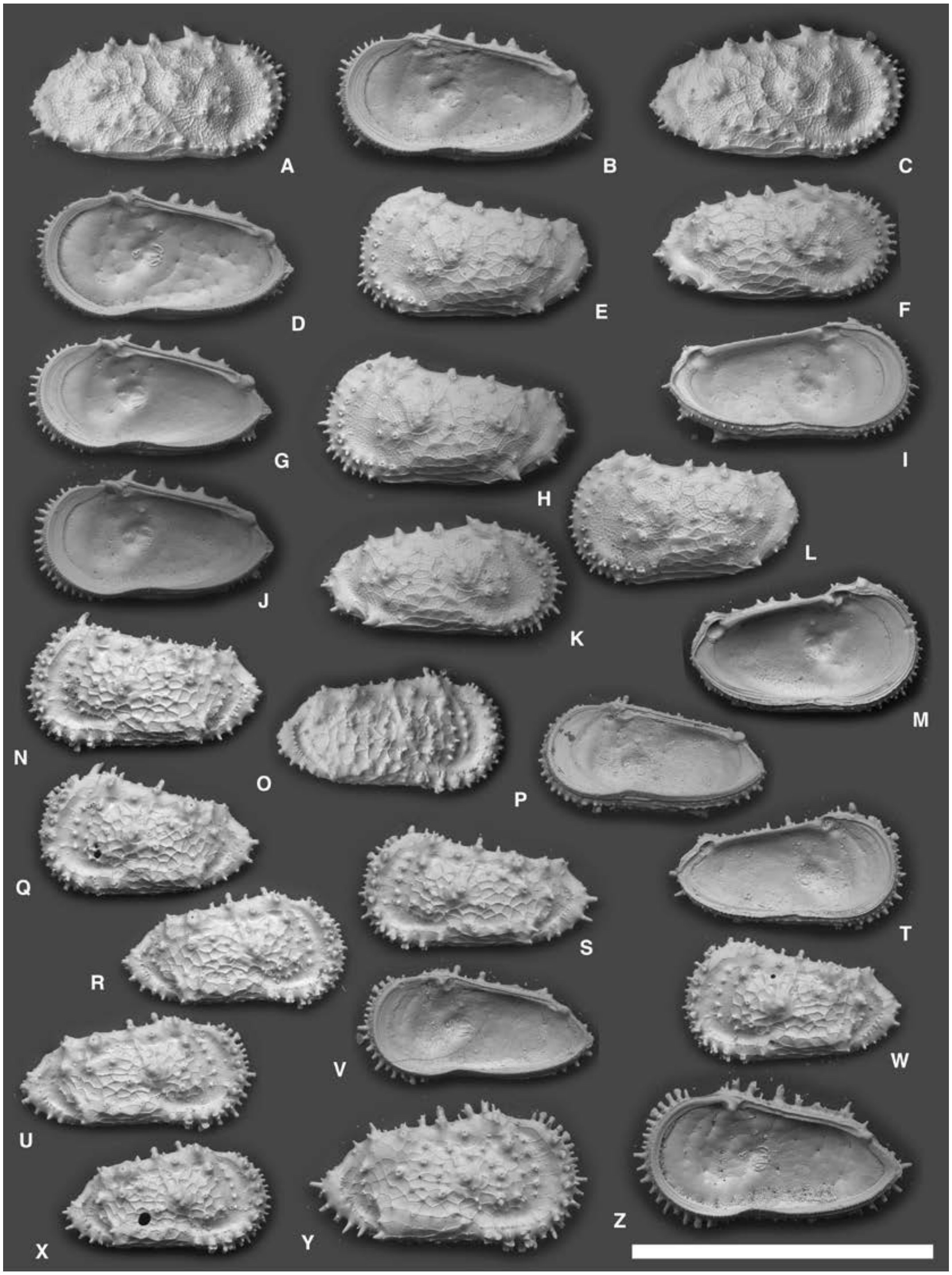


FIGURE 56. Scanning electron microscope images of *Cythereis ayressi* (Jellinek and Swanson, 2003) and *Cythereis bensoni* sp. nov. A, C, E–F, H, K–L, N–O, Q–S, U, W–Y, lateral views; B, D, G, I–J, M, P, T, V, Z, internal views. **A–M,** *Cythereis ayressi* (Jellinek and Swanson, 2003). A–B, TRA520 (USNM 607555), adult RV from DSDP 208, 2/4/50–56, Pleistocene, southwestern Pacific. C–D, TRA526 (USNM 607556), adult RV from DSDP 208, 3/4/50–56, late Pliocene, southwestern Pacific. E, TRA954 (USNM 607557), adult LV from NGC 99 Pilot, 0–5, Modern, southwestern Pacific. F–G, TRA955 (USNM 607558), adult RV from NGC 99 Pilot, 0–5, Modern, southwestern Pacific. H–I, TRA956 (USNM 607559), adult LV from NMC 14, 0–5, Modern, southwestern Pacific. J, TRA958 (USNM 607560), adult RV from NMC 14, 0–5, Modern, southwestern Pacific. K, TRA957 (USNM 607561), adult RV from NMC 14, 0–5, Modern, southwestern Pacific. L–M, SIMY0025 (USNM 607562), adult LV from NGC 99 Pilot, 0–5, Modern, southwestern Pacific. **N–Z,** *Cythereis bensoni* sp. nov. N, TRA401 (USNM 607563), adult LV from DSDP 277, 17/3/??, early Oligocene, Southern Ocean. O–P, TRA402 (USNM 607564), adult RV from DSDP 277, 17/3/??, early Oligocene, Southern Ocean. Q, TRA403 (USNM 607565), adult LV from DSDP 277, 17/3/??, early Oligocene, Southern Ocean. R, TRA404 (USNM 607566), adult RV from DSDP 277, 17/3/??, early Oligocene, Southern Ocean. S–T, TRA421 (USNM 607567), adult LV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. U–V, TRA422 (USNM 607568), adult RV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. W, TRA423 (USNM 607569), adult LV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. X, TRA424 (USNM 607570), adult RV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. Y–Z, TRA414 (USNM 607571), adult RV from DSDP 284, 18/1/130–137, late Miocene, southwestern Pacific. Scale bar represents 1 mm.

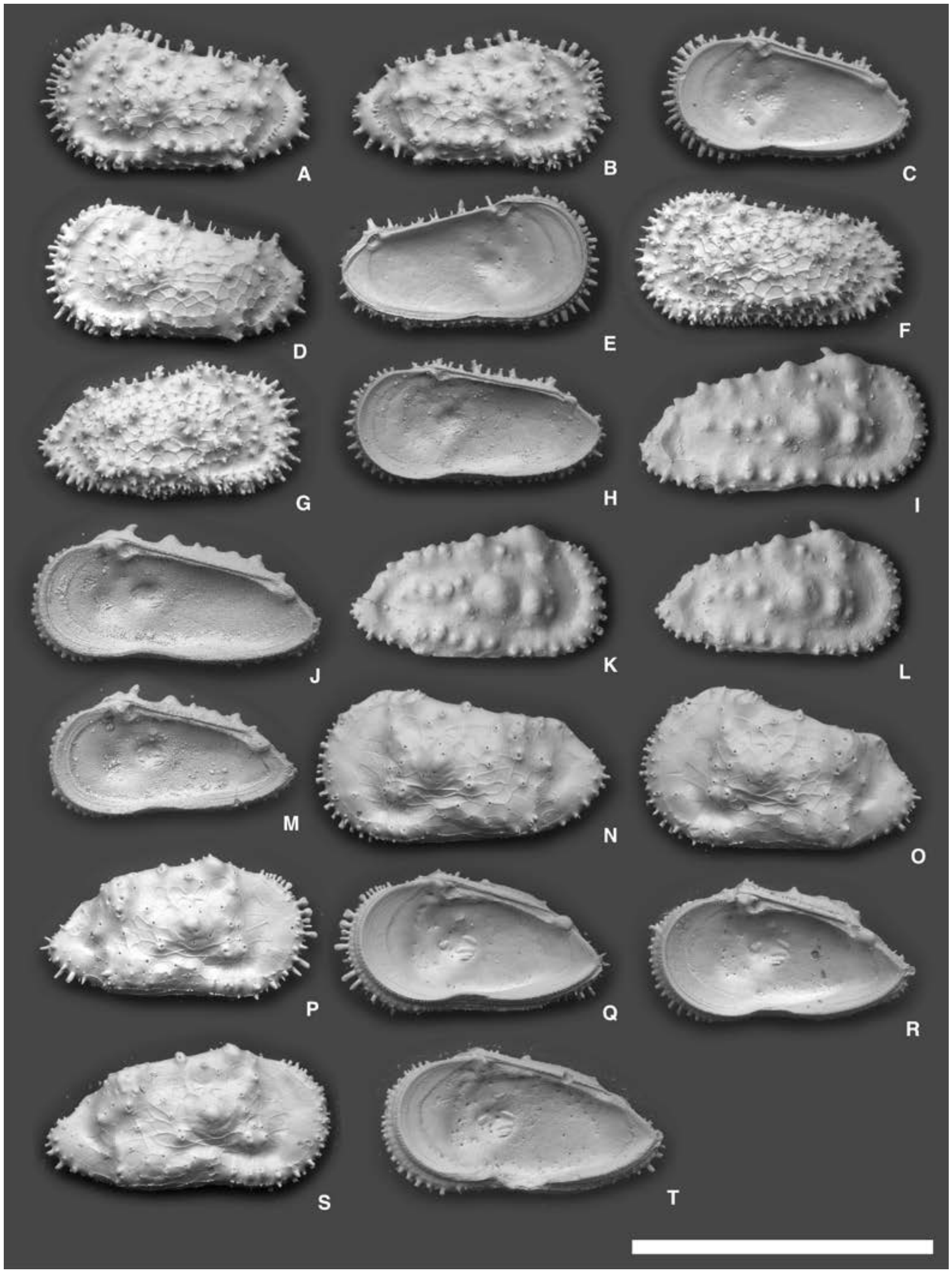


FIGURE 57. Scanning electron microscope images of *Cythereis ulcus* (Jellinek and Swanson, 2003), *Cythereis bensoni* sp. nov., *Cythereis purii* sp. nov., *Cythereis orientalis* (Guernet, 1985), and *Cythereis fungina* sp. nov. A–B, D, F–G, I, K–L, N–P, S, lateral views; C, E, H, J, M, Q–R, T, internal views. **A–C,** *Cythereis ulcus* (Jellinek and Swanson, 2003). A, TRA830 (USNM 607572), adult LV from A315, Modern, southwestern Pacific. B, TRA831 (USNM 607573), adult RV from A315, Modern, southwestern Pacific. C, TRA832 (USNM 607574), adult RV from A315, Modern, southwestern Pacific. **D–E,** *Cythereis bensoni* sp. nov., TRA951 (USNM 607575), adult LV from NMC 16, 0–5, Modern, southwestern Pacific. **F–H,** *Cythereis purii* sp. nov. F, TRA1011 (USNM 607576), adult LV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. G, TRA1012 (USNM 607577), adult RV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. H, TRA1013 (USNM 607578), adult RV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. **I–M,** *Cythereis orientalis* (Guernet, 1985). I–J, TRA547 (USNM 607579), adult RV from DSDP 214, 34/4/60–66, early Eocene, Indian Ocean. K, TRA548 (USNM 607580), adult RV from DSDP 214, 34/4/60–66, early Eocene, Indian Ocean. L–M, TRA549 (USNM 607581), adult RV from DSDP 214, 34/4/60–66, early Eocene, Indian Ocean. **N–T,** *Cythereis fungina* sp. nov. N, TRA435 (USNM 607582), adult LV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. O, TRA436 (USNM 607583), adult LV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. P–Q, TRA437 (USNM 607584), adult RV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. R, TRA438 (USNM 607585), adult RV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. S–T, TRA417 (USNM 607586), adult RV from DSDP 284, 18/1/130–137, late Miocene, southwestern Pacific. Scale bar represents 1 mm.

TRA402, TRA403, TRA404, TRA421, TRA423, TRA424, TRA414, TRA951).

Type Locality and Horizon. DSDP 277, 5/2/114–121, early Oligocene, 52.2238°S, 166.1913°E, 1,214 m water depth, Southern Ocean.

Other Localities. DSDP 284, late Miocene, southwestern Pacific; NMC 16, Modern, southwestern Pacific.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by small size; thick, well-developed, reticulate, and not spinose ventrolateral ridge; well-developed primary reticulation without secondary reticulation; lack of eye tubercle; and very well developed posterior marginal rim and sulcus.

Description. Carapace heavily calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing clavate spines; posterior margin acuminate, bearing spines; dorsal margin almost straight or slightly concave, bearing spines; ventral margin almost straight; ventrolateral ridge thick, well developed, reticulate, and continuous with anterior marginal rim, bearing a spine on posterior end; subcentral tubercle present. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with well-developed primary reticulation and pore conuli. Anterior and posterior marginal rims and sulci very well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

Remarks. *Cythereis bensoni* sp. nov. is very similar to *Taracythere* sp. of Jellinek and Swanson (2003:31, pl. 11, figs. 1–3), which also belongs to *Cythereis* in our generic concept, but the latter has a thick, but smooth, ventrolateral ridge without reticulation and a more nodose appearance. *Cythereis bensoni* sp. nov. is distinguished from *Cythereis sylvesterbradleyi* sp. nov. and *Cythereis guerneti* sp. nov. by the presence of a thick, reticulate, but not spinose, ventrolateral ridge and a very well developed posterior marginal rim and sulcus and the lack of secondary reticulation and an eye tubercle.

Cythereis ulcus (Jellinek and Swanson, 2003)

FIGURES 57A–C, 58A–B

Taracythere ulcus Jellinek and Swanson, 2003:29, pl. 16, figs. 1–3.

Locality and Age of Specimens Examined. A315, Modern, southwestern Pacific.

Dimensions. See Table 1.

Remarks. This species is very similar to *Cythereis orientalis rete* (Guernet, 1993) but is distinguished from it by a much more spinose carapace.

Cythereis purii sp. nov.

FIGURES 57F–H, 58C–D

Derivation of Name. In honor of Harbans S. Puri, formerly of Florida Geological Survey, for his important contribution to trachyleberidid ostracod taxonomy.

Holotype. Adult LV, USNM 607576 (TRA1011; Figure 57F).

Paratypes. USNM 607577, 607578 (TRA1012, TRA1013).

Type Locality and Horizon. DSDP 253, 9/3/50–56, early Miocene, 24.8775°S, 87.3662°E, 1,962 m water depth, Indian Ocean.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by small size, spinose carapace and ventrolateral ridge with numerous small spines, and well-developed but shallow primary reticulation without secondary reticulation.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing numerous spines; posterior margin acuminate and upturned, bearing spines; dorsal and ventral margins almost straight, bearing numerous spines; ventrolateral ridge well developed, spinose with small spines, and continuous with anterior marginal rim; subcentral tubercle present. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with well-developed primary reticulation and small spines. Anterior and posterior marginal rims and sulci present. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

Remarks. *Cythereis purii* sp. nov. is very similar to *Cythereis sylvesterbradleyi* sp. nov. but is distinguished by the lack of secondary reticulation and the presence of a more spinose carapace. *Cythereis purii* sp. nov. is also very similar to *Cythereis bensoni* sp. nov. but is distinguished by its much more spinose carapace and ventrolateral ridge.

Cythereis orientalis (Guernet, 1985)

FIGURES 57I–M, 58E–F

Actinocythereis orientalis Guernet, 1985:289, pl. 2, figs. 1–2, 4–5, 7.

Actinocythereis orientalis Guernet; Hunt, Wicaksono, Brown, and MacLeod, 2010, text-fig. 2B.

?*Actinocythereis orientalis* Guernet; Bergue and Nicolaidis, 2012:52, fig. 2.26–2.27.

Locality and Age of Specimens Examined. DSDP 214, early Eocene, Indian Ocean.

Dimensions. See Table 1.

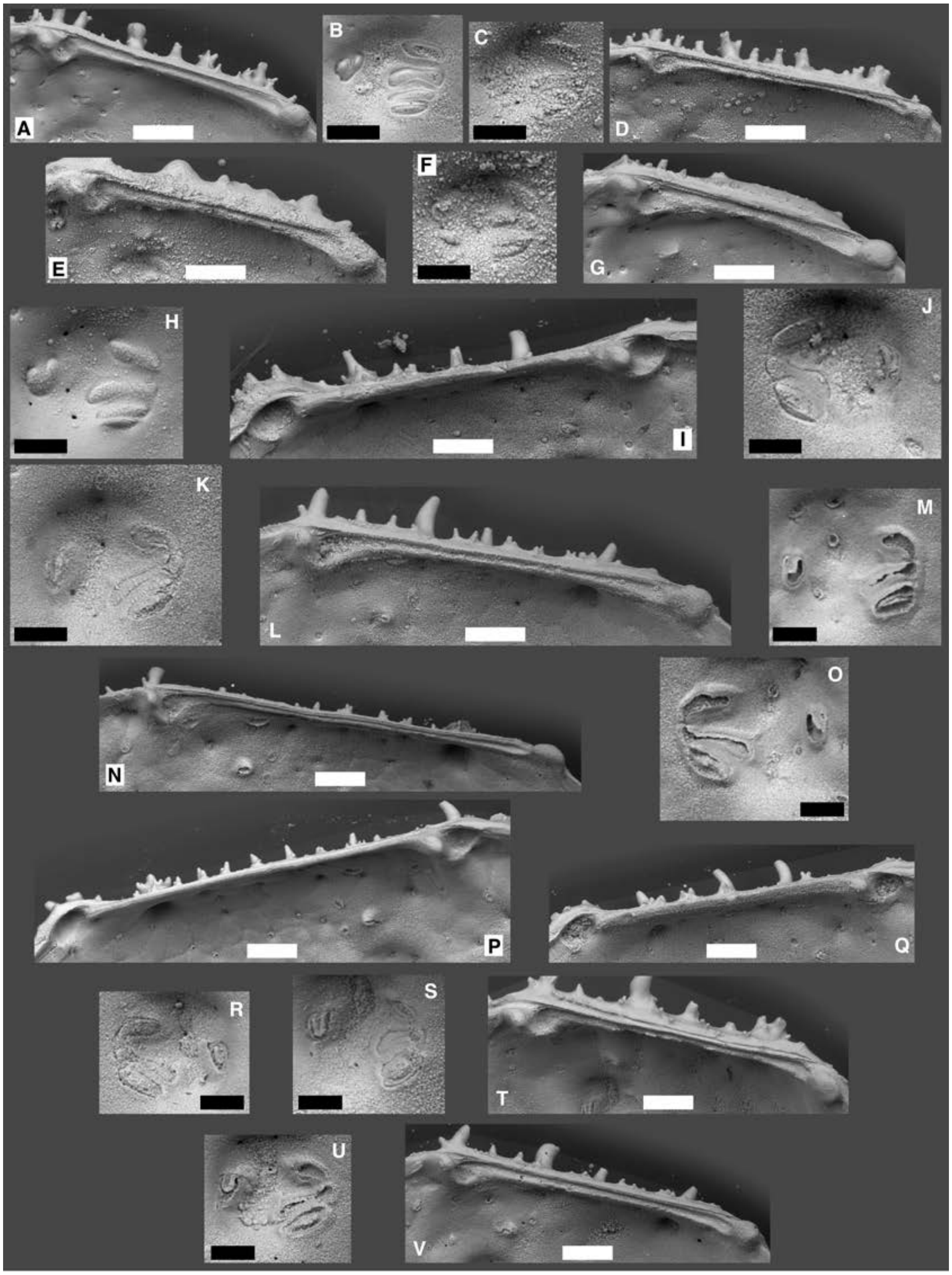


FIGURE 58. Internal details of *Cythereis ulcus* (Jellinek and Swanson, 2003), *Cythereis purii* sp. nov., *Cythereis orientalis* (Guernet, 1985), *Cythereis fungina* sp. nov., *Cythereis tomcronini* sp. nov., *Cythereis legitimoformis* sp. nov., and *Cythereis richardbensoni* sp. nov. **A–B,** *Cythereis ulcus* (Jellinek and Swanson, 2003), TRA832 (USNM 607574), adult RV. A, hingement. B, subcentral muscle scars. **C–D,** *Cythereis purii* sp. nov., TRA1013 (USNM 607578), adult RV. C, subcentral muscle scars. D, hingement. **E–F,** *Cythereis orientalis* (Guernet, 1985), TRA549 (USNM 607581), adult RV. E, hingement. F, subcentral muscle scars. **G–H,** *Cythereis fungina* sp. nov., TRA437 (USNM 607584), adult RV. G, hingement. H, subcentral muscle scars. **I–L,** *Cythereis tomcronini* sp. nov. I–J, TRA335 (USNM 607603), adult LV. I, hingement. J, subcentral muscle scars. K–L, TRA137 (USNM 607604), adult RV. K, subcentral muscle scars. L, hingement. **M–P,** *Cythereis legitimoformis* sp. nov. M–N, TRA945 (USNM 607598), adult RV. M, subcentral muscle scars. N, hingement. O–P, TRA943 (USNM 607600), adult LV. O, subcentral muscle scars. P, hingement. **Q–V,** *Cythereis richardbensoni* sp. nov. Q–R, TRA603 (USNM 607608), adult LV. Q, hingement. R, subcentral muscle scars. S–T, TRA605 (USNM 607610), adult RV. S, subcentral muscle scars. T, hingement. U–V, TRA606 (USNM 607611), adult RV. U, subcentral muscle scars. V, hingement. Scale bars represent 0.1 mm for A, D–E, G, I, L, N, P–Q, T, V and 50 μm for B–C, F, H, J–K, M, O, R–S, U.

Remarks. Our specimens have a better-developed eye tubercle but are otherwise identical to *Cythereis orientalis* (Guernet, 1985).

Cythereis fungina sp. nov.

FIGURES 57N–T, 58G–H, 59A–C

Derivation of Name. From the Latin *fungina* (adjective in the nominative singular, feminine), meaning "mushroom," with reference to the similarity of its clavate anterior marginal spines to mushrooms.

Holotype. Adult RV, USNM 607584 (TRA437; Figures 57P–Q, 58G–H).

Paratypes. USNM 607582, 607583, 607585, 607586, 607587, 607588 (TRA435, TRA436, TRA438, TRA417, TRA426, TRA427).

Type Locality and Horizon. DSDP 279A, 8/1/81–89, early Miocene, 51.3357°S, 162.6350°E, 3,341 m water depth, Southern Ocean.

Other Localities. DSDP 284, late Miocene, southwestern Pacific; DSDP 277, early Oligocene, Southern Ocean.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by a smooth but heavily calcified carapace with very weak primary reticulation, well-developed clavate marginal spines, and broad and smooth ventrolateral ridge.

Description. Carapace heavily calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing numerous clavate spines; posterior margin acuminate, bearing clavate spines; dorsal margin concave in LV and straight in RV and almost smooth in both valves; ventral margin almost straight; ventrolateral ridge that is broad, almost smooth, and continuous with anterior marginal rim; subcentral tubercle well developed; eye tubercle well developed; posterodorsal node very large. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with very weak primary reticulation. Anterior and posterior marginal rims and sulci broad and well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

Remarks. *Cythereis fungina* sp. nov. is distinguished from all other *Cythereis* species by its heavily calcified and smooth carapace with very weak primary reticulation, very large posterodorsal node, well-developed clavate marginal spines, and broad and smooth ventrolateral ridge.

Cythereis tomcronini sp. nov.

FIGURES 58I–L, 60A–D,K–N, 61A–D

Derivation of Name. In honor of Thomas M. Cronin, U.S. Geological Survey, for his invaluable contribution to ostracod research.

Holotype. Adult RV, USNM 607604 (TRA137; Figures 58K–L, 61C–D).

Paratypes. USNM 607595, 607596, 607601, 607602, 607603 (TRA502, TRA325, TRA331, TRA334, TRA335).

Type Locality and Horizon. DSDP 357, 5/3/50–59, late Miocene, 30.0042°S, 35.5598°W, 2,086 m water depth, southwestern Atlantic.

Other Localities. DSDP 292, Oligocene, northwestern Pacific; DSDP 359, Miocene, southeastern Atlantic; DSDP 357, Miocene and late Oligocene, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by very large size, weakly developed primary reticulation without secondary reticulation, spinose ventrolateral ridge, and lack of median lateral ridge.

Description. Carapace very large, highest at anterodorsal corner. Outline subtriangular-trapezoidal; anterior margin evenly rounded, bearing clavate spines; posterior margin acuminate, bearing clavate spines; dorsal margin concave in LV and straight in RV and bearing large and small spines; ventral margin almost straight and densely spinose; ventrolateral ridge well developed, bearing long spines, and continuous with anterior marginal rim; subcentral tubercle present, bearing a few spines. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with shallow primary reticulation and spines. Anterior and posterior marginal rims and sulci broad and well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

Remarks. *Cythereis tomcronini* sp. nov. is very similar to *Cythereis ornatissima* (Reuss, 1846) but is distinguished by its much larger size, slender outline, and less spinose carapace and the lack of a median lateral ridge. *Cythereis tomcronini* sp. nov. is also similar to *Cythereis careyi* (McKenzie et al., 1991), but the latter has a more slender outline, more spinose carapace, and less developed ventrolateral ridge.

Cythereis legitimoformis sp. nov.

FIGURES 58M–P, 60E–J

Derivation of Name. With reference to its similarity to *Legitimocythere* species.

Holotype. Adult RV, USNM 607599 (POS1257; Figure 60G–H).

Paratypes. USNM 607600, 607597, 607598 (TRA943, TRA944, TRA945).

Type Locality and Horizon. NB 68, 5–10, Quaternary, 21.2792°N, 174.7618°E, 2,505 m water depth, North Pacific.

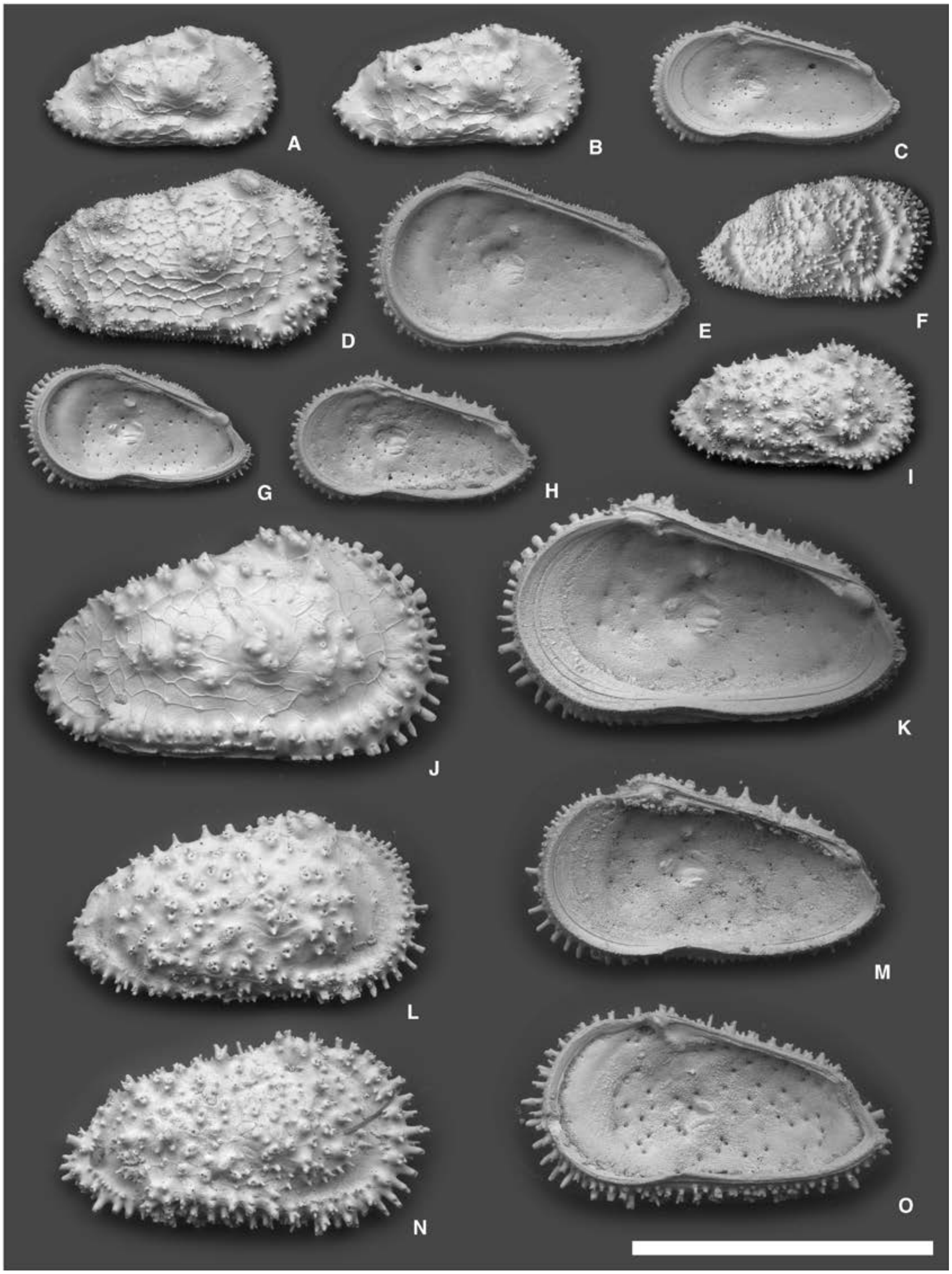


FIGURE 59. Scanning electron microscope images of *Cythereis fungina* sp. nov., *Cythereis* sp. 4, *Cythereis* sp. 5, *Cythereis* sp. 6, *Cythereis* sp. 7, *Cythereis* sp. 8, and *Cythereis* sp. 9. A–B, D, F, I–J, L, N, lateral views; C, E, G–H, K, M, O, internal views. **A–C,** *Cythereis fungina* sp. nov. A, TRA426 (USNM 607587), adult RV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. B–C, TRA427 (USNM 607588), adult RV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. **D–E,** *Cythereis* sp. 4, TRA418 (USNM 607589), adult RV from DSDP 264, 3/1/60–67, middle Eocene, Indian Ocean. **F–G,** *Cythereis* sp. 5, TRA415 (USNM 607590), adult RV from DSDP 284, 18/1/130–137, late Miocene, southwestern Pacific. **H–I,** *Cythereis* sp. 6, TRA840 (USNM 607591), adult RV from SI-25, late Eocene, New Zealand. **J–K,** *Cythereis* sp. 7, TRA619 (USNM 607592), adult RV from DSDP 356, 3/5/50–58, early Miocene, southwestern Atlantic. **L–M,** *Cythereis* sp. 8, TRA838 (USNM 607593), adult RV from SI-25, late Eocene, New Zealand. **N–O,** *Cythereis* sp. 9, TRA839 (USNM 607594), adult RV from SI-25, late Eocene, New Zealand. Scale bar represents 1 mm.

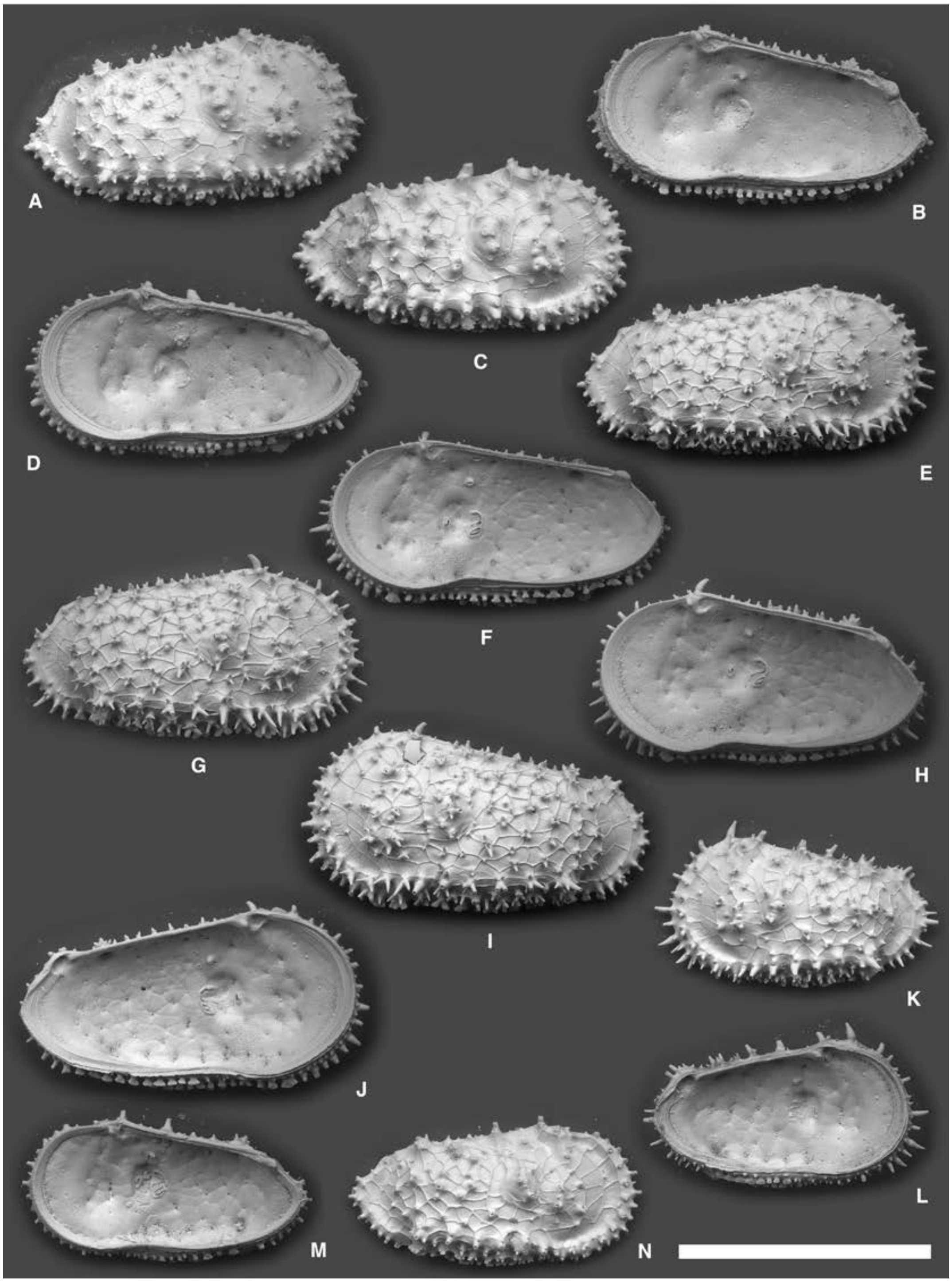


FIGURE 60. Scanning electron microscope images of *Cythereis tomcronini* sp. nov. and *Cythereis legitimoformis* sp. nov. A, C, E, G, I, K, N, lateral views; B, D, F, H, J, L–M, internal views. **A–D, K–N,** *Cythereis tomcronini* sp. nov. A–B, TRA502 (USNM 607595), adult RV from DSDP 292, 23/1/54–60, Oligocene, equatorial western Pacific. C–D, TRA325 (USNM 607596), adult RV from DSDP 359, 2/6/85–95, Miocene, southeastern Atlantic. K–L, TRA331 (USNM 607601), adult LV from DSDP 357, 6/3/33–35, middle Miocene, southwestern Atlantic. M–N, TRA334 (USNM 607602), adult RV from DSDP 357, 12/5/50–59, early Miocene, southwestern Atlantic. **E–J,** *Cythereis legitimoformis* sp. nov. E, TRA944 (USNM 607597), adult RV from NB 68, 5–10, Quaternary, North Pacific. F, TRA945 (USNM 607598), adult RV from NB 68, 5–10, Quaternary, North Pacific. G–H, POS1257 (USNM 607599), adult RV from NB 68, 5–10, Quaternary, North Pacific. I–J, TRA943 (USNM 607600), adult LV from NB 68, 5–10, Quaternary, North Pacific. Scale bar represents 1 mm.

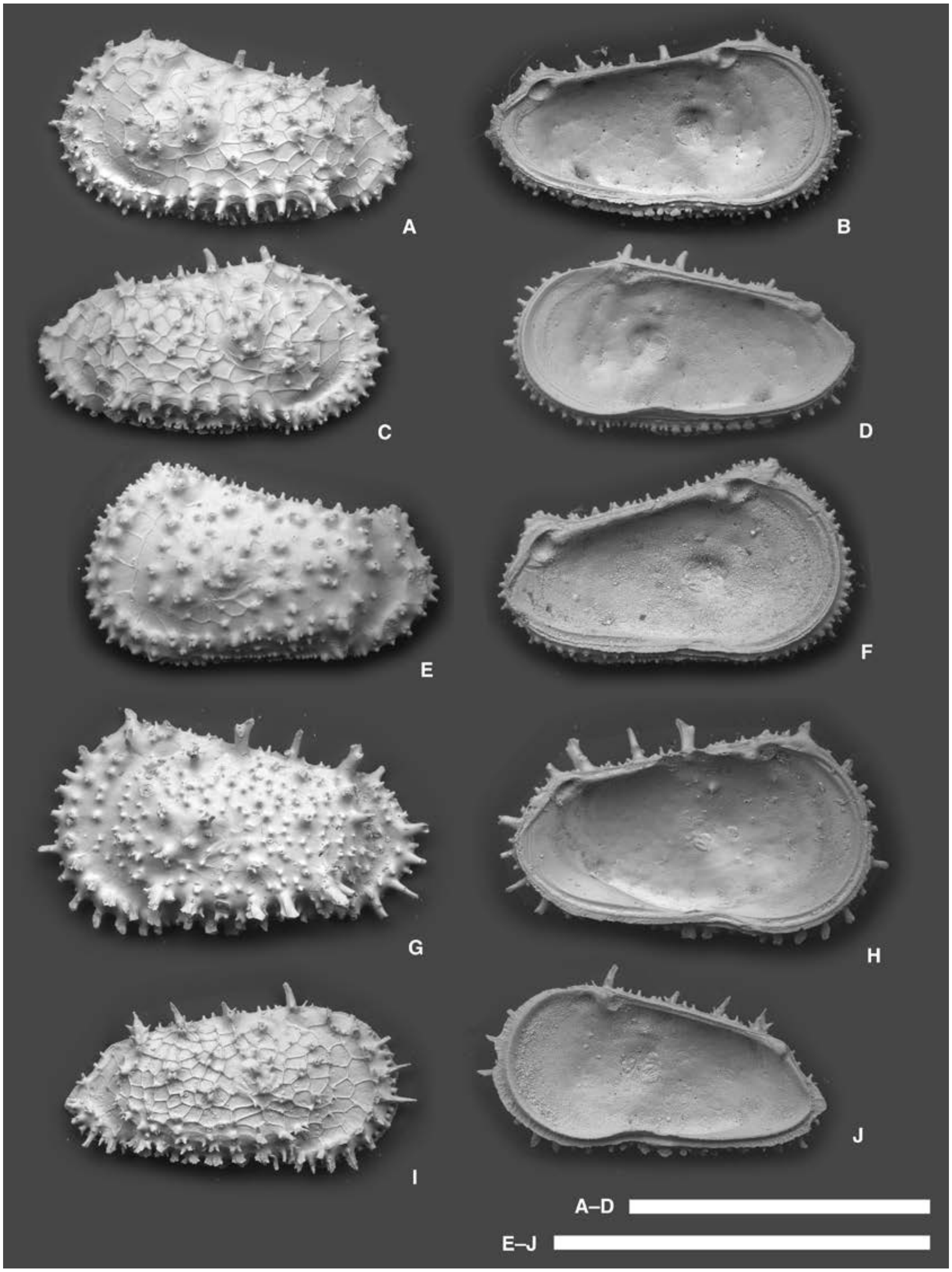


FIGURE 61. Scanning electron microscope images of *Cythereis tomcronini* sp. nov., *Cythereis* sp. 10, *Croninocythereis* cf. *tridentiferi* sp. nov., and *Croninocythereis tridentiferi* sp. nov. A, C, E, G, I, lateral views; B, D, F, H, J, internal views. **A–D,** *Cythereis tomcronini* sp. nov. A–B, TRA335 (USNM 607603), adult LV from DSDP 357, 17/5/44–54, late Oligocene, southwestern Atlantic. C–D, TRA137 (USNM 607604), adult RV from DSDP 357, 5/3/50–59, late Miocene, southwestern Atlantic. **E–F,** *Cythereis* sp. 10, TRA801 (USNM 607605), adult LV from DSDP 258A, 9/4/50–56, Santonian, Indian Ocean. **G–H,** *Croninocythereis* cf. *tridentiferi* sp. nov., TRA306 (USNM 607606), adult LV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. **I–J,** *Croninocythereis tridentiferi* sp. nov., TRA452 (USNM 607607), adult RV from DSDP 305, 8/5/54–60, early Oligocene, northwestern Pacific. Scale bars represent 1 mm.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by very large size, well-developed multifurcate spines, and shallow primary reticulation.

Description. Carapace moderately calcified, very large, highest at anterodorsal corner. Outline subtriangular-trapezoidal; anterior margin evenly rounded, bearing long spines; posterior margin bluntly acuminate, bearing spines; dorsal margin straight, bearing spines; ventral margin almost straight and densely spinose; ventrolateral ridge well developed, bearing multifurcate spines, straight, and continuous with anterior marginal rim; subcentral tubercle present, bearing spines. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with shallow primary reticulation and multifurcate spines. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

Remarks. *Cythereis legitimoformis* sp. nov. is similar to *Cythereis tomcronini* sp. nov. and *Cythereis ornatissima* (Reuss, 1846) but differs from them in having well-developed multifurcate spines and a more slender outline. This species is very similar to *Legitimocythere* species but is distinguished by its V-shaped frontal scar as well as by its subrectangular outline, less spinous carapace, and distinct ventrolateral ridge.

Cythereis richardbensoni sp. nov.

FIGURES 51A–K, 58Q–V

Trachyleberis sp. Benson and Peypouquet, 1983, pl. 2, figs. 2, 4, 6, 8.

Derivation of Name. In honor of the late Richard H. Benson, formerly of Smithsonian Institution, for his invaluable contribution to ostracod research. He was the first to recognize this species.

Holotype. Adult RV, USNM 607610 (TRA605; Figures 51D–E, 58S–T).

Paratypes. USNM 607608, 607609, 607611, 607612, 607613, 607614 (TRA603, TRA604, TRA606, TRA607, TRA608, TRA316).

Type Locality and Horizon. DSDP 516, 4/2/80–90, early Pliocene, 30.2763°S, 35.2852°W, 1,313 m water depth, southwestern Atlantic.

Other Localities. DSDP 516, DSDP 357, late Miocene and Pliocene, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by very large size, relatively rectangular or ovate outline, deep marginal sulci, and shallow primary reticulation.

Description. Carapace very large, highest at anterodorsal corner. Outline subrectangular-subovate; anterior margin evenly rounded, bearing spines; posterior margin bluntly acuminate, bearing spines; dorsal margin straight, bearing long and short spines (one long, recurved spine in the middle and one long, weakly recurved spine on the anterior end); ventral margin slightly convex and spinose; ventrolateral ridge well developed, bearing long spines, straight (or slightly curved), and continuous with anterior marginal rim; subcentral tubercle well developed. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular and prominent in LV and weakly angular in RV. Lateral surface ornamented with shallow primary reticulation, small spines, and pore conuli. Anterior and posterior marginal sulci deep and very well developed. Anterior and posterior marginal rims well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

Remarks. *Cythereis richardbensoni* sp. nov. is similar to *Cythereis bermudezi* van den Bold, 1946 (see van den Bold, 1960, 1988) and *Cythereis crebripustulosa* (van den Bold, 1966), but van den Bold's species lack primary reticulation. This species is also similar to *Cythereis careyi* (McKenzie et al., 1991), but the latter is much more slender and spinose. Benson and Peypouquet (1983) first recognized this species as *Trachyleberis* sp.

Cythereis dinglei sp. nov.

FIGURES 51L–O, 62A–C

Derivation of Name. In honor of Richard V. Dingle, formerly of University of Copenhagen, for his pioneering works on Atlantic deep-sea ostracods.

Holotype. Adult RV, USNM 607616 (TRA610; Figures 51N–O, 62C).

Paratype. USNM 607615 (TRA609).

Type Locality and Horizon. DSDP 516, 42/2/55–65, early Miocene, 30.2763°S, 35.2852°W, 1,313 m water depth, southwestern Atlantic.

Other Locality. DSDP 516, middle Miocene, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Cythereis* species characterized by an almost smooth carapace with very weak primary and secondary reticulation.

Description. Carapace heavily calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing numerous spines; posterior margin acuminate, bearing spines; dorsal margin straight, bearing four clavate spines on anterior half; ventral margin slightly sinuous and smooth; ventrolateral ridge well developed, composed of two parallel carinae, bearing a spine on posterior end, and continuous with anterior marginal rim; node-like median lateral ridge present; subcentral tubercle present. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with very weak primary and secondary reticulation but otherwise smooth. Anterior and posterior marginal sulci deep and

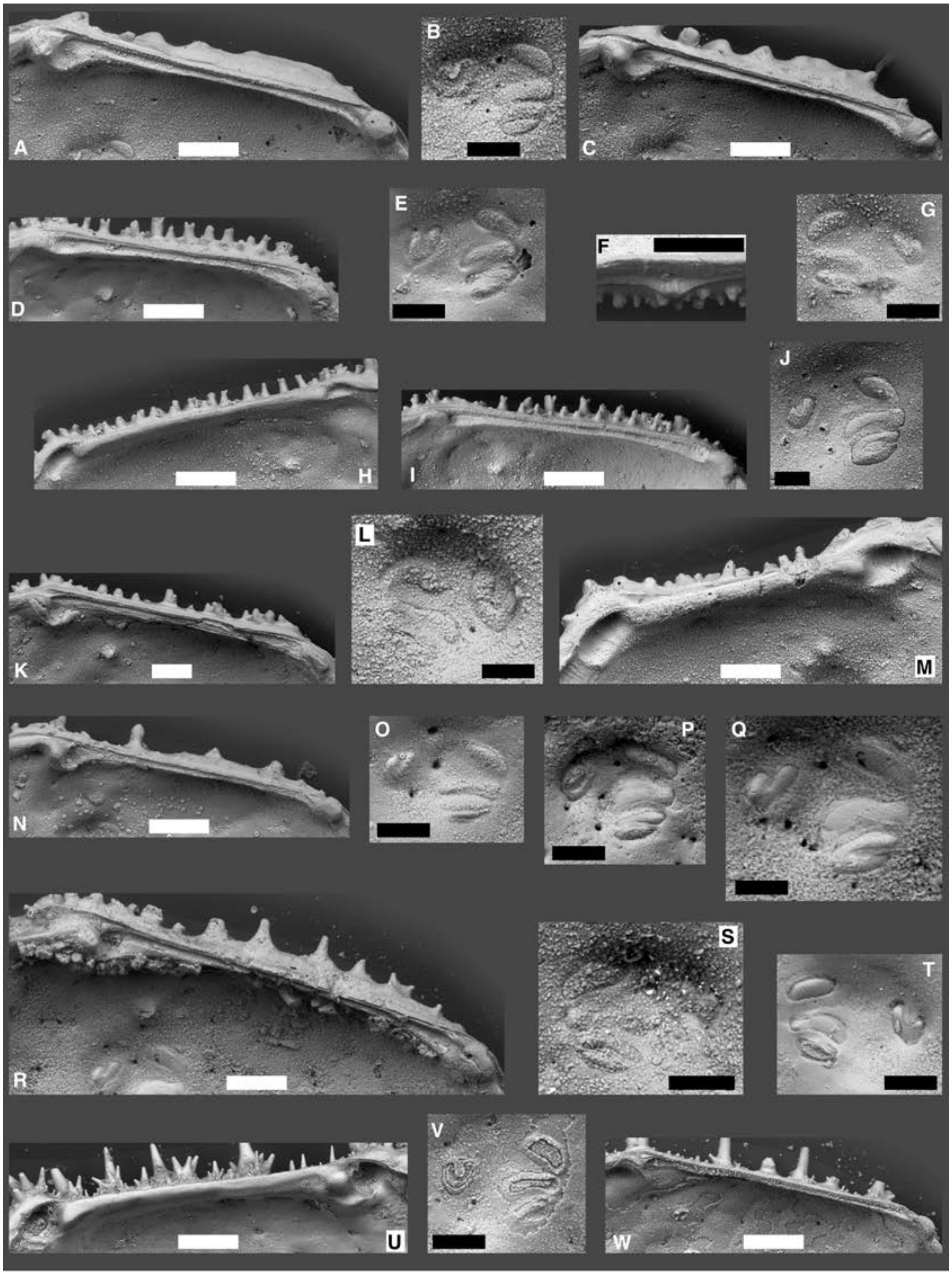


FIGURE 62. Internal details of *Cythereis dinglei* sp. nov., *Cythereis ovi* sp. nov., *Cythereis swansoni* sp. nov., *Cythereis* sp. 1, *Cythereis* sp. 3, *Cythereis* sp. 5, *Cythereis* sp. 6, *Cythereis* sp. 8, *Cythereis* sp. 10, *Cythereis* sp. 11, and *Cythereis* sp. 12. **A–C,** *Cythereis dinglei* sp. nov. A–B, TRA609 (USNM 607615), adult RV. A, hingement. B, subcentral muscle scars. C, TRA610 (USNM 607616), adult RV, hingement. **D–I,** *Cythereis ovi* sp. nov. D–F, TRA614 (USNM 607641), adult RV. D, hingement. E, subcentral muscle scars. F, ventromarginal area (snap-knob structure unclear and probably absent). G–H, TRA612 (USNM 607642), adult LV. G, subcentral muscle scars. H, hingement. I, TRA613 (USNM 607643), adult RV, hingement. **J–K,** *Cythereis swansoni* sp. nov., TRA409 (USNM 607649), adult RV. J, subcentral muscle scars. K, hingement. **L–M,** *Cythereis* sp. 1, TRA768 (USNM 607397), adult LV. L, subcentral muscle scars. M, hingement. **N,** *Cythereis* sp. 3, TRA425 (USNM 607545), adult RV, hingement. **O,** *Cythereis* sp. 5, TRA415 (USNM 607590), adult RV, subcentral muscle scars. **P,** *Cythereis* sp. 6, TRA840 (USNM 607591), adult RV, subcentral muscle scars. **Q–R,** *Cythereis* sp. 8, TRA838 (USNM 607593), adult RV. Q, subcentral muscle scars. R, hingement. **S,** *Cythereis* sp. 10, TRA801 (USNM 607605), adult LV, subcentral muscle scars. **T–U,** *Cythereis* sp. 11, TRA217 (USNM 607647), adult LV. T, subcentral muscle scars. U, hingement. **V–W,** *Cythereis* sp. 12, TRA340 (USNM 607707), adult RV. V, hingement. W, subcentral muscle scars. Scale bars represent 0.1 mm for A–B, D, F, H–I, K, M–N, R, U, W and 50 μm for C, E, G, J, L, O–Q, S–T, V.

very well developed. Anterior and posterior marginal rims well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; dorsomedian, ventromedian, and ventral scars close to each other.

REMARKS. *Cythereis dinglei* sp. nov. is similar to *Cythereis richardbensoni* sp. nov. in general shape and has similar distinct marginal rims but is distinguished by its almost smooth carapace. *Cythereis dinglei* sp. nov. is also similar to *Glencoeleberis* cf. *occultata* of Ayress (2006), but the latter has a curved ventrolateral ridge and nodose appearance and completely lacks reticulation.

Cythereis ovi sp. nov.

FIGURES 62D–I, 63K–Q

DERIVATION OF NAME. From the Latin *ovi* (a noun in the genitive case), meaning "egg," with reference to its relatively ovate outline.

HOLOTYPE. Adult LV, USNM 607642 (TRA612; Figures 62G–H, 63M–N).

PARATYPES. USNM 607644, 607643, 607641 (TRA611, TRA613, TRA614).

TYPE LOCALITY AND HORIZON. DSDP 516F, 30/2/59–64, Oligocene, 30.2765°S, 35.2850°W, 1,313 m water depth, southwestern Atlantic.

OTHER LOCALITY. DSDP 516F, early Miocene, southwestern Atlantic.

DIMENSIONS. See Table 1.

DIAGNOSIS. *Cythereis* species characterized by relatively ovate outline, spinose carapace with well-developed, irregular secondary reticulation, and weakly developed ventrolateral ridge.

DESCRIPTION. Carapace moderately calcified, highest at anterodorsal corner. Outline trapezoidal-ovate; anterior margin evenly rounded, bearing long spines; posterior margin bluntly acuminate in RV and blunt in LV, bearing spines; dorsal margin straight, bearing spines; ventral margin slightly convex and densely spinose; ventrolateral ridge weakly developed, bearing spines, slightly curved, and continuous with anterior marginal rim; subcentral tubercle subdued. Anterodorsal corner forms an obtuse angle; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface ornamented with primary reticulation, well-developed, irregular secondary reticulation, and numerous small spines. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont, but anterior terminal tooth of median hinge element (LV) subdued. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

REMARKS. *Cythereis ovi* sp. nov. is similar to *Legitimocythere* species but can be distinguished by its V-shaped frontal scar as well as its smaller size, unbranched spines, and the presence of secondary reticulation. *Cythereis ovi* sp. nov. is also similar to *Cythereis tomcronini* sp. nov. and *Cythereis legitimoformis* sp. nov. but can be distinguished by its much less slender outline, well-developed, irregular secondary reticulation, and smaller size. *Cythereis ovi* is distinct from most other *Cythereis* species in several aspects, including its blunt posterior margin, suboval outline, densely spinous carapace, and regularly arranged spines in vertical rows.

Cythereis swansoni sp. nov.

FIGURES 62J–K, 64C–F

DERIVATION OF NAME. In honor of Kerry M. Swanson, University of Canterbury, for his work on southwestern Pacific ostracods.

HOLOTYPE. Adult RV, USNM 607649 (TRA409; Figures 62J–K, 64E–F).

PARATYPE. USNM 607648 (TRA408).

TYPE LOCALITY AND HORIZON. DSDP 281, 10/2/135–142, middle Miocene, 47.9973°S, 147.7642°E, 1,591 m water depth, Southern Ocean.

OTHER LOCALITY. DSDP 281, late Miocene, Southern Ocean.

DIMENSIONS. See Table 1.

DIAGNOSIS. *Cythereis* species characterized by blunt posterior margin, very weakly developed primary reticulation without secondary reticulation, spinose ventrolateral ridge, and lack of median lateral ridge.

DESCRIPTION. Carapace heavily calcified, highest at anterodorsal corner. Outline subrectangular-subtrapezoidal; anterior margin evenly rounded, bearing spines; posterior margin bluntly acuminate, bearing spines; dorsal margin straight, bearing spines; ventral margin slightly sinuous and densely spinose; ventrolateral ridge well developed, spinose, almost straight, and continuous with anterior marginal rim; subcentral tubercle present, bearing spines. Anterodorsal and posterodorsal corners moderately angular. Lateral surface ornamented with spines and very weak, partial primary reticulation. Anterior and posterior marginal sulci and rims present but subdued. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other.

REMARKS. *Cythereis swansoni* sp. nov. is very similar to *Cythereis* sp. 10, but the latter has a less spinose carapace, primary reticulation in the anterior marginal sulcus, and finer spines along the dorsal and ventral margins. These differences are rather subtle, but the two species are of very different ages (Miocene for *C. swansoni* versus Santonian for *C.* sp. 10), and we provisionally consider them independent. *Cythereis swansoni* sp. nov. is also similar to *Cythereis richardbensoni* sp. nov., but it is distinguished by its less developed primary reticulation and marginal sulci and rims and by its lack of long spines on dorsal margin.

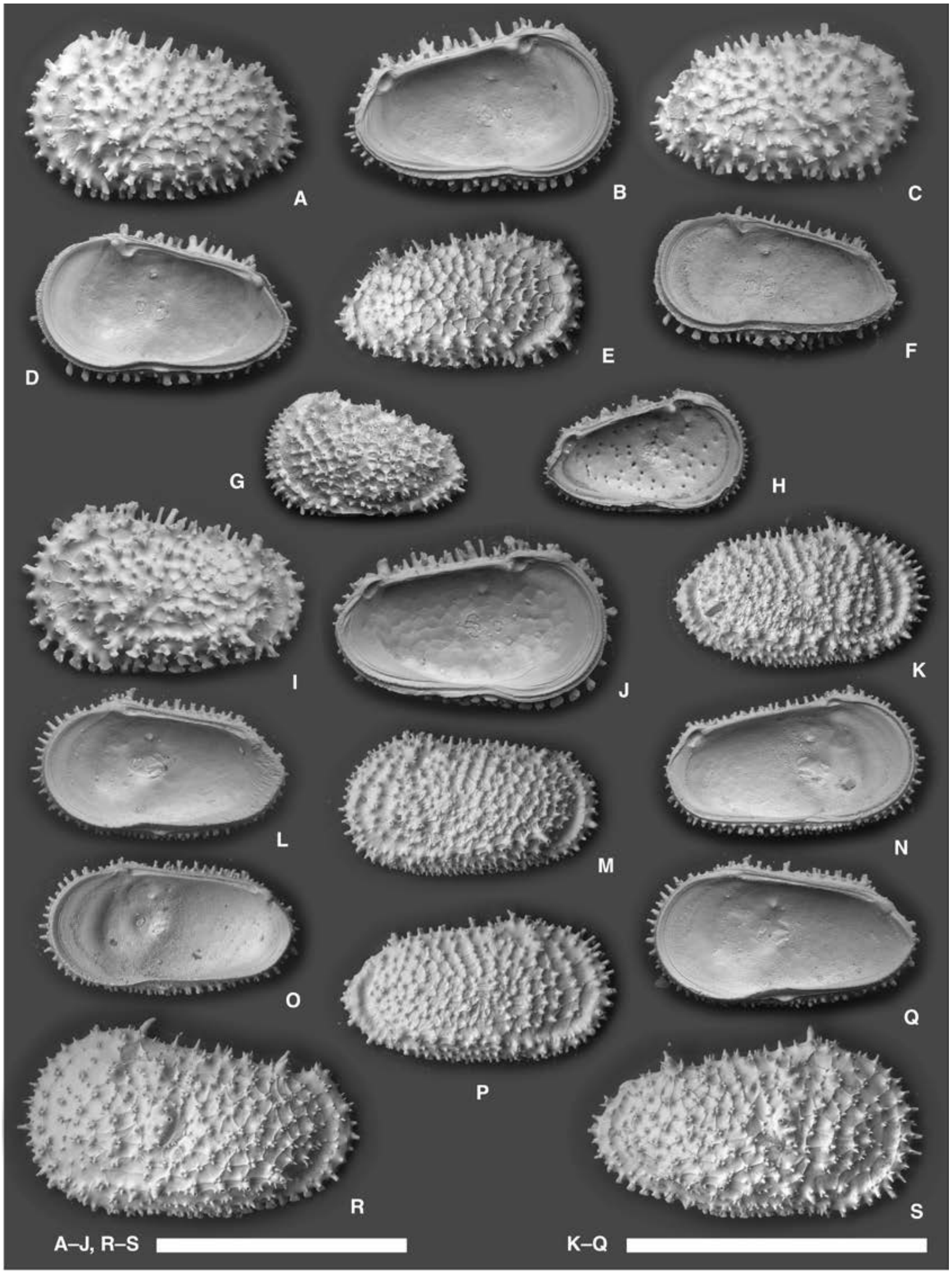


FIGURE 63. Scanning electron microscope images of *Croninocythereis cronini* sp. nov., *Croninocythereis* sp. 1, *Cythereis ovi* sp. nov., and *Legitimocythere acanthoderma* s.l. (Brady, 1880). A, C, E, G, I, K, M, P, R–S, lateral views; B, D, F, H, J, L, N–O, Q, internal views. **A–F, I–J,** *Croninocythereis cronini* sp. nov. A–B, TRA940 (USNM 607636), adult LV from NGC 76-5, 65–70, Quaternary, North Pacific. C–D, TRA941 (USNM 607637), adult RV from NGC 76-5, 65–70, Quaternary, North Pacific. E–F, TRA501 (USNM 607638), adult RV from DSDP 305, 6/4/100–106, middle Miocene, northwestern Pacific. I–J, TRA449 (USNM 607640), adult LV from DSDP 310, 4/5/44–49, Pliocene, North Pacific. **G–H,** *Croninocythereis* sp. 1, TRA218 (USNM 607639), adult LV from Alb 4874, Modern, northwestern Pacific. **K–Q,** *Cythereis ovi* sp. nov. K–L, TRA614 (USNM 607641), adult RV from DSDP 516F, 30/2/59–64, Oligocene, southwestern Atlantic. M–N, TRA612 (USNM 607642), adult LV from DSDP 516F, 30/2/59–64, Oligocene, southwestern Atlantic. O, TRA613 (USNM 607643), adult RV from DSDP 516F, 30/2/59–64, Oligocene, southwestern Atlantic. P–Q, TRA611 (USNM 607644), adult RV from DSDP 516F, 3/3/61–71, early Miocene, southwestern Atlantic. **R–S,** *Legitimocythere acanthoderma* s.l. (Brady, 1880). R, TRA536 (USNM 607645), adult LV from DSDP 223, 2/6/50–56, early Pleistocene, Indian Ocean. S, TRA537 (USNM 607646), adult RV from DSDP 223, 2/6/50–56, early Pleistocene, Indian Ocean. Scale bars represent 1 mm.

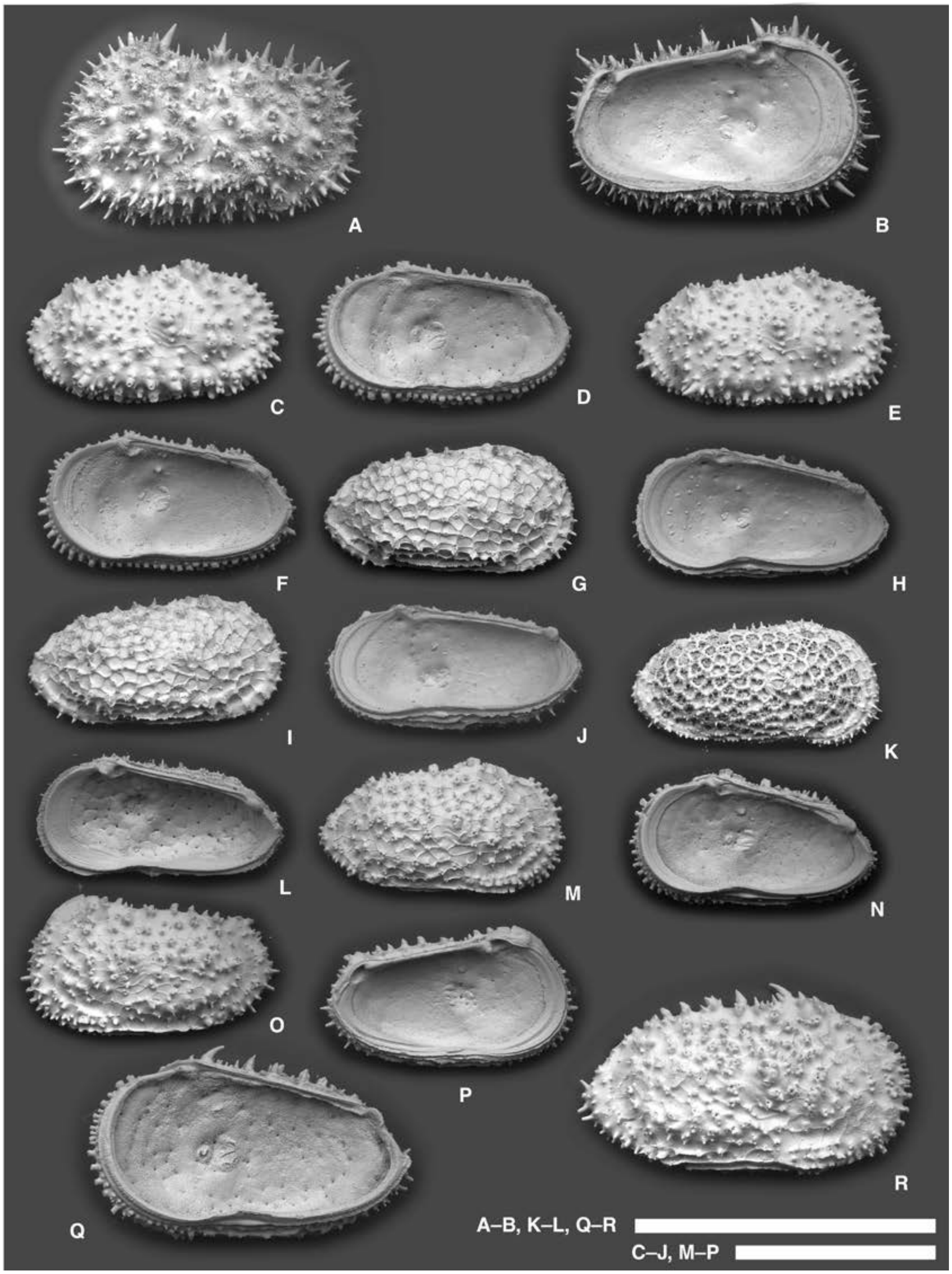


FIGURE 64. Scanning electron microscope images of *Cythereis* sp. 11, *Cythereis swansoni* sp. nov., *Bensonocosta bensoni* sp. nov., *Bensonocosta* sp. 1, and *Ayressoleberis* cf. *colesi* sp. nov. A, C, E, G, I, K, M, O, R, lateral views; B, D, F, H, J, L, N, P–Q, internal views. **A–B,** *Cythereis* sp. 11, TRA217 (USNM 607647), adult LV from Alb 4874, Modern, northwestern Pacific. **C–F,** *Cythereis swansoni* sp. nov. C–D, TRA408 (USNM 607648), adult RV from DSDP 281, 6/6/134–141, late Miocene, Southern Ocean. E–F, TRA409 (USNM 607649), adult RV from DSDP 281, 10/2/135–142, middle Miocene, Southern Ocean. **G–J,** *Bensonocosta bensoni* sp. nov. G–H, TRA305 (USNM 607650), adult RV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. I–J, TRA750 (USNM 607651), adult RV from DSDP 327A, 12/3/50–55, Maastrichtian, southwestern Atlantic. **K–L,** *Bensonocosta* sp. 1, TRA749 (USNM 607652), adult RV from DSDP 327A, 12/3/50–55, Maastrichtian, southwestern Atlantic. **M–R,** *Ayressoleberis* cf. *colesi* sp. nov. M–N, TRA942 (USNM 607653), adult RV from SC 9DD, 5–10, Quaternary, equatorial western Pacific. O–P, TRA234 (USNM 607654), adult LV from DSDP 62.0, 2/3/50–56, late Miocene, equatorial western Pacific. Q–R, TRA235 (USNM 607655), adult RV from DSDP 64.0, 3/3/50–56, late Miocene, equatorial western Pacific. Scale bars represent 1 mm.

Cythereis sp. 1

FIGURES 49O–P, 62L–M

Locality and Age of Specimen Examined. DSDP 111A, Campanian, North Atlantic.

Dimensions. See Table 1.

Remarks. This species is very similar to the type species *Cythereis ornatissima* (Reuss, 1846), but the latter has a more slender outline, a more spinose but less reticulate carapace, and a better-developed marginal rim.

Cythereis sp. 2

FIGURE 53C–D

Locality and Age of Specimen Examined. DSDP 258A, late Miocene, Indian Ocean.

Dimensions. See Table 1.

Remarks. This species is very similar to *Cythereis anteplana* s.l. (Bate, 1972) but can be distinguished by its comparatively subrectangular outline, eye tubercle, better-developed median lateral ridge, and less angular and less prominent posterodorsal corner.

Cythereis sp. 3

FIGURES 53K–L, 62N

Locality and Age of Specimen Examined. DSDP 277, early Oligocene, Southern Ocean.

Dimensions. See Table 1.

Remarks. This species is most similar to *Cythereis neoanteplana* sp. nov. but is distinguished by its much smaller size, less spinose carapace, better-developed primary reticulation, and much less spinose ventrolateral ridge.

Cythereis sp. 4

FIGURE 59D–E

Locality and Age of Specimen Examined. DSDP 264, middle Eocene, Indian Ocean.

Dimensions. See Table 1.

Remarks. This species is similar to *Cythereis fungina* sp. nov. but can be distinguished by its much larger size, better-developed primary reticulation, less acuminate posterior margin, and much more spinose carapace with fine spines.

Cythereis sp. 5

FIGURES 59F–G, 62O

Locality and Age of Specimen Examined. DSDP 284, late Miocene, southwestern Pacific

Dimensions. See Table 1.

Remarks. This species is similar to *Cythereis* sp. 4 but is distinguished by its much smaller size and more triangular outline. This species is also similar to *Cythereis fungina* sp. nov. but is distinguished by its spinose appearance.

Cythereis sp. 6

FIGURES 59H–I, 62P

Locality and Age of Specimen Examined. SI-25, late Eocene, New Zealand.

Dimensions. See Table 1.

Remarks. *Cythereis* sp. 6 is similar to *Cythereis purii* sp. nov. but is distinguished by much less developed primary reticulation and better-developed multifurcate spines. *Cythereis brevicosta major* (McKenzie et al., 1991) is distinguished from *Cythereis* sp. 6 in that its carapace is covered by larger clavate spines. *Cythereis* sp. 6 is also similar to *Hornibrookoleberis thomsoni* (Hornibrook, 1952) but is distinguished by weak primary reticulation, better-developed multifurcate spines, and the lack of a distinct median lateral ridge. *Cythereis* sp. 6 shows features intermediate between *Cythereis* Jones, 1849 and *Hornibrookoleberis* gen. nov., but the frontal scar of this species is not clearly visible in our specimen. Thus, we tentatively refer this species to *Cythereis*.

Cythereis sp. 7

FIGURE 59J–K

Locality and Age of Specimen Examined. DSDP 356, early Miocene, southeastern Atlantic.

Dimensions. See Table 1.

Remarks. This species is similar to *Cythereis* sp. 4 but is distinguished by its larger carapace and larger spines, as well as by its groupings of well-developed spines in posteromedian and anteromedian areas.

Cythereis sp. 8

FIGURES 59L–M, 62Q–R

Locality and Age of Specimen Examined. SI-25, late Eocene, New Zealand.

Dimensions. See Table 1.

Remarks. This species is similar to *Cythereis* sp. 6, but it is much larger and higher in proportion to its length.

Cythereis sp. 9

FIGURE 59N–O

Locality and Age of Specimen Examined. SI-25, late Eocene, New Zealand.

DIMENSIONS. See Table 1.

REMARKS. *Cythereis* sp. 9 is similar to *Cythereis* sp. 8, but the former has a more spinose carapace and a slightly more acuminate posterior margin. These differences may be intraspecific variation. *Cythereis* sp. 9 is distinguished from *Cythereis purii* sp. nov. by a more spinose carapace with multifurcate spines and less developed primary reticulation.

Cythereis sp. 10

FIGURES 61E–F, 62S

LOCALITY AND AGE OF SPECIMEN EXAMINED. DSDP 258A, Santonian, Indian Ocean.

DIMENSIONS. See Table 1.

REMARKS. This species is similar to *Cythereis tomcronini* sp. nov. but is distinguished by its less slender carapace, less spinose ventrolateral ridge, better-developed posterodorsal corner, and lack of reticulation in the posterior half.

Cythereis sp. 11

FIGURES 62T–U, 64A–B

LOCALITY AND AGE OF SPECIMEN EXAMINED. Alb 4874, Modern, northwestern Pacific.

DIMENSIONS. See Table 1.

REMARKS. This species is very similar to *Legitimocythere* species but is distinguished by its V-shaped frontal scar. In addition, typical *Legitimocythere* species are larger in size, and they typically bear a ventrolateral ridge that consists of a row of long, sharp, unbranched spines, a more densely spinous lateral surface, and a more oval-shaped outline.

Cythereis sp. 12

FIGURES 62V–W, 65K–L

LOCALITY AND AGE OF SPECIMEN EXAMINED. DSDP 246, early Pliocene, Indian Ocean.

DIMENSIONS. See Table 1.

REMARKS. This species is very similar to *Legitimocythere* species but is distinguished by its V-shaped frontal scar and much smaller size. This species is also very similar to *Cythereis swansoni* sp. nov. but is distinguished by a more spinose carapace and better-developed primary reticulation.

Genus *Hornibrookoleberis* gen. nov.

TYPE SPECIES. *Trachyleberis lytteltonensis* Harding and Sylvester-Bradley, 1953.

DERIVATION OF NAME. In honor of the late Norcott de Bisson Hornibrook, formerly of New Zealand Geological Survey, for his pioneering works on New Zealand ostracods and with reference to its similarity to *Trachyleberis* Brady, 1898.

DIAGNOSIS. A trachyleberidid genus characterized by an elongate and slender outline, spinose ventrolateral ridge continuing into the anterior marginal rim, spinose carapace often with multifurcate spines, spinose subcentral tubercle, subdued anterior and posterior marginal sulci and rims, elongate frontal scar, a vertical row of four adductor scars, and holamphidont hinge; marginal frill absent. Primary reticulation and internal snap-knob structure lacking or weakly developed.

REMARKS. *Hornibrookoleberis* gen. nov. is similar to *Cythereis* Jones, 1849 but is distinguished by its elongate frontal scar and the lack of well-developed marginal sulci and rims. This new genus is also similar to *Trachyleberis* Brady, 1898 but is distinguished by its elongate frontal scar and well-developed ventrolateral ridge and by its lack of an ocular ridge. Currently, two species, both from New Zealand, are known, as detailed below. This genus may be descended from a *Cythereis* ancestor.

Hornibrookoleberis thomsoni (Hornibrook, 1952)

FIGURES 55A–B, 66A–B

Trachyleberis thomsoni Hornibrook, 1952:33, pl. 3, figs. 40–41, 47.
Trachyleberis thomsoni Hornibrook; Ayress, 1993, fig. 9Q (non 9R).
Trachyleberis thomsoni Hornibrook; Ayress, 1995, fig. 11.4–11.5
Glencoeleberis? thomsoni (Hornibrook); Ayress, 2006:370, fig. 6G–K,M.

LOCALITY AND AGE OF SPECIMENS EXAMINED. RM 1001, Modern, New Zealand.

DIMENSIONS. See Table 1.

REMARKS. We consider this specimen conspecific with a topotype specimen shown in Ayress (2006).

Hornibrookoleberis lytteltonensis (Harding and Sylvester-Bradley, 1953)

FIGURES 55C–D, 66C–D

Trachyleberis scabrocuneata (Brady); Brady, 1898:444, pl. 47, figs. 1–7, 18–25.
?*Trachyleberis scabrocuneata* (Brady); Hornibrook, 1952:32, pl. 3, figs. 38–39, 48.
Trachyleberis lytteltonensis Harding and Sylvester-Bradley, 1953:4, text-figs. 2–19; pl. 1, figs. 1–4, 7; pl. 2, figs. 1–4, 7–8.
Trachyleberis scabrocuneata Brady, 1898 [*sic*]; Jellinek and Swanson, 2003:20, pls. 3–4.

LOCALITY AND AGE OF SPECIMENS EXAMINED. RM 1001, Modern, New Zealand.

DIMENSIONS. See Table 1.

REMARKS. Compared with SEM images of a paratype specimen shown in Jellinek and Swanson (2003), our specimen has a better-developed ventrolateral ridge and multifurcate spines on its lateral surface but is otherwise very similar. This

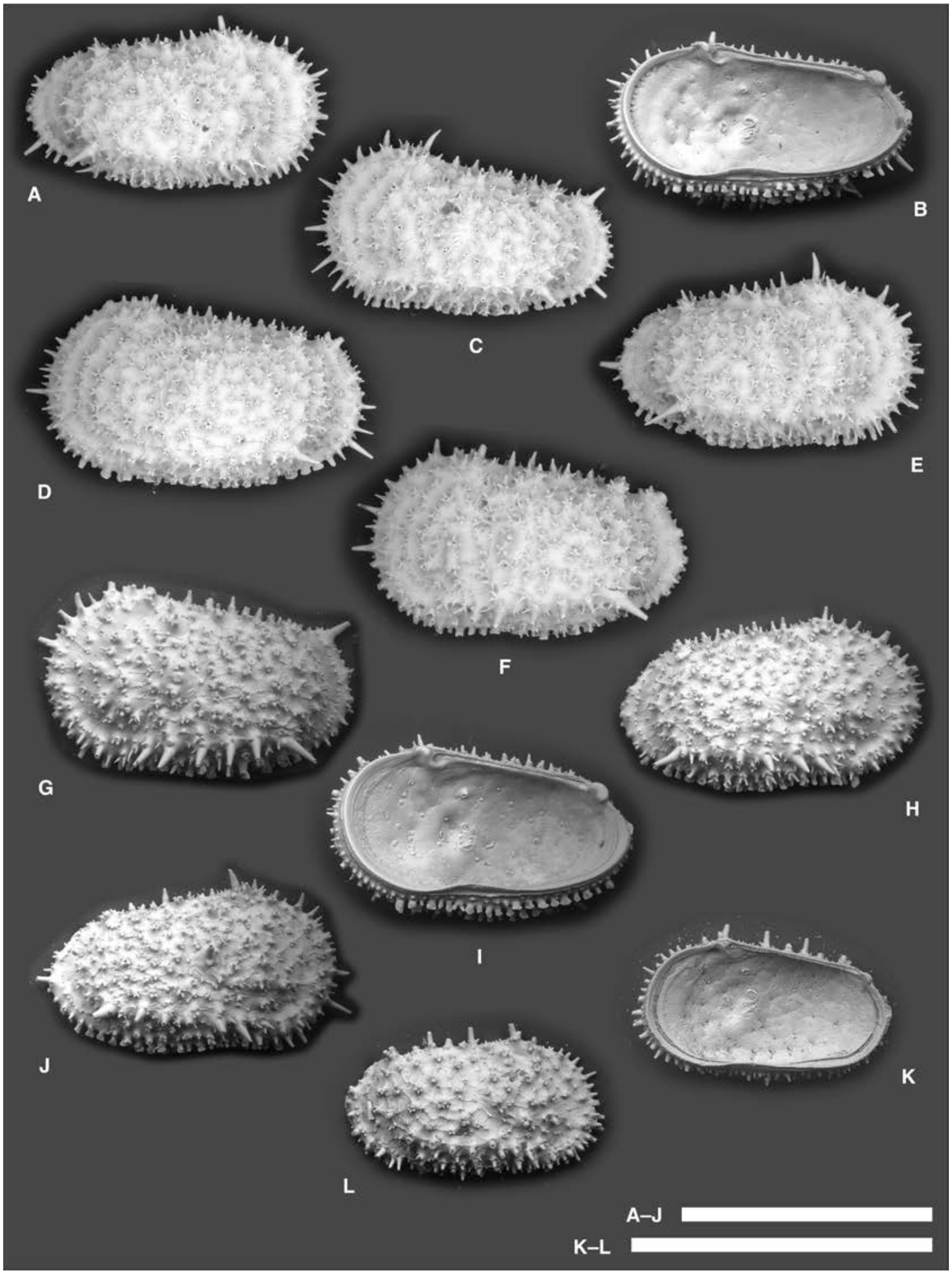


FIGURE 65. Scanning electron microscope images of *Legitimocythere acanthoderma* s.l. (Brady, 1880) and *Cythereis* sp. 12. A, C–H, J, L, lateral views; B, I, K, internal views. **A–J,** *Legitimocythere acanthoderma* s.l. (Brady, 1880). A–B, TMC216 (USNM 607700), adult RV from Chain 82-24-4P, 459–461, Pleistocene, North Atlantic. C, TMC217 (USNM 607701), adult LV from Chain 82-24-4P, 461–464, Pleistocene, North Atlantic. D, TMC221 (USNM 607702), adult LV from Chain 82-24-4P, 443–446, Pleistocene, North Atlantic. E, TMC225 (USNM 607703), adult RV from Chain 82-24-4P, 438–440, Pleistocene, North Atlantic. F, TMC314 (USNM 607704), adult LV from DSDP 607, 13/6/90–92, late Pliocene, North Atlantic. G, ODP980065 (USNM 607705), adult LV from ODP 980C, 2/4/0–2, Pleistocene, northeastern Atlantic. H–I, ODP980071 (USNM 607706), adult RV from ODP 980C, 2/3/0–2, Pleistocene, northeastern Atlantic. J, SIMY0301 (USNM 537187), adult RV from ODP 1055B, 1/3/122–124, Pleistocene, northwestern Atlantic. **K–L,** *Cythereis* sp. 12, TRA340 (USNM 607707), adult RV from DSDP 246, 2/cc, early Pliocene, Indian Ocean. Scale bars represent 1 mm.

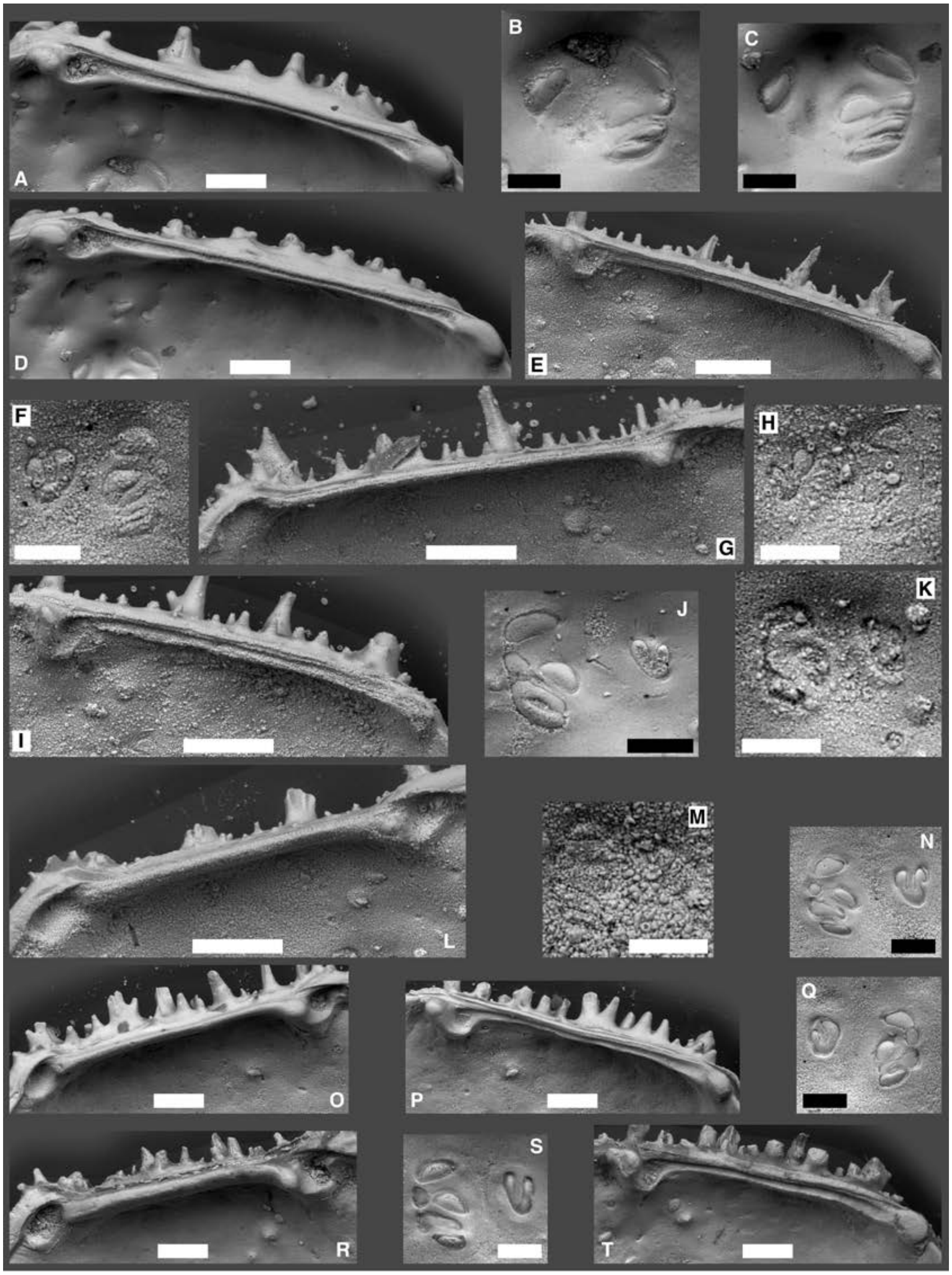


FIGURE 66. Internal details of *Hornibrookoleberis thomsoni* (Hornibrook, 1952), *Hornibrookoleberis lytteltonensis* (Harding and Sylvester-Bradley, 1953), *Croninocythereis tridentiferi* sp. nov., *Croninocythereis* cf. *tridentiferi* sp. nov., *Croninocythereis presequenta* (Benson, 1977), *Croninocythereis* cf. *presequenta* (Benson, 1977), and *Croninocythereis cronini* sp. nov. **A–B,** *Hornibrookoleberis thomsoni* (Hornibrook, 1952), TRA829 (USNM 607546), adult RV. A, hingement. B, subcentral muscle scars. **C–D,** *Hornibrookoleberis lytteltonensis* (Harding and Sylvester-Bradley, 1953), TRA828 (USNM 607547), adult RV. C, subcentral muscle scars. D, hingement. **E–I,** *Croninocythereis tridentiferi* sp. nov. E–F, TRA452 (USNM 607607), adult RV. E, hingement. F, subcentral muscle scars. G, TRA238 (USNM 607619), adult LV, hingement. H–I, TRA239 (USNM 607620), adult RV. H, subcentral muscle scars. I, hingement. **J,** *Croninocythereis* cf. *tridentiferi* sp. nov., TRA306 (USNM 607606), adult LV, subcentral muscle scars. **K–L,** *Croninocythereis presequenta* (Benson, 1977), TRA701 (USNM 607622), adult LV. K, subcentral muscle scars. L, hingement. **M,** *Croninocythereis* cf. *presequenta* (Benson, 1977), TRA542 (USNM 607623), adult LV, subcentral muscle scars. **N–T,** *Croninocythereis cronini* sp. nov. N–O, TRA940 (USNM 607636), adult LV. N, subcentral muscle scars. O, hingement. P–Q, TRA941 (USNM 607637), adult RV. P, hingement. Q, subcentral muscle scars. R–S, TRA139 (USNM 607624), adult LV. R, hingement. S, subcentral muscle scars. T, TRA140 (USNM 607625), adult RV, hingement. Scale bars represent 0.1 mm for A, D–E, G, I, L, O–P, R, T and 50 µm for B–C, F, H, J–K, M–N, Q, S.

species is similar to *Trachyleberis* species (e.g., *Trachyleberis scabrocuneata* and *Trachyleberis niitsumai*), especially in its outline, but it can be distinguished by the lack of an ocular ridge and its elongate frontal muscle scar and a well-developed ventrolateral ridge that continues into the anterior marginal rim.

Genus *Croninocythereis* gen. nov.

Type Species. *Croninocythereis cronini* sp. nov.

Derivation of Name. In honor of Thomas M. Cronin, U.S. Geological Survey, for his pioneering works on deep-sea ostracod paleoecology.

Diagnosis. A trachyleberidid genus characterized by a ventrolateral ridge that does not continue into the anterior marginal rim, a well-developed marginal frill in internal view, shallow primary reticulation, spinose carapace, well-developed anterior and posterior marginal rims, V-shaped frontal scar, divided dorsomedian adductor scar, and holamphidont hinge. Species in this genus also lack an internal snap-knob structure and a well-developed subcentral tubercle. Spines often clavate.

Remarks. *Croninocythereis* gen. nov. is similar to *Cythereis* Jones, 1849, but in the former, (1) the ventrolateral ridge does not continue into the anterior marginal rim, (2) the marginal frill is broad and distinct in the internal view, (3) the dorsomedian adductor scar is divided, and (4) the subcentral tubercle is often indistinct. This new genus is also similar to *Legitimocythere* Coles and Whatley, 1989 but is distinguished by its V-shaped frontal scar, divided dorsomedian adductor scar, distinct marginal frill in the internal view, much smaller size, and less inflated carapace.

Croninocythereis tridentiferi sp. nov.

FIGURES 61I–J, 66E–I, 67A–F

Derivation of Name. From the Latin *tridentiferi* (a noun in the genitive case), meaning "one carrying a trident," with reference to its three distinct spines on the posterior half of the dorsal margin.

Holotype. Adult RV, USNM 607620 (TRA239; Figures 66H–I, 67C–D).

Paratypes. USNM 607607, 607619, 607621 (TRA452, TRA238, TRA625).

Type Locality and Horizon. DSDP 529, 12/1/??, early Miocene, 28.9305°S, 2.7680°E, 3,043 m water depth, southeastern Atlantic.

Other Localities. DSDP 305, early Oligocene, northwestern Pacific; DSDP 527, late Oligocene, southeastern Atlantic; DSDP 21A, middle Eocene, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Croninocythereis* species characterized by three distinct spines on the posterior half of the dorsal margin, comparatively well developed primary reticulation, and spinose carapace.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subrectangular-subtrapezoidal; anterior margin evenly rounded, bearing long spines; posterior margin acuminate, bearing spines; dorsal margin straight, bearing three long spines on posterior half, one long spine on anterodorsal corner, and small spines throughout; ventral margin slightly sinuous and densely spinose with clavate spines; ventrolateral ridge well developed, spinose, slightly curved; subcentral tubercle subdued, composed of a spine. Anterodorsal corner forms an obtuse angle; posterodorsal corner moderately angular. Lateral surface ornamented with spines and shallow primary reticulation. Anterior and posterior marginal sulci and rims present. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; dorsomedian scar divided. Anterior marginal frill clearly visible in internal view.

Remarks. *Croninocythereis tridentiferi* sp. nov. is similar to *Croninocythereis presequenta* (Benson, 1977) but can be distinguished by a more spinose carapace, better-developed primary reticulation, and much longer spines on the dorsal margin, ventrolateral ridge, and anterior margin. In *Croninocythereis presequenta*, three spines on the posterior half of the dorsal margin are more nodose, broad, and continuous into the valve's lateral surface compared with those of *Croninocythereis tridentiferi* sp. nov.

Croninocythereis cf. *tridentiferi* sp. nov.

FIGURES 61G–H, 66J

Legitimocythere sp. Majoran, Widmark, and Kucera, 1997, fig. 4E.
Legitimocythere sp. Majoran and Widmark, 1998:854, fig. 3.12.
Legitimocythere presequenta (Benson); Majoran and Dingle, 2001, pl. 1, fig. 16.

Locality and Age of Specimen Examined. DSDP 329, late Miocene, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. *Legitimocythere* sp. of Majoran and Widmark (1998) and Majoran et al. (1997) is conspecific with this species. This species is very similar to *Croninocythereis tridentiferi* sp. nov., but it lacks primary reticulation and has longer spines on the dorsal margin. These differences may represent intraspecific variation.

Croninocythereis presequenta (Benson, 1977)

FIGURES 66K–L, 67G–H

Acanthocythereis? presequenta Benson, 1977:877, pl. 2, fig. 5.
Acanthocythereis? subsequenta Benson, 1977:877, pl. 2, fig. 6.
Hyphalocythere sp. Pokorný, 1981, pl. 1, fig. 2.
Legitimocythere presequenta (Benson); Coles and Whatley, 1989:101, pl. 4, figs. 10–11.

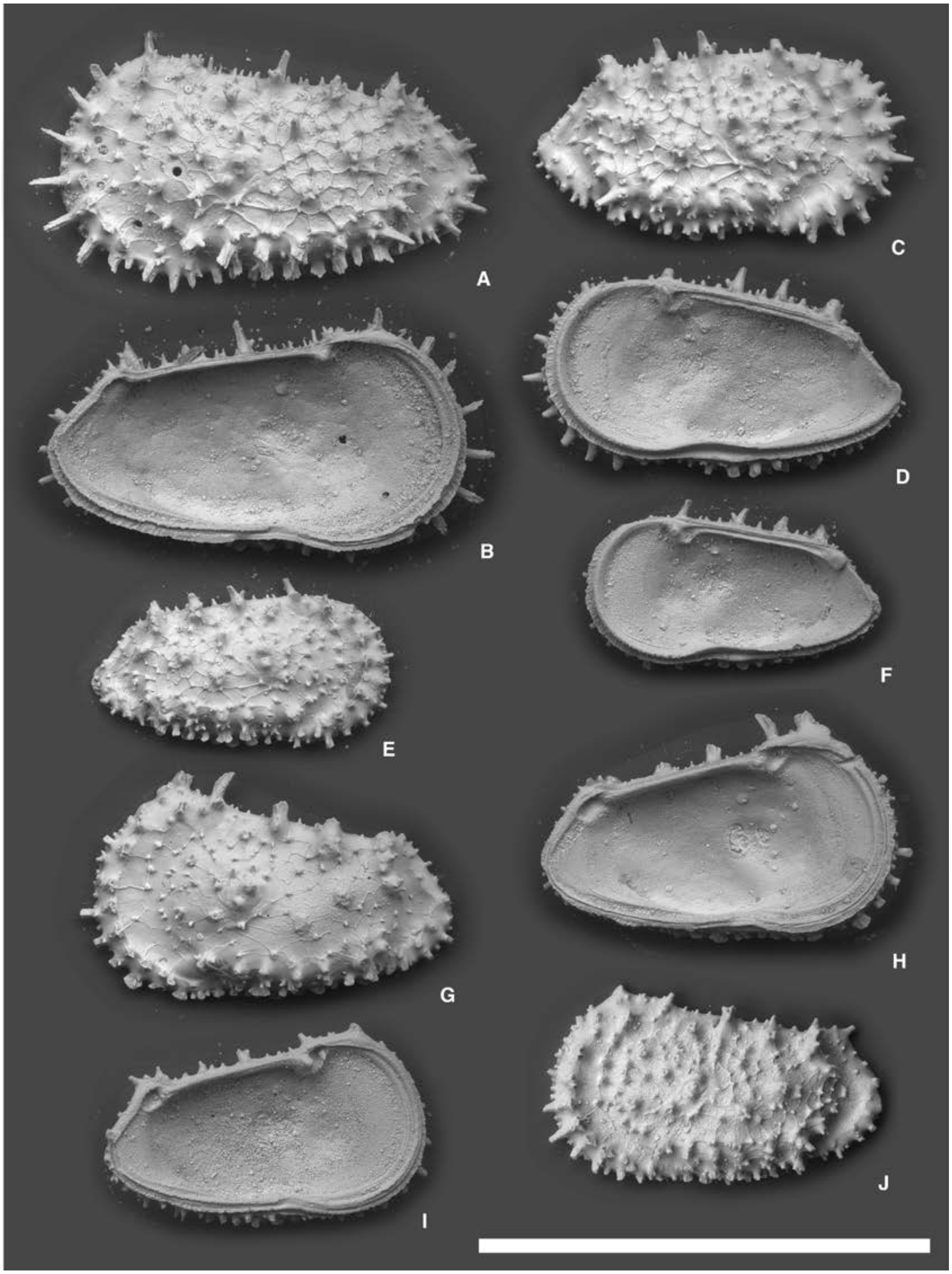


FIGURE 67. Scanning electron microscope images of *Croninocythereis tridentiferi* sp. nov., *Croninocythereis presequenta* (Benson, 1977), and *Croninocythereis* cf. *presequenta* (Benson, 1977). A, C, E, G, J, lateral views; B, D, F, H–I, internal views. **A–F,** *Croninocythereis tridentiferi* sp. nov. A–B, TRA238 (USNM 607619), adult LV from DSDP 527, 15/1/65–72, late Oligocene, southeastern Atlantic. C–D, TRA239 (USNM 607620), adult RV from DSDP 529, 12/1/??, early Miocene, southeastern Atlantic. E–F, TRA625 (USNM 607621), adult RV from DSDP 21A, 1/4/50–56, middle Eocene, southwestern Atlantic. **G–H,** *Croninocythereis presequenta* (Benson, 1977), TRA701 (USNM 607622), adult LV from DSDP 21, 2/4/44–50, late Paleocene, southwestern Atlantic. **I–J,** *Croninocythereis* cf. *presequenta* (Benson, 1977), TRA542 (USNM 607623), adult LV from DSDP 214, 26/cc, early Oligocene, Indian Ocean. Scale bar represents 1 mm.

non *Legitimocythere presequenta* (Benson); Guernet and Bellier, 2000:264, pl. 3, figs. 2–3.

Legitimocythere presequenta (Benson); Dall'Antonia, 2003, fig. 3.2.

non *Legitimocythere presequenta* (Benson); Ayress, De Deckker, and Coles, 2004:36, pl. 1, figs. 11–12, 14–16.

Legitimocythere presequenta (Benson); Bergue and Govindan, 2010:752, fig. 3.18.

Legitimocythere presequenta (Benson); Bergue and Nicolaidis, 2012:53, fig. 3.8–3.9.

Locality and Age of Specimen Examined. DSDP 21, late Paleocene, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. We consider *Croninocythereis subsequenta* (Benson, 1977) a junior synonym of *Croninocythereis presequenta* (Benson, 1977), in agreement with Coles and Whatley (1989). The difference between these two species is merely in the degree of development of the spines. According to the synonymy above, the stratigraphic range of this species is from Paleocene to Miocene.

Croninocythereis cf. *presequenta* (Benson, 1977)

FIGURES 66M, 67I–J

"*Hyphalocythere*" sp. Benson,1978, pl. 2, fig. 1.

?*Atlanticythere* sp. 1 Ducasse and Peypouquet, 1979, pl. 3, fig. 2.

Legitimocythere presequenta (Benson); Majoran and Dingle, 2002, fig. 3.21.

Locality and Age of Specimens Examined. DSDP 214, early Oligocene, Indian Ocean.

Dimensions. See Table 1.

Remarks. This species is very similar to *Croninocythereis presequenta* (Benson, 1977), but it is more spinose. This difference may be intraspecific variation.

Croninocythereis cronini sp. nov.

FIGURES 63A–F,I–J, 66N–T, 68

?"*Hyphalocythere*" sp. Berggren, Benson, Haq, Riedel, Sanfilippo, Schrader, and Tjalsma, 1976, pl. 6, figs. 7–8.

?*Trachyleberis acanthoderma* (Brady); Ruan and Hao, 1988:356, pl. 64, figs. 22–25.

?*Trachyleberis acanthoderma* (Brady); Ruan, 1989:126, pl. 23, fig. 18.

Legitimocythere presequenta (Benson); Ayress, De Deckker, and Coles, 2004:36, pl. 1, figs. 11–12, 14–16.

Derivation of Name. In honor of Thomas M. Cronin, U.S. Geological Survey, for his contribution to marine and brackish ostracod research.

Holotype. Adult RV, USNM 607637 (TRA941; Figures 63C–D, 66P–Q).

Paratypes. USNM 607624, 607625, 607626, 607627, 607628, 607629, 607630, 607631, 607632, 607633, 607634, 607635, 607636, 607638, 607640 (TRA139, TRA140, RB318, RB319, RB345, RB346, RB413, RB414, TRA228, TRA229, TRA230, TRA231, TRA940, TRA501, TRA449).

Type Locality and Horizon. NGC 76-5, 65–70, Quaternary, 33.8933°N, 179.0800°E, 2,182 m water depth, North Pacific.

Other Localities. EL 47 5069, Modern, Southern Ocean; KN 25 sta 291, Alb 2568, Alb 2713, Modern, northwestern Atlantic; DSDP 47.2, DSDP 305, Miocene, northwestern Pacific; DSDP 310, Pliocene, North Pacific.

Dimensions. See Table 1.

Diagnosis. *Croninocythereis* species characterized by densely spinose dorsal margin and high carapace in proportion to its length.

Description. Carapace heavily calcified, highest at anterodorsal corner. Outline subtrapezoidal; anterior margin evenly rounded and spinose; posterior margin bluntly acuminate and spinose; dorsal margin almost straight and densely spinose with large sharp or clavate spines; ventral margin slightly curved and densely spinose with clavate spines; ventrolateral ridge well developed, curved, spinose with clavate spines and a sharp spine at the posterior end; subcentral tubercle present as a spine. Anterodorsal corner forms an obtuse angle; posterodorsal corner prominent and angular in LV and moderately angular in RV. Lateral surface ornamented with spines and shallow primary and secondary reticulation. Anterior and posterior marginal sulci and rims well developed. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; dorsomedian scar divided. Anterior marginal frill present in internal view.

Remarks. *Croninocythereis cronini* sp. nov. is similar to *Croninocythereis presequenta* (Benson, 1977) and *Croninocythereis tridentiferi* sp. nov. but differs from them in having a densely spinose dorsal margin and a much higher carapace in proportion to its length. *Croninocythereis cronini* sp. nov. has some geographic variation. For example, Atlantic specimens are more spinous and have much better developed secondary reticulation than Pacific specimens.

Croninocythereis sp. 1

FIGURES 63G–H, 69A–B

Locality and Age of Specimen Examined. Alb 4874, Modern, northwestern Pacific.

Dimensions. See Table 1.

Remarks. This species is similar to *Croninocythereis cronini* sp. nov. but is distinguished by its more triangular outline, smaller size, deeper primary reticulation, and less developed ventrolateral ridge. This species has an intermediate appearance between *Croninocythereis* and *Acanthocythereis* Howe, 1963, suggesting the close affinity of these genera.

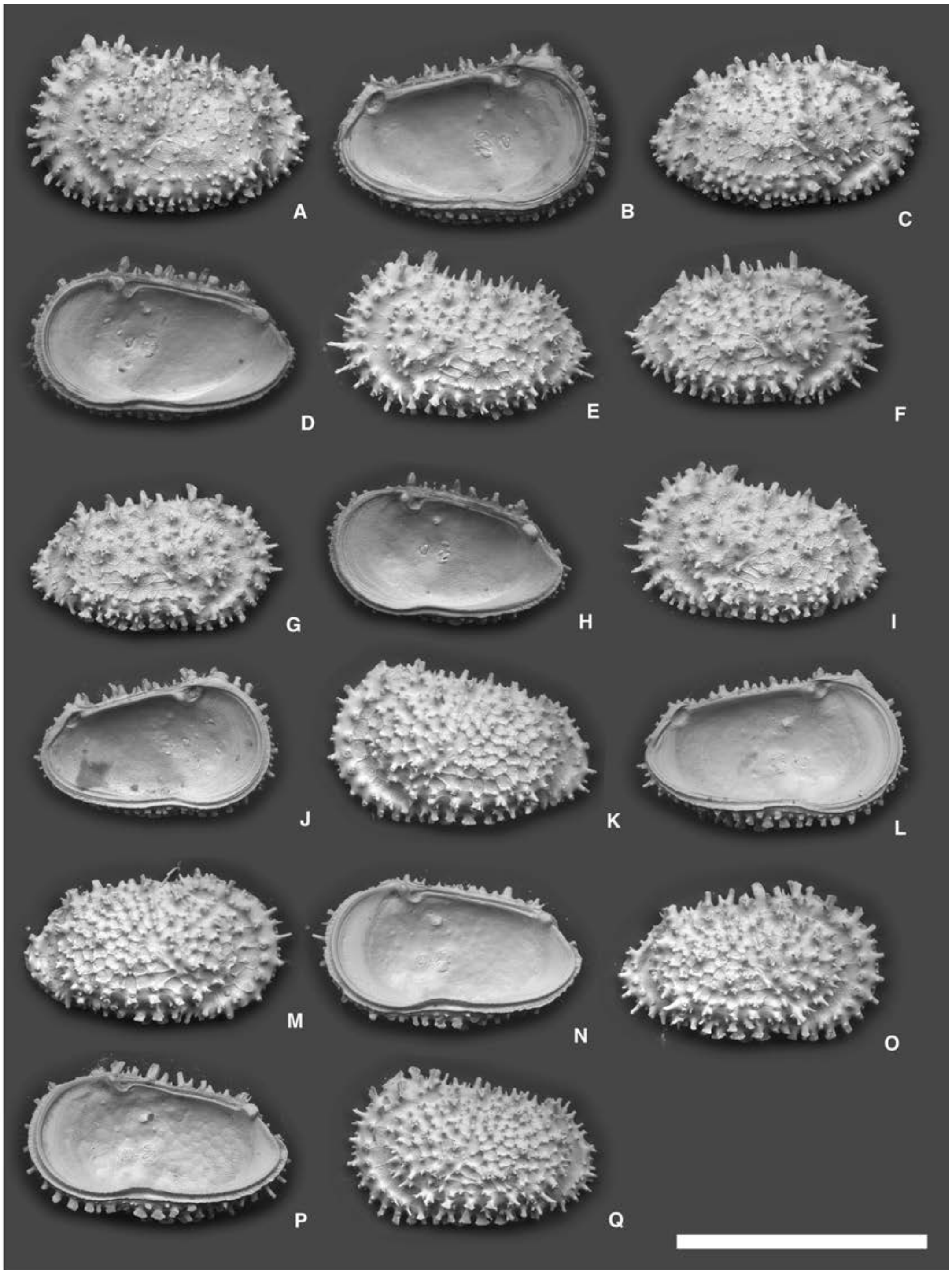


FIGURE 68. Scanning electron microscope images of *Croninocythereis cronini* sp. nov. A, C, E–G, I, K, M, O, Q, lateral views; B, D, H, J, L, N, P, internal views. A–B, TRA139 (USNM 607624), adult LV from EL 47 5069, Modern, Southern Ocean. C–D, TRA140 (USNM 607625), adult RV from EL 47 5069, Modern, Southern Ocean. E, RB318 (USNM 607626), adult LV from KN 25 sta 291, Modern, northwestern Atlantic. F, RB319 (USNM 607627), adult RV from KN 25 sta 291, Modern, northwestern Atlantic. G, RB345 (USNM 607628), adult RV from Alb 2568, Modern, northwestern Atlantic. H, RB346 (USNM 607629), adult RV from Alb 2568, Modern, northwestern Atlantic. I, RB413 (USNM 607630), adult LV from Alb 2713, Modern, northwestern Atlantic. J, RB414 (USNM 607631), adult LV from Alb 2713, Modern, northwestern Atlantic. K–L, TRA228 (USNM 607632), adult LV from DSDP 47.2, 6/2/50–56, late Miocene, northwestern Pacific. M–N, TRA229 (USNM 607633), adult RV from DSDP 47.2, 6/2/50–56, late Miocene, northwestern Pacific. O–P, TRA230 (USNM 607634), adult RV from DSDP 47.2, 6/2/50–56, late Miocene, northwestern Pacific. Q, TRA231 (USNM 607635), adult LV from DSDP 48.2, 1/4/50–56, late Miocene, northwestern Pacific. Scale bar represents 1 mm.

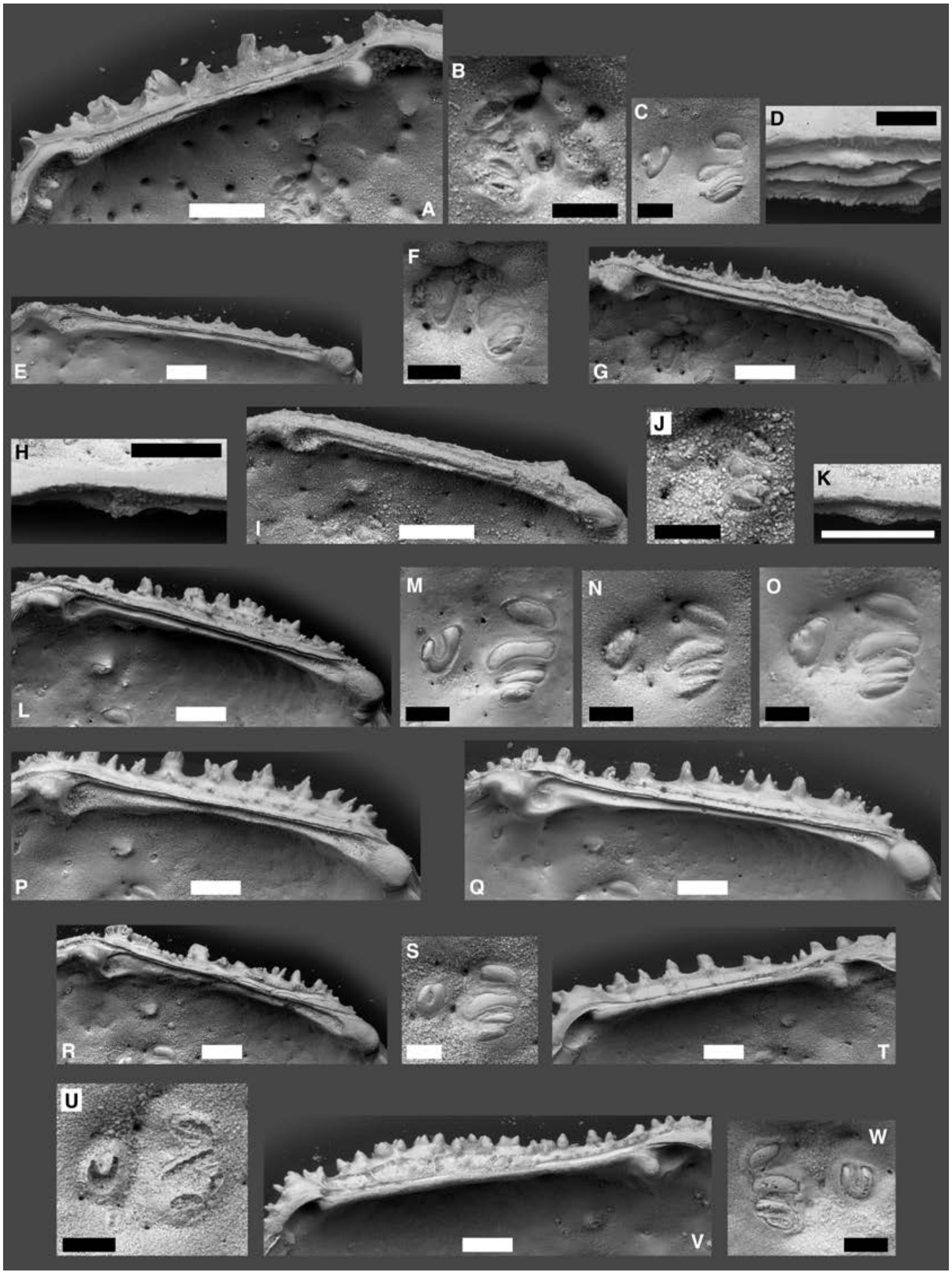


FIGURE 69. Internal details of *Croninocythereis* sp. 1, *Bensonocosta bensoni* sp. nov., *Bensonocosta* sp. 1, *Bensonocosta* sp. 2, *Ayressoleberis* cf. *bathymarina* (Ayress, 1993), *Ayressoleberis colesi* sp. nov., *Ayressoleberis* cf. *colesi* sp. nov., and *Ayressoleberis* sp. 1. **A–B,** *Croninocythereis* sp. 1, TRA218 (USNM 607639), adult LV. A, hingement. B, subcentral muscle scars. **C–E,** *Bensonocosta bensoni* sp. nov. C, TRA305 (USNM 607650), adult RV, subcentral muscle scars. D–E, TRA750 (USNM 607651), adult RV. D, ventromarginal area (snap-knob structure unclear). E, hingement. **F–H,** *Bensonocosta* sp. 1, TRA749 (USNM 607652), adult RV. F, subcentral muscle scars. G, hingement. H, ventromarginal area (snap-knob structure unclear). **I–K,** *Bensonocosta* sp. 2, TRA804 (USNM 607835), adult RV. I, hingement. J, subcentral muscle scars. K, ventromarginal area (snap-knob structure unclear). **L–M,** *Ayressoleberis* cf. *bathymarina* (Ayress, 1993), TRA146 (USNM 607656), adult RV. L, hingement. M, subcentral muscle scars. **N–Q,** *Ayressoleberis colesi* sp. nov. N, P, TRA532 (USNM 607658), adult RV. N, subcentral muscle scars. P, hingement. O, Q, TRA939 (USNM 607660), adult RV. O, subcentral muscle scars. Q, hingement. **R–U,** *Ayressoleberis* cf. *colesi* sp. nov. R–S, TRA942 (USNM 607653), adult RV. R, hingement. S, subcentral muscle scars. T, TRA234 (USNM 607654), adult LV, hingement. U, TRA235 (USNM 607655), adult RV, subcentral muscle scars. **V–W,** *Ayressoleberis* sp. 1, TRA515 (USNM 607657), adult LV. V, hingement. W, subcentral muscle scars. Scale bars represent 0.1 mm for A, D–E, G–I, K–L, P–R, T, V; 50 μm for B–C, F, J, M–O, S, U, W.

Genus *Bensonocosta* gen. nov.

Type Species. *Bensonocosta bensoni* sp. nov.

Derivation of Name. In honor of the late Richard H. Benson, formerly of Smithsonian Institution, for his contribution to ostracod paleobiology and with reference to its similarity to *Paraplatycosta* Dingle, 1971.

Diagnosis. A trachyleberidid genus characterized by its elongate outline, distinct, regular primary reticulation, well-developed marginal frill in internal view, subdued marginal sulci and rims, V-shaped frontal scar, a vertical row of four adductor scars, and paramphidont hinge and by lacking a subcentral tubercle. Ventrolateral ridge weakly or moderately developed and not continuous with anterior marginal rim. Internal snap-knob structure probably present.

Remarks. *Bensonocosta* gen. nov. is similar to *Paraplatycosta* Dingle, 1971, but the latter has a holamphidont hinge and lacks spines on the lateral surface. This genus is also similar to *Ayressoleberis* Brandão and Yasuhara, 2013 but is distinguished by its distinct primary reticulation, marginal frill in the internal view, and paramphidont hinge and by the lack of nodose spines. This genus is distinguished from *Cythereis* Jones, 1849 by its well-developed marginal frill in the internal view and distinct, regular primary reticulation and the lack of a subcentral tubercle; its ventrolateral ridge also does not continue into the anterior marginal rim.

Bensonocosta bensoni sp. nov.

FIGURES 64G–J, 69C–E

Derivation of Name. In honor of the late Richard H. Benson, formerly of Smithsonian Institution, for his contribution to marine and brackish ostracod research.

Holotype. Adult RV, USNM 607650 (TRA305; Figures 64G–H, 69C).

Paratype. USNM 607651 (TRA750).

Type Locality and Horizon. DSDP 329, 5/6/80–88, late Miocene, 50.6552°S, 46.0955°W, 1,519 m water depth, southwestern Atlantic.

Locality and Age of Other Specimen Examined. DSDP 327A, Maastrichtian, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Bensonocosta* species characterized by comparatively shallow primary reticulation without ingrowing spines.

Description. Carapace moderately calcified, highest at the anterodorsal corner. Outline elongate and subrectangular; anterior margin evenly rounded, bearing spines especially in ventral half; posterior margin bluntly acuminate and upturned, bearing spines especially in ventral half; dorsal margin straight, bearing five to six spines; ventral margin straight; ventrolateral ridge well developed, straight, spinose, reticulate. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with distinct but shallow primary reticulation and with pore conuli. Anterior and posterior marginal sulci and rims subdued. Hingement paramphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; ventral and ventromedian scars close to each other. Anterior marginal frill well developed in internal view.

Remarks. *Bensonocosta bensoni* sp. nov. is very similar to *Bensonocosta* sp. 1 but is distinguished by its much shallower primary reticulation without ingrowing spines.

Bensonocosta sp. 1

FIGURES 64K–L, 69F–H

Locality and Age of Specimen Examined. DSDP 327A, Maastrichtian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. See *Bensonocosta bensoni* section.

Bensonocosta sp. 2

FIGURES 69I–K, 70R–S

Locality and Age of Specimen Examined. DSDP 258A, Santonian, Indian Ocean.

Dimensions. See Table 1.

Remarks. This species is similar to *Bensonocosta* sp. 1 but is distinguished by irregular primary reticulation, a better-developed ventrolateral ridge, and a large tubercle near the posterodorsal corner. This species is similar to *Trachyleberidea* Bowen, 1953, but the ventrolateral ridge of this species does not continue into the anterior marginal rim, and *Trachyleberidea* species have a much more triangular outline. This similarity may suggest a close phylogenetic relationship between these two genera.

Genus *Ayressoleberis* Brandão and Yasuhara, 2013

Type Species. *Trachyleberis bathymarina* Ayress, 1993.

Diagnosis. (From Brandão and Yasuhara, 2013) A trachyleberidid genus characterized by an elongate outline, spinous carapace, nodose and often multifurcate spines, V-shaped frontal scar, a vertical row of four adductor scars, and holamphidont hinge and the lack of a ventrolateral ridge and subcentral tubercle. No broad and distinct marginal frill in internal view. Sexual dimorphism distinct: males more elongate and slender.

Remarks. *Henryhowella* Puri, 1957 is similar to *Ayressoleberis* Brandão and Yasuhara, 2013, but the former has distinct and broad marginal frill in the internal view of the right valve. *Ayressoleberis* is distinguished from *Cythereis* Jones, 1849 by the lack of a ventrolateral ridge and subcentral tubercle.

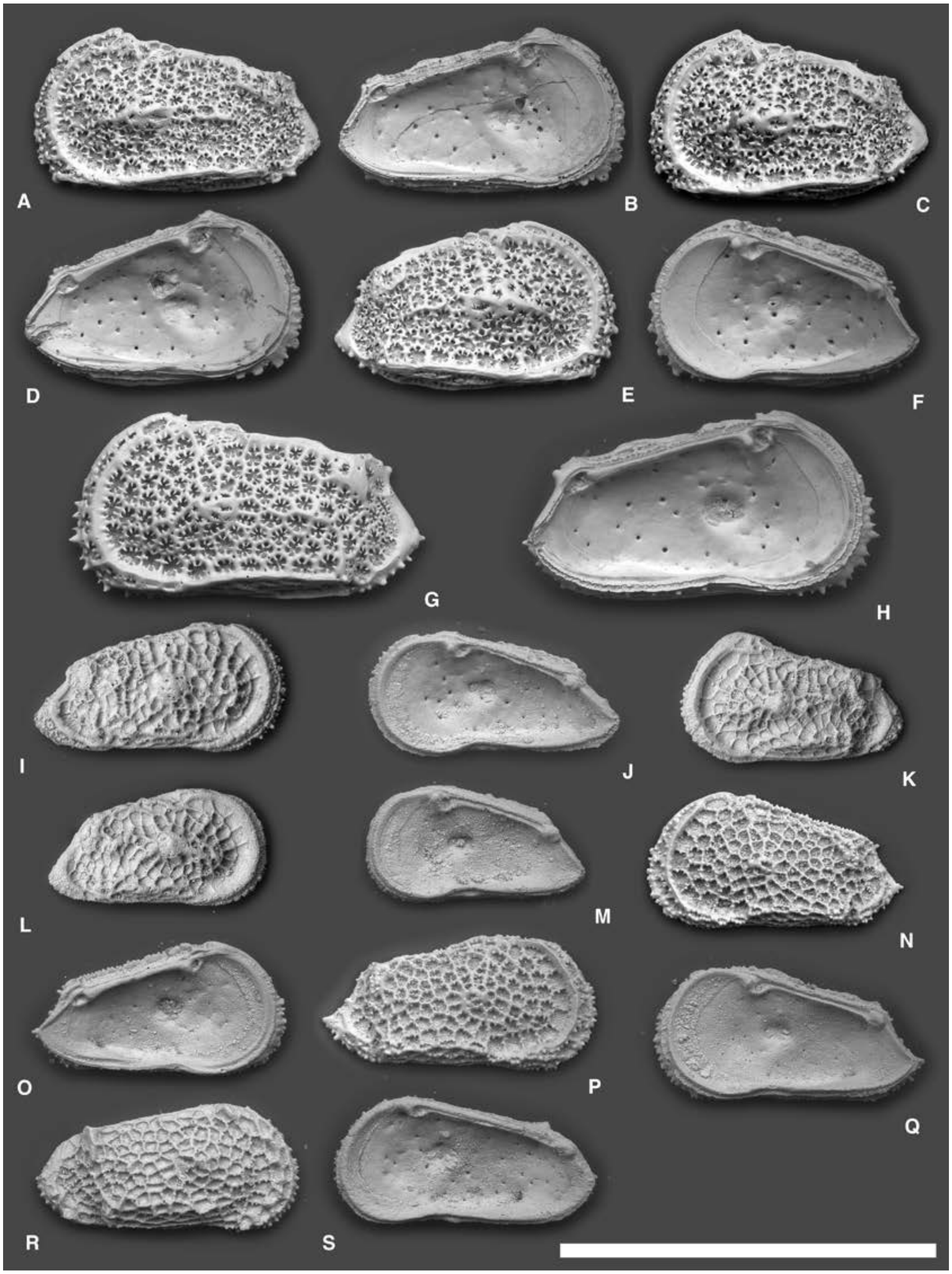


FIGURE 70. Scanning electron microscope images of *Trachyleberidea mammidentata* (van den Bold, 1946), *Trachyleberidea elegans* Guernet, 1985, *Trachyleberidea geinitzi* (Reuss, 1874), and *Bensonocosta* sp. 2. A, C, E, G, I, K–L, N, P, R, lateral views; B, D, F, H, J, M, O, Q, S, internal views. **A–H,** *Trachyleberidea mammidentata* (van den Bold, 1946). A–B, TRA225 (USNM 607816), adult LV from Alb 2402, Modern, Gulf of Mexico. C–D, TRA226 (USNM 607817), adult LV from Alb 2402, Modern, Gulf of Mexico. E–F, TRA227 (USNM 607818), adult RV from Alb 2402, Modern, Gulf of Mexico. G–H, GSM112 (USNM 607819), adult LV from WHOI 1726, Modern, northwestern Atlantic. **I–M,** *Trachyleberidea elegans* Guernet, 1985. I–J, TRA539 (USNM 607820), adult RV from DSDP 214, 27/cc, late Eocene, Indian Ocean. K, TRA545 (USNM 607821), adult LV from DSDP 214, 34/4/60–66, early Eocene, Indian Ocean. L–M, TRA546 (USNM 607822), adult RV from DSDP 214, 34/4/60–66, early Eocene, Indian Ocean. **N–Q,** *Trachyleberidea geinitzi* (Reuss, 1874). N–O, TRA636 (USNM 607833), adult LV from DSDP 21A, 3/4/50–56, Paleocene to early Eocene, southwestern Atlantic. P–Q, TRA627 (USNM 607834), adult RV from DSDP 21A, 1/4/50–56, middle Eocene, southwestern Atlantic. **R–S,** *Bensonocosta* sp. 2, TRA804 (USNM 607835), adult RV from DSDP 258A, 9/4/50–56, Santonian, Indian Ocean. Scale bar represents 1 mm.

Taracythere Ayress, 1995 is most similar to *Ayressoleberis*, but the former has a divided frontal muscle scar, which is composed of an elongate scar and a small rounded scar, and tends to have a more upturned posterior margin and less spinous lateral surface of the carapace.

Cythere dasyderma Brady, 1880, *Trachyleberis brevicosta* Hornibrook, 1952, and *Actinocythereis microagrenon* Ayress, 1995 are included in this genus.

Ayressoleberis bathymarina (Ayress, 1993)

Trachyleberis bathymarina Ayress, 1993:105, pl. 20-106, figs. 1–5, pl. 20-108, figs. 1–4.

Trachyleberis bathymarina Ayress; Yasuhara, Cronin, Hunt, and Hodell, 2009a:923, figs. 5.6, 11.7–11.8, 12.1–12.8.

Remarks. The details of this type species are found in Ayress (1993) and Yasuhara et al. (2009c). This species is very similar to *Ayressoleberis dasyderma* (Brady, 1880) (see Brandão and Yasuhara, 2013, for details about this species), but it has a more slender shape that tapers posteriorly, and the latter has more irregular reticulation.

Ayressoleberis cf. *bathymarina* (Ayress, 1993)

FIGURES 69L–M, 71A–B

?*Trachyleberis bathymarina* Ayress; Ayress, De Deckker, and Coles, 2004:36, pl. 3, fig. 10.

Locality and Age of Specimens Examined. EL 47 5117, Modern, Southern Ocean.

Dimensions. See Table 1.

Remarks. *Ayressoleberis* cf. *bathymarina* (Ayress, 1993) is very similar to *Ayressoleberis bathymarina* (Ayress, 1993), but it lacks secondary reticulation and may differ slightly in lateral shape. Only one specimen of this species has been found, and thus, further specimens are needed for detailed comparison with *Ayressoleberis bathymarina*.

Ayressoleberis colesi sp. nov.

FIGURES 69N–Q, 71E–L

Derivation of Name. In honor of Graham P. Coles, formerly of University College of Wales, Aberystwyth, for his contribution to deep-sea ostracod research.

Holotype. Adult RV, USNM 607660 (TRA939; Figures 69O,Q, 71I–J).

Paratypes. USNM 607658, 607659, 607661 (TRA532, TRA521, TRA528).

Type Locality and Horizon. NGC 100 pilot, 0–5, Modern, 25.2705°S, 162.0000°E, 1,299 m water depth, southwestern Pacific.

Other Localities. DSDP 206, DSDP 208, late Miocene, early Pliocene, and Pleistocene, southwestern Pacific.

Dimensions. See Table 1.

Diagnosis. *Ayressoleberis* species characterized by a very broad anterior marginal rim in its ventral half that is covered by dense, fine spines.

Description. Carapace heavily calcified, highest at anterodorsal corner. Outline elongate; anterior margin evenly rounded and densely spinose; posterior margin bluntly acuminate and spinose; dorsal margin almost straight, bearing spines; ventral margin straight and spinose. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with primary reticulation and multifurcate spines. Anterior and posterior marginal sulci and rims well developed; ventral half of anterior marginal rim particularly broad, bearing numerous small spines. Hingement holamphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four elongate scars; dorsomedian scar large and deflected.

Remarks. *Ayressoleberis colesi* sp. nov. is similar to *Ayressoleberis bathymarina* (Ayress, 1993), but the anterior marginal rim of the former is very broad and is covered by dense, fine spines in its ventral half. In addition, this new species has a more triangular posterior margin and lacks secondary reticulation.

Ayressoleberis cf. *colesi* sp. nov.

FIGURES 64M–R, 69R–U

Locality and Age of Specimens Examined. SC 9DD, DSDP 62.0, DSDP 64.0, late Miocene and Quaternary, equatorial western Pacific.

Dimensions. See Table 1.

Remarks. This species is very similar to *Ayressoleberis colesi* sp. nov. but lacks that species' distinctive broadening of the ventral part of the anterior marginal rim. Also, the ventral margin of *Ayressoleberis* cf. *colesi* bears thin, but distinct and continuous, carina. Thus, we prefer to call this species *Ayressoleberis* cf. *colesi* for now, pending further comparable materials.

Ayressoleberis sp. 1

FIGURES 69V–W, 71C–D

Locality and Age of Specimen Examined. DSDP 141, late Pliocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. *Ayressoleberis* sp. 1 is very similar to *Ayressoleberis bathymarina* (Ayress, 1993), but the latter is slightly more slender. Although this slight difference may represent intraspecific variation, only one specimen of this species has been found in the present study, and thus, further specimens are needed for detailed comparison with *Ayressoleberis bathymarina*.

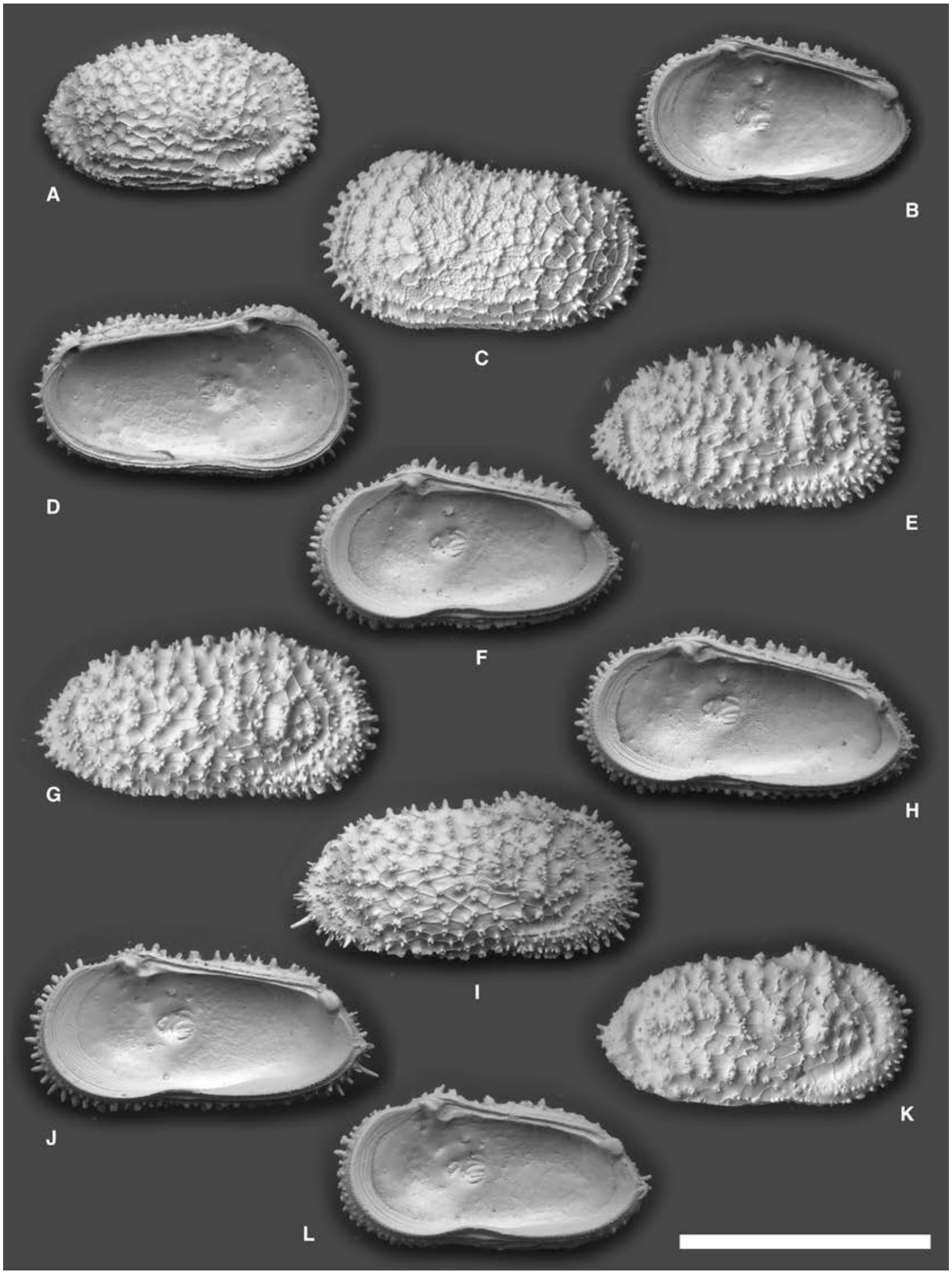


FIGURE 71. Scanning electron microscope images of *Ayressoleberis* cf. *bathymarina* (Ayress, 1993), *Ayressoleberis* sp. 1, and *Ayressoleberis colesi* sp. nov. A, C, E, G, I, K, lateral views; B, D, F, H, J, L, internal views. **A–B,** *Ayressoleberis* cf. *bathymarina* (Ayress, 1993), TRA146 (USNM 607656), adult RV from EL 47 5117, Modern, Southern Ocean. **C–D,** *Ayressoleberis* sp. 1, TRA515 (USNM 607657), adult LV from DSDP 141, 2/3/50–56, late Pliocene, northeastern Atlantic. **E–L,** *Ayressoleberis colesi* sp. nov. E–F, TRA532 (USNM 607658), adult RV from DSDP 206, 19/4/50–56, early Pliocene, southwestern Pacific. G–H, TRA521 (USNM 607659), adult RV from DSDP 208, 2/4/50–56, Pleistocene, southwestern Pacific. I–J, TRA939 (USNM 607660), adult RV from NGC 100 pilot, 0–5, Modern, southwestern Pacific. K–L, TRA528 (USNM 607661), adult RV from DSDP 208, 11/4/60–66, late Miocene, southwestern Pacific. Scale bar represents 1 mm.

Genus *Leguminocythereis* Howe in Howe and Law, 1936

Type Species. *Leguminocythereis scarabaeus* Howe and Law, 1936.

Remarks. The type species is reported from the Oligocene of Louisiana, United States (Howe and Law, 1936). Although subcentral muscle scars of the type species are unknown, species similar to the type species consistently show a divided frontal scar and a vertical row of four adductor scars (Howe and Law, 1936; Hazel et al., 1980). The hinge is holamphidont.

Leguminocythereis? buzasi sp. nov.

Figures 72A–H, 73A–G

Derivation of Name. In honor of Martin A. Buzas, Smithsonian Institution, for his pioneering work on large-scale deep-sea biodiversity patterns.

Holotype. Adult RV, USNM 607663 (TRA116; Figures 72B–C, 73A–C).

Paratypes. USNM 607662, 607664, 607665, 607666, 607667 (TRA115, TRA117, TRA118, TRA119, TRA120).

Type Locality and Horizon. DSDP 526C, 7/1/79–86, late Eocene, 30.1227°S, 3.1380°E, 1,054 m water depth, southeastern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Leguminocythereis* species characterized by elongate carapace, well-developed ventrolateral ridge, very large spine on ventral half of posterior margin, and well-developed marginal rims.

Description. Carapace heavily calcified, highest at middle or anterodorsal corner. Outline elongate in lateral view; anterior margin evenly rounded, bearing small spines; posterior margin bluntly acuminate, bearing a very large spine on ventral half; dorsal margin almost straight and smooth; ventral margin convex and smooth; ventrolateral ridge well developed and curved, bearing two spines on posterior end; median lateral ridge weakly developed but very long. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with well-developed, deep primary reticulation; ingrowing spines weakly developed, especially in anterior half. Anterior and posterior marginal rims and sulci well developed. Hingement holamphidont. Frontal muscle scar probably divided. Adductor muscle scars consist of a vertical row of four scars. Internal snap-knob structure weakly developed.

Remarks. This species is very similar to *Leguminocythereis oertlii* Keij, 1958 in its overall appearance, very large spine on the ventral half of the posterior margin, holamphidont hingement, and divided frontal scar. However, *Leguminocythereis oertlii* has a curved dorsal margin and a less elongate outline, less upturned posterior margin, and less developed ventrolateral ridge than this new species. Although we tentatively consider that this species is congeneric with *Leguminocythereis*, there are certain differences: for example, *Leguminocythereis* species usually lack well-developed marginal rims and sulci and ventrolateral ridge. Although DSDP 526 presently sits at a depth greater than 1 km, during the Eocene this site was much shallower (~500 m; Moore et al., 1984).

Genus *Oertliella* Pokorný, 1964b

Type Species. *Cythere reticulata* Kafka, 1886.

Remarks. *Oertliella* Pokorný, 1964b is very similar to, and perhaps ancestral to, *Agrenocythere* Benson, 1972, but the latter has a set of emphasized muri near the muscle scars that Benson (1972) called a castrum, a more triangular posterior margin, and a better-developed ventrolateral ridge with very deep fossae. *Agrenocythere* also lacks an eye tubercle, but this is doubtful as a diagnostic character because this feature has been independently lost many times among deep-sea lineages. See Benson (1972) and Pokorný (1964b) for a detailed discussion of the morphology and phylogeny of these genera.

Oertliella semivera (Hornibrook, 1952)

Figures 72K–P, 73H–K

Bradleya semivera Hornibrook, 1952:43, pl. 8, figs. 103–104, 109.
Agrenocythere? semivera? (Hornibrook); Benson, 1972, pl. 1, fig. 5.
Agrenocythere semivera (Hornibrook); Ayress, 1993, fig. 9C.
Oertliella semivera (Hornibrook); Ayress, 1995, fig. 9.8.

Locality and Age of Specimens Examined. Ashley Mudstone Formation, SI-25, late Eocene, New Zealand.

Dimensions. See Table 1.

Remarks. We agree with Ayress (1995) and include this species in *Oertliella* Pokorný, 1964b. Our specimens are identical to topotypic (in a broad sense) specimens from New Zealand's Paleogene strata (Benson, 1972; Ayress, 1993, 1995).

Oertliella cf. *semivera* (Hornibrook, 1952)

Figures 72I–J, 73L–M

Locality and Age of Specimen Examined. DSDP 277, early Oligocene, Southern Ocean.

Dimensions. See Table 1.

Remarks. This species is very similar to *Oertliella semivera* Hornibrook, 1952, but its carapace is much less spinose, and its primary reticulation is more regular. Furthermore, this species has small normal pores on muri; in contrast, *Oertliella semivera* has very large sieve-type pores at the bottom of fossae.

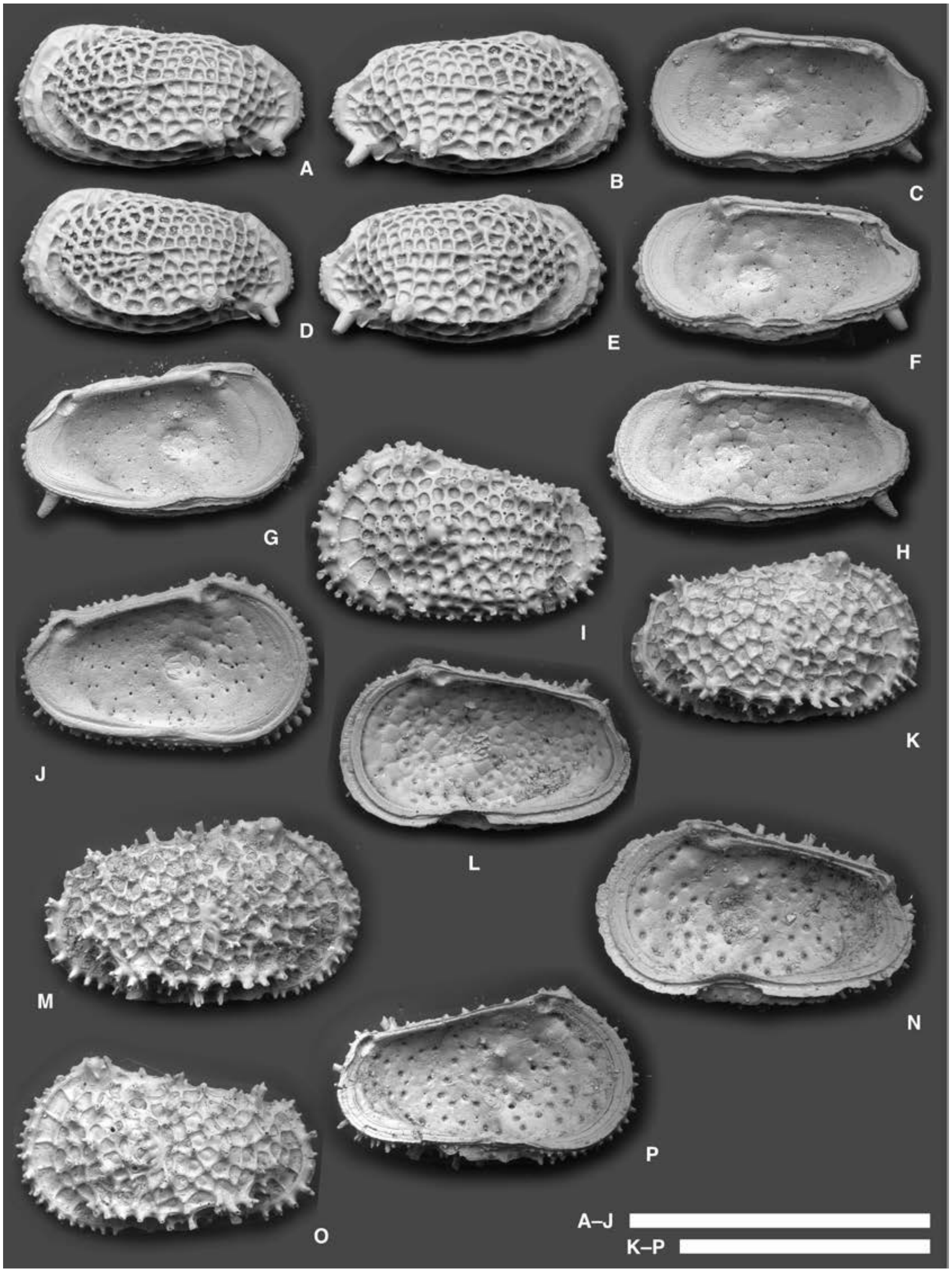


FIGURE 72. Scanning electron microscope images of *Leguminocythereis? buzasi* sp. nov., *Oertliella* cf. *semivera* (Hornibrook, 1952), and *Oertliella semivera* (Hornibrook, 1952). A–B, D–E, I, K, M, O, lateral views; C, F–H, J, L, N, P, internal views. **A–H,** *Leguminocythereis? buzasi* sp. nov. A, TRA115 (USNM 607662), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. B–C, TRA116 (USNM 607663), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. D, TRA117 (USNM 607664), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. E–F, TRA118 (USNM 607665), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. G, TRA119 (USNM 607666), adult LV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. H, TRA120 (USNM 607667), adult RV from DSDP 526C, 7/1/79–86, late Eocene, southeastern Atlantic. **I–J,** *Oertliella* cf. *semivera* (Hornibrook, 1952), TRA420 (USNM 607668), adult LV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. **K–P,** *Oertliella semivera* (Hornibrook, 1952). K–L, TRA836 (USNM 607669), adult RV from SI-25, late Eocene, New Zealand. M–N, TRA1031 (USNM 607670), adult RV from Ashley Mudstone Formation, late Eocene, New Zealand. O–P, TRA1030 (USNM 607671), adult LV from Ashley Mudstone Formation, late Eocene, New Zealand. Scale bars represent 1 mm.

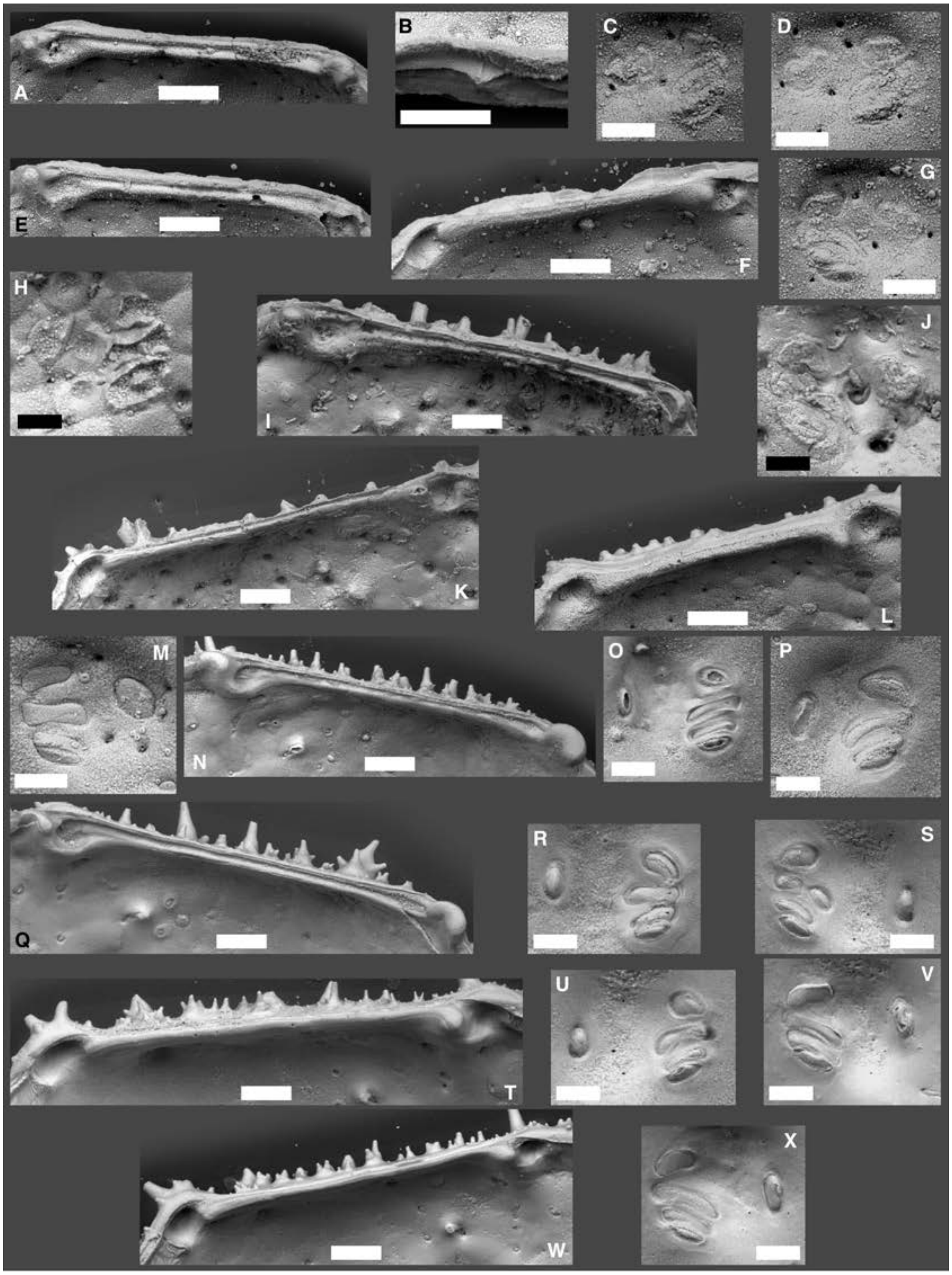


FIGURE 73. Internal details of *Leguminocythereis? buzasi* sp. nov., *Oertliella semivera* (Hornibrook, 1952), *Oertliella* cf. *semivera* (Hornibrook, 1952), and *Legitimocythere acanthoderma* s.l. (Brady, 1880). **A–G,** *Leguminocythereis? buzasi* sp. nov. A–C, TRA116 (USNM 607663), adult RV. A, hingement. B, ventromarginal area showing snap-knob structure. C, subcentral muscle scars. D–E, TRA118 (USNM 607665), adult RV. D, subcentral muscle scars. E, hingement. F–G, TRA119 (USNM 607666), adult LV. F, hingement. G, subcentral muscle scars. **H–K,** *Oertliella semivera* (Hornibrook, 1952). H, TRA836 (USNM 607669), adult RV, subcentral muscle scars. I, TRA1031 (USNM 607670), adult RV, hingement. J–K, TRA1030 (USNM 607671), adult LV. J, subcentral muscle scars. K, hingement. **L–M,** *Oertliella* cf. *semivera* (Hornibrook, 1952), TRA420 (USNM 607668), adult LV. L, hingement. M, subcentral muscle scars. **N–X,** *Legitimocythere acanthoderma* s.l. (Brady, 1880). N–O, ODP980071 (USNM 607706), adult RV. N, hingement. O, subcentral muscle scars. P, TRA522 (USNM 607689), adult RV, subcentral muscle scars. Q–R, RB320 (USNM 607697), adult RV. Q, hingement. R, subcentral muscle scars. S–T, ODP925162 (USNM 607711), adult LV. S, subcentral muscle scars. T, hingement. U, ODP925163 (USNM 607712), adult RV, subcentral muscle scars. V–W, SIMY0030 (USNM 607714), adult LV. V, subcentral muscle scars. W, hingement. X, SIMY0029 (USNM 607713), adult LV, subcentral muscle scars. Scale bars represent 0.1 mm for A–B, E–F, I, K–L, N, Q, T, W and 50 μm for C–D, G–H, J, M, O–P, R–S, U–V, X.

Genus *Legitimocythere* Coles and Whatley, 1989

Type Species. *Cythere acanthoderma* Brady, 1880.

Remarks. *Legitimocythere* is similar to some species of *Cythereis* Jones, 1849 and *Croninocythereis* gen. nov. but is distinguished by its single and small oval-shaped frontal scar (see the *Cythereis* and *Croninocythereis* sections for further detailed comparison). *Legitimocythere* is known from the Atlantic, Pacific, Indian, and Southern Oceans but not from the Arctic Ocean and the Nordic Seas.

Legitimocythere acanthoderma s.l. (Brady, 1880)

FIGURES 63R–S, 65A–J, 73N–X, 74A–C,Q, 75E–N, 76, 77A–I

Cythere acanthoderma Brady, 1880:104, pl. 18, fig. 5a–e.
Cythereis ericea (Brady); Tressler, 1941:101, pl. 19, fig. 23.
Cythere acanthoderma Brady; Puri and Hulings, 1976:267, pl. 11, figs. 16–18.
?*Thalassocythere acanthoderma* (Brady); Ducasse and Peypouquet, 1979, pl. 3, fig. 4.
?"*Thalassocythere*" sp. Cronin and Compton-Gooding, 1987, pl. 2, fig. 3.
non "*Thalassocythere*" *acanthoderma* (Brady); Benson, DelGrosso, and Steineck, 1983, pl. 2, fig. 9.
"*Thalassocythere*" *acanthoderma* (Brady); Malz, 1987, fig. 2b.
"*Thalassocythere*" *acanthoderma* (Brady); Whatley and Coles, 1987, pl. 6, figs. 1–2.
non *Legitimocythere acanthoderma* (Brady); Coles and Whatley, 1989:100, pl. 4, fig. 9.
Legitimocythere acanthoderma (Brady); Dingle and Lord, 1990, fig. 2.11.
"*Thalassocythere*" *acanthoderma* (Brady); Malz, 1990, fig. 8.5–8.7.
Thalassocythere acanthoderma (Brady); Didié and Bauch, 2000, pl. 3, figs. 15–16.
Legitimocythere acanthoderma (Brady); Jellinek and Swanson, 2003:33.
Legitimocythere sp. A Jellinek and Swanson, 2003:37, pl. 27, figs. 1–2.
Legitimocythere sp. B Jellinek and Swanson, 2003:37, pl. 27, figs. 3–4.
Legitimocythere acanthoderma (Brady); Ayress, De Deckker, and Coles, 2004:36, pl. 1, figs. 6–7.
Legitimocythere acanthoderma (Brady); Mazzini, 2005:42, figs. 22A–L, 23A–F.
Legitimocythere geniculata Mazzini, 2005:44, fig. 24A–M.
Legitimocythere acanthoderma (Brady); Alvarez Zarikian, 2009:6, pl. 1, figs. 4–5 [this should be pl. 1, figs. 4, 6].
Legitimocythere acanthoderma (Brady); Yasuhara, Cronin, Hunt, and Hodell, 2009a:922, figs. 5.5, 11.1–11.6.
Legitimocythere sp. Yasuhara, Okahashi, and Cronin, 2009c:927, pl. 21, fig. 5; pl. 22, figs. 7–8.
Legitimocythere acanthoderma (Brady); Brandão, 2013:16, pls. 1–2.

Locality and Age of Specimens Examined. DSDP 223, early Pleistocene, Indian Ocean; DSDP 208, Pleistocene and late Pliocene, southwestern Pacific; Chain 82-24-4P, DSDP 607, Pleistocene and late Pliocene, North Atlantic; NMC 13, Quaternary, southwestern Pacific; EL 47 5069, Modern, Southern Ocean; Alb 2566, Alb 2568, Alb D2570, Alb 2711, KN 25 sta 291, Modern, northwestern Atlantic; KN 714-15A, ODP 980C, Quaternary, northeastern Atlantic; ODP 1055B, Pleistocene, northwestern Atlantic; ODP 925D, Pleistocene, equatorial western Atlantic; AQ 14, Quaternary, equatorial western Pacific.

Dimensions. See Table 1.

Remarks. Many of our specimens are from the North and equatorial Atlantic. Most of them look slightly more slender than *Legitimocythere acanthoderma* s.s. reported from the Southern Ocean, but some (e.g., Figure 65G,H) look very similar. Specimens from other oceans also show variability in outline and spine development. We tentatively consider these variations in outline (including slender and high-carapace forms) and development of spines intraspecific variations and prefer to call them *Legitimocythere acanthoderma* s.l., pending further investigation.

Jellinek and Swanson (2003) described very similar species of *Legitimocythere aculeata* Jellinek and Swanson, 2003 and *Legitimocythere castanea* Jellinek and Swanson, 2003 largely on the basis of the soft parts. It is almost impossible to distinguish these species from *Legitimocythere acanthoderma* (Brady, 1880) on the basis of shell morphology. The carapaces of these three species are almost identical, with slight differences in the development of spines that may vary within species as well. Some of the specimens illustrated here as *Legitimocythere acanthoderma* s.l. may belong to these other species, but we do not make these distinctions here because of the difficulties in doing so without information about the soft parts.

Jellinek and Swanson (2003) also reported shells of the very similar species *Legitimocythere* sp. A and *Legitimocythere* sp. B. Mazzini (2005) described the very similar species *Legitimocythere geniculata* Mazzini, 2005 from the Southern Ocean on the basis of only the shells. Both studies distinguished these species from other similar species by slight differences in the size and development of spines (again, which may vary within species as well). We tentatively included these species in the synonymy of *Legitimocythere acanthoderma* s.l. above.

The SEM images of lectotype and topotype specimens are shown in Mazzini (2005) and Brandão (2013). A detailed discussion of *Legitimocythere acanthoderma* s.s. is given by Brandão (2013).

Legitimocythere tomi sp. nov.

FIGURES 74D–P, 75A–D, 78A–J

"*Echinocythereis*" *acanthoderma* (Brady); LeRoy and Levinson, 1974:22, pl. 13, figs. 1–5.
Trachyleberis bermudezi crebripustulosa van den Bold; van den Bold, 1981, pl. 4, fig. 10 (non fig. 11).

Derivation of Name. In honor of Thomas M. Cronin, U.S. Geological Survey, for his contribution to marine and brackish ostracod research.

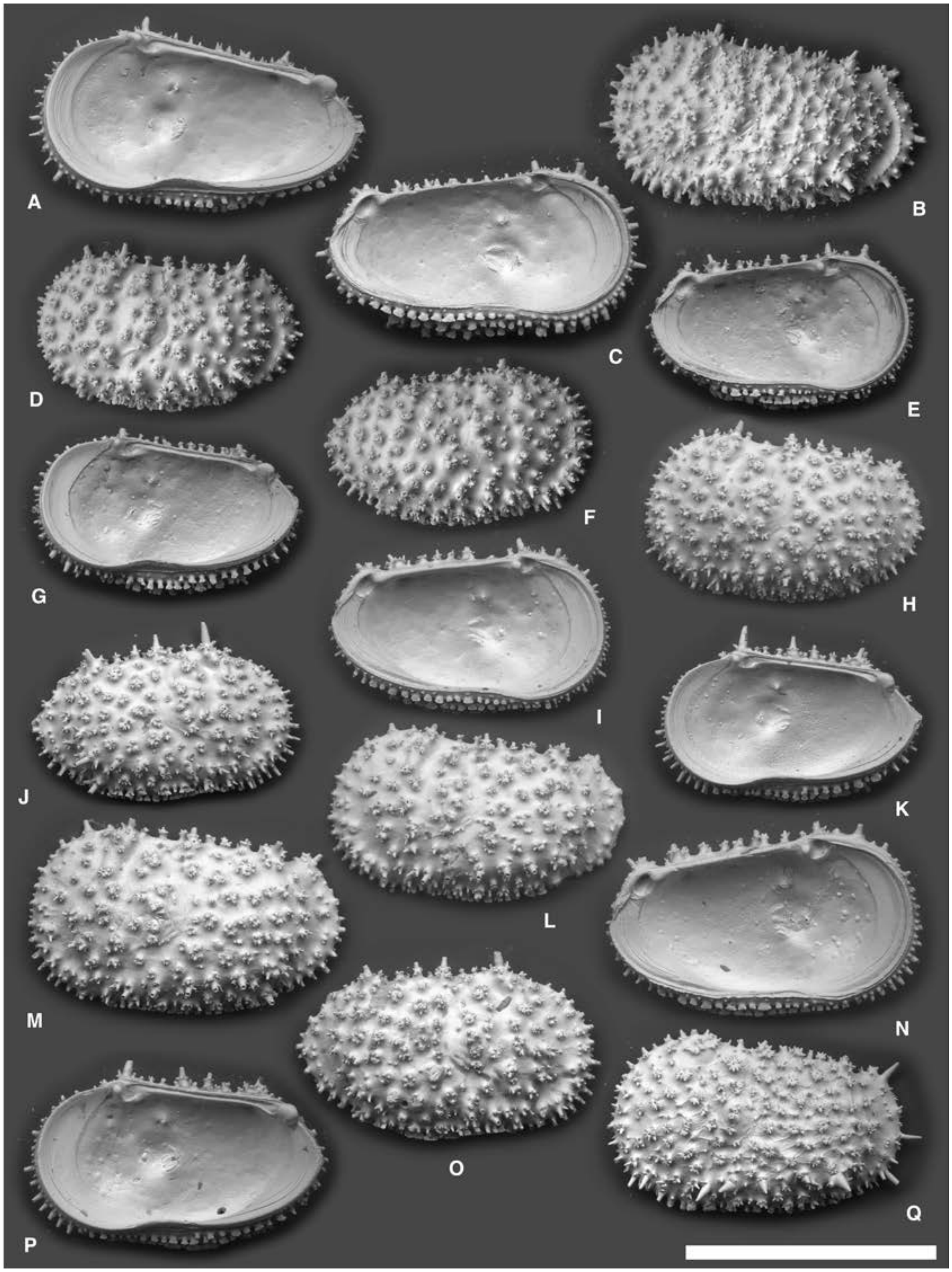


FIGURE 74. Scanning electron microscope images of *Legitimocythere acanthoderma* s.l. (Brady, 1880) and *Legitimocythere tomi* sp. nov. B, D, F, H, J, L–M, O, Q, lateral views; A, C, E, G, I, K, N, P, internal views. **A–C, Q,** *Legitimocythere acanthoderma* s.l. (Brady, 1880). A, TRA537 (USNM 607672), adult RV from DSDP 223, 2/6/50–56, early Pleistocene, Indian Ocean. B–C, TRA525 (USNM 607673), adult LV from DSDP 208, 3/4/50–56, late Pliocene, southwestern Pacific. Q, GSM165 (USNM 607681), adult LV from Chain 82-24-4P, 167–170, Pleistocene, North Atlantic. **D–P,** *Legitimocythere tomi* sp. nov. D–E, TRA529 (USNM 607674), adult LV from Alb D2399, Modern, Gulf of Mexico. F–G, TRA530 (USNM 607675), adult RV from Alb D2399, Modern, Gulf of Mexico. H–I, RB439 (USNM 607676), adult LV from Alb D2751, Modern, northwestern Atlantic. J–K, RB440 (USNM 607677), adult RV from Alb D2751, Modern, northwestern Atlantic. L, RB451 (USNM 607678), adult LV from Alb D2754, Modern, northwestern Atlantic. M–N, RB452 (USNM 607679), adult LV from Alb D2754, Modern, northwestern Atlantic. O–P, RB453 (USNM 607680), adult RV from Alb D2754, Modern, northwestern Atlantic. Scale bar represents 1 mm.

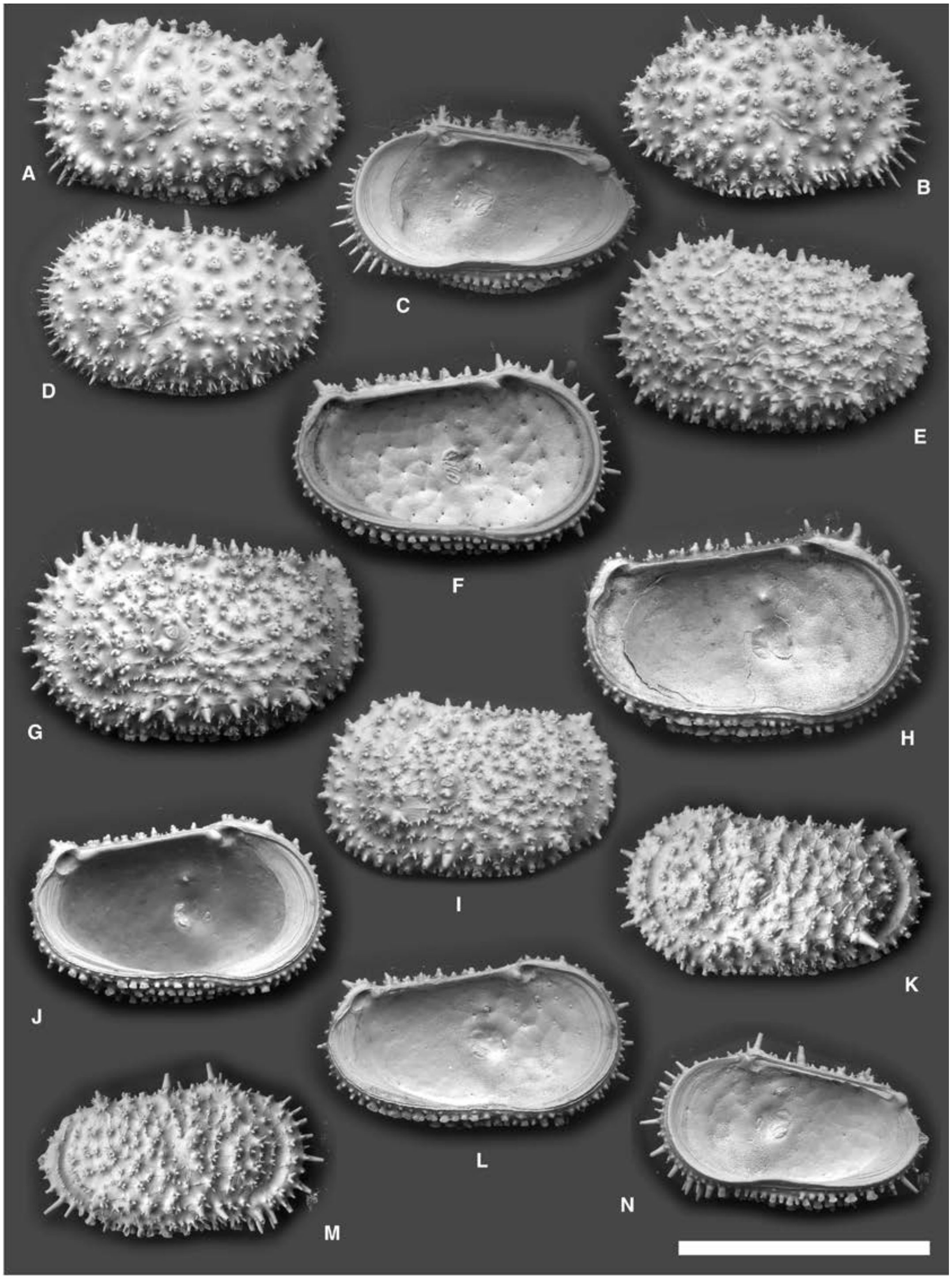


FIGURE 75. Scanning electron microscope images of *Legitimocythere acanthoderma* s.l. (Brady, 1880) and *Legitimocythere tomi* sp. nov. A–B, D–E, G, I, K, M, lateral views; C, F, H, J, L, N, internal views. **A–D,** *Legitimocythere tomi* sp. nov. A, RB305 (USNM 607682), adult LV from KN 25 sta 299, Modern, northwestern Atlantic. B–C, RB306 (USNM 607683), adult RV from KN 25 sta 299, Modern, northwestern Atlantic. D, RB307 (USNM 607684), adult LV from KN 25 sta 297, Modern, northwestern Atlantic. **E–N,** *Legitimocythere acanthoderma* s.l. (Brady, 1880). E–F, SIMY0011 (USNM 607685), adult LV from NMC 13, 25–30, Quaternary, southwestern Pacific. G–H, TRA138 (USNM 607686), adult LV from EL 47 5069, Modern, Southern Ocean. I–J, RB340 (USNM 607687), adult LV from Alb 2566, Modern, northwestern Atlantic. K–L, TRA518 (USNM 607688), adult LV from DSDP 208, 2/4/50–56, Pleistocene, northwestern Pacific. M–N, TRA522 (USNM 607689), adult RV from DSDP 208, 5/4/60–66, late Pliocene, northwestern Pacific. Scale bar represents 1 mm.

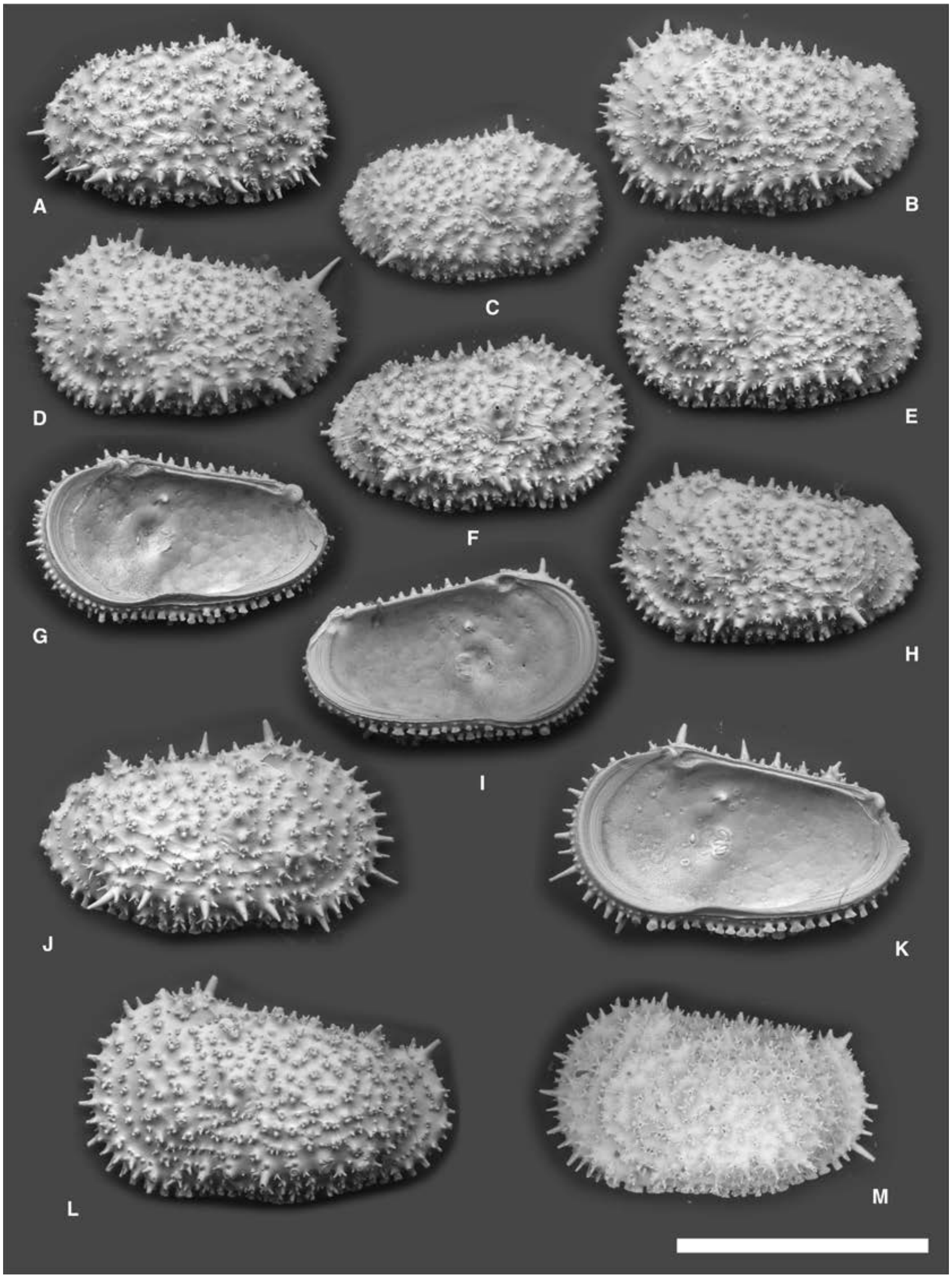


FIGURE 76. Scanning electron microscope images of *Legitimocythere acanthoderma* s.l. (Brady, 1880). A–F, H, J, L–M, lateral views; G, I, K, internal views. A, GSM166 (USNM 607690), adult RV from Chain 82-24-4P, 167–170, Pleistocene, North Atlantic. B, GSM233 (USNM 607691), adult LV from KN 714-15A, 184, Quaternary, northeastern Atlantic. C, USGSD126 (USNM 607692), adult RV from DSDP 607, 14/6/24, late Pliocene, North Atlantic. D, USGSD158 (USNM 607693), adult LV from DSDP 607, 13/1/90–92, early Pleistocene, North Atlantic. E, RB347 (USNM 607694), adult LV from Alb 2568, Modern, northwestern Atlantic. F–G, RB355 (USNM 607695), adult RV from Alb D2570, Modern, northwestern Atlantic. H–I, RB403 (USNM 607696), adult LV from Alb 2711, Modern, northwestern Atlantic. J–K, RB320 (USNM 607697), adult RV from KN 25 sta 291, Modern, northwestern Atlantic. L, RB321 (USNM 607698), adult LV from KN 25 sta 291, Modern, northwestern Atlantic. M, TMC202 (USNM 607699), adult LV from Chain 82-24-4P, 311–313, Pleistocene, North Atlantic. Scale bar represents 1 mm.

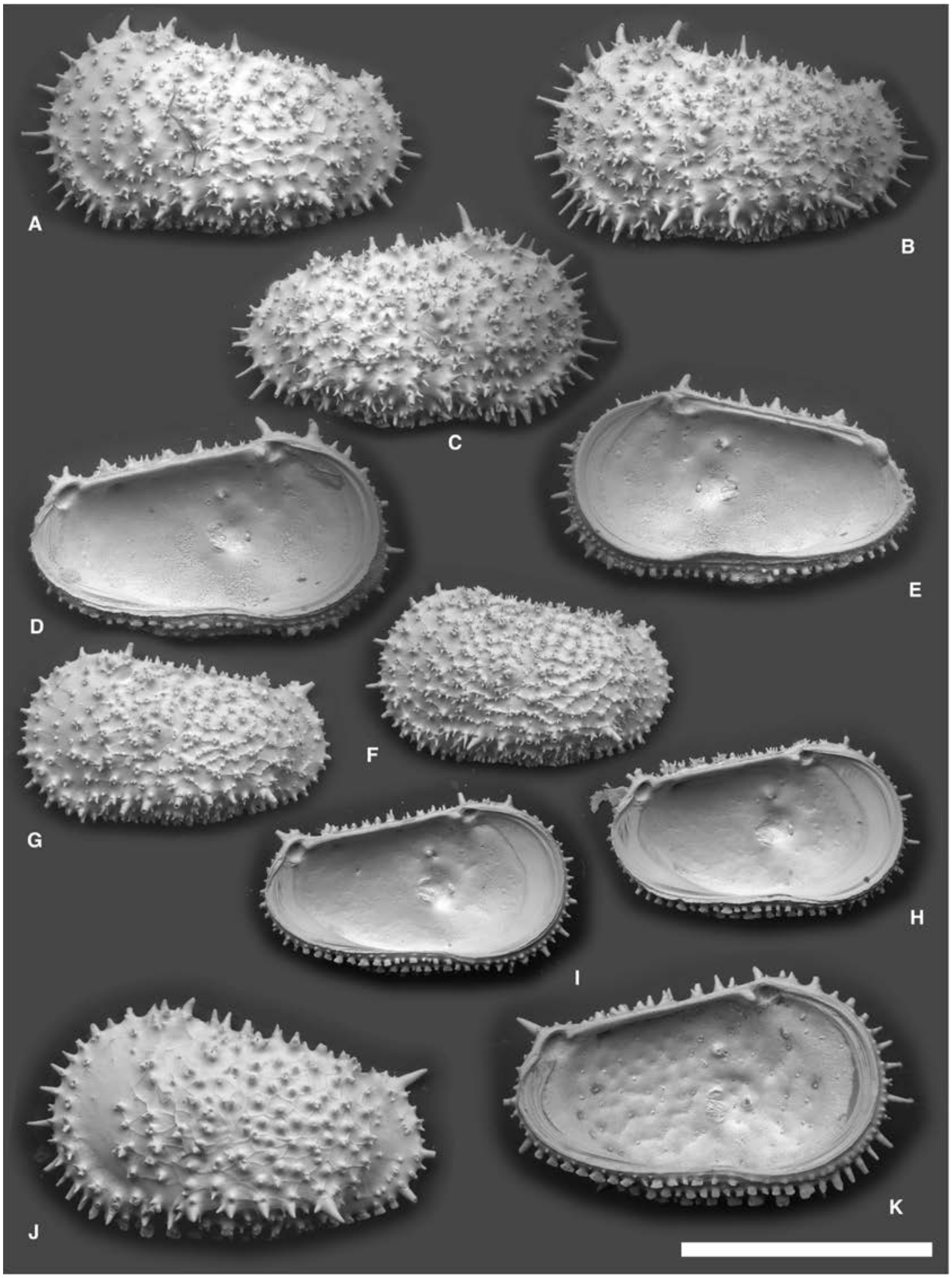


FIGURE 77. Scanning electron microscope images of *Legitimocythere acanthoderma* s.l. (Brady, 1880) and *Legitimocythere audax* (Brady and Norman, 1889). A–C, F–G, J, lateral views; D–E, H–I, K, internal views. **A–I,** *Legitimocythere acanthoderma* s.l. (Brady, 1880). A, ODP925150 (USNM 607708), adult LV from ODP 925D, 1/6/67–69, Pleistocene, equatorial western Atlantic. B, ODP925160 (USNM 607709), adult LV from ODP 925C, 1/3/107–109, Pleistocene, equatorial western Atlantic. C, ODP925161 (USNM 607710), adult RV from ODP 925C, 1/3/107–109, Pleistocene, equatorial western Atlantic. D, ODP925162 (USNM 607711), adult LV from ODP 925D, 1/4/47–49, Pleistocene, equatorial western Atlantic. E, ODP925163 (USNM 607712), adult RV from ODP 925D, 1/4/47–49, Pleistocene, equatorial western Atlantic. F, H, SIMY0029 (USNM 607713), adult LV from AQ 14, 20–30, Quaternary, equatorial western Pacific. G, I, SIMY0030 (USNM 607714), adult LV from AQ 14, 20–30, Quaternary, equatorial western Pacific. **J–K,** *Legitimocythere audax* (Brady and Norman, 1889), SIMY0010 (USNM 607715), adult LV from NMC 13, 25–30, Quaternary, southwestern Pacific. Scale bar represents 1 mm.

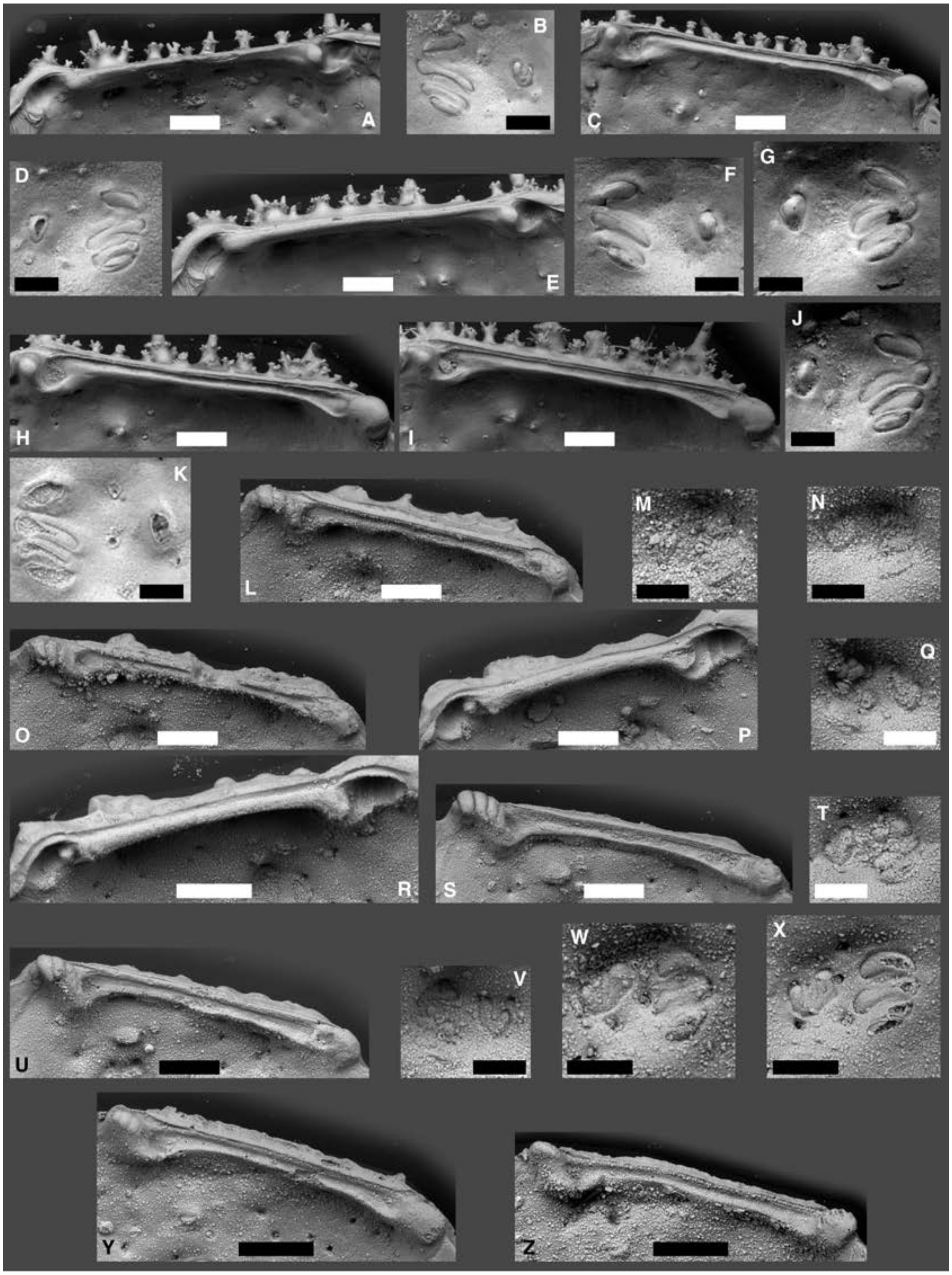


FIGURE 78. Internal details of *Legitimocythere tomi* sp. nov, *Legitimocythere audax* (Brady and Norman, 1889), *Herrigocythere cenozoica* (Benson, 1977), *Herrigocythere cretacea* (Benson, 1977), and *Ryugucivis jablonskii* sp. nov. **A–J,** *Legitimocythere tomi* sp. nov. A–B, TRA529 (USNM 607674), adult LV. A, hingement. B, subcentral muscle scars. C–D, TRA530 (USNM 607675), adult RV. C, hingement. D, subcentral muscle scars. E–F, RB439 (USNM 607676), adult LV. E, hingement. F, subcentral muscle scars. G–H, RB453 (USNM 607680), adult RV. G, subcentral muscle scars. H, hingement. I–J, RB306 (USNM 607683), adult RV. I, hingement. J, subcentral muscle scars. **K,** *Legitimocythere audax* (Brady and Norman, 1889), SIMY0010 (USNM 607715), adult LV, subcentral muscle scars. **L–O,** *Herrigocythere cenozoica* (Benson, 1977). L–M, TRA637 (USNM 607717), adult RV. L, hingement. M, subcentral muscle scars. N–O, TRA805 (USNM 607722), adult RV. N, subcentral muscle scars. O, hingement. **P–V,** *Herrigocythere cretacea* (Benson, 1977). P– Q, TRA638 (USNM 607716), adult LV. P, hingement. Q, subcentral muscle scars. R, TRA733 (USNM 607718), adult LV, hingement. S–T, TRA734 (USNM 607719), adult RV. S, hingement. T, subcentral muscle scars. U, TRA738 (USNM 607720), adult RV, hingement. V, TRA739 (USNM 607721), adult LV, subcentral muscle scars. **W–Z,** *Ryugucivis jablonskii* sp. nov. W, TRA711 (USNM 607727), adult RV, subcentral muscle scars. X–Y, TRA722 (USNM 607728), adult RV. X, subcentral muscle scars. Y, hingement. Z, TRA746 (USNM 607731), adult RV, hingement. Scale bars represent 0.1 mm for A, C, E, H–I, L, O–P, R–S, U, Y–Z and 50 µm for B, D, F–G, J–K, M–N, Q, T, V–X.

Holotype. Adult RV, USNM 607683 (RB306; Figures 75B–C, 78I–J).

Paratypes. USNM 607674, 607675, 607676, 607677, 607678, 607679, 607680, 607682, 607684 (TRA529, TRA530, RB439, RB440, RB451, RB452, RB453, RB305, RB307).

Type Locality and Horizon. KN 25 sta 299, Modern, 7.9183°N, 55.7000°W, 2,005 m water depth, northwestern Atlantic.

Other Localities. Alb D2399, Modern, Gulf of Mexico; Alb D2751, Alb D2754, KN 25 sta 299, KN 25 sta 297, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Legitimocythere* species characterized by its ovate outline, evenly well developed multifurcate spines, and comparatively subdued ventrolateral ridge.

Description. Carapace moderately calcified, highest at middle or anterodorsal corner. Outline ovate-subrectangular in lateral view; anterior margin evenly rounded and spinose; posterior margin bluntly acuminate and spinose; dorsal margin straight or slightly concave, bearing multifurcate and/or sharp spines; ventral margin convex and densely spinose; ventrolateral ridge subdued and spinose. Anterodorsal corner weakly angular; posterodorsal corner prominent and angular in LV and weakly angular in RV. Lateral surface ornamented with evenly well developed multifurcate spines. Hingement holamphidont. Frontal muscle scar small and ovate. Adductor muscle scars consist of a vertical row of four elongate scars, dorsomedian one longest and deflected.

Remarks. This species was reported as "*Echinocythereis*" *acanthoderma* (Brady, 1880) from the Gulf of Mexico (LeRoy and Levinson, 1974). *Legitimocythere tomi* sp. nov. is distinguished from all other *Legitimocythere* species by its more ovate outline, evenly well developed multifurcate spines, and comparatively subdued ventrolateral ridge and by its lack of primary reticulation. We observed one specimen (Figures 74E, 78A–B) to have a V-shaped frontal scar, suggesting that this feature can show occasional variation within species. Nevertheless, even in this specimen, the frontal scar is relatively small, as seen in other specimens of this species and other species of this genus.

Legitimocythere audax (Brady and Norman, 1889)

FIGURES 77J–K, 78K

?*Cythere audax* Brady and Norman, 1889:167, pl. 17, figs. 14–15.

Bathycythere audax Brady and Norman; Ayress, De Deckker, and Coles, 2004:33, pl. 1, figs. 1–5.

Legitimocythere sp. Mazzini, 2005:46, fig. 25A–J.

Locality and Age of Specimen Examined. NMC 13, Quaternary, southwestern Pacific.

Dimensions. See Table 1.

Remarks. This species has been confused with *Bathycythere vanstraateni* Sissingh, 1971. See the *Bathycythere* section for further details.

Genus *Herrigocythere* Gründel, 1973

Type Species. *Idiocythere definita* Herrig, 1965.

Remarks. *Paleoabyssocythere* Benson, 1977 (type species, *Paleoabyssocythere cenozoica* Benson, 1977) is a junior synonym of *Herrigocythere* Gründel, 1973. *Idiocythere definita* Herrig, 1965 and *Paleoabyssocythere cenozoica* share (1) a V-shaped frontal scar, (2) a paramphidont hinge with strong crenulation in the anterior tooth, (3) well-developed secondary reticulation, (4) well-developed marginal rims, subcentral tubercle, and dorsolateral ridge, (5) a well-developed but short ventrolateral ridge, and (6) a nodose carapace. Primary reticulation is absent or weakly developed. These shared characters are enough to consider that these two species are congeneric in our opinion. *Bathypterocythereis* Coles and Whatley, 1989 is also a junior synonym of *Herrigocythere*. *Bathypterocythereis* is merely a bit more nodose than *Herrigocythere*. In our opinion, the prominent anterior cardinal angle (i.e., hinge ear) is not necessarily a diagnostic character of *Herrigocythere*. *Idiocythere* Triebel, 1958 is distinguished from *Herrigocythere* by its much more elongate and slender outline, much less nodose carapace, and different position of the ventrolateral ridge. In *Idiocythere*, the short ventrolateral ridge is situated much more anteriorly than that of *Herrigocythere*. This comparison is based on the type species of *Idiocythere* (*Idiocythere lutetiana* Triebel, 1958) and *Herrigocythere* and also on the *Herrigocythere* species in the present study. *Herrigocythere* was originally erected as a subgenus of *Idiocythere*, but we consider *Herrigocythere* an independent genus, in accordance with the views of others (Donze et al., 1982; Dingle, 1985; Jarvis et al., 1988).

Herrigocythere is very similar to *Abyssocythere* Benson, 1971 and may be a junior synonym of this genus. Internal features are almost identical, that is, a well-developed amphidont-type hinge with a crenulate anterior tooth in LV and a V-shaped frontal muscle scar. However, here we consider *Herrigocythere* an independent genus for the following reasons: In *Herrigocythere*, (1) the dorsomedian adductor scar seems to be divided (although poor preservation prevents clear determination for the internal views shown in Figures 11 and 78), (2) the carapace and, in particular, the ventrolateral ridge are more nodose, (3) the outline is more triangular, especially in LV, and (4) primary reticulation is subdued. In contrast, the dorsomedian adductor scar is undivided, the carapace and ventrolateral ridge are not nodose, the outline is rather rectangular, and primary reticulation is usually well developed in *Abyssocythere*.

Synonymized Genera. *Paleoabyssocythere* Benson, 1977 and *Bathypterocythereis* Coles and Whatley, 1989.

Herrigocythere cenozoica (Benson, 1977)

FIGURES 11C–D,K–L, 78L–O

Paleoabyssocythere cenozoica Benson, 1977:876, pl. 2, fig. 7.

Locality and Age of Specimens Examined. DSDP 21A, Paleocene to early Eocene, southwestern Atlantic; DSDP 363, middle Paleocene, southeastern Atlantic.

Dimensions. See Table 1.

Remarks. Right valves and internal details of this species are shown here for the first time. Only the lateral view of the left valve (holotype specimen) of this species has been previously figured.

Herrigocythere cretacea (Benson, 1977)

FIGURES 11A–B,E–J, 78P–V

Paleoabyssocythere cretacea Benson, 1977:876, pl. 2, fig. 8.

Locality and Age of Specimens Examined. DSDP 21, Campanian–Maastrichtian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. Right and left valves and internal details of this species are shown here. Only the lateral view of the left valve (holotype specimen) of this species has been previously figured.

Herrigocythere sp. 1

FIGURE 11O–P

Locality and Age of Specimen Examined. DSDP 327A, late Campanian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. *Herrigocythere* sp. 1 is similar to *Herrigocythere cenozoica* (Benson, 1977) but is distinguished by two spines (instead of one) on the anterodorsal corner, a very large spine on the posterior half of the dorsal margin immediately anterior to the posterodorsal corner, a less nodose carapace, and better-developed primary reticulation. *Herrigocythere* sp. 1 is easily distinguished from other *Herrigocythere* species by its much less nodose appearance. *Herrigocythere* sp. 1 shows features intermediate between *Herrigocythere* and *Abyssocythere*.

Herrigocythere sp. 2

FIGURE 11Q–R

Locality and Age of Specimen Examined. DSDP 111A, late Maastrichtian, North Atlantic.

Dimensions. See Table 1.

Remarks. *Herrigocythere* sp. 2 is very similar to *Herrigocythere bathypteron* (Coles and Whatley, 1989), but the former has a more triangular outline and less prominent posterodorsal corner. *Herrigocythere* sp. 2 is easily distinguished from other *Herrigocythere* species by its much less prominent anterodorsal corner and numerous small nodes on muri.

Herrigocythere sp. 3

FIGURE 11S

Locality and Age of Specimen Examined. ARL 4778, late Cretaceous, Santonian, Europe.

Dimensions. See Table 1.

Remarks. *Herrigocythere* sp. 3 is similar to *Herrigocythere cretacea* (Benson, 1977) but is distinguished by its much more slender outline and better-developed primary reticulation.

Genus *Pennyella* Neale, 1974

Type Species. *Pennyella pennyi* Neale, 1974.

Remarks. See Yasuhara et al. (2013). *Pennyella* Neale, 1974 is similar to *Trachyleberis* Brady, 1898 but is distinguished by the lack of an ocular ridge and internal snap-knob stricture and the presence of a well-developed marginal frill in the internal view (see Figure 79 for a *Pennyella* species, *Pennyella rexi* Yasuhara et al., 2013). *Pennyella* is known from the Atlantic, Pacific, Indian, and Southern Oceans but not from the Arctic Ocean and Nordic Seas (Yasuhara et al., 2013).

Genus *Rugocythereis* Dingle, Lord, and Boomer, 1990

Type Species. *Oxycythereis horridus* Whatley and Coles, 1987.

Remarks. See Yasuhara et al. (2013). We consider the very similar genus *Abyssophilos* Jellinek and Swanson, 2003 to be a junior synonym of *Rugocythereis* Dingle et al., 1990; see Yasuhara et al. (2013) for details. *Rugocythereis* is similar to *Trachyleberis* Brady, 1898 but is distinguished by the lack of an ocular ridge and by the presence of a well-developed marginal frill in the internal view and a hinge that is paramphidont, not holamphidont as in *Trachyleberis* (see Figure 79 for a *Rugocythereis* species, *Rugocythereis horrida* (Whatley and Coles, 1987)). *Rugocythereis* is known from the Atlantic, Pacific, and Southern Oceans but not from the Arctic Ocean and Nordic Seas (Yasuhara et al., 2013).

Synonymized Genus. *Abyssophilos* Jellinek and Swanson, 2003.

Genus *Ryugucivis* gen. nov.

Type Species. *Ryugucivis jablonskii* sp. nov.

Derivation of Name. Japanese and Latin combination, citizen (*civis*: noun, nominative singular, common)

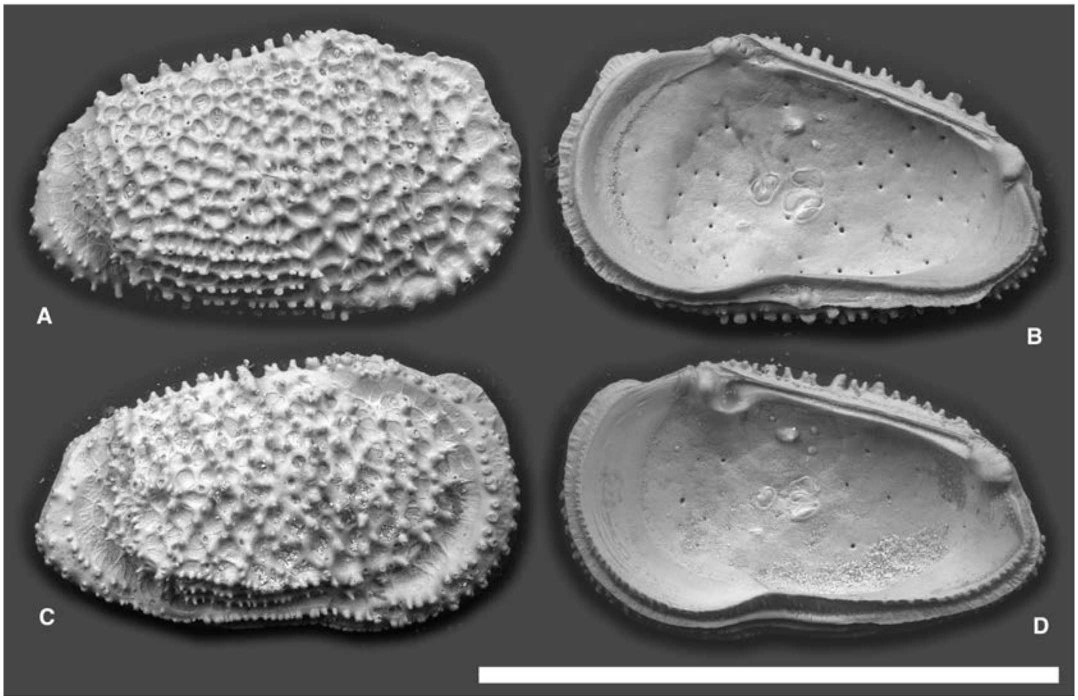


FIGURE 79. Scanning electron microscope images of *Pennyella rexi* Yasuhara et al., 2013, and *Rugocythereis horrida* (Whatley and Coles, 1987). A, C, lateral views; B, D, internal views. **A–B,** *Rugocythereis horrida* (Whatley and Coles, 1987), SIMY0014 (USNM 558059), adult RV from NMC 17, modern, southwestern Pacific. **C–D,** *Pennyella rexi* Yasuhara et al., 2013, ODP982009 (USNM 557980), adult RV from ODP 982A, 1/1/127–129, late Pleistocene, northeastern Atlantic. Scale bar represents 1 mm.

of Ryugu, the undersea palace of the tutelary deity of the sea in Japanese mythology.

Diagnosis. A trachyleberidid genus characterized by a trapezoidal-triangular outline; thin, carina-like ventrolateral ridge; punctate appearance; weakly developed primary reticulation (if any); well-developed marginal rims, well-developed marginal sulci with secondary reticulation; V-shaped frontal scar; a vertical row of four adductor scars; paramphidont hinge; marginal frill in internal view; and lack of spines on lateral surface and dorsal margin. Internal snap-knob structure unclear but may present.

Remarks. *Ryugucivis* gen. nov. is similar to *Pennyella* Neal, 1974, but it lacks spines on the lateral surface and dorsal margin and has a paramphidont hinge. This new genus is also similar to *Pseudoprotocythere* Oertli, 1966, but the latter has a long ventrolateral ridge continuing into both anterior and posterior margins, a strongly crenulate median hinge bar, a less developed anteromarginal sulcus, and a more prominent anterior cardinal angle. This new genus is distinguished from *Abyssocythere* Benson, 1971 by its triangular outline, punctate carapace, smooth dorsal margin, very well developed posterior marginal rim and sulcus, thin ventrolateral ridge, and much less prominent anterodorsal corner and by its lack of distinct primary reticulation on the anterior marginal rim.

Ryugucivis jablonskii sp. nov.

FIGURES 78W–Z, 80A–G

Derivation of Name. In honor of David Jablonski, University of Chicago, for his invaluable contributions to paleobiology.

Holotype. Adult RV, USNM 607727 (TRA711; Figures 78W, 80A–B).

Paratypes. USNM 607728, 607729, 607730, 607731 (TRA722, TRA729, TRA745, TRA746).

Type Locality and Horizon. DSDP 21, 4/3/148–150, Campanian–Maastrichtian, 28.5850°S, 30.5975°W, 2,113 m water depth, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Ryugucivis* species characterized by a finely punctate lateral surface and comparatively higher carapace in proportion to its length.

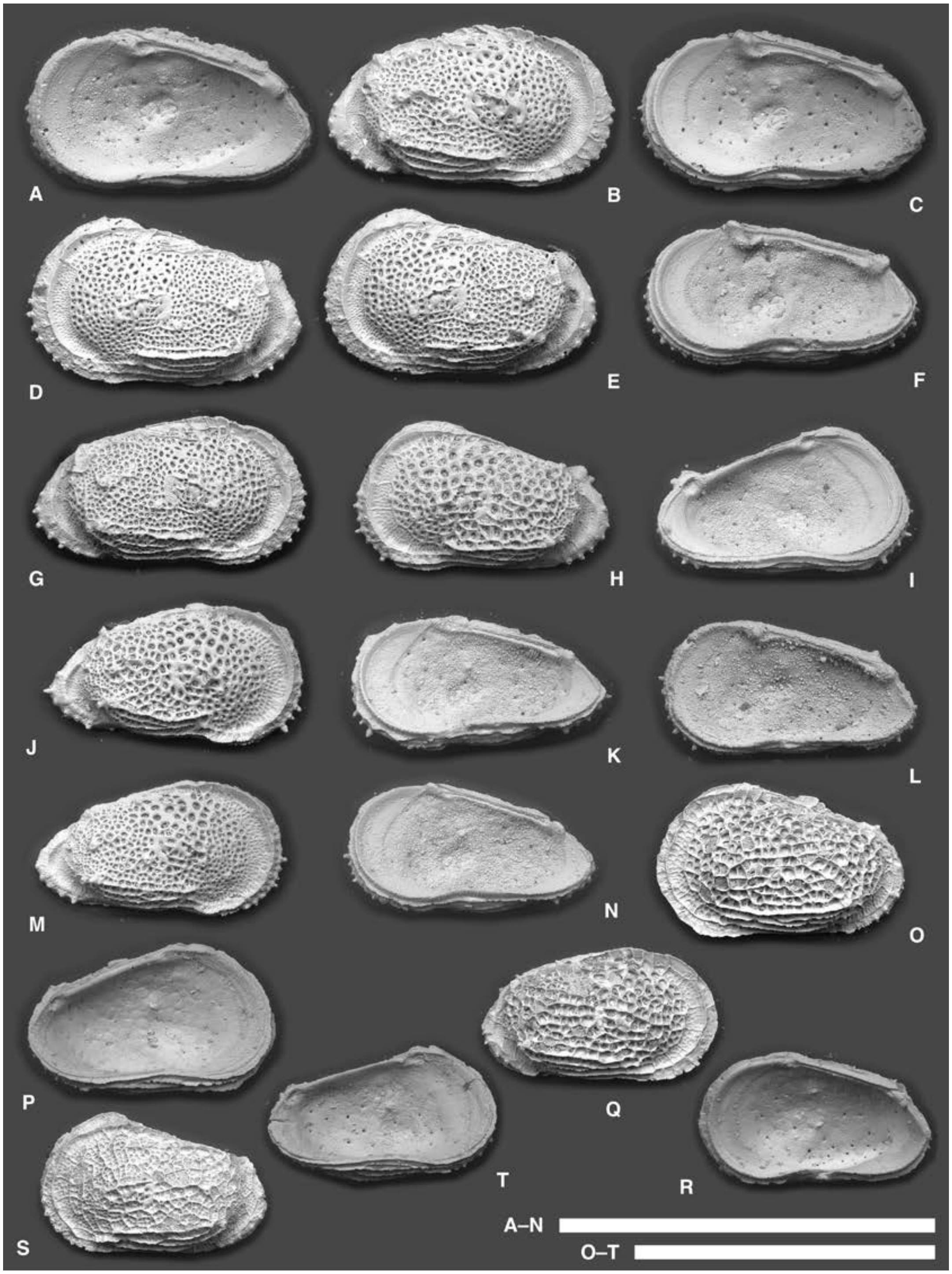


FIGURE 80. Scanning electron microscope images of *Ryugucivis jablonskii* sp. nov., *Ryugucivis acuminata* sp. nov., and *Ryugucivis obtusa* sp. nov. B, D–E, G–H, J, M, O, Q, S, lateral views; A, C, F, I, K–L, N, P, R, T, internal views. **A–G,** *Ryugucivis jablonskii* sp. nov. A–B, TRA711 (USNM 607727), adult RV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, northwestern Atlantic. C, TRA722 (USNM 607728), adult RV from DSDP 21, 4/4/60–66, Campanian–Maastrichtian, northwestern Atlantic. D, TRA729 (USNM 607729), adult LV from DSDP 21, 5/1/31–33, Campanian–Maastrichtian, northwestern Atlantic. E, TRA745 (USNM 607730), adult LV from DSDP 21, 5/3/??, Campanian–Maastrichtian, northwestern Atlantic. F–G, TRA746 (USNM 607731), adult RV from DSDP 21, 5/3/??, Campanian–Maastrichtian, northwestern Atlantic. **H–N,** *Ryugucivis acuminata* sp. nov. H–I, TRA710 (USNM 607732), adult LV from DSDP 21, 4/3/148–150, Campanian–Maastrichtian, northwestern Atlantic. J–K, TRA714 (USNM 607733), adult RV from DSDP 21, 4/1/148–150, Campanian–Maastrichtian, northwestern Atlantic. L, TRA740 (USNM 607734), adult RV from DSDP 21, 6/6/3–5, Campanian, northwestern Atlantic. M–N, TRA725 (USNM 607735), adult RV from DSDP 21, 4/5/148–150, Campanian–Maastrichtian, northwestern Atlantic. **O–T,** *Ryugucivis obtusa* sp. nov. O–P, TRA313 (USNM 607736), adult LV from DSDP 329, 5/6/80–88, late Miocene, northwestern Atlantic. Q–R, TRA314 (USNM 607737), adult RV from DSDP 329, 5/6/80–88, late Miocene, northwestern Atlantic. S–T, TRA315 (USNM 607738), adult LV from DSDP 329, 5/6/80–88, late Miocene, northwestern Atlantic. Scale bars represent 1 mm.

Description. Carapace heavily calcified, highest at anterodorsal corner. Outline subtrapezoidal-subtriangular; anterior margin evenly rounded, bearing small spines in ventral half; posterior margin bluntly acuminate, bearing small spines in ventral half; dorsal margin straight; ventral margin slightly sinuous; ventrolateral ridge relatively short and thin; short and sinuous median lateral ridge present more clearly in RV than LV. Anterodorsal corner weakly angular; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface ornamented with fine punctation and a few pore conuli. Primary reticulation very weakly developed in posterior half, and secondary reticulation well developed only in marginal sulci. Anterior and posterior marginal sulci and rims wide and very well developed. Hingement paramphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four scars; ventral and ventromedian scars smaller and close to each other. Anterior marginal frill present in internal view.

Remarks. *Ryugucivis jablonskii* sp. nov. is similar to *Ryugucivis acuminata* sp. nov. but can be distinguished by its more finely punctate and less triangular carapace. *Ryugucivis jablonskii* sp. nov. is also similar to *Ryugucivis obtusa* sp. nov., but the latter has well-developed carina-like muri on the lateral surface. *Ryugucivis jablonskii* sp. nov. also has a more strongly developed hingement than the other two *Ryugucivis* species.

Ryugucivis acuminata sp. nov.

FIGURES 80H–N, 81A–C

Derivation of Name. From the Latin *acuminata* (adjective in the nominative singular, feminine), meaning "tapering," with reference to its triangular outline and acuminate posterior margin.

Holotype. Adult LV, USNM 607732 (TRA710; Figures 80H–I, 81A).

Paratypes. USNM 607733, 607734, 607735 (TRA714, TRA740, TRA725).

Type Locality and Horizon. DSDP 21, 4/3/148–150, Campanian–Maastrichtian, 28.5850°S, 30.5975°W, 2,113 m water depth, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Ryugucivis* species characterized by a triangular outline and relatively coarse punctation, especially in midlength.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtriangular; anterior margin evenly rounded, bearing small spines in ventral half; posterior margin acuminate, especially in RV, bearing small spines in ventral half; dorsal margin straight and smooth; ventral margin slightly sinuous; ventrolateral ridge relatively short and thin. Anterodorsal corner weakly angular; posterodorsal corner prominent and angular in LV and weakly angular in RV. Lateral surface bearing punctae and a few pore conuli. Punctation coarser in midlength above subcentral muscle scar impression. Secondary reticulation well developed only in marginal sulci. Anterior and posterior marginal rims well developed. Anterior and posterior marginal sulci wide and very well developed. Hingement paramphidont. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four scars. Anterior marginal frill present in internal view in RV.

Remarks. See the *Ryugucivis jablonskii* section.

Ryugucivis obtusa sp. nov.

FIGURES 80O–T, 81D–H

Derivation of Name. From the Latin *obtusa* (adjective in the nominative singular, feminine), meaning "blunt," with reference to its bluntly acuminate posterior margin.

Holotype. Adult RV, USNM 607737 (TRA314; Figures 80Q–R, 81E–F).

Paratypes. USNM 607736, 607738 (TRA313, TRA315).

Type Locality and Horizon. DSDP 329, 5/6/80–88, late Miocene, 50.6552°S, 46.0955°W, 1,519 m water depth, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Ryugucivis* species characterized by a relatively blunt posterior margin, a comparatively high carapace in proportion to its length, and well-developed carina-like muri.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtrapezoidal-subtriangular; anterior margin evenly rounded, lacking spines; posterior margin bluntly acuminate; dorsal margin almost straight; ventral margin slightly sinuous; ventrolateral ridge thin but relatively long, especially in LV. Anterodorsal and posterodorsal corners weakly angular. Lateral surface ornamented with well-developed coarse punctation and carina-like muri. Secondary reticulation well developed only in marginal sulci. Anterior and posterior marginal rims moderately developed. Anterior and posterior marginal sulci wide and well developed. Hingement amphidont-type (details not visible). Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four scars. Anterior marginal frill present in internal view in RV.

Remarks. See the *Ryugucivis jablonskii* section. In addition, *Ryugucivis obtusa* sp. nov. is distinguished from other *Ryugucivis* species by its spineless anterior margin. The specimen shown in Figure 80S–T shows a rather reticulate appearance with primary and secondary reticulation (instead of a deeply punctate appearance) but otherwise is very similar to holotype and paratype specimens. As all of the specimens are from the same core and interval, we tentatively consider this reticulate form (Figure 80S–T) an intraspecific variant of *Ryugucivis obtusa* sp. nov.

Ryugucivis sp. 1

FIGURE 82A–B

Locality and Age of Specimen Examined. DSDP 305, late Albian, northwestern Pacific.

Dimensions. See Table 1.

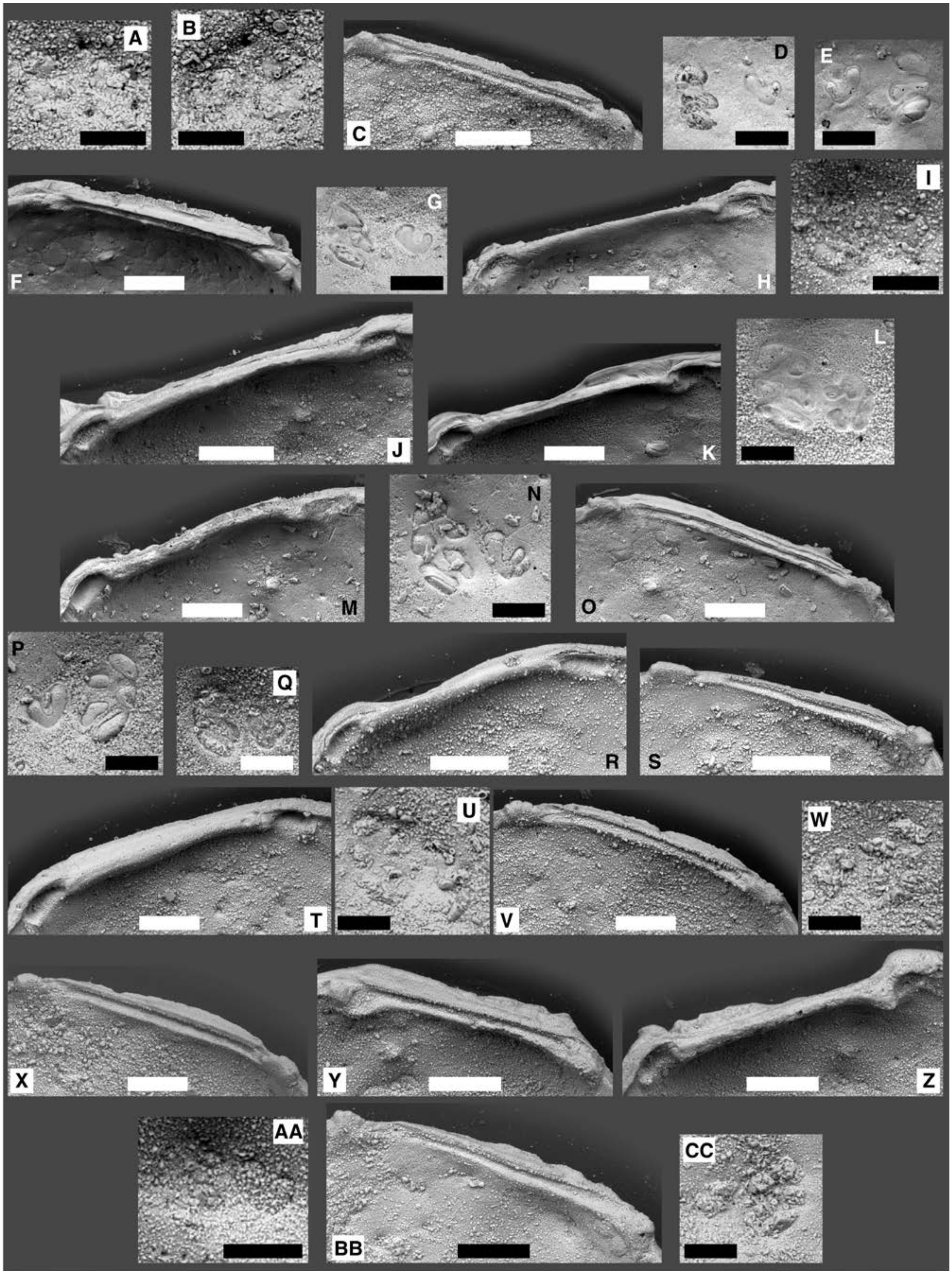

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FIGURE 81. (Opposite page) Internal details of *Ryugucivis acuminata* sp. nov., *Ryugucivis obtusa* sp. nov., *Ryugucivis* sp. 2, *Phacorhabdotus mazzinireticulatus* sp. nov., *Phacorhabdotus anteronudus* Coles and Whatley, 1989, *Phacorhabdotus nudus* sp. nov., *Phacorhabdotus slipperi* sp. nov., and *Phacorhabdotus subtridentus* Benson, 1977. **A–C,** *Ryugucivis acuminata* sp. nov. A, TRA710 (USNM 607732), adult LV, subcentral muscle scars. B, TRA714 (USNM 607733), adult RV, subcentral muscle scars. C, TRA725 (USNM 607735), adult RV, hingement. **D–H,** *Ryugucivis obtusa* sp. nov. D, TRA313 (USNM 607736), adult LV, subcentral muscle scars. E–F, TRA314 (USNM 607737), adult RV. E, subcentral muscle scars. F, hingement. G–H, TRA315 (USNM 607738), adult LV. G, subcentral muscle scars. H, hingement. **I–J,** *Ryugucivis* sp. 2, TRA754 (USNM 607740), adult LV. I, subcentral muscle scars. J, hingement. **K–L,** *Phacorhabdotus mazzinireticulatus* sp. nov., TRA147 (USNM 607741), adult LV. K, hingement. L, subcentral muscle scars. **M–S,** *Phacorhabdotus anteronudus* Coles and Whatley, 1989. M–N, TRA303 (USNM 607743), adult LV. M, hingement. N, subcentral muscle scars. O–P, TRA304 (USNM 607744), adult RV. O, hingement. P, subcentral muscle scars. Q, TRA337 (USNM 607745), adult LV, subcentral muscle scars. R, TRA752 (USNM 607746), adult LV, hingement. S, TRA753 (USNM 607747), adult RV, hingement. **T–X,** *Phacorhabdotus nudus* sp. nov. T–U, TRA715 (USNM 607756), adult LV. T, hingement. U, subcentral muscle scars. V–W, TRA717 (USNM 607758), adult RV. V, hingement. W, subcentral muscle scars. X, TRA718 (USNM 607759), adult RV, hingement. **Y–AA,** *Phacorhabdotus slipperi* sp. nov. Y, TRA809 (USNM 607753), adult RV, hingement. Z–AA, TRA808 (USNM 607755), adult LV. Z, hingement. AA, subcentral muscle scars. **BB–CC,** *Phacorhabdotus subtridentus* Benson, 1977, TRA742 (USNM 607752), adult RV. BB, hingement. CC, subcentral muscle scars. Scale bars represent 0.1 mm for C, F, H, J–K, M, O, R–T, V, X–Z, BB and 50 μm for A–B, D–E, G, I, L, N, P–Q, U, W, AA, CC.

Remarks. *Ryugucivis* sp. 1 and *Ryugucivis* sp. 2 are very similar to each other, but the latter has a much better developed ventrolateral ridge.

Ryugucivis sp. 2

FIGURE 81I–J, 82C–D

Locality and Age of Specimen Examined. DSDP 327A, late Campanian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. *Ryugucivis* sp. 2 is distinguished from *Ryugucivis acuminata* sp. nov. by its much better developed secondary reticulation.

Genus *Phacorhabdotus* Howe and Laurencich, 1958

Type Species. *Phacorhabdotus texanus* Howe and Laurencich, 1958.

Remarks. See Howe and Laurencich (1958) and Pokorný (1963a) for a detailed discussion of this genus. *Phacorhabdotus* Howe and Laurencich, 1958 is similar to *Ambocythere* van den Bold, 1957a, but the latter has a well-developed caudal process with distinct marginal spines, a very broad (especially anterior) inner lamella, and a vertical row of four undivided adductor scars; *Ambocythere* also lacks a marginal frill in the internal view. In *Phacorhabdotus* the dorsal and/or dorsomedian adductor scars are divided. Well-preserved specimens of the present study clarify the details of adductor scars in the genus (see Figures 81 and 85): dorsal and/or dorsomedian adductor scars are divided, and ventral and ventromedian adductor scars are very closely positioned (Pokorný [1963a, text-figs. 12–13] probably misidentified these two scars as one ventral scar).

However, we should note that Coles and Whatley (1989) reported two *Phacorhabdotus* species with a vertical row of four undivided adductor scars. These species otherwise have typical internal and external features of the genus, including a holamphidont hinge, V-shaped frontal scar, three lateral ridges in the posterior half, and an almost smooth carapace. In addition, although Howe and Laurencich (1958), Pokorný (1963a), and Coles and Whatley (1989) consistently reported that *Phacorhabdotus* species have a holamphidont hinge (i.e., amphidont-type hinge with smooth anterior and posterior terminal teeth in RV), our specimens of *Phacorhabdotus* shown in Figures 81, 83, 84, and 85 show crenulate terminal teeth in RV (i.e., paramphidont hingement). This condition may be a preservational artifact as suggested by Pokorný (1963a), but that seems unlikely to us. Also, the anterior terminal tooth of the median hinge element in LV (or the socket in RV) is often very weakly developed, approaching a merodont-type hinge. In sum, adductor scar and hingement features of this genus are still somewhat unresolved. (Note that the SEM images of internal views of these species shown in Coles and Whatley [1989, pl. 5, figs. 8, 10] do not have enough resolution to observe subcentral muscle scars, but some adductor scars seem to be divided to M.Y.)

Phacorhabdotus mazzinireticulatus sp. nov.

FIGURES 81K–L, 83A–C

Derivation of Name. In honor of Ilaria Mazzini, Consiglio Nazionale delle Ricerche, Istituto di Geologia Ambientale e Geoingegneria, Italy, for her contribution to

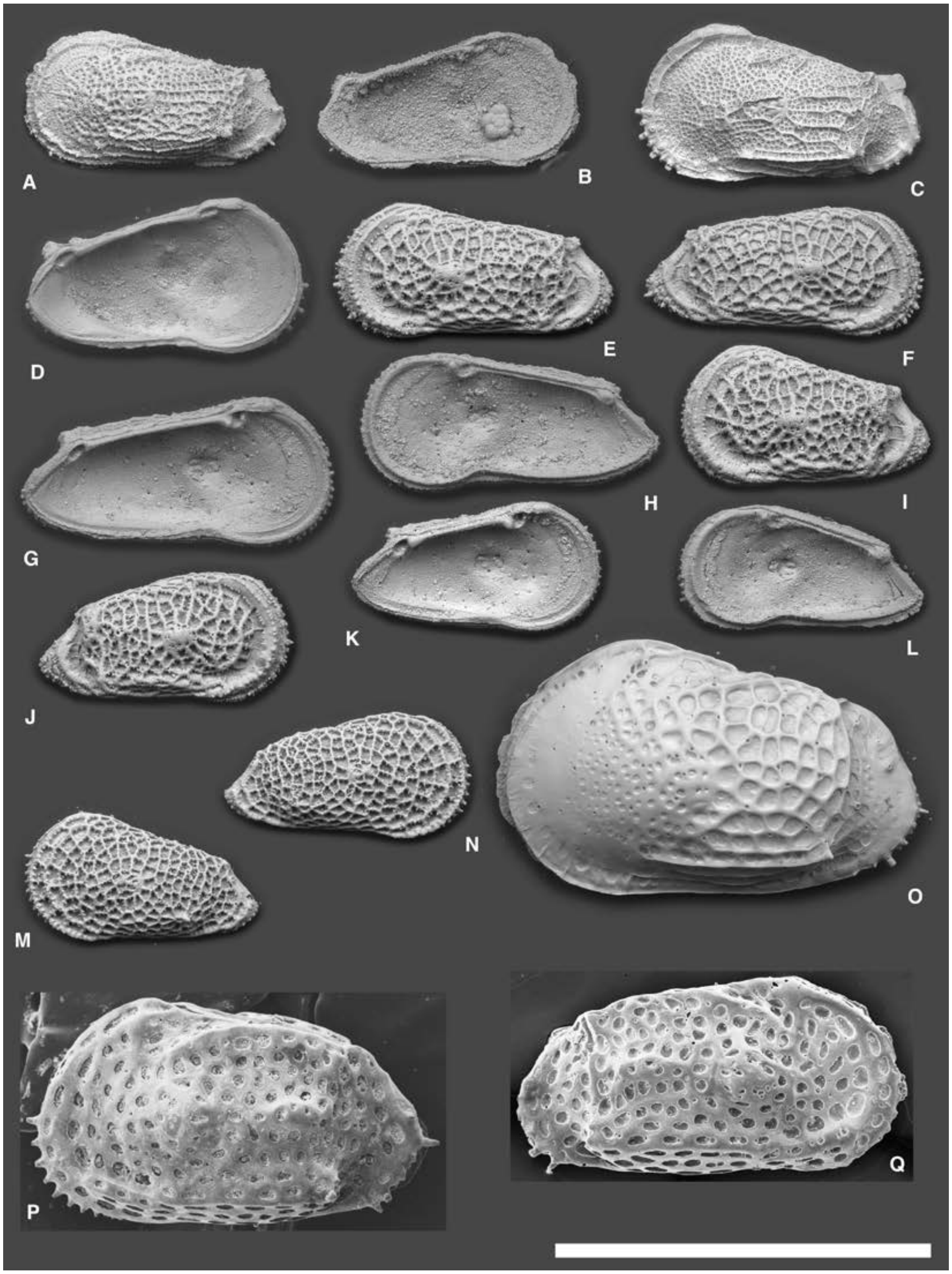

FIGURE 82. Scanning electron microscope images of *Ryugucivis* sp. 1, *Ryugucivis* sp. 2, *Trachyleberidea elegans* Guernet, 1985, *Philoneptunus gigas* Jellinek and Swanson, 2003, and *Philoneptunus gravezia* (Hornibrook, 1952). A, C, E–F, I–J, M–Q, lateral views; B, D, G–H, K–L, internal views. **A–B,** *Ryugucivis* sp. 1, TRA450 (USNM 607739), adult? LV from DSDP 305, 42/1/120–126, late Albian, northwestern Pacific. **C–D,** *Ryugucivis* sp. 2, TRA754 (USNM 607740), adult LV from DSDP 327A, 13/2/100–105, late Campanian, northwestern Atlantic. **E–N,** *Trachyleberidea elegans* Guernet, 1985. E, RB211 (USNM 607823), adult LV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. F, RB212 (USNM 607824), adult RV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. G, RB217 (USNM 607825), adult LV from DSDP 214, 26/cc/50cc, early Oligocene, Indian Ocean. H, RB218 (USNM 607826), adult RV from DSDP 214, 26/cc/50cc, early Oligocene, Indian Ocean. I, RB213 (USNM 607827), adult LV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. J, RB214 (USNM 607828), adult RV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. K, RB215 (USNM 607829), adult LV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. L, RB216 (USNM 607830), adult RV from DSDP 214, 28/3/50–56, late Eocene, Indian Ocean. M, RB219 (USNM 607831), juvenile LV from DSDP 214, 26/cc/50cc, early Oligocene, Indian Ocean. N, RB220 (USNM 607832), juvenile RV from DSDP 214, 26/cc/50cc, early Oligocene, Indian Ocean. **O,** *Philoneptunus gigas* Jellinek and Swanson, 2003, SIMY0012 (USNM 607786), juvenile LV from NMC 14, 0–5, Modern, southwestern Pacific. **P–Q,** *Philoneptunus gravezia* (Hornibrook, 1952); images provided by M. A. Ayress, used with permission. P, OP 1154, adult LV from topotype locality, New Zealand. Q, adult RV from J42/f208. Scale bar represents 1 mm.

Pacific deep-sea ostracod taxonomy and with reference to its reticulate carapace (*reticulatus*: Latin, adjective in the nominative singular, masculine).

Holotype. Adult LV, USNM 607741 (TRA147; Figures 81K–L, 83A–B).

Paratype. USNM 607742 (TRA948).

Type Locality and Horizon. Alb 4728, Modern, 13.7833°S, 114.3667°W, 1,899 m water depth, southeastern Pacific.

Other Locality. SC 8, Quaternary, northwestern Pacific.

Dimensions. See Table 1.

Diagnosis. *Phacorhabdotus* species characterized by its slender outline, thin lateral ridges, and partially developed primary and secondary reticulation.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline elongate, subrectangular-subtrapezoidal; anterior margin evenly rounded, bearing well-developed marginal frill; posterior margin bluntly acuminate, bearing small spines in ventral half; dorsal margin almost straight and smooth; ventral margin smooth and slightly sinuous; ventrolateral ridge well developed, long, and straight; median lateral ridge well developed; dorsolateral ridge short, but well developed. Anterodorsal corner rounded; posterodorsal corner weakly angular in RV and prominent in LV. Lateral surface ornamented partially with primary and secondary reticulation especially in posterior one-third of carapace. Anterior marginal rim well developed. Hingement amphidont type, but anterior terminal tooth of median hinge element in LV very weakly developed, approaching merodont type. Frontal muscle scar divided into four scars (but this may be a preservational artifact similar to that reported by Pokorný, 1963a). Adductor muscle scars consist of a vertical row of four scars; dorsal scar is divided; dorsomedian scar is divided or at least narrows in the middle; ventromedian and ventral scars are very close to each other. Anterior marginal frill well developed in internal view.

Remarks. *Phacorhabdotus mazzinireticulatus* sp. nov. is very similar to *Phacorhabdotus* sp. of Mazzini (2005) but is distinguished by its distinct anterior marginal rim, thinner lateral ridges, and more slender outline. This species is also similar to *Phacorhabdotus posteropunctissima* Coles and Whatley, 1989, but that species lacks primary reticulation and distinct anterior marginal rims, and it has thicker lateral ridges.

Phacorhabdotus anteronudus Coles and Whatley, 1989

FIGURES 81M–S, 83D–M

?*Phacorhabdotus* (generic assignment only); Laughton, Berggren, Benson, Davies, Franz, Musich, Perch-Nielsen, Ruffman, van Hinte, and Whitmarsh, 1972, pl. 12, fig. 4.

Phacorhabdotus varians (Bornemann); Hazel, Mumma, and Huff, 1980, pl. 6, figs. 2–3.

Phacorhabdotus aff. *P. sculptilis* (Alexander); Cronin and Compton-Gooding, 1987, pl. 1, fig. 3.

Phacorhabdotus anteronudus Coles and Whatley, 1989:104, pl. 5, figs. 6–8; pl. 7, figs. 9–10.

Locality and Age of Specimens Examined. DSDP 329, late Miocene, southwestern Atlantic; DSDP 356, early Paleocene, southwestern Atlantic; DSDP 327A, late Campanian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. *Phacorhabdotus anteronudus* Coles and Whatley, 1989 is very similar to *Phacorhabdotus semiplicatus* (Reuss, 1846) (based on a sketch in Pokorný, 1963a), but the latter has well-developed marginal carina throughout the anterior and dorsal margins. In *Phacorhabdotus anteronudus*, this carina runs precisely along the anterodorsal margin. In addition, the dorsolateral ridge is longer in *Phacorhabdotus semiplicatus* than in *Phacorhabdotus anteronudus*. *Phacorhabdotus anteronudus* is also very similar to *Phacorhabdotus texanus* Howe and Laurencich, 1958 (based on a sketch in Pokorný, 1963a), but it is distinguished by its less slender outline and shorter dorsolateral ridge. *Phacorhabdotus furcatus* (Pietrzeniuk, 1965) is distinguished from *Phacorhabdotus anteronudus* by its furcate median lateral ridge and partially divided V-shaped frontal scar (composed of a large V-shaped scar plus a small rounded scar). Comparisons with other species similar to this species can be found in Coles and Whatley (1989). Coles and Whatley's (1989) specimens and our specimens share most of the internal and external features, but the adductor muscle scars are different. Coles and Whatley (1989) described and sketched a vertical row of four undivided adductor scars. (Note that the SEM image of the internal view shown in Coles and Whatley [1989, pl. 5, fig. 8] does not have enough resolution to observe details of subcentral muscle scars, but some adductor scars look divided to M.Y.) However, our specimens of this and other *Phacorhabdotus* species consistently show divided dorsomedian and/or dorsal adductor scars, and thus, we believe this is a diagnostic feature of the genus. In addition, the anterior terminal tooth of the median hinge element in LV (or the socket in RV) is often very weakly developed, approaching a merodont-type hinge, as mentioned above. Our specimens have considerable size variation. Miocene specimens (Figure 83D–G) are larger than Paleocene (Figure 83H–I) and Cretaceous specimens (Figure 83J–M). Our specimens also have considerable morphological variation, especially in the shape of the posterior margin and the development of lateral ridges. We tentatively consider these differences to represent intraspecific variation.

Phacorhabdotus nudus sp. nov.

FIGURES 81T–X, 84A–F

Derivation of Name. From the Latin *nudus* (adjective in the nominative singular, masculine), meaning "nude," with reference to its carapace lacking any lateral ornamentation.


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FIGURE 83. (Opposite page) Scanning electron microscope images of *Phacorhabdotus mazzinireticulatus* sp. nov., *Phacorhabdotus anteronudus* Coles and Whatley, 1989, *Phacorhabdotus* sp. 1, *Phacorhabdotus subtridentus* Benson, 1977, and *Phacorhabdotus slipperi* sp. nov. A, C–D, F, H, J, L, N–Q, S, U, W, lateral views; B, E, G, I, K, M, R, T, V, X, internal views. **A–C,** *Phacorhabdotus mazzinireticulatus* sp. nov. A–B, TRA147 (USNM 607741), adult LV from Alb 4728, Modern, southeastern Pacific. C, TRA948 (USNM 607742), adult RV from SC 8, 5–10, Quaternary, equatorial western Pacific. **D–M,** *Phacorhabdotus anteronudus* Coles and Whatley, 1989. D–E, TRA303 (USNM 607743), adult LV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. F–G, TRA304 (USNM 607744), adult RV from DSDP 329, 5/6/80–88, late Miocene, southwestern Atlantic. H–I, TRA337 (USNM 607745), adult LV from DSDP 356, 28/3/59–61, early Paleocene, southwestern Atlantic. J–K, TRA752 (USNM 607746), adult LV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. L–M, TRA753 (USNM 607747), adult RV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. **N, P,** *Phacorhabdotus* sp. 1. N, TRA727 (USNM 607748), adult LV from DSDP 21, 4/5/148–150, Campanian–Maastrichtian, southwestern Atlantic. P, TRA728 (USNM 607750), adult LV from DSDP 21, 4/5/148–150, Campanian–Maastrichtian, southwestern Atlantic. **O, Q–T,** *Phacorhabdotus subtridentus* Benson, 1977. O, TRA726 (USNM 607749), adult LV from DSDP 21, 4/5/148–150, Campanian–Maastrichtian, southwestern Atlantic. Q–R, TRA741 (USNM 607751), adult RV from DSDP 21, 6/6/3–5, Campanian, southwestern Atlantic. S–T, TRA742 (USNM 607752), adult RV from DSDP 21, 6/6/3–5, Campanian, southwestern Atlantic. **U–X,** *Phacorhabdotus slipperi* sp. nov. U–V, TRA809 (USNM 607753), adult RV from DSDP 363, 17/2/71–88, middle Paleocene, southeastern Atlantic. W, TRA807 (USNM 607754), adult LV from DSDP 363, 17/2/71–88, middle Paleocene, southeastern Atlantic. X, TRA808 (USNM 607755), adult LV from DSDP 363, 17/2/71–88, middle Paleocene, southeastern Atlantic. Scale bar represents 1 mm.

Holotype. Adult RV, USNM 607758 (TRA717; Figures 81V–W, 84D–E).

Paratypes. USNM 607756, 607757, 607759 (TRA715, TRA716, TRA718).

Type Locality and Horizon. DSDP 21, 4/2/??, Campanian–Maastrichtian, 28.5850°S, 30.5975°W, 2,113 m water depth, southwestern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Phacorhabdotus* species characterized by a smooth carapace.

Description. Carapace moderately calcified, highest at anterodorsal corner. Outline subtrapezoidal; anterior margin evenly rounded and smooth; posterior margin bluntly acuminate and smooth; dorsal margin slightly convex and smooth; ventral margin smooth and slightly sinuous. Anterodorsal and posterodorsal corners weakly angular. Lateral surface lacks any ornamentation. Anterior and posterior terminal teeth in RV look crenulate; anterior terminal tooth of median hinge element in LV appears to be absent, and thus, hingement should be hemimerodont, although the possibility of this being a preservational artifact cannot be excluded. Frontal muscle scar V shaped. Adductor muscle scars consist of a vertical row of four scars; details not clearly preserved, but dorsomedian and dorsal scars may be divided. Anterior marginal frill seen in internal view.

Remarks. *Phacorhabdotus nudus* sp. nov. differs from all other *Phacorhabdotus* species in its lack of any lateral ornamentation.

Phacorhabdotus slipperi sp. nov.

FIGURES 81Y–AA, 83U–X

Derivation of Name. In honor of Ian J. Slipper, University of Greenwich, for his contributions to Cretaceous ostracod research.

Holotype. Adult RV, USNM 607753 (TRA809; Figures 81Y, 83U–V).

Paratypes. USNM 607754, 607755 (TRA807, TRA808).

Type Locality and Horizon. DSDP 363, 17/2/71–88, middle Paleocene, 19.6458°S, 9.0467°E, 2,248 m water depth, southeastern Atlantic.

Dimensions. See Table 1.

Diagnosis. *Phacorhabdotus* species characterized by a punctate carapace and well-developed lateral ridges.

Description. Carapace heavily calcified, highest at anterodorsal corner. Outline subrectangular-subtrapezoidal; anterior margin evenly rounded and smooth; posterior margin bluntly acuminate and smooth; dorsal margin concave and smooth; ventral margin smooth and slightly sinuous; ventral, median lateral, and dorsolateral ridges long and well developed. Anterodorsal and posterodorsal corners weakly angular in RV and prominent in LV. Lateral surface ornamented with punctation. Hingement amphidont type. Frontal muscle scar seems to be V shaped. Adductor muscle scars consist of a vertical row of four scars; dorsomedian and/or dorsal scars seem to be divided.

Remarks. *Phacorhabdotus slipperi* sp. nov. is distinguished from any other *Phacorhabdotus* species by the presence of well-developed punctation throughout the lateral surface.

Phacorhabdotus subtridentus Benson, 1977

FIGURES 81BB–CC, 83O,Q–T

Phacorhabdotus subtridentus Benson, 1977:877, pl. 1, fig. 2.

Locality and Age of Specimens Examined. DSDP 21, Campanian–Maastrichtian, southwestern Atlantic.

Dimensions. See Table 1.

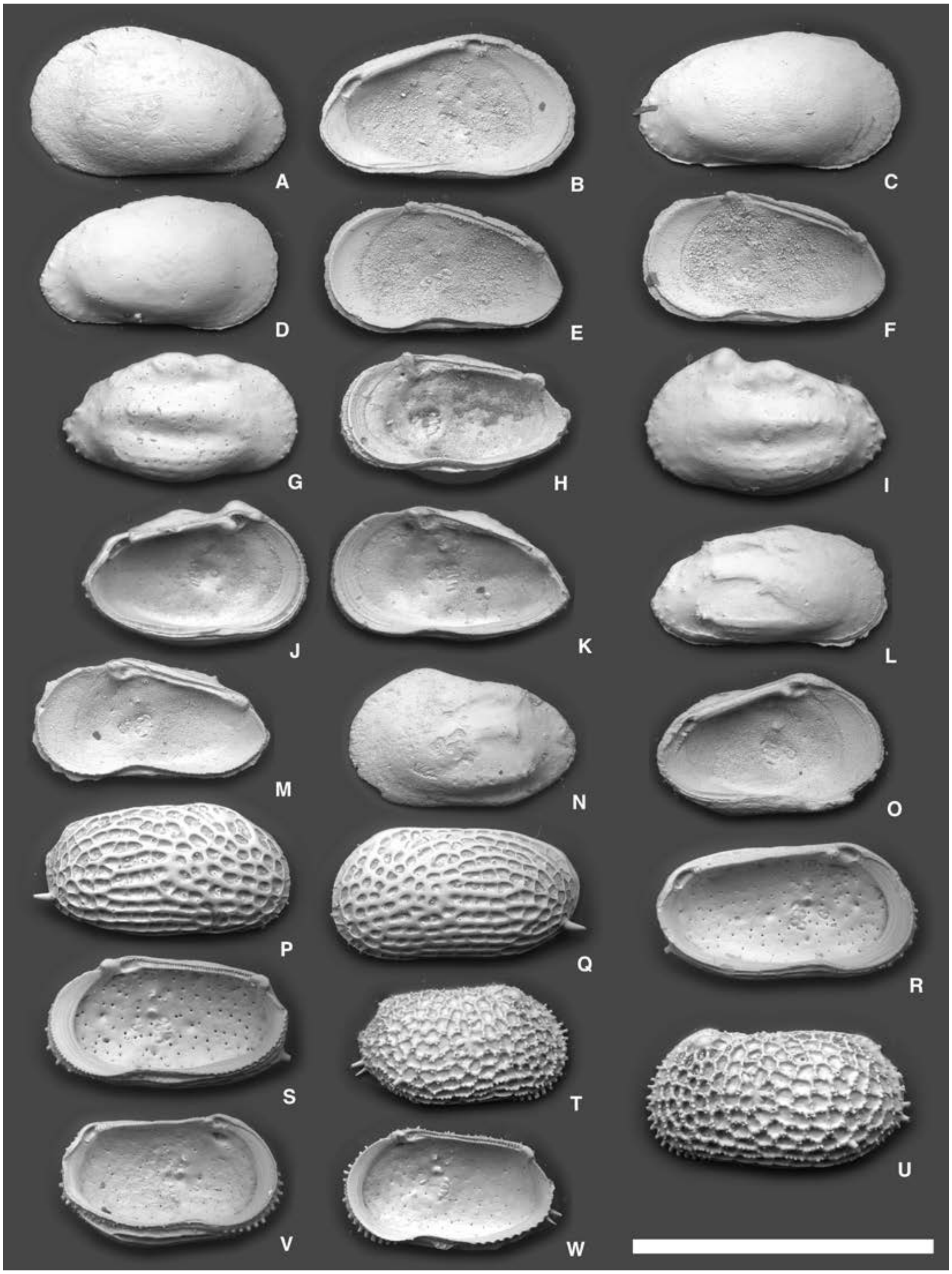


FIGURE 84. Scanning electron microscope images of *Phacorhabdotus nudus* sp. nov., *Veenia* sp. 1, *Phacorhabdotus* cf. *subtridentus* Benson, 1977, *Bicornucythere bisanensis* (Okubo, 1975), and *Pistocythereis bradyi* (Ishizaki, 1968). A, C–D, G, I, L, N, P–Q, T–U, lateral views; B, E–F, H, J–K, M, O, R–S, V–W, internal views. **A–F,** *Phacorhabdotus nudus* sp. nov. A–B, TRA715 (USNM 607756), adult LV from DSDP 21, 4/2/??, Campanian–Maastrichtian, southwestern Atlantic. C, TRA716 (USNM 607757), adult RV from DSDP 21, 4/2/??, Campanian–Maastrichtian, southwestern Atlantic. D–E, TRA717 (USNM 607758), adult RV from DSDP 21, 4/2/??, Campanian–Maastrichtian, southwestern Atlantic. F, TRA718 (USNM 607759), adult RV from DSDP 21, 4/2/??, Campanian–Maastrichtian, southwestern Atlantic. **G–K,** *Veenia* sp. 1. G–H, TRA814 (USNM 607760), adult RV from ARL 4730, Campanian?, Europe. I–J, TRA813 (USNM 607761), adult LV from ARL 4730, Campanian?, Europe. K, TRA815 (USNM 607762), adult RV from ARL 4730, Campanian?, Europe. **L–O,** *Phacorhabdotus* cf. *subtridentus* Benson, 1977. L–M, TRA770 (USNM 607763), adult RV from DSDP 111A, 11/6/50–56, Campanian, North Atlantic. N–O, TRA769 (USNM 607764), adult LV from DSDP 111A, 11/6/50–56, Campanian, North Atlantic. **P–S,** *Bicornucythere bisanensis* (Okubo, 1975). P, TRA1102 (USNM 607765), adult RV from OB2, 106, Holocene, Japan. Q, TRA1103 (USNM 607766), adult LV from OB2, 106, Holocene, Japan. R, TRA1105 (USNM 607767), adult LV from OB2, 106, Holocene, Japan. S, TRA1106 (USNM 607768), adult RV from OB2, 106, Holocene, Japan. **T–W,** *Pistocythereis bradyi* (Ishizaki, 1968). T, W, TRA1049 (USNM 607769), adult RV from UU-16, Modern, Japan. U, TRA1117 (USNM 607770), adult LV from OB2, 116, Holocene, Japan. V, TRA1107 (USNM 607771), adult LV from OB2, 106, Holocene, Japan. Scale bar represents 1 mm.

Remarks. This is the first report of this species other than the original description by Benson (1977), who showed only the lateral view of the left valve of the holotype specimen. Right valves shown here completely lack primary reticulation. We consider this difference to be intraspecific variation.

Phacorhabdotus cf. *subtridentus* Benson, 1977

FIGURES 84L–O, 85A–D

Locality and Age of Specimens Examined. DSDP 111A, Campanian, North Atlantic.

Dimensions. See Table 1.

Remarks. This species is very similar to *Phacorhabdotus subtridentus* Benson, 1977, but it has better-developed median lateral and dorsolateral ridges and a comparatively more upturned posterior margin.

Phacorhabdotus sp. 1

FIGURE 83N,P

Locality and Age of Specimens Examined. DSDP 21, Campanian–Maastrichtian, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. *Phacorhabdotus* sp. 1 is similar to *Phacorhabdotus anteronudus* Coles and Whatley, 1989, but it is distinguished by the lack of both a median lateral ridge and an anterior marginal rim. *Phacorhabdotus* sp. 1 is also similar to *Phacorhabdotus subtridentus* Benson, 1977, but it is distinguished by the prominent posterodorsal corner and by the lack of a median lateral ridge.

Genus *Veenia* Butler and Jones, 1957

Type Species. *Cythereis ozanana* Israelsky, 1929 (see Benson and Tatro [1964] and Puri [1974] for clear photographs of this species).

Remarks. *Veenia* Butler and Jones, 1957 is very similar to *Protocythere* Triebel, 1938, but the former has an amphidont-type hinge. There are no other notable differences between these two genera (e.g., see Slipper, 2009; note that we consider *Homocythere* Kaye, 1963 a junior synonym of *Veenia*; see below). *Veenia* species are distinguished from *Phacorhabdotus* Howe and Laurencich, 1958 by the presence of a vertical row of four undivided adductor scars, an almond-shaped outline, a convex ventral margin, and long, broad ventrolateral, median, and dorsolateral ridges that often have obscure edges. We consider *Veenia* to include all types of amphidont hinges, with and without crenulation on the anterior and/or posterior terminal teeth in RV. Thus, *Homocythere* Kaye, 1963, *Protoveenia* Damotte, 1961, and *Mandocythere* Gründel, 1964 are junior synonyms of *Veenia* in our opinion because they share almost all of the diagnostic features, except the presence or absence of crenulation on the terminal teeth of the hingement. Some useful discussions on the hingement and phylogenetics of genera related to *Veenia* can be found in Gründel (1974), Schornikov (1975), and Malz et al. (2005), but we do not always agree with them.

Synonymized Genera. *Homocythere* Kaye, 1963, *Protoveenia* Damotte, 1961, and *Mandocythere* Gründel, 1964.

Veenia sp. 1

FIGURES 84G–K, 85E–J

Locality and Age of Specimens Examined. ARL 4730, Campanian?, Belgium, Europe.

Dimensions. See Table 1.

Genus *Bicornucythere* Schornikov and Shaitarov, 1979

Type Species. *Leguminocythereis bisanensis* Okubo, 1975.

Remarks. *Bicornucythere* Schornikov and Shaitarov, 1979 is similar to *Anebocythereis* Bate, 1972, but *Anebocythereis* has multiple posterior spines as opposed to the single distinct posteroventral spine in *Bicornucythere*. Arrangement of adductor scars is also very different. In *Bicornucythere*, ventromedian and ventral scars are almost horizontally arranged (see Figure 85L,N), unlike the vertical row of four adductor scars in *Anebocythereis*. No deep-sea species of *Bicornucythere* are known.

Bicornucythere bisanensis (Okubo, 1975)

FIGURES 84P–S, 85K–N

Locality and Age of Specimens Examined. OB2, Holocene, Osaka Bay, Japan.

Dimensions. See Table 1.

Genus *Pistocythereis* Gou in Gou et al., 1983

Type Species. *Echinocythereis bradyi* Ishizaki, 1968.

Remarks. *Pistocythereis* Gou, 1983 is similar to *Anebocythereis* Bate, 1972 and *Lankacythere* Bhatia and Kumar, 1979 (the lectotype SEM image of the type species is shown in Zhao and Whatley, 1989), but *Anebocythereis* and *Lankacythere* have a V-shaped frontal scar, unlike the subovate frontal scar in *Pistocythereis*. No deep-sea *Pistocythereis* species are known.

Pistocythereis bradyi (Ishizaki, 1968)

FIGURES 84T–W, 85O–R

Locality and Age of Specimens Examined. UU-16, Modern, Urauchi Bay, Japan; OB2, Holocene, Osaka Bay, Japan.

Dimensions. See Table 1.

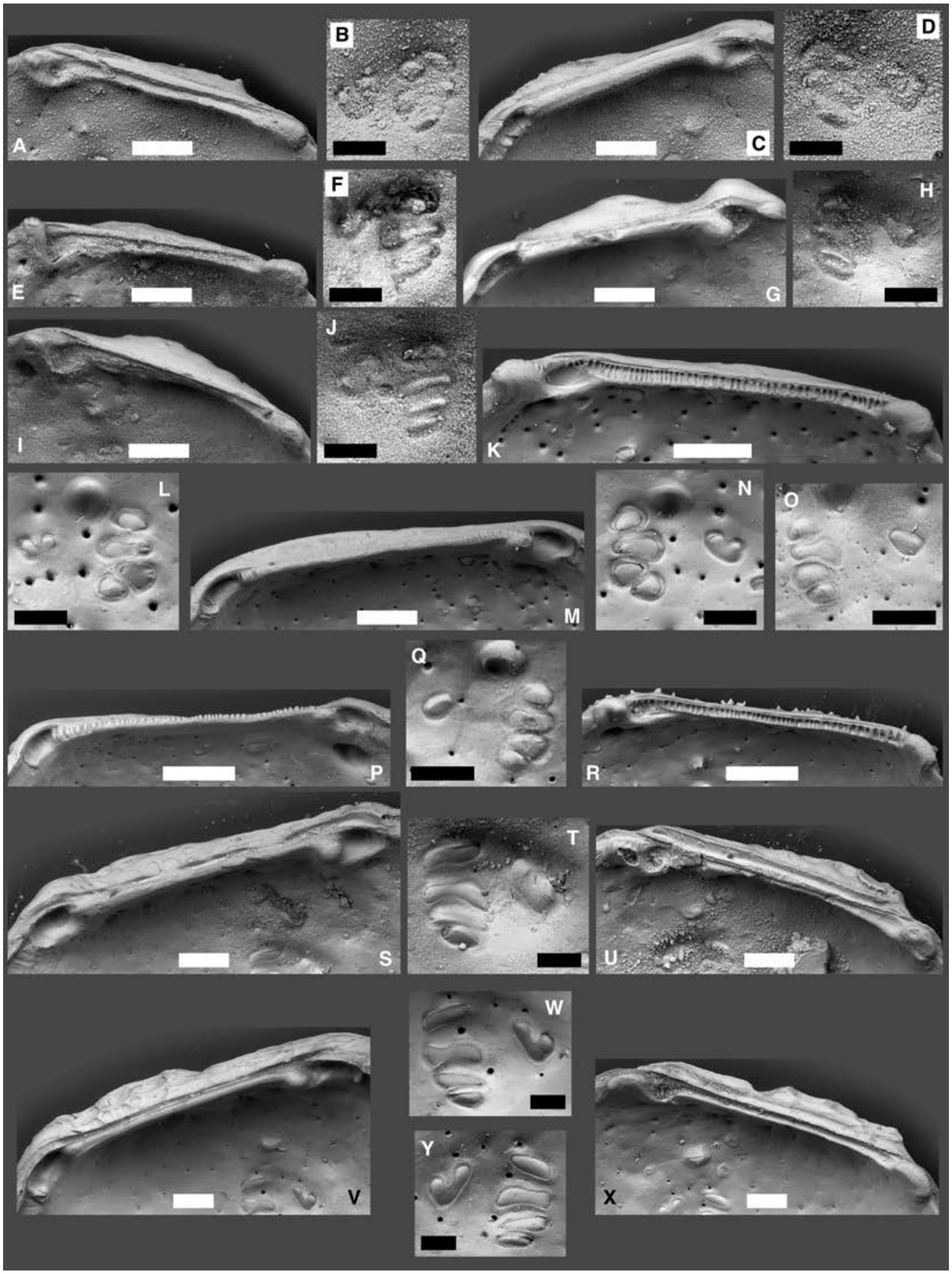


FIGURE 85. Internal details of *Phacorhabdotus* cf. *subtridentus* Benson, 1977, *Veenia* sp. 1, *Bicornucythere bisanensis* (Okubo, 1975), *Pistocythereis bradyi* (Ishizaki, 1968), *Philoneptunus gravezia* (Hornibrook, 1952), and *Philoneptunus cassidyi* Ayress et al., 2004. **A–D,** *Phacorhabdotus* cf. *subtridentus* Benson, 1977. A–B, TRA770 (USNM 607763), adult RV. A, hingement. B, subcentral muscle scars. C–D, TRA769 (USNM 607764), adult LV. C, hingement. D, subcentral muscle scars. **E–J,** *Veenia* sp. 1. E–F, TRA814 (USNM 607760), adult RV. E, hingement. F, subcentral muscle scars. G–H, TRA813 (USNM 607761), adult LV. G, hingement. H, subcentral muscle scars. I–J, TRA815 (USNM 607762), adult RV. I, hingement. J, subcentral muscle scars. **K–N,** *Bicornucythere bisanensis* (Okubo, 1975). K–L, TRA1106 (USNM 607768), adult RV. K, hingement. L, subcentral muscle scars. M–N, TRA1105 (USNM 607767), adult LV. M, hingement. N, subcentral muscle scars. **O–R,** *Pistocythereis bradyi* (Ishizaki, 1968). O–P, TRA1107 (USNM 607771), adult LV. O, subcentral muscle scars. P, hingement. Q–R, TRA1049 (USNM 607769), adult RV. Q, subcentral muscle scars. R, hingement. **S–U,** *Philoneptunus gravezia* (Hornibrook, 1952). S–T, TRA1042 (USNM 607772), adult LV. S, hingement. T, subcentral muscle scars. U, TRA1043 (USNM 607773), adult RV, hingement. **V–Y,** *Philoneptunus cassidyi* Ayress et al., 2004. V–W, TRA143 (USNM 607774), adult LV. V, hingement. W, subcentral muscle scars. X–Y, TRA142 (USNM 607775), adult RV. X, hingement. Y, subcentral muscle scars. Scale bars represent 0.1 mm for A, C, E, G, I, K, M, P, R–S, U–V, X and 50 µm for B, D, F, H, J, L, N–O, Q, T, W, Y.

Genus *Philoneptunus* Whatley, Millson, and Ayress, 1992

Type Species. *Cythereis gravezia* Hornibrook, 1952.

Remarks. See Whatley et al. (1992) for details. The hingement is holamphidont. The frontal muscle scar is V shaped; adductor muscle scars consist of a vertical row of four undivided scars. Note that plates 1 and 3 of Whatley et al. (1992) are erroneously interchanged with each other (see errata in Whatley et al., 1993, for correctly ordered plates). The distribution of this genus is limited to the southwestern Pacific and Southern Oceans, mainly around New Zealand (Whatley et al., 1992; Jellinek and Swanson, 2003; Ayress et al., 2004).

Philoneptunus gravezia (Hornibrook, 1952)

FIGURES 82P–Q, 85S–U, 86A–D

Cythereis gravezia Hornibrook, 1952:37, pl. 5, figs. 68–69, 76.

Philoneptunus gravezia (Hornibrook); Whatley, Millson, and Ayress, 1992:44, pl. 1, figs. 1–3.

Locality and Age of Specimens Examined. Trig Z f280, Earthquakes f72, late Oligocene to early Miocene, New Zealand; "topotypic" locality, New Zealand.

Dimensions. See Table 1.

Remarks. Our specimens are identical to *Philoneptunus gravezia* (Hornibrook, 1952). A SEM image of a topotype specimen shown in Whatley et al. (1992, 1993) is shown here in Figure 82.

Philoneptunus cassidyi Ayress, De Deckker, and Coles, 2004

FIGURES 85V–Y, 86E–I

Philoneptunus cassidyi Ayress, De Deckker, and Coles, 2004:24, pl. 2, figs. 1–11.

Locality and Age of Specimens Examined. EL 47 5117, EL 47 5119, EL 47 5120, Modern, Southern Ocean.

Dimensions. See Table 1.

Remarks. Our specimens are identical to the form of *Philoneptunus cassidyi* Ayress et al., 2004 with weak secondary reticulation (see Ayress et al., 2004). *Philoneptunus cassidyi* is very similar to *Philoneptunus provocator* Jellinek and Swanson, 2003, but the former has a longer ventrolateral ridge that continues into the anterior marginal carina. *Philoneptunus cassidyi* has a continuous vertical carina starting from the posterodorsal corner that is absent in *Philoneptunus provocator*, whereas *Philoneptunus provocator* has a ventrolateral ridge that upturns anteriorly and reaches the anterodorsal corner.

Philoneptunus paragravezia Whatley, Millson, and Ayress, 1992

FIGURES 86J–N, 87A–B

Philoneptunus paragravezia Whatley, Millson, and Ayress, 1992:47, pl. 1, figs. 19–23.

Locality and Age of Specimens Examined. DSDP 279A, early Miocene, Southern Ocean.

Dimensions. See Table 1.

Remarks. *Philoneptunus paragravezia* Whatley et al., 1992 bears features intermediate between *Philoneptunus cassidyi* Ayress et al., 2004 and *Philoneptunus paeminosus* s.l. Whatley et al., 1992. *Philoneptunus paragravezia* is distinguished from *Philoneptunus cassidyi* by its smooth and better-developed median lateral ridge and subcentral tubercle. *Philoneptunus paragravezia* is distinguished from *Philoneptunus paeminosus* s.l. by its much better developed reticulation.

Philoneptunus paeminosus s.l. Whatley, Millson, and Ayress, 1992

FIGURES 86O–R, 87C–D

Philoneptunus paeminosus Whatley, Millson, and Ayress, 1992:49, pl. 2, figs. 7–14.

Philoneptunus paeminosus Whatley et al.; Jellinek and Swanson, 2003:49, pl. 42, figs. 1–11; pl. 43, figs. 1–3.

Locality and Age of Specimens Examined. DSDP 277, early Oligocene, Southern Ocean; DSDP 279A, early Miocene, Southern Ocean.

Dimensions. See Table 1.

Remarks. The specimens shown here display some morphological variation. Jellinek and Swanson (2003) also reported this species, but their specimens are not exactly the same as the type specimens and other original specimens reported by Whatley et al. (1992). For example, the type specimens have ventrolateral ridges that are sinuous or concave, but Jellinek and Swanson's specimens have slightly convex ventrolateral ridges. Also, the anterior marginal carina is much less developed in Jellinek and Swanson's specimens than in the type specimens. Further research is needed to assess if this variation encompasses one or several species.

Philoneptunus gigas Jellinek and Swanson, 2003

FIGURE 82O

Philoneptunus sp. 2 Whatley, Millson, and Ayress, 1992:54, pl. 3, figs. 14, 17.

Philoneptunus gigas Jellinek and Swanson, 2003:51, pl. 46, figs. 1–10.

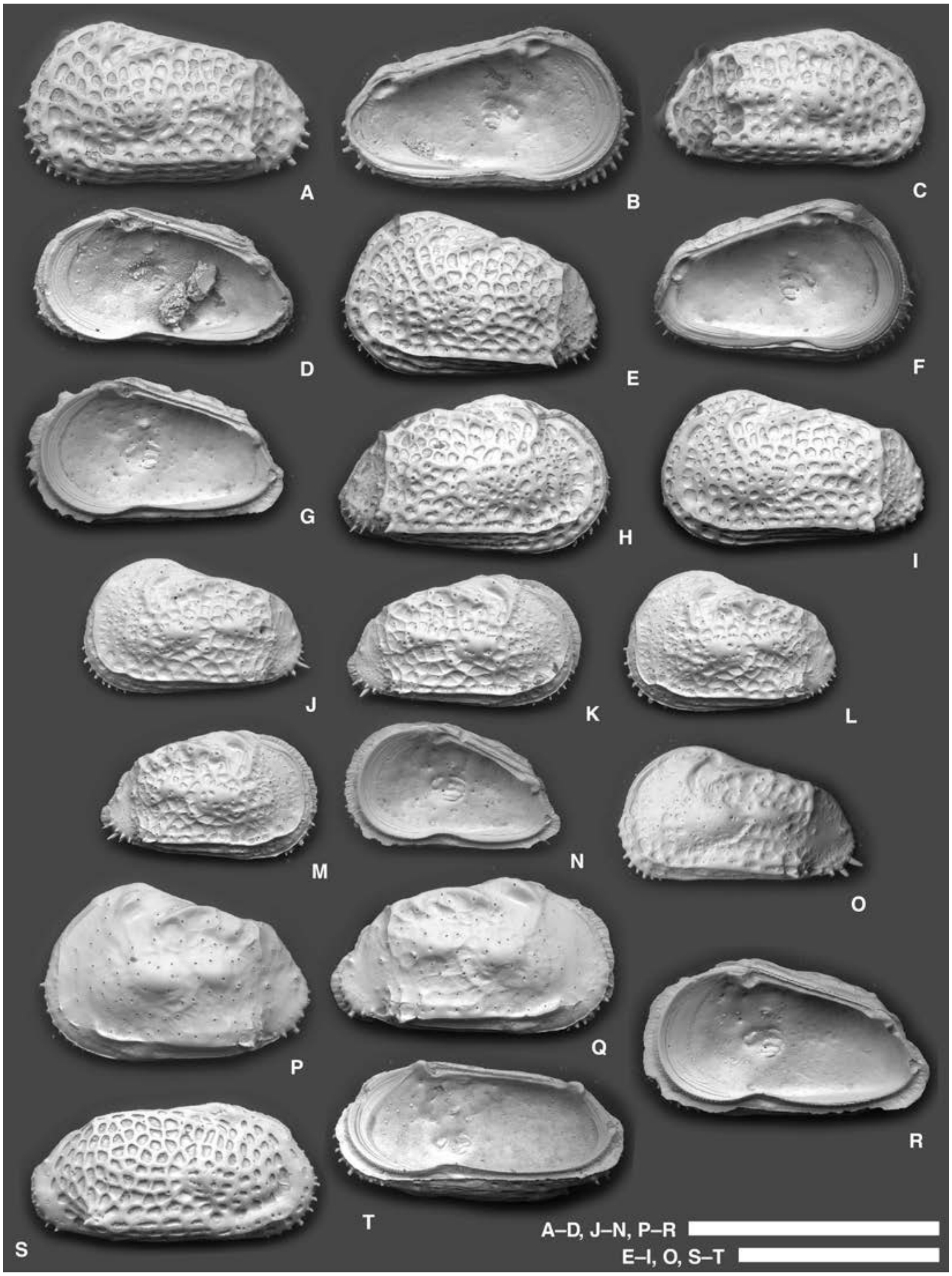


FIGURE 86. Scanning electron microscope images of *Philoneptunus gravezia* (Hornibrook, 1952), *Philoneptunus cassidyi* Ayress et al., 2004, *Philoneptunus paragravezia* Whatley et al., 1992, *Philoneptunus paeminosus* s.l. Whatley et al., 1992, and *Philoneptunus* sp. 1. A, C, E, H–M, O–Q, S, lateral views; B, D, F–G, N, R, T, internal views. **A–D,** *Philoneptunus gravezia* (Hornibrook, 1952). A–B, TRA1042 (USNM 607772), adult LV from Trig Z f280, late Oligocene to early Miocene, New Zealand. C–D, TRA1043 (USNM 607773), adult RV from Earthquakes f72, late Oligocene, New Zealand. **E–I,** *Philoneptunus cassidyi* Ayress et al., 2004. E–F, TRA143 (USNM 607774), adult LV from EL 47 5119, Modern, Southern Ocean. G, TRA142 (USNM 607775), adult RV from EL 47 5120, Modern, Southern Ocean. H, TRA144 (USNM 607776), adult RV from EL 47 5119, Modern, Southern Ocean. I, TRA145 (USNM 607777), adult LV from EL 47 5117, Modern, Southern Ocean. **J–N,** *Philoneptunus paragravezia* Whatley et al., 1992. J, TRA441 (USNM 607778), adult LV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. K, TRA442 (USNM 607779), adult RV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. L, TRA443 (USNM 607780), adult LV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. M–N, TRA444 (USNM 607781), adult RV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. **O–R,** *Philoneptunus paeminosus* s.l. Whatley et al., 1992. O, TRA419 (USNM 607782), adult LV from DSDP 277, 5/2/114–121, early Oligocene, Southern Ocean. P, TRA439 (USNM 607783), adult LV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. Q–R, TRA440 (USNM 607784), adult RV from DSDP 279A, 8/1/81–89, early Miocene, Southern Ocean. **S–T,** *Philoneptunus* sp. 1, SIMY0007 (USNM 607785), adult RV from NMC 14, 0–5, Modern, southwestern Pacific. Scale bars represent 1 mm.

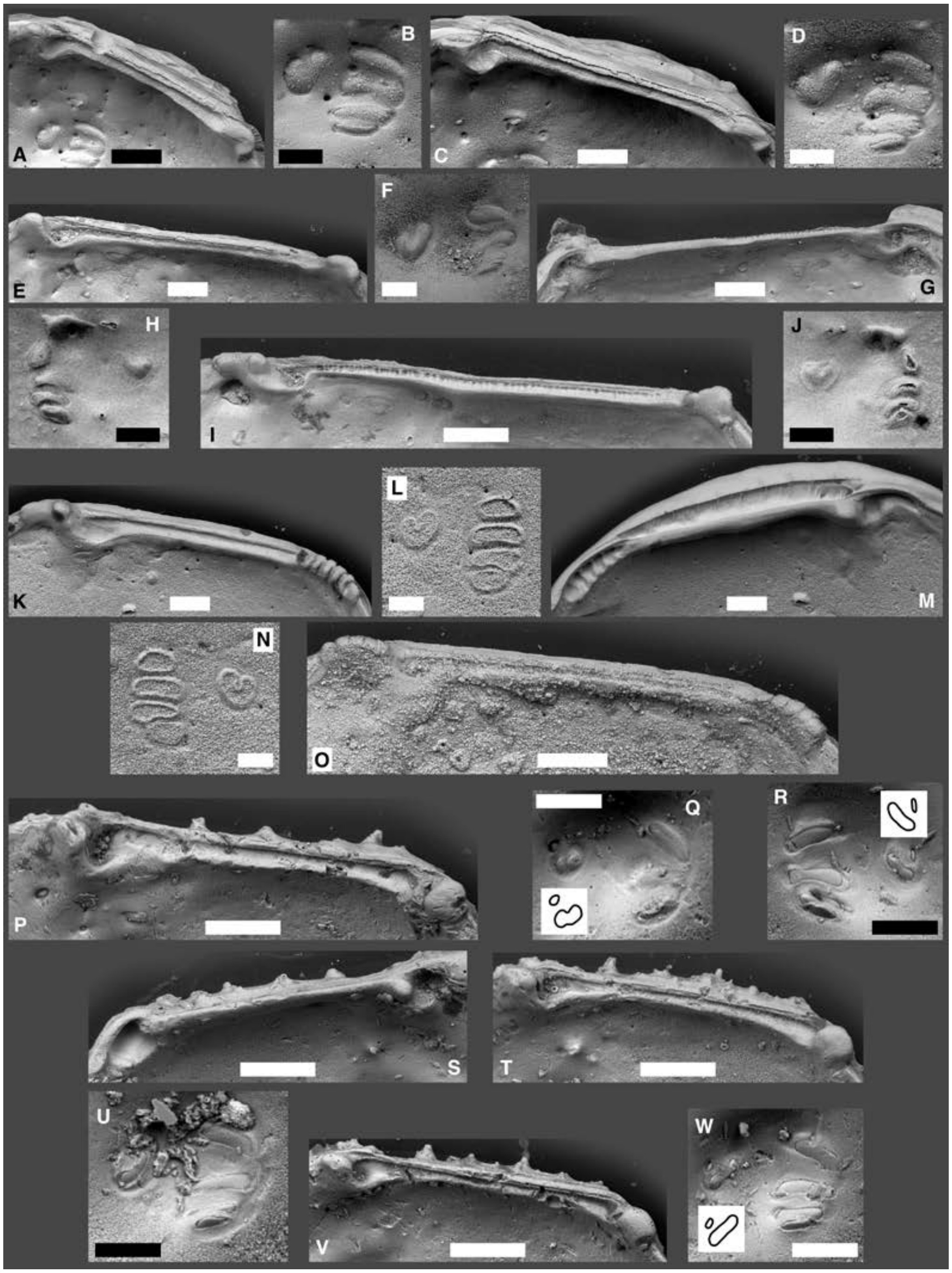


FIGURE 87. Internal details of *Philoneptunus paragravezia* Whatley et al., 1992, *Philoneptunus paeminosus* s.l. Whatley et al., 1992, *Philoneptunus* sp. 1, *Pterygocythereis americana* (Ulrich and Bassler, 1904), *Pterygocythere nobilis* (Jellinek et al., 2006), *Pterygocythere* sp. 1, *Taracythere proterva* (Hornibrook, 1953), and *Taracythere conjunctispinosa* Ayress, 1995. **A–B,** *Philoneptunus paragravezia* Whatley et al., 1992, TRA444 (USNM 607781), adult RV. A, hingement. B, subcentral muscle scars. **C–D,** *Philoneptunus paeminosus* s.l. Whatley et al., 1992, TRA440 (USNM 607784), adult RV. C, hingement. D, subcentral muscle scars. **E–F,** *Philoneptunus* sp. 1, SIMY0007 (USNM 607785), adult RV. E, hingement. F, subcentral muscle scars. **G–J,** *Pterygocythereis americana* (Ulrich and Bassler, 1904). G–H, GSM113 (USNM 607787), adult LV. G, hingement. H, subcentral muscle scars. I–J, GSM114 (USNM 607788), adult RV. I, hingement. J, subcentral muscle scars. **K–N,** *Pterygocythere nobilis* (Jellinek et al., 2006). K–L, TMC203 (USNM 607791), adult RV. K, hingement. L, subcentral muscle scars. M–N, TMC204 (USNM 607792), adult LV. M, hingement. N, subcentral muscle scars. **O,** *Pterygocythere* sp. 1, TRA751 (USNM 607789), adult RV, hingement. **P–Q,** *Taracythere proterva* (Hornibrook, 1953), TRA1033 (USNM 607802), adult RV. P, hingement. Q, subcentral muscle scars (with sketch of frontal scar). **R–W,** *Taracythere conjunctispinosa* Ayress, 1995. R–S, TRA1034 (USNM 607803), adult LV. R, subcentral muscle scars (with sketch of frontal scar). S, hingement. T–U, TRA1035 (USNM 607804), adult RV. T, hingement. U, subcentral muscle scars. V–W, TRA1036 (USNM 607805), adult RV. V, hingement. W, subcentral muscle scars (with sketch of frontal scar). Scale bars represent 0.1 mm for A, C, E, G, I, K, M, O–P, S–T, V and 50 µm for B, D, F, H, J, L, N, Q–R, U, W.

Locality and Age of Specimen Examined. NMC 14, Modern, southwestern Pacific.

Dimensions. See Table 1.

Remarks. The specimen shown here is the A-1 juvenile of *Philoneptunus gigas* Jellinek and Swanson, 2003.

Philoneptunus sp. 1

FIGURES 86S–T, 87E–F

Locality and Age of Specimen Examined. NMC 14, Modern, southwestern Pacific.

Dimensions. See Table 1.

Remarks. This species is distinguished from any other *Philoneptunus* species by its elongate carapace, regular primary reticulation, and broad and smooth marginal rims and by its lack of secondary reticulation.

Genus *Pterygocythereis* Blake, 1933

Type Species. *Cythereis jonesii* Baird, 1850.

Remarks. *Pterygocythereis* Blake, 1933 is typically a shallow marine genus with many species, but it is also known from the upper bathyal depths. *Pterygocythereis* is similar to *Alataleberis* McKenzie and Warne, 1986, but the latter has a triangular outline and well-developed marginal rims. A detailed comparison of these genera can be found in McKenzie and Warne (1986) and Warne (2010). We follow Hill (1954) and van Morkhoven (1963) and consider *Alatacythere* Murray and Hussey, 1942 a junior synonym of *Pterygocythereis*.

As seen in and indicated by several studies (e.g., Hill, 1954; van Morkhoven, 1963), *Pterygocythereis* has an amphidont-type hinge with some variants (hemiamphidont, holamphidont, or paramphidont, in our opinion). In RV, the anterior terminal tooth can be pointed or crenulate; the posterior terminal tooth can be smooth or crenulate, but it is always knob-like (i.e., not elongate) and triangular. Although its relative *Pterygocythere* Hill, 1954 has an anterior terminal tooth (i.e., pointed or crenulate) similar to that of *Pterygocythereis*, the posterior terminal tooth of *Pterygocythere* is always crenulate, low, elongate, and curved. In addition, *Pterygocythere* is distinguished from *Pterygocythereis* by the lack of a dorsolateral ridge and, to a lesser degree, by the lack of a prominent hinge ear (i.e., anterodorsal corner) of LV. In this generic concept, some shallow marine *Pterygocythereis* species will need to be reassigned to *Pterygocythere* (e.g., see Hill, 1954; Guernet, 1990), although that is outside the scope of this work. *Pterygocythereis* has a "*Cythereis*"-like lateral appearance.

Synonymized Genus. *Alatacythere* Murray and Hussey, 1942.

Pterygocythereis americana (Ulrich and Bassler, 1904)

FIGURES 87G–J, 88A–D

Cythereis cornuta var. *americana* Ulrich and Bassler, 1904:122, pl. 37, figs. 29–33.

Pterygocythereis americana (Ulrich and Bassler); Forester, 1980:12, pl. 4, fig. 4.

Locality and Age of Specimens Examined. WHOI 1626, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Remarks. Well-preserved specimens from the modern northwestern Atlantic Ocean are shown here. *Pterygocythereis americana* (Ulrich and Bassler, 1904) is very similar to *Pterygocythereis inexpectata* (Blake, 1929) (see Hazel, 1983). The morphological differences between these two species may fall within intraspecific variation. A comprehensive synonymy and detailed discussion of these two species can be found in Forester (1980).

Genus *Pterygocythere* Hill, 1954

Type Species. *Cypridina alata* Bosquet, 1847.

Remarks. Several researchers have suggested a similarity between *Pseudobosquetina* Guernet and Moullade, 1994 and *Pterygocythere* Hill, 1954 (Guernet and Moullade, 1994; Mazzini, 2005; Jellinek et al., 2006). All of them considered these to be two independent genera, mainly because of the much more prominent ala of *Pterygocythere*. However, as seen in *Cytheropteron* Sars, 1866, the degree of development of the ala can be quite varied within a genus. Hinge and subcentral muscle scars are quite similar between these two genera. The hinge is hemiamphidont, the frontal scar is V shaped, and the adductor scars are a vertical row of four elongate scars (Hill, 1954; Moore, 1961; van Morkhoven, 1963; Mazzini, 2005; Jellinek et al., 2006). Furthermore, lateral appearance is very similar, and there is no diagnostic difference to distinguish these two genera other than ala development. Thus, we agree with Ayress et al. (2004) and consider *Pseudobosquetina* a junior synonym of *Pterygocythere*. The correct nomenclature of *Cytheropteron mucronalatum* Brady, 1880 is therefore *Pterygocythere mucronalata* (Brady, 1880), as already applied by several authors, often with gender error, that is, as "*mucronalatum*" (e.g., van Harten, 1990; Corrége, 1993; Cronin, 1996a; Ayress et al., 1997, 2004). *Brachycythere* Alexander, 1933 (emended by Puckett, 2002; type species: *Brachycythere crenulata* Crane, 1965) is similar to *Pterygocythere* but is distinguished by its divided dorsomedian adductor scar and fused ventral and ventromedian adductor scars. The dorsal adductor scar is also divided in most *Brachycythere* species (Puckett, 2002). *Bosquetina* Keij, 1957 is distinguished from *Pterygocythere* by its divided frontal scar. See the *Pterygocythereis* section for its distinction from *Pterygocythere*.

Synonymized Genus. *Pseudobosquetina* Guernet and Moullade, 1994.

Pterygocythere nobilis (Jellinek, Swanson, and Mazzini, 2006)

FIGURES 87K–N, 88G–S

Cytheropteron mucronalatum Brady; Tressler, 1941:102, pl. 19, fig. 25.

Brachycythere mucronalatum (Brady); Benson, DelGrosso, and Steineck, 1983:1, figs. 6–7.

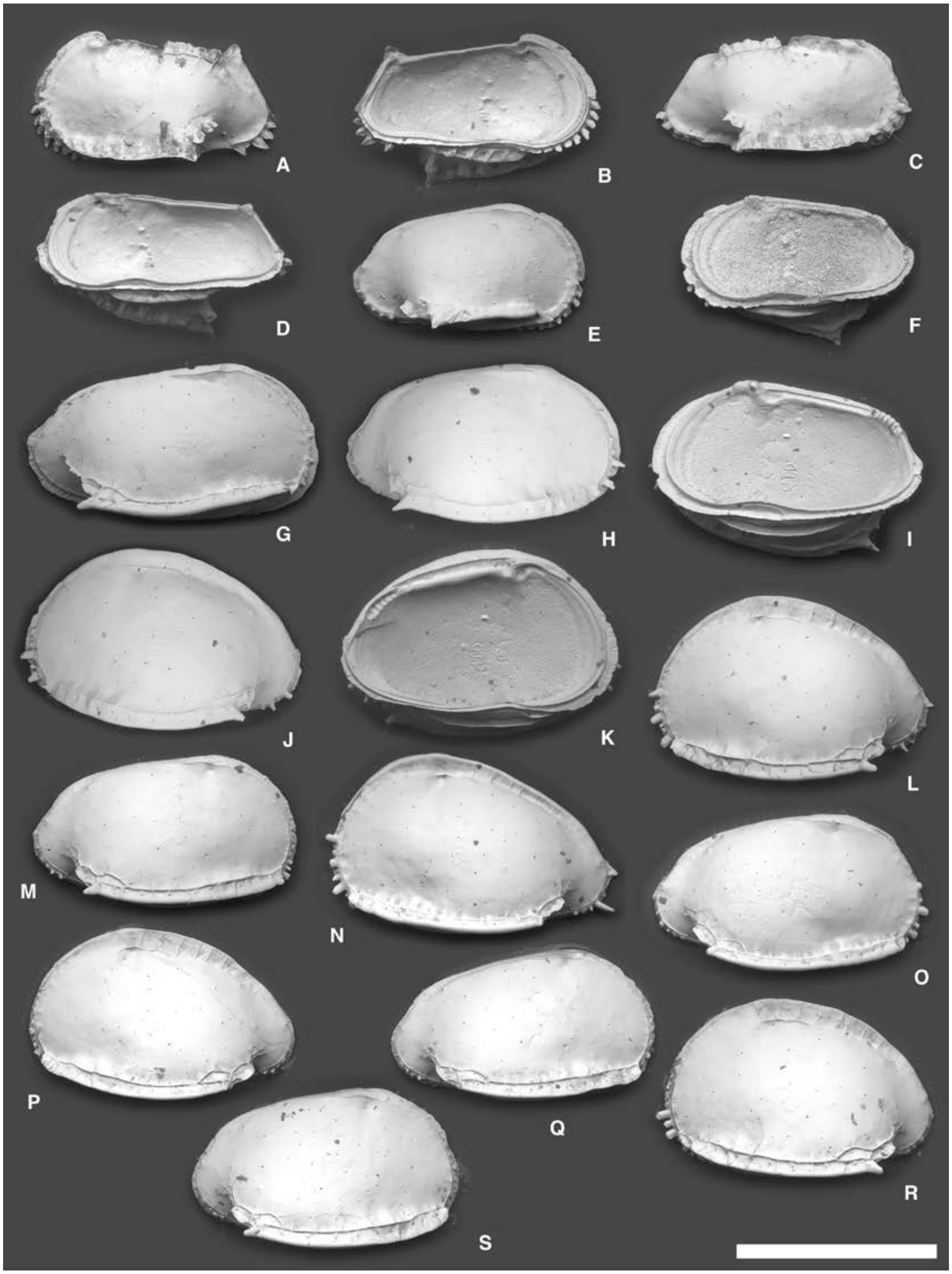


FIGURE 88. Scanning electron microscope images of *Pterygocythereis americana* (Ulrich and Bassler, 1904), *Pterygocythere* sp. 1, and *Pterygocythere nobilis* (Jellinek et al., 2006). A, C, E, G–H, J, L–S, lateral views; B, D, F, I, K, internal views. **A–D,** *Pterygocythereis americana* (Ulrich and Bassler, 1904). A–B, GSM113 (USNM 607787), adult LV from WHOI 1626, Modern, northwestern Atlantic. C–D, GSM114 (USNM 607788), adult RV from WHOI 1626, Modern, northwestern Atlantic. **E–F,** *Pterygocythere* sp. 1, TRA751 (USNM 607789), adult RV from DSDP 327A, 13/2/100–105, late Campanian, southwestern Atlantic. **G–S,** *Pterygocythere nobilis* (Jellinek et al., 2006). G, SIMY0015 (USNM 607790), adult RV from AQ 19, 5–10, Quaternary, equatorial western Pacific. H–I, TMC203 (USNM 607791), adult RV from Chain 82-24-4P, 313.5–316, Pleistocene, North Atlantic. J–K, TMC204 (USNM 607792), adult LV from Chain 82-24-4P, 313.5–316, Pleistocene, North Atlantic. L, RB261 (USNM 607793), adult LV from KN 35 sta 340A, Modern, northwestern Atlantic. M, RB262 (USNM 607794), adult RV from KN 35 sta 340A, Modern, northwestern Atlantic. N, RB301 (USNM 607795), adult LV from KN 25 sta 307, Modern, northwestern Atlantic. O, RB302 (USNM 607796), adult RV from KN 25 sta 307, Modern, northwestern Atlantic. P, RB351 (USNM 607797), adult LV from Alb 2569, Modern, northwestern Atlantic. Q, RB352 (USNM 607798), adult RV from Alb 2569, Modern, northwestern Atlantic. R, RB353 (USNM 607799), adult LV from Alb 2569, Modern, northwestern Atlantic. S, RB354 (USNM 607800), adult RV from Alb 2569, Modern, northwestern Atlantic. Scale bar represents 1 mm.

Bosquetina mucronalatum (Brady); Whatley and Coles, 1987, pl. 5, figs. 1–2.
Pseudobosquetina nobilis Jellinek, Swanson, and Mazzini, 2006:41, figs. 6–8.

LOCALITY AND AGE OF SPECIMENS EXAMINED. AQ 19, Quaternary, equatorial western Pacific; Chain 82-24-4P, Pleistocene, North Atlantic; KN 35 sta 340A, KN 25 sta 307, Alb 2569, Modern, northwestern Atlantic.

DIMENSIONS. See Table 1.

REMARKS. A comprehensive synonymy can be found in Jellinek et al. (2006). Although the Pacific specimen (Figure 88G) is slightly different from the Atlantic specimens in outline (Pacific specimen looks slightly more slender), we consider this to be intraspecific variation. This species has been confused with *Pterygocythere mucronalata* (Brady, 1880). Several researchers reported some species that are very similar to, but not conspecific with, *Pterygocythere mucronalata* or *Pterygocythere nobilis* (Jellinek et al., 2006) as "*mucronalata*" (Guernet and Moullade, 1994; Cronin, 1996a).

Pterygocythere sp. 1

FIGURES 87O, 88E–F

LOCALITY AND AGE OF SPECIMEN EXAMINED. DSDP 327A, late Campanian, southwestern Atlantic.

DIMENSIONS. See Table 1.

REMARKS. This species is distinguished from any other *Pterygocythere* species by its short ventrolateral ridge.

Genus *Taracythere* Ayress, 1995

TYPE SPECIES. *Trachyleberis proterva* Hornibrook, 1953.

EMENDED DIAGNOSIS. A blind, spinose trachyleberidid genus with divided frontal muscle scar, which is composed of an elongate scar and a small rounded scar. The anterior marginal rim is wide, and the posterior margin is upturned with maximum valve length just above midheight of valve. Carapace relatively high in proportion to length. External valve surface spinose and with weak or absent primarily reticulation; secondary reticulation common. Most species have a prominent spine close to the posteroventral margin below a ventrolateral ridge or a row of shorter spines. Hinge holamphidont. Adductor muscle scars in a vertical row of four undivided scars; ventral and ventromedian scars close to each other. Anterior marginal frill and snap-knob structure absent.

REMARKS. Our high-resolution SEM images of well-preserved specimens reveal that *Taracythere* Ayress, 1995 has a divided frontal muscle scar, which is composed of an elongate scar and a small rounded scar. We consider this to be one of the most important diagnostic characters of this genus, and thus, we emended the diagnosis. Although Ayress (1995) described a V-shaped frontal scar of *Taracythere conjunctispinosa* Ayress, 1995, we reexamined this species and confirmed that its frontal muscle scar is divided. *Taracythere* Ayress, 1995 is superficially similar to *Acanthocythere* Sylvester-Bradley, 1956 (emended by Bate, 1963) but is distinguished by its holamphidont hinge and reticulation. *Acanthocythere* has a lobodont or antimerodont hinge (Sylvester-Bradley, 1956; Bate, 1963) and a lateral surface that is densely and finely spinose and lacks any reticulation (see photographs of the holotype specimen of the type species, *Cythere sphaerulata* Jones and Sherborn, 1888, shown in Bate, 1969). Although Jellinek and Swanson (2003) consider several slender trachyleberidid species to be *Taracythere*, all of those species have an undivided frontal scar. In addition, a relatively high carapace in proportion to the length is an important diagnostic character of *Taracythere* in our opinion. Thus, we consider these slender trachyleberidid species to be *Cythereis* Jones, 1849 (see the Other Species section of *Cythereis*). Geographical distribution of *Taracythere* seems to be restricted to the Pacific and Southern Oceans.

Taracythere proterva (Hornibrook, 1953)

FIGURES 87P–Q, 89A–C

Trachyleberis proterva Hornibrook, 1953:309, fig. 2.7.
?"*Cribrocythere*" *proterva* (Hornibrook); Ayress, 1993, fig. 9P.
Dutoitella aff. *proterva* (Hornibrook); Ayress, 1993, fig. 3N.
Taracythere proterva (Hornibrook); Ayress, 1995:918, figs. 9.13, 10.1–10.4.

LOCALITY AND AGE OF SPECIMENS EXAMINED. Ashley Mudstone Formation, late Eocene, New Zealand.

DIMENSIONS. See Table 1.

REMARKS. The specimens shown here are provided courtesy of M. A. Ayress and are from Ayress's (1995) location of the Eocene Ashley Mudstone Formation, New Zealand.

Taracythere conjunctispinosa Ayress, 1995

FIGURES 87R–W, 89D–I

Taracythere conjunctispinosa Ayress, 1995:918, fig. 10.5–10.8, 10.10.
?*Taracythere conjunctispinosa* Ayress; Ayress, 2006:370, fig. 5P.

LOCALITY AND AGE OF SPECIMENS EXAMINED. Ashley Mudstone Formation, late Eocene, New Zealand.

DIMENSIONS. See Table 1.

REMARKS. The specimens shown here are provided courtesy of M. A. Ayress and are from Ayress's (1995) location of the Eocene Ashley Mudstone Formation, New Zealand.

Taracythere ayressoabyssora sp. nov.

FIGURES 89J–O, 90A–B, 91A–F

DERIVATION OF NAME. In honor of Michael Ayress, Ichron Limited, for his contribution to southwestern

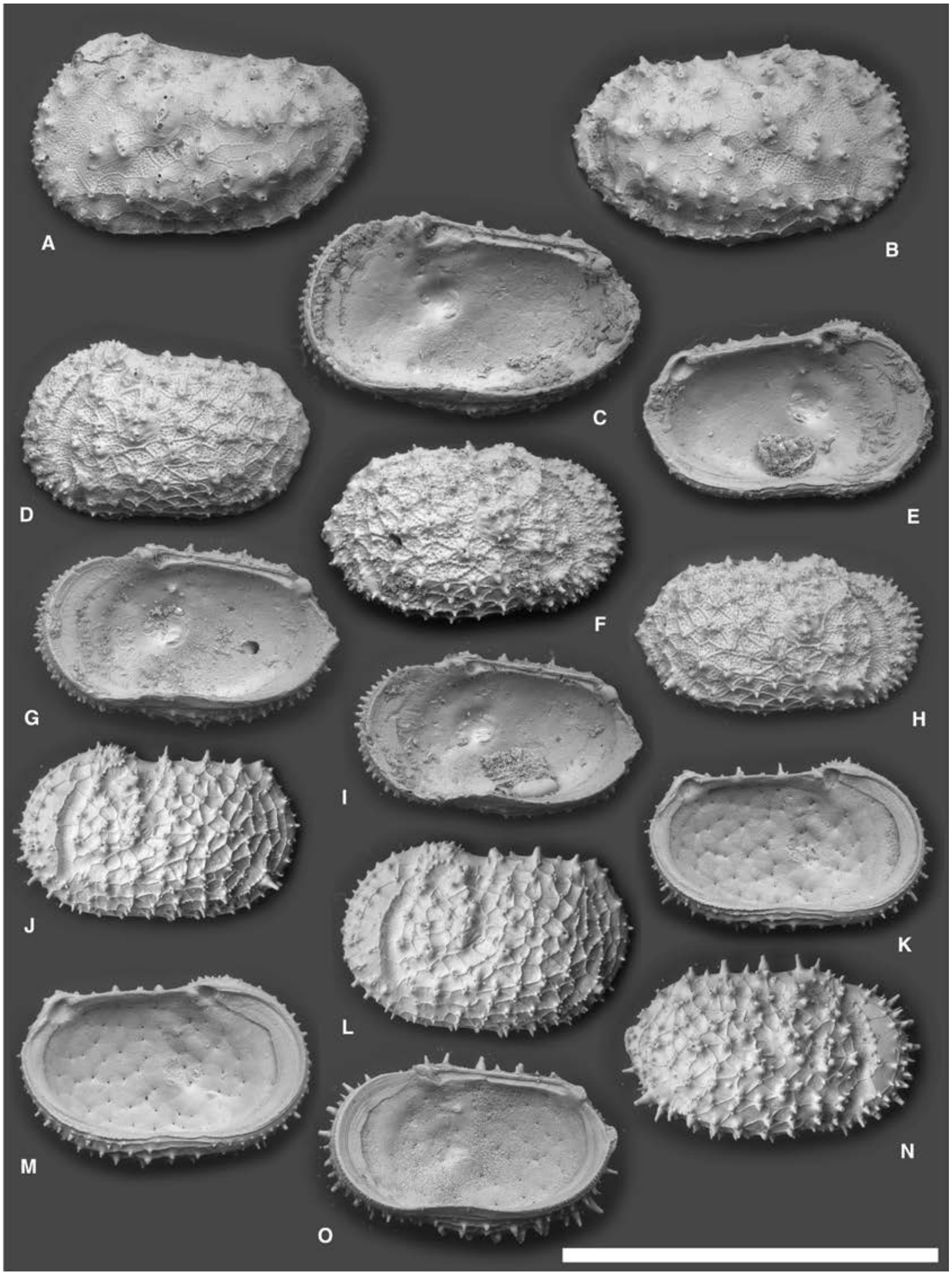


FIGURE 89. Scanning electron microscope images of *Taracythere proterva* (Hornibrook, 1953), *Taracythere conjunctispinosa* Ayress, 1995, and *Taracythere ayressoabyssora* sp. nov. A–B, D, F, H, J, L, N, lateral views; C, E, G, I, K, M, O, internal views. **A–C,** *Taracythere proterva* (Hornibrook, 1953). A, TRA1032 (USNM 607801), adult LV from Ashley Mudstone Formation, late Eocene, New Zealand. B–C, TRA1033 (USNM 607802), adult RV from Ashley Mudstone Formation, late Eocene, New Zealand. **D–I,** *Taracythere conjunctispinosa* Ayress, 1995. D–E, TRA1034 (USNM 607803), adult LV from Ashley Mudstone Formation, late Eocene, New Zealand. F–G, TRA1035 (USNM 607804), adult RV from Ashley Mudstone Formation, late Eocene, New Zealand. H–I, TRA1036 (USNM 607805), adult RV from Ashley Mudstone Formation, late Eocene, New Zealand. **J–O,** *Taracythere ayressoabyssora* sp. nov. J–K, TRA523 (USNM 607806), adult LV from DSDP 208, 5/4/60–66, late Pliocene, southwestern Pacific. L–M, TRA524 (USNM 607807), adult LV from DSDP 208, 5/4/60–66, late Pliocene, southwestern Pacific. N–O, TRA527 (USNM 607808), adult RV from DSDP 208, 3/4/50–56, late Pliocene, southwestern Pacific. Scale bar represents 1 mm.

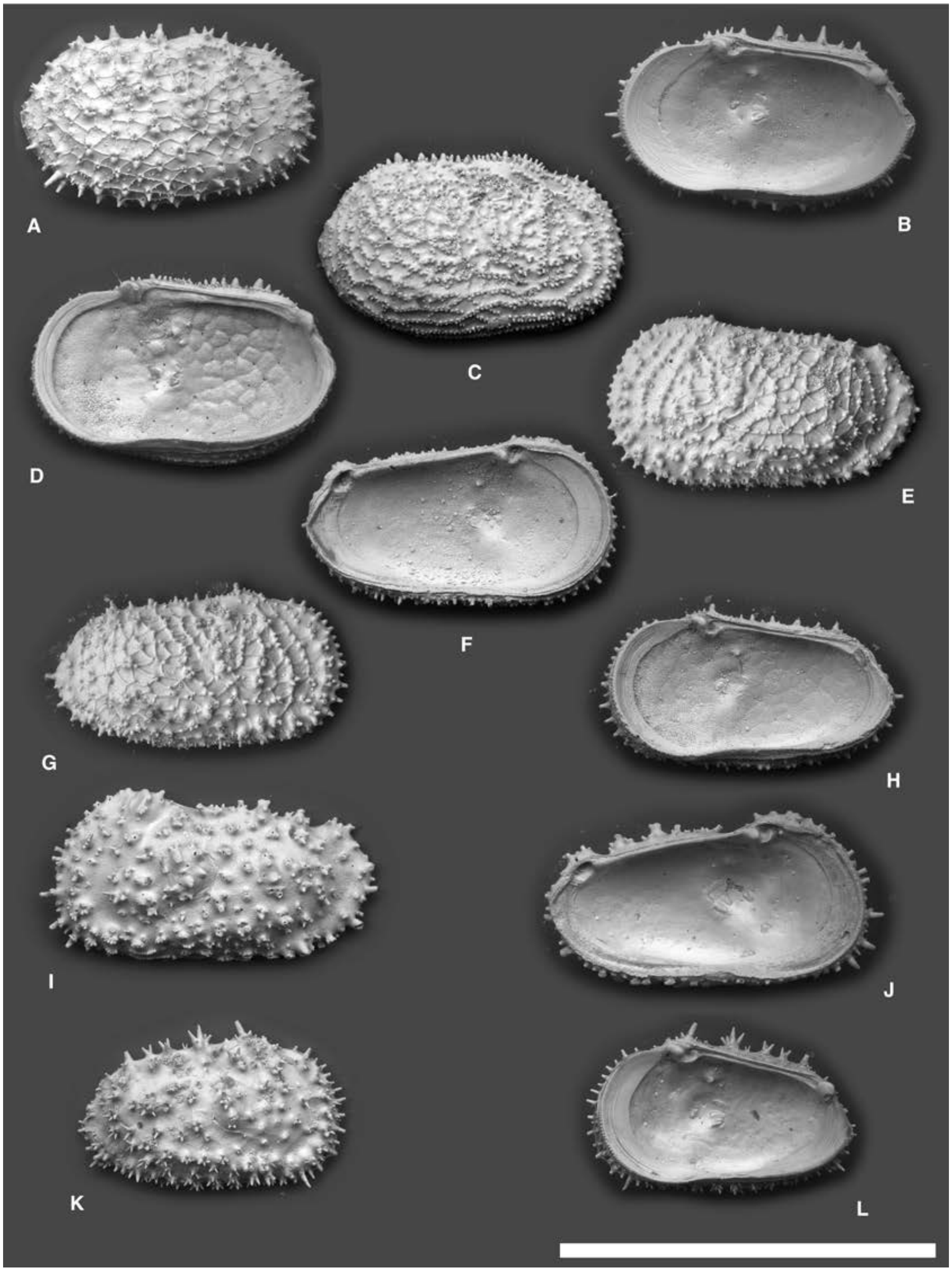


FIGURE 90. Scanning electron microscope images of *Taracythere ayressoabyssora* sp. nov., *Taracythere abyssora* Ayress et al., 2004, *Taracythere thalassoformis* sp. nov., *Taracythere* sp. 1, and *Taracythere* sp. 2. A, C, E, G, I, K, lateral views; B, D, F, H, J, L, internal views. **A–B,** *Taracythere ayressoabyssora* sp. nov. A, TRA952 (USNM 607809), adult RV from NGC 99 pilot, 0–5, Modern, southwestern Pacific. B, TRA953 (USNM 607810), adult RV from NGC 99 pilot, 0–5, Modern, southwestern Pacific. **C–D,** *Taracythere abyssora* Ayress et al., 2004, TRA141 (USNM 607811), adult RV from EL 47 5069, Modern, Southern Ocean. **E–H,** *Taracythere thalassoformis* sp. nov. E–F, TRA503 (USNM 607812), adult LV from DSDP 292, 23/1/54–60, Oligocene, northwestern Pacific. G–H, TRA504 (USNM 607813), adult RV from DSDP 292, 23/1/54–60, Oligocene, northwestern Pacific. **I–J,** *Taracythere* sp. 1, TRA210 (USNM 607814), adult LV from Alb D5576, Modern, northwestern Pacific. **K–L,** *Taracythere* sp. 2, TRA211 (USNM 607815), adult RV from Alb 5516, Modern, northwestern Pacific. Scale bar represents 1 mm.

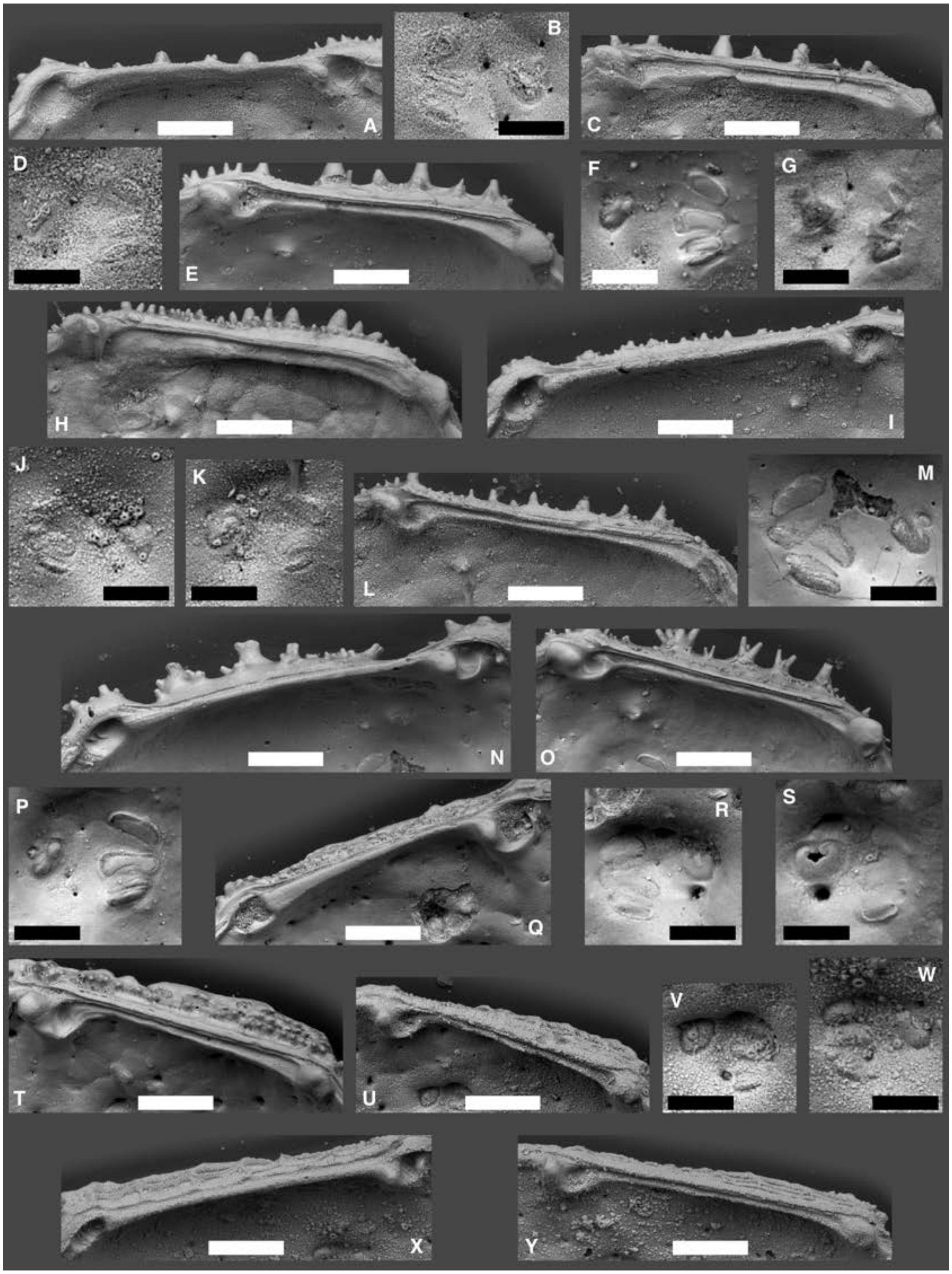


FIGURE 91. Internal details of *Taracythere ayressoabyssora* sp. nov., *Taracythere abyssora* Ayress et al., 2004, *Taracythere thalassoformis* sp. nov., *Taracythere* sp. 1, *Taracythere* sp. 2, *Trachyleberidea mammidentata* (van den Bold, 1946), and *Trachyleberidea elegans* Guernet, 1985. **A–F,** *Taracythere ayressoabyssora* sp. nov. A–B, TRA524 (USNM 607807), adult LV. A, hingement. B, subcentral muscle scars. C–D, TRA527 (USNM 607808), adult RV. C, hingement. D, subcentral muscle scars. E–F, TRA953 (USNM 607810), adult RV. E, hingement. F, subcentral muscle scars. **G–H,** *Taracythere abyssora* Ayress et al., 2004, TRA141 (USNM 607811), adult RV. G, subcentral muscle scars. H, hingement. **I–L,** *Taracythere thalassoformis* sp. nov. I–J, TRA503 (USNM 607812), adult LV. I, hingement. J, subcentral muscle scars. K–L, TRA504 (USNM 607813), adult RV. K, subcentral muscle scars. L, hingement. **M–N,** *Taracythere* sp. 1, TRA210 (USNM 607814), adult LV. M, subcentral muscle scars. N, hingement. **O–P,** *Taracythere* sp. 2, TRA211 (USNM 607815), adult RV. O, hingement. P, subcentral muscle scars. **Q–T,** *Trachyleberidea mammidentata* (van den Bold, 1946). Q–R, TRA226 (USNM 607817), adult LV. Q, hingement. R, subcentral muscle scars. S–T, TRA227 (USNM 607818), adult RV. S, subcentral muscle scars. T, hingement. **U–Y,** *Trachyleberidea elegans* Guernet, 1985. U–V, TRA539 (USNM 607820), adult RV. U, hingement. V, subcentral muscle scars. W–X, RB217 (USNM 607825), adult LV. W, subcentral muscle scars. X, hingement. Y, RB218 (USNM 607826), adult RV, hingement. Scale bars represent 0.1 mm for A, C, E, H–I, L, N–O, Q, T–U, X–Y and 50 μm for B, D, F–G, J–K, M, P, R–S, V–W.

Pacific deep-sea ostracod taxonomy and with reference to its similarity to *Taracythere abyssora* Ayress et al., 2004.

Holotype. Adult RV, USNM 607808 (TRA527; Figures 89N–O, 91C–D).

Paratypes. USNM 607806, 607807, 607809, 607810 (TRA523, TRA524, TRA952, TRA953).

Type Locality and Horizon. DSDP 208, 3/4/50–56, late Pliocene, 26.1102°S, 161.2212°E, 1,545 m water depth, southwestern Pacific.

Other Locality. NGC 99 pilot, Modern, southwestern Pacific.

Dimensions. See Table 1.

Diagnosis. *Taracythere* species characterized by a spinose carapace with relatively sharp spines, lack of secondary reticulation, shallow primary reticulation with thin muri, and a very wide anterior marginal rim.

Description. Carapace moderately calcified; height similar throughout between anterodorsal and posterodorsal corners. Outline subrectangular–elliptical in lateral view, high in proportion to length; anterior margin evenly rounded, bearing spines; posterior margin truncate and upturned, bearing spines; a sharp, long spine is situated near posteroventral corner; dorsal margin almost straight, bearing sharp spines; ventral margin convex, bearing sharp spines; ventrolateral ridge weakly developed, spinose, and upturned posteriorly; subcentral tubercle present. Anterodorsal corner prominent in LV and weakly angular in RV; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface ornamented with shallow primary reticulation with thin muri and relatively sharp spines. Anterior marginal rim very wide; anterior marginal sulcus well developed; posterior marginal rim and sulcus subdued. Hinge holamphidont. Frontal muscle scar divided, composed of an elongate scar and a small rounded scar. Adductor muscle scars in a vertical row of four undivided scars, ventral and ventromedian scars close to each other.

Remarks. *Taracythere ayressoabyssora* sp. nov. is very similar to *Taracythere abyssora* Ayres et al., 2004 but can be distinguished by its sharp, larger, less dense spines. *Taracythere ayressoabyssora* sp. nov. is also similar to *Taracythere conjunctispinosa* Ayress, 1995, but the latter has well-developed secondary reticulation and a more nodose appearance.

Taracythere abyssora Ayress, De Deckker, and Coles, 2004

FIGURES 90C–D, 91G–H

Taracythere abyssora Ayress, De Deckker, and Coles, 2004:27, pl. 1, figs. 17–22.

Locality and Age of Specimen Examined. EL 47 5069, Modern, Southern Ocean.

Dimensions. See Table 1.

Remarks. Our specimen lacks a sharp, long spine situated near the posteroventral corner, but otherwise, it matches the description of this species. This spine may be very weakly developed or not preserved in our specimen.

Taracythere thalassoformis sp. nov.

FIGURES 90E–H, 91I–L

Derivation of Name. With reference to its similarity to *Legitimocythere* species. From Benson's informal genus name "*Thalassocythere*" that was later formally described as *Legitimocythere* (see above).

Holotype. Adult RV, USNM 607813 (TRA504; Figures 90G–H, 91K–L).

Paratypes. USNM 607812 (TRA503).

Type Locality and Horizon. DSDP 292, 23/1/54–60, Oligocene, 15.8185°N, 124.6508°E, 2,943 m water depth, northwestern Pacific.

Dimensions. See Table 1.

Diagnosis. *Taracythere* species characterized by *Legitimocythere*-like lateral appearance and comparatively slender outline.

Description. Carapace moderately calcified; highest at anterodorsal corner. Outline subrectangular in lateral view; anterior margin evenly rounded, bearing spines; posterior margin moderately upturned, bearing spines; dorsal margin almost straight, bearing spines; ventral margin spinose and slightly convex; ventrolateral ridge weakly developed, spinose, and upturned posteriorly; subcentral tubercle present but subdued. Anterodorsal corner prominent in LV and weakly angular in RV; posterodorsal corner angular in LV and weakly angular in RV. Lateral surface ornamented with shallow primary reticulation with thin muri and small spines. Anterior and posterior marginal rims present, but often subdued. Hinge holamphidont. Frontal muscle scar divided, composed of an elongate scar and a small rounded scar. Adductor muscle scars a vertical row of four undivided scars.

Remarks. *Taracythere thalassoformis* sp. nov. is similar to *Taracythere ayressoabyssora* sp. nov. but is distinguished by its much more slender outline. *Taracythere thalassoformis* sp. nov. is also similar to *Taracythere conjunctispinosa* Ayress, 1995, but it is distinguished by its more slender outline and lack of secondary reticulation.

Taracythere sp. 1

FIGURES 90I–J, 91M–N

Locality and Age of Specimen Examined. Alb D5576, Modern, northwestern Pacific.

Dimensions. See Table 1.

Remarks. This species is very similar to *Legitimocythere* species but has a divided frontal scar, an upturned posterior margin, and a smaller size, and it lacks a row of long, sharp, unbranched spines on the ventrolateral ridge. In our opinion, the similarities between this species and *Legitimocythere* are the result of convergence because we heavily weigh subcentral muscle scar characters in interpreting phylogeny (see Hazel, 1967).

Taracythere sp. 2

FIGURES 90K–L, 91O–P

Locality and Age of Specimens Examined. Alb 5516, Modern, northwestern Pacific.

Dimensions. See Table 1.

Remarks. This species is very similar to *Legitimocythere* species in lateral appearance, but it has a divided frontal scar and much smaller size, and it lacks a row of long, sharp, unbranched spines on the ventrolateral ridge. This species is very similar to *Cythereis* sp. 11. The only differences are the V-shaped frontal muscle scar and slightly more spinose carapace in *Cythereis* sp. 11. We tentatively consider these species independent, but we need additional specimens to confirm this decision.

Genus *Trachyleberidea* Bowen, 1953

Type Species. *Cythereis prestwichiana* Jones and Sherborn, 1887.

Remarks. *Trachyleberidea* Bowen, 1953 is similar to *Pennyella* Neale, 1974, but the former has a continuous ventrolateral-anteromarginal ridge.

Trachyleberidea mammidentata (van den Bold, 1946)

FIGURES 70A–H, 91Q–T

Cythereis cubensis var. *mammidentata* van den Bold, 1946:91, pl. 10, fig. 23a–d.

Trachyleberidea mammidentata (van den Bold); van den Bold, 1968:57, pl. 5, figs. 5, 7.

Trachyleberidea pretiosa Levinson (in LeRoy and Levinson, 1974), 1974:22, pl. 14, figs. 1–5.

Trachyleberidea mammidentata (van den Bold); van den Bold, 1981, pl. 4, fig. 14.

Trachyleberidea pretiosa Levinson; Cronin, 1983, pl. 3, fig. B.

Trachyleberidea mammidentata (van den Bold); van den Bold, 1988:38, pl. 5, figs. 5–6.

Locality and Age of Specimens Examined. Alb 2402, Modern, Gulf of Mexico; WHOI 1726, Modern, northwestern Atlantic.

Dimensions. See Table 1.

Remarks. A comprehensive synonymy can be found in van den Bold (1988). The images of van den Bold (1988) and those from his synonym list show some variation, although the shape of the outline and dorsal and ventrolateral ridges are quite consistent. The development of the subcentral tubercle does differ among different studies, and some specimens seem to bear secondary reticulation (e.g., van den Bold, 1981, 1988), although the relatively low quality of the images and possible preservational artifacts make confident determination impossible. Van den Bold (1988) tentatively considered *Trachyleberidea pretiosa* Levinson, 1974 (in LeRoy and Levinson, 1974) a junior synonym of *Trachyleberidea mammidentata* (van den Bold, 1946). It is possible that *Trachyleberidea mammidentata* includes multiple species and that *Trachyleberidea mammidentata* and *Trachyleberidea pretiosa* are independent species. However, for now we follow van den Bold (1988) and include all of them in *Trachyleberidea mammidentata* by accepting wide intraspecific variation because images of the holotype specimen (designated by van den Bold, 1968) are available only as a sketch and because clear SEM images of better-preserved fossil specimens are needed for further investigation. Our specimens are conspecific with the Pleistocene Gulf of Mexico specimens of "*Trachyleberidea pretiosa*" of LeRoy and Levinson (1974) and the modern specimen reported under this name by Cronin (1983) but are less certainly related to other less clear images of older Oligocene–Pliocene fossil specimens in the publications listed in van den Bold's (1988) synonym list of *Trachyleberidea mammidentata*.

Trachyleberidea elegans Guernet, 1985

FIGURES 70I–M, 82E–N, 91U–Y

Trachyleberidea elegans Guernet, 1985:282, pl. 3, figs. 1–4, 6.

Locality and Age of Specimens Examined. DSDP 214, early Eocene to early Oligocene, Indian Ocean.

Dimensions. See Table 1.

Remarks. Guernet's (1985) specimens are more heavily calcified but otherwise very similar to the specimens shown here.

Trachyleberidea geinitzi (Reuss, 1874)

FIGURES 70N–Q, 92A–C

Cythere geinitzi Reuss, 1874:146, pl. 27, fig. 4a–b.

Spinicythereis geinitzi (Reuss); Pokorný, 1964b, fig. 1, pl. 1, fig. 1.

Trachyleberidea geinitzi (Reuss); Babinot and Colin, 1979, pl. 1, figs. 9, 11, 12.

Locality and Age of Specimens Examined. DSDP 21A, Paleocene to middle Eocene, southwestern Atlantic.

Dimensions. See Table 1.

Remarks. *Trachyleberidea geinitzi* (Reuss, 1874) (see Pokorný, 1964b; Babinot and Colin, 1979) is similar to *Trachyleberidea prestwichiana* (Jones and Sherborn, 1887) (see Haskins, 1963; Babinot and Colin, 1979), but *Trachyleberidea prestwichiana* has much more developed median and dorsolateral

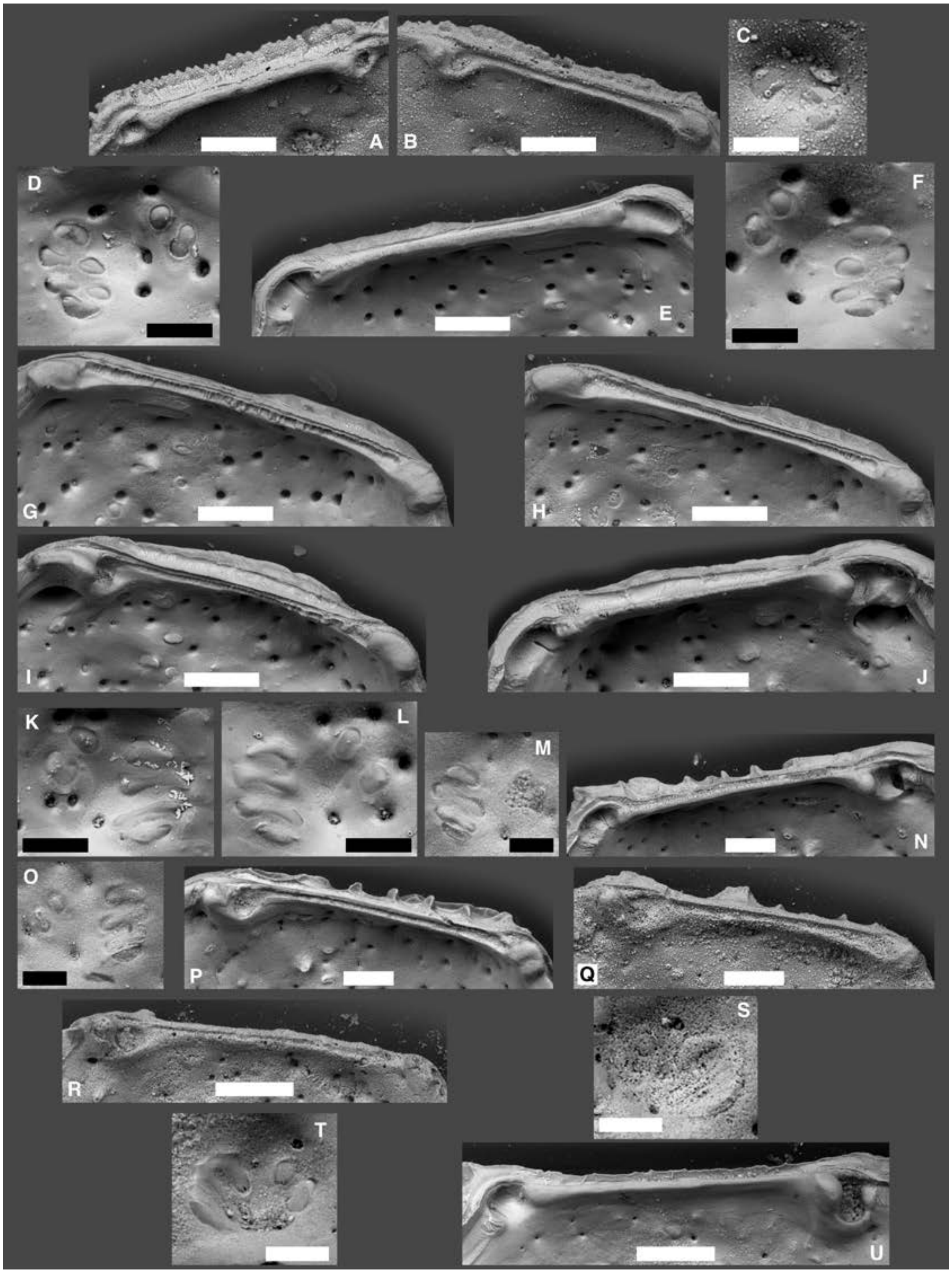


FIGURE 92. Internal details of *Trachyleberidea geinitzi* (Reuss, 1874), *Muellerina abyssicola* (Sars, 1866), *Thaerocythere crenulata* (Sars, 1866), *Bradleya dictyon* (Brady, 1880), *Tongacythere* sp. 1, *Tongacythere* sp. 2, and *Tongacythere* sp. 3. **A–C,** *Trachyleberidea geinitzi* (Reuss, 1874). A, TRA636 (USNM 607833), adult LV, hingement. B–C, TRA627 (USNM 607834), adult RV. B, hingement. C, subcentral muscle scars. **D–H,** *Muellerina abyssicola* (Sars, 1866). D–E, RB142 (USNM 607840), adult LV. D, subcentral muscle scars. E, hingement. F–G, RB145 (USNM 607843), adult RV. F, subcentral muscle scars. G, hingement. H, RB143 (USNM 607841), adult RV, hingement. **I–L,** *Thaerocythere crenulata* (Sars, 1866). I, K, RB158 (USNM 607849), adult RV. I, hingement. K, subcentral muscle scars. J, L, RB157 (USNM 607850), adult LV. J, hingement. L, subcentral muscle scars. **M–P,** *Bradleya dictyon* (Brady, 1880). M–N, GSM306 (USNM 607855), adult LV. M, subcentral muscle scars. N, hingement. O–P, GSM313 (USNM 607856), adult RV. O, subcentral muscle scars. P, hingement. **Q,** *Tongacythere* sp. 1, TRA448 (USNM 607495), adult RV, hingement. **R–S,** *Tongacythere* sp. 2, TRA834 (USNM 607496), adult RV. R, hingement. S, subcentral muscle scars. **T–U,** *Tongacythere* sp. 3, TRA938 (USNM 607497), adult LV. T, subcentral muscle scars. U, hingement. Scale bars represent 0.1 mm for A–B, E, G–J, N, P–R, U and 50 μm for C–D, F, K–M, O, S–T.

ridges. *Trachyleberidea pisinensis* (Kollmann, 1962) sensu Coles (1996) has a comparatively heavily calcified carapace and better-developed dorsolateral ridge but is otherwise very similar to *Trachyleberidea geinitzi*.

Family Thaerocytheridae Hazel, 1967

Genus *Thaerocythere* Hazel, 1967

Type Species. *Cythereis crenulata* Sars, 1866.

Remarks. Only one species of this genus, *Thaerocythere crenulata* (Sars, 1866), is known from the deep sea. This genus is widely distributed in the shallow marine North Atlantic region, especially at high latitudes (Hazel, 1967; Cronin, 1991; Wood and Whatley, 1997).

Thaerocythere crenulata (Sars, 1866)

FIGURES 92I–L, 93J–O

Cythereis crenulata Sars, 1866:39.
Thaerocythere crenulata (Sars); Hazel, 1967:25, pl. 4, figs. 2–5, 8; pl. 9, fig. 4.
Thaerocythere crenulata (Sars); Benson, 1972, pl. 2, fig. 3.
Thaerocythere (*Thaerocythere*) *crenulata* (Sars); Liebau, 1991:158, pl. 91, figs. 1–5; pl. 92, figs. 1, 7; text-figs. 85, 99.6.
Thaerocythere crenulata (Sars); Penney, 1993, fig. 4r.
Thaerocythere crenulata (Sars); Coles, Ainsworth, Whatley, and Jones, 1996:151, pl. 6, figs. 12–13.
Thaerocythere crenulata (Sars); Whatley, Eynon, and Moguilevsky, 1996a, pl. 4, figs. 10–11, 15.
Thaerocythere crenulata (Sars); Wood and Whatley, 1997:11, pl. 2, fig. 5.

Locality and Age of Specimens Examined. DSDP 352, Pleistocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. Further synonymy can be found in Wood and Whatley (1997), Liebau (1991), and Hazel (1967). Neale and Howe (1975) clearly showed a circumpolar distribution for this species in the North Atlantic Ocean. This species is known from the shelf to upper bathyal depths.

Genus *Poseidonamicus* Benson, 1972

Type Species. *Poseidonamicus major* Benson, 1972.

Remarks. As seen in Benson (1972), Whatley et al. (1986), and Hunt (2007), generic distinction is not difficult, but species differences within the genus are often subtle. Hunt (2007) listed all species reported until 2007, and Yasuhara et al. (2009a) and Brandão and Päplow (2011) described four new species since then. This genus appears to be more diverse in the Pacific and Indian Oceans than in the Atlantic (Benson, 1972; Whatley et al., 1986; Hunt, 2007; Yasuhara et al., 2009a; Hunt et al., 2010; Brandão and Päplow, 2011).

Poseidonamicus minor Benson, 1972

FIGURE 94P–Q

Poseidonamicus minor Benson, 1972:53, pl. 10, figs. 13–18.
Poseidonamicus minor Benson; Hunt, 2007, fig. 11.4–11.5.

Holotype. Adult LV, USNM 174357 (Figure 94Q)

Paratypes. USNM 188561 is shown here (see Benson, 1972, for other paratypes).

Type Locality and Horizon. DWBG 74, Modern, 28.7167°S, 107.6000°W, 3,220 m water depth, southeastern Pacific.

Other Localities. EL 21-10, Modern, southeastern Pacific.

Dimensions. See Table 1.

Remarks. The SEM images of the holotype specimen and a paratype specimen (Figure 94P) that was not figured in Benson (1972) are shown here for the first time.

Poseidonamicus pintoi Benson, 1972

FIGURE 94R

Poseidonamicus pintoi Benson, 1972:53, fig. 23, pl. 10, figs. 7–12.
Poseidonamicus pintoi Benson; Hunt, 2007, fig. 12.1–12.3.

Locality and Age of Specimen Examined. Chain 82-24-4P, Pleistocene, North Atlantic.

Dimensions. See Table 1.

Remarks. The figured species is common in the Atlantic Ocean from the Pliocene onward. It differs somewhat from the type material described by Benson, which has rather narrow marginal rims and a flared dorsal ridge and is higher relative to its length (see Hunt, 2007, fig. 12-1). Reflecting these differences, some authors (e.g., Whatley and Coles, 1987) have used qualifiers such as cf. when comparing this material to *Poseidonamicus pintoi*. We know of no published or unpublished records ascribed to *Poseidonamicus pintoi* that precisely match the characteristics of Benson's type material, and it is possible that the widely distributed Atlantic species figured here is not conspecific with the type material of *Poseidonamicus pintoi*.

Poseidonamicus anteropunctatus Whatley, Downing, Kesler, and Harlow, 1986

FIGURE 94S–T

Poseidonamicus anteropunctatus Whatley, Downing, Kesler, and Harlow, 1986:389, pl. 1, figs. 4–8.
Poseidonamicus anteropunctatus Whatley et al.; Hunt, 2007, fig. 9.2.
Poseidonamicus anteropunctatus Whatley et al.; Hunt, Wicaksono, Brown, and MacLeod, 2010, text-fig. 2P.

FIGURE 93. Scanning electron microscope images of *Muellerina abyssicola* (Sars, 1866) and *Thaerocythere crenulata* (Sars, 1866). A–D, I–M, lateral views; E–H, N–O, internal views. **A–I,** *Muellerina abyssicola* (Sars, 1866). A, RB148 (USNM 607836), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. B, RB149 (USNM 607837), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. C, RB150 (USNM 607838), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. D, RB151 (USNM 607839), adult RV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. E, RB142 (USNM 607840), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. F, RB143 (USNM 607841), adult RV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. G, RB144 (USNM 607842), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. H, RB145 (USNM 607843), adult RV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. I, RB152 (USNM 607844), adult RV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. **J–O,** *Thaerocythere crenulata* (Sars, 1866). J, RB153 (USNM 607845), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. K, RB154 (USNM 607846), adult RV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. L, RB155 (USNM 607847), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. M, RB156 (USNM 607848), adult RV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. N, RB158 (USNM 607849), adult RV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. O, RB157 (USNM 607850), adult LV from DSDP 352, 4/4/129–134, Pleistocene, northeastern Atlantic. Scale bar represents 1 mm.

Locality and Age of Specimens Examined. DSDP 253, early Miocene, Indian Ocean.

Dimensions. See Table 1.

Remarks. This form is found from the Oligocene to the end of the Miocene in the Indian Ocean (Hunt et al., 2010). It is somewhat more elongate than the specimens illustrated by Whatley et al. (1986) but otherwise conforms well to their description.

Genus *Harleya* Jellinek and Swanson, 2003

Type Species. *Harleya davidsoni* Jellinek and Swanson, 2003.

Remarks. We did not encounter any specimens of this genus during our investigation. Brandão and Päplow (2011) described the species *Poseidonamicus yasuharai* Brandão and Päplow, 2011 and noted that it bears features of both *Poseidonamicus* Benson, 1972 and *Harleya* Jellinek and Swanson, 2003. This ambiguous species notwithstanding, *Harleya* has a more rectangular, "*Bradleya*-like" lateral shape and less rounded anterior field fossae compared with *Poseidonamicus*; see Jellinek and Swanson (2003) for further details.

Genus *Bradleya* Hornibrook, 1952

Type Species. *Cythere arata* Brady, 1880.

Remarks. As seen in Whatley et al. (1984) and Jellinek and Swanson (2003), this genus is far more diverse in the Pacific Ocean than in the Atlantic Ocean (e.g., see Whatley and Coles, 1987; Coles and Whatley, 1989, for Atlantic ostracods).

Bradleya dictyon (Brady, 1880)

FIGURES 92M–P, 94A–N

Cythere dictyon Brady, 1880:99, pl. 24, fig. 1h–i,l,o,p,s,t,u (non 1a–g,j,k,m,n,q,r,v–y) [from Benson, 1972].

Cythereis sp. Tressler, 1941:101, pl. 19, figs. 18–19.

Bradleya dictyon (Brady); Benson, 1972:34, fig. 15; pl. 8, fig. 7; pl. 9; pl. 11, fig. 18 (figs. 13B, 16–17; pl. 8, fig. 8?).

non *Bradleya dictyon* (Brady); Whatley, Downing, Kesler, and Harlow, 1984:274, pl. 1, figs. 1–3.

Bradleya dictyon (Brady); Malz, 1990, fig. 3; fig. 6.1–6.3, 6.6–6.7.

Bradleya dictyon (Brady); Didié and Bauch, 2001, pl. 1, fig. 4.

Bradleya dictyon (Brady); Jellinek and Swanson, 2003:58, pl. 55, figs. 3–5.

Bradleya dictyon (Brady); Alvarez Zarikian, 2009:6, pl. P5, figs. 8–9.

Locality and Age of Specimens Examined. Alb D2751, Alb D2754, Modern, northwestern Atlantic; DSDP 610A, DSDP 552A, DSDP 610, middle Miocene to late Pliocene, northeastern Atlantic.

Dimensions. See Table 1.

Remarks. See Benson (1972) and Jellinek and Swanson (2003) for further synonymy. The microscopic image of lectotype specimen is shown in Benson (1972).

Bradleya cf. *mesembrina* Mazzini, 2005

FIGURE 94O

Locality and Age of Specimen Examined. Chain 82-24-4P, Pleistocene, North Atlantic.

Dimensions. See Table 1.

Remarks. The specimen shown here is very similar to *Bradleya mesembrina* Mazzini, 2005. The only major difference is that our specimen has a shorter anteromarginal ridge that terminates at midheight. *Bradleya mesembrina* has a long anteromarginal ridge that reaches the anterior cardinal angle.

Genus *Tongacythere* Hazel and Holden, 1971

Type Species. *Tongacythere kondoi* Hazel and Holden, 1971.

Remarks. Our SEM images confirm the internal details of this genus: hinge holamphidont, frontal muscle scar divided, and adductor muscle scars in a vertical row of four elongate scars. Only two previously described species have been assigned to this genus: *Tongacythere kondoi* Hazel and Holden, 1971, reported from a late Eocene limestone outcrop in Tonga, and *Tongacythere hanaii* Nohara, 1987, reported from modern sediment from off Minami-Daitō-jima Island, Okinawa, Japan (2,450 m water depth). Several undescribed species have been reported from the Pacific Ocean, not only from outcrops (Yamaguchi and Kamiya, 2009) but also from deep-sea cores (also see Ayress, 1995; Boomer and Whatley, 1995; Whatley and Boomer, 1995).

Tongacythere sp. 1

FIGURES 46A–B, 92Q

Locality and Age of Specimens Examined. DSDP 277, early Eocene, Southern Ocean.

Dimensions. See Table 1.

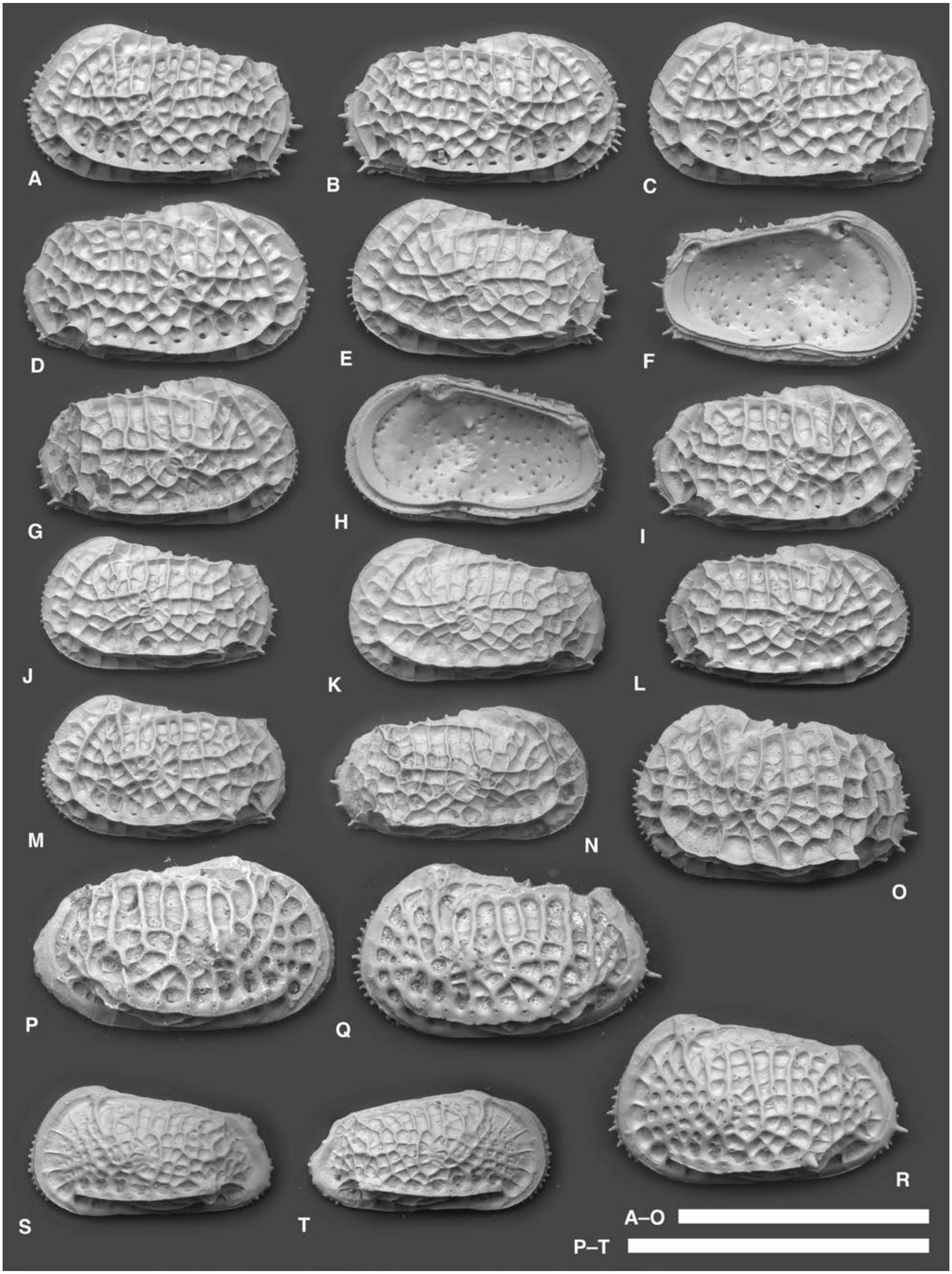
Tongacythere sp. 2

FIGURES 46C–D, 92R–S

Locality and Age of Specimens Examined. SI-25, late Eocene, New Zealand.

Dimensions. See Table 1.

Remarks. This species is very similar to *Tongacythere kondoi* Hazel and Holden, 1971 but is distinguished by a


A
B
C
D
E
F
G
H
I
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L
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Q
R
S
T
A–O
P–T

FIGURE 94. (Opposite page) Scanning electron microscope images of *Bradleya dictyon* (Brady, 1880), *Bradleya* cf. *mesembrina* Mazzini, 2005, *Poseidonamicus minor* Benson, 1972, *Poseidonamicus pintoi* Benson, 1972, and *Poseidonamicus anteropunctatus* Whatley et al., 1986. A–E, G, I–T, lateral views; F, H, internal views. **A–N,** *Bradleya dictyon* (Brady, 1880). A, RB436 (USNM 607851), adult LV from Alb D2751, Modern, northwestern Atlantic. B, RB437 (USNM 607852), adult RV from Alb D2751, Modern, northwestern Atlantic. C, RB449 (USNM 607853), adult LV from Alb D2754, Modern, northwestern Atlantic. D, RB450 (USNM 607854), adult RV from Alb D2754, Modern, northwestern Atlantic. E–F, GSM306 (USNM 607855), adult LV from DSDP 610A, 15/7/4–6, late Pliocene, northeastern Atlantic. G–H, GSM313 (USNM 607856), adult RV from DSDP 610A, 16/6/18, late Pliocene, northeastern Atlantic. I, GSM5087 (USNM 607857), adult RV from DSDP 552A, 15/3/79–81, Pliocene, northeastern Atlantic. J, GSM5091 (USNM 607858), adult LV from DSDP 552A, 15/3/38–40, Pliocene, northeastern Atlantic. K, GSM615 (USNM 607859), adult LV from DSDP 552A, 9/4/20–22, Pliocene, northeastern Atlantic. L, TMC385 (USNM 607860), adult RV from DSDP 610, 17/4/69, middle Miocene, northeastern Atlantic. M, USGSD241 (USNM 607861), adult LV from DSDP 552A, 19/1/80–82, Pliocene, northeastern Atlantic. N, USGSD245 (USNM 607862), adult RV from DSDP 552A, 10/2/109–111, Pliocene, northeastern Atlantic. **O,** *Bradleya* cf. *mesembrina* Mazzini, 2005, GSM174 (USNM 607863), adult LV from Chain 82-24-4P, 181.5–184.5, Pleistocene, North Atlantic. **P–Q,** *Poseidonamicus minor* Benson, 1972. P, TRA1020 (USNM 188561), adult RV from EL 21-10, Modern, southeastern Pacific. Q, TRA1025 (USNM 174357), adult LV from DWBG 74, Modern, southeastern Pacific. **R,** *Poseidonamicus pintoi* Benson, 1972, TMC103 (USNM 607864), adult LV from Chain 82-24-4P, 286–288, Pleistocene, North Atlantic. **S–T,** *Poseidonamicus anteropunctatus* Whatley et al., 1986. S, TRA1006 (USNM 607865), adult LV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. T, TRA1007 (USNM 607866), adult RV from DSDP 253, 9/3/50–56, early Miocene, Indian Ocean. Scale bars represent 1 mm.

distinct spine on the midlength of the dorsal margin and its less prominent and upturned posterior margin.

Tongacythere sp. 3

FIGURES 46E–F, 92T–U

Locality and Age of Specimens Examined. NGC 100 pilot, Modern, southwestern Pacific.

Dimensions. See Table 1.

Family Hemicytheridae Puri, 1953a

Genus *Muellerina* Bassiouni, 1965

Type Species. *Cythere latimarginata* Speyer, 1863.

Remarks. *Muellerina* Bassiouni, 1965 is similar to *Thaerocythere* Hazel, 1967, but the former has deep and distinct anterior and posterior marginal sulci, adductor muscle scars that are often divided, and a much more slender outline. See Hazel (1967) and Wood and Whatley (1997) for further details. Weiss (1998) erected *Kempfidea* Weiss, 1998 for Neogene "*Muellerina*" species, including *Muellerina abyssicola* (Sars, 1866), to separate them from *Muellerina* (the type species, *Cythere latimarginata* Speyer, 1863, is known from the Oligocene), mainly on the basis of slight differences in hingement and subcentral muscle scars. However, the overall morphologies of these genera are very similar in both lateral and internal views. The undivided ventromedian scar that Weiss (1998) considered an important character to separate *Muellerina* from *Kempfidea* is also seen in some Neogene *Muellerina* and has been considered intrageneric variation (Wouters, 1979; Wood and Whatley, 1997). Furthermore, this separation makes *Muellerina* a monospecific genus composed of only the type species. Thus, we consider *Kempfidea* a junior synonym of *Muellerina*. *Muellerina* is a diverse shallow marine genus widely distributed in the (especially high-latitude) shallow marine North Atlantic region (Hazel, 1967, 1983; Cronin, 1991; Wood and Whatley, 1997), but at least one species, *Muellerina abyssicola* (Sars, 1866), is known from bathyal depth.

Synonymized Genus. *Kempfidea* Weiss, 1998.

Muellerina abyssicola (Sars, 1866)

FIGURES 92D–H, 93A–I

Cythereis abyssicola Sars, 1866:43.
Muellerina abyssicola (Sars); Hazel, 1967:22, pl. 3, figs. 1–2, 7–8, 10, 16.
Muellerina abyssicola (Sars); Benson, DelGrosso, and Steineck, 1983:448, pl. 2, figs. 3, 5.
Muellerina canadensis (Brady); Benson et al., 1983:448, pl. 2, figs. 4, 6, 7.
Muellerina abyssicola (Sars); Penney, 1993, fig. 4q.
Muellerina abyssicola (Sars); Coles, Ainsworth, Whatley, and Jones, 1996:150, pl. 6, figs. 8–11.
Muellerina abyssicola (Sars); Wood and Whatley, 1997:3, pl. 1, figs. 2–3.
Muellerina abyssicola (Sars); Freiwald and Mostafawi, 1998, pl. 58, fig. 15.

Locality and Age of Specimens Examined. DSDP 352, Pleistocene, northeastern Atlantic.

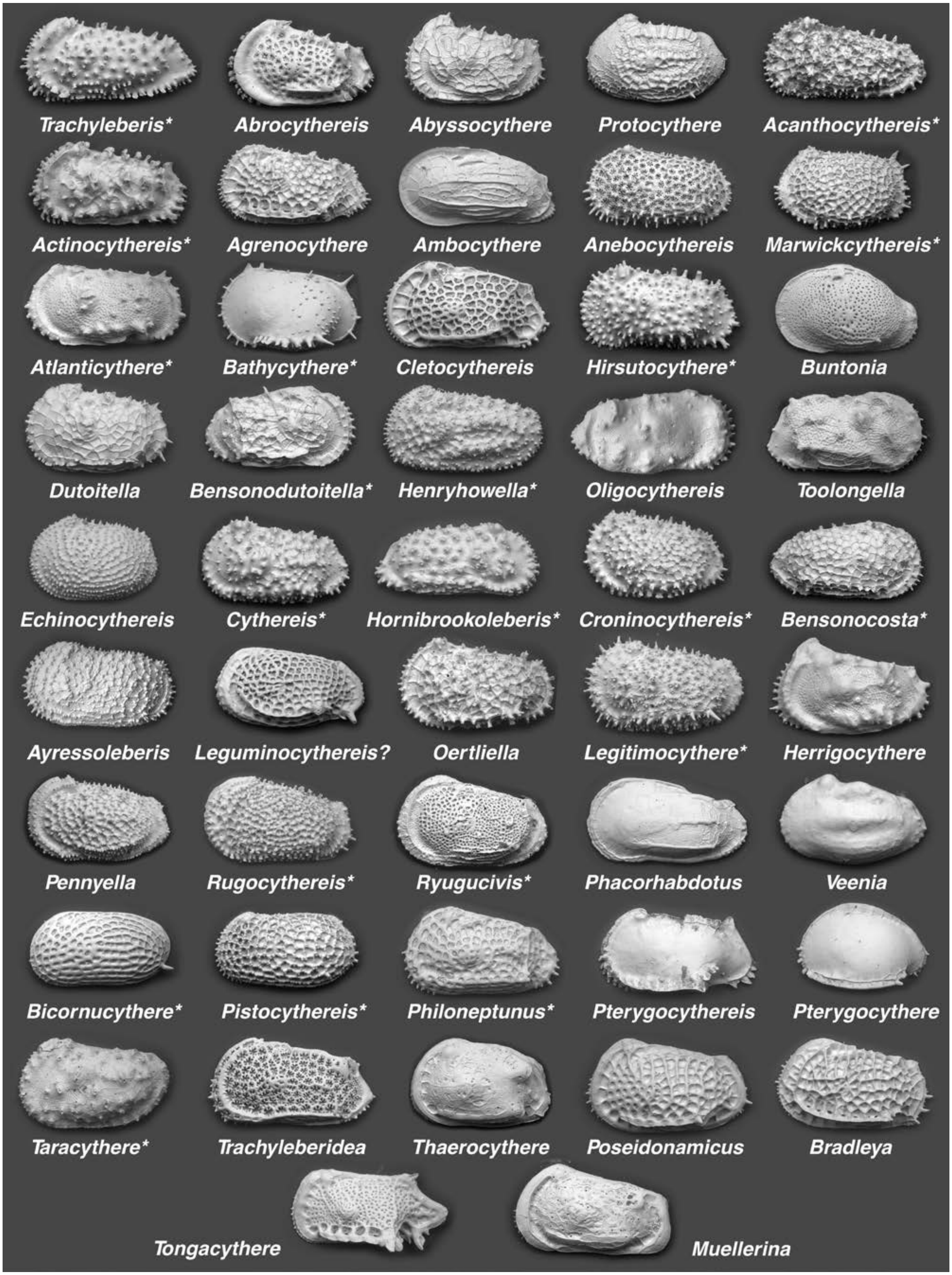
Dimensions. See Table 1.

Remarks. The most recent reinvestigation of this species was conducted by Wood and Whatley (1997). Clear SEM and microscopic images of specimens of *Muellerina abyssicola* (Sars, 1866) from several localities in northern Europe, including the type locality in Norway, are available (Bassiouni, 1965; Wouters, 1979; Lord, 1980; Penney, 1993; Wood and Whatley, 1997; Freiwald and Mostafawi, 1998) and suggest that these specimens are conspecific. Although Wood and Whatley (1997) did not mention any North American occurrence records, the North American specimens (Hazel, 1967) appear to be conspecific with the north European specimens as well. The specimens that Benson et al. (1983) reported as *Muellerina canadensis* (Brady) (Benson et al., 1983, pl. 2, figs. 4, 6, 7) are also conspecific with *Muellerina abyssicola*. We observe intraspecific variation in the development of reticulation in this species. Specimens from deeper water may tend to have weak reticulation (e.g., Benson et al.'s [1983] specimens and our specimens herein), although some variation is observed even within our specimens from a single location. This species is known from the shelf to upper bathyal depths (<1,500 m water depth: Benson et al., 1983).

Note

All trachyleberidid, thaerocytherid, and hemicytherid genera discussed herein are shown (one representative species for each genus) in Figure 95 for comparison.

FIGURE 95. (Opposite page) Representative scanning electron microscope images of trachyleberidid, thaerocytherid, and hemicytherid genera discussed in the present study (an asterisk indicates type species).


Trachyleberis*
Abrocythereis
Abyssocythere
Protocythere
Acanthocythereis*
Actinocythereis*
Agrenocythere
Ambocythere
Anebocythereis
Marwickcythereis*
Atlanticythere*
Bathycythere*
Cletocythereis
Hirsutocythere*
Buntonia
Dutoitella
Bensonodutoitella*
Henryhowella*
Oligocythereis
Toolongella
Echinocythereis
Cythereis*
Hornibrookoleberis*
Croninocythereis*
Bensonocosta*
Ayressoleberis
Leguminocythereis?
Oertliella
Legitimocythere*
Herrigocythere
Pennyella
Rugocythereis*
Ryugucivis*
Phacorhabdotus
Veenia
Bicornucythere*
Pistocythereis*
Philoneptunus*
Pterygocythereis
Pterygocythere
Taracythere*
Trachyleberidea
Thaerocythere
Poseidonamicus
Bradleya
Tongacythere
Muellerina

Appendix

TABLE A1. Detailed information for the specimens used in the present study.

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607200	TRA1109	*Trachyleberis scabrocuneata*		R	A	F	JP	OB2	106	Holocene	34.597	135.158	21.91	6	A
USNM 607201	TRA1113	*Trachyleberis scabrocuneata*		R	A	F	JP	OB2	106	Holocene	34.597	135.158	21.91	6	B, E–F, I
USNM 607202	TRA1110	*Trachyleberis scabrocuneata*		L	A	M	JP	OB2	106	Holocene	34.597	135.158	21.91	6	C
USNM 607203	TRA1112	*Trachyleberis scabrocuneata*		L	A	F	JP	OB2	106	Holocene	34.597	135.158	21.91	6	D, G–H
USNM 607204	TRA219	*Abrocythereis malaysiana*		L	A	?	NWP	Alb 5469	Modern	Modern	13.733	123.700	900	7	A–B
														8	B, E
USNM 607205	TRA220	*Abrocythereis malaysiana*		R	A	?	NWP	Alb 5469	Modern	Modern	13.733	123.700	900	7	C–D
														8	A, C, D
USNM 607206	RB314	*Abyssocythere atlantica*		L	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	7	E
USNM 607207	RB315	*Abyssocythere atlantica*		R	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	7	F–G
														8	F, I
USNM 607208	RB317	*Abyssocythere atlantica*		R	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	7	H–I
														8	H, J
USNM 607209	RB316	*Abyssocythere atlantica*		L	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	7	J
USNM 607210	RB330	*Abyssocythere atlantica*		L	A	?	NWA	KN 25 sta 288	Modern	Modern	11.037	–55.092	4425	7	K
														8	G, K
USNM 607211	RB331	*Abyssocythere atlantica*		R	A	?	NWA	KN 25 sta 288	Modern	Modern	11.037	–55.092	4425	7	L
USNM 607212	TRA121	*Abyssocythere diagrenona*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	7	M–N
														8	M, Q
USNM 607213	TRA122	*Abyssocythere diagrenona*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	7	O
USNM 607214	TRA123	*Abyssocythere diagrenona*		R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	7	P–Q
														8	L, O
USNM 607215	TRA236	*Abyssocythere diagrenona*		R	A	?	SEA	DSDP 522	34/1/ 113–120	Early Oligocene	–26.114	–5.130	4441	7	R–S
														8	N, P
USNM 607216	TRA762	*Abyssocythere scotti*	P	L	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	–46.784	2400	7	T–U
USNM 607217	TRA309	*Abyssocythere scotti*	P	R	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	9	A–B
														10	A, D
USNM 607218	TRA312	*Abyssocythere scotti*	P	L	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	9	C–D
														10	B, F
USNM 607219	TRA747	*Abyssocythere scotti*	H	R	A	?	SWA	DSDP 327A	12/3/ 50–55	Maastrichtian	–50.871	–46.784	2400	9	E–F
														10	C, E
USNM 607220	RB186	*Protocythere vitjasi*		L	A	?	NWP	DSDP 305	3/2/50–56	Pliocene	32.002	157.850	2903	9	G–H
														10	J, L
USNM 607221	RB187	*Protocythere vitjasi*		R	A	?	NWP	DSDP 305	3/2/50–56	Pliocene	32.002	157.850	2903	9	I–J
														10	I, K

USNM 607222	GSM244	*Protocythere sulcatoperforata*	R	A	?	NWA	DSDP 541	14/4/36	Pliocene	15.520	-58.728	4940	9	K–L
													10	M, O
USNM 607223	USGSD149	*Protocythere sulcatoperforata*	L	A	?	NA	DSDP 607	14/5/ 17–19	Late Pliocene	41.001	–32.957	3427	9	M–N
													10	N, P
USNM 607224	TRA854	*Acanthocythereis araneosa*	L	A	M	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	A–B
													13	B, F
USNM 607225	TRA856	*Acanthocythereis araneosa*	R	A	M	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	C–D
													13	A, D, G
USNM 607226	TRA861	*Acanthocythereis araneosa*	L	A	F	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	E
USNM 607227	TRA862	*Acanthocythereis araneosa*	R	A	F	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	F–G
													13	C, E, H
USNM 607228	TRA858	*Acanthocythereis* cf. *araneosa*	L	A	?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	H
USNM 607229	TRA859	*Acanthocythereis* cf. *araneosa*	R	A	?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	I
USNM 607230	TRA860	*Acanthocythereis* cf. *araneosa*	R	A	?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	J
													13	I–K
USNM 607231	TRA855	*Acanthocythereis stenzeli*	L	A	?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	K
USNM 607232	TRA857	*Acanthocythereis stenzeli*	R	A	?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	12	L–M
													13	L–N
USNM 607233	TRA842	*Actinocythereis exanthemata*	L	A	F	NAM	Calvert Formation	Outcrop	Miocene	38.600	–76.517	OC	12	N–O
													13	O, S
USNM 607234	TRA841	*Actinocythereis exanthemata*	L	A	M	NAM	Calvert Formation	Outcrop	Miocene	38.600	–76.517	OC	12	P
USNM 607235	TRA843	*Actinocythereis exanthemata*	L	A	F	NAM	Calvert Formation	Outcrop	Miocene	38.600	–76.517	OC	12	Q
USNM 607236	TRA844	*Actinocythereis exanthemata*	R	A	F	NAM	Calvert Formation	Outcrop	Miocene	38.600	–76.517	OC	12	R–S
													13	P–R
USNM 607237	TRA845	*Actinocythereis exanthemata*	R	A	F	NAM	Calvert Formation	Outcrop	Miocene	38.600	–76.517	OC	12	T
USNM 607238	TRA221	*Actinocythereis vineyardensis*	L	A	M	NWA	Alb 2555	Modern	Modern	39.883	–71.533	244	14	A–B
													13	V–W
USNM 607239	TRA222	*Actinocythereis vineyardensis*	R	A	M	NWA	Alb 2555	Modern	Modern	39.883	–71.533	244	14	C–D
													13	T–U, X
USNM 607240	TRA223	*Actinocythereis vineyardensis*	L	A	F	NWA	Alb 2544	Modern	Modern	40.029	–70.400	235	14	E
USNM 607241	TRA224	*Actinocythereis vineyardensis*	R	A	F	NWA	Alb 2544	Modern	Modern	40.029	–70.400	235	14	F
USNM 607242	TRA903	*Actinocythereis purii*	R	A	M?	NAM	Cocoa Sand Member	Outcrop	Late Eocene	31.900	–88.400	OC	14	G

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607243	TRA863	*Actinocythereis texana*		L	A	M?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	14	H
USNM 607244	TRA864	*Actinocythereis texana*		L	A	F?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	14	I
USNM 607245	TRA865	*Actinocythereis texana*		R	A	M?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	14	J
USNM 607246	TRA866	*Actinocythereis texana*		R	A	F?	NAM	Cook Mountain Formation	Outcrop	Eocene	31.450	–93.750	OC	14 13	K–L Y–AA
USNM 607247	TRA901	*Actinocythereis purii*		L	A	F?	NAM	Cocoa Sand Member	Outcrop	Late Eocene	31.900	–88.400	OC	14	M
USNM 607248	TRA902	*Actinocythereis purii*		R	A	F?	NAM	Cocoa Sand Member	Outcrop	Late Eocene	31.900	–88.400	OC	14 15	N A–C
USNM 607249	TRA201	*Actinocythereis? scutigera*		L	A	M	NWP	Alb D5348	Modern	Modern	10.963	118.638	686	14 15	O–P G–H
USNM 607250	TRA202	*Actinocythereis? scutigera*		R	A	M	NWP	Alb D5348	Modern	Modern	10.963	118.638	686	14 15	Q–R D–F
USNM 607251	TRA203	*Actinocythereis? scutigera*		L	A	F	NWP	Alb D5348	Modern	Modern	10.963	118.638	686	14	S
USNM 607252	TRA204	*Actinocythereis? scutigera*		R	A	F	NWP	Alb D5348	Modern	Modern	10.963	118.638	686	14	T
USNM 607253	SIMY0026	*Agrenocythere hazelae*		L	A	F	EWP	SC 9DD	0–1	Modern	–0.292	158.112	2230	16	A
USNM 607254	POS1220	*Agrenocythere hazelae*		R	A	F	EWP	SC 9DD	0–1	Modern	–0.292	158.112	2230	16	B
USNM 607255	RB107	*Agrenocythere hazelae*		L	A	M	SEA	DSDP 526A	1/1/60–67	Early Pliocene	–30.123	3.138	1054	16	C–D
USNM 607256	RB108	*Agrenocythere hazelae*		R	A	F	SEA	DSDP 526A	1/1/60–67	Early Pliocene	–30.123	3.138	1054	16 15	E–F I, K
USNM 607257	USGSD141	*Agrenocythere hazelae*		L	A	F	NA	DSDP 607	14/3/129	Late Pliocene	41.001	–32.957	3427	16 15	G–H J, L
USNM 607258	RB431	*Agrenocythere hazelae*		L	A	M	NWA	Alb D2751		Modern	16.900	–63.200	1256	16	I
USNM 607259	RB432	*Agrenocythere hazelae*		R	A	M	NWA	Alb D2751		Modern	16.900	–63.200	1256	16	J
USNM 607260	RB433	*Agrenocythere hazelae*		L	A	F	NWA	Alb D2751		Modern	16.900	–63.200	1256	16	K
USNM 607261	RB434	*Agrenocythere hazelae*		R	A	F	NWA	Alb D2751		Modern	16.900	–63.200	1256	16	L
USNM 607262	POS966	*Agrenocythere?* sp.		L	A-1?		NEA	DSDP 116	21/3/50–56	Late Oligocene	57.496	–15.924	1151	16	M
USNM 607263	POS965	*Agrenocythere?* sp.		R	A	M	NEA	DSDP 116	23/2/80–86	Early Oligocene	57.496	–15.924	1151	16	N
USNM 607264	ODP982012	*Ambocythere caudata*		L	A	F	NEA	ODP 982A	1/2/47–49	Pleistocene	57.517	–15.867	1135.3	17	A
USNM 607265	ODP982013	*Ambocythere caudata*		R	A	M	NEA	ODP 982A	1/2/47–49	Pleistocene	57.517	–15.867	1135.3	17 15	B–C M

USNM 607266	ODP982014	*Ambocythere caudata*		R	A	F	NEA	ODP 982A	1/1/ 142–144	Pleistocene	57.517	–15.867	1135.3	17 18 15	D–E S N–O
USNM 607267	ODP982015	*Ambocythere caudata*		R	A	F	NEA	ODP 982A	1/1/ 142–144	Pleistocene	57.517	–15.867	1135.3	17	F
USNM 607268	ODP982016	*Ambocythere caudata*		L	A	M	NEA	ODP 982A	1/2/7–9	Pleistocene	57.517	–15.867	1135.3	17	G
USNM 607269	ODP982017	*Ambocythere caudata*		L	A	M	NEA	ODP 982A	1/1/ 127–129	Pleistocene	57.517	–15.867	1135.3	17 15	H P–Q
USNM 607270	GSM103	*Ambocythere tomocaudata*	H	R	A	?	NWA	WHOI 1608	Modern	Modern	26.208	–79.767	584	17 18	I T
USNM 607271	GSM105	*Ambocythere tomocaudata*	P	L	A	?	NWA	WHOI 1617	Modern	Modern	27.037	–79.660	549	17	J
USNM 607272	GSM104	*Ambocythere tomocaudata*	P	R	A	?	NWA	WHOI 1608	Modern	Modern	26.208	–79.767	584	17	K
USNM 607273	USGSD201	*Ambocythere* cf. *ramosa*		L	A	?	NEA	DSDP 552A	16/2/ 88–90	Pliocene	56.043	–23.231	2301	17	L–M
USNM 607274	USGSD202	*Ambocythere* cf. *ramosa*		R	A	?	NEA	DSDP 552A	16/2/ 88–90	Pliocene	56.043	–23.231	2301	17	N–O
USNM 607275	ODP982018	*Ambocythere ramosa*		L	A	F	NEA	ODP 982A	1/2/ 107–109	Pleistocene	57.517	–15.867	1135.3	17	P
USNM 607276	ODP982019	*Ambocythere ramosa*		R	A	F	NEA	ODP 982A	1/2/ 107–109	Pleistocene	57.517	–15.867	1135.3	17	Q–R
USNM 607277	ODP982020	*Ambocythere ramosa*		L	A	F	NEA	ODP 982A	1/2/ 107–109	Pleistocene	57.517	–15.867	1135.3	17 15	S T–U
USNM 607278	ODP982021	*Ambocythere ramosa*		R	A	M	NEA	ODP 982A	1/3/ 102–104	Pleistocene	57.517	–15.867	1135.3	17 15	T–U R–S, V
USNM 607279	GSM214	*Ambocythere whatleyi*	H	R	A	?	NEA	KN 714-15A	404	Quaternary	58.767	–25.950	2598	18	A–B
USNM 607280	GSM237	*Ambocythere whatleyi*	P	R	A	?	NEA	KN 714-15A	133	Quaternary	58.767	–25.950	2598	18	C, E
USNM 607281	GSM236	*Ambocythere whatleyi*	P	L	A	?	NEA	KN 714-15A	133	Quaternary	58.767	–25.950	2598	18	D
USNM 607282	GSM213	*Ambocythere whatleyi*	P	L	A	?	NEA	KN 714-15A	404	Quaternary	58.767	–25.950	2598	18 15	F–G Z
USNM 607283	ODP980078	*Ambocythere whatleyi*	P	L	A	?	NEA	ODP 980C	2/2/0–2	Pleistocene	55.485	–14.702	2168	18	H–I
USNM 607284	RB411	*Ambocythere whatleyi*	P	R	A	?	NWA	Alb 2714	Modern	Modern	38.367	–70.300	2983	18 15	J–K W–Y
USNM 607285	RB435	*Ambocythere hyakunome*	H	R	A	F	NWA	Alb D2751	Modern	Modern	16.900	–63.200	1256	18 19	L–M A–B, E
USNM 607286	RB438	*Ambocythere hyakunome*	P	R	A	M	NWA	Alb D2751	Modern	Modern	16.900	–63.200	1256	18 19	N–O C–D, F
USNM 607287	RB459	*Ambocythere hyakunome*	P	L	A	F	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	18	P
USNM 607288	POS1244	*Ambocythere* sp.1		R	A	?	EWP	AQ 14	10–20	Quaternary	–4.997	159.993	1716	18 19	Q–R G–I

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607289	TRA342	*Anebocythereis reticulata*		R	A	?	IO	DSDP 258	1/4/ 100–106	Pleistocene	–33.795	112.474	2793	20 19	A–B J–K, N
USNM 607290	TRA343	*Anebocythereis reticulata*		L	A	?	IO	DSDP 258	1/4/ 100–106	Pleistocene	–33.795	112.474	2793	20	C
USNM 607291	TRA344	*Anebocythereis reticulata*		R	A	?	IO	DSDP 258	1/4/ 100–106	Pleistocene	–33.795	112.474	2793	20	D–E
USNM 607292	TRA538	*Anebocythereis reticulata*		R	A	?	IO	DSDP 214	27/cc	Late Eocene	–11.337	88.718	1655	20	F–G
USNM 607293	TRA543	*Anebocythereis reticulata*		L	A	?	IO	DSDP 214	34/4/ 60–66	Early Eocene	–11.337	88.718	1655	20 19	H–I M, O
USNM 607294	TRA544	*Anebocythereis reticulata*		R	A	?	IO	DSDP 214	34/4/ 60–66	Early Eocene	–11.337	88.718	1655	20	J–K
USNM 607295	TRA835	*Marwickcythereis marwicki*		R	A	?	NZ	SI-25	Outcrop	Late Eocene	–45.100	170.900	OC	20 19	L–M R, T, V
USNM 607296	TRA1028	*Marwickcythereis marwicki*		L	A	?	NZ	Hampden Formation	Outcrop	Middle Eocene	–45.300	170.817	OC	20 19	N–O S, W
USNM 607297	TRA1029	*Marwickcythereis marwicki*		R	A	?	NZ	Hampden Formation	Outcrop	Middle Eocene	–45.300	170.817	OC	20 19	P–Q U, X
USNM 607298	TRA826	*Anebocythereis hostizea*		L	A	?	NZ	SI-25	Outcrop	Late Eocene	–45.100	170.900	OC	21	A
USNM 607299	TRA827	*Anebocythereis hostizea*		R	A	?	NZ	SI-25	Outcrop	Late Eocene	–45.100	170.900	OC	21 19	B–C Y, AA, CC
USNM 607300	TRA833	*Anebocythereis hostizea*		R	A	?	NZ	SI-25	Outcrop	Late Eocene	–45.100	170.900	OC	21 19	D Z, BB, DD
USNM 607301	TRA130	*Anebocythereis reticulata*		L	A	?	SEA	DSDP 529	9/1/90–97	Early Miocene	–28.931	2.768	3043	21	E–F
USNM 607302	TRA131	*Anebocythereis reticulata*		R	A	?	SEA	DSDP 529	12/1/??	Early Miocene	–28.931	2.768	3043	21 19	G–H L, Q
USNM 607303	TRA132	*Anebocythereis reticulata*		R	A	?	SEA	DSDP 529	12/1/??	Early Miocene	–28.931	2.768	3043	21	I–J
USNM 607304	TRA237	*Anebocythereis reticulata*		L	A	?	SEA	DSDP 522	34/1/ 113–120	Early Oligocene	–26.114	–5.130	4441	21	K–L

USNM 607305	TRA552	*Anebocythereis reticulata*		L	A	?	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	21	M–N
USNM 607306	TRA1014	*Anebocythereis reticulata*		L	A	?	IO	DSDP 253	10/3/ 100–106	Late Oligocene	–24.878	87.366	1962	21	O
USNM 607307	TRA1015	*Anebocythereis reticulata*		R	A	?	IO	DSDP 253	10/3/ 100–106	Late Oligocene	–24.878	87.366	1962	21	P
USNM 607308	TRA341	*Anebocythereis reticulata*		L	A	?	IO	DSDP 255	3/2/70–76	Pliocene	–24.878	87.366	1144	21 19	Q–R P
USNM 607309	TRA702	*Atlanticythere maestrichtia*		R	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	24	A
USNM 607310	TRA703	*Atlanticythere maestrichtia*		R	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	24	B
USNM 607311	TRA706	*Atlanticythere maestrichtia*		R	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	24	C–D
USNM 607312	TRA712	*Atlanticythere maestrichtia*		R	A	?	SWA	DSDP 21	4/1/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	24 25	E–F A, C
USNM 607313	TRA704	*Atlanticythere maestrichtia*		L	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	24 25	G–H B, D
USNM 607314	TRA721	*Atlanticythere maestrichtia*		R	A	?	SWA	DSDP 21	4/4/ 60–66	Campanian–Maastrichtian	–28.585	–30.598	2113	24	I
USNM 607315	TRA720	*Atlanticythere maestrichtia*		L	A	?	SWA	DSDP 21	4/4/ 60–66	Campanian–Maastrichtian	–28.585	–30.598	2113	24	J
USNM 607316	TRA723	*Atlanticythere maestrichtia*		R	A	?	SWA	DSDP 21	4/5/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	24	K–L
USNM 607317	TRA632	*Atlanticythere bensoni*	P	L	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	–28.585	–30.598	2113	24	M
USNM 607318	TRA633	*Atlanticythere bensoni*	H	L	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	–28.585	–30.598	2113	24 25	N–O F, H
USNM 607319	TRA634	*Atlanticythere bensoni*	P	R	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	–28.585	–30.598	2113	24 25	P–Q E, G
USNM 607320	TRA635	*Atlanticythere bensoni*	P	L	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	–28.585	–30.598	2113	24	R
USNM 607321	TRA705	*Atlanticythere bensoni*	P	L	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	24	S
USNM 607322	TRA641	*Atlanticythere murareticulata*		L	A	?	SWA	DSDP 21A	1/4/50–56	Middle Eocene	–28.585	–30.598	2113	26	A
USNM 607323	TRA642	*Atlanticythere murareticulata*		R	A	?	SWA	DSDP 21A	1/4/50–56	Middle Eocene	–28.585	–30.598	2113	26	B
USNM 607324	TRA643	*Atlanticythere murareticulata*		R	A	?	SWA	DSDP 21A	1/4/50–56	Middle Eocene	–28.585	–30.598	2113	26 25	C–D I–J
USNM 607325	TRA630	*Atlanticythere murareticulata*		L	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	–28.585	–30.598	2113	26	E

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607326	TRA631	*Atlanticythere murareticulata*		L	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	–28.585	–30.598	2113	26 25	F K–L
USNM 607327	TRA639	*Atlanticythere murareticulata*		L	A	?	SWA	DSDP 21A	2/4/50–56	Early Eocene	–28.585	–30.598	2113	26	G–H
USNM 607328	TRA640	*Atlanticythere murareticulata*		R	A	?	SWA	DSDP 21A	2/4/50–56	Early Eocene	–28.585	–30.598	2113	26	I–J
USNM 607329	TRA103	*Atlanticythere murareticulata*		L	A	?	SEA	DSDP 526A	22/1/124–131	Early Miocene	–30.123	3.138	1054	26	K
USNM 607330	TRA104	*Atlanticythere murareticulata*		R	A	?	SEA	DSDP 526A	22/1/124–131	Early Miocene	–30.123	3.138	1054	26	L
USNM 607331	TRA105	*Atlanticythere murareticulata*		L	A	?	SEA	DSDP 526A	22/1/124–131	Early Miocene	–30.123	3.138	1054	26	M–N
USNM 607332	TRA106	*Atlanticythere murareticulata*		R	A	?	SEA	DSDP 526A	22/1/124–131	Early Miocene	–30.123	3.138	1054	26	O–P
USNM 607333	TRA332	*Atlanticythere murareticulata*		L	A	?	SWA	DSDP 357	6/2/50–60	Middle Miocene	–30.004	–35.560	2086	26	Q–R
USNM 607334	TRA333	*Atlanticythere murareticulata*		R	A	?	SWA	DSDP 357	6/2/50–60	Middle Miocene	–30.004	–35.560	2086	27 25	A–B N
USNM 607335	TRA126	*Atlanticythere murareticulata*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	27	C–D
USNM 607336	TRA127	*Atlanticythere murareticulata*		R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	27	E
USNM 607337	TRA128	*Atlanticythere murareticulata*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	27	F
USNM 607338	TRA129	*Atlanticythere murareticulata*		R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	27	G
USNM 607339	TRA124	*Atlanticythere murareticulata*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	27	H
USNM 607340	TRA125	*Atlanticythere murareticulata*		R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	27	I–J
USNM 607341	TRA724	*Atlanticythere prethalassia*		L	A	?	SWA	DSDP 21	4/5/148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	27	K–L
USNM 607342	TRA319	*Atlanticythere oculi*	P	L	A	?	SEA	DSDP 359	3/2/53–60	Late Eocene	–34.985	–4.497	1655	27	M
USNM 607343	TRA320	*Atlanticythere oculi*	H	R	A	?	SEA	DSDP 359	3/2/53–60	Late Eocene	–34.985	–4.497	1655	27 25	N–O M, O
USNM 607344	TRA707	*Atlanticythere prethalassia*		L	A	?	SWA	DSDP 21	4/3/148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	28	A

USNM 607345	TRA708	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian– Maastrichtian	–28.585	–30.598	2113	28	B–C
USNM 607346	TRA709	*Atlanticythere prethalassia*		L	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian– Maastrichtian	–28.585	–30.598	2113	28 25	D Q–R
USNM 607347	TRA713	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	4/1/ 148–150	Campanian– Maastrichtian	–28.585	–30.598	2113	28 25	E P
USNM 607348	TRA719	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	4/4/ 13–15	Campanian– Maastrichtian	–28.585	–30.598	2113	28	F–G
USNM 607349	TRA730	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	5/1/ 31–33	Campanian– Maastrichtian	–28.585	–30.598	2113	28	H
USNM 607350	TRA731	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	5/1/ 31–33	Campanian– Maastrichtian	–28.585	–30.598	2113	28	I–J
USNM 607351	TRA732	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	5/1/ 31–33	Campanian– Maastrichtian	–28.585	–30.598	2113	28	K–L
USNM 607352	TRA735	*Atlanticythere prethalassia*		L	A	?	SWA	DSDP 21	5/3/ 50–56	Campanian– Maastrichtian	–28.585	–30.598	2113	28	M
USNM 607353	TRA736	*Atlanticythere prethalassia*		L	A	?	SWA	DSDP 21	5/3/ 50–56	Campanian– Maastrichtian	–28.585	–30.598	2113	28	N
USNM 607354	TRA737	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	5/3/ 50–56	Campanian– Maastrichtian	–28.585	–30.598	2113	28	O–P
USNM 607355	TRA743	*Atlanticythere prethalassia*		L	A	?	SWA	DSDP 21	5/3/??	Campanian– Maastrichtian	–28.585	–30.598	2113	28	Q
USNM 607356	TRA744	*Atlanticythere prethalassia*		R	A	?	SWA	DSDP 21	5/3/??	Campanian– Maastrichtian	–28.585	–30.598	2113	28	R–S
USNM 607357	TRA802	*Dutoitella atlantiformis*	P	L	A	?	IO	DSDP 258A	9/4/50–56	Santonian	–33.795	112.474	2793	28	T
USNM 607358	TRA803	*Dutoitella atlantiformis*	H	R	A	?	IO	DSDP 258A	9/4/50–56	Santonian	–33.795	112.474	2793	28 41	U–V A–B
USNM 607359	RB532	*Bathycythere vanstraateni*		L	A	?	MED	AII 59 sta 214		Modern	33.000	16.000	1500	29 25	A–B S, U
USNM 607360	RB533	*Bathycythere vanstraateni*		R	A	?	MED	AII 59 sta 214		Modern	33.000	16.000	1500	29 25	C–D T, V
USNM 607361	GSM155	*Bathycythere vanstraateni*		L	A	?	NA	Chain 82-24-4P	4–7	Holocene	41.717	–32.850	3427	29	E
USNM 607362	USGSD151	*Bathycythere vanstraateni*		L	A	?	NA	DSDP 607	15/3/ 110–112	Late Pliocene	41.001	–32.957	3427	29	F–G
USNM 607363	TRA850	*Cletocythereis scutulata*		L	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29	H
USNM 607364	TRA851	*Cletocythereis scutulata*		L	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29	I
USNM 607365	TRA852	*Cletocythereis scutulata*		R	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29 25	J–K W
USNM 607366	TRA853	*Cletocythereis scutulata*		R	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29 25	L X

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607367	TRA846	*Hirsutocythere hornotina*		L	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29	M
USNM 607368	TRA847	*Hirsutocythere hornotina*		L	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29	N
														30	B–C
USNM 607369	TRA848	*Hirsutocythere hornotina*		R	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29	O
USNM 607370	TRA849	*Hirsutocythere hornotina*		R	A	?	NAM	Avon Park Limestone	Outcrop	Middle Eocene	29.100	–82.600	OC	29	P
														30	A, D–E
USNM 607371	TRA212	“*Echinocythereis* cf. melobesioides”		L	A	?	NWP	Alb 5140	Modern	Modern	6.258	121.050	137	29	Q
USNM 607372	TRA214	“*Echinocythereis* cf. *melobesioides*”		R	A	?	NWP	Alb 5140	Modern	Modern	6.258	121.050	137	29	R
USNM 607373	TRA215	“*Echinocythereis* cf. *melobesioides*”		L	A	?	NWP	Alb 5139	Modern	Modern	6.100	121.117	36	29	S
														30	G, I
USNM 607374	TRA216	“*Echinocythereis* cf. *melobesioides*”		R	A	?	NWP	Alb 5138	Modern	Modern	6.100	121.106	34	29	T
														30	F, H
USNM 607375	ODP982068	*Buntonia textilis*		L	A	?	NEA	ODP 982A	1/2/7–9	Pleistocene	57.517	–15.867	1135.3	31	A
USNM 607376	ODP982069	*Buntonia textilis*		R	A	?	NEA	ODP 982A	1/2/27–29	Pleistocene	57.517	–15.867	1135.3	31	B
USNM 607377	ODP982070	*Buntonia textilis*		L	A	?	NEA	ODP 982A	1/2/87–89	Pleistocene	57.517	–15.867	1135.3	31	C–D
														30	K, M
USNM 607378	ODP982071	*Buntonia textilis*		R	A	?	NEA	ODP 982A	1/2/87–89	Pleistocene	57.517	–15.867	1135.3	31	E–F
														30	J, L
USNM 607379	TMC355	*Buntonia textilis*		L	A	?	NEA	DSDP 610	17/5/23	Middle Miocene	53.222	–18.887	2417	31	G
USNM 607380	TMC364	*Buntonia textilis*		L	A	?	NEA	DSDP 610	17/3/36	Middle Miocene	53.222	–18.887	2417	31	H
USNM 607381	TMC365	*Buntonia textilis*		R	A	?	NEA	DSDP 610	17/3/36	Middle Miocene	53.222	–18.887	2417	31	I
USNM 607382	TMC254	*Buntonia radiatopora*		L	A	?	NA	DSDP 607	13/2/ 77–79	Early Pleistocene	41.001	–32.957	3427	31	J
USNM 607383	RB536	*Buntonia radiatopora*		L	A	?	SEA	AII 42 sta 200	Modern	Modern	-9.000	10.000	2700	31	K–L
														30	P–Q
USNM 607384	RB537	*Buntonia radiatopora*		R	A	?	SEA	AII 42 sta 200	Modern	Modern	-9.000	10.000	2700	31	M–N
														30	N–O
USNM 607385	GSM246	*Buntonia radiatopora*		L	A	?	NEA	ODP 658A	25x/4/135	Late Pliocene	20.749	–18.581	2263.5	31	O

USNM 607386	GSM245	*Buntonia radiatopora*		L	A	?	NEA	ODP 659A	11/4/143	Pliocene	18.077	–21.026	3071.2	31	P
USNM 607387	USGSD152	*Buntonia radiatopora*		L	A	?	NA	DSDP 607	12/6/ 120–122	Early Pleistocene	41.001	–32.957	3427	31	Q
USNM 155077	TRA1024	*Cythereis ornatissima*	L	C	A	?	EUR	Pokorný 1963 Loc	Outcrop	Coniacian, Upper Cretaceous	50.000	15.000	OC	49	A
USNM 607388	TRA810	*Cythereis* cf. *ornatissima*		L	A	?	EUR	ARL 4778		Late Cretaceous, Santonian	52.750	9.383	OC	49 47	B–C U–V
USNM 607389	TRA811	*Cythereis* cf. *ornatissima*		R	A	?	EUR	ARL 4778		Late Cretaceous, Santonian	52.750	9.383	OC	49 47	D–E W–X
USNM 607390	TRA816	*Cythereis ornatissima*		L	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	49 47	F–G R–S
USNM 607391	TRA817	*Cythereis ornatissima*		R	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	49	H
USNM 607392	TRA818	*Cythereis ornatissima*		R	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	49 47	I–J P–Q
USNM 607393	TRA819	*Cythereis ornatissima*		R	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	49	K
USNM 607394	TRA820	*Cythereis ornatissima*		L	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	49	L
USNM 607395	TRA821	*Cythereis ornatissima*		R	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	49	M
USNM 607396	TRA822	*Cythereis ornatissima*		R	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	49 47	N T
USNM 607397	TRA768	*Cythereis* sp. 1		L	A	?	NA	DSDP 111A	11/6/ 50–56	Campanian	50.426	–46.368	1797	49 62	O–P L–M
USNM 607398	TMC242	*Dutoitella cronini*	P	R	A	?	NA	DSDP 607	13/4/ 135–137	Late Pliocene	41.001	–32.957	3427	32	A–B
USNM 607399	RB322	*Dutoitella cronini*	H	R	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	32 30	C–D S–T
USNM 607400	RB265	*Dutoitella cronini*	P	L	A	?	NWA	KN 35 sta 340A	Modern	Modern	38.240	–70.338	3300	32	E
USNM 607401	RB328	*Dutoitella cronini*	P	L	A	?	NWA	KN 25 sta 288	Modern	Modern	11.037	–55.092	4425	32 30	F R, U
USNM 607402	RB329	*Dutoitella cronini*	P	R	A	?	NWA	KN 25 sta 288	Modern	Modern	11.037	–55.092	4425	32	G
USNM 607403	RB412	*Dutoitella cronini*	P	R	A	?	NWA	Alb 2714	Modern	Modern	38.367	–70.300	2983	32	H
USNM 607404	RB415	*Dutoitella cronini*	P	R	A	?	NWA	Alb 2713	Modern	Modern	38.333	–70.142	3346	32	I–J
USNM 607405	GSM149	*Dutoitella cronini*	P	L	A	?	NA	Chain 82-24-4P	85–87	Pleistocene	41.717	–32.850	3427	32	K
USNM 607406	GSM173	*Dutoitella cronini*	P	L	A	?	NA	Chain 82-24-4P	184.5–187	Pleistocene	41.717	–32.850	3427	32	L
USNM 607407	GSM626	*Dutoitella cronini*	P	L	A	?	NWA	Alb D2038		Modern	38.000	–68.000	3659	32 30	M–N V–W
USNM 607408	GSM627	*Dutoitella cronini*	P	R	A	?	NWA	Alb D2038		Modern	38.000	–68.000	3659	32	O–P
USNM 607409	TRA533	*Dutoitella spinaplana*		R	A	?	SWP	DSDP 206	19/4/ 50–56	Early Pliocene	–32.013	165.453	3196	32 33	Q–R A–B
USNM 607410	TRA327	*Dutoitella praesuhmi*		L	A	?	SWA	DSDP 357	20/2/ 106–120	Late Eocene	–30.004	–35.560	2086	34 33	A–B D, F

(continued)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607411	TRA328	*Dutoitella praesuhmi*		R	A	?	SWA	DSDP 357	20/2/106–120	Late Eocene	–30.004	–35.560	2086	34 33	C–D C, E
USNM 607412	TRA964	*Dutoitella* cf. *praesuhmi*		R	A	?	EWP	AQ 14	5–10	Quaternary	–4.997	159.993	1716	34 33	E–F G–H
USNM 607413	SIMY0031	*Dutoitella* cf. *praesuhmi*		L	A	?	EWP	AQ 14	20–30	Quaternary	–4.997	159.993	1716	34 33	G–H I–J
USNM 607414	TRA109	*Dutoitella crassinodosa*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	34 33	I–J M–N
USNM 607415	TRA111	*Dutoitella crassinodosa*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	34	K
USNM 607416	TRA112	*Dutoitella crassinodosa*		R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	34 33	L–M K–L
USNM 607417	TRA113	*Dutoitella crassinodosa*		L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	34 33	N O
USNM 607418	TRA114	*Dutoitella crassinodosa*		R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	34	O
USNM 607419	TRA110	*Dutoitella crassinodosa*		R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	34	P
USNM 607420	TRA553	*Dutoitella symmetrica*	P	L	A	?	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	35	A
USNM 607421	TRA554	*Dutoitella symmetrica*	H	R	A	?	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	35 33	B–C P, R
USNM 607422	TRA326	*Dutoitella neogenica*		L	A	?	SWA	DSDP 357	22/3/81–83	Middle Eocene	–30.004	–35.560	2086	35 33	D–E Q, S
USNM 607423	TRA133	*Dutoitella mazziniae*	P	L	A	?	SWA	DSDP 357	5/3/50–59	Late Miocene	–30.004	–35.560	2086	35 36	F–G B–C
USNM 607424	TRA134	*Dutoitella mazziniae*	H	R	A	?	SWA	DSDP 357	5/3/50–59	Late Miocene	–30.004	–35.560	2086	35 36	H–I E–F
USNM 607425	TRA243	*Dutoitella mazziniae*	P	R	A	?	SEA	DSDP 526A	6/1/ 124–131	Late Miocene	–30.123	3.138	1054	35	J
USNM 607426	TRA244	*Dutoitella mazziniae*	P	R	A	?	SEA	DSDP 526A	6/1/124–131	Late Miocene	–30.123	3.138	1054	35 36	K–L A, D
USNM 607427	TRA410	*Dutoitella paradinglei*	P	L	A	?	SO	DSDP 281	10/2/ 135–142	Middle Miocene	–47.997	147.764	1591	35 36	M–N G–H
USNM 607428	TRA411	*Dutoitella paradinglei*	H	R	A	?	SO	DSDP 281	10/2/ 135–142	Middle Miocene	–47.997	147.764	1591	35 36	O–P I–J
USNM 607429	TRA412	*Dutoitella paradinglei*	P	L	A	?	SO	DSDP 281	10/2/ 135–142	Middle Miocene	–47.997	147.764	1591	35	Q

USNM 607430	TRA413	*Dutoitella paradinglei*	P	R	A	?	SO	DSDP 281	10/2/ 135–142	Middle Miocene	–47.997	147.764	1591	35 36	R–S K
USNM 607431	TRA321	*Dutoitella ayressi*	P	L	A	?	SEA	DSDP 359	2/6/85–95	Miocene	–34.985	–4.497	1655	37 36	A–B L–M
USNM 607432	TRA322	*Dutoitella ayressi*	H	R	A	?	SEA	DSDP 359	2/6/85–95	Miocene	–34.985	–4.497	1655	37 36	C–D N–O
USNM 607433	TRA1005	*Dutoitella mazziniae*	P	R	A	?	SEA	DSDP 359	1/3/42–53	Early Pliocene	–34.985	-4.497	1655	37 36	E–F P–Q
USNM 607434	TRA240	*Dutoitella mazziniae*	P	L	A	?	SEA	DSDP 526A	1/1/60–67	Early Pliocene	–30.123	3.138	1054	37 36	G–H R–S
USNM 607435	TRA241	*Dutoitella mazziniae*	P	L	A	?	SEA	DSDP 526A	1/1/60–67	Early Pliocene	–30.123	3.138	1054	37	I
USNM 607436	TRA242	*Dutoitella mazziniae*	P	R	A	?	SEA	DSDP 526A	1/1/60–67	Early Pliocene	–30.123	3.138	1054	37	J
USNM 607437	TRA338	*Dutoitella* sp. 1		R	A	?	IO	DSDP 246	2/cc	Early Pliocene	–33.620	45.160	1030	37 36	K–L T, V
USNM 607438	TRA339	*Dutoitella* sp. 2		R	A	?	IO	DSDP 246	2/cc	Early Pliocene	–33.620	45.160	1030	37 36	M–N U, W
USNM 607439	TRA101	*Dutoitella* cf. *mazziniae*		L	A	?	SEA	DSDP 526A	22/1/ 124–131	Early Miocene	–30.123	3.138	1054	37 36	O–P X–Y
USNM 607440	TRA102	*Dutoitella* cf. *mazziniae*		R	A	?	SEA	DSDP 526A	22/1/ 124–131	Early Miocene	–30.123	3.138	1054	38	A–B
USNM 607441	TRA317	*Dutoitella mimica*		L	A	?	SEA	DSDP 359	3/2/53–60	Late Eocene	–34.985	-4.497	1655	38 39	C–D A–B
USNM 607442	TRA318	*Dutoitella mimica*		R	A	?	SEA	DSDP 359	3/2/53–60	Late Eocene	–34.985	-4.497	1655	38 39	E–F C–D
USNM 607443	TRA308	*Dutoitella* sp. 3		L	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	-46.096	1519	38 39	G–H E–F
USNM 607444	TRA756	*Dutoitella colesi*	P	L	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	-46.784	2400	38 39	I–J G–H
USNM 607445	TRA757	*Dutoitella colesi*	P	L	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	-46.784	2400	38	K
USNM 607446	TRA758	*Dutoitella colesi*	H	R	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	-46.784	2400	38 39	L–M I–J
USNM 607447	TRA761	*Dutoitella spinosa*	P	R	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	-46.784	2400	38 39	N–O K–L
USNM 607448	TRA307	*Dutoitella spinosa*	H	R	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	-46.096	1519	38 39	P–Q M–N
USNM 607449	TRA806	*Dutoitella whatleyi*	P	R	A	?	SEA	DSDP 363	17/2/71–88	Middle Paleocene	–19.646	9.047	2248	38 39	R–S O–P
USNM 607450	TRA759	*Dutoitella whatleyi*	H	L	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	-46.784	2400	40 39	A–B Q–R

(continued)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607451	TRA336	*Dutoitella whatleyi*	P	L	A	?	SWA	DSDP 356	25/3/86–88	Middle Paleocene	–28.287	-41.088	3175	40 39	C–D S–T
USNM 607452	TRA760	*Bensonodutoitella* sp. 1		R	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	-46.784	2400	40 39	E–F U–V
USNM 607453	TRA311	*Bensonodutoitella bicornigeri*	P	R	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	-46.096	1519	40 39	G–H W–X
USNM 607454	TRA310	*Bensonodutoitella bicornigeri*	H	R	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	-46.096	1519	40 39	I–J Y–Z
USNM 607455	GSM320	*Henryhowella evax*		L	A	M	NAM	75BBC, Calvert Formation, Plum Point, Maryland	Outcrop	Miocene	38.600	–76.517	OC	40 41	K–L C–D
USNM 607456	GSM321	*Henryhowella evax*		R	A	M	NAM	75BBC, Calvert Formation, Plum Point, Maryland	Outcrop	Miocene	38.600	–76.517	OC	40 41	M–N E–F
USNM 607457	GSM322	*Henryhowella evax*		L	A	F	NAM	75BBC, Calvert Formation, Plum Point, Maryland	Outcrop	Miocene	38.600	–76.517	OC	40	O–P
USNM 607458	TRA430	*Henryhowella asperrima*		R	A	?	SO	DSDP 277	5/1/50–57	Early Oligocene	–52.224	166.191	1214	40	Q–R
USNM 607459	TRA962	*Henryhowella asperrima*		L	A	?	SEA	DSDP 526A	10/1/ 123–130	Late Miocene	–30.123	3.138	1054	40	S–T
USNM 607460	TRA963	*Henryhowella asperrima*		R	A	?	SEA	DSDP 526A	10/1/ 123–130	Late Miocene	–30.123	3.138	1054	40 42	U A
USNM 607461	GSM628	*Henryhowella asperrima*		L	A	?	GOM	Alb D2383	Modern	Modern	28.533	–88.100	2160	42	B–C
USNM 607462	GSM629	*Henryhowella asperrima*		R	A	?	GOM	Alb D2383	Modern	Modern	28.533	–88.100	2160	42 41	D–E G–H
USNM 607463	GSM630	*Henryhowella asperrima*		L	A	?	GOM	Alb D2383	Modern	Modern	28.533	–88.100	2160	42 41	F–G I–J
USNM 607464	GSM631	*Henryhowella asperrima*		R	A	?	GOM	Alb D2383	Modern	Modern	28.533	–88.100	2160	42	H–I
USNM 607465	TRA616	*Henryhowella asperrima*		R	A	?	SWA	DSDP 516F	30/2/59–64	Oligocene	–30.277	–35.285	1313	42	J–K
USNM 607466	TRA516	*Henryhowella asperrima*		L	A	?	NEA	DSDP 141	1/3/50–56	Early Pleistocene	19.419	–23.999	4148	42	L–M

USNM 607467	TRA517	*Henryhowella asperrima*		R	A	?	NEA	DSDP 140	1/2/50–56	Pliocene	21.750	–21.792	4483	42 41	N–O K
	K&N 1993	*Henryhowella asperrima*		R	A	M	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	A
	K&N 1993	*Henryhowella asperrima*		R	A	M	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	B
	K&N 1993	*Henryhowella asperrima*		L	A	M	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	C
	K&N 1993	*Henryhowella asperrima*		L	A	M	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	D
	K&N 1993	*Henryhowella asperrima*		R	A	F	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	E
	K&N 1993	*Henryhowella asperrima*		L	A	F	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	F
	K&N 1993	*Henryhowella asperrima*		R	A	F	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	G
	K&N 1993	*Henryhowella asperrima*		L	A	F	EUR	Vienna Basin		Miocene, Badenian	48.500	17.000	OC?	43	H
NHM 80.38.58		*Henryhowella circumdentata*	L	L	A?	M?	SP	Challenger station 276		Modern	–13.467	–149.500	4298	43	I–K
USNM 607468	TRA513	*Henryhowella* sp. 1		L	A	?	NEA	DSDP 141	2/3/50–56	Late Pliocene	19.419	–23.999	4148	42	P
USNM 607469	TRA514	*Henryhowella* sp. 1		R	A	?	NEA	DSDP 141	2/3/50–56	Late Pliocene	19.419	–23.999	4148	42 47	Q–R A–B
USNM 607470	TRA907	*Henryhowella argentinensis*		L	A	M	SAM	NR27, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44 41	A–B M
USNM 607471	TRA913	*Henryhowella argentinensis*		L	A	M	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	C
USNM 607472	TRA908	*Henryhowella argentinensis*		R	A	M	SAM	NR27, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	D
USNM 607473	TRA911	*Henryhowella argentinensis*		L	A	M	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	E
USNM 607474	TRA912	*Henryhowella argentinensis*		R	A	M	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44 41	F–G N
USNM 607475	TRA927	*Henryhowella argentinensis*		L	A	M	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	H
USNM 607476	TRA928	*Henryhowella argentinensis*		R	A	M	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	I
USNM 607477	TRA932	*Henryhowella argentinensis*		L	A	M	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44 41	J L
USNM 607478	TRA914	*Henryhowella argentinensis*		L	A	F	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	K

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607479	TRA921	*Henryhowella argentinensis*		R	A	F	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44 41	L–M O
USNM 607480	TRA923	*Henryhowella meridionalis*		L	A	F	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	N
USNM 607481	TRA931	*Henryhowella argentinensis*		R	A	F	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	O
USNM 607482	TRA929	*Henryhowella argentinensis*		L	A	F	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	P–Q
USNM 607483	TRA930	*Henryhowella argentinensis*		R	A	F	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	44	R
USNM 607484	TRA904	*Henryhowella nascens*		L	A	F	SAM	NR27, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45 41	A–B V
USNM 607485	TRA905	*Henryhowella nascens*		R	A	F	SAM	NR27, Rocca Formation	Outcrop	Early Paleocene	-39.000	–67.533	OC	45	C
USNM 607486	TRA906	*Henryhowella nascens*		R	A	F	SAM	NR27, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45 41	D U, W
USNM 607487	TRA915	*Henryhowella nascens*		L	A	M	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45	E
USNM 607488	TRA916	*Henryhowella meridionalis*		R	A	M	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45	F
USNM 607489	TRA910	*Henryhowella meridionalis*		R	A	M	SAM	NR27, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45	G–H
USNM 607490	TRA922	*Henryhowella meridionalis*		L	A	M	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45 41	I–J P–Q
USNM 607491	TRA909	*Henryhowella meridionalis*		L	A	F	SAM	NR27, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45	K–L
USNM 607492	TRA917	Henryhowella meridionalis		L	A	F	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45	M
USNM 607493	TRA918	Henryhowella meridionalis		R	A	F	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45	N–O
USNM 607494	TRA924	Henryhowella meridionalis		R	A	F	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	45 41	P–Q R–S
USNM 607495	TRA448	*Tongacythere* sp. 1		R	A	?	SO	DSDP 277	43/1/ 40–47	Early Eocene	–52.224	166.191	1214	46 92	A–B Q
USNM 607496	TRA834	*Tongacythere* sp. 2		R	A	?	NZ	SI-25	Outcrop	Late Eocene	–45.100	170.900	OC	46 92	C–D R–S
USNM 607497	TRA938	*Tongacythere* sp. 3		L	A	?	SWP	NGC 100 pilot	0–5	Modern	–25.271	162.000	1299	46 92	E–F T–U

USNM 607498	TRA534	*Oligocythereis sylvesterbradleyi*	P	R	A	M	IO	DSDP 237	24/4/50–56	Middle Eocene	–7.083	58.125	1623	46 47 G–H E–F
USNM 607499	TRA535	*Oligocythereis sylvesterbradleyi*	H	R	A	F	IO	DSDP 237	24/4/50–56	Middle Eocene	–7.083	58.125	1623	46 47 I–J C–D
USNM 607500	TRA626	*Toolongella* sp. 1		R	A	?	SWA	DSDP 21A	1/4/50–56	Middle Eocene	–28.585	–30.598	2113	46 47 K–L G
USNM 607501	TRA919	*Henryhowella meridionalis*		L	A	F	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	46 M–N
USNM 607502	TRA920	*Henryhowella meridionalis*		R	A	F	SAM	NR29, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	46 41 O–P T
USNM 607503	TRA925	*Henryhowella meridionalis*		L	A	F	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	46 Q–R
USNM 607504	TRA926	*Henryhowella meridionalis*		R	A	F	SAM	NR30, Rocca Formation	Outcrop	Early Paleocene	–39.000	–67.533	OC	46 S–T
USNM 607505	TMC149	*Echinocythereis echinata*		L	A	?	NA	Chain 82-24-4P	398–400	Pleistocene	41.717	-32.850	3427	48 A
USNM 607506	TMC150	*Echinocythereis echinata*		R	A	?	NA	Chain 82-24-4P	398–400	Pleistocene	41.717	-32.850	3427	48 B
USNM 607507	TMC153	*Echinocythereis echinata*		R	A	?	NA	Chain 82-24-4P	345–348	Pleistocene	41.717	-32.850	3427	48 C
USNM 607508	TMC218	*Echinocythereis echinata*		R	A	?	NA	Chain 82-24-4P	461–464	Pleistocene	41.717	-32.850	3427	48 D
USNM 607509	TMC234	*Echinocythereis echinata*		R	A	?	NA	Chain 82-24-4P	660–663	Pleistocene	41.717	-32.850	3427	48 E
USNM 607510	TMC378	*Echinocythereis echinata*		L	A	?	NEA	DSDP 610	17/4/87	Middle Miocene	53.222	-18.887	2417	48 F
USNM 607511	RB356	*Echinocythereis echinata*		L	A	?	NWA	Alb D2570	Modern	Modern	39.900	-67.092	3263	48 G
USNM 607512	RB357	*Echinocythereis echinata*		R	A	?	NWA	Alb D2570	Modern	Modern	39.900	-67.092	3263	48 H
USNM 607513	TMC130	*Echinocythereis echinata*		R	A	?	NA	Chain 82-24-4P	258–260	Pleistocene	41.717	-32.850	3427	48 I
USNM 607514	TMC131	*Echinocythereis echinata*		R	A	?	NA	Chain 82-24-4P	263–265	Pleistocene	41.717	-32.850	3427	48 47 J H–I
USNM 607515	GSM202	*Echinocythereis echinata*		R	A	?	NA	DSDP 607	12/3/52–54	Early Pleistocene	41.001	-32.957	3427	48 K
USNM 607516	GSM624	*Echinocythereis echinata*		L	A	?	NWA	Alb D2308	Modern	Modern	38.000	-68.000	3659	48 L
USNM 607517	GSM625	*Echinocythereis echinata*		R	A	?	NWA	Alb D2308	Modern	Modern	38.000	-68.000	3659	48 M
USNM 607518	USGSD157	*Echinocythereis echinata*		R	A	?	NA	DSDP 607A	13/4/60–62	Late Pliocene	41.001	-32.957	3427	48 N
USNM 607519	USGSD159	*Echinocythereis echinata*		L	A	?	NA	DSDP 607	13/1/ 105–107	Early Pleistocene	41.001	-32.957	3427	48 O
USNM 607520	TRA960	*Echinocythereis margaritifera*		R	A	?	GOM	Alb D2400	Modern	Modern	28.683	-86.117	304	48 P
USNM 608273	TRA961	*Echinocythereis margaritifera*		R	A	?	GOM	Alb D2400	Modern	Modern	28.683	-86.117	304	48 47 Q J–K
USNM 607521	TRA959	*Echinocythereis margaritifera*		L	A	?	GOM	Alb D2400	Modern	Modern	28.683	-86.117	304	48 47 R–S L–M
USNM 607522	TRA1026	*Echinocythereis margaritifera*		L	A	?	NAM	E. garretti topotype		Middle Miocene?	33.900	-78.883	OC	48 T
USNM 607523	TRA1027	*Echinocythereis margaritifera*		L	A	?	NAM	E. garretti topotype		Middle Miocene?	33.900	-78.883	OC	48 47 U N–O

(continued)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607524	RB455	*Marwickcythereis ericea*		L	A	?	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	22 23	A–B E–F
USNM 607525	RB456	*Marwickcythereis ericea*		R	A	?	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	22 23	C–D D, G–H
USNM 607526	TRA601	*Marwickcythereis ericea*		L	A	?	SWA	DSDP 516	8/2/40–50	Early Pliocene	–30.276	–35.285	1313	22	E–F
USNM 607527	TRA602	*Marwickcythereis ericea*		R	A	?	SWA	DSDP 516	8/2/40–50	Early Pliocene	–30.276	–35.285	1313	22	G–H
USNM 607528	RB534	*Marwickcythereis ericea*		R	A	?	SWA	AII 60 sta 262A	Modern	Modern	–36.000	–52.000	2500	22 23	I–J I–J, L
USNM 607529	RB535	*Marwickcythereis ericea*		L	A	?	SWA	AII 60 ata 262A	Modern	Modern	–36.000	–52.000	2500	22 23	K–L K, M
USNM 607530	RB332	*Marwickcythereis ericea*		L	A	?	SWA	AII 31 sta 159	Modern	Modern	–7.967	–34.367	834-939	22	M
NHM 80.38.76		*Marwickcythereis ericea*	L	R	A	?	SWA	Challenger station 120	Modern	Modern	–8.617	–34.467	1234	23	A–C
USNM 607531	TRA135	*Cythereis guerneti*	P	L	A	F	SWA	DSDP 357	16/1/ 102–113	Late Oligocene	–30.004	–35.560	2086	50 52	A–B A, C
USNM 607532	TRA136	*Cythereis guerneti*	H	R	A	F	SWA	DSDP 357	16/1/ 102–113	Late Oligocene	–30.004	–35.560	2086	50 52	C, F E–F
USNM 607533	TRA329	*Cythereis guerneti*	P	R	A	M	SWA	DSDP 357	20/2/ 106–120	Late Eocene	–30.004	–35.560	2086	50	D
USNM 607534	TRA330	*Cythereis guerneti*	P	R	A	M	SWA	DSDP 357	20/2/ 106–120	Late Eocene	–30.004	–35.560	2086	50 52	E B, D
USNM 607535	TRA405	*Cythereis parajohnnealei*	H	L	A	?	SO	DSDP 277	11/2/90–97	Early Oligocene	–52.224	166.191	1214	50 52	G–H O–P
USNM 607536	TRA434	*Cythereis johnnealei*	H	R	A	F	SO	DSDP 277	5/1/50–57	Early Oligocene	–52.224	166.191	1214	50 52	I–J K, M
USNM 607537	TRA428	*Cythereis johnnealei*	P	L	A	M	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	50 52	K–L L, N
USNM 607538	TRA407	*Cythereis parajohnnealei*	P	R	A	?	SO	DSDP 277	30/2/60–67	Middle Eocene	–52.224	166.191	1214	50 52	M–N Q–R
USNM 607539	TRA323	*Cythereis neoanteplana*	H	L	A	?	SEA	DSDP 359	2/6/85–95	Miocene	–34.985	–4.497	1655	50 52	O–P S–T
USNM 607540	TRA324	*Cythereis neoanteplana*	P	R	A	?	SEA	DSDP 359	2/6/85–95	Miocene	–34.985	–4.497	1655	53 54	A–B A, C
USNM 607541	TRA345	*Cythereis* sp. 2		L	A	?	IO	DSDP 258A	7/4/100–106	Late Miocene	–33.795	112.474	2793	53	C–D

USNM 607542	TRA406	*Cythereis zululandensis*		L	A	?	SO	DSDP 277	30/2/60–67	Middle Eocene	–52.224	166.191	1214	53 54	E–F G–H
USNM 607543	TRA624	*Cythereis neoanteplana?*		R	A	?	SWA	DSDP 21A	1/4/50–56	Middle Eocene	–28.585	–30.598	2113	53 54	G–H B, D
USNM 607544	TRA837	*Cythereis neoanteplana?*		R	A	?	NZ	SI-25		Late Eocene	–45.100	170.900	OC	53 54	I–J E–F
USNM 607545	TRA425	*Cythereis* sp. 3		R	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	53 62	K–L N
USNM 607546	TRA829	*Hornibrookoleberis thomsoni*		R	A	?	NZ	RM 1001	Modern	Modern	–37.640	178.460	?	55 66	A–B A–B
USNM 607547	TRA828	*Hornibrookoleberis lytteltonensis*		R	A	?	NZ	RM 1001	Modern	Modern	–37.640	178.460	?	55 66	C–D C–D
USNM 607548	TRA540	*Cythereis sylvesterbradleyi*	H	L	A	F	IO	DSDP 214	27/cc	Late Eocene	–11.337	88.718	1655	55 54	E–F I–J
USNM 607549	TRA541	*Cythereis sylvesterbradleyi*	P	R	A	F	IO	DSDP 214	26/cc	Early Oligocene	–11.337	88.718	1655	55 54	G–H K–L
USNM 607550	TRA555	*Cythereis sylvesterbradleyi*	P	L	A	M	IO	DSDP 214	22/5/50–56	Early Miocene	–11.337	88.718	1655	55	I–J
USNM 607551	TRA1008	*Cythereis sylvesterbradleyi*	P	L	A	M	IO	DSDP 253	9/3/50–56	Early Miocene	–24.878	87.366	1962	55	K
USNM 607552	TRA1009	*Cythereis sylvesterbradleyi*	P	R	A	M	IO	DSDP 253	9/3/50–56	Early Miocene	–24.878	87.366	1962	55	L
USNM 607553	TRA1010	*Cythereis sylvesterbradleyi*	P	R	A	M	IO	DSDP 253	9/3/50–56	Early Miocene	–24.878	87.366	1962	55 54	M M
USNM 607554	TRA346	*Cythereis sylvesterbradleyi*	P	L	A	M	IO	DSDP 258A	7/4/ 100–106	Late Miocene	–33.795	112.474	2793	55	N–O
USNM 607555	TRA520	*Cythereis ayressi*		R	A	?	SWP	DSDP 208	2/4/50–56	Pleistocene	–26.110	161.221	1545	56	A–B
USNM 607556	TRA526	*Cythereis ayressi*		R	A	?	SWP	DSDP 208	3/4/50–56	Late Pliocene	–26.110	161.221	1545	56	C–D
USNM 607557	TRA954	*Cythereis ayressi*		L	A	?	SWP	NGC 99 Pilot	0–5	Modern	–29.996	162.000	1158	56	E
USNM 607558	TRA955	*Cythereis ayressi*		R	A	?	SWP	NGC 99 Pilot	0–5	Modern	–29.996	162.000	1158	56 54	F–G N–O
USNM 607559	TRA956	*Cythereis ayressi*		L	A	?	SWP	NMC 14	0–5	Modern	–33.229	161.910	1224	56	H–I
USNM 607560	TRA958	*Cythereis ayressi*		R	A	?	SWP	NMC 14	0–5	Modern	–33.229	161.910	1224	56	J
USNM 607561	TRA957	*Cythereis ayressi*		R	A	?	SWP	NMC 14	0–5	Modern	–33.229	161.910	1224	56	K
USNM 607562	SIMY0025	*Cythereis ayressi*		L	A	?	SWP	NGC 99 Pilot	0–5	Modern	–29.996	162.000	1158	56 54	L–M P–Q
USNM 607563	TRA401	*Cythereis bensoni*	P	L	A	?	SO	DSDP 277	17/3/??	Early Oligocene	–52.224	166.191	1214	56	N
USNM 607564	TRA402	*Cythereis bensoni*	P	R	A	?	SO	DSDP 277	17/3/??	Early Oligocene	–52.224	166.191	1214	56	O–P
USNM 607565	TRA403	*Cythereis bensoni*	P	L	A	?	SO	DSDP 277	17/3/??	Early Oligocene	–52.224	166.191	1214	56	Q

(continued)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607566	TRA404	*Cythereis bensoni*	P	R	A	?	SO	DSDP 277	17/3/??	Early Oligocene	–52.224	166.191	1214	56	R
USNM 607567	TRA421	*Cythereis bensoni*	P	L	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	56	S–T
USNM 607568	TRA422	*Cythereis bensoni*	H	R	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	56	U–V
														54	R–S
USNM 607569	TRA423	*Cythereis bensoni*	P	L	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	56	W
USNM 607570	TRA424	*Cythereis bensoni*	P	R	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	56	X
USNM 607571	TRA414	*Cythereis bensoni*	P	R	A	?	SWP	DSDP 284	18/1/ 130–137	Late Miocene	–40.508	167.680	1066	56	Y–Z
														54	T–U
USNM 607572	TRA830	*Cythereis ulcus*		L	A	?	SWP	A315	Modern	Modern	–39.767	167.750	1148.5	57	A
USNM 607573	TRA831	*Cythereis ulcus*		R	A	?	SWP	A315	Modern	Modern	–39.767	167.750	1148.5	57	B
USNM 607574	TRA832	*Cythereis ulcus*		R	A	?	SWP	A315	Modern	Modern	–39.767	167.750	1148.5	57	C
														58	A–B
USNM 607575	TRA951	*Cythereis bensoni*	P	L	A	?	SWP	NMC 16	0–5	Modern	–30.000	162.998	1160	57	D–E
														54	V–W
USNM 607576	TRA1011	*Cythereis purii*	H	L	A	?	IO	DSDP 253	9/3/50–56	Early Miocene	–24.878	87.366	1962	57	F
USNM 607577	TRA1012	*Cythereis purii*	P	R	A	?	IO	DSDP 253	9/3/50–56	Early Miocene	–24.878	87.366	1962	57	G
USNM 607578	TRA1013	*Cythereis purii*	P	R	A	?	IO	DSDP 253	9/3/50–56	Early Miocene	–24.878	87.366	1962	57	H
														58	C–D
USNM 607579	TRA547	*Cythereis orientalis*		R	A	M	IO	DSDP 214	34/4/60–66	Early Eocene	–11.337	88.718	1655	57	I–J
USNM 607580	TRA548	*Cythereis orientalis*		R	A	F	IO	DSDP 214	34/4/60–66	Early Eocene	–11.337	88.718	1655	57	K
USNM 607581	TRA549	*Cythereis orientalis*		R	A	F	IO	DSDP 214	34/4/60–66	Early Eocene	–11.337	88.718	1655	57	L–M
														58	E–F
USNM 607582	TRA435	*Cythereis fungina*	P	L	A	?	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	57	N
USNM 607583	TRA436	*Cythereis fungina*	P	L	A	?	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	57	O
USNM 607584	TRA437	*Cythereis fungina*	H	R	A	?	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	57	P–Q
														58	G–H
USNM 607585	TRA438	*Cythereis fungina*	P	R	A	?	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	57	R

USNM 607586	TRA417	*Cythereis fungina*	P	R	A	?	SWP	DSDP 284	18/1/ 130–137	Late Miocene	–40.508	167.680	1066	57	S–T
USNM 607587	TRA426	*Cythereis fungina*	P	R	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	59	A
USNM 607588	TRA427	*Cythereis fungina*	P	R	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	59	B–C
USNM 607589	TRA418	*Cythereis* sp. 4		R	A	?	IO	DSDP 264	3/1/60–67	Middle Miocene	–34.969	112.045	2876	59	D–E
USNM 607590	TRA415	*Cythereis* sp. 5		R	A	?	SWP	DSDP 284	18/1/ 130–137	Late Miocene	–40.508	167.680	1066	59 62	F–G O
USNM 607591	TRA840	*Cythereis* sp. 6		R	A	?	NZ	SI-25		Late Eocene	–45.100	170.900	OC	59 62	H–I P
USNM 607592	TRA619	*Cythereis* sp. 7		R	A	?	SWA	DSDP 356	3/5/50–58	Early Miocene	-28.287	-41.088	3175	59	J–K
USNM 607593	TRA838	*Cythereis* sp. 8		R	A	?	NZ	SI-25		Late Eocene	-45.100	170.900	OC	59 62	L–M Q–R
USNM 607594	TRA839	*Cythereis* sp. 9		R	A	?	NZ	SI-25		Late Eocene	–45.100	170.900	OC	59	N–O
USNM 607595	TRA502	*Cythereis tomcronini*	P	R	A	?	NWP	DSDP 292	23/1/54–60	Oligocene	15.819	124.651	2943	60	A–B
USNM 607596	TRA325	*Cythereis tomcronini*	P	R	A	?	SEA	DSDP 359	2/6/85–95	Miocene	–34.985	-4.497	1655	60	C–D
USNM 607597	TRA944	*Cythereis legitimoformis*	P	R	A	?	NP	NB 68	5–10	Quaternary	21.279	174.762	2505	60	E
USNM 607598	TRA945	*Cythereis legitimoformis*	P	R	A	?	NP	NB 68	5–10	Quaternary	21.279	174.762	2505	60 58	F M–N
USNM 607599	POS1257	*Cythereis legitimoformis*	H	R	A	?	NP	NB 68	5–10	Quaternary	21.279	174.762	2505	60	G–H
USNM 607600	TRA943	*Cythereis legitimoformis*	P	L	A	?	NP	NB 68	5–10	Quaternary	21.279	174.762	2505	60 58	I–J O–P
USNM 607601	TRA331	*Cythereis tomcronini*	P	L	A	?	SWA	DSDP 357	6/3/33–35	Middle Miocene	–30.004	–35.560	2086	60	K–L
USNM 607602	TRA334	*Cythereis tomcronini*	P	R	A	?	SWA	DSDP 357	12/5/50–59	Early Miocene	–30.004	–35.560	2086	60	M–N
USNM 607603	TRA335	*Cythereis tomcronini*	P	L	A	?	SWA	DSDP 357	17/5/44–54	Late Oligocene	–30.004	–35.560	2086	61 58	A–B I–J
USNM 607604	TRA137	*Cythereis tomcronini*	H	R	A	?	SWA	DSDP 357	5/3/50–59	Late Miocene	–30.004	–35.560	2086	61 58	C–D K–L
USNM 607605	TRA801	*Cythereis* sp. 10		L	A	?	IO	DSDP 258A	9/4/50–56	Santonian	–33.795	112.474	2793	61 62	E–F S
USNM 607606	TRA306	*Croninocythereis* cf. *tridentiferi*		L	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	61 66	G–H J
USNM 607607	TRA452	*Croninocythereis tridentiferi*	P	R	A	?	NWP	DSDP 305	8/5/54–60	Early Oligocene	32.002	157.850	2903	61 66	I–J E–F
USNM 607608	TRA603	*Cythereis richardbensoni*	P	L	A	?	SWA	DSDP 516	4/2/80–90	Early Pliocene	–30.276	–35.285	1313	51 58	A–B Q–R

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607609	TRA604	*Cythereis richardbensoni*	P	R	A	?	SWA	DSDP 516	4/2/80–90	Early Pliocene	–30.276	–35.285	1313	51	C
USNM 607610	TRA605	*Cythereis richardbensoni*	H	R	A	?	SWA	DSDP 516	4/2/80–90	Early Pliocene	–30.276	–35.285	1313	51	D–E
														58	S–T
USNM 607611	TRA606	*Cythereis richardbensoni*	P	R	A	?	SWA	DSDP 516	4/2/80–90	Early Pliocene	–30.276	–35.285	1313	51	F–G
														58	U–V
USNM 607612	TRA607	*Cythereis richardbensoni*	P	R	A	?	SWA	DSDP 516	14/2/85–95	Late Miocene	–30.276	–35.285	1313	51	H
USNM 607613	TRA608	*Cythereis richardbensoni*	P	R	A	?	SWA	DSDP 516	14/2/85–95	Late Miocene	–30.276	–35.285	1313	51	I
USNM 607614	TRA316	*Cythereis richardbensoni*	P	R	A	?	SWA	DSDP 357	2/2/51–60	Pliocene	–30.004	–35.560	2086	51	J–K
USNM 607615	TRA609	*Cythereis dinglei*	P	R	A	?	SWA	DSDP 516	18/2/70–80	Middle Miocene	-30.276	–35.285	1313	51	L–M
														62	A–B
USNM 607616	TRA610	*Cythereis dinglei*	H	R	A	?	SWA	DSDP 516	42/2/55–65	Early Miocene	–30.276	–35.285	1313	51	N–O
														62	C
USNM 607617	TRA618	*Cythereis guerneti*	P	R	A	?	SWA	DSDP 516F	31/2/87–91	Oligocene	–30.277	–35.285	1313	51	P–Q
														52	G–H
USNM 607618	TRA617	*Cythereis guerneti*	P	L	A	?	SWA	DSDP 516F	30/2/59–64	Oligocene	–30.277	–35.285	1313	51	R–S
														52	I–J
USNM 607619	TRA238	*Croninocythereis tridentiferi*	P	L	A	?	SEA	DSDP 527	15/1/65–72	Late Oligocene	–28.042	1.763	4428	67	A–B
														66	G
USNM 607620	TRA239	*Croninocythereis tridentiferi*	H	R	A	?	SEA	DSDP 529	12/1/??	Early Miocene	–28.931	2.768	3043	67	C–D
														66	H–I
USNM 607621	TRA625	*Croninocythereis tridentiferi*	P	R	A	?	SWA	DSDP 21A	1/4/50–56	Middle Eocene	–28.585	–30.598	2113	67	E–F
USNM 607622	TRA701	*Croninocythereis presequenta*		L	A	?	SWA	DSDP 21	2/4/44–50	Late Paleocene	–28.585	–30.598	2113	67	G–H
														66	K–L
USNM 607623	TRA542	*Croninocythereis* cf. *presequenta*		L	A	?	IO	DSDP 214	26/cc	Early Oligocene	–11.337	88.718	1655	67	I–J
														66	M
USNM 607624	TRA139	*Croninocythereis cronini*	P	L	A	?	SO	EL 47 5069	Modern	Modern	–51.234	76.748	3277	68	A–B
														66	R–S
USNM 607625	TRA140	*Croninocythereis cronini*	P	R	A	?	SO	EL 47 5069	Modern	Modern	–51.234	76.748	3277	68	C–D
														66	T
USNM 607626	RB318	*Croninocythereis cronini*	P	L	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	68	E
USNM 607627	RB319	*Croninocythereis cronini*	P	R	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	68	F
USNM 607628	RB345	*Croninocythereis cronini*	P	R	A	?	NWA	Alb 2568	Modern	Modern	39.250	–68.133	3200	68	G
USNM 607629	RB346	*Croninocythereis cronini*	P	R	A	?	NWA	Alb 2568	Modern	Modern	39.250	–68.133	3200	68	H
USNM 607630	RB413	*Croninocythereis cronini*	P	L	A	?	NWA	Alb 2713	Modern	Modern	38.333	–70.142	3346	68	I

USNM 607631	RB414	*Croninocythereis cronini*	P	L	A	?	NWA	Alb 2713	Modern	Modern	38.333	–70.142	3346	68	J
USNM 607632	TRA228	*Croninocythereis cronini*	P	L	A	?	NWP	DSDP 47.2	6/2/50–56	Late Miocene	32.448	157.712	2689	68	K–L
USNM 607633	TRA229	*Croninocythereis cronini*	P	R	A	?	NWP	DSDP 47.2	6/2/50–56	Late Miocene	32.448	157.712	2689	68	M–N
USNM 607634	TRA230	*Croninocythereis cronini*	P	R	A	?	NWP	DSDP 47.2	6/2/50–56	Late Miocene	32.448	157.712	2689	68	O–P
USNM 607635	TRA231	*Croninocythereis cronini*	P	L	A	?	NWP	DSDP 48.2	1/4/50–56	Late Miocene	32.408	158.022	2619	68	Q
USNM 607636	TRA940	*Croninocythereis cronini*	P	L	A	?	NP	NGC 76-5	65–70	Quaternary	33.893	179.080	2182	63 66	A–B N–O
USNM 607637	TRA941	*Croninocythereis cronini*	H	R	A	?	NP	NGC 76-5	65–70	Quaternary	33.893	179.080	2182	63 66	C–D P–Q
USNM 607638	TRA501	*Croninocythereis cronini*	P	R	A	?	NWP	DSDP 305	6/4/100–106	Middle Miocene	32.002	157.850	2903	63	E–F
USNM 607639	TRA218	*Croninocythereis* sp. 1		L	A	?	NWP	Alb 4874	Modern	Modern	34.633	130.050	119	63 69	G–H A–B
USNM 607640	TRA449	*Croninocythereis cronini*	P	L	A	?	NP	DSDP 310	4/5/44–49	Pliocene	36.869	176.902	3516	63	I–J
USNM 607641	TRA614	*Cythereis ovi*	P	R	A	?	SWA	DSDP 516F	30/2/59–64	Oligocene	–30.277	–35.285	1313	63 62	K–L D–F
USNM 607642	TRA612	*Cythereis ovi*	H	L	A	?	SWA	DSDP 516F	30/2/59–64	Oligocene	–30.277	–35.285	1313	63 62	M–N G–H
USNM 607643	TRA613	*Cythereis ovi*	P	R	A	?	SWA	DSDP 516F	30/2/59–64	Oligocene	–30.277	–35.285	1313	63 62	O I
USNM 607644	TRA611	*Cythereis ovi*	P	R	A	?	SWA	DSDP 516F	3/3/61–71	Early Miocene	–30.277	–35.285	1313	63	P–Q
USNM 607645	TRA536	*Legitimocythere acanthoderma* s.l.		L	A	?	IO	DSDP 223	2/6/50–56	Early Pleistocene	18.750	60.130	3633	63	R
USNM 607646	TRA537	*Legitimocythere acanthoderma* s.l.		R	A	?	IO	DSDP 223	2/6/50–56	Early Pleistocene	18.750	60.130	3633	63	S
USNM 607647	TRA217	*Cythereis* sp. 11		L	A	?	NWP	Alb 4874	Modern	Modern	34.633	130.050	119	64 62	A–B T–U
USNM 607648	TRA408	*Cythereis swansoni*	P	R	A	?	SO	DSDP 281	6/6/ 134–141	Late Miocene	–47.997	147.764	1591	64	C–D
USNM 607649	TRA409	*Cythereis swansoni*	H	R	A	?	SO	DSDP 281	10/2/ 135–142	Middle Miocene	–47.997	147.764	1591	64 62	E–F J–K
USNM 607650	TRA305	*Bensonocosta bensoni*	H	R	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	64 69	G–H C
USNM 607651	TRA750	*Bensonocosta bensoni*	P	R	A	?	SWA	DSDP 327A	12/3/ 50–55	Maastrichtian	–50.871	–46.784	2400	64 69	I–J D–E
USNM 607652	TRA749	*Bensonocosta* sp. 1		R	A	?	SWA	DSDP 327A	12/3/ 50–55	Maastrichtian	–50.871	–46.784	2400	64 69	K–L F–H
USNM 607653	TRA942	*Ayressoleberis* cf. *colesi*		R	A	?	EWP	SC 9DD	5–10	Quaternary	–0.292	158.112	2230	64	M–N

(continued)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607654	TRA234	*Ayressoleberis* cf. *colesi*		L	A	?	EWP	DSDP 62.0	2/3/50–56	Late Miocene	1.870	141.938	2602	69 64 69	R–S O–P T
USNM 607655	TRA235	*Ayressoleberis* cf. *colesi*		R	A	?	EWP	DSDP 64.0	3/3/50–56	Late Miocene	–1.742	158.610	2060	64 69	Q–R U
USNM 607656	TRA146	*Ayressoleberis* cf. *bathymarina*		R	A	F?	SO	EL 47 5117	Modern	Modern	–53.333	72.239	915	71 69	A–B L–M
USNM 607657	TRA515	*Ayressoleberis* sp. 1		L	A	?	NEA	DSDP 141	2/3/50–56	Late Pliocene	19.419	-23.999	4148	71 69	C–D V–W
USNM 607658	TRA532	*Ayressoleberis colesi*	P	R	A	F	SWP	DSDP 206	19/4/50–56	Early Pliocene	–32.013	165.453	3196	71 69	E–F N, P
USNM 607659	TRA521	*Ayressoleberis colesi*	P	R	A	M	SWP	DSDP 208	2/4/50–56	Pleistocene	–26.110	161.221	1545	71	G–H
USNM 607660	TRA939	*Ayressoleberis colesi*	H	R	A	M	SWP	NGC 100 pilot	0–5	Modern	–25.271	162.000	1299	71 69	I–J O, Q
USNM 607661	TRA528	*Ayressoleberis colesi*	P	R	A	M	SWP	DSDP 208	11/4/60–66	Late Miocene	–26.110	161.221	1545	71	K–L
USNM 607662	TRA115	*Leguminocythereis? buzasi*	P	L	A	M	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	72	A
USNM 607663	TRA116	*Leguminocythereis? buzasi*	H	R	A	M	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	72 73	B–C A–C
USNM 607664	TRA117	*Leguminocythereis? buzasi*	P	L	A	F	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	72	D
USNM 607665	TRA118	*Leguminocythereis? buzasi*	P	R	A	F	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	72 73	E–F D–E
USNM 607666	TRA119	*Leguminocythereis? buzasi*	P	L	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	72 73	G F–G
USNM 607667	TRA120	*Leguminocythereis? buzasi*	P	R	A	?	SEA	DSDP 526C	7/1/79–86	Late Eocene	–30.123	3.138	1054	72	H
USNM 607668	TRA420	*Oertliella* cf. *semivera*		L	A	?	SO	DSDP 277	5/2/ 114–121	Early Oligocene	–52.224	166.191	1214	72 73	I–J L–M
USNM 607669	TRA836	*Oertliella semivera*		R	A	?	NZ	SI-25	Outcrop	Late Eocene	–45.100	170.900	OC	72 73	K–L H
USNM 607670	TRA1031	*Oertliella semivera*		R	A	?	NZ	Ashley Mudstone Formation	Outcrop	Late Eocene	–44.800	170.967	OC	72 73	M–N I
USNM 607671	TRA1030	*Oertliella semivera*		L	A	?	NZ	Ashley Mudstone Formation	Outcrop	Late Eocene	–44.800	170.967	OC	72 73	O–P J–K

USNM 607672	TRA537	*Legitimocythere acanthoderma* s.l.		R	A	?	IO	DSDP 223	2/6/50–56	Early Pleistocene	18.750	60.130	3633	74	A
USNM 607673	TRA525	*Legitimocythere acanthoderma* s.l.		L	A	?	SWP	DSDP 208	3/4/50–56	Late Pliocene	–26.110	161.221	1545	74	B–C
USNM 607674	TRA529	*Legitimocythere tomi*	P	L	A	?	GOM	Alb D2399	Modern	Modern	28.733	–86.300	352	74	D–E
														78	A–B
USNM 607675	TRA530	*Legitimocythere tomi*	P	R	A	?	GOM	Alb D2399	Modern	Modern	28.733	–86.300	352	74	F–G
														78	C–D
USNM 607676	RB439	*Legitimocythere tomi*	P	L	A	?	NWA	Alb D2751	Modern	Modern	16.900	–63.200	1256	74	H–I
														78	E–F
USNM 607677	RB440	*Legitimocythere tomi*	P	R	A	?	NWA	Alb D2751	Modern	Modern	16.900	–63.200	1256	74	J–K
USNM 607678	RB451	*Legitimocythere tomi*	P	L	A	?	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	74	L
USNM 607679	RB452	*Legitimocythere tomi*	P	L	A	?	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	74	M–N
USNM 607680	RB453	*Legitimocythere tomi*	P	R	A	?	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	74	O–P
														78	G–H
USNM 607681	GSM165	*Legitimocythere acanthoderma* s.l.		L	A	?	NA	Chain 82-24-4P	167–170	Pleistocene	41.717	–32.850	3427	74	Q
USNM 607682	RB305	*Legitimocythere tomi*	P	L	A	?	NWA	KN 25 sta 299	Modern	Modern	7.918	–55.700	2005	75	A
USNM 607683	RB306	*Legitimocythere tomi*	H	R	A	?	NWA	KN 25 sta 299	Modern	Modern	7.918	–55.700	2005	75	B–C
														78	I–J
USNM 607684	RB307	*Legitimocythere tomi*	P	L	A	?	NWA	KN 25 sta 297	Modern	Modern	7.755	–54.400	515	75	D
USNM 607685	SIMY0011	*Legitimocythere acanthoderma* s.l.		L	A	?	SWP	NMC 13	25–30	Quaternary	–35.500	160.998	3167	75	E–F
USNM 607686	TRA138	*Legitimocythere acanthoderma* s.l.		L	A	?	SO	EL 47 5069	Modern	Modern	–51.234	76.748	3277	75	G–H
USNM 607687	RB340	*Legitimocythere acanthoderma* s.l.		L	A	?	NWA	Alb 2566	Modern	Modern	37.383	–68.133	4700	75	I–J
USNM 607688	TRA518	*Legitimocythere acanthoderma* s.l.		L	A	?	SWP	DSDP 208	2/4/50–56	Pleistocene	–26.110	161.221	1545	75	K–L
USNM 607689	TRA522	*Legitimocythere acanthoderma* s.l.		R	A	?	SWP	DSDP 208	5/4/60–66	Late Pliocene	–26.110	161.221	1545	75	M–N
														73	P
USNM 607690	GSM166	*Legitimocythere acanthoderma* s.l.		R	A	?	NA	Chain 82-24-4P	167–170	Pleistocene	41.717	–32.850	3427	76	A
USNM 607691	GSM233	*Legitimocythere acanthoderma* s.l.		L	A	?	NEA	KN 714-15A	184	Quaternary	58.767	–25.950	2598	76	B
USNM 607692	USGSD126	*Legitimocythere acanthoderma* s.l.		R	A	?	NA	DSDP 607	14/6/24	Late Pliocene	41.001	–32.957	3427	76	C
USNM 607693	USGSD158	*Legitimocythere acanthoderma* s.l.		L	A	?	NA	DSDP 607	13/1/90–92	Early Pleistocene	41.001	–32.957	3427	76	D
USNM 607694	RB347	*Legitimocythere acanthoderma* s.l.		L	A	?	NWA	Alb 2568	Modern	Modern	39.250	–68.133	3200	76	E
USNM 607695	RB355	*Legitimocythere acanthoderma* s.l.		R	A	?	NWA	Alb D2570	Modern	Modern	39.900	–67.092	3263	76	F–G

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607696	RB403	*Legitimocythere acanthoderma* s.l.		L	A	?	NWA	Alb 2711	Modern	Modern	38.983	–70.117	2779	76	H–I
USNM 607697	RB320	*Legitimocythere acanthoderma* s.l.		R	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	76 73	J–K Q–R
USNM 607698	RB321	*Legitimocythere acanthoderma* s.l.		L	A	?	NWA	KN 25 sta 291	Modern	Modern	10.102	–55.233	3865	76	L
USNM 607699	TMC202	*Legitimocythere acanthoderma* s.l.		L	A	?	NA	Chain 82-24-4P	311–313	Pleistocene	41.717	–32.850	3427	76	M
USNM 607700	TMC216	*Legitimocythere acanthoderma* s.l.		R	A	?	NA	Chain 82-24-4P	459–461	Pleistocene	41.717	–32.850	3427	65	A–B
USNM 607701	TMC217	*Legitimocythere acanthoderma* s.l.		L	A	?	NA	Chain 82-24-4P	461–464	Pleistocene	41.717	–32.850	3427	65	C
USNM 607702	TMC221	*Legitimocythere acanthoderma* s.l.		L	A	?	NA	Chain 82-24-4P	443–446	Pleistocene	41.717	–32.850	3427	65	D
USNM 607703	TMC225	*Legitimocythere acanthoderma* s.l.		R	A	?	NA	Chain 82-24-4P	438–440	Pleistocene	41.717	–32.850	3427	65	E
USNM 607704	TMC314	*Legitimocythere acanthoderma* s.l.		L	A	?	NA	DSDP 607	13/6/90–92	Late Pliocene	41.001	–32.957	3427	65	F
USNM 607705	ODP980065	*Legitimocythere acanthoderma* s.l.		L	A	?	NEA	ODP 980C	2/4/0–2	Pleistocene	55.485	–14.702	2168	65	G
USNM 607706	ODP980071	*Legitimocythere acanthoderma* s.l.		R	A	?	NEA	ODP 980C	2/3/0–2	Pleistocene	55.485	–14.702	2168	65 73	H–I N–O
USNM 537187	SIMY0301	*Legitimocythere acanthoderma* s.l.		R	A	?	NWA	ODP 1055B	1/3/ 122–124	Pleistocene	32.784	–76.286	1797.7	65	J
USNM 607707	TRA340	*Cythereis* sp. 12		R	A	?	IO	DSDP 246	2/cc	Early Pliocene	–33.620	45.160	1030	65 62	K–L V–W
USNM 607708	ODP925150	*Legitimocythere acanthoderma* s.l.		L	A	?	EWA	ODP 925D	1/6/67–69	Pleistocene	4.204	–43.489	3040.5	77	A
USNM 607709	ODP925160	*Legitimocythere acanthoderma* s.l.		L	A	?	EWA	ODP 925C	1/3/ 107–109	Pleistocene	4.204	–43.489	3040.6	77	B
USNM 607710	ODP925161	*Legitimocythere acanthoderma* s.l.		R	A	?	EWA	ODP 925C	1/3/ 107–109	Pleistocene	4.204	–43.489	3040.6	77	C
USNM 607711	ODP925162	*Legitimocythere acanthoderma* s.l.		L	A	?	EWA	ODP 925D	1/4/47–49	Pleistocene	4.204	–43.489	3040.5	77 73	D S–T
USNM 607712	ODP925163	*Legitimocythere acanthoderma* s.l.		R	A	?	EWA	ODP 925D	1/4/47–49	Pleistocene	4.204	–43.489	3040.5	77 73	E U
USNM 607713	SIMY0029	*Legitimocythere acanthoderma* s.l.		L	A	?	EWP	AQ 14	20–30	Quaternary	-4.997	159.993	1716	77 73	F, H X

USNM 607714	SIMY0030	*Legitimocythere acanthoderma* s.l.		L	A	?	EWP	AQ 14	20–30	Quaternary	-4.997	159.993	1716	77 73	G, I V–W
USNM 607715	SIMY0010	*Legitimocythere audax*		L	A	?	SWP	NMC 13	25–30	Quaternary	-35.500	160.998	3167	77 78	J–K K
USNM 607716	TRA638	*Herrigocythere cretacea*		L	A	?	SWA	DSDP 21	7/1/ 148–150	Campanian	-28.585	-30.598	2113	11 78	A–B P–Q
USNM 607717	TRA637	*Herrigocythere cenozoica*		R	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	-28.585	-30.598	2113	11 78	C–D L–M
USNM 607718	TRA733	*Herrigocythere cretacea*		L	A	?	SWA	DSDP 21	5/3/50–56	Campanian–Maastrichtian	-28.585	-30.598	2113	11 78	E–F R
USNM 607719	TRA734	*Herrigocythere cretacea*		R	A	?	SWA	DSDP 21	5/3/50–56	Campanian–Maastrichtian	-28.585	-30.598	2113	11 78	G–H S–T
USNM 607720	TRA738	*Herrigocythere cretacea*		R	A	?	SWA	DSDP 21	5/1/31–33	Campanian–Maastrichtian	-28.585	-30.598	2113	11 78	I U
USNM 607721	TRA739	*Herrigocythere cretacea*		L	A	?	SWA	DSDP 21	6/6/3–5	Campanian	-28.585	-30.598	2113	11 78	J V
USNM 607722	TRA805	*Herrigocythere cenozoica*		R	A	?	SEA	DSDP 363	17/2/71–88	Middle Paleocene	-19.646	9.047	2248	11 78	K–L N–O
USNM 607723	TRA651	*Abyssocythere* sp. 1		L	A	?	NP	DSDP 44	5/cc	Middle Eocene	19.308	-169.015	1478	11 10	M–N G–H
USNM 607724	TRA755	*Herrigocythere* sp. 1		L	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	-50.871	-46.784	2400	11	O–P
USNM 607725	TRA767	*Herrigocythere* sp. 2		L	A	?	NA	DSDP 111A	11/3/ 50–56	Late Maastrichtian	50.426	-46.368	1797	11	Q–R
USNM 607726	TRA812	*Herrigocythere* sp. 3		L	A	?	EUR	ARL 4778		Late Cretaceous, Santonian	52.750	9.383	OC	11	S
USNM 558059	SIMY0014	*Rugocythereis horrida*		R	A	?	SWP	NMC 17	Core top	Modern	-27.967	162.082	1471	79	A–B
USNM 557980	ODP982009	*Pennyella rexi*	P	R	A	?	NEA	ODP 982A	1/1/ 127–129	Late Pleistocene	57.517	-15.867	1135.3	79	C–D
USNM 607727	TRA711	*Ryugucivis jablonskii*	H	R	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian–Maastrichtian	-28.585	-30.598	2113	80 78	A–B W
USNM 607728	TRA722	*Ryugucivis jablonskii*	P	R	A	?	SWA	DSDP 21	4/4/ 60–66	Campanian–Maastrichtian	-28.585	-30.598	2113	80 78	C X–Y
USNM 607729	TRA729	*Ryugucivis jablonskii*	P	L	A	?	SWA	DSDP 21	5/1/ 31–33	Campanian–Maastrichtian	-28.585	-30.598	2113	80	D
USNM 607730	TRA745	*Ryugucivis jablonskii*	P	L	A	?	SWA	DSDP 21	5/3/??	Campanian–Maastrichtian	-28.585	-30.598	2113	80	E
USNM 607731	TRA746	*Ryugucivis jablonskii*	P	R	A	?	SWA	DSDP 21	5/3/??	Campanian–Maastrichtian	-28.585	-30.598	2113	80 78	F–G Z
USNM 607732	TRA710	*Ryugucivis acuminata*	H	L	A	?	SWA	DSDP 21	4/3/ 148–150	Campanian–Maastrichtian	-28.585	-30.598	2113	80 81	H–I A
USNM 607733	TRA714	*Ryugucivis acuminata*	P	R	A	?	SWA	DSDP 21	4/1/ 148–150	Campanian–Maastrichtian	-28.585	-30.598	2113	80 81	J–K B

(continued)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607734	TRA740	*Ryugucivis acuminata*	P	R	A	?	SWA	DSDP 21	6/6/3–5	Campanian	–28.585	–30.598	2113	80	L
USNM 607735	TRA725	*Ryugucivis acuminata*	P	R	A	?	SWA	DSDP 21	4/5/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	80	M–N
														81	C
USNM 607736	TRA313	*Ryugucivis obtusa*	P	L	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	80	O–P
														81	D
USNM 607737	TRA314	*Ryugucivis obtusa*	H	R	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	80	Q–R
														81	E–F
USNM 607738	TRA315	*Ryugucivis obtusa*	P	L	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	80	S–T
														81	G–H
USNM 607739	TRA450	*Ryugucivis* sp. 1		L	A?	?	NWP	DSDP 305	42/1/ 120–126	Late Albian	32.002	157.850	2903	82	A–B
USNM 607740	TRA754	*Ryugucivis* sp. 2		L	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	–46.784	2400	82	C–D
														81	I–J
USNM 607741	TRA147	*Phacorhabdotus mazzinireticulatus*	H	L	A	?	SEP	Alb 4728	Modern	Modern	–13.783	–114.367	1899	83	A–B
														81	K–L
USNM 607742	TRA948	*Phacorhabdotus mazzinireticulatus*	P	R	A	?	NWP	SC 8	5–10	Quaternary	5.010	156.143	3600	83	C
USNM 607743	TRA303	*Phacorhabdotus anteronudus*		L	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	83	D–E
														81	M–N
USNM 607744	TRA304	*Phacorhabdotus anteronudus*		R	A	?	SWA	DSDP 329	5/6/80–88	Late Miocene	–50.655	–46.096	1519	83	F–G
														81	O–P
USNM 607745	TRA337	*Phacorhabdotus anteronudus*		L	A	?	SWA	DSDP 356	28/3/59–61	Early Paleocene	–28.287	–41.088	3175	83	H–I
														81	Q
USNM 607746	TRA752	*Phacorhabdotus anteronudus*		L	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	–46.784	2400	83	J–K
														81	R
USNM 607747	TRA753	*Phacorhabdotus anteronudus*		R	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	–46.784	2400	83	L–M
														81	S
USNM 607748	TRA727	*Phacorhabdotus* sp. 1		L	A	?	SWA	DSDP 21	4/5/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	83	N
USNM 607749	TRA726	*Phacorhabdotus subtridentus*		L	A	?	SWA	DSDP 21	4/5/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	83	O
USNM 607750	TRA728	*Phacorhabdotus* sp. 1		L	A	?	SWA	DSDP 21	4/5/ 148–150	Campanian–Maastrichtian	–28.585	–30.598	2113	83	P
USNM 607751	TRA741	*Phacorhabdotus subtridentus*		R	A	?	SWA	DSDP 21	6/6/3–5	Campanian	–28.585	–30.598	2113	83	Q–R
USNM 607752	TRA742	*Phacorhabdotus subtridentus*		R	A	?	SWA	DSDP 21	6/6/3–5	Campanian	–28.585	–30.598	2113	83	S–T
														81	BB–CC
USNM 607753	TRA809	*Phacorhabdotus slipperi*	H	R	A	?	SEA	DSDP 363	17/2/71–88	Middle Paleocene	–19.646	9.047	2248	83	U–V
														81	Y

USNM 607754	TRA807	*Phacorhabdotus slipperi*	P	L	A	?	SEA	DSDP 363	17/2/71–88	Middle Paleocene	–19.646	9.047	2248	83 W
USNM 607755	TRA808	*Phacorhabdotus slipperi*	P	L	A	?	SEA	DSDP 363	17/2/71–88	Middle Paleocene	–19.646	9.047	2248	83 X 81 Z–AA
USNM 607756	TRA715	*Phacorhabdotus nudus*	P	L	A	?	SWA	DSDP 21	4/2/??	Campanian–Maastrichtian	–28.585	–30.598	2113	84 A–B 81 T–U
USNM 607757	TRA716	*Phacorhabdotus nudus*	P	R	A	?	SWA	DSDP 21	4/2/??	Campanian–Maastrichtian	–28.585	–30.598	2113	84 C
USNM 607758	TRA717	*Phacorhabdotus nudus*	H	R	A	?	SWA	DSDP 21	4/2/??	Campanian–Maastrichtian	–28.585	–30.598	2113	84 D–E 81 V–W
USNM 607759	TRA718	*Phacorhabdotus nudus*	P	R	A	?	SWA	DSDP 21	4/2/??	Campanian–Maastrichtian	–28.585	–30.598	2113	84 F 81 X
USNM 607760	TRA814	*Veenia* sp. 1		R	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	84 G–H 85 E–F
USNM 607761	TRA813	*Veenia* sp. 1		L	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	84 I–J 85 G–H
USNM 607762	TRA815	*Veenia* sp. 1		R	A	?	EUR	ARL 4730		Campanian?	50.630	5.563	OC	84 K 85 I–J
USNM 607763	TRA770	*Phacorhabdotus* cf. *subtridentus*		R	A	?	NA	DSDP 111A	11/6/50–56	Campanian	50.426	–46.368	1797	84 L–M 85 A–B
USNM 607764	TRA769	*Phacorhabdotus* cf. *subtridentus*		L	A	?	NA	DSDP 111A	11/6/50–56	Campanian	50.426	–46.368	1797	84 N–O 85 C–D
USNM 607765	TRA1102	*Bicornucythere bisanensis*		R	A	F	JP	OB2	106	Holocene	34.597	135.158	21.91	84 P
USNM 607766	TRA1103	*Bicornucythere bisanensis*		L	A	M	JP	OB2	106	Holocene	34.597	135.158	21.91	84 Q
USNM 607767	TRA1105	*Bicornucythere bisanensis*		L	A	M	JP	OB2	106	Holocene	34.597	135.158	21.91	84 R 85 M–N
USNM 607768	TRA1106	*Bicornucythere bisanensis*		R	A	F	JP	OB2	106	Holocene	34.597	135.158	21.91	84 S 85 K–L
USNM 607769	TRA1049	*Pistocythereis bradyi*		R	A	F	JP	UU-16	Modern	Modern	31.858	129.841	28.3	84 T, W 85 Q–R
USNM 607770	TRA1117	*Pistocythereis bradyi*		L	A	M	JP	OB2	116	Holocene	34.597	135.158	21.91	84 U
USNM 607771	TRA1107	*Pistocythereis bradyi*		L	A	F	JP	OB2	106	Holocene	34.597	135.158	21.91	84 V 85 O–P
USNM 607772	TRA1042	*Philoneptunus gravezia*		L	A	?	NZ	Trig Z f280	Outcrop	Late Oligocene–early Miocene	–44.812	170.527	OC	86 A–B 85 S–T
USNM 607773	TRA1043	*Philoneptunus gravezia*		R	A	?	NZ	Earthquakes f72	Outcrop	Late Oligocene	–44.882	170.625	OC	86 C–D 85 U
OP 1154		*Philoneptunus gravezia*		L	A	?	NZ	P. gravezia topotype	N/A	N/A	–34.500	173.000	N/A	82 P
		Philoneptunus gravezia		R	A	?		J42/f208	N/A	N/A	N/A	N/A	N/A	82 Q
USNM 607774	TRA143	*Philoneptunus cassidyi*		L	A	F	SO	EL 47 5119	Modern	Modern	–53.333	72.239	1045	86 E–F 85 V–W

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607775	TRA142	*Philoneptunus cassidyi*		R	A	F	SO	EL 47 5120	Modern	Modern	–53.331	72.943	747	86 85	G X–Y
USNM 607776	TRA144	*Philoneptunus cassidyi*		R	A	F	SO	EL 47 5119	Modern	Modern	–53.333	72.239	1045	86	H
USNM 607777	TRA145	*Philoneptunus cassidyi*		L	A	M	SO	EL 47 5117	Modern	Modern	–53.333	72.239	915	86	I
USNM 607778	TRA441	*Philoneptunus paragravezia*		L	A	M	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	86	J
USNM 607779	TRA442	*Philoneptunus paragravezia*		R	A	M	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	86	K
USNM 607780	TRA443	*Philoneptunus paragravezia*		L	A	F	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	86	L
USNM 607781	TRA444	*Philoneptunus paragravezia*		R	A	F	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	86 87	M–N A–B
USNM 607782	TRA419	*Philoneptunus paeminosus* s.l.		L	A	M?	SO	DSDP 277	5/2/114–121	Early Oligocene	–52.224	166.191	1214	86	O
USNM 607783	TRA439	*Philoneptunus paeminosus* s.l.		L	A	F?	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	86	P
USNM 607784	TRA440	*Philoneptunus paeminosus* s.l.		R	A	F?	SO	DSDP 279A	8/1/81–89	Early Miocene	–51.336	162.635	3341	86 87	Q–R C–D
USNM 607785	SIMY0007	*Philoneptunus* sp. 1		R	A	?	SWP	NMC 14	0–5	Modern	–33.229	161.910	1224	86 87	S–T E–F
USNM 607786	SIMY0012	*Philoneptunus gigas*		L	A-1	?	SWP	NMC 14	0–5	Modern	–33.229	161.910	1224	82	O
USNM 607787	GSM113	*Pterygocythereis americana*	P	L	A	?	NWA	WHOI 1626	Modern	Modern	27.667	–79.835	229	88 87	A–B G–H
USNM 607788	GSM114	*Pterygocythereis americana*	H	R	A	?	NWA	WHOI 1626	Modern	Modern	27.667	–79.835	229	88 87	C–D I–J
USNM 607789	TRA751	*Pterygocythere* sp. 1		R	A	?	SWA	DSDP 327A	13/2/ 100–105	Late Campanian	–50.871	-46.784	2400	88 87	E–F O
USNM 607790	SIMY0015	*Pterygocythere nobilis*		R	A	?	EWP	AQ 19	5–10	Quaternary	0.032	160.115	2881	88	G
USNM 607791	TMC203	*Pterygocythere nobilis*		R	A	?	NA	Chain 82-24-4P	313.5–316	Pleistocene	41.717	–32.850	3427	88 87	H–I K–L
USNM 607792	TMC204	*Pterygocythere nobilis*		L	A	?	NA	Chain 82-24-4P	313.5–316	Pleistocene	41.717	–32.850	3427	88 87	J–K M–N
USNM 607793	RB261	*Pterygocythere nobilis*		L	A	?	NWA	KN 35 sta 340A	Modern	Modern	38.240	–70.338	3300	88	L
USNM 607794	RB262	*Pterygocythere nobilis*		R	A	?	NWA	KN 35 sta 340A	Modern	Modern	38.240	–70.338	3300	88	M
USNM 607795	RB301	*Pterygocythere nobilis*		L	A	?	NWA	KN 25 sta 307	Modern	Modern	12.573	–58.988	3850	88	N
USNM 607796	RB302	*Pterygocythere nobilis*		R	A	?	NWA	KN 25 sta 307	Modern	Modern	12.573	–58.988	3850	88	O
USNM 607797	RB351	*Pterygocythere nobilis*		L	A	?	NWA	Alb 2569	Modern	Modern	39.433	–68.058	3200	88	P
USNM 607798	RB352	*Pterygocythere nobilis*		R	A	?	NWA	Alb 2569	Modern	Modern	39.433	–68.058	3200	88	Q

USNM 607799	RB353	*Pterygocythere nobilis*		L	A	?	NWA	Alb 2569	Modern	Modern	39.433	–68.058	3200	88	R
USNM 607800	RB354	*Pterygocythere nobilis*		R	A	?	NWA	Alb 2569	Modern	Modern	39.433	–68.058	3200	88	S
USNM 607801	TRA1032	*Taracythere proterva*		L	A	?	NZ	Ashley Mudstone Formation	Outcrop	Late Eocene	–44.800	170.967	OC	89	A
USNM 607802	TRA1033	*Taracythere proterva*		R	A	?	NZ	Ashley Mudstone Formation	Outcrop	Late Eocene	–44.800	170.967	OC	89 87	B–C P–Q
USNM 607803	TRA1034	*Taracythere conjunctispinosa*		L	A	?	NZ	Ashley Mudstone Formation	Outcrop	Late Eocene	–44.800	170.967	OC	89 87	D–E R–S
USNM 607804	TRA1035	*Taracythere conjunctispinosa*		R	A	?	NZ	Ashley Mudstone Formation	Outcrop	Late Eocene	–44.800	170.967	OC	89 87	F–G T–U
USNM 607805	TRA1036	*Taracythere conjunctispinosa*		R	A	?	NZ	Ashley Mudstone Formation	Outcrop	Late Eocene	–44.800	170.967	OC	89 87	H–I V–W
USNM 607806	TRA523	*Taracythere ayressoabyssora*	P	L	A	?	SWP	DSDP 208	5/4/60–66	Late Pliocene	–26.110	161.221	1545	89	J–K
USNM 607807	TRA524	*Taracythere ayressoabyssora*	P	L	A	?	SWP	DSDP 208	5/4/60–66	Late Pliocene	–26.110	161.221	1545	89 91	L–M A–B
USNM 607808	TRA527	*Taracythere ayressoabyssora*	H	R	A	?	SWP	DSDP 208	3/4/50–56	Late Pliocene	–26.110	161.221	1545	89 91	N–O C–D
USNM 607809	TRA952	*Taracythere ayressoabyssora*	P	R	A	?	SWP	NGC 99 pilot	0–5	Modern	–29.996	162.000	1158	90	A
USNM 607810	TRA953	*Taracythere ayressoabyssora*	P	R	A	?	SWP	NGC 99 pilot	0–5	Modern	–29.996	162.000	1158	90 91	B E–F
USNM 607811	TRA141	*Taracythere abyssora*		R	A	?	SO	EL 47 5069	Modern	Modern	–51.234	76.748	3277	90 91	C–D G–H
USNM 607812	TRA503	*Taracythere thalassoformis*	P	L	A	?	NWP	DSDP 292	23/1/54–60	Oligocene	15.819	124.651	2943	90 91	E–F I–J
USNM 607813	TRA504	*Taracythere thalassoformis*	H	R	A	?	NWP	DSDP 292	23/1/54–60	Oligocene	15.819	124.651	2943	90 91	G–H K–L
USNM 607814	TRA210	*Taracythere* sp. 1		L	A	?	NWP	Alb D5576	Modern	Modern	5.432	120.061	507	90 91	I–J M–N
USNM 607815	TRA211	*Taracythere* sp. 2		R	A	?	NWP	Alb 5516	Modern	Modern	8.767	123.542	315	90 91	K–L O–P
USNM 607816	TRA225	*Trachyleberidea mammidentata*		L	A	F	GOM	Alb 2402	Modern	Modern	28.600	–85.558	200	70	A–B
USNM 607817	TRA226	*Trachyleberidea mammidentata*		L	A	F	GOM	Alb 2402	Modern	Modern	28.600	–85.558	200	70 91	C–D Q–R
USNM 607818	TRA227	*Trachyleberidea mammidentata*		R	A	F	GOM	Alb 2402	Modern	Modern	28.600	–85.558	200	70 91	E–F S–T

(continued)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607819	GSM112	*Trachyleberidea mammidentata*		L	A	M	NWA	WHOI 1726	Modern	Modern	29.547	–80.000	494	70	G–H
USNM 607820	TRA539	*Trachyleberidea elegans*		R	A	F	IO	DSDP 214	27/cc	Late Eocene	–11.337	88.718	1655	70 91	I–J U–V
USNM 607821	TRA545	*Trachyleberidea elegans*		L	A	F	IO	DSDP 214	34/4/60–66	Early Eocene	–11.337	88.718	1655	70	K
USNM 607822	TRA546	*Trachyleberidea elegans*		R	A	F	IO	DSDP 214	34/4/60–66	Early Eocene	–11.337	88.718	1655	70	L–M
USNM 607823	RB211	*Trachyleberidea elegans*		L	A	M	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	82	E
USNM 607824	RB212	*Trachyleberidea elegans*		R	A	M	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	82	F
USNM 607825	RB217	*Trachyleberidea elegans*		L	A	M	IO	DSDP 214	26/cc/50cc	Early Oligocene	–11.337	88.718	1655	82 91	G W–X
USNM 607826	RB218	*Trachyleberidea elegans*		R	A	M	IO	DSDP 214	26/cc/50cc	Early Oligocene	–11.337	88.718	1655	82 91	H Y
USNM 607827	RB213	*Trachyleberidea elegans*		L	A	F	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	82	I
USNM 607828	RB214	*Trachyleberidea elegans*		R	A	F	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	82	J
USNM 607829	RB215	*Trachyleberidea elegans*		L	A	F	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	82	K
USNM 607830	RB216	*Trachyleberidea elegans*		R	A	F	IO	DSDP 214	28/3/50–56	Late Eocene	–11.337	88.718	1655	82	L
USNM 607831	RB219	*Trachyleberidea elegans*		L	A-1	?	IO	DSDP 214	26/cc/50cc	Early Oligocene	–11.337	88.718	1655	82	M
USNM 607832	RB220	*Trachyleberidea elegans*		R	A-1	?	IO	DSDP 214	26/cc/50cc	Early Oligocene	–11.337	88.718	1655	82	N
USNM 607833	TRA636	*Trachyleberidea geinitzi*	P	L	A	?	SWA	DSDP 21A	3/4/50–56	Paleocene–early Eocene	–28.585	–30.598	2113	70 92	N–O A
USNM 607834	TRA627	*Trachyleberidea geinitzi*	H	R	A	?	SWA	DSDP 21A	1/4/50–56	Middle Eocene	–28.585	–30.598	2113	70 92	P–Q B–C
USNM 607835	TRA804	*Bensonocosta* sp. 2		R	A	?	IO	DSDP 258A	9/4/50–56	Santonian	–33.795	112.474	2793	70 69	R–S I–K
USNM 607836	RB148	*Muellerina abyssicola*		L	A	M	NEA	DSDP 352	4/4/129–134	Pleistocene	63.650	–12.471	990	93	A
USNM 607837	RB149	*Muellerina abyssicola*		L	A	M	NEA	DSDP 352	4/4/129–134	Pleistocene	63.650	–12.471	990	93	B

USNM 607838	RB150	*Muellerina abyssicola*	L	A	F	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	C
USNM 607839	RB151	*Muellerina abyssicola*	R	A	M	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	D
USNM 607840	RB142	*Muellerina abyssicola*	L	A	M	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93 92	E D–E
USNM 607841	RB143	*Muellerina abyssicola*	R	A	M	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93 92	F H
USNM 607842	RB144	*Muellerina abyssicola*	L	A	F	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	G
USNM 607843	RB145	*Muellerina abyssicola*	R	A	F	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93 92	H F–G
USNM 607844	RB152	*Muellerina abyssicola*	R	A	F	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	I
USNM 607845	RB153	*Thaerocythere crenulata*	L	A	F	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	J
USNM 607846	RB154	*Thaerocythere crenulata*	R	A	F	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	K
USNM 607847	RB155	*Thaerocythere crenulata*	L	A	M	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	L
USNM 607848	RB156	*Thaerocythere crenulata*	R	A	M	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93	M
USNM 607849	RB158	*Thaerocythere crenulata*	R	A	M	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93 92	N I, K
USNM 607850	RB157	*Thaerocythere crenulata*	L	A	F	NEA	DSDP 352	4/4/ 129–134	Pleistocene	63.650	–12.471	990	93 92	O J, L
USNM 607851	RB436	*Bradleya dictyon*	L	A	F?	NWA	Alb D2751	Modern	Modern	16.900	–63.200	1256	94	A
USNM 607852	RB437	*Bradleya dictyon*	R	A	F?	NWA	Alb D2751	Modern	Modern	16.900	–63.200	1256	94	B
USNM 607853	RB449	*Bradleya dictyon*	L	A	M?	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	94	C
USNM 607854	RB450	*Bradleya dictyon*	R	A	F?	NWA	Alb D2754	Modern	Modern	11.667	–58.550	1584	94	D
USNM 607855	GSM306	*Bradleya dictyon*	L	A	F?	NEA	DSDP 610A	15/7/4–6	Late Pliocene	53.222	–18.887	2417	94 92	E–F M–N
USNM 607856	GSM313	*Bradleya dictyon*	R	A	F?	NEA	DSDP 610A	16/6/18	Late Pliocene	53.222	–18.887	2417	94 92	G–H O–P
USNM 607857	GSM5087	*Bradleya dictyon*	R	A	F?	NEA	DSDP 552A	15/3/79–81	Pliocene	56.043	–23.231	2301	94	I
USNM 607858	GSM5091	*Bradleya dictyon*	L	A	M?	NEA	DSDP 552A	15/3/38–40	Pliocene	56.043	–23.231	2301	94	J
USNM 607859	GSM615	*Bradleya dictyon*	L	A	M?	NEA	DSDP 552A	9/4/20–22	Pliocene	56.043	–23.231	2301	94	K
USNM 607860	TMC385	*Bradleya dictyon*	R	A	F?	NEA	DSDP 610	17/4/69	Middle Miocene	53.222	–18.887	2417	94	L
USNM 607861	USGSD241	*Bradleya dictyon*	L	A	M?	NEA	DSDP 552A	19/1/80–82	Pliocene	56.043	–23.231	2301	94	M
USNM 607862	USGSD245	*Bradleya dictyon*	R	A	M?	NEA	DSDP 552A	10/2/ 109–111	Pliocene	56.043	–23.231	2301	94	N

(*continued*)

TABLE A1. (*Continued*)

Catalog No.	MY No.[a]	Species	T[a]	V[a]	Instar[a]	Sex[a]	Region[b]	Locality code[c]	Section[a,d]	Age[a]	Lat[a] (deg)	Long[a] (deg)	WD[a] (m)	Figure No.	Figure Part
USNM 607863	GSM174	*Bradleya* cf. *mesembrina*		L	A	?	NA	Chain 82-24-4P	181.5–184.5	Pleistocene	41.717	–32.850	3427	94	O
USNM 188561	TRA1020	*Poseidonamicus minor*	P	R	A	?	SEP	EL 21-10		Modern	-36.683	–93.617	3137	94	P
USNM 174357	TRA1025	*Poseidonamicus minor*	H	L	A	?	SEP	DWBG 74	Modern	Modern	-28.717	–107.600	3220	94	Q
USNM 607864	TMC103	*Poseidonamicus pintoi*		L	A	?	NA	Chain 82-24-4P	286–288	Pleistocene	41.717	–32.850	3427	94	R
USNM 607865	TRA1006	*Poseidonamicus anteropunctatus*		L	A	?	IO	DSDP 253	9/3/50–56	Early Miocene	-24.878	87.366	1962	94	S
USNM 607866	TRA1007	*Poseidonamicus anteropunctatus*		R	A	?	IO	DSDP 253	9/3/50–56	Early Miocene	-24.878	87.366	1962	94	T

[a] Abbreviations: MY No.: Moriaki Yasuhara's personal catalog number. T: type (P, paratype; H, holotype; L, lectotype). V: valve (C, carapace; L, left; R, right). Instar: A, adult; A-1, last juvenile instar (adult minus one). Sex: F, female; M, male; ?, sex not certain. Lat: latitude. Long: longitude. WD: water depth (OC, outcrop; ?, depth unknown). N/A, not available.

[b] Region codes: EUR, Europe; EWA, equatorial western Atlantic; EWP, equatorial western Pacific; GOM, Gulf of Mexico; IO, Indian Ocean; JP, Japan; MED, Mediterranean; NA, North Atlantic; NAM, North America; NEA, northeastern Atlantic; NP, North Pacific; NWA, northwestern Atlantic; NWP, northwestern Pacific; NZ, New Zealand; SAM, South America; SEA, southeastern Atlantic; SEP, southeastern Pacific; SO, Southern Ocean; SP, South Pacific; SWA, southwestern Atlantic; SWP, southwestern Pacific.

[c] Locality codes are designated by the name of the sample (sediment core or surface sediment), the geological stratum, or other locality-related information.

[d] Sections are designated by standard Ocean Drilling Program (ODP) notation (core/section/interval) or depth interval in centimeters, except for modern and outcrop samples.

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