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Scyllarella (Decapoda: Achelata: Scyllaridae) from the Lookingglass Formation (Eocene): first occurrence on western coast of North America

Rodney M. Feldmann* and Carrie E. Schweitzer**

*Department of Geology, Kent State University, Kent, OH 44242, USA <rfeldman@kent.edu>
**Department of Geology, Kent State University at Stark, North Canton, OH 44720, USA <cschweit@kent.edu>

Abstract

A single specimen of scyllarid lobster documents a new species, *Scyllarella manleyi*, from the Eocene (Ypresian–Lutv etian) Lookingglass Formation in Oregon, USA. The paleoecological setting of the Lookingglass Formation is consistent with that of extant scyllarids. The occurrence extends the geological range of the genus into the Eocene and the geographical range to the western coast of North America. The discovery represents only the second occurrence of scyllarids in the fossil record of west coastal North America.

Key words: Decapoda, Achelata, Scyllaridae, Eocene, Oregon, USA

Introduction

The Eocene Lookinglass Formation in west central Oregon has yielded several brachyurans (Table 1). The specimen described herein represents the first record of an achelatan lobster.

The formation was named by Baldwin (1974) for an unconformity-bounded, interbedded sandstone and siltstone with coal beds and conglomerate locally at the base. The unit, originally referred to as the Middle Member of the Umpqua Formation, attains a thickness of 1570 m (Baldwin, 1974). The middle Eocene age is based upon bivalved mollusks and foraminiferans (Baldwin and Hess, 1971).

Although decapod fossils are uncommon in the unit, they tend to be well-preserved (Orr and Kooser, 1971), and the specimen described here is no exception. The purpose of this work is to describe a new species of scyllarid lobster representing the first occurrence of the genus in western North America and the youngest occurrence of the genus worldwide.

Table 1. List of species of brachyuran decapod crustaceans known from the Lookingglass Formation. References are cited where taxonomic revisions have been made.

Taxon	Reference
Orithopsidae	
Marycarcinus hannae (Rathbun, 1926), as *Necrocarcinus*	Schweitzer *et al.*, 2003
Lyreididae	
Rogueus orri Berglund and Feldmann, 1989	
Raninidae	
Raninoides vaderensis Rathbun, 1926	
Raninoides washburnei Rathbun, 1926	
Hepatidae	
Eriosachila orri (Kooser and Orr, 1973), as *Zanthopsis*	Schweitzer and Feldmann, 2000
Goneplacidae	
Orbitoplax weaveri (Rathbun, 1926), as *Plagiolophus*	Schweitzer, 2000
Panopeidae	
Panopeus baldwini (Kooser and Orr, 1973), as *Lophopanopeus*	Schweitzer, 2000
Hexapodidae	
Palaeopinnixa rathbunae Schweitzer *et al.*, 2000, replacing *Pinnixa eocenica* Rathbun, 1926	Schweitzer *et al.*, 2000

Systematic Paleontology

Infraorder Achelata Scholtz and Richter, 1995
Family Scyllaridae Latreille, 1825

Remarks: Extant Scyllaridae have been subdivided into four subfamilies (Holthuis 1991): Arctinae Holthuis, 1985; Ibacinae Holthuis, 1985; Scyllarinae Latreille, 1825; and Theinae Holthuis, 1985. Based upon his key to genera (Holthuis, 1991, p. 171), species of *Scyllarella* discussed below might be best referred to Scyllarinae based upon presence of open orbits on the frontal margin, weak cervical and postcervical grooves, and nodose lateral margins. Extant species of the sole genus within the family, *Scyllarus* Fabricius, 1775, typically bear three longitudinal, nodose ridges similar to those seen on *Scyllarella* spp. Notwithstanding these significant points of comparison suggesting placement

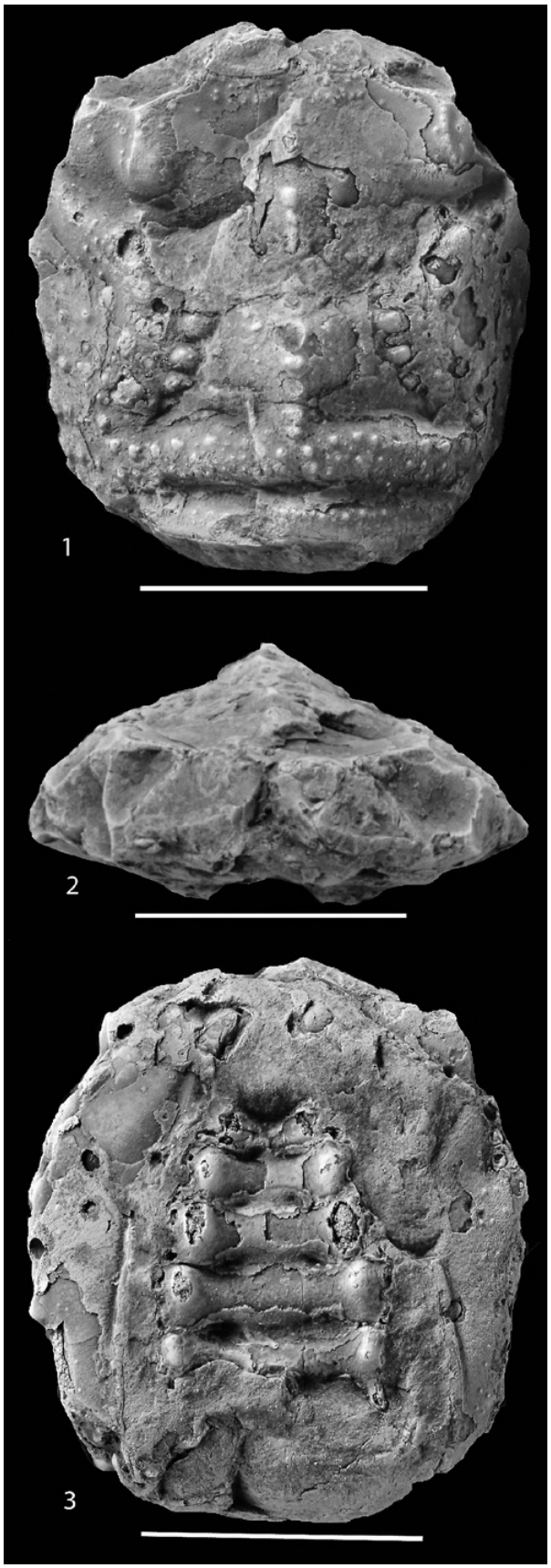

Fig. 1. *Scyllarella manleyi* n. sp., F-69399, from the Eocene Lookingglass Formation, Oregon. 1. Dorsal carapace. 2. Frontal view of carapace. 3. Ventral view of carapace. Scale bars = 1.0 cm.

of *Scyllarella* within Scyllarinae, it is imprudent to formally place the genus in the subfamily until more complete specimens bearing mouthparts and the pleon can further support the assignment.

Genus *Scyllarella* Rathbun, 1935

Type species: *Scyllarella gibbera* Rathbun, 1935, p. 76, by original designation.

Included species: *Scyllarella adinae* Franţescu, 2013; S. *aspera* Rathbun, 1935; S. *gardneri* (Woods, 1925); S. *manleyi* n. sp.

Diagnosis: A diagnosis of the genus has recently been published (Schweitzer *et al*. 2015) and will not be repeated herein. The new species differs from the published diagnosis only in that the carapace is slightly longer than wide, whereas the published diagnosis indicates that the carapace is wider than long.

***Scyllarella manleyi* n. sp.**

(Fig. 1)

Diagnosis: Carapace slightly longer than wide, bearing coarse nodes on axial and branchial regions and granules on protogastric and hepatic regions. Sternum with longitudinally ovoid swellings on lateral terminations of sternites 5–8; sternite 8 with transversely ovoid axial node and long episternal projection.

Etymology: The trivial name honors Mr. Robert Manley, Mt. Angel, Oregon, who collected the specimen and made it available for study.

Description: Carapace small, quadrate, length excluding frontal margin 19.2 mm, greater than maximum width, 18.7 mm, measured at about midlength; weakly vaulted transversely and flattened longitudinally. Surface of exocuticle, endocuticle, and mold of the interior similarly ornamented; smooth regions, finely granular areas, and nodose sculpture are visible on all surfaces.

Frontal margin poorly preserved, but appears to be weakly projected axially bounded by smooth, concave surfaces extending nearly to anterolateral corner, interpreted to be orbits. Orbits nearly circular, directed forward. Lateral margin sharply defined, nodose, deflected to subbranchial surface at acute angle. Weak notches on anterolateral margin define intersection of cervical and postcervical grooves. Posterior margin broadly and gently arched and bearing a single row of small granules and narrow posterior rim.

Cervical groove crosses midline as straight element and curves anterolaterally to terminate at shallow notch on margin; groove more prominently developed on moldic surface than on cuticular surface. Postcervical groove parallels cervical groove laterally and becomes obscure axially. Epigastric region broad, short, bearing a field of

fine granules. Mesogastric region broadly triangular, bearing three or more axial nodes. Protogastric region concave, generally smooth. Hepatic region with strong, granular axial and smaller lateral lobes. Metagastric and urogastric regions undifferentiated, depressed, short. Cardiac region the most strongly elevated region of the carapace, circular, granular laterally, nodose axially with one large centrally placed node. Intestinal region short, narrow, granular. Epibranchial region a transversely elevated, granular region. Remainder of branchial region with arcuate, strongly nodose ridge extending from epibranchial region slightly posterolaterally to join a broad, coarsely granular transverse ridge at level of intestinal region. Pterygostomial and subbranchial regions generally smooth with a few tiny granules and well-defined axial rim.

Sternum broad, triangular; sternites 1–3 quadrate, narrow, 0.9 mm wide measured at posterior end, poorly preserved; sternites 4–8 longer, 12.4 mm, than wide, 9.6 mm, measured at sternite 8, fused axially and in contact but may be separated by narrow fissures laterally. Surface of sternite 4 deeply concave axially, and swollen and elevated into prominent lateral nodes, separated from sternite 5 by fused, weakly depressed axial section and lateral pits. Sternites 5–8 similar in form but widening progressively posteriorly. Each somite weakly concave axially and terminating laterally by prominent, longitudinally ovoid bosses. A transversely ovoid boss is situated at midpoint of sternite 8, and episternal projection long, narrow, paralleling margin of sternum. Cuticle, where present between sternites 5 and 6, with tiny punctate granules.

Mandibles large, ovoid, right one slightly larger than the left.

Pleon and thoracic appendages not preserved.

Holotype: The holotype, and sole specimen, F-69399, is deposited in the Museum of Natural and Cultural History Condon Fossil Collection, Condon Museum, University of Oregon, Eugene, Oregon. The specimen was collected by Mr. Robert Manley, Mt. Angel, Oregon.

Occurrence: The holotype was collected from the Lookingglass Formation, at N42° 33.604', W124° 01.262', locality UO 2593, three miles east from Agness, Curry County, Oregon (Fig. 2), on the south side of Road 3406. The age of the formation is Ulatisian, lower middle Eocene (Ypresian–Lutetian).

Remarks: *Scyllarella manleyi* n. sp. can confidently be placed within *Scyllarella* based upon its overall shape, which is nearly equidimensional. The genus is characterized by being wider than long (Schweitzer *et al*., 2015) although the width only slightly exceeds the length. *Scyllarella manleyi* n. sp. is only slightly longer than wide. Other species within

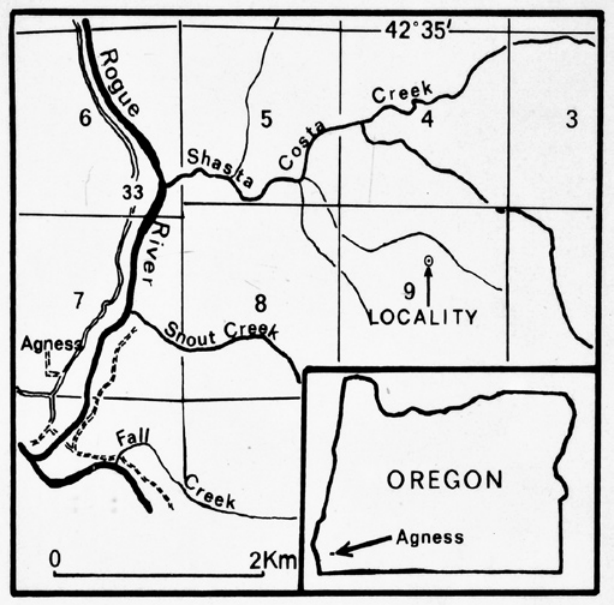

Fig. 2. Locality map showing the site, UO 2593, from which *Scyllarella manleyi* was collected. Map modified from Berglund and Feldmann (1989).

Scyllaridae are much longer than wide. The ornamentation on the dorsal carapace is similar to that of *Biarctus* Holthuis, 2002; *Scyllarides* Gill, 1898; and *Scyllarus* Fabricius, 1775, in exhibiting three prominent, nodose, or granular longitudinal keels; however, these genera contain species that are markedly longer than wide. Perhaps the most distinctive character of *Scyllarella* spp. is the form of the sternum. That structure is preserved on the holotype of *S. gibbera* and the holotype of *S. adinae*, as well as on *S. manleyi* n. sp. The sterna of all three species exhibit deep pits or depressions on the abaxial parts of the sutures between sternites, resulting in an axially compressed appearance of sternites 5–8. This sternal architecture is unique to *Scyllarella* spp.

Scyllarella manleyi n. sp. differs sufficiently from other members of the genus to clearly warrant erection of a new species. The axial ridge on the new species bears relatively large, discrete nodes on the cardiac region, grading to smaller, discrete nodes on the intestinal and gastric regions. The axial nodes on the type species form a double row on the cardiac region and a single row on the gastric region. The axial ridge on the holotype of *S. gardneri* is sharp and bears only a few nodes, the most prominent one of which is on the cardiac region. The ridge as expressed on *S. adinae* is broad and granular on the cardiac region and is not preserved on the gastric regions. *Scyllarella aspera* is based upon a partial, distorted carapace so that characterizing the axial ridge is not possible.

Discussion

Paleoecology: Habitats of many species of extant

Scyllaridae representing seven genera are recorded by Holthuis (1991). Most are relatively shallow water dwellers and often live on siliciclastic substrates, including sand and mud (Schweitzer and Feldmann 2014). The general broad, dorso-ventrally compressed form would seem to be ideally adapted for this lifestyle. Species of *Scyllarus*, with one exception have been collected at depths between 4 and 150 m (Holthuis, 1991). One species reported, *S. batei* Holthuis, 1946, was found at depths up to 484 m (ibid., p. 220).

The Lookingglass Formation is a siliciclastic unit (Baldwin, 1974), suggesting that the nature of the substrate was consistent with the preferred substrate of extant scyllarids. The depth at which the Lookingglass Formation was deposited is less well constrained, but William Orr (personal commun. to RMF, 2016) suggested that it was deposited in shallow water, less than 100 m. *Scyllarella manleyi* was extracted from a concretionary structure which makes it difficult to determine whether it was preserved in situ or whether it was transported into the depositional site. In either case, a shallow water living site is indicated.

Biogeography: Previously described species of *Scyllarella* range in age from Early Cretaceous to Paleocene (Schweitzer *et al*., 2015). The discovery of *S. manleyi* n. sp. in the Lookingglass Formation in Oregon extends the range of the species into the Eocene. The earliest forms are *S. gardneri* from the Early Cretaceous (Albian) Gault beds (Waters *et al*., 2007) at Folkestone, England, represented by a nearly complete carapace (Woods, 1925 in 1923–1931). An approximately contemporary taxon is *Scyllarella adinae* from the Early Cretaceous (Albian) Pawpaw Shale at Fort Worth, Texas, U.S.A. Subsequent occurrences are documented by *S. gardneri*, the type species, and *S. aspera*, both from the Paleocene (Danian) Porters Creek Formation in Alabama (Rathbun, 1935; Renken, 1992). The unit from which the specimens were collected was formerly known as the Sucarnoochee Formation (Rathbun, 1935) which, at the time of publication, was considered lower Eocene in age. Thus, the presence of *S. manleyi* n. sp. in the Eocene Lookingglass Formation in Oregon, U.S.A., represents the latest occurrence of the genus.

Prior to this occurrence, there has been only one report of Scyllaridae on the west coast of North America, *Parribacus caesius* Squires, 2001, from the Eocene Llajas Formation in Ventura County, southern California. Thus, the discovery of *Scyllarella manleyi* n. sp. represents the westernmost occurrence of the genus and the second occurrence of the family on the west coast. Extant Scyllaridae are still uncommon on the western coast of North America. The only west coast occurrences of living representatives of the family are *Scyllarides astori* Holthuis, 1960, from the Gulf of California and the Galapagos Islands and *Evibacus princeps* S. I. Smith, 1869, that ranges along the Pacific coast from northern South America to the Gulf of California (Holthuis, 1991). The majority of scyllarids are living today in the western Pacific and Indian oceans.

Acknowledgments

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