Shorter Contributions to Paleontology and Stratigraphy

Edited by Ellis L. Yochelson

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CONTENTS

CHAPTER C

Middle and Upper Triassic Marine Ostracoda From the Shublik Formation, Northeastern Alaska

By I. G. SOHN

U.S. GEOLOGICAL SURVEY BULLETIN 1664

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CONTENTS

PLATES

[Plates follow References]

FIGURE

TABLES

Middle and Upper Triassic Marine Ostracoda From the Shublik Formation, Northeastern Alaska

By I. G. Sohn

Abstract

Twenty-two taxa from beds dated by megafossils as Ladinian through Norian are described and illustrated in 7 new species, 13 in open nomenclature, and 1 as Gen. and sp. indet. The *Hungarella–Ogmoconcha* problem is discussed, and specimens of *Ogmoconcha* from the Carnian of Hungary are illustrated as evidence that the genus was present during the Triassic. Twelve of the taxa are restricted to the Ladinian part of the Shublik Formation of the reference section, one taxon is restricted to the Carnian, and six taxa are restricted to the Norian. Related genera have been recorded from the Middle Triassic of the Primor'ye Zoogeographical Province of the Pacific Realm and from the Middle and Upper Triassic in the Tethyan Zoogeographical Province of Eurasia.

The following taxa are included: *Cavussurella grammi* n. sp., *C.*? sp. 1, *C.*? sp. 2, Covracytheridae n. fam., *Covracythere binoda* n. sp., *C. gryci* n. sp., *Dettermania truncata* n. gen., n. sp., *Ogmoconcha tailleuri* n. sp., *O. unicerata* n. sp., *O. alaskaense*. n. sp., *O. marquardti* n. sp., *O.*? sp. aff. *Hungarella limbata* (Reuss, 1868), *O.* aff. *O. owthropensis* (Anderson, 1964), *Cavussurella*? sp. 1, *C*?. sp. 2, "*Healdia*" sp. 1, "*H*" sp. 2, "*H*" sp. 3, *Hyatobairdia*? ex gr. *H. arcuata* Kristan-Tollman, 1970, *Recytella* sp. 1, *R.* sp. 2, *Triassocypris*? sp., *Pseudobythocypris*? sp. *Rhombocythere*? sp., and Gen. and sp. indet.

In addition, *Cornutobairdia reidae* n. sp. from the Lewes River Formation (Norian), Yukon Territory, Canada, is described. This species is representative of an abundant and varied silicified ostracode assemblage that differs on the generic level from those in northern Alaska. This assemblage is similar to ostracodes from Nevada and to taxa described from the Carnian and Rhaetian of the Tethyan Zoogeographical Region. During the Middle Triassic (Anisian and Ladinian), the sea that became northern Alaska was located in the Primor'ye Zoogeographical Province not directly connected with the Tethyan Zoogeographical Region. During the Late Triassic (Norian and ?Rhaetian), that sea had connections with the Tethyan Zoogeographical Province of Eurasia. Northern Alaska is not one of the accretionary exotic terranes postulated for western North America and southern Alaska.

INTRODUCTION

Purpose and Scope

The discovery and production of oil in the North Slope of Alaska involved detailed geologic, stratigraphic, and paleontologic studies by the U.S. Geological Survey (USGS) and many private companies. This report deals with Middle and Late Triassic ostracodes from the reference section of the Shublik Formation, 10.4 kilometers N83°W of the confluence of Fire Creek and the Sadlerochit River (fig. 1) in the Mount Michelson quadrangle (Detterman and others, 1975, p. 14–16, fig. 6). Stage assignments for the units in this reference section are based on megafossils identified by N. J. Silberling (Detterman and others, 1975, p. 43). Because ostracodes also are present in boreholes in the North Slope (Sohn, 1984a, p. 334), description of the ostracodes from surface collections makes these microfossils available for surface and subsurface identification.

Previous Work

From 1857 through 1966, only 25 publications dealing with marine Triassic ostracodes were published (Sohn, 1968, p. 6, 64), and all were from Europe and Asia. During the past two decades, the number of publications on the Triassic ostracodes from Europe and Asia has increased dramatically. Sohn (1965) recorded *Hungarella*? spp., *Paracypris*? spp., *Darwinula*? sp., and unidentified steinkerns in 30 collections of very poorly preserved pyritized ostracodes from the Shublik Formation on Dodo Creek about 10 km east-northeast of the Fire Creek reference section. In the same publication, the following taxa were recorded for silicified ostracodes from the Grantsville Formation (Ladinian), Shoshone Mountains, Nye County, Nev. (USGS Mesozoic loc. M76): *Acratia*? sp., *Carinobairdia*? sp., *Cytherelloidea* n. sp. 1, *Cytherelloidea* n. sp. 2, new genus Thlipsuracea?, Gen. indet. Beyrichicopina?, Gen. indet. Cytheracea, and Gen. indet. Healdiidae.

Harlan Bergquist gave me 37 slides with ostracodes he found while studying the foraminifers from the Fire Creek reference section of the Shublik Formation for R. L. Detterman. In 1973, I reported that they contained *Hungarella* spp., *Bairdia* sp. (one carapace), and steinkerns of undetermined genera. As result of my report, Detterman sent me 88 samples from the reference section of the Shublik Formation that had been prepared by grinding for mineralogical studies. Sixty-one of these contained ostracodes. Both suites of samples from the reference section were documented by collection numbers and by distances measured in feet above the base of the Shublik Formation. These samples were small, ranging in dry weight from 22 to 104 grams; the ostracodes recovered, which varied from 1 to more than 30 specimens per sample, provided the ostracodes for this study.

Acknowledgments

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Preservation and Laboratory Techniques

All the samples were treated in Quaternary-O, sieved and picked using a binocular microscope. Selected specimens were prepared for scanning electron microscope (SEM) photomicrography. Both methods have been described by Sohn (1983, p. 10).

Because the samples had been crushed previously, most of the ostracodes are either steinkerns or broken or corroded carapaces and are small, from 0.4 to 0.8 millimeter in greatest length. Clean dissociated valves are rare. The outer surfaces of many of the carapaces, particularly those taxa with smooth surfaces, are rough because they are coated with an as yet undetermined mineral (pl. 6, figs. 15–18). Some have adhering mineral grains (pl. 6, figs. 6–9), and others are pitted and gouged (pl. 9, figs. 15, 18). On some of the steinkerns and broken carapaces, either the hinge structure or the adductor muscle-attachment scar is exposed

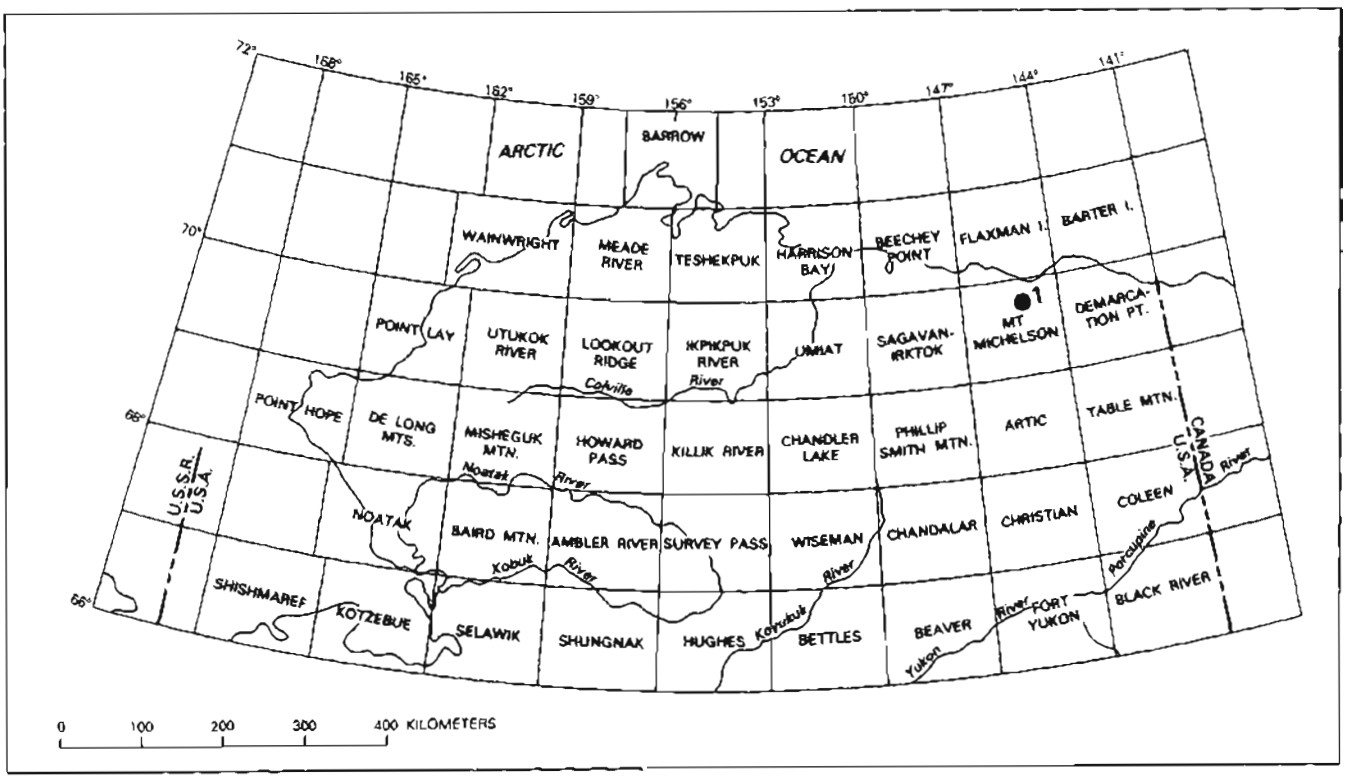

Figure 1. Map of northeastern Alaska showing location of Fire Creek reference section of Shublik Formation; 1 is the Fire Creek outcrop section.

(pl. 1, figs. 7, 8, 15, 16, 18, 20; pl. 5, figs. 14, 16; pl. 8, figs. 25, 26; pl. 9, figs. 11, 12, 22, 23; pl. 10, figs. 18, 19, 26; pl. 11, fig. 26). These two morphologic characters are particularly important in the generic and suprageneric classification of ostracodes.

GEOLOGIC SETTING

Current interpretations suggest that modern-day Alaska is composed of at least two unrelated blocks: A northern segment consisting of the North Slope and the Brooks Range that was once connected to the Canadian Arctic Islands (Grantz, Johnson, and Sweeny, 1982, pl. 111) and a central and southern portion composed of accretionary terranes that are part of the active convergent Pacific microplates (Jones, Silberling, and Hillhouse, 1978, p. 71–74; Plafker and Jones, 1982, p. 78, fig. 1). The Brooks Range and the Canada Basin may have formed simultaneously during the Late Jurassic or Early Cretaceous by the counterclockwise rotation of Arctic Alaska (Mull, 1984; Tozer 1982, p. 1085). Several studies, however, suggest no post-Triassic rotation (Churkin, 1972; Churkin and Trexler, 1981; Dutro, 1981). The affinities of the ostracodes, on the generic level, to those in the Primor'ye Territory support the latter view.

With one exception, *Cornutobairdia reidae* n. sp., from the Lewes River Formation (Norian), Yukon Territory, Canada, the ostracodes described herein are from the Shublik Formation in the northern segment of Alaska. The distinctive lithology, namely thin-bedded black phosphatic limestone and dolomite, shale and chert, and abundant fossils, make the Shublik Formation a readily recognized stratigraphic unit in northern Alaska. This formation represents a condensed sequence of rock of remarkably uniform thickness. Detterman and others (1975, p. 14–16) designated the Fire Creek outcrop section as the reference section of the Shublik Formation. They described the distribution of the formation and the stratigraphic relations, lithology, and age based on megafossils of the section. *C. reidae* is included to indicate that the accretionary terranes may contain entirely different Triassic ostracode assemblages.

Age of the Ostracodes

Silberling (Detterman and others, 1975, p. 15, fig. 6; p. 43) recorded *Daonella frami* Kittl and *Leiophyllites* sp. in the basal siltstone member of the Shublik Formation at the reference section. USGS colln. M6052, collected from 8.2 to 21.9 meters (27–72 feet) above the base of the Shublik Formation, indicates an Anisian or Ladinian age. Only a small carapace of *Ogmoconcha tailleuri* (USNM 389916) was recovered from the siltstone member of the Shublik Formation at 25.9 m (85 ft) above the base of the Shublik Formation (USGS colln. 33106).

The lower part of the overlying limestone and dolomite member of the Shublik Formation yielded most of the ostracodes. The majority occurred from approximately 30 to 70 m (100–235 ft) above the base of the formation. Based on the megafossils, this interval is Ladinian in age. USGS colln. M6054 from the limestone and dolomite member, 30.5 m (100 ft) above the base of the Shublik Formation, contains *Daonella frami* Kittl, and USGS colln. M6053 in the same member, 30.5 to 33.5 m (100–110 ft) above the base of the Shublik Formation, contains *D. frami*, *Lima* sp., *Camptonectes* sp., and spiriferoid brachiopods; these indicate a Ladinian age for this interval. Only three ostracode taxa, *Covracythere gryci* n. sp., *O.* sp. aff. *O. owthropensis* (Anderson, 1964), and *O. tailleuri* n. sp. extend above this interval into the Norian. The ostracodes from 30.5 to 70 m (100–230 ft) must be Ladinian because of the associated megafossils.

The middle part of the section, the limestone member of the Shublik Formation, from approximately 69 m (225 ft) to approximately 97 m (320 ft) above the base of the Shublik Formation is Carnian in age. Silberling (Detterman and others, 1975, p. 15, fig. 6, p. 43) recorded the following Carnian megafossils from USGS colln. M6056, from 68.6 to 71.6 m (225–235 ft) above the base of the Shublik Formation in the limestone member: *Halobia* cf. *H. zitteli* Lindstrom, *Leptochondria nationalis* Smith, *Gryphea* sp., *Lima* sp., arcetid ammonites, rhynchonellid brachiopods, and gastropods. In USGS colln. M6057, from about 74 to 97 m (245–320 ft) Silberling recorded the following Carnian megafossils: *Halobia* cf. *H. zitteli* Lindstrom, *H. ornatissima*, and *Sirenites* sp. Only *Pseudobythocypris*? sp. is restricted to this interval.

The overlying clay shale member of the Shublik Formation, from approximately 106 to 145.5 m (350–477 ft) above the base of the Shublik Formation is Norian in age based on the megafossils from the upper part of this member, from about 127 m (420 ft) above the base of the Shublik Formation. Siberling (Detterman and others, 1975, p. 16, 45) recorded the following megafossils in USGS collns. M6058, M6059, and M6067: *Halobia* cf. *H. fallax* Mojsisovics, *H.* cf. *H. lineata* Mojsisovics, *Monotis scutiformis pinensis* Westermann, *M.* cf. *M. scutiformis* Westermann, *M.* cf. *M. obtusicostata*, *Gryphea* sp. and rhynchonellid brachiopods. Of the eight ostracode taxa recovered from the Norian, *Ogmoconcha marquardti* n. sp., *O. alaskaense* n. sp., *Hiatobairdia*? sp. ex gr. *H. arcuata* Kristan-Tollmann, 1970, *Triassocypris*? sp., and Gen. and sp. indet. are confined to this unit; the other three taxa extend upward from the Ladinian.

The Triassic ostracodes described from northeastern Alaska are new species, taxa tentatively referred to related or known Triassic species, or undescribed species discussed and illustrated in open nomenclature. Except for *Dettermania* n. gen., *Ogmoconcha* Triebel, 1941 [originally described from the Liassic (Lower Jurassic)], and *Pseudobythocypris* Shaver, 1958 (previously known from the Paleozoic), all the taxa are related to genera known from the

Primor'ye Province from the Pacific Ocean Zoogeographical Region (Burij and Zharnikova, 1977, p. 90–92) or from the Tethyan Zoogeographical Region, as shown in table 1.

Paleogeographic Implications

The affinity of the ostracodes in northeastern Alaska with those in the Primor'ye Territory (table 2) poses a paleogeographical problem. Tozer (1982) based a model for the Triassic paleogeography on plate tectonics, paleomagnetics, and paleontology. The upper map of Tozer (1982, p. 1094–1095, fig. 2) represents the Triassic, and the lower map as well as a large scale map (Tozer, 1982, p. 1083, fig. 1) show the current world geography. The paleogeographic model shows the paleopacific (Panthalassa) to contain scattered shoals and islands. Plate-bound areas on Tozer's maps of the present are shown to include northeastern Alaska, where the ostracodes were collected. The Triassic model shows the Primor'ye Territory as part of a midpaleolatitude, about 40°N. of the Triassic equator (Tozer, 1982, p. 1086), volcanic terrane that later became part of Japan and part of Asia (Tozer, 1982, p. 1095, fig. 2, no. 18). Blome and Reed (oral commun., 1984) reported that some of the Triassic radiolarians in the Brooks Range, Alaska, are related on the generic level to those in Japan.

A different model for the Triassic faunal relation was proposed by Kristan-Tollmann and Tollmann (1981, fig. 1; 1983, fig. 9). They considered the Triassic Pacific Ocean as a gigantic ocean without any islands in which a major paleocurrent, the "Tethys current," transported the Triassic fauna from the west coast of North America to the Mediterranean (Tethyan) Zoogeographical Province.

Neither model explains the similarity on the generic level of the ostracodes in northern Alaska to those in the Primor'ye Territory. A combination of the above models may explain more closely the similarities. Although Tozer (1982) did not discuss paleocurrents, currents in the Triassic certainly influenced the distribution of marine organisms (Choi, 1984, p. 731). If the paleocurrent patterns proposed by Kristan-Tollman and Tollmann (1981) were modified, reflecting the presence of the various islands and shoals, the

Table 1. Stratigraphic occurrences of taxa in Alaska

Taxa	Ages		
	Ladinian	Carnian	Norian
Covracythere binoda n. sp.	X		
Recytella sp. 1	X		
Recytella sp. 2	X		
Dettermania truncata n. sp.	X		
"*Healdia*" sp. 1	X		
"*Healdia*" sp. 2	X		
Rhombocythere? sp.	X		
Ogmoconcha? sp. aff. *Hungarella limbata* (Reuss, 1868)	X		
Cavussurella? sp. 1	X		
Cavussurella? sp. 2	X		
Ogmoconcha unicerata n. sp.	X		
Ogmoconcha tailleuri n. sp.	X		X
Covracythere gryci n. sp.	X		X
Ogmoconcha sp. aff. *O. owthropensis* (Anderson, 1964)	X	X	X
"*Healdia*" sp. 3	X	X	
Cavussurella grammi n. sp.	X	X	
Pseudobythocypris? sp.		X	
Ogmoconcha marquardti n. sp.			X
Ogmoconcha alaskaense n. sp.			X
Hiatobairdia? sp. ex gr. *H. arcuata* Kristan-Tollmann, 1970			X
Triassocypris? sp.			X
Gen. and sp. indet.			X

Table 2. Paleozoogeographical provinces and ages of related taxa

[Provinces: *=Primor'ye, **=Tethyan, ***=Britain and Germany]

Taxa	Age
Cavussurella grammi n. sp	*Upper Anisian
Covracythere binoda n. sp.	Do.
"*Healdia*" sp. 1	*Upper Anisian
"*Healdia*" sp. 2	Do.
"*Healdia*" sp. 3	Do.
Cavussurella grammi n. sp.	Do.
Covracythere gryci n. sp.	Do.
Cavussurella? sp. 1	Do.
Cavussurella? sp. 2	Do.
Recytella sp. 1	*Ladinian
Recytella sp. 2	Do.
Ogmoconcha? sp. aff. *Hungarella limbata* (Reuss, 1868)	**Lower Carnian
Ogmoconcha unicerata n. sp.	Do.
Rhombocythere sp.	**Norian-Rhaetian
Pseudobythocypris? sp.	Do.
Ogmoconcha tailleuri n. sp.	***Rhaetian
Ogmoconcha sp. aff. *O. owthropensis* (Anderson, 1964)	Do.
Hiatobairdia? sp. ex gr. *H. arcuata* Kristan-Tollmann, 1970	**Rhaetian
Ogmoconcha alaskaense n. sp.	Do.
Triassocypris? sp.	Do.
Ogmoconcha marquardti n. sp.	Do.

new model could explain the similarity on the generic level shown in table 2.

Burij and Zharnikova (1977) used the Jaccard coefficient in the analysis of Triassic ammonite genera to determine paleozoogeographic provinces. They distinguished two latitudinal zoogeographic provinces in the northern Pacific Basin: a northern, colder, Yakutian–Canadian (including northern Alaska) subregion in the Boreal Zone and a warmer Primor'ye–Californian subregion in the Equatorial Zone. During the early Middle Triassic (Anisian), the Yakutian province was connected closely with the Primor'ye province (Burij and Zharnikova, 1977, p. 102). During the Ladinian, the Yakutian and Canadian provinces (including northern Alaska) were interconnected (Burij and Zharnikova, 1977, p. 104). Paleocurrents during the Anisian could have distributed the Primor'ye taxa described by Gramm (1969a, b, 1970, 1975) into the Yakutian province, and, during the Ladinian, paleocurrents could have transported those taxa into the area of northeastern Alaska.

Environment of the Ostracodes

The genera to which the taxa in northeastern Alaska are assigned indicate a benthic life style, probably less than 200 m in depth. Dutro (1981, p. 25) proposed that the Shublik Formation was deposited in relatively deep water far from shore. He based his conclusions on the fact that the sediments consist of thin-bedded phosphatic limestone, shale, and chert. According to Dutro, the Shublik Formation represents a comparatively long period of time in which very little sediment was deposited.

Burij and Zharnikova (1977) considered Alaska to be located in a Boreal Paleozoogeographical Province. The presence in Alaska of taxa related on the generic level (table 2) to forms originally described from Britain and northern Germany that were connected to the Boreal Sea (Fisher, 1984) supports their interpretation.

The ostracode assemblage in northeastern Alaska differs markedly on the generic level from the ostracodes in the Lewes River Formation (Norian), Yukon Territory, Canada. This formation contains *Cornutobairdia reidae* n. sp., described herein, and undescribed taxa tentatively referred to the following genera: *Acratia* Delo, 1930, Paleozoic through Upper Triassic; *Alatobairdia* Kristan-Tollmann, 1971b, Rhaetian; *Bairdia* McCoy, 1844, smooth type, Paleozoic through Holocene; *Bairdiacypris* Bradfield, 1935, Paleozoic through Rhaetian; *Carinobairdia* Kollmann, 1963, Norian through Rhaetian; *Ceratobairdia* Sohn, 1954 sensu Kristan-Tollman, 1970, Permian through Rhaetian; *Leviella* Sohn, 1968, Anisian through Rhaetian; *Lobobairdia* Kollmann, 1963, Norian through Rhaetian; *Polycopsis* Müller, 1894, Scythian through Holocene; *Ptychobairdia* Kollmann, 1960, Norian through Rhaetian; *Vavilovella* Kozur, 1973, Norian; and additional, as yet unidentified, taxa.

THE *HUNGARELLA-OGMOCONCHA* PROBLEM

The *Hungarella–Ogmoconcha* problem was created when Méhes (1911, p. 21, pl. 2, figs. 14–18) described *Bairdia? problematica* and stated (p. 22) that if subsequent investigations determined that the species belonged to a new genus, that genus should be named in the literature as *Hungarella*. The original description of *Bairdia? problematica* (Méhes, 1911, p. 21, 22) stated that the valves were very well preserved and not thick, were completely glassy, and were transparent. The above description suggests a Holocene or Tertiary contamination, either in the field or in the laboratory, of some of the collections that Méhes studied.

Triebel (1941, p. 377) described and illustrated with excellent photographs the genus *Ogmoconcha* from the Liassic of Germany. Shaver (Moore, 1961, p. Q161), van Morkhoven (1963, p. 132), and Anderson (1964, p. 146) considered *Ogmoconcha* to be a junior subjective synonym of *Hungarella* because conditional names, such as *Hungarella*, were declared valid according to Article 17(8) in the second edition of the International Code of Zoological Nomenclature [Stoll and others, 1961, p. 17; article 51c (ii) of the third edition (International Commission on Zoological Nomenclature, 1985, p. 97)]. Sohn (1968, p. 28) discussed the differences between *Ogmoconcha* and *Hungarella* Méhes, 1911. Since that time, the *Hungarella–Ogmoconcha* problem has been discussed by Kozur (1970b, p. 20), Bolz (1971b, p. 156, 243), Malz (1971, p. 434), Lord (1972, p. 332; 1982, p. 262), Gerry and Kozur (1973, p. 67–69), Kristan-Tollmann (1977, p. 133, 142, 143), and Bate (1978, p. 186). Except for Lord (1972, p. 352), the above writers did not take into account the possibility that Méhes included younger contaminants in his faunule (Mandelstam, 1960, footnote p. 292; Sohn, 1968, p. 39; Tappan, 1951, p. 7; Vadasz, 1933, p. 173). Lord (1982, p. 262) considered the relationship of *Ogmoconcha* and *Hungarella* to be unresolved until topotype material of *Hungarella* would be restudied and reillustrated.

The basic problem involves the presence or absence of a calcified inner lamella (duplicature), a denticulate hinge, and an aggregate, so-called healdiid, adductor muscle scar in *Hungarella*. An aggregate adductor muscle scar has been described in *Ogmoconcha* and also in the original and subsequent descriptions of *Hungarella*. Gerry and Kozur (1973, p. 67–69) reported that they examined a "cell" containing type material of Méhes (1911) at the Hungarian Geological Institute and noted the following regarding *Hungarella* "*Bairdia*"? *problematica* Méhes, 1911: "Syntype T685 AFL Ladinian, Felsörs. Destroyed, some badly preserved fragments showing no calcified inner lamella. (Generotype of *Hungarella*!!)"

My experience with ostracode types (Zalanyi, 1959) at the Hungarian Geological Survey may provide a plausible explanation as to the condition of the types of *Hungarella*. I saw Zalányi's Aptian types at the Hungarian Geological

Institute, Budapest, on August 10, 1976. All the specimens were on one large, plastic, multicelled slide that was covered by similar material attached at the corners with tiny screws. The cover was inscribed with a grid covering each cavity so that the species in each cavity was identified by coordinates written in a notebook. I recognized in this multicelled slide that the specimen in the cavity identified as *Metacypris aculeata* Zalányi, 1959, was not that species, and I saw many specimens, some crushed, that had moved into neighboring cavities with time and handling since Boda (1964) published his catalogue of Hungarian fossils. It is possible that the fragments examined by Gerry and Kozur (1973, p. 67, 69) in the *Bairdia? problematica* cavity may have had a similar history and belong to a different species, or they may represent different specimen than the one illustrated by Lord (1972, pl. 1, figs. 1a, b) with the same catalog number. Lord (1972, p. 321) stated that his illustration was provided by the Hungarian Geological Institute.

Hungarella? pricei Sohn, 1968, from the Ladinian of Israel, and *Hungarella?* sp. Sohn, 1970, from the Early Triassic of the Salt Range, West Pakistan, have calcified inner lamellas and denticulate hingements (Sohn, 1968, p. 29, pl. 2, figs. 28, 29, text fig. 3; 1970, p. 204, pl. 1, figs. 41, 42). Méhes (1911, p. 21) did not record a denticulate hinge in the type species, *Bairdia? problematica*, nor in the second taxon, *B.? problematica* var. *reniformis*. He did mention that two specimens of the variety *reniformis* have a strong ventroposterior spine. Kozur (1970a, p. 22, pl. 4, figs. 15–17) described and illustrated *Healdia* (*Hungarella*) *reniformis* (Méhes, 1911), from the Anisian and Ladinian of Hungary, and stated that the hinge is not denticulate ("Schlosselemente glatt").

Dr. J. Fülöp, Director of the Hungarian Geological Survey, mailed me some washed samples from the Triassic of Hungary, including one from the Carnian marl that is equivalent to locality no. 5 of Méhes (USGS colln. 33172). He informed me (written commun., June 22, 1966) that it was (and still may be) impossible to collect at the localities studied by Méhes. Specimens with a posteroventral spine and a denticulated hinge are present in the collection, and one is illustrated herein as *Ogmoconcha* sp. (pl. 10, figs. 12, 13; Sohn, 1984b, fig. 11E–G). Other specimens in the collection have thick valves and are opaque, and the adductor muscle scar could not be discerned even after treatment with hydrofluoric acid (pl. 11, figs. 13–16, 20–23).

A "healdiid" adductor muscle scar combined with a denticulate hinge were illustrated by Gramm (1982, p. 198, text figs. 6–8; pls. 2–5) for the Lower Carboniferous genus *Healdianella* Posner, 1951. Anderson (1970, fig. 1) and Sohn (1977, fig. 1b; 1985, figs. 2.3, 2.7, 2.10, 2.14, 3.18) illustrated a similarly aggregate adductor muscle scar for the nonmarine genus *Carbonita* Strand, 1928, that does not have a denticulate hinge. The number of individual adductor muscle scars in the living *Darwinula stevensoni* (Brady and Robertson, 1870) is not related to growth stages and may vary in opposite valves of the same individual (Sohn, 1976, p. 305). The "healdiid" adductor muscle scar is clearly developed in several different groups of Ostracoda; consequently, the "healdiid" pattern should not be used as the sole criterion for generic determination. To validate *Hungarella* Méhes, 1911, a neotype should be selected from the Hungarian Triassic, and the genus should be redefined, because, based on the present information, the taxon should be considered a nomen dubium.

USGS MESOZOIC FOSSIL COLLECTION LOCALITIES

[All collections measured from base of Shublik Formation, conversion of feet to meters to the nearest 0.1 m. Measured reference section of the Shublik Formation (Detterman and others, 1975, p. 14, fig. 6), located 13.4 km (6.3 mi) 84°W. of the confluence of Fire Creek with the Sadlerochit River, Mount Michelson quadrangle, Alaska; lat. 69°31′45″N., long. 145°12′20″W. Collected by R. L. Detterman, field station 69 ADT 105]

Siltstone Member (Anisian and Ladinian)

33106. 25.9 to 27.4 m (85–90 ft). Field no. 3–3.

Limestone and Dolomite Member (Ladinian)

33107. 30.5 to 32.0 m (100–105 ft). Field no. 3–6.
33108. 32.0 to 33.5 m (105–110 ft). Field no. 3–7.
33109. 33.5 to 35.1 m (110–115 ft). Field no. 3–8.
33110. 35.1 to 36.6 m (115–120 ft). Field no. 3–9.
33111. 36.6 to 38.1 m (120–125 ft). Field no. 3–10.
33112. 38.1 to 39.6 m (125–130 ft). Field no. 3–11.
33113. 39.6 to 41.1 m (130–135 ft). Field no. 3–12.
33114. 41.1 to 42.7 m (135–140 ft). Field no. 3–13.
33115. 42.7 to 44.2 m (140–145 ft). Field no. 3–14.
33116. 44.2 to 45.7 m (145–150 ft). Field no. 3–15.
33117. 45.7 to 47.2 m (150–155 ft). Field no. 3–16.
33118. 47.2 to 48.8 m (155–160 ft). Field no. 3–17.
33119. 48.8 to 50.3 m (160–165 ft). Field no. 3–18.
33120. 50.3 to 51.8 m (165–170 ft). Field no. 3–19.
33121. 51.8 to 53.3 m (170–175 ft). Field no. 3–20.
33122. 53.3 to 54.8 m (175–180 ft). Field no. 3–21.
33123. 54.8 to 56.4 m (180–185 ft). Field no. 3–22.
33124. 56.4 to 57.9 m (185–190 ft). Field no. 3–23.
33125. 57.9 to 59.4 m (190–195 ft). Field no. 3–24.
33126. 59.4 to 61.0 m (195–200 ft). Field no. 3–25.
33127. 61.0 to 62.5 m (200–205 ft). Field no. 3–26.
33128. 62.5 to 64.0 m (205–210 ft). Field no. 3–27.
33129. 64.0 to 65.3 m (210–215 ft). Field no. 3–28.
33130. 65.3 to 67.1 m (215–220 ft). Field no. 4–1.
33131. 67.1 to 68.6 m (220–225 ft). Field no. 4–2.

Limestone Member (Carnian)

33132. 68.6 to 70.1 m (225–230 ft). Field no. 4–3.
33133. 82.2 to 83.8 m (27–275 ft). Field no. 5–9.
33134. 83.8 to 85.3 m (27–280 ft). Field no. 5–10. No ostracodes recovered.

33135. 85.3 to 86.9 m (280–285 ft). Field no. 5–11. No ostracodes recovered.
33136. 86.9 to 88.4 m (285–290 ft). Field no. 5–12.
33137. 88.4 to 89.9 m (290–295 ft). Field no. 5–13.
33138. 89.9 to 91.4 m (295–300 ft). Field no. 5–14. No ostracodes recovered.
33139. 91.4 to 93.0 m (300–305 ft). Field no. 5–15. No ostracodes recovered.
33140. 93.0 to 94.5 m (305–310 ft). Field no. 5–16.
33141. 94.5 to 96.0 m (310–315 ft). Field no. 5–17.
33142. 96.0 to 97.5 m (315–320 ft). Field no. 5–18.
33143. 97.5 to 99.1 m (320–325 ft). Field no. 5–19.

Clay Shale Member (Norian)

33144. 106.7 to 108.2 m (350–355 ft). Field no. 6–6.
33145. 108.2 to 109.7 m (360–365 ft). Field no. 6–7.
33146. 109.7 to 111.3 m (360–365 ft). Field no. 6–8.
33147. 111.3 to 112.8 m (365–370 ft). Field no. 6–9.
33148. 112.8 to 114.3 m (370–375 ft). Field no. 6–10.
33149. 114.3 to 115.8 m (375–380 ft). Field no. 6–11.
33150. 115.8 to 117.3 m (380–385 ft). Field no. 6–12.
33151. 117.3 to 118.9 m (385–390 ft). Field no. 6–13.
33152. 118.9 to 120.4 m (390–395 ft). Field no. 6–14.
33153. 120.4 to 121.9 m (395–405 ft). Field no. 6–15.
33154. 121.9 to 123.4 m (400–405 ft). Field no. 6–16.
33155. 123.4 to 125.0 m (405–410 ft). Field no. 6–17.
33156. 125.0 to 126.5 m (410–415 ft). Field no. 6–18.
33157. 126.5 to 128.0 m (415–420 ft). Field no. 6–19.
33158. 128.0 to 129.5 m (420–425 ft). Field no. 6–20.
33159. 129.5 to 131.1 m (425–430 ft). Field no. 6–21.
33160. 131.1 to 132.6 m (430–435 ft). Field no. 6–22.
33161. 132.6 to 134.1 m (435–440 ft). Field no. 6–23.
33162. 134.1 to 135.6 m (440–445 ft). Field no. 6–24.
33163. 135.6 to 137.2 m (445–450 ft). Field no. 6–25.
33164. 137.2 to 138.7 m (450–455 ft). Field no. 6–26.
33165. 138.7 to 140.2 m (455–460 ft). Field no. 6–27.
33166. 140.2 to 141.7 m (460–465 ft). Field no. 6–28.
33167. 141.7 to 143.3 m (465–470 ft). Field no. 6–29.
33168. 143.3 to 144.8 m (470–475 ft). Field no. 6–30.
33169. 144.8 to 145.4 m (475–477 ft). Field no. 6–31.

Other localities

33170. South side of Lime Peak, about 300 m above level of Lake Thomas, 60°04′24″N., 134°51′6″W., Whitehorse Trough, Yukon Territory, Canada. Interreef limestone beds in the Lewes River Formation, Norian. Collected by Pamela Reid, field no. R–80–b.
33171. North side of Lime Peak, about 450 m above Thomas Lake (on south side of peak), and 250 m above ponds in valley on north side, 61°04′02″N., 134°53′42″W. Collected by Pamela Reid, field no. R–39–8.
33172. Lower Carnian marl from Csopak, Neszteri Valley, Hungary, corresponds to that of locality no. 5 studied by Méhes (1911). Sent by Dr. J. Fülöp, Director, Hungarian Geological Survey, June 1966.

SYTEMATIC PALEONTOLOGY

Except those illustrated specimens deposited in the geological Survey of Canada, Ottawa (GSC), all specimens are deposited in the National Museum of Natural History, Washington, D.C. (USNM).

Order PODOCOPIDA Sars, 1866
Suborder BAIRDIOCOPINA Gründel, 1967
Superfamily BAIRDIACEA Sars, 1888
Family BAIRDIIDAE Sars, 1888
Subfamily BAIRDIINAE Sars, 1923
Genus HIATOBAIRDIA Kristan-Tollmann, 1970

Hiatobairdia Kristan-Tollmann, 1970, p. 285. Rhatean, Austria.

Type species.—*H. subsymmetrica* Kristan-Tollmann, 1970, p. 286, pl. 35, figs. 1–3.

Discussion.—Kristan-Tollmann (1970, p. 286-289) described three species in *Hiatobairdia: H. subsymmetrica* based on seven specimens and *H. labrifera* and *H. arcuata* based on a single specimen each. I doubt whether the three species are congeneric. Because I have only three small steinkerns, I do not have sufficient information to establish a new generic category; consequently, I am referring them to *Hiatobairdia?* sp. ex gr. *H. arcuata.*

Geologic range.—Upper Triassic.

Geographic distribution.—Known from Europe, and ?northeastern Alaska.

Hiatobairdia? sp. ex gr. H. arcuata
Kristan-Tollmann, 1970
Plate 2, figures 18, 19

Hiatobairdia arcuata Kristan-Tollmann, 1970, p. 288, pl. 35, fig. 5. Rhaetian, Austria.

Hyatobairdia sic. sp. ex gr. *H. arcuata* Kristan-Tollmann, 1970. Sohn 1984b, p. 21 figure 11H.

not *Bairdia arcuata* (Kristan-Tollmann, 1970). Bolz, 1971a, p. 170, pl. 6, figs. 65–67. Differs in lateral outline.

not *Hiatobairdia* aff. *H. arcuata* Bolz, 1971b, pl. 1, fig. 6.

Discussion.—The three small steinkerns resemble *H. arcuata* in lateral outline and in that both ends curve upwards; they differ in that the ventral margins are convex instead of straight, and the greatest width is above the midheight instead of below the midheight.

Measurements (in mm).—USNM 389814, greatest length, 0.50, greatest height 0.30; measured specimen, USNM 389815, greatest length 0.45, greatest height 0.30; measured specimen, USNM 389816, greatest height 0.42, greatest height 0.35.

Geologic range.—Norian, from 112.0 to 140.9 m (370–465 ft) above the base of the Shublik Formation.

Genus CORNUTOBAIRDIA Kristan-Tollmann, 1970

Cornutobairdia Kristan-Tollman, 1970, p. 303.

Triebelina (Triebelina) van den Bold, 1946, of Bolz, 1971a, p.183.

Type species.—*C. reticulata* Kristan-Tollmann, 1970, p. 305, pl. 37, figs. 4–6. Rhaetian, "Plackles," Austria.

Original diagnosis (translated).—"Carapace elongated, strongly to moderately sculptured with three more or less elongated elements of which the two outer may join into a ring. The sculpture of both valves is different, in that the dorsal area of the left valve differs from the right; the left has additional strong sculpture, that expands into knobs and spines particularly in the posterodorsal area (compare generotype). In addition, the complete carapace is covered by a netforming pitted sculpture. The hinge is a simple, smooth bairdiid hinge terminated by numerous toothlets."

Discussion.—Kristan-Tollmann illustrated the type species with drawings of two carapaces that are dimorphic in width of dorsal and ventral outlines (1970, pl. 37), figs. 4a–d, 5a–d) and the hingement of a right valve (1970, pl. 37, figs. 61, b). She referred to *C. reticulata* a specimen from the same locality, illustrated by Kollmann as *Triebelina* sp./498 with photographs of the inside and outside of a right valve (Kollmann, 1963, 1979, pl. 8, figs. 11, 13). Kristan-Tollmann (1970, p. 306) stated that the right valve illustrated in outside view by Kollmann (1963, p. 1979, pl. 8, fig. 12) as *Triebelina* sp. 158 represents an additional species in this genus and illustrated a juvenile left valve (Kristan-Tollmann, 1970, pl. 37, fig. 3a, b) as *Cornutobairdia* n. sp. from the Rhaetian Zlambachmergeln at Krautgartenalm, Austria. Kristan-Tollmann (1971b, p. 77, pl. 5, figs. 4, 5) referred the above specimen to *C. trinodosa* Kristan-Tollmann, 1971b. Bolz (1971a, p. 720) considered the above specimen as the A-3 stage of *Triebelina* sp./158 Kollmann, 1963, and illustrated a right valve of *C. reticulata* (Bolz, 1971b, p. 721, pl. 2, fig. 12). Bolz (1971a, p. 184, pl. 9, figs. 122–126, text fig. 24) considered *Cornutobairdia* a synonym of *Triebelina* and referred all the above taxa except *C. trinodosa* to *Triebelina (Triebelina) reticulata* (Kristan-Tollmann, 1970), republished his plate 2, figure 12 as plate 9, figure 124, and recorded the range of the species as Upper Norian-?Liassic. Kozur (1972a, p. 652, pl. 2, fig. 2) republished Bolz's (1971b) plate 9, figure 122, as *"Triebelina reticulata"* and included Bolz's photograph on a plate illustrating a shallow neritic Upper Norian ostracode assemblage.

Bolz (1971a, p. 176–183) reviewed the literature on *Triebelina* van den Bold, 1964, and constructed a table showing characters of species in that genus. All the species of Tertiary to present ages, except *Triebelina schulzi* Hartmann, 1964, are from 0.59 to 0.75 mm in greatest length. The living *T. schultzi* Hartmann, 1964, is recorded to be 1.04 mm in greatest length, and the species is smooth (Hartmann, 1964, p. 44, pl. 4, fig. 14) and has a denticulated hinge (Hartmann, 1964, p. 45, pl. 4, figs. 20, 21); consequently, *T. schulzi* should not be classified with either *Triebelina* or *Cornutobairdia*. Van Morkhoven (1963, p. 35) recorded the length of species in *Triebelina* to be from 0.6 to 0.9 mm. Specimens of *Cornutobairdia* are larger than 1.0 mm (Bolz, 1971b, text figs. 23, 24), and all the species described in the genus have a dorsoposterior horn on the larger valve or on both valves, a feature not recorded in *Triebelina*. *Cornutobairdia*, although related to *Triebelina*, is considered a valid genus for the above reasons. Combining the two taxa masks the stratigraphic utility of both genera. The following species are known:

Cornutobairdia bicornuta Kristan-Tollmann, 1979, p. 153, pl. 7, fig. 4; pl. 8, fig. 4, Rhaetian, Persia.

C. reidae n. sp., Norian, Canada.

C. reticulata Kristal-Tollmann, 1970, p. 305, pl. 37, figs. 4–6, Upper Norian-?Liassic, Austria.

C. trinodosa Kristen-Tollmann, 1971b, p. 77, figs. 4, 5, Upper Norian-Austria.

Geologic range.—Upper Norian-?Liassic.

Geologic distribution.—Known from Europe and North America.

Cornutobairdia reidae Sohn, n. sp.

Plate 3, figures 1–6

Etymology of name.—In honor of Ms. Pamela Reid, University of Miami, who collected the samples that contain this species.

Holotype.—GSC 80063.

Paratypes.—GSC 80064-80066, USNM 389830–389834.

Type locality.—Southern slope of Lime Peak, Yukon Territory, Canada, USGS colln. 33170.

Other locality.—Northwest slope of Lime Peak, Yukon Territory, Canada, USGS colln. 33171.

Type level.—Lewes River Formation, Norian, USGS colln. 33170.

Diagnosis.—*Cornutobairdia* with two subcentral nodes, dorsal margin of the larger valve with upward-trending spine near anterior and dorsolateral trending spine near posterior, minute spinelets on anterior and ventroposterior margins. Reversal of overlap and hingement present, but mostly left valve larger.

Description.—The shells are heavily calcified, asymmetrical; larger valve overreaches the smaller along a straight dorsal hinge, overlaps slightly along the gently convex ventral margin. The surface of the larger valve bears a large node at or slightly below midheight in front of the greatest length of the hingeline and a second, smaller node located slightly higher than the subcentral node about equidistant from the hingeline and dorsoposterior margin. The dorsoposterior margin is obtuse, with about 130° angle from the posterior end of the hingeline, extends backward to about three-fourths of the height or below the posterior node, and then points to the rear to form a posterior spine; it then curves gently forward to meet the gently convex ventral margin. The anterior margin is subround, the dorsoanterior is straighter than the dorsoposterior. A rounded rim borders

the ventral and anterior margins and continues above the dorsal margins as a spine (pl. 3, figs. 2, 3, 6). From this spine, a straight, narrower ridge extends backwards to the posterior corner where it forms a posterolateral-pointing sharp spine. Above the dorsal ridge, the dorsal margin forms a pleatlike ridge that bends inward to overreach the hingeline (pl. 3, figs. 2, 5).

The smaller valve has two nodes and a rounded rim along the ventral and anterior margins as well as along the posteroventral margin but lacks the dorsal spines and the pleatlike overreaching structure of the larger valve. The anterior and ventroposterior margins bear minute spinelets (pl. 3, figs. 4, 5). The duplicature is wide along the anterior margin, narrow or missing along the posterior margins on both valves.

Measurements (in mm).—Width measured on subcentral nodes. USNM 389831 contains seven specimens, USNM 389832 contains two specimens. R. V. = right valve, L. V. = left valve).—

	Greatest length	*Greatest height*	*Greatest width*
GSC 80063, larger R. V.	1.10	0.65	0.52
GSC 80064, smaller R. V.	1.05	.50	
GSC 80065, larger L. V.	1.04	.63	
GSC 80066, larger L. V.	.96	.50	.45+
Paratype, USNM 389830, larger L. V.	1.00	.50	.45
Paratypes, USNM 389831, larger L. V.	1.0–1.20	.53–.64	
Paratype, USNM 389833, larger L. V.	1.05	.61	

Discussion.—The ostracodes are silicified, many are poorly preserved, and the adductor muscle scar is not observed. The marginal spines can be seen on the single valve (pl. 3, figs. 4, 5). This species is associated with specimens on which the subcentral nodes coalesce to form a ridge (USNM 389835, 389836) similar to those illustrated by Bolz (1971b, pl. 9, figs. 122–126) as *Triebelina (Triebelina) reticulata* (Kristan-Tollmann, 1970) = *Cornutobairdia*. A few specimens have three distinct nodes in a straight line, with or without the posterior node extending into a lateral spine (USNM 389836). These variants are not yet available in sufficient numbers for a population study to determine whether they represent one or more species. They are, however, distinct from *C. reidae* because the posterior node in the new species is located higher on the lateral surface than the subcentral node, and, on the variants, more than two nodes occur in a straight line.

Geologic range.—Known only from the two collections from the Lewes River Formation (Norian) in the Yukon Territory, Canada. USGS collns. 33170, 33171.

Suborder unknown
Superfamily unknown
?Family PARACYPRIDIDAE Sars, 1923
Genus TRIASSOCYPRIS Kozur, 1970

Type species.—*Macrocypris? pusilla* Kozur, 1968b, p. 500, pl. 2, figs. 14, 20–27. Lower and Middle Triassic, Thuringia.

Diagnosis (translated).—"Carapace small, right valve larger than left; dorsal margin convex, not angled; posterior margin pointed; ventral margin almost straight. Shell surface smooth. Hinge adont. Calcified inner lamella and vestibule wide in front, otherwise narrow."

Kozur assigned to this genus the holotype *T. pusilla* (Kozur, 1968b) and *T. tenuis* (Kozur, 1968b), both originally described as *Macrocypris?*.

Discussion.—Kozur (1970b, p. 445) referred *Triassocypris* to the Paracyprididae. The Paracyprididae were defined in Moore (1961, p. Q245) as having a wide duplicature and large anterior and posterior vestibules. *Triassocypris* has a wide anterior and a narrow posterior vestibule and probably should not be classified in the Paracyprididae.

Geolgoic range.—Triassic.

Geographic distribution.—Known from Europe and, questionably, from northeastern Alaska.

Triassocypris? sp.
Plate 11, figures 1–4

Discussion.—The Upper Triassic specimen from Alaska is a poorly preserved carapace with most of the shell probably missing; consequently, the internal morphology of the valves is unknown. Because the specimen resembles *Triassocypris* in lateral outline, I am tentatively referring it to the genus.

Measurements (in mm).—Plate 11, figures 1–4, USNM 390005, greatest length 0.30, greatest height 0.15.

Geologic range.—Norian, from 111.3 to 112.8 m (365–370 ft) above the base of the Shublik Formation. USGS colln. 33147.

Gen. and sp. indet.
Plate 11, figures 5, 6

Discussion.—The illustrated specimen is a poorly preserved carapace from the same collection as *Triassocypris?* sp. It differs in having a less pointed posterior, and the left valve apparently overlaps the right.

Measurements (in mm).—Plate 11, figures 5, 6, USNM 390006, greatest length 0.27, greatest height 0.15.

Geologic range.—Norian, from 111.3 to 112.8 m (365–370 ft) above the base of the Shublik Formation. USGS colln. 33112.

Suborder CYTHEROCOPINA Gründel, 1967
Superfamily CYTHERACEA Baird

Discussion.—The adductor muscle-attachment scar illustrated on pl. 2, figs. 22–26, is typical for Cyntheracea.

Family COVRACYTHERIDAE n. fam.

Diagnosis.—Small, less than 1 mm in length, elongated, with straight dorsal and gently convex ventral margins, with sulcus in front of midlength, two or more horizontal ribs that may or may not join at end margins, surface finely punctate or smooth. Hingement unknown, hingeline obscured by dorsal rib; overlap slight, left over right. Dimorphic in width of posterior.

Discussion.—Gramm (1975) referred *Covracythere* and two additional Triassic genera to the subfamily Editinae Knüpfer, 1967, in the Bythocytheridae Sars, 1926. Although the nominate genus, *Editia germanica* Knüpfer, 1967, has a cytheracean adductor muscle-attachment scar, it has a well-developed eye tubercle that is not present in *Covracythere* nor the other genera referred herein to the new family. Except for the adductor muscle scar, the hingement and other internal morphology of *Covracythere* were unknown to Gramm (1975, p. 108) and are not known for the species in Alaska.

When originally examined, the specimen illustrated on plate 7, figures 16–20, was tentatively referred to the Paleozoic family Beyrichiopsidae Sohn (Moore, 1961) because of the horizontal ribs (Sohn, 1984b, p. 21, fig. 11I). SEM micrography, with the carapace tilted, disclosed the cast of the horizontal ribs on a specimen with a cytheracean adductor muscle scar (pl. 2, fig. 25), thus placing that specimen in the Cytheracea Baird, 1850. The specimens from the Triassic differ from *Beyrichiopsis* Jones and Kirkby, 1886, in lacking a marginal frill as shown by Sohn (Moore, 1961, p. Q183, fig. 6). The new family is established to include the nominate genus, *Racvetina* Gramm, 1975, *Acvocarina* Gramm, 1975, and, tentatively, *Dettermania* new genus because the aductor muscle scar of the new genus is unknown.

Geologic range.—Known only from the Middle and Upper Triassic.

Genus COVRACYTHERE Gramm, 1975

Type species.—*Covracythere kiparissovae* Gramm, 1975, p. 108, pl. 1, figs. 23–27, 33. Middle Triassic, Primor'ye Territory.

Original diagnosis (translated).—"Carapace small, nearly rectangular, with dorsal and ventral flattenings, and poorly defined transverse depression. Extremities rounded, the posterior narrower. Dorsal and ventral margins straight and parallel. Surface faintly pitted; a thin looplike ridge stretches along the anterior and ventral margins and the middle of the surface (parallel to dorsal margin). Adductor muscle scar comprises five elongate, obliquely directed spots juxtaposed in a vertical row.

"Assigned species: Only the type species."

Discussion.—Gramm's illustration of the adductor muscle-attachment scar (1975, pl. 1, fig. 33) is identical to those illustrated on the species from Alaska (pl. 2, figs. 20–26).

Geologic range.—Upper Anisian to Norian.

Geographic distribution.—Primor'ye Territory, U.S.S.R., and northeastern Alaska.

Covracythere gryci n. sp.

Plate 2, figures 20–26; plate 7, figures 16–25

New genus, n. sp. Sohn, 1984b, p. 21. fig. 11I.

Etymology of name.—In honor of George Gryc, Chief, National Petroleum Reserve in Alaska.

Holotype.—Pl. 7, figs. 23-25, USNM 389824.

Paratypes.—USNM 389817, 389822, 389823, 389825–389828, ?389829, ?389940.

Type level.—Ladinian, from 36.4 to 37.9 m above base of Shublick, Formation.

Other levels.—Norian, from 143.9 to 144.5 m above base of Shublik Formation.

Diagnosis.—*Covracythere* with three horizontal ribs, lower two ribs joined to form elongated ellipse, middle rib unbroken across subcentral sulcus, surface finely pitted.

Description.—The carapace is elongated, the greatest length is above midheight, about twice the greatest height; the greatest width is in the posterior quarter of the greatest length. The ends are rounded, the posterior margin meets the convex ventral margin slightly higher than it does the anterior margin. The sulcus is deep, concave towards the anterior, located in the front part of the central one-third of the greatest length. The adductor muscle-attachment scar consists of a vertical row of five scars concave towards the anterior and is located on the anterior wall of the sulcus. The dorsoanterior part of the sulcus curves forward above the central horizontal rib to outline a low rounded node on the interior of the valve (pl. 2, figs. 21, 23–25; pl. 7, fig. 24). The lower two horizontal ribs are joined at the ends to form an ellipse, the lower rib is located just below the bottom of the sulcus, and the middle rib crosses the sulcus (pl. 7, figs. 17, 19).

Measurements (in mm) (unfigd. = unfigured specimen).—

	Greatest length	*Greatest height*
Paratype, USNM 389827, unfigd.	0.55	0.30
Paratype, USNM 389826, unfigd.	.61	.27
USNM 389822	.61	.32
USNM 389817	.64	.32
Paratype, USNM 389825, unfigd.	.65	.32
USNM 389823	.72	.32
USNM 389824	.80	.32

Discussion.—The diagnosis and description are based on seven poorly preserved specimens. Dimorphism appears to be reflected by the greater width near the posterior of the largest available specimen (pl. 7, figs. 23–25) presumed to be a female. Although a steinkern, this specimen is desig-

nated as the holotype. A poorly preserved steinkern (USNM 389940) also may belong to this species.

Geologic range.—Middle and Upper Triassic, Ladinian to Norian, from 36.4 to 144.5 m (120–447 ft) above the base of the Shublik Formation.

Covracythere binoda Sohn, n. sp.

Plate 7, figures 1–3

Etymology of name.—Two small nodes in front of sulcus on each side of the second rib.

Holotype.—Left valve, USNM 389818.

Type level.—Ladinian, from 36.4 to 37.9 m above the base of Shublik Formation.

Type locality.—Fire Creek section, Mount Michelson quadrangle, Alaska. USGS Mesozoic colln. 33111.

Diagnosis.—*Covracythere* with four horizontal ribs, elongated posterior-trending sulcus below first to above third rib, and two small nodes in front of sulcus on each side of second rib.

Description.—The valve is subquadrate, the dorsal and ventral margins are straight, the anterior margin is evenly rounded, the anterior is probably straight in the dorsal two-thirds and probably truncated towards the venter. The dorsal rib is connected to the second rib, subparallel and slightly removed from the anterior margin, the second rib is connected to the third rib near the posterior margin, and the fourth rib is convex ventrad and connected to the anterior of the third rib. A straight sulcus extends backward from below the first rib to above the third rib. Two small rounded nodes are located on each side of the third rib in front of the sulcus. The second rib is broken by the sulcus.

Discussion.—Although only a single left valve is available, it is formally described because it differs from the known taxa in the genus by having two nodes.

Measurements (in mm).—USNM 389818, greatest length 0.50, greatest height 0.30.

Geologic range.—Known only from the Ladinian part of the Shublik Formation, from 36.4 to 37.9 m (120–125 ft) above the base of the Shublik Formation.

Genus DETTERMANIA n. gen.

Type species.—*D. truncata* n. sp.

Etymology of name.—In honor of my colleague R. L. Detterman, U.S. Geological Survey, who collected the samples.

Diagnosis.—Small, greatest length less than 1 mm. Straightbacked; sulcate, with anterocentral node anterior to sulcus. Smooth or finely punctate; with two or more horizontal ribs; dorsum flat, dorsal margin straight, ventral margin convex, rounded anterior margin and pointed posterior margin. Left over right overlap slight, dimorphic in width of posterior. Hingement and adductor muscle scar unknown.

Discussion.—This genus differs from *Covracythere* Gramm, 1975, described from the Upper Anisian in the Soviet Far East and present also in Alaska, in lateral outline and in having a subcentral node in front of the sulcus.

Species assigned.—*D. truncata* n. sp. and *?Monoceratina subtriangulata* Huang and Gou, 1977 (Ye and others, 1977) from the Norian of Yunnan, The People's Republic of China (P.R.C.).

Geologic range.—Middle and Upper Triassic.

Geographic distribution.—Known from Yunnan, P.R.C., and northeastern Alaska.

Dettermania truncata Sohn, n. sp.

Plate 7, figures 4–15

New genus, n. sp. Sohn, 1984b, p. 21, fig. 11J.

Etymology of name.—Truncated posterior.

Holotype.—Heteromorph, USNM 389820.

Paratypes.—USNM 389819, 389821.

Type level.—Ladinian, from 37.9 to 39.4 m above base of Shublik Formation.

Type locality.—Fire Creek section, Mount Michelson quadrangle. USGS Mesozoic colln. 33112.

Diagnosis.—*Dettermania* with four ribs, second rib from top weakly developed; straight dorsal margin, convex ventral margin curving sharply backwards to form acute posterior margin, anterior margin evenly rounded. Sulcus wide, shallow, posterior to low rounded node extending from the third, strongest rib to level of weak second rib; fourth rib weaker than first. Dimorphic in width of posterior.

Description.—The shell is relatively thick as illustrated in plate 7, figure 4. The hinge margin is straight, the dorsum is flat, bounded by the straight dorsal rib. The ventral margin is convex, curves roundly into the anterior margin, and bends backward and upwards below the approximate posterior end of the third, strongest rib. A shallow, wide sulcus extends from below the dorsal rib to the third, best developed rib. This sulcus curves towards the anterior to delineate a subround node that extends upwards to the elevation of the very faint second rib (pl. 7, figs. 9–11).

Measurements (in mm).—USNM 389820, greatest length 0.43+, greatest height 0.5+; USNM 389819, greatest length 0.75+, greatest height 0.39+; USNM 389821, greatest length 0.98, greatest height 0.42.

Discussion.—This species is dimorphic in width of posterior. Plate 7, figure 9, illustrates the heteromorph which has a relatively wider posterior than the tecnomorph that is shown on plate 7, figure 14.

In lateral outline the species resembles *Monoceratina subtriangulata* Huang and Gou, 1977 (Ye and others, 1977, p. 282, pl. 1, fig. 21), from the Upper Triassic Shizhongshan Formation of Jinchuan, Yunnan, P.R.C. Although that species was described as having only one ventral rib, the original illustration shows also a dorsal rib and a deep subcentral sulcus; consequently, *M. subtriangulata* is questionably referred to *Dettermania*.

Geologic range.—Known only from the Ladinian, from 37.9 to 39.4 m (125–130 ft) above the base of the Shublik Formation.

Family unknown

Anderson (1964, p. 138) questionably classified the genus *Rhombocythere* in the Brachycytheridae Puri, 1954. Based on the species assigned to the genus, the genus probably does not belong in the Brachycytheridae.

Genus RHOMBOCYTHERE Anderson, 1964

Rhombocythere Anderson, 1964, p. 138.

Notocythere Will, 1969, p. 60.

Type species.—*Rhombocythere wicheri* Anderson, 1964, p. 138, pl. 9, figs. 1–8. Lower Rhaetian, borehole, Germany.

Original diagnosis.—"Medium sized oblong-ovate carapace, smooth or with close small circular puncta set in wide shallow depressions. Normal pore canals open into the punctae frequently in pairs. Anterior and posterior margins flanged. Dorsal and ventral margins carinate. Venter flattened. Hinge straight, long and sunk. Dentition of *Hemicythere* type. In the left valve a crenulate bar terminates anteriorly in a small undivided tooth in front in which is a deep socket. A similar socket occupies the postero-dorsal angle. In the right valve a shallow socketted groove is succeeded anteriorly and posteriorly by large anvil-shaped teeth. Lamella free and wide, radial pore canals straight and widely spaced. General shape like *Camptocythere*. Left valve larger."

Discussion.—In addition to the type species, Anderson (1964) described and illustrated *R. ruegeri* and *R. schotti*. He based the holotypes of the three species on specimens originally illustrated in open nomenclature by Wicher (1951) from Lower Rhaetian cores in boreholes, Germany. In addition, Anderson (1964) described and illustrated *R. penarthensis* from the Lower Rhaetian of South Wales.

The following Upper Triassic taxa have been described in, or referred to, *Rhombocythere:*

Notocythere elegans Will, 1969, p. 73, pl. 3, figs. 1, 2. Rhaetian.

Gemmanella (*Rhombocythere*) *gracilis* Kozur, 1968a, p. 851, pl. 2, figs. 1, 2, text figs. 2, 3 = *R. gracilis* (Kozur, 1968) fide Kozur, 1972a, p. 642. Lower Rhaetian.

Notocythere hechti brevis Will, 1969, p. 72, pl. 2, figs. 6a–d. Upper Norian.

N. hechti hechti Will, 1969, p. 68, pl. 2, figs. 3a, b, text figs. 25–28. Upper Norian.

N. hechti longa Will, 1969, p. 71, pl. 2, figs. 5a–d. Upper Norian.

N. hechti nodosa Will, 1969, p. 70, pl. 2, figs. 4a, b. Upper Norian = junior secondary homonym of *Rhombocythere nodosa* (Kozur, 1968a).

Notocythere magna intermedia Will, 1969, p. 79, pl. 3, figs. 4a, b. Rhaetian.

N. magna magna Will, 1969, p. 75, pl. 3, figs. 2a, b, text figs. 29–31 = *R. wicheri* Anderson, 1964. Rhaetian.

N. magna maritima Will, 1969, p. 77, pl. 3, figs. 3a–d. Rhaetian = *R. schotti* Anderson, 1964.

N. media excelsa Will, 1969, p. 66, pl. 2, figs. 2a, d. Rhaetian. Not conspecific with *Notocythere media excelsa* Will *in* Dadlez and Kopik, 1963, p. 139, pl. 1, fig. 10.

N. media media Will, 1969, p. 65, pl. 1, figs. 6a–d. Norian (type species of *Notocythere*).

N. media prima Will, 1969, p. 63, pl. 1, figs. 7a–d. Upper Norian.

Gemmanella (*Rhombocythere*) *nodosa* Kozur, 1968a, p. 852, pl. 1, figs. 14, 15 = *R. nodosa* Kozur, 1968, fide Styk, 1982, p. 21. Lower Rhaetian.

Notocythere obliqua Will, 1969, p. 79, pl. 1, figs. 5a, b. Rhaetian.

Rhombocythere penarthensis Anderson, 1964, p. 140, pl. 10, figs. 18–25. Rhaetian.

R. ruegeri Anderson, 1964, p. 139, pl. 9, figs. 9–12. Rhaetian.

R. schotti Anderson, 1964, p. 139, pl. 11, figs. 13–15. Rhaetian.

Gemmanella willi willi Dreyer, 1967, p. 506, pl. 7, figs. 1a–d = *R. penarthensis* Anderson, 1964. Rhaetian.

G. willi laevis Dreyer, 1965, p. 507, pl. 7, figs. 2, 3, 4a–d = *R. wicheri* Anderson, 1964. Rhaetian.

Rhombocythere wicheri Anderson, 1964, p. 138, pl. 9, figs. 1–8. Rhaetian.

The Lower Rhaetian species *Rhombocythere gorvoziensis* Styk, 1972 (p. 876, 884, pl. 3, figs. 6–8) does not belong in the genus. Styk (1982, p. 22, pl. 3, figs. 1, 2) placed her species in subjective synonymy with *Speluncella tenuistriata* Kozur, 1968a, in the new combination *R. tenuistriata* (Kozur, 1968a). Based on their lateral outlines and surface morphology, the two are not conspecific, and neither belongs in *Rhombocythere*.

The two inadequately preserved specimens from the Ladinian of Alaska are questionably referred to *Rhombocythere* solely on external morphology.

Geologic range.—Ladinian?, Norian, and Rhaetian.

Geographic distribution.—Known only from Europe, and ?northeastern Alaska.

Rhombocythere? sp.

Plate 10, figures 10, 11; plate 11, figures 28–31

Discussion.—A fragment of a left valve with the dorsal and end margins missing, and a poorly preserved steinkern of a right valve on matrix resemble *Rhombocythere*. Features in common with the genus are as follows: Straight-backed in lateral outline; carinate anterior and ventral margins (the posterior and dorsal margins are not preserved), anterior margin wider than posterior in lateral outline, in dorsal outline wider towards anterior; and puncta similar to *R. penarthensis* Anderson, 1964 (Anderson, 1964, pl. 10, figs. 18, 19; Bate, 1978, pl. 1, fig. 10) preserved near the

posterior margin (pl. 11, fig. 30). Because the dorsal and end margins are missing and the adductor muscle-attachment scar is not preserved on the fragment, the internal morphology diagnostic of *Rhombocythere* is unknown for the specimens on hand.

The fragment of a left valve illustrated on plate 10, figure 11, was tilted in the SEM (to look for a possible adductor muscle-attachment scar) so that the dorsal edge was below the plane of the micrograph. The tilting resulted in the distortion of the ventral groove for reception of the smaller valve. Examination with reflected light at X160 shows the proximal boundary of the groove is at the edge of the valve surface as shown by arrows. I cannot interpret the thin ridge that is terminated by minute toothlets inside the groove. Anderson (1964, pl. 10, figs. 21–23) showed that the left valve overlaps the right along the free margins, and Will (1969, p. 69, text figs. 25, 26) illustrated widely spaced radial pore canals along the ventral margin of *Notocythere* (= *Rhombocythere*). The thin ridge inside the groove along the ventral margin shown on figure 11 may represent infilling of the vestibule. The minute toothlets on either side of the ridge could possibly represent bases of radial pore canals; however, the entire structure may be an artifact resulting from fossilization.

The specimens on hand differ from all the known species in *Rhombocythere* in having a shallow kidney-shaped trough on the central part of the lateral surface; a shallow indentation from above into the dorsal boundary of the trough (pl. 10, fig. 10; pl. 11, figs. 29, 30); and widest in front of midlength in dorsal outline.

Measurements (in mm).—USNM 389853, greatest length 0.50, greatest height 0.40; USNM 389912, greatest length 0.62, greatest height 0.33.

Geologic range.—Ladinian, from 65.3 to 67.1 m (215–220 ft) above the base of the Shublik Formation.

Suborder METACOPINA Sylvester-Bradley, *in* Moore, 1961
Superfamily HEALDIACEA Harlton, 1933

Sohn (1965) discussed this superfamily. The aggregate adductor muscle-attachment scar also is present in nonmarine podocopids of Mississippian age (Sohn, 1985). This similarity indicates homeomorphy rather than phylogeny in the evolution of the so-called healdiid adductor muscle scar.

Family HEALDIIDAE Harlton, 1933

Gramm (1982, p. 194–198) published the best and most recent discussion of the family and the genus *Healdia* with superb SEM micrographs of the adductor muscle-attachment scars of genera in the family.

Genus HEALDIA Roundy, 1926

Type species (original designation).—*H. simplex* Roundy, 1926, p. 8, pl. 1, fig. 11a–c. Graham Formation (Upper Pennsylvanian), Stephens County, Texas.

Discussion.—Shaver (Moore, 1961, p. Q361) recorded the stratigraphic range of *Healdia* to be Devonian to Permian, but Coryell (1963, p. 929) listed three Lower Jurassic species of *Healdia*. Sohn (1968, p. 52) recorded two taxa in the Triassic: *Healdia bella* Gerke, 1937, from the Lower Triassic of Siberia, as a nomen nudum, and Ostracode C Kristan-Tollmann, 1964, as *Healdia?* sp. However, Kristan-Tollmann (1971a, p.51) described the new genus *Torohealdia* and designated Ostracode C as the type species, *T. amphicrassa* n. gen. n. sp., from the Norian-Rhaetian of the Alpine Triassic.

The following species from the Triassic have been described in or referred to *Healdia*:

Will (1969, p. 52) described from the Rhaetian of northwestern Germany *Healdia? tenuivirgata* = *Ogmoconcha martini* (Anderson, 1964) fide Bate, 1978, p. 82. Gramm (1969a) illustrated the adductor muscle scars in open nomenclature of *Healdia* sp. 1, *H.* ? sp. 2, and *H.* sp. 3, and the carapaces of *H.* sp. 1 and *H.*? sp. 2 from the Upper Anisian of the Primor'ye Region, U.S.S.R. The next year, Gramm (1970) described the specimens and erected *Healdia unitumulata* and also *H. zharnikovae* to which he referred *H.* sp. 1 Gramm, 1969, and *H.* spp. 3 to 8 Gramm, 1969a. Kozur (1970a, p. 21–23) described from the Upper Anisian of Hungary *Healdia* (*Healdia*) *anisica*, *H.* (*H.*) *felsooerensis*, and *H.* (*Hungarella*) *reniformis* (Méhes, 1911) and stated that the three species have a nondenticulated hinge. Bolz (1971b, p. 742, 744, pls. 3, 4) illustrated *Healdia* spp. A to G from the Alpine Norian-Rhaetian. Kozur (1972a, table 1) listed from the Rhaetian of Germany *Healdia* (*Hungarella*) *aspinata* Drexler, 1958, originally described from the Lower Jurassic, *H.* (*Hungarella*) *caudata* Anderson, 1964, *H.* (*Hungarella*) *martini* Anderson, 1964, and *H.* (*Hungarella*) *owthropensis* Anderson, 1964. Urlichs 1972 (1973 fide Kristan-Tollmann and Hamedani, 1973, p. 210), p. 688, identified *Healdia martini* (Anderson, 1964) from the German Upper Norian-Rhaetian. Urlichs' illustrated specimens, however, do not have a posterolateral hump on the left valve; consequently, they are not conspecific with Anderson's species. Gheorgian (1976, p. 37) identified and illustrated *Healdia* (*Healdia*) *felsooerensis* Kozur, 1970, from the Ladinian of Rumania. The presence of two spines on each valve of the Rumanian specimen excludes that species from *Healdia* (*H.*) *felsooerensis*. Hou and Gou, 1977 (Ye and others, 1977, p. 301), described and illustrated *Healdia jingguensis* from the Carnian of Yunnan, P.R.C.

Because Gramm (1969a, p. 457, figs. 1, 2; 1970, p. 45, figs. 1, 2) illustrated the adductor muscle-attachment scars of *Healdia zharnikovae* with a few scars, similar to those illustrated herein, I am referring the specimens from Alaska to "*Healdia*." The Triassic species lack the dorsoposterior flattening originally described in *Healdia*. The discovery of

better preserved Triassic specimens may require the establishment of a new genus.

These specimens are not formally named because only one carapace with part of the right valve and the posterior dorsal portion of the left valve retained is available; the others are steinkerns. Plate 1, figures 1–4, are of a steinkern with the same lateral outline as the other illustrated specimens. Although the posterior lateral ridge is not preserved, this specimen is included because the denticulate hinge is partly preserved on the posterior and dorsal views (pl. 1, figs. 1, 3). Plate 1, figures 5–9, are of a smaller steinkern that has a well preserved adductor muscle scar as well as dorsal attachment muscle scars (pl. 1, figs. 6–8) and a faint indication of a denticulate hinge (pl. 1, fig. 5).

Plate 1, figures 10–14, are of the largest available steinkerns that show straight posterior lateral ridges instead of curved ridges as on the illustrated specimens that follow. Plate 1, figure 13, has a poorly preserved adductor muscle-attachment scar that is similar in number of individual spots (stigmata) to that illustrated on figures 7, 8, and 18. These scars resemble the pattern illustrated by Gramm (1969a, p. 457, fig. 1.1–1.5) for *Healdia* sp. 1 (= *H. zharnikovae* Gramm, 1970) from the upper Anisian, and the posterior ridge on *H.* sp. 3 Gramm [1969a, figs. 4g, d (4d, e in English translation)] resembles the specimen illustrated herein as figures 12 and 13.

Prof. M. N. Gramm kindly examined the illustrations and a preliminary version of this discussion. He stated (written commun., July 12, 1984) that the adductor muscle-attachment scar pattern on the specimens from Alaska are close to those he had illustrated on specimens from the Primor'ye Region. He added that he had seen denticulation along the hinge of the right valve of *Healdia* sp. 3 (Gramm, 1970, pl. 7, fig. 2). Plate 1, figures 15–21, show the adductor muscle-attachment scar pattern and denticulate hinge, but, because the posterior lateral ridges are curved on this specimen and appear to be straight on the steinkern illustrated on plate 1, figures 12 and 13, this specimen probably represents a different species. The specimens are illustrated herein as "*Healdia*" sp. 1, sp. 2, and sp. 3.

Geologic range.—Devonian-Triassic, ?Lower Jurassic.

Geographic distribution.—Cosmopolitan.

"Healdia" sp. 1

Plate 1, figures 1–9

Discussion.—Two steinkerns and one measured specimen (USNM 389808) on which the right valve is missing and the anterior part of the left valve is missing are illustrated herein. The cast of the right valve on this specimen has a well-preserved adductor muscle-attachment scar that is similar to those illustrated herein (pl. 1, figs. 7, 8, 10), and the posterior of the left valve does not have a posterolateral ridge nor is one preserved on the cast of the right valve.

Measurements (in mm).—USNM 389804, greatest length 0.48, greatest height 0.30; measured specimen USNM 389808, greatest length 0.50, greatest height 0.28; USNM 389803, greatest length 0.53, greatest height 0.30.

Geologic range.—Ladinian, limestone and dolomite member, from 36.6 to 66.5 m (120–215 ft) above the base of the Shublik Formation.

"Healdia" sp. 2

Plate 1, figures 10–14

Discussion.—One steinkern with straight posterolateral ridges that differ from the curved ridges of "*Healdia*" sp. 3 is illustrated. The adductor muscle-attachment scar is poorly preserved (fig. 13) but is within the limits of those illustrated herein for "*Healdia*".

Measurements (in mm).—USNM 389805, greatest length 0.60, greatest height 0.40.

Geologic range.—Ladinian, limestone and dolomite member, from 65.5 to 70.1 m (215–220 ft) above the base of the Shublik Formation.

"Healdia" sp. 3

Plate 1, figures 15–21

Discussion.—In addition to the illustrated specimen, a steinkern (USNM 389807) from the Ladinian has an adductor muscle scar with four rows of stigmata arranged in a more circular outline than those illustrated. In addition, two specimens from the Carnian (USGS colln. 33143), one of which is a carapace and the other the posterior half of a carapace (USNM 389809), have curved posterolateral ridges. These specimens are probably conspecific with the one illustrated herein.

Measurements (in mm).—Unfigured specimen, USNM 389807, greatest length 0.42, greatest height, 0.28; USNM 809806, greatest length 0.53, greatest height 0.35; two unfigured specimens, USNM 389809, broken carapace greatest length 0.35, greatest height 0.31, carapace, greatest length 0.50, greatest height 0.32.

Geologic range.—Ladinian, limestone and dolomite member, from 35.1 to 36.6 m (115–120 ft) above the base of the Shublik Formation, and Carnian, Limestone Member, from 97.5 to 99.1 m (320–325 ft) above the base of the Shublik Formation.

Genus PSEUDOBYTHOCYPRIS Shaver, 1958

Type species.—*Bythocypris pediformis* Knight, 1928

Discussion.—Sohn (1983, p. 27) discussed this genus and recorded the geologic range of *Pseudobythocypris* to be Mississippian through Permian, but, based on this possible Triassic occurrence, the range is here questionably extended into the Upper Triassic (Carnian).

Psuedobythocypris? sp.

Plate 2, figures 14–17

Discussion.—The unique specimen is a thin-shelled, smooth carapace with a gently curved dorsal margin, a rounded anterior margin, and a truncated posterior margin.

The dorsal outline is elliptical, with gently curved sides and relatively blunt, equal ends. The greatest width is in front of the midlength. The carapace resembles the Pennsylvanian *Bythocypris pediformis* Knight, 1928, the type-species of *Pseudobythocypris*. Bolz (1971a, p. 235, pl. 8, figs. 120–121) illustrated from the Norian-Rhaetian, Norten Alps, the right views of one instar and one adult of *Bythocypris* sp. B that differ from the specimen on hand in being slightly higher and larger (length 0.80–0.91 mm, height 0.41–0.50 mm, and width 0.38–0.43 mm). Bate (1978, p. 180, pl. 1, fig. 4) illustrated the left view of a carapace of Lower Anisian age as *Bythocypris* sp. B Bolz, 1971. The specimen from Britian has the right valve larger than the left instead of the reverse as in both *Bythocypris* and *Pseudobythocypris* and should not be considered congeneric with the specimens discussed above. Because the adductor muscle-attachment scar of the carapace from Alaska is unknown, it is only tentatively referred to the Paleozoic genus.

Measurements (in mm).—USNM 389813, greatest length 0.70, greatest height 0.35, greatest width 0.26.

Geologic range. —Known only from the Carnian, limestone member, 94.5 to 96.0 m (310–315 ft) above the base of the Shublik Formation.

Genus OGMOCONCHA Triebel, 1941

Ogmoconcha Triebel, 1941, p. 377; Sohn, 1968, p. 29; Malz, 1971, p. 434; Lord, 1972, p. 332; 1982, p. 262; Kristan-Tollmann, 1977, p. 133, 142.

Hungarella Méhes, 1911 sensu Anderson, 1964.

Type species.—*O. contractula* Triebel, 1941, p. 377, pl. 14, figs. 156–160. Liassic, borehole, Germany.

Diagnosis (from Anderson, 1964, p. 146).—"A smooth genus in the Healdiidae with strong overlap of the left valve over right on all margins. Hinge margin of right valve with minute vertically oriented teeth which articulate with serial sockets in left valve. Adductor muscle-attachment scar aggregate."

Description.—According to Triebel (1941, p. 378), *Ogmoconcha* is small to medium sized, with thick, smooth shells. The carapace is elliptical to egg-shaped in lateral, dorsal, and end views. The left valve has a marginal groove for the reception of the right valve. Abundant minute, normal pore canals are simple; marginal pore canals are barely discernable, and a definite zone of concrescence (Verschmeltzungszone) is not discernible.

Discussion.—As indicated in the discussion of the *Hungarella-Ogmoconcha* problem, most of the Triassic species have been recorded as *Hungarella* Méhes, 1911. Lord (1972, p. 323) listed the Triassic species under *Hungarella* and the Liassic species under *Ogmoconcha*. Following is an objective list of Triassic species that have been described in, or transferred to, *Ogmoconcha:*

Torohealdia amphicrassa Kristan-Tollmann, 1971a, by Urlichs, 1972, p. 691. Upper Norian.

Hungarella bristolensis Anderson, 1964, by Bate, 1978, p. 182. Upper Rhaetian, Liassic.

H. caudata Anderson, 1964, by Bate, 1978, p. 182. Lower Rhaetian.

Ogmoconcha hagenowi Drexler, 1958, by Urlichs, 1972, p. 690. Upper Norian.

O.? limbata (Reuss, 1868) sensu Urlichs, 1971, herein. Ladinian.

Hungarella martini Anderson, 1964, by Bate, 1978, p. 182. Upper Rhaetian.

H. moorei (Jones, 1894) Anderson, 1964, by Bate, 1978, p. 182. Upper Rhaetian.

H. owthropensis Anderson, 1964, by Bate, 1978, p. 180. Lower Rhaetian.

Ogmoconcha sp. Urlichs, 1972, p. 693. Norian-Rhaetian.

Because several Triassic ostracodes in Alaska have an aggregate adductor muscle-attachment scar and some of these have denticulate hinges, the genus *Ogmoconcha* is confirmed in the Triassic. Many, but not all, of the Triassic species referred to *Hungarella* Méhes, 1911, that have a denticulate hinge probably belong in *Ogmoconcha*.

Key to the species of Ogmoconcha *in Alaska*

1. Posteroventral spine on right valve .... *unicerata*
1a. No posteroventral spine on right valve 2
2(1a). Height over length index less than 0.700 ..... *tailleuri*
2a. Height over length index 0.700 or more 3
3(2a). Horizontal pleat below dorsal margin of left valve ..... aff. *limbata*
3a. No horizontal pleat below dorsal margin of left valve 4
4(3a). Anterior margin of left valve higher than posterior ..... *marquardti*
4a. Anterior margin of left valve not higher than posterior 5
5(4a). Posterior margin in dorsal outline obtuse ..... aff. *owthropensis*
5a. Posterior margin in dorsal outline acute ..... *alaskaense*

Geologic range.—Triassic-Jurassic.

Geographic distribution.—Europe, Asia, and northeastern Alaska.

Ogmoconcha sp. aff. O. owthropensis (Anderson, 1964)

Plate 5, figures 11–16; plate 6, figures 1–9; plate 8, figures 7–9, 20–27; plate 9, figures 9–16, 19–23.

Hungarella owthropensis Anderson, 1964, p. 147, pl. 14, figs. 96–101. Lower Rhaetian, Nottinghamshire, Great Britian.

Ogmoconcha owthropensis (Anderson, 1964) Bate, 1978, p. 180, pl. 1, figs. 11, 15. Same specimens as above.

Gen. and sp. indet. ex gr. *Ogmoconcha* Triebel, 1941. Sohn, 1984b, p. 21, fig. 11K.

Discussion.—The holotype, a carapace, was recorded by Anderson (1964, p. 147) to be 0.625 mm long and 0.450 mm high. The height over the length (h/l) index of the

holotype equals 0.720. Specimens from Alaska range in length from 0.41 to 0.61 mm and in height from 0.29 to 0.43 mm, and their h/l ranges from 0.700 to 0.800. In addition to size and h/l index, these specimens have in common with *O. owthropensis* a relatively straight ventral contact, a relatively blunt posterior outline in dorsal view with evenly curved sides that taper more towards the anterior than towards the posterior, and a similar outline in end view. The hinge of a paratype of *O. owthropensis* is denticulated and tripartite with a narrow central portion and wider end portions (Anderson, 1964, pl. 14, fig. 101; Bate, 1978, pl. 1, fig. 15). The specimens in Alaska have poorly preserved denticulate hingements. The posterior two-thirds of the right valve of the carapace illustrated on plate 5, figures 11–16, is missing, thus exposing denticulations only along the center of the hinge, and the left valve illustrated on plate 9, figures 9–12, has a denticulated hinge that may not be tripartite. Twelve specimens from Ladinian to Norian collections in Alaska are illustrated to show that they can vary. Better preserved material may disclose that more than one species may be represented.

Measurements (in mm).—

	Greatest length	*Greatest height*	*Height/ length*
USNM 389860	0.41	0.29	0.707
USNM 389919	.41	.30	.732
USNM 389881	.41	.31	.756
USNM 389880	.44	.32	.727
USNM 389857	.45	.32	.711
USNM 389884	.50	.36	.720
USNM 389861	.50	.40	.800
USNM 389886	.50	.40	.800
USNM 389852	.51	.39	.765
USNM 389879	.52	.40	.769
USNM 389877	.56	.40	.714
USNM 389878	.61	.43	.705

Geologic range.— Ladinian through Norian, from 33.5 to 145.4 m (110–477 ft) above the base of the Shublik Formation.

Ogmoconcha alaskaense n. sp.

Plate 5, figures 23–28; plate 9, figures 17, 18, 24, 25; plate 11, figures 17–19

Gen. and sp. undet. ex gr. *Ogmoconcha* Triebel, 1941. Sohn, 1984b, p. 21, fig. 1F. Herein pl. 11, figs. 17–19.

Etymology of name.—Type locality in Alaska.

Holotype.—USNM 389887.

Paratypes.—USNM 389859, 389870, 389885, 389894, 389896, 389935, 389937, 389938, 389950, 389951.

Type locality.—Fire Creek reference section of Shublik Formation. USGS colln. 33149.

Type level.—Norian, clay shale member of Shublik Formation.

Diagnosis.— A species of *Ogmoconcha* with a height to length index of more than 0.700 and with an acute posterior outline in dorsal view.

Description.—The carapace is smooth, without any spines or pleats. In lateral outline, the dorsal margin is convex with the greatest height behind midlength, the ventral margin is straight, and the anterior margin is narrower than the posterior margin. The dorsal margin is elliptical, with the greatest width behind midlength, and the anterior end is slightly more acute than the posterior end. The hingement is denticulate.

Measurements (in mm) (figd. = figured specimen).—

	Greatest length	*Greatest height*	*Height/ length*
USNM 389870	0.40	0.30	0.750
USNM 389951	.40	.30	.750
USNM 389938	.41	.30	.732
USNM 389935	.42	.30	.714
USNM 389885, figd.	.42	.31	.738
USNM 389950	.42	.31	.738
USNM 389859, figd.	.43	.31	.721
USNM 389896, figd.	.46	.34	.739
USNM 389887, figd.	.51	.40	.784
USNM 389894	.55	.40	.727
USNM 389937	.55	.42	.763

Discussion.—Specimens with the height to length index of more than 0.700 differ from the specimens illustrated herein as *O.* sp. aff. *O. owthropensis* (Anderson, 1964) in that they have a more acute posterior in dorsal outline. These specimens are not considered to be sexual dimorphs of the above taxon because they range in length from 0.40 to 0.55 mm, thus representing two or more growth stages younger than *O.* sp. aff. *O. owthropensis* of which the largest specimen is 0.61 mm in length. The hingement of a juvenile is denticulate (pl. 5, figs. 25, 28), but the adductor muscle scar of the new species is unknown. The holotype (pl. 9, figs. 24, 25) lacks part of the posterior of the right valve, but the outline of the posterior end of the left valve in dorsal view is definitely acute.

Geologic range.—Norian, clay shale member, from 112.8 to 143.3 m (370–470 ft) above the base of the Shublik Formation.

Ogmoconcha unicerata Sohn, n. sp.

Plate 5, figures 1–10

Ogmoconcha n. sp. Sohn, 1984b, fig. 11A–D.

Etymology of name.—Posteroventral spine on right valve only.

Holotype.—USMN 389855.

Paratype.—USNM 389856.

Type level.—Ladinian. USGS colln. 33112.

Diagnosis.—*Ogmoconcha* with a posteroventral spine on the smaller right valve.

Description.—The carapace is small, less than 0.5 mm in greatest length, the valves are subovate, the ends are rounded, the dorsoanterior margin is more gently rounded than the dorsoposterior margin, and the overlap is even around all the margins. A stout spine, of which only the base is preserved on the specimens recovered, is located about equidistant from the ventral and posterior margins on the right valve. The greatest length is approximately at mid-height, the greatest height is slightly behind midlength. The dorsal outline is subelliptical, the anterior end is narrower than the posterior end, and the greatest width is behind midlength.

Measurements (in mm).—USNM 389855, greatest length 0.42, greatest height 0.30, h/l 0.714; USNM 389856, greatest length 0.43, greatest height 0.29, h/l 0.674.

Discussion.—*Healdia (Hungarella) reniformis* (Méhes, 1911) of Kozur, 1970, as illustrated by Kozur (1970b, p. 22, pl. 4, figs. 15–17) from the Anisian and Ladinian near Felsoörs, Bakony, Hungary, also has a ventroposterior spine on the right valve. The specimens from Alaska differ from Hungarian specimens not only in a more elongate lateral outline and in lacking a ridge below the posterior half of the dorsal margin of the right valve (pl. 10, figs. 12, 13) but also in the fact that the hingement of the Hungarian specimens is smooth ("Schlosselemente glatt"), whereas the specimens from Alaska have a denticulated hinge as shown herein (pl. 5, figs. 1, 2). The largest specimen from Felsoörs recorded by Kozur (1970b) is 0.520 mm long. Méhes (1911, p. 22), however, recorded the length of his *Bairdia*(?) *problematica* var. *reniformis* as 0.71 mm. Specimens as long as 0.70 mm with a ventroposterior spine on the right valve and a denticulate hinge are present in the Lower Carnian marl from Csopak, Nesztery Valley, Hungary (Sohn, 1984b, figs. 11E–G; herein pl. 10, figs. 12–14). In addition, specimens in the same collection without a posteroventral spine on the right valve that have denticulate hinges (pl. 11, figs. 13–16, 20–24) are present in the Hungarian Triassic. Unfortunately, I have not been able to determine the adductor muscle scar in my specimens from Hungary, even after converting some specimens to fluorite.

Geologic range.—Ladinian, limestone and dolomite member, from 38.1 to 39.6 m (125–130 ft) above the base of the Shublik Formation.

Ogmoconcha tailleuri n. sp.

Plate 5, figures 17–22; plate 6, figures 10–18; plate 8, figures 1–6, 10–19; plate 9, figures 1–4; plate 10, figures 1–8, 15–22; plate 11, figures 7–12.

?*Ogmoconcha* sp. Urlichs, 1972, p. 693, pl. 4, fig. 6. Norian, Austrian Alps.

Etymology of name.—In honor of my colleague I. L. Tailleur, U.S. Geological Survey.

Holotype.—USNM 389865.

Paratypes.—USNM 389858, 389862–389864, 389866–389869, 389875, 389876, 389883, 389888, 389899, 389901–389904, 389907, 389908, 389910, 389911, 389914–389917, 389926.

Type level.—Ladinian, limestone and dolomite member, from 48.8 to 50.3 m (160–165 ft) above the base of the Shublik Formation. USGS colln. 33119.

Other levels.—Anisian?, Ladinian through Norian, from 25.9 to 154.4 m (85–477 ft) above the base of the Shublik Formation.

Diagnosis.—Elongated; dorsal margin evenly convex, ventral margin gently convex; end margins rounded, posterior broader than anterior. Dorsal outline subelliptical, anterior narrower than posterior, lateral sides evenly convex, greatest width at or behind midlength, h/l index less than 0.700.

Description.—The holotype, a carapace with a fragment of the shell missing on the posterior of the left valve, has a relatively thick shell as shown on plate 8, figures 12 and 14. The dorsal margin of the larger valve does not overreach and overlap the smaller valve as much as the ventral margin does (pl. 8, figs. 1, 12). The greatest convexity of the anterior margin of the left valve is lower in relation to the height than that of the posterior margin (pl. 8, figs. 14, 18; pl. 9, fig. 2; pl. 10, figs. 3, 5). The denticulate hinge of the right valve is not as distinctly tripartite (pl. 5, figs. 20–22) as it is in *O. owthropensis* (Anderson, 1964) (Anderson, 1964, pl. 14, fig. 101; Bate, 1978, pl. 1, fig. 15), as well as in the Hungarian *O.* sp. illustrated herein (pl. 10, figs. 12, 13). Although the adductor muscle scar is poorly preserved (pl. 8, figs. 18, 19; pl. 10, fig. 5), the aggregate outline is typical of *Ogmoconcha*.

Measurements (in mm) (R. V. = right valve; B = steinkern).—

	Greatest length	*Greatest height*	*Height/ length*
USNM 389883	0.33	0.21	0.636
USNM 389888, R. V.	.42	.24	--
USNM 389911	.43	.25	.581
USNM 389866	.44	.30	.682
USNM 389901	.44	.30	.682
USNM 389858, R. V.	.44	.30	--
USNM 389903, R. V.	.45	.30	—
USNM 389910	.46	.27	.587
USNM 389876	.46	.31	.674
USNM 389899, B	.48	.27	.563
USNM 389862	.50	.30	.600
USNM 389875	.50	.32	.640
USNM 389864	.50	.33	.660
USNM 390004	.59	.30	.508
USNM 389865	.60	.40	.667
USNM 389863	.60	.40	.667

Discussion.—The carapace from the Austrian Alps that was illustrated by Urlichs (1972, pl. 4, fig. 6) resembles a paratype illustrated herein (pl. 8, figs. 15–19) in lateral outline and in apparent surface punctation. I attribute the relatively thin shell of the illustrated specimen to corrosion which removed part of the outside of the shell. Urlichs' specimen also represents a corroded carapace as indicated by the missing shell material along the dorsoanterior margin. The puncta that are present on the anterior half on my specimen and that are barely visible on the posterior half of Urlichs' illustration are interpreted to be cross sections of normal pores.

Geologic range.—Anisian?, Ladinian through Norian, from 25.9 to 145.4 m (85–477 ft) above the base of the Shublik Formation. The Anisian age is questioned because USGS colln. 33106, from which a carapace (USNM 389916) was recovered, is located below the Ladinian as determined by megafossils.

Ogmoconcha marquardti n. sp.

Plate 9, figures 5–8; plate 10, figures 23–32

Etymology of name.—In honor of Mr. J. F. Marquardt, Reference Librarian, Smithsonian Institution Libraries, whose expert and cooperative assistance for more than 25 years is greatly appreciated.

Holotype.—USNM 389905.

Paratype.—USNM 389882, 389889.

Type level.—Norian, clay shale member, from 128.0 to 129.5 m (420–425 ft) above the base of the Shublik Formation. USGS colln. 33158.

Other level.—The same member as above, from 121.9 to 123.4 m (400–405 ft) above the base of the Shublik Formation. USGS colln. 33154.

Diagnosis.–Differs from all other species of *Ogmoconcha* in subtriangular lateral outline, the anterior margin being much higher than the posterior margin.

Description.—The carapaces are small, less than 0.5 mm in greatest length. The hingeline is almost straight; it extends forward from the posterior margin to about two-thirds of the greatest length of the valves. The anterior margin is broadly rounded and is about twice the height of the posterior margin, and its greatest convexity is located below the hingeline at or lower than the junction of the posterior margin with the ventral margin. The ventral margin curves steeply backward and upward to meet the posterior margin. The left valve overlaps the right along the free margins and overreaches slightly along the hinge margin. The paratype (pl. 10, figs. 23–26) lacks a small part of the right valve at the dorsoposterior, where the denticulated hinge is exposed (pl. 10, figs. 23, 26).

Measurements (in mm).—USNM 389882, greatest length 0.23, greatest height 0.17, h/l 0.739; USNM 389889, greatest length 0.43, greatest height 0.30, h/l 0.750; USNM 389905, greatest length 0.45, greatest height 0.35, h/l 0.778.

Discussion.—Although only two carapaces and one steinkern of this species have been recovered, they differ in lateral outline from the described species in *Ogmoconcha*, thus warranting their description as a new species. Both carapaces have what appears to be a minute ventroposterior spine on the right valve (pl. 10, figs. 24, 28, 29). Because both carapaces are covered with adhering grains of an undetermined mineral, I did not use the presence of the spinelet(?) as an additional specific character. A minute steinkern (pl. 9, figs. 5–8) is referred to this species because of its lateral outline. Although the adductor muscle scar of specimens is unknown, this species is referred to *Ogmoconcha* because of the external morphology.

The Lower Pliensbachian (Jurassic) *O. eocontractula* Park, 1984, from Europe, has a triangular lateral outline, but that species (0.87–0.91 mm long) is much larger than *O. marquardti*, its ventral margin is not as truncated towards the posterior, and both valves have spinelets along the anterior margin—features that differentiate the two species. *Cytherella inaequata* Donze, 1966, as illustrated by Blaszyk and Gazdzicki (1982, p. 133, pl. 46, fig. 2) from the Hettangian (Late Jurassic) of Poland, differs from Donze's (1966) species in having a triangular lateral outline similar to the new species. This unnamed species is larger than *O. marquardti* (L = 0.76 mm), and it has an obtuse posterior in dorsal outline.

Geologic range.—Norian, clay shale member, from 119.3 to 129.5 m (365–425 ft) above the base of the Shublik Formation.

Ogmoconcha sp.

Plate 10, figures 12–14

Ogmoconcha n. sp. Sohn, 1984b, p. 21, fig. 11E–G, Carnian, Hungary.

Discussion.—See discussion under *O. unicerata* n. sp. Kozur's species, however, does not have a denticulated hinge and does not belong to *Ogmoconcha*. The Hungarian species is not formally named and described because study of Hungarian material is beyond the scope of this paper. The Upper Triassic (Carnian) taxon illustrated herein has a tripartite denticulate hinge, suggesting that *O. unicerata* from Alaska is not related on the generic level with the Anisian and Ladinian specimens illustrated by Kozur (1970a, p. 22, pl. 4, figs. 15–17) as *Ogmoconcha reniformis* (Méhes, 1911).

Measurements (in mm).—USNM 389999, greatest length 0.70, greatest height 0.50, h/l 0.714.

Geologic range.—Carnian (Upper Triassic), Hungary. USGS colln. 33172.

Ogmoconcha? sp. aff. Hungarella limbata (Reuss, 1868) sensu Urlichs, 1971

Plate 3, figure 7

Cytherella limbata Reuss, 1868, p. 108 (no illustration). Cassinian, Italy.

Hungarella limbata (Reuss, 1868) Urlichs, 1971, p. 707, pl. 1, figs. 3–14, text figs. 4–6. Cassinian, Italy (topotypes).

?*Ogmoconcha* sp. Sohn, 1968, p. 29, pl. 3, figs. 1–3, 8. Ladinian, Italy.

Discussion.—Because only one left valve on matrix from the Ladinian part of the Shublik Formation (63.6–65.2 m above the base) is available, the species is not named. The specimen is probably a left valve because of the well developed dorsal pleat and narrower ventral pleat or rim. This specimen differs from the left valves illustrated by Urlichs (1971, pl. 1, figs. 3, 5, text fig. 4) in lateral outline and size of dorsal pleat. Because the interior of the valve is obscured by rock, neither the hingement nor the adductor muscle scar can be determined; it is only questionably referred to *Ogmoconcha*. To orient the specimen for measurement, an attempt to smooth the rock below the valve resulted in breaking the anteroventral part of the shell. Approximate measurements are 0.8 mm long and 0.6 mm high.

Because Reuss (1868, p. 108) did not illustrate *Cytherella limbata*, that species was listed as "Gen. and sp. indet." (Sohn, 1968, p. 45), and the illustrated specimens were identified as *Ogmoconcha* sp. (Sohn, 1968, pl. 3, figs. 1–3, 8). Unfortunately, the valve illustrated on fig. 8 is lost; consequently, only the three remaining carapaces illustrated above could be measured to compare them with Urlichs' measurements of an ontogenetic series.

Urlichs (1971, p. 708) stated that his collections were from Reuss' type locality, and he identified and illustrated the species based on the original description. He described the right valve as having a small ventroposterior spine (1971, pl. 1, figs. 7, 8, 11) and a narrow frill along the anterior margin. The anterior marginal frill is not discernible on the three carapaces from Italy in the National Museum. The illustrated carapace (Sohn, 1968, pl. 3, fig. 2) has a minute posteroventral spine not seen on the published magnification of X30, but the other two carapaces do not have that spine preserved.

Only the specimens discussed above have pleats on the left valve; all the other species in *Ogmoconcha* have smooth left valves. Figure 7 was included on the plate that illustrates specimens of the Ussuricavininae Gramm, 1969, to suggest that these *Ogmoconcha* specimens are possible relatives of the Ussuricavininae, a subfamily that is poorly known.

Measurements (in mm).—Plate 3, figure 7, USNM 389837, greatest length 0.8, greatest height 0.6, h/l 0.750. Specimens from Italy, USNM 147198, greatest length 0.62, greatest height 0.55, h/l 0.887; USNM 147199, greatest length 0.65, greatest height 0.52, h/l 0.800; USNM 147200, greatest length 0.65, greatest height 0.56, h/l 0.862.

Geologic range.—Ladinian, limestone and dolomite member, from 63.6 to 65.2 m (210–215 ft) above the base of the Shublik Formation.

Order PLATYCOPIDA Sars, 1866
Suborder PLATYCOPINA Sars, 1866
Superfamily CAVELLINACEA Egorov, 1950
Family CAVELLINIDAE Egorov, 1950

Discussion.—Sohn (1968, p. 17) discussed the above classification.

Subfamily USSURICAVININAE Gramm, 1969

Discussion.—Gramm (1969b, p. 55) described this subfamily for the Triassic marine genera *Ussuricavina* Gramm, 1969, *Orlovicavina* Gramm, 1969, and *Cavussurella* Gramm, 1969. The following year, Gramm (1970, p. 100) established the subfamily Recytellinae in the family Cytherellidae Sars, 1866, for the Middle Triassic genera *Recytella* Gramm, 1970, and *Recytelloidea* Gramm, 1970. Kozur (1972b, p. 18) considered *Cavussurella* Gramm, 1969, and *Recytella* Gramm, 1970, to be synonyms of *Reubenella* Sohn, 1968; *Orlovicavina* Gramm, 1969, to be a synonym of *Issacharella* Sohn, 1968; and *Recytelloidea* Gramm, 1970 to be a synonym of *Leviella* Sohn, 1968—all in the family Cytherellidae Sars, 1866. Sohn (1968, p. 21) questionably referred *Leviella* to the Cytherellidae Sars, 1866, because the adductor muscle-attachment scar pattern of this genus was not known. Kristan-Tollmann (1973, p. 360, 363, 370) illustrated aggregate adductor muscle-attachment scars of several species of Triassic (Carnian) *Leviella* similar to those in the Cavellinacea as defined in Moore (1961, p. Q368) but not to those in the Cytherellacea as defined in Moore (1961, p. Q382).

The subfamily Recytellinae Gramm, 1970, was defined as having an external depression on the ventral portion of the brood pouch on each female valve (Gramm, 1970, p. 100), a feature absent in the Ussuricavininae. *Cavussurella* and *Recytella* are considered in this study to be valid genera.

Geologic range.—Middle and Upper Triassic.

Geographic distribution.—Primor'ye Territory, U.S.S.R., and northeastern Alaska.

Genus CAVUSSURELLA Gramm, 1969

Cavussurella Gramm, 1969b, p. 72.

Type species.—*C. kramtchanini* Gramm, 1969b, p. 72, pl. 5, figs. 5–15; pl. 6, fig. 8; pl. 8, figs. 1–24; text fig. 3.8. Upper Anisian, Primor'ye Region, U.S.S.R.

Original diagnosis (translated).—"Middle-sized Ussuricavininae, with variable oval outlines, elongated or shortened. Unequivalved. Surface pitted punctate. Adductor scar consists of three or four rows of spots; rows 1 and 2 prominent, posterior rows considerably reduced."

Discussion.—The holotype of *C. kramtchanini* Gramm (1969b, pl. 5, fig. 14) is a possible juvenile right valve 0.775 mm long and 0.520 mm high. A paratype, the carapace of a male (Gramm, 1969b, pl. 5, figs. 15a–d), 0.925 mm long, 0.575 mm high, and 0.350 mm wide was illustrated in right, left, dorsal, and ventral views. Both specimens have a weak subcentral pit and a marginal rim that is

stronger along the convex dorsal and ventral margins similar to the specimens illustrated herein. Gramm did not illustrate or describe the dimorphism observed in the present specimens from Alaska.

Gramm did not describe the hingement of *Cavussurella*. A fragment of a valve that is herein provisionally assigned to *Cavussurella* in informal nomenclature as *Cavussurella*? sp. 1 (pl. 10, fig. 9; pl. 11, figs. 25, 26) has a well-developed ridge and groove along the hinge and a groove along the venter to receive the smaller valve similar to the ventral groove shown on plate 4, figure 16. Fragments and a steinkern of a valve (pl 10, fig. 9; pl. 11, figs. 25–27) that differ in lateral outline from *Cavussurella grammi* n. sp. are illustrated in informal nomenclature as *Cavussurella*? spp.

Geologic age.—Middle and Upper Triassic.

Geographic distribution.—Primor'ye Territory, U.S.S.R., and northeastern Alaska.

Cavussurella grammi Sohn, n. sp.

Plate 3, figures 8–21; plate 4, figures 1–21

Etymology of name.—In honor of Dr. M. N. Gramm, Vladivostok, U.S.S.R.

Holotype.—A damaged female carapace, USNM 389845.

Paratypes.—USNM 389838–389844, 389846–389849, 389854, 390039.

Type level.—Ladinian, limestone and dolomite member, from 48.8 to 50.3 m (160–165 ft) above the base of the Shublik Formation.

Diagnosis.—Differs from *Cavussurella kramtchanini* Gramm, 1969b, in that the posterior margin is more broadly rounded, dimorphic in width of posterior.

Description.—Although the specimens are poorly preserved, the following composite conception of the new species can be constructed. The valves are relatively thick (pl. 3, figs. 13, 14, 15–17, 18, 19; pl. 4, figs. 14, 18), subovate, almost elliptical. The dorsal and ventral margins are gently convex and are of approximately the same curvature and height. The right valve overlaps the left slightly along the ventral margin (pl. 3, figs. 16, 17; pl. 4, figs. 3, 12–14) and overreaches along the dorsal margin (pl. 4, figs. 5, 10); it is more convex along the dorsum than the smaller left valve (pl. 4, fig. 2). The right valve has a thicker marginal rim than the left valve (pl. 4, figs. 1, 3, 10–15), and the rim is more pronounced along the dorsum than along the ventral margin and is subdued along the end margins (pl. 3, figs. 14, 15; pl. 4, figs. 3, 4, 10, 14). The species is dimorphic in dorsal outline; the heteromorphs (females) are widest near the posterior (pl. 4, fig. 12), and the tecnomorphs (males and juveniles) are widest behind mid-length (pl. 3, figs. 15, 18; pl. 4, figs. 1, 3, 9). One juvenile (pl. 4, figs. 1–5) has a punctate surface, and it is assumed that the smooth specimens were also punctate. The adductor muscle scar is not preserved, except possibly on the steinkern of the left valve (pl. 3, fig. 20) where it is too poorly preserved to determine the individual rows of spots. Fragments and steinkerns from the same collection as the paratypes (USGS colln. 33132) are tentatively referred to this species (USNM 390039). Because the genus is based primarily on the adductor muscle scar of the type species, the illustrations and a preliminary draft of the description of this species were sent to Prof. M. N. Gramm who very kindly compared the illustrations with the holotype and paratypes of *C. kramtchanini*. He stated (written commun., July 12, 1984) that, in his opinion, the forms are congeneric.

Measurements (in mm) (unfigd. = unfigured specimen, L. V. = left valve).—

	Greatest length	*Greatest height*
USNM 389843	0.53	0.32
USNM 389839	.60	.36
USNM 389841	.60	.40
USNM 389844	.70	.40
USNM 389840	.70+	.50
USNM 38954	.75	.50
USNM 389842	.75+	.5+
USNM 389838	.8+	.4+
USNM 389845	.8+	.5+
USNM 390039, unfigd., L. V.	.80	.60

Geologic range.—Ladinian to Norian, from 36.6 to 145.4 m (120–477 ft) above the base of the Shublik Formation.

Cavussurella? spp.

Plate 10, figure 9; plate 11, figures 25–27

Discussion.—Fragments and steinkerns of specimens that cannot be assigned with certainty to *Cavussurella grammi* are provisionally assigned to the genus. A fragment of a left valve (pl. 10, fig. 9; pl. 11, figs. 25, 26) and a steinkern of a left valve (pl. 11, fig. 27) are illustrated.

The fragment (pl. 10, fig. 9; pl. 11, figs. 25, 26), illustrated as *Cavussurella* sp. 1, has a relatively thick shell similar to *C. grammi* shown on plate 3, figures 13–21, and plate 4, figures 10–21, and has a pleat below the dorsal margin similar to those on plate 3, figure 10, and plate 4, figure 11. The hinge consists of a groove (pl. 10, fig. 9; pl. 11, fig. 26) hitherto not known in *Cavussurella* because neither Gramm (1969b) nor I have been able to observe the hingement on specimens of this genus. The groove along the venter for the reception of the smaller valve resembles the groove exposed on broken carapaces of *C. grammi* (pl. 3, figs. 16, 17; pl. 4, figs. 14, 15, 18). Neither of the two spots seen on plate 11, figure 26, represents the adductor muscle scar when examined in the SEM at X500.

The steinkern of a left valve, illustrated herein as *Cavussurella*? sp. 2 (pl. 11, fig. 27), differs in lateral outline from

C. grammi, as does a second damaged steinkern (USNM 389850).

Measurements (in mm).—USNM 389851, greatest length 0.7+, greatest height 0.60; USNM 389003, greatest length 0.80, greatest height 0.50; unfig. steinkern USNM 389850, greatest length 0.7+, greatest height 0.40.

Geologic range.—Ladinian, limestone and dolomite member, from 45.7 to 64.0 m (155–215 ft) above the base of the Shublik Formation.

Subfamily RECYTELLINAE Gramm, 1970

See discussion under the Ussuricavininae.

Genus RECYTELLA Gramm, 1970

Type species.—*R. amnekhoroshevi* Gramm, 1970, p. 101, text fig. 1, pl. 4, figs. 1–9. Ladinian (AGI translation, p. 86), Primor'ye Territory, U.S.S.R.

Diagnosis.—"Cytherellid Recytellinae of average size. Inequivalvular. The adductor scar is of complex structure consisting of a double-row group and is in the stage of reduction of the supernumerary maculae."

Discussion.—As stated in the discussion of the subfamily Ussuricavininae, Kozur (1972b) considered *Cavussurella* and *Recytella* to be junior synonyms of *Reubenella*. He stated (1972b, p. 19) that *Ussuricavina* Gramm, 1969b, and the Ussuricavininae belong in the Cavellinidae and that the Recytellinae, including *Reubenella*, belong to the Cytherellidae. The females (heteromorphs) of *Reubenella* have a ventroposterior lobe on the outside of the valves (Sohn, 1968, pl. 1, figs. 40, 43–45) that are represented on the inside by distinct cavities (Sohn, 1968, pl. 4, fig. 12). These cavities are lobes on steinkerns as illustrated herein (pl. 2, figs. 1–13) and by Gramm (1969b, pl. 4, figs. 1a, b, 4a).

The adductor muscle-attachment scar of *Recytella* Gramm, 1970, consists of four rows of scars (Gramm, 1970, text fig. 1, pl. 4, figs. 4–9), including the supplementary maculae.

The adductor muscle scar of *Reubenella* Sohn, 1968, consists of more than four rows (Sohn, 1968, pl. 4, fig. 12). The adductor muscle scars illustrated herein (pl. 2, figs. 2, 3, 5) are similar in pattern to the adductor muscle-attachment scar illustrated by Gramm for *Recytella* and document the presence of *Recytella* in Alaska. Because of very poor preservation and inadequate material, the specimens from Alaska are placed in open nomenclature.

Geologic range.—Middle Triassic (Anisian-Ladinian).

Geographic distribution.—Primor'ye Territory, U.S.S.R., and northeastern Alaska.

Recytella sp. 1

Plate 2, figures 1–9

Discussion.—The adductor muscle scar illustrated on plate 2, figure 5, and the posterolateral bulge shown on figures 2, 4, 6, 8, 9 identify the two steinkerns as belonging in *Recytella*.

Measurements (in mm).—USNM 389810, greatest length 0.72+, greatest height 0.41+; USNM 389811, greatest length 0.7+, greatest height 0.4+.

Geologic range.—Ladinian, limestone and dolomite member, from 56.4 to 67.1 m (185–220 ft) above the base of the Shublik Formation.

Recytella sp. 2

Plate 2, figures 10–13

Discussion.—The illustrated specimen appears to have shell material retained on the right valve. The fact that this apparent shell material extends on the left over the area of the impression of the ventral contact on the steinkern (figs. 10, 11, 13) suggests that this is neither original nor replaced shell material. A steinkern of a left valve and the inside of a damaged left valve in USGS colln. 33132 (USNM 390010) probably belong to this taxon.

Measurements in (mm).—USNM 389812, greatest length 0.72, greatest height 0.5+; unfigd. spec. USNM 390010, greatest length 0.71, greatest height 0.44.

Geologic range.—Ladinian, limestone and dolomite member, from 67.1 to 68.6 m (220–225 ft) above the base of the Shublik Formation.

REFERENCES

Anderson, F. W., 1964, Rhaetic Ostracoda: Great Britain Geological Survey Bulletin 21, p. 133–174, pls. 8–15.

——— 1970, Carboniferous Ostracoda—The genus *Carbonita* Strand: Great Britain Geological Survey Bulletin 32, p. 69–121.

Bate, R. H., 1978, The Trias, *in* Bate, R. H., and Robinson, Eric, eds., A stratigraphical index of British Ostracoda: Geological Journal, Special Issue 8, p. 175–188, 2 pls.

Blaszyk, Janusz, and Gazdzicki, Andrzej, 1982, Lower Lias ostracodes of the Tatra Mts. (West Carpathians): Acta Palaeontologica Polonica, v. 27, no. 1–4, p. 129–136, pls. 46, 47.

Blome, C. D., and Reed, K. M., 1984, Mesozoic radiolarian biostratigraphy of the Brooks Range, northern Alaska [abs.]: Geological Society of America, Abstracts with Programs, v. 16, no. 5, p. 271.

Boda, Jenö, 1964, Catalogus originalum fossilium Hungariae. Pars Zoologica: Magyar Allami Földtani Intezet Budapest, 229 p.

Bolz, Heiner, 1971a, Die Zlamback-Schichten (alpine Obertrias) unter besonderer Berücksichtigung der Ostracoden. 1: Ostracoden der Zlambach-Schichten, besonders Bairdiidae: Senckenbergian Lethaea, v. 52, p. 129–283, 16 pls.

———1971b, Late Triassic Bairdiidae and Healdiidae, *in* Oertli, H. J., ed., Colloque sur la paléoécologie des ostracodes—Colloquium on the paleoecology of ostracodes, Pau, 20–27, VII, 1970: Centre de Recherches de Pau-SNPA Bulletin, v. 5, supplement, p. 717–745, 4 pls.

Burij, I. V., and Zharnikova, N. K., 1977, Paleobiogeograficheskoe raionirovanie basseina Tikhogo okeana v triasovoe vremya [Triassic biogeography of the Pacific Ocean basin], *in* Krassilov, V. A., ed., Evolyutsia organich-

eskogo mira tikhookeanskogo poyasa [Organic evolution in the Circum-Pacific belt]: Vladibvostok, Akademia Nauk SSSR, Dal'nevostochnyi Nauchnyi Tcentr Biologo-Pochvennye Institute [Academy of Sciences, Far-eastern Scientific Centre, Institute of Biology and Pedology], p. 89–113.

Choi, D. R., 1984, Late Permian-Early Triassic paleogeography of northern Japan: Did the Pacific microplates accrete to Japan: Geology, v. 12, p. 728–731, 5 figs.

Churkin, Michael, Jr., 1972, Western boundary of the North American continental plate in Asia: Geological Society of America Bulletin, v. 83, no. 4, p. 1027–1036, 5 figs.

Churkin, Michael, Jr., and Trexler, J. H., Jr., 1981, Continental plates and accreted oceanic terranes in the Arctic, *in* Nairn, A. E. M., Churkin, Michael, Jr., and Stehli, F. G., ed., The ocean basins and margins—The Arctic Ocean: New York, Plenum Press, v. 5, p. 1–20, 12 figs.

Cooper, C. L., 1941, Chester ostracodes of Illinois: Illinois State Geological Survey Report of Investigations 77, 101 p., 14 pls.

Coryell, H. N., 1963, Bibliographic index and classification of the Mesozoic Ostracoda: Dayton, Ohio, University of Dayton Press, v. 2, p. 379–1175.

Dadlez, Ryszard, and Kopik, Janusz, 1963, Problem retyky w zachodniej Polse na tle profilu w kssiazu Wielkopolskim [Problem of the Rhaetic in Western Poland in the light of the profile at ksiaz Wielkopolski]: Kwartalnik Geologiczny, v. 7, no. 1, p. 131–158, 2 pls. (Polish, English summary.)

Delo, D. M., 1930, Some Upper Carboniferous Ostracoda from the shale basin western Texas: Journal of Paleontology, v. 4, no. 2, p. 152–178, pls. 12, 13.

Detterman, R. L., Reiser, H. N., Brosgé, W. P., and Dutro, J. T., Jr., 1975, Post-Carboniferous stratigraphy, northeastern Alaska: U.S. Geological Survey Professional Paper 886, 46 p., 14 figs.

Donze, Pierre, 1966, Ostracodes de l'Hettangien entre Aubenas et Privas (Ardeche): Laboratories de Géologie de la Faculté des Sciences de Lyon, Travaux, new series, no. 13, p. 121–139, pls. 5–7.

Dreyer, Eva, 1965 [1967], Mikrofossilien des Röt und Lias von SW-Brandenburg: Jahrbuch Geologie, v. 1, p. 491–531, 9 pls.

Dutro, J. T. Jr., 1981, Geology of Alaska bordering the Arctic Ocean, *in* Nairn, A. E. M., Churkin, Michael, Jr., and Stehli, F. G., eds., The ocean basins and margins—The Arctic Ocean: New York, Plenum Press, v. 5, p. 21–36.

Egorov, V. G., 1950, Ostrakody Franskogo Yarusa Russkoi Platformy [Ostracoda of the Frasnian Stage of the Russian Platform]. 1. Kloedenellidae: Moscov, Vsesoyuznyi Neftyanoi Nauchno-Issledovatel'skii Geologo-Razvedochnyi Institut, Moscovskii Filial, 140 p., 18 pls.

Fischer, M. J., 1984, Triassic, *in* Glennie, K. W. ed., Introduction to the petroleum geology of the North Sea: London, Blackwell Scientific Publications, p. 85–101, 12 figs.

Gerry, Ephraim, and Kozur, Heinz, 1973, Original of Méhes, 1911, "Uber Trias-Ostracoden aus dem Bakony" at the Hungarian Geological Institute: Földtani Közlöny, v. 103, p. 67–69.

Gheorghian, Doina, 1976, Contributii la cunoasterea unor microfaune Triasice din Munţii Apuseni (Padurea Craiului) [Contributions a la connaisance d'une microfaune Triassique des Monts Apuseni (Padurea Craiului)]: Rumania, Instutal de Geolgie si Geofizică Dări de Seama ale Şedintelor, Paleontologie, v. 62 (1974–1975), [pt.] 3, p. 25–38, pls. 7–9.

Gramm, M. N., 1969a, Otpechatki adduktora Healdiidae (Ostracoda) iz srednego triassa Yuzhnogo Primor'ya [Casts of the adductor of Healdiidae (Ostracoda) from the Middle Triassic of the South Maritime Territory]: Akademia Nauk SSSR, Doklady, 1969, v. 186, no. 2, p. 457–460, 4 figs. (English translation by American Geological Institute, 1970, no. 2, p. 234–257.)

——— 1969b, Ussuricavininae—Novoe podsemeistvo Triassovykh ostrakod, *in* Gramm, M. N. and Krasilov, V. A., eds., Iskopaemaya fauna i flora Dal'nego Vostoka: Vlkadivostok, Akademia Nauk SSR Sibirskoe Otdelenie, Dal'nevostchnyi filial im. V. L. Komarova, Dal'nevostochnyi Geologicheskii Institut, p. 41–78, ps. 3–8.

——— 1970, Otpechatki adduktora Triasovykh cytherellid (Ostracoda) Primor'ya i nekotorye voprosy teorii filembriogeneza. [Adductor scars on Triassic cytherellid (Ostracoda) from the Maritime Territory and problems of phylembryogenesis]: Paleontologicheskii Zhurnal, 1970, no. 1, p. 88–103, pl. 6. (English translation by American Geological Institute Paleontological Journal, 1970, v. 4, no. 1, p. 76–90.)

——— 1975, Marine Triassic Cytheracea (Ostracoda) from south Primor'ye [Soviet Far East]: Paleontographica, pt. A, v. 151, p. 102–110, 1 pl.

——— 1982, The systematic position of the ostracod genus *Healdianella* Posner, 1951, *in* Bate, R. H., Robinson, Eric, and Sheppard, L. M., eds., Fossil and recent ostracods: Chichester, Ellis Horwood Ltd., for the British Micropalaeontological Society, p. 193–218, 5 pls.

Grantz, Arthur, Johnson, Leonard and Sweeny, J. F., 1982, The Arctic region, *in* Palmer, A. R., ed., Perspectives in regional geological planning for the geology of North America: Geological Society of America, D–NAG Special Publication 1, p. 105–115.

Gründel, Joachim, 1967, Zur Grossgliederung der Ordnung Podocopida G. W. Müller, 1894 (Ostracoda): Neues Jahrbuch für Geologie and Paläontologie, Monatshefte, Jahrgang 1967, no. 6, p. 321–332.

Harlton, B. H., 1933, Micropaleontology of the Pennsylvanian Ostracoda of the Johns Valley shale of the Ouachita Mountains, Oklahoma, and its relationship to the Mississippian Caney Shale: Journal of Paleontology, v. 1, p. 3–29, 7 pls.

Hartmann, Gerd, 1964, Zur Kenntnis der Ostracoden des Roten Meeres: Kieler Meeresforschungen, v. 20, p. 35–127, 62 pls.

International Commission on Zoological Nomenclature, 1985, International Code of Zoological Nomenclature: London, International Trust for Zoological Nomenclature, 338 p.

Jones, D. L., Silberling, N. J., and Hillhouse, J. W., 1978, microplate tectonics of Alaska—Significance for the Mesozoic history of the Pacific coast of North America, *in* Howell, D. G., and McDougall, K. A., eds., Mesozoic paleogeography of the Western United States: Los Angeles, Society of Economic Paleontologists and Mineralogists, Pacific section, p. 71–74.

Jones, T. R., 1894, On the Rhaetic and some Liassic Ostracoda of Britain: Geological Society of London Quarterly Journal, v. 50, p. 156–169, pl. 9.

Jones, T. R., and Kirkby, J. W., 1886, On some fringed and other

Ostracoda from the Carboniferous series: Geological Magazine, new series, Decade 3, v. 3, no. 10, p. 433–439, pls. 11, 12.

Knüpfer, Jürgen, 1967, *Editia germanica* sp. n., eine neue Ostracodenart aus dem Untercarbon im Norden der DDR und zur Taxionomie der Familie Bythocytheridae Sars 1926: Deutsche Gesellschaft für geologische Wissenschaften, Berichte, A. Geologie und Paläontologie, v. 12, no. 3/4, p. 193–200, 1 pl.

Kollmann, Kurt, 1960, Osrtakoden aus der alpinen Trias Österreichs. I. Parabairdia n. g. und Ptychobairdia n. g. (Bairdiidae): Austria, Geologische Bundesanstalt Jahrbuch, Sonderband 5, p. 79–105, 6 pls.

——— 1963, Ostracoden aus der alpinen Trias II. Weitere Bairdiidae: Austria, Geologische Bundensanstalt Jahrbuch, v. 106, p. 121–203, 11 pls.

Kozur, Heinz, 1968a, Einige seltene Ostracoden-Arten aus der germanischen Trias: Deutsche Akademie der Wissenschaften zu Berlin, Monatsberichte, v. 10, no. 11, p. 849–872, 4 pls.

——— 1968b, Neue Ostracoden aus dem Rôt und Muschelkalk des germanschen Binnenbeckens: Deutsche Akademie der Wissenschaften zu Berlin, Monatsberichte, v. 10, no. 7, p. 448–519, 3 pls.

——— 1970a, Neue Ostracoden-Arten aus dem obersten Anis des Bakonyhochlandes (Ungarn): Naturwissenschaftlich-Medizinischer Verein, Berichte, v. 58, p. 1–40, 4 pls.

——— 1970b, Neue Ostracoden-Arten der germanischen Mittel-und Obertrias: Geologie, Jahrgang 19, no. 4, p. 434–455, 4 pls.

——— 1971, Zur Verwertbarkeit von Conodonten, Ostracoden und Oekologische-Fazielle Untersuchungen in der Trias: Geologický Sborník, v. 22, no. 1, p. 105–130, 4 pls.

——— 1972a, Die Bedeutung triassischer Ostracoden für stratigraphische und paläoökologische Untersuchungen: Gesellschaft Geologische Bergbaustudien Mitteilungen Innsbruck, v. 21, p. 623–660, 3 pls.

——— 1972b, Einige Bemerkungen zur Systematik der Ostracoden und Beschriebung neuer Platytcopida aus der Trias Ungarns und der Slowakei: Geologisch-Paläontologische Mitteilungen Innsbruck, v. 2, no. 10, p. 1–27, 2 pls.

——— 1973, Beitrage zur Stratigraphie und Paläontologie der Trias: Geologisch-Paläontologische Mitteilungen Innsbruck, v. 3, no. 1, p. 1–30, 3 pls.

Kristan-Tollmann, Edith, 1964, Zur Charakteristik triadischer Mikrofaunen: Paläontolgische Zeitschrift, v. 38, no. 1/2, p. 63–73, pls. 6, 7.

——— 1970, Einige neue Bairdien (Ostracoda) aus der alpinen Trias: Neues Jahrbuch Geologie and Paläontologie Abhandlungen, v. 135, no. 3, p. 268–310, pls. 33–37.

——— 1971a, Torohealdia n. gen., eine characteristische Ostracoden-Gattung der obersten alpinen Trias: Erdöl-Erdgas-Zeitschrift/Maratime Rohstoffgewinnung, v. 87, no. 2, p. 50–54, 1 pl.

——— 1971b, Weitere Beobachtungen an skulptierten Bairdiidae (Ostrac.) der alpinen Trias: Neues Jahrbuch Geologie und Paläontologie Abhandlungen, v. 139, no. 1, p. 57–81, 5 pls.

——— 1973, Zur Ausbildung des Schliesmuskelfelden bei triadischen Cytherellidae (Ostracoda): Neues Jahrbuch Geologie and Paläontologie Monatschefte, Jahrgang 1973, v. 6, p. 351–373, 9 figs.

——— 1977, On the development of muscle scar patterns in Triassic Ostracoda, *in* Löffler, Heinz, and Danielopol, Dan, eds., Aspects of ecology and zoogeography of Recent and fossil Ostracoda: The Hague, W. Junk, p. 133–143, 5 figs.

——— 1979, Die Mikrofauna des Rhät von Waliabad *in* Kristan-Tollmann, Edith, Tollmann, Alexander, and Hamedani, Ali, Beiträge zur Kenntnis der Trias von Persien. 1, Revision der Triasgliederung, Rhätfacies im Raum von Isfahan und Kössner Fazieseinschlag bei Waliabad SE Adadeh: Österreichische geologische Gesellschaft Mitteilungen, v. 70, 1977, p. 119–186, 5 pls.

Kristan-Tollman, Edith, and Hamedani, Ali, 1973, Eine specifische Mikrofaunen-Vergsellschaftung aus den Opponitzer Schichten des Oberkarn der niederösterreichischen Kalkvoralpen: Neues Jahrbuch Geololgie und Paläontologie Abhandlungen, v. 143, no. 2, p. 193–222, 13 figs.

Kristan-Tollmann, Edith, and Tollmann, Alexander, 1981, Die Stellung der Tethys in der Trias und die Herkunft ihrer Fauna: Österreichische geologische Gesellschaft, Mitteilungen, v. 74/75, (1981/82), p. 129–135, 1 fig.

——— 1983, Tethys-Faunenelemente in der Trias der USA: Oesterreichische geologische Gesellschaft, Mitteilungen, v. 76, (1983), p. 213–272, 17 pls., 15 figs.

Lord, Alan, 1972, The ostracode genera *Ogmoconcha* and *Protocytheridea* in the Lower Jurassic: Geological Society of Denmark Bulletin, v. 21, p. 319–336, 1 pl.

——— 1982, Metacopine ostracodes in the Lower Jurassic, *in* Banner, F. T., and Lord, Alan, eds., Aspects of micropaleontology: London, George Allen & Unwin, p. 262–277, 4 figs.

Malz, Heinz, 1971, Zur Taxonomie "glattschaliger" Lias-Ostracoden: Senckenbergiana Lethaea, v. 52, no. 5/6, p. 433–455, 5 pls.

Mandelstam, M. I., 1960, Stepene izuchenosti ostracod iz Permskikh, Triasovykh, Melovykh i Chetvetichnikh otlozhenii, *in* Subbotina, N. N. ed., Trudy pervogo seminara po mikrofaune: Leningrad, Vsesoyuznyi Neftyanoi Nauchno-Issledovatel'skii Geologo-Razvedochnyi Institut (VNIGRI), Leningrad, p. 287–311.

Méhes, Gyula, 1911, Ueber Trias-ostracodes aus dem Bakony: Resultate der Wissenschaftlichen Erforschung des Balatonsees. Balaton-Ausschusse der Ungarischen Geographischen Gesellschaft, v. 1, pt. 1, Anhang, Palaeontologie der Umgebung des Balatonsees, v. 3, no. 6, 38 p., 12 pls.

Moore, R. C., ed., 1961, Treatise on invertebrate paleontology, pt. Q, Arthropoda 3, Crustacea, Ostracoda: New York and Lawrence, Kans., Geological Society of America and University of Kansas Press, New York and University Kansas Press, 422 p., 334 figs.

Mull, C. G., 1984, New interpretations on timing and origin of arctic Alaska block [abs.]: Geological Society of America, Abstracts with Programs, v. 16, no. 5, p. 323.

Park, S. M., 1984, On *Ogmosconcha eocontractula* Park, sp. nov.: Stereo-atlas of ostracod shells, v. 11, no. 14, cards 67–70. (London, British Micropaleontological Society.)

Plafker, George, and Jones, D. L., 1982, Geology and tectonic evolution of Alaska, *in* Palmer, A. R., ed., Perspectives in regional planning for the geology of North America: Geological Society of America, D-NAG Special Publication 1, p. 77–80.

Reuss, A. E., 1868, Foraminiferen und Ostracoden aus dem Schichten von St. Cassian: K. Akademie Wissenschaften,

Mathematisch-Naturwissenschaftliche Klasse, Sitzungsberichte, v. 57, pt. 1, p. 101–108.

Roundy, P. V., 1926, The microfauna, *in* Roundy, P. V., Girty, G. H., and Goldman, M. I., Mississippian formations of San Saba County, Texas: U.S. Geological Survey Professional Paper 146, p. 5–23, pls. 1–4.

Sars, G. O., 1866, Oversigt af Norges marine ostracoder: Videnskabs-Selskabets i Cristiania Forhandlinger (in 1865), 130 p.

——— 1888, Nye bidrag til kundskaben om Middelhavets invertebrat fauna: Archiv for Mathematik og Naturvidenskab, v. 12, pt. 4, p. 173–324, 20 pls.

——— 1928, Ostracoda, v. 9 of An account of the Crustacea of Norway: Bergen, Norway, Bergen Museum, 277 p., 119 pls. (Originally published in parts as follows: Parts 1, 2—1922, pts. 3, 4—1923, pts. 5–12—1925, pts. 13, 14—1926, and pts. 15, 16 including title page, corrections, bibliography, and systematic list—1928.)

Schneider, G. F., 1956, New genera, *in* Kiparisova, L. D., Markovsko, B. P., and Radchenko, G. P., eds., Novye semeistva i rody: Vsesoyuznyi Nauchno-Issledovatelskii Geologicheskii Institut (VSEGEI), Ministerstva Geologii i Okrany Nedr SSR, new series, Paleontologiya, no. 12, p. 120–127, pls. 19, 20, 22.

Shaver, R. H. 1958, A study of *Pseudobythocypris pediformis*, a new name for an old ostracod: American Midland Naturalist, v. 59, no. 1, p. 120–137, 3 figs.

Sohn, I. G., 1964, Significance of Triassic ostracodes from Alaska and Nevada: U.S. Geological Survey Professional Paper 501–D, p. D40–D42.

——— 1965, Classification of the superfamily Healdiacea and the genus *Pseudophanasymmetria* Sohn and Berdan, 1952 (Ostracoda): U.S. Geological Survey Professional Paper 525–B, p. B69–B72.

——— 1968, Triassic ostracodes from Makhtesh Ramon, Israel: Israel Geological Survey Bulletin 44, 71 p., 4 pls.

——— 1970, Early Triassic marine ostracodes from the Salt Range and Sughar Range, West Pakistan, *in* Kummel, Bernard, and Teichert, Curt, eds., Stratigraphic boundary problems—Permian and Triassic of West Pakistan: Kansas University, Department of Geology Special Publication 4, p. 193–206, 1 pl.

——— 1976, Antiquity of the adductor muscle attachment scar in *Darwinula* Brady and Robertson, 1885, *in* Hartmann, Gerd, ed., Proceedings of the 5th International Symposium on Ostracoda: Naturwissenschaftliche Verein in Hamburg Abhandlungen und Verhandlungen NF 18/19 (Supplement), p. 305–308, 3 pls.

——— 1977, Muscle scars of late Paleozoic freshwater ostracodes from West Viriginia: U.S. Geological Survey Journal of Research, v. 5, no. 1, p. 135–141, 3 figs.

——— 1983, Ostracodes of the "Winifrede Limestone" (Middle Pennsylvanian) in the region of the proposed Pennsylvania System stratotype, West Virginia: Bulletins of American Paleontology, v. 84, no. 316, 53 p., 11 pls.

——— 1984a, Marine Middle and Late Triassic Ostracoda in northern Alaska (abs.): Geological Society of America, Abstracts with Programs, v. 16, no. 5, p. 334.

——— 1984b, Tethyan marine Triassic ostracodes northeastern Alaska, *in* Reed, K. M., and Bartsch-Winkler, Suzan, eds., The United States Geological Survey in Alaska during 1982: U.S. Geological Survey Circular 939, p. 21–23, fig. 11.

——— 1985, Late Mississippian (Namurian A) nonmarine ostracodes from West Virginia and Virginia: Journal of Paleontology, v. 59, no.2, p. 446–460, 6 figs.

Stoll, R. N., and others, 1961, International Code of Zoological Nomenclature: London, International Trust for Zoological Nomenclature, 176 p.

Strand, Embrick, 1928, *Miscellanea nomenclatorica zoologica et palaeontologica* I–II: Archiv für Naturgeschichte, v. 92 (1926), Abt. A, no. 8, p. 30–75.

Styk, Olga, 1972, Some more important new species of foraminifers and ostracodes from the Triassic deposits of Poland: Kwartalnik Geologiczny, v. 16, no. 4, p. 267-885, 3 pls.

——— 1979, Gromada Ostracoda Latreille, 1806, *in* Malinowskiej, Liddi, ed., Atlasa skamielnialosci przewodnich i charakterystycznych: Budowa geologiczna Polski, v. 3, no. 2a, Mezozoic, Trias, p. 107–126, pls. 24–34.

——— 1982, Biostratigrafia osadow epikontynentalnego Triasu Polska na podstowie malżoraczków [Biostratigraphy of the epicontinental Triassic deposits of Poland based on the occurrence of ostracods]: Poland, Institut Geologiczny Bulletin, v. 329, p. 5–62, 15 pls.

Tappan, Helen, 1951, Foraminifera from the Arctic Slope of Alaska: U.S. Geological Survey Professional Paper 236–A, 20 p.

Tozer, E. T.,1982, Marine Triassic faunas of North America—Their significance for assessing plate and terrane movements: Geologische Rundschau, v. 71, p. 1077–1104, 2 figs.

Triebel, Erich, 1941, Morphologie und Ökologie der fossilen Ostracoden: Senckenbergiana, v. 23, no. 4/6, p. 294–400, 15 pls.

Urlichs, Max, 1971, Variability of some ostracods from the Cassian beds (Alpine Triassic) depending on the ecology, *in* Oertli, H. J., ed., Colloque sur la paléoécologie des ostracodes—Colloquium on the Paleocology of ostracodes, Pau, 20–27, VII, 1970: Centre de Recherches de Pau–SNPA, Bulletin, v. 5, supplement, p. 695–715, 1 pl.

——— 1972 (1973), Ostracoden aus den Kössener Schichten und ihre Abhängigkeit von der Ökologie: Gesellschaft Geologische Bergbaustudien Mitteilungen, v. 21, p. 661–710, 6 pls. (1973 fide Kristan-Tollmann, and Hamedani, 1973, p. 210).

Vadasz, Elemer, 1933, Neuer Beitrag zur Frage der Triasforaminiferen in Bakony: Centralblatt Mineralogie, Geologie und Paläontologie, Jahrgang 1933, Abteilung B, no. 3, p. 173–178.

Van Morkhoven, F. P.C. M., 1963, Post-Paleozoic Ostracoda: Their morphology, taxonomy, and economic use, v. 2, Generic descriptions: Amsterdam, Elsevier, 478 p.

Wicher, C. A., 1951, Zur mikropaläontologischen Gliederung des nichtmarinen Rhät: Erdöl und Kohle, v. 4, p. 755–760, 1 pl.

Will, H.–J., 1969, Untesuchungen zur Stratigraphie und Genese des Oberkeupers in Nordwestdeutschland (posthumously edited by Graman, Friederich, and Plumhoff, Franz): Geologische Jahrbuch, Beihefte, v. 54, 239 p., 4 pls.

Ye Chun-hui, Gou Yun-xian, Hou You-tang, and Cao Mei-chen, 1977, Mesozoic and Cenozoic ostracode fauna from Yunnan, China: Nanking Institute of Geology and Paleontology, fascicle 2, p. 153–384, 24 pls. (In Chinese.)

Zalányi, Béla, 1959, Ostracoden-Faunen aus der Aptstufe des Nördlichen Bakony-Gebirges: Hungary, Magyar Állami Földtani Intézet Évkönyve, v. 47, fascicle 2, p. 357–563, 6 pls.

PLATES 1–11

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PLATE 1

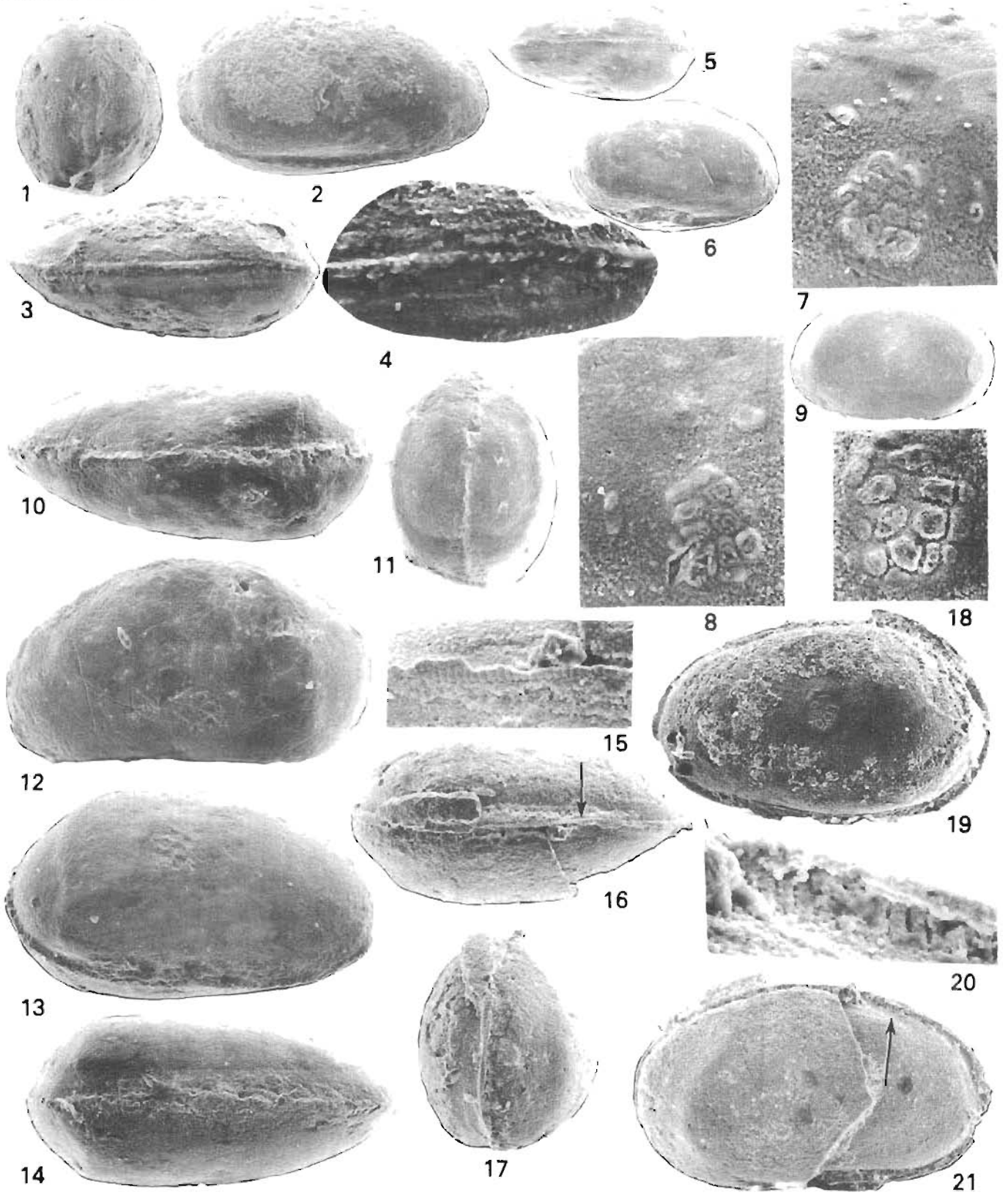
FIGURES 1–9. "*Healdia*" sp. 1

1–4. Posterior, right, dorsal (anterior to left), and ventral views of steinkern, approx. X120. Figured specimen, USNM 389803. Ladinian, USGS colln. 33123.

5–9. Dorsal (anterior to right), right, detail of adductor muscle-attachment scar of right valve, left, and detail adductor muscle scar of left valve of steinkern, approx. X80, details approx. X280. Note frontal and dorsal muscle-attachment scars in figs. 7, 8. Figured specimen, USNM 389804. Ladinian, USGS colln. 33111.

10–14. "*Healdia*" sp. 2. Dorsal (anterior to left), left, right, and ventral (anterior to right) views of steinkern, approx. X120. Figured specimen, USNM 389805. Ladinian, USGS colln. 33130.

15–21. "*Healdia*" sp. 3. Detail of denticulated hinge in area shown by arrow on fig. 16, approx. X267, dorsal (anterior to left), posterior, detail of adductor muscle scar of left valve, approx. X400, detail of denticulated hinge in area shown by arrow on fig. 21, approx. X600, and right views of steinkern with retained parts of shell, approx. X120. Figured specimen, USNM 389806. Ladinian, USGS colln. 33110.



"*HEALDIA*"

PLATE 2

FIGURES 1–9. *Recytella* sp. 1.

1–5. Dorsal (anterior to left), right, left, and ventral (anterior to right) views of broken steinkern, approx. X80, detail of left adductor muscle-attachment scar, approx. X400. Figured specimen, USNM 389810. Ladinian, USGS colln. 33124.

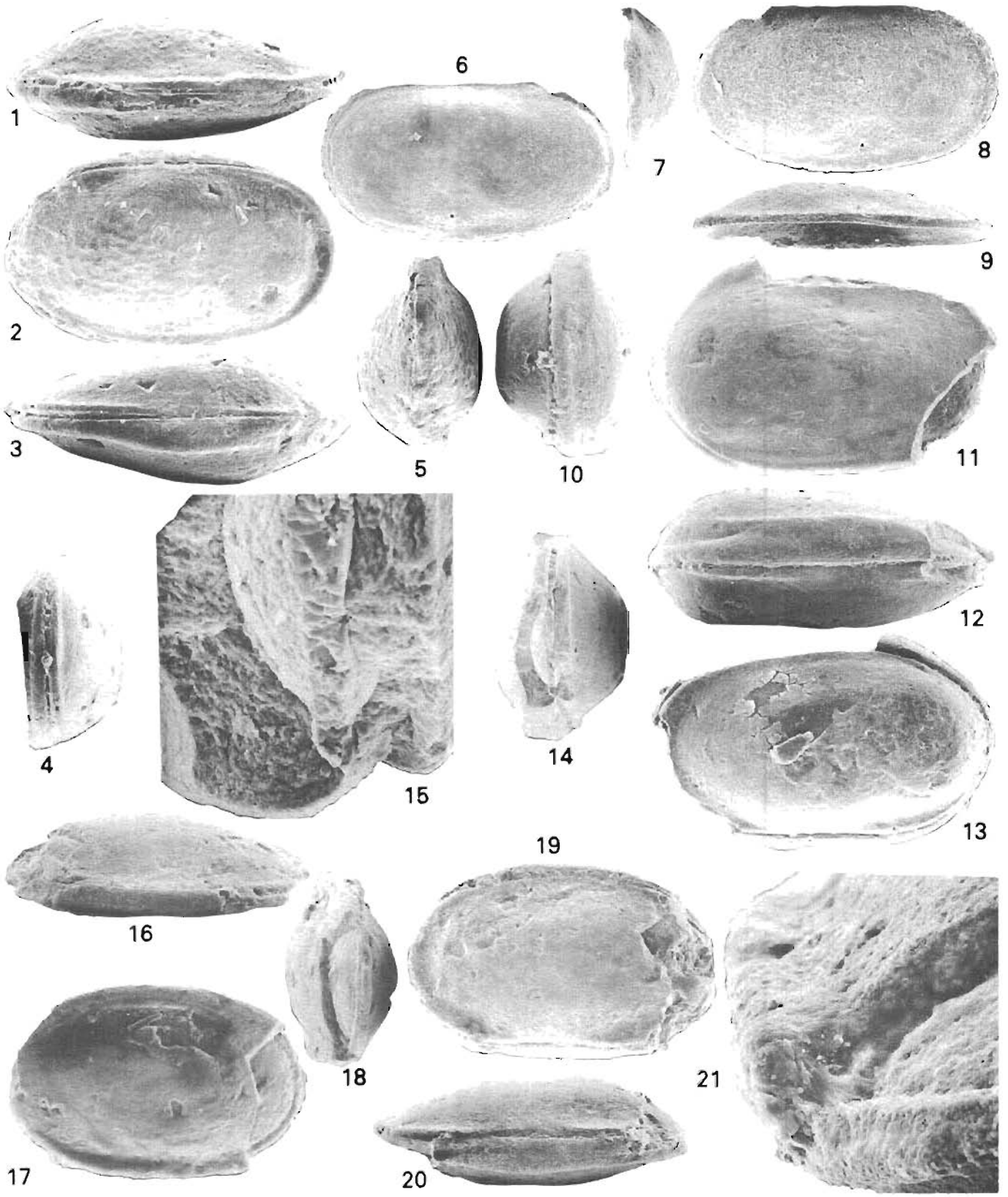
6–9. Dorsal (anterior to left), left, right, and ventral (anterior to right) views of steinkern, approx. X80. Figured specimen, USNM 389811. Ladinian, USGS colln. 33130.

10–13. *Recytella* sp. 2. Left, ventral (anterior to left), dorsal (anterior to right), and posterior views of carapace with poorly preserved right valve and missing left valve, approx. X80. Figured specimen, USNM 389812. Ladinian, USGS colln. 33131.

14–17. *Pseudobythocypris*? sp. Dorsal (anterior to right), right, left, and posterior views of carapace, approx. X60. The white spot and line near the ventroposterior of fig. 16 is an artifact due to adhering lint. Figured specimen, USNM 389813. Carnian, USGS colln. 33141.

18, 19. *Hiatobairdia*? sp. ex gr. *H. arcuata* Kristan-Tollman, 1970. Dorsal (anterior to left) and left, slightly tilted towards venter, views of abraded carapace, approx. X120. Figured specimen, USNM 389814. Norian, USGS colln. 33148.

20–26. *Covracythere gryci* n. sp. Posterior oblique, dorsal (anterior to right), detail of right adductor muscle-attachment scar, right, left, left tilted to show costae, and detail of left adductor muscle-attachment scar, approx. X100; details of adductor muscle-attachment scar approx. X400. Paratype, USNM 389817. Ladinian, USGS colln. 33129.



CAVUSSURELLA

PLATE 5

FIGURES 1–10. *Ogmoconcha unicerata* Sohn, n. sp.

1–7. Detail of posterior part of hinge, approx. X275; dorsal (anterior to left), outside, and posterior views of right valve, approx. X120, and detail of posteroventral spine, approx. X533. Holotype, USNM 389855. Ladinian, USGS colln. 33112.

8–10. Posterior, right, and dorsal views of carapace, approx. X120. Arrow on fig. 8 shows posterodorsal spine. Paratype, USNM 389856. Ladinian, same colln. as above.

11–16. *Ogmoconcha* aff. sp. *O. owthropensis* (Anderson, 1964). Posterior, dorsal (anterior to left), anterior, right, and left views of carapace with posterior two-thirds of right valve missing to expose adductor muscle-attachment scar, approx. X120; detail adductor muscle-attachment scar, approx. X360. Figured specimen, USNM 389857. Ladinian, USGS colln. 33154.

17–22. *Ogmoconcha tailleuri* n. sp. Outside, posterior, dorsal (anterior to left), and inside views of right valve, approx. X120; details of anterior and posterior parts of hinge, approx. X240. Paratype, USNM 389858. Norian, USGS colln. 33155.

23–28. *Ogmoconcha alaskaense* n. sp. Dorsal (anterior to right), right, posterior oblique detail of exposed part of right hinge, left, posterior, and exposed right hinge of carapace with posterior part of left valve missing, approx. X120; fig. 25, approx. X500; fig. 28, approx. X340. Note rough outside surface of shell, presumed to be surface deposit chartacteristic of many of the smooth forms at this locality, shown best on figs. 25, 28. Paratype, USNM 389859. Norian, USGS colln. 33158.

PLATE 6

FIGURES 1–9. *Ogmoconcha* sp. aff. *O. owihropensis* (Anderson, 1964).

1–3. Dorsal (anterior to right), right, and ventral (anterior to right) views of carapace, approx. X120. Figured specimen, USNM 389852. Norian, USGS colln. 33156.

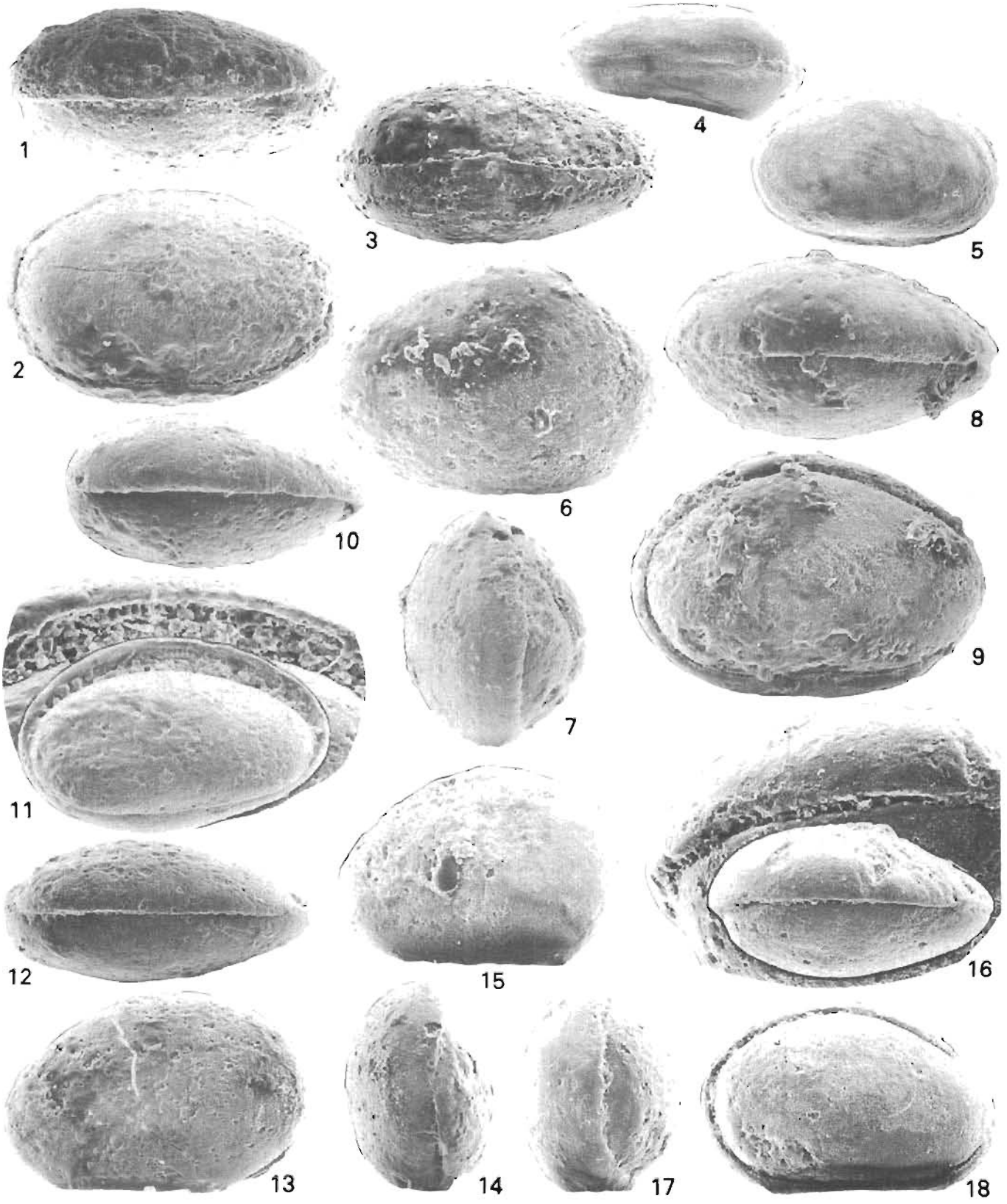
4, 5. Dorsal (anterior to left) and right views of steinkern of carapace with poorly preserved adductor muscle-attachment scar, approx. X120. Figured specimen, USNM 389860. Norian, USGS colln. 33159.

6–9. Left, posterior, dorsal (anterior to right), and right views of carapace, approx. X120. Figured specimen, USNM 389861. Norian, USGS colln. 33169.

10–18. *Ogmoconcha tailleuri* n. sp

10–14. Dorsal (anterior to right), right and detail of left hinge to show denticulation, ventral (anterior to right), left, and posterior views of a left valve with a right valve of an other individual inside, approx. X120; detail of hinge, approx. X240. Paratype, USNM 389862. Norian, USGS colln. 33156.

15–18. Left, dorsal (anterior to right) and detail of dorsal slightly tilted to show poorly preserved denticulated hinge, posterior, and right views of carapace, approx. X100; detail, approx. X200. Paratype, USNM 389863. Norian, USGS colln. 33165.



OGMOCONCHA

PLATE 7

FIGURES 1–3. *Covracythere binoda* Sohn, n. sp.

Dorsal (anterior to left), outside, and ventral (anterior to right) views of left valve, approx. X120. Holotype, USNM 389818. Ladinian, USGS colln. 33111.

4–15. *Dettermania truncata* Sohn, n. sp.

4–6. Dorsal (anterior to right), left, and ventral (anterior to left) views of steinkern with ventral two-thirds of left valve preserved to expose the thickness of the valve, approx. X60. Paratype, USNM 389819. Ladinian, USGS colln. 33112.

7–11. Ventral (anterior to left), anterior, dorsal (anterior to right), right, and left views of carapace with missing posterior, approx. X80. Holotype, USNM 389820. Same colln. as above.

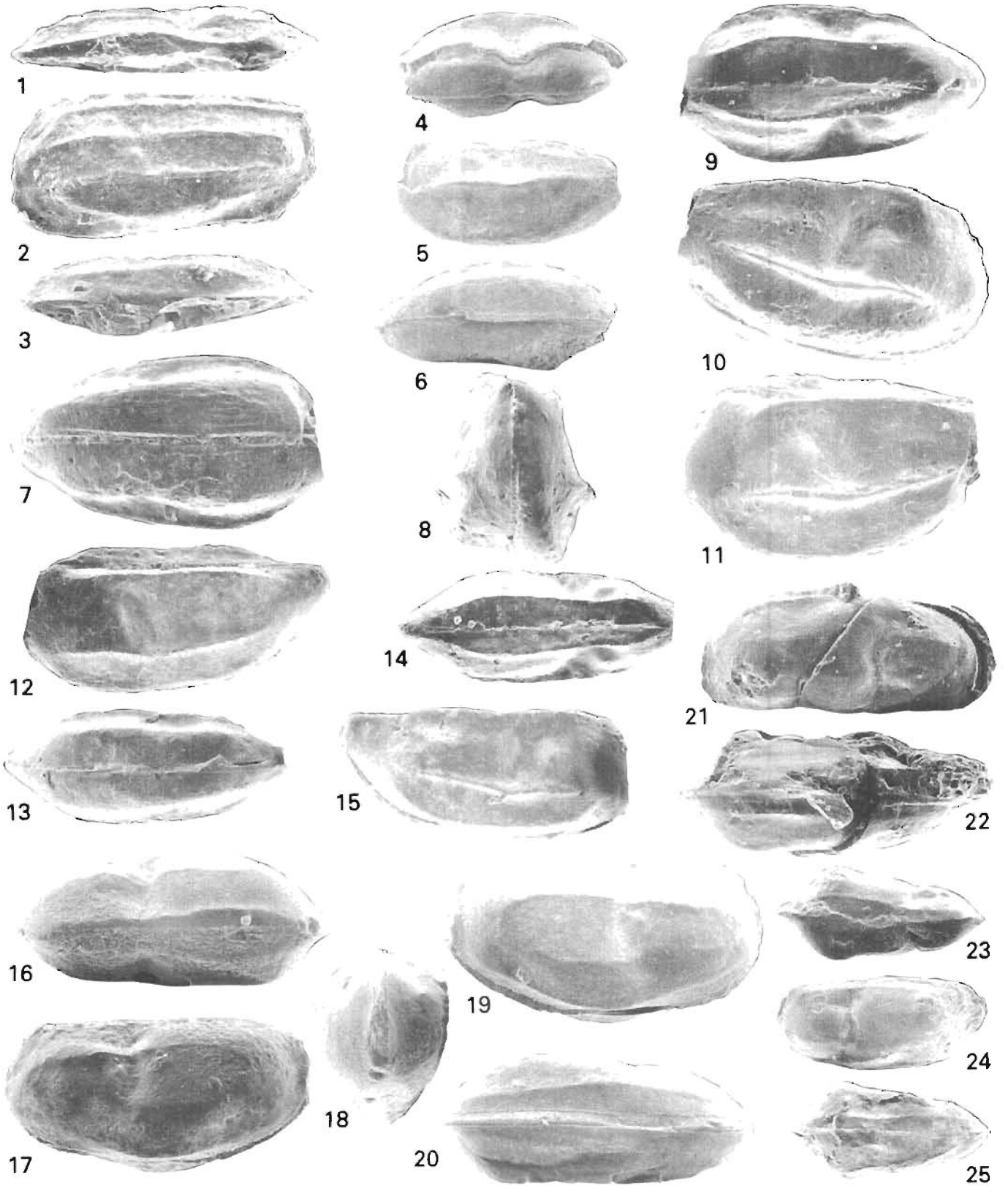
12–15. Left, ventral (anterior to right), dorsal (anterior to left), and right views of carapace, approx. X60. Paratype, USNM 389821. Same colln. as above.

16–25. *Corvacythere gryci* n. sp.

16–20. Dorsal (anterior to left), left, posterior, right, and ventral (anterior to right) views of tecnomorph, carapace with only the innermost surface of the valves preserved, approx. X100. Paratype, USNM 389822. Norian, USGS colln. 33169.

21, 22. Left (ventral up) and ventral views of poorly preserved steinkern of heteromorph, approx. X80. Paratype USNM 389823. Ladinian, USGS colln. 33113.

23–25. Dorsal (anterior to right), left, and ventral (anterior to right) views of steinkern of heteromorph, approx. X53. Holotype, USNM 389824. Ladinian, USGS colln. 33111.



COVRACYTHERE AND DETTERMANIA

PLATE 8

FIGURES 1–6, 10–19. *Ogmoconcha tailleuri* n. sp.

1–3. Posterior, right, and dorsal (anterior to left) views of carapace, approx. X80. Paratype, USNM 389875. Ladinian, USGS colln. 33119.

4–6. Posterior, right, and dorsal (anterior to right) views of carapace, approx. X100. Paratype, USNM 389876. Ladinian, USGS colln. 333124.

10, 11. Dorsal (anterior to left) and posterior views of carapace, approx. X120. Paratype, USNM 389864. Ladinian, USGS colln. 33117.

12–14. Posterior, dorsal (anterior to right), and left views of carapace with a fragment of posterior of left valve missing to expose thickness of shell, approx. X120. Holotype, USNM 389865. Ladinian, USGS colln. 33119.

15–19. Dorsal (anterior to left), posterior, right, and left views of carapace with part of the ventral valve missing, approx. X80; detail of adductor muscle scar, approx. X400. Paratype, USNM 389866. Same colln. as above.

7–9, 20–27. *Ogmoconcha* sp. aff. *O. owthropensis* (Anderson, 1964).

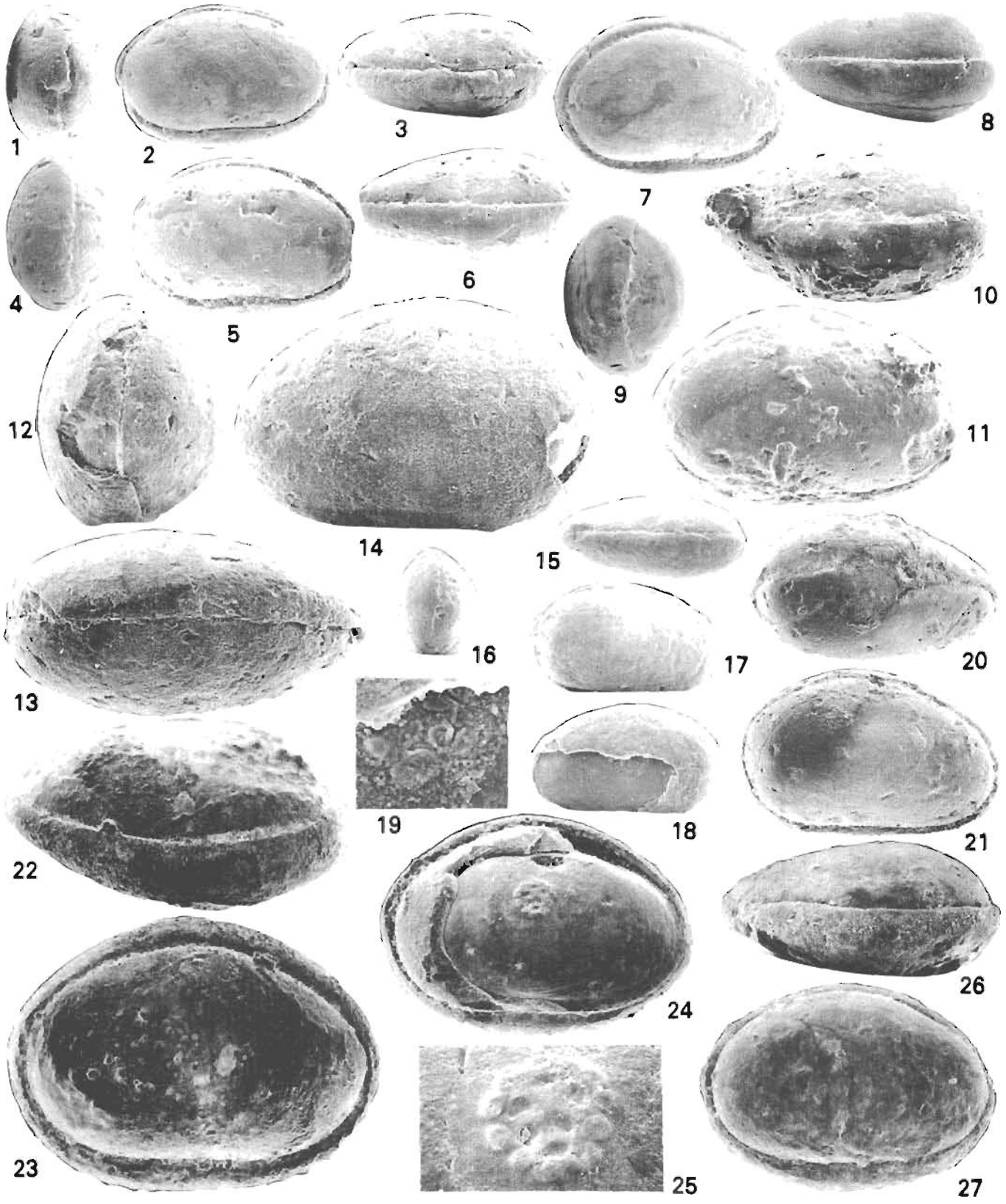
7–9. Right, dorsal (anterior to left), and posterior views of carapace, approx. X80. Figured specimen, USNM 389877. Ladinian, USGS colln. 33109.

20, 21. Dorsal oblique (anterior to right), and right views of carapace, approx. X80. Figured specimen, USNM 389878. Ladinian, USGS colln. 33130.

22, 23. Dorsal (anterior to left) and right views of carapace, approx. X120. Figured specimen, USNM 389879. Norian, USGS colln. 33148.

24, 25. Right view of carapace with most of the valve missing to expose the adductor muscle-attachment scar, approx. X127, and detail of adductor muscle-attachment scar, approx. X433. Figured specimen, USNM 389880. Norian, USGS colln. 33145.

26, 27. Dorsal (anterior to left) and right views of carapace, approx. X127. Figured specimen, USNM 389881. Norian, USGS colln. 33149.



OGMOCONCHA

PLATE 9

FIGURES 1–4. *Ogmoconcha tailleuri* n. sp. Ventral (anterior to left), left, posterior, and right views of corroded carapace, approx. X80. Paratype USNM 389883. Ladinian, USGS colln. 31127.

5–8. *Ogmoconcha marquardti* n. sp. Left, dorsal (anterior to left), posterior, and right views of steinkern, very young instar, approx. X120. Paratype, USNM 389882. Norian, USGS colln. 33147.

9–16, 19–23. *Ogmoconcha* sp. aff. *O. owthropensis* (Anderson, 1964).

9–12. Outside, ventral (anterior to left), and inside views of left valve, approx. X133; detail of anterior part of denticulated hinge, shown by arrow on fig. 11, approx. X820. Figured specimen, USNM 389919. Norian, USGS colln. 33156.

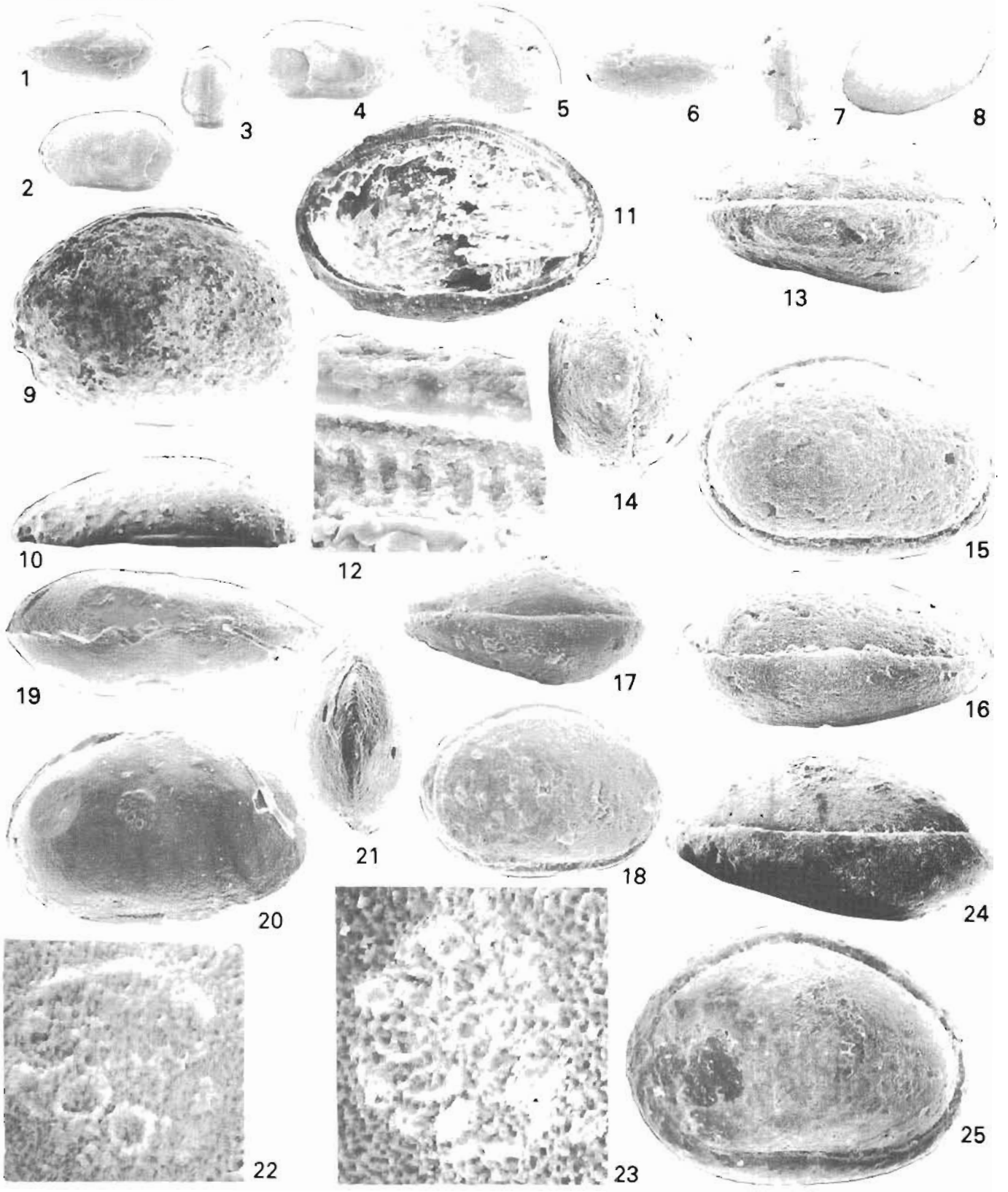
13–16. Dorsal (anterior to left), posterior, right, and ventral (anterior to right) views of carapace, approx. X120. Figured specimen, USNM 389884. Ladinian, USGS colln. 33119.

19–23. Dorsal (anterior to right), right, and anterior views of steinkern, approx. X120; details of right and left adductor muscle-attachment scar, approx. X600. Figured specimen, USNM 389886. Ladinian, USGS colln. 33130.

17, 18, 24, 25. *Ogmoconcha alaskaense* n. sp.

17, 18. Dorsal (anterior to left) and right views of carapace, posterodorsal part of right valve missing, approx. X120. Paratype, USNM 389885. Norian, USGS colln. 33148.

24, 25. Right view of carapace with most of the valve missing to expose the adductor muscle-attachment scar, approx. X127, and detail of adductor muscle-attachment scar, approx. X433. Holotype, USNM 389887. Norian, USGS colln. 33149.



OGMOCONCHA

PLATE 10

FIGURES 1–8, 15–22. *Ogmoconcha tailleuri* n. sp.

1–4. Dorsal (anterior to left), posterior, right, and ventral (anterior to right) views of carapace, approx. X80. Paratype, USNM 389901. Ladinian, USGS colln,. 33119.

5–7. Left showing poorly preserved adductor muscle scar, posterior, and dorsal (anterior to left) views of steinkern, approx. X80. Note poorly preserved denticulation on dorsoposterior of fig. 7. Paratype, USNM 389899. Ladinian, USGS colln. 33111.

8. Inside view of right valve showing denticulated hinge, approx. X120. Paratype USNM 389888. Norian, USGS colln. 33155.

15–19. Dorsal (anterior to right), posterior, right, left, and detail of adductor muscle scar exposed on left valve of carapace, approx. X120; detail, approx. X290. Paratype, USNM 389910. Ladinian, USGS colln. 33120.

20–22. Posterior, dorsal oblique tilted on right valve, and right views of carapace, approx. X120. Paratype, USNM 389911. Ladinian, USGS colln. 33129.

9. *Cavussurella?* sp. 1. Posterior oblique view of fragment of left valve showing hinge groove and groove along venter for reception of smaller valve, approx. X80. Left end of micrograph trimmed to fit plate, compare with pl. 4, figs. 15, 21. Figured specimen, USNM 389851. Ladinian, USGS colln. 33117.

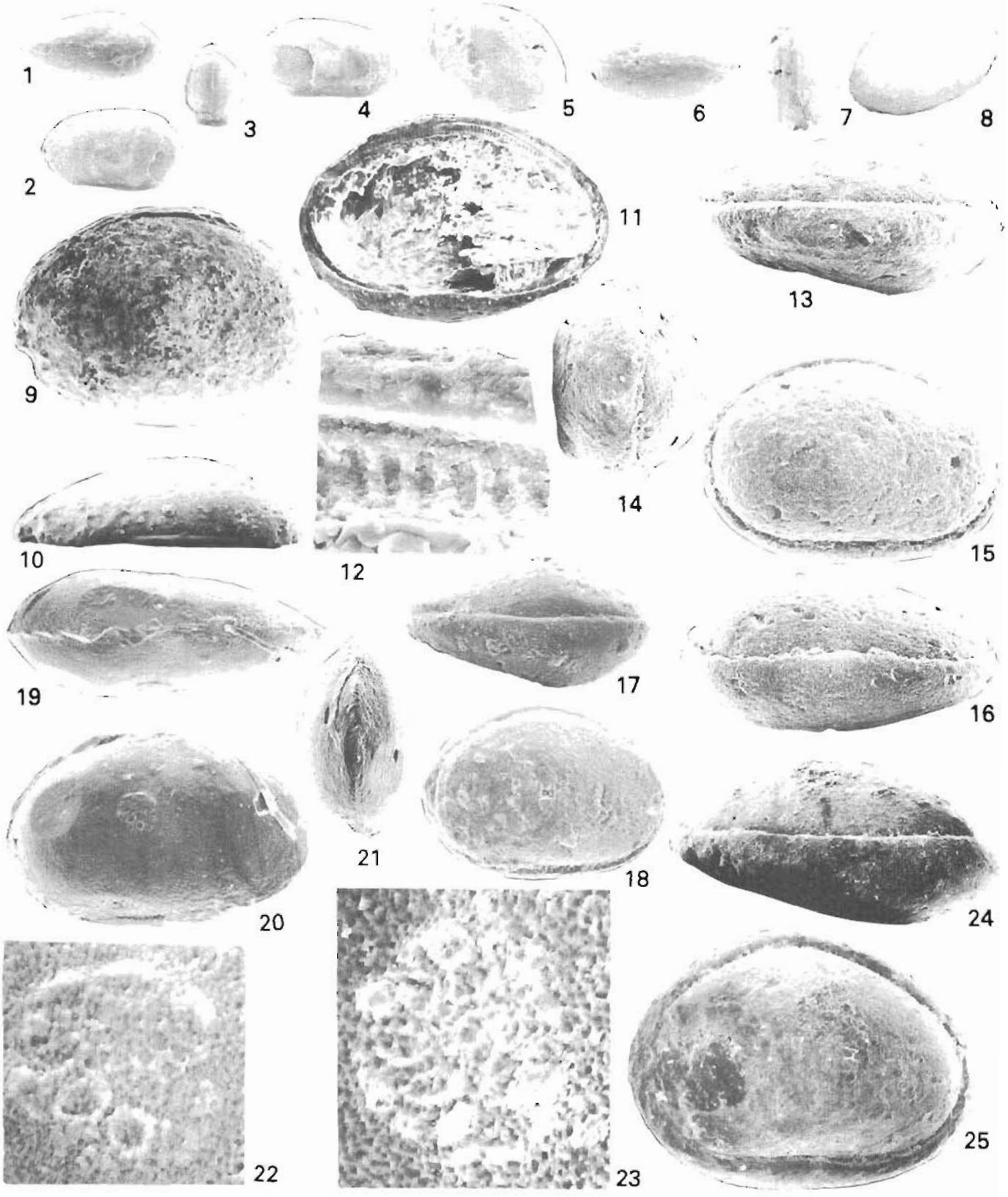
10, 11. *Rhombocythere?* sp. Outside and inside views of fragment of left valve showing groove along the venter, approx. X100. Apparent denticulations on both ends of ridge above groove are probably artifacts due to preservation. Figured specimen, USNM 389853. Ladinian, USGS colln. 33132.

12–14. *Ogmoconcha* sp. Dorsal (anterior to left), detail of dorsum to show denticulation, and right views of carapace with the right valve slightly rotated within the left to show denticulation hinge, approx. X80; detail, approx. X160. Figured specimen, USNM 389999. Lower Carnian, Hungary, USGS colln. 33172.

23–32. *Ogmoconcha marquardti* n. sp.

23–26. Dorsal (anterior to left), right, and ventral (anterior to right) views of carapace on which dorsoposterior edge of right valve is missing to expose denticulated hinge, approx. X120; detail of exposed denticulation, approx. X600. Paratype, USNM 389889. Norian, USGS colln. 33154.

27–32. Posterior, right tilted down to show dorsal overlap, right tilted up to show ventral overlap, dorsal (anterior to right), left, and ventral (anterior to left) views of carapace. Holotype, USNM 389905. Norian, USGS colln. 33158.



OGMOCONCHA

PLATE 10

FIGURES 1–8, 15–22. *Ogmoconcha tailleuri* n. sp.

1–4. Dorsal (anterior to left), posterior, right, and ventral (anterior to right) views of carapace, approx. X80. Paratype, USNM 389901. Ladinian, USGS colln,. 33119.

5–7. Left showing poorly preserved adductor muscle scar, posterior, and dorsal (anterior to left) views of steinkern, approx. X80. Note poorly preserved denticulation on dorsoposterior of fig. 7. Paratype, USNM 389899. Ladinian, USGS colln. 33111.

8. Inside view of right valve showing denticulated hinge, approx. X120. Paratype USNM 389888. Norian, USGS colln. 33155.

15–19. Dorsal (anterior to right), posterior, right, left, and detail of adductor muscle scar exposed on left valve of carapace, approx. X120; detail, approx. X290. Paratype, USNM 389910. Ladinian, USGS colln. 33120.

20–22. Posterior, dorsal oblique tilted on right valve, and right views of carapace, approx. X120. Paratype, USNM 389911. Ladinian, USGS colln. 33129.

9. *Cavussurella?* sp. 1. Posterior oblique view of fragment of left valve showing hinge groove and groove along venter for reception of smaller valve, approx. X80. Left end of micrograph trimmed to fit plate, compare with pl. 4, figs. 15, 21. Figured specimen, USNM 389851. Ladinian, USGS colln. 33117.

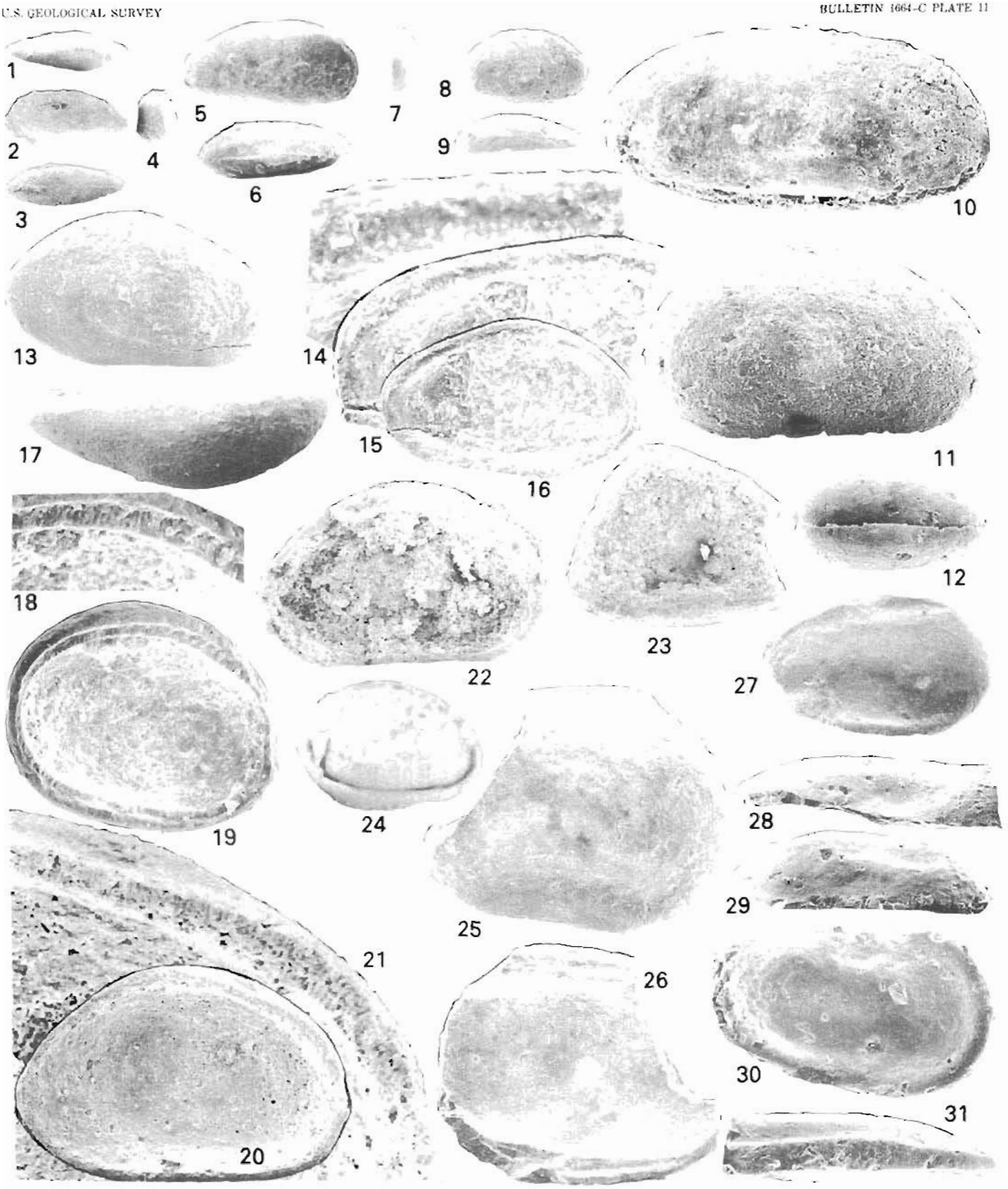
10, 11. *Rhombocythere?* sp. Outside and inside views of fragment of left valve showing groove along the venter, approx. X100. Apparent denticulations on both ends of ridge above groove are probably artifacts due to preservation. Figured specimen, USNM 389853. Ladinian, USGS colln. 33132.

12–14. *Ogmoconcha* sp. Dorsal (anterior to left), detail of dorsum to show denticulation, and right views of carapace with the right valve slightly rotated within the left to show denticulation hinge, approx. X80; detail, approx. X160. Figured specimen, USNM 389999. Lower Carnian, Hungary, USGS colln. 33172.

23–32. *Ogmoconcha marquardti* n. sp.

23–26. Dorsal (anterior to left), right, and ventral (anterior to right) views of carapace on which dorsoposterior edge of right valve is missing to expose denticulated hinge, approx. X120; detail of exposed denticulation, approx. X600. Paratype, USNM 389889. Norian, USGS colln. 33154.

27–32. Posterior, right tilted down to show dorsal overlap, right tilted up to show ventral overlap, dorsal (anterior to right), left, and ventral (anterior to left) views of carapace. Holotype, USNM 389905. Norian, USGS colln. 33158.



TRIASSOCYPRIS?, *OGMOCONCHA*, *CAVUSSURELLA?*, AND *RHOMBOCYTHERE?*