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A NEW CRAB, *ROGUEUS ORRI* N. GEN. AND SP. (DECAPODA: BRACHYURA), FROM THE LOOKINGGLASS FORMATION (ULATISIAN STAGE: LOWER MIDDLE EOCENE) OF SOUTHWESTERN OREGON

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ABSTRACT—A new genus and species of raninid crab, *Rogueus orri,* is described from the Tenmile Member of the Lookingglass Formation in southwestern Oregon. Based upon previous studies of foraminiferans, the rock unit has been assigned an early middle Eocene age. Distinct from other raninids with its sinuous fronto-orbital margin, bifid rostrum, and uniquely branched anterolateral teeth, *Rogueus orri* may be descended from *Notopocorystes (Cretacoranina) fritschi.*

INTRODUCTION

FOSSIL RANINID crabs are exceedingly rare in deposits throughout the world, probably because members of the family often inhabit deeper, offshore water (Feldmann and Zinsmeister, 1984). Because these kinds of habitats are well represented in Paleogene rocks of the Pacific Northwest, the fossil record of raninids is particularly robust.

This paper describes a new genus and species of raninid crab collected in 1979. Crab-bearing concretions were found in a roadcut near Agness, Curry County, in southwestern Oregon (Figure 1). The westerly dipping sediments at this location were mapped as Lookingglass Formation (late early to early middle Eocene) by Baldwin (1974; Baldwin and Beaulieu, 1973). Four species of crabs were reported from here by Orr and Kooser (1971) and Kooser and Orr (1973). The assemblage is dominated by *Plagiolophus weaveri* Rathbun, with rarer specimens of *Raninoides washburnei* Rathbun, *Lophopanopeus baldwini* Orr and Kooser, and *Zanthopsis rathbunae* Orr and Kooser. The new taxon, *Rogueus orri* n. gen. and sp., is very rare. The 19 specimens representing the type collection were collected between 1979 and 1985 during several visits to the locality. In addition to the new taxon, three other crabs previously unreported from the Lookingglass Formation were found, including a small raninid tentatively identified as *Raninoides* cf. *R. vaderensis,* two carapaces belonging to a small crab questionably identified as *Necrocarcinus* sp., and four carapaces belonging to *Pinnixa* cf. *P. eocenica.* According to Rathbun (1926), *R. vaderensis* has been found at Basket Point, in Douglas County. Rocks at that locality are mapped as basal Elkton Formation (middle Eocene) (Turner, 1938). The genus *Pinnixa,* represented by *P. faba,* was reported by Zullo and Chivers (1969) from late Pleistocene terrace deposits at Cape Blanco, Oregon. There have been no documented occurrences of the genus *Necrocarcinus* in Oregon.

DEPOSITIONAL SETTING AND PALEOECOLOGY

The Lookingglass Formation, lying unconformably between the Flournoy Formation above and the Roseburg Formation below, was divided into three members by Baldwin (1974). These are, in ascending order, the Bushnell Rock, Tenmile, and Olalla Creek Members. A detailed description of the geology and stratigraphy of the Lookingglass Formation and its members is given by Baldwin (1974; Baldwin and Beaulieu, 1973).

The Tenmile Member is composed of thin, rhythmically bedded sandstone and siltstone, best exposed at its type locality in Tenmile Valley where 980 m (3,200 feet) of section was measured (Peterson, 1957, *in* Baldwin, 1974). Baldwin (1974) stated: "The fine grained sandstone and siltstone indicate deposition in quiet water not close to shore, perhaps the product of rela-

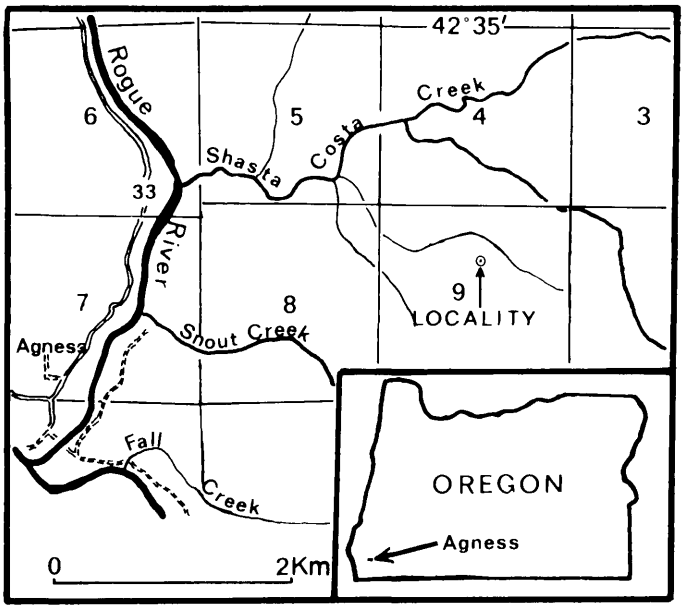

FIGURE 1—Location map showing site from which *Rogueus orri* n. gen. and sp. was collected.

tively weak turbidity currents." Foraminifera recovered from Tenmile Member sediments in the Powers quadrangle northwest of Agness are representative of the middle B zone of Laiming and the upper Penutian (late early Eocene age) or the lower Ulatisian (early middle Eocene age) stages of Mallory (1959) (Thoms *in* Baldwin and Beaulieu, 1973; Rau, personal commun. to Baldwin, 1973).

The crab-bearing siltstones along road No. 2308 (Snout Creek road) are part of the Tenmile Member (Baldwin, personal commun.) and were deposited in a shallow lobe of an Eocene basin that extended to the south of Agness. Westerly dipping sediments at this locality consist of dark-gray, well-indurated siltstone that weathers to a yellowish tan.

In addition to decapods, Orr and Kooser (1971) reported an associated fauna that included 16 species of mollusks, 16 species of foraminifera, and several whole specimens of eleutherozoan echinoderms. A large nautiloid tentatively identified as *Eutrephoceras* sp. was collected during this investigation. Many of the specimens of *Plagiolophus weaveri* reported by Orr and Kooser (1971), as well as those collected during this investigation, are articulated. This type of preservation suggests little transport and deposition in quiet, low-energy waters. Orr and Kooser (1971) suggested that *P. weaveri* may have been like some of its extant relatives in the Goneplacidae, a burrower, found in the mudflats of bays and inlets. The presence of several specimens of *Pinnixa* cf. *P. eocenica* is suggestive of a shallow-water environment. *Pinnixa* is commensal in clams and oysters, and frequently takes refuge in burrows (Ricketts and Calvin, 1952). No evidence of fossil burrow remains was noted.

LOCALITY, TYPE MATERIAL, AND OCCURRENCE

The collecting site is a north-facing roadcut along forest road No. 2308, approximately 3.6 km east of Agness (Figure 1). This location is near the University of Oregon Museum of Natural History collecting site No. 2594, and is in the SW¼, NE¼, sec. 9, T35S, R11W, Agness 15′ quadrangle, Oregon.

The new crab is known from the holotype (USNM 430027), a fairly well-preserved carapace, and 18 less well-preserved paratypes (USNM 430028–430044 and KSU 5644). All were found entirely or partially enclosed in small, spherical to ovoid, gray, calcareous concretions 2–5 cm in diameter in a well-indurated siltstone. None of the specimens is complete. The carapace is most often preserved; six possess some parts of the sternum; four, some pereiopod parts; and three include fragments of the chelae.

SYSTEMATIC PALEONTOLOGY

Order DECAPODA Latreille, 1803
Infraorder BRACHYURA Latreille, 1803
Section PODOTREMATA Guinot, 1978
Family RANINIDAE deHaan, 1841
Genus ROGUEUS n. gen.

Type species.—*Rogueus orri* n. sp., the sole included species.

Etymology.—The new genus takes its name from the Rogue River, which flows through southwestern Oregon near the type locality.

Description.—Moderate-sized raninid with elongated, obovate carapace widest at approximately anterior two-fifths; posterior approximately four-tenths maximum width; distance between outer orbital teeth approximately three-fourths maximum width; forward-pointing outer orbital teeth joined to short, broad, and bifid rostrum by sinuous fronto-orbital margin, with single, short, shallow supraorbital fissure; each horizontally extended anterolateral tooth bears a prominent branching and forward-pointing spine; chelae flattened, with deflected fixed fingers; sternum broad anteriorly, narrow posteriorly.

Remarks.—From its description it is clear the new taxon belongs in the Raninidae. However, comparison of its characters with other genera in the family reveals strong differences. The elongated carapace with rapidly tapering margins and narrow posterior is similar to *Notosceles bournei* Rathbun (1928), *Raninella carlilensis* Feldmann and Maxey (1980), *Notopocorystes* (*Cretacoranina*) *fritschi* Glaessner (1969), *Lyreidus channeri* Woods-Mason (*in* Feldmann and Zinsmeister, 1984), and *Symethis johnsoni* Rathbun (1935). It differs significantly from *Notosceles* and *Raninella* in the area of the fronto-orbital margin, by its fewer teeth, and lacking the produced anterior and spination of *Lyreidus* and *Symethis*. Furthermore, it has fewer lateral teeth than either *Raninella* or *Notopocorystes*. The morphology of the fronto-orbital margin and rostrum is very similar to that of *Notopocorystes*, but *Rogueus orri* has a slightly shorter rostrum, the termination of which consists of two gently curved lobes instead of sharp tips. The morphology of the sternal plastron, with a flattened surface and lack of longitudinal grooving along the mid-line, is similar to that for *Lyreidus* and *Notopocorystes*. It is unlike many species of *Raninoides* that possess a deep medial groove that begins in element 5 and extends posteriorly. Additionally, the uniquely branched anterolateral teeth serve as an obvious point of distinction between *Rogueus* and other genera in the family.

ROGUEUS ORRI n. sp.
Figures 2.1–2.6, 3.1, 3.2

Diagnosis.—Raninid with bifid rostrum; sinuous fronto-orbital margin; branched anterolateral teeth pointing more outward than forward; first five elements of sternal plastron flat, without longitudinal grooving along midline.

Etymology.—The trivial name honors William N. Orr of the University of Oregon, who has made significant contributions to the knowledge of fossils, particularly the fossil Decapoda, of Oregon.

Depository.—The holotype, USNM 430027, and 17 paratypes, USNM 430028–430044, are deposited in the U.S. Na-

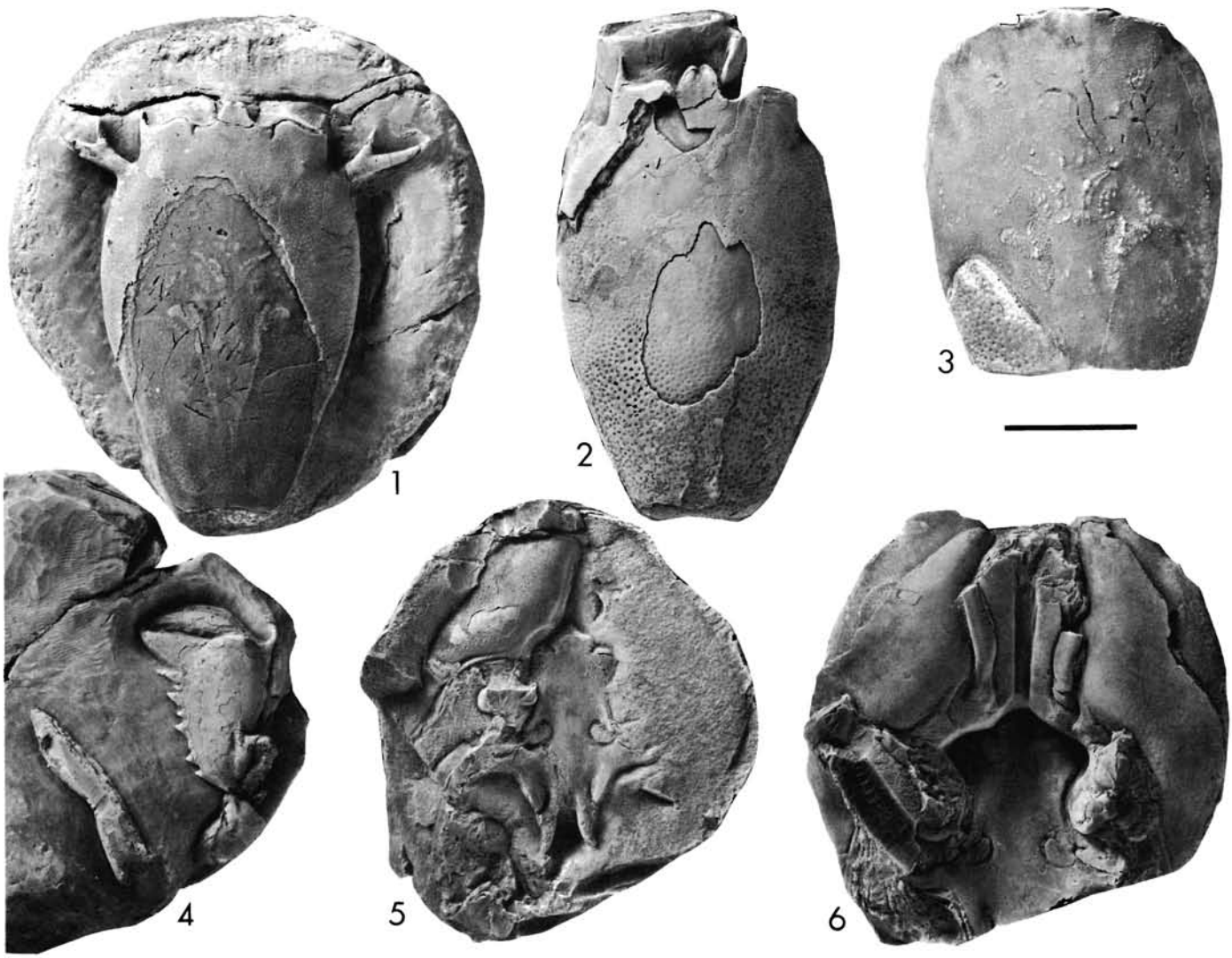

FIGURE 2—*Rogueus orri* n. gen. and sp. *1,* holotype, USNM 430027, showing a complete outline of the cephalothorax, muscle scar impressions, and terebriporid(?) bryozoan borings; *2,* paratype, USMN 430029; *3,* paratype, USNM 430037, portion of the mold of the interior of the cephalothorax with muscle scar impressions and terebriporid(?) bryozoan traces; *4,* paratype, USNM 430030, lower surface of left cheliped; *5,* paratype, USNM 430038, nearly complete sternum of male; *6,* paratype, USNM 430034, anterior portion of sternum and maxillipeds of large individual. Scale bar equals 1 cm.

tional Museum of Natural History, Washington, D.C. A single paratype, KSU 5644, is deposited in the Geology Department, Kent State University, Kent, Ohio.

Measurements.—Measurements, in mm, are given in Table 1. Location and orientation of measurements are shown in Figure 3.1.

Description.—Carapace typically raninid, elongated, obovate, gently convex longitudinally, moderately so transversely; length from tip of rostrum to posterior margin approximately 1.5 times maximum width; maximum width developed two-fifths total length from anterior and posterior to anterolateral teeth; carapace width slightly constricted immediately behind anterolateral teeth; posterolateral margins sinuous, converging rapidly posteriorly; posterior margin slightly concave and just less than half maximum width.

Fronto-orbital margin generally transverse, about three-fourths maximum carapace width and bounded by sharply-tipped, forward pointing extraorbital teeth; each extraorbital tooth extends nearly as far forward as rostrum, and joined to broadly rounded orbital lobe by smoothly curved sinus to form sinusoidal fronto-orbital margin (Figure 2.1, 2.2); supraorbital fissure short, narrow, shallow, situated lateral to deepest part of sinus adjacent base of rostrum; rostrum slightly downturned and medially sulcate from base forward, wider than long, narrowing slightly anteriorly, tip gently bilobed, with a very small rounded node on surface of each lobe; anterolateral teeth, located at anterior one-sixth of carapace, extend obliquely outward and slightly upward; broad at base and elliptical in cross section, each tooth branches approximately at mid-length, one branch an extension of main axis, other branching spine extends anteriorly approximately 2 mm from main trunk, and nearly as far as extraorbital tooth (Figure 2.1).

Carapace surface with branchiocardiac furrows faintly visible; small punctae densely cover entire carapace, finer in gastric

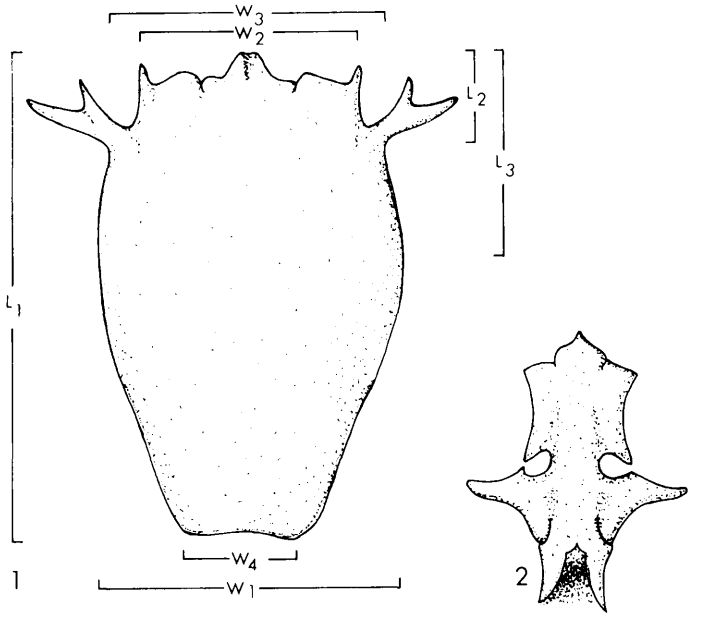

FIGURE 3—*1*, Outline drawings of *Rogueus orri* n. gen. and sp. showing the orientation of measurements taken on the carapace. Letter designations are keyed to Table 1 where the measurements are tabulated, *2*, Outline drawing of sternum of *Rogueus orri* drawn to the same scale as that of the carapace.

region and along anterior margin; rim of small bead-like granules originates just posterior to widest section of carapace and continues around posterolateral and posterior margins; below rim, carapace sides heavily punctate and nearly vertical; scars for insertion of internal mandible adductor muscles, posterior gastric muscles, and attractor epimeralis muscles deeply impressed on internal surface of carapace (Figure 2.1, 2.3); other muscle attachment areas less distinct.

Sternal plastron incomplete in type material; section from sternal elements 1 through 5 longitudinally continuous, surface gently undulatory, randomly finely punctate (Figure 2.5, 2.6); sternal elements 1 through 3 fused into short acutely tipped, petaloid anteromedian projection; element 4 narrows from its widest section to approximately one-fourth maximum carapace width between bases of chelae; lateral extension (episternum), on each side of sternal element 5, transversely flat across midline, rapidly narrowing in width, becoming slightly convex near termination; posterior to sternal element 5, sternum very narrow, approximately one-third width between bases of chelae, deeply depressed axially; pterygostomial region, heavily inflated, lies below pleural suture, entire surface finely punctate, but papillate adjacent to thoracic sternite 4; reflexed edges of carapace above pleural suture punctate, less dense in sub-hepatic region and more dense posteriorly; margins of buccal cavity approximately parallel and very closely spaced; endognath long, blade-like, slightly wider at anterior end, about twice width of exognath; only one specimen, paratype USNM 430038 (Figure 2.5), a male, could be positively sexed, based on narrow abdomen.

Chelae approximately equal in size; merus of cheliped approximately one and two-thirds times as long as carpus, sinuous, distal half approximately as high as carpus, proximal half tapering to about half as high, reduction in height beginning at sharp node located at about midpoint of upper margin; carpus longer than high, upper margin nearly straight, except near ends; very long spine on upper margin near articulation with propodus, distally directed and nearly parallel upper margin of propodus; upper and lower margins subparallel, outer surface slightly convex longitudinally and very convex between upper and lower margins; propodus nearly as high as long, upper edge thin and straight, terminating in a large, sharp, distally directed spine on proximal side of articulation with dactylus (Figure 2.4); fixed finger deflected nearly 90° from long axis of manus; viewed from outside, fixed finger broadly triangular, its distal end curves around tip of dactylus, terminating in sharp tip; occlusal surface dentate, with at least three blunt teeth that mesh with those of dactylus without gaping; five large setal pits aligned below tooth line, proximal three spaced farther apart, a sixth located on distal side of large node near articulation; lower margin of manus armed with eight sharp spines generally decreasing in size proximally, first, third, fifth, and seventh considerably larger than second, fourth, sixth, and eighth; dactylus stout, distal margin strongly convex, outer face convex, smooth with fine punctae; narrow, flattened rim borders distal margin, with row of large punctae extending along proximal edge of rim.

TABLE *1*—Measurements (in mm) taken on specimens of *Rogueus orri* n. gen. and sp. Location and orientation of measurements are shown in Figure 3.

	Specimen						
USNM no.	L1	L2	L3	W1	W2	W3	W4
430027	32.0	5.5	12.5	20.3	15.3	18.3	9.0
430028	36.5	7.5	—	—	16.0	—	—
430029	35.6	7.3	14.5	23.0	—	19.8	9.5
430030	—	—	—	23.8	16.6	—	—
430031	50.4	7.2	16.0	26.3	—	—	10.8
430032	—	—	—	28.5	18.6	25.0	—
430033	—	—	—	13.5	—	—	6.0
430034	—	—	—	33.2	21.0	27.8	—
430035	34.4	—	13.8	22.0	15.1	18.8	—
430036	—	—	—	16.0	—	14.3	6.7

Discussion.—The assignment of *Rogueus orri* n. gen. and sp. to the Raninidae is manifested by its elongated, obovate carapace, a sternum that is broad anteriorly and narrow posteriorly, flattened chelae with strongly deflected fixed fingers, and possession of both lanceolate and crescent-shaped dactyli on certain of its walking legs. *Rogueus orri* may have been both a burrowing and a swimming crab (Bourne, 1922).

The branched anterolateral teeth of *Rogueus*, though unusual, are not unique in the Raninidae. Branching also occurs in species of *Ranina*; but these taxa bear little, if any, other similarity to *Rogueus orri*. The closest relative to *Rogueus orri* may have been *Notopocorystes* (*Cretacoranina*) *fritschi*, based upon the strong similarity in morphology of the anterior margins and configuration of the sternal plastron.

Delicate boring patterns, possibly produced by terebriporid bryozoans, are preserved on molds of the interior of two specimens (Figure 2.1, 2.3). No certain evidence exists to determine whether the borings were developed during the life of the crabs or whether they are postmortem features; however, because they are expressed on the interior of the carapace, the latter interpretation seems most likely.

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