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The Burke Museum

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- The Museum undertakes these activities to promote a commitment, in the citizens of the Pacific Northwest, to a better stewardship of their natural and cultural heritage.

Burke Museum
Contributions in
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A New Species of *Cancer* (Decapoda: Brachyura) from the Miocene Astoria Formation in Washington

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ABSTRACT

A new species of crab, *Cancer wahkiakumensis*, is described from fossils of early to early middle Miocene age in the Astoria Formation of southwestern Washington. These fossils were collected from rocks within a relatively small depositional basin within which the new taxon appears to have been endemic. Rocks of the Astoria Formation in southwestern Washington contain a very diverse crustacean assemblage including the families Atelecyclidae (?), Calappidae, Callianassidae, Cancridae, Galatheidae, and Majidae. Of these, only the Callianassidae has been previously identified from the Astoria Formation.

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INTRODUCTION

Rocks of the Astoria Formation in southwestern Washington contain fossils which represent a diverse and previously undocumented decapod crustacean assemblage. These fossils include species representing the families Atelecyclidae (?), Calappidae, Callianassidae, Cancridae, Galatheidae, and Majidae (table 1). There are, in addition, two crab species whose familial relationships are still to be determined, and at least three cancrid species whose identity must await the discovery of more complete specimens. This paper describes a new species of the genus *Cancer* from this fossil decapod assemblage.

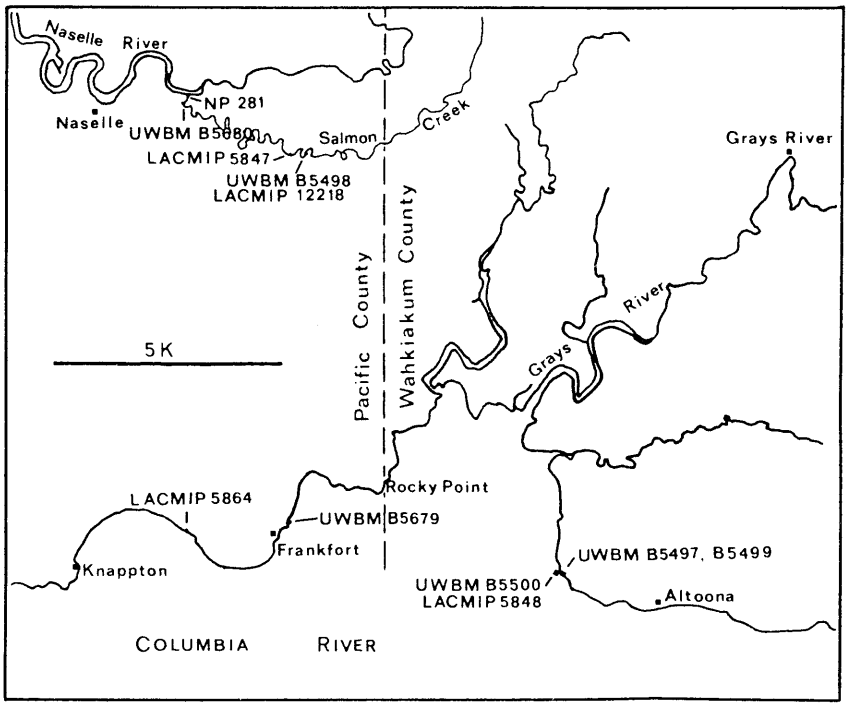
Very few fossil decapods have been documented from rocks of the Astoria Formation, which is exposed throughout much of coastal Oregon and western Washington (Etherington 1931; Moore 1963). In Oregon, the mud-shrimp *Callianassa oregonensis* Dana, 1849, is the only decapod described from rocks of the Astoria Formation. In southwestern Washington, Rathbun (1926) identified *Callianassa clallamensis*, *C. twinensis*, and a crab, *Eumorphocorystes naselensis*, all from rocks now mapped as part of the Astoria Formation (Wolfe and McKee 1968, 1972; Wells 1979, 1989).

Rocks of the Astoria Formation crop out at the town of Grays River along a roadcut immediately southwest of the town and adjacent to the river. One of the paratypes of *Callianassa twinensis* Rathbun, 1926, was collected from "sandy shale bluffs on Grays River, at Grays River" (Rathbun 1926:117); however, during this investigation no additional specimens of *C. twinensis* were found at or near this locality. Claw parts tentatively identified as *C. twinensis* were collected at several localities along Salmon Creek (near Naselle) and along the north shore of the Columbia River, west of Rocky Point and east of the site of the town of Frankfort. Elsewhere, *C. twinensis* is known only from older sediments (Rathbun 1926).

Rathbun (1926) identified *Callianassa clallamensis* and described a raninid crab, *Eumorphocorystes naselensis*, from a locality near Naselle. This locality (Stanford University, North Pacific 281) is described as being along the Naselle River, near the mouth of Salmon Creek (Rathbun 1926:16). Rocks near the mouth of Salmon Creek have been mapped by Wells (1979, 1989) as part of the Astoria Formation of early Miocene age. Our efforts to confirm the presence of *C. clallamensis* and *E. naselensis* in rocks at that locality have been unsuccessful; however, *C. clallamensis* was found at several localities within the Astoria Formation along Salmon Creek, east of Naselle. Interestingly, Rathbun (1926:16) noted that the locality number for the holotype of *E. naselensis* was "badly rubbed but is almost certainly 281." The presence of *E. naselensis* in older rocks of the northeast Pacific basin (Jeletzky 1975; Tucker and Feldmann 1990) and the apparent absence of this taxon in the Astoria Formation raises a question concerning the accuracy of the type locality description.

The mud-shrimps *Callianassa clallamensis*, *C. oregonensis*, and *C. twinensis* are, therefore, the only decapod crustaceans previously documented with certainty from rocks of the Astoria Formation.

Figure 1.
Map of Grays River area of southwestern Washington showing place names and collecting localities.



DEPOSITIONAL SETTING AND PALEOECOLOGY

Rocks of the Astoria Formation are widely distributed in southwestern Washington (Weaver 1937; Wolfe and McKee 1968, 1972; Wells 1979, 1989) but these rocks are not well exposed because of thick vegetation. The formation is best exposed along streams and rivers, especially at a few localities along the north shore of the Columbia River, between the old townsite of Knappton on the west and Altoona to the east. Smaller outcrops are along the Naselle River, and Salmon Creek, near the town of Naselle.

Wolfe and McKee (1968, 1972) divided the Astoria Formation within the Grays River Quadrangle (U.S. Geological Survey, 15 minute series) into units I, II, and III. West of the Grays River Quadrangle, rocks of the Astoria Formation, including facies of units I and III, were named the Naselle unit and Bald Ridge unit, respectively, by Wells (1989). These rocks were deposited in a local downwarp, perhaps near the mouth of the ancestral Columbia River (Wolfe and McKee 1972). The new cancrid crab has been found only in rocks of units I and II that were deposited within this small embayment.

Although the geology of the Astoria Formation has been examined and reported, the macropaleontology of the formation in southwestern Washington has not received much detailed attention. Weaver (1937, 1942) listed some fossil localities in the area; faunal lists (Foraminifera and mollusks) were given by Wolfe and McKee (1972); an otariid pinniped was described by Barnes (1987); and some new pteropods were described by Squires (1989). The molluscan fauna has been assigned to the Pillarian (early Miocene) and Newportian (early to early middle Miocene) provincial molluscan stages by Moore and Addicott (1987). The mollusks suggest warm marine conditions; Foraminifera referable to the Saucesian Stage from units I and II indicate water depths ranging between approximately 30 and 150 meters (Wolfe and McKee 1972).

Fossil plants from rocks of unit III (Bald Ridge unit) suggest a warm climate on the adjacent land areas. Near the townsite of Frankfort, fossil leaves from rocks of unit III were identified by J. A. Wolfe as representing five genera: *Fagus*, *Metasequoia*, *Quercus*, *Sequoia*, and *Vitis* (E. J. Moore, in litt.). Farther east, near Rocky Point, plant fossils are abundant. From this locality J. A. Wolfe identified twelve taxa, including the genera *Cercidiphyllum*, *Metasequoia*, *Osmunda*, and *Quercus*. Rocks of unit III were deposited in part by turbidity currents at depths ranging from 16 to 650 meters (Wolfe and McKee 1972:51, 54).

In summary, the new taxon lived in a relatively

Table 1
Decapod crustacean diversity: Astoria Formation of southwestern Washington. (Unit divisions follow Wolfe and McKee 1968, 1972.)

Genus and Species	Unit I	Unit II	Unit III
Trachycarcinus sp.[1]	X		X[2]
Mursia yaquinensis	X	X	
Callianassa clallamensis	X		
Callianassa twinensis, ~~n. sp.~~	X		X
Cancer wahkiakumensis, N. SP.	X	X	
Cancer sp. (2 other species)[1]	X		
Cancer sp. (1 species)[1]			X
Munida sp.[1]	X		
Macrocheira cf. *M. teglandi*		X	
Undetermined genera (2)[3]		X	

1. Undetermined species, possibly new.
2. Specimen may have been derived from Unit I sediments, locality being adjacent to contact between Units I and III.
3. Possibly new genera.

small early Miocene embayment, with a substrate that ranged from muddy to sandy and usually contained organic detritus. This embayment was near the mouth of a large river, the water was warm, and the climate was subtropical.

MATERIALS AND METHODS

The authors collected from every outcrop of the Astoria Formation that could be found in the Naselle–Grays River area from about 1980 to 1990 (fig. 1). All outcrops along major stream and river channels were prospected for fossils; every decapod fossil that appeared to be diagnostic was collected.

These institutional acronyms are used for specimen and locality numbers: UWBM (Thomas Burke Memorial Washington State Museum, University of Washington, Seattle, Washington); LACMIP (Natural History Museum of Los Angeles County, Invertebrate Paleontology Section, Los Angeles, California); USNM (United States National Museum of Natural History, Washington, D.C.); NP (Leland Stanford Junior University, Stanford, California).

Voucher specimens of callianassid shrimps from the Astoria Formation in the Naselle, Washington, vicinity are: *Callianassa clallamensis* UWBM 11829, from locality UWBM B5680; *C. twinensis* UWBM 11827, locality UWBM B5679; and *C. twinensis* UWBM 11828, locality UWBM B5680. Other fossil decapods mentioned are under study by Berglund.

SYSTEMATIC PALEONTOLOGY

Order DECAPODA Latreille, 1803
Infraorder BRACHYURA Latreille, 1803
Section CANCRIDEA Latreille, 1803
Family CANCRIDAE Latreille, 1803
Subfamily CANCRINAE Latreille, 1803
Genus *Cancer* Linnaeus, 1758

Included subgenera: *Cancer* (Linnaeus, 1758); *Glebocarcinus* Nations, 1975; *Metacarcinus* (Milne-Edwards, 1862); *Romaleon* (Gistl, 1848).

Subgenus *Romaleon* (Gistl, 1848)

***Cancer (Romaleon) wahkiakumensis*, new species, figs. 2–16**

Diagnosis

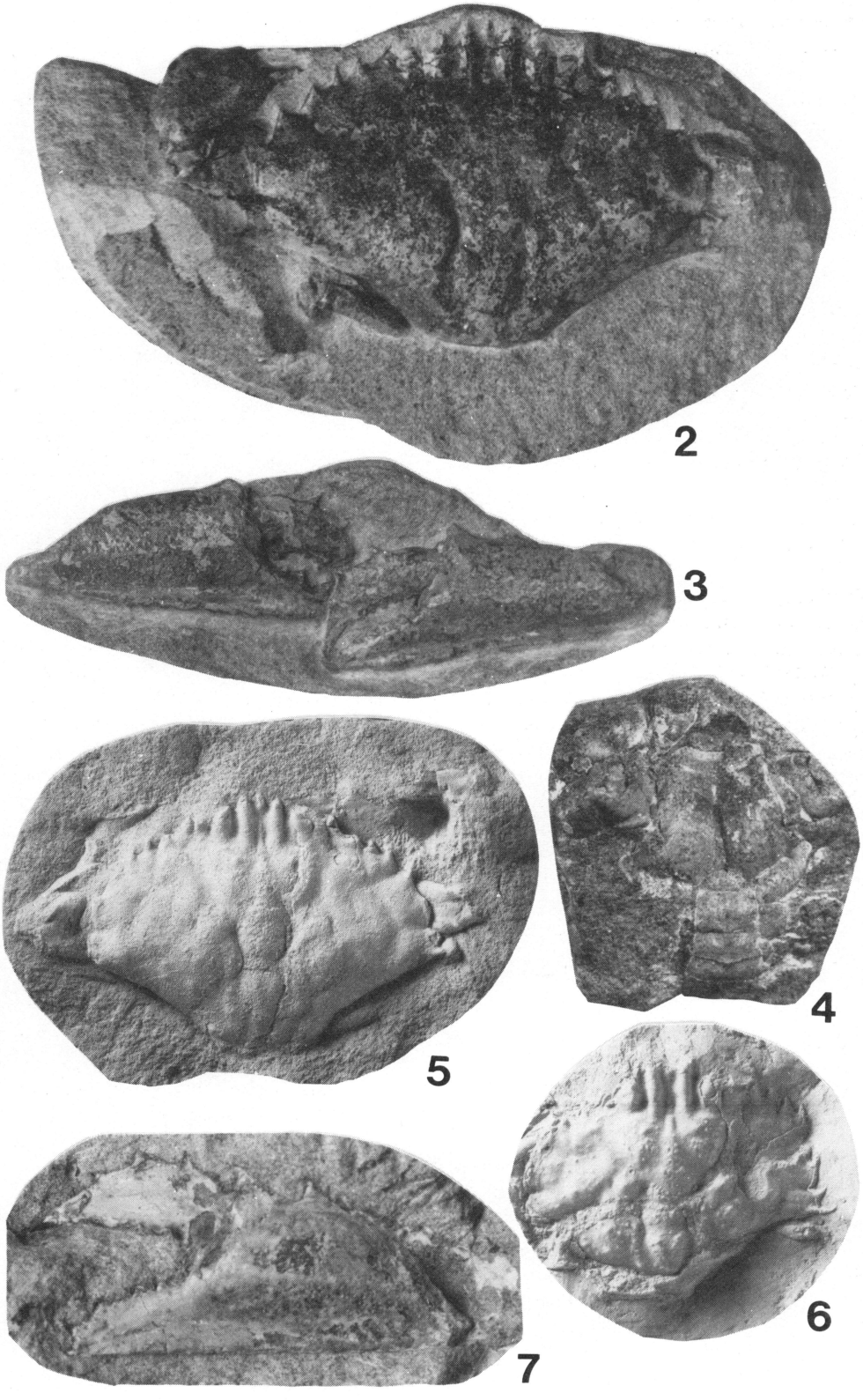
Crab small. Carapace broad, with 8 sharp-tipped anterolateral teeth having finely granulated margins; carapace widest at 8th anterolateral tooth; front moderately produced with 5 frontal teeth; medial tooth narrow, short, subacute; inner orbital tooth very small, tip rounded; outer orbital tooth long, acute; posterolateral margins strongly concave, without teeth or carinae. Chelipeds equal in size; movable fingers and mani with three sharp spines on thin upper margins; outer surface of mani carinate.

Description

Carapace suboctagonal, wider than long; moderately arched longitudinally, less so transversely; 8 anterolateral teeth, including outer orbital tooth and tooth at posterolateral angle; carapace widest at 8th anterolateral tooth, nearly as wide at 7th anterolateral tooth. Length from tip of medial tooth to posterior margin approximately 70% maximum carapace width; distance from frontal margin posterior to line indicating maximum carapace width approximately 70% total length. Posterolateral margins concave in outline; posterior margin narrow, approximately 30% maximum carapace width. Fronto-orbital width nearly 40% maximum width; anterior extension of front produced slightly more than orbits. Orbits moderately large, elliptical, with two deep, longitudinally-trending fissures in supraorbital margin. Medial tooth, and 2 adjoining teeth, blunt to subacute, approximately equal in anterior extension; medial tooth much narrower and shorter than adjoining pair, contiguous with narrow anterior portion of the mesogastric region. Inner orbital teeth very small, short and narrow, with rounded nipple-like tips, on same vertical plane as three medial teeth, with anterad extension not as great; each inner orbital tooth separated from tooth on axial side by broad, shallow sinus. On supraorbital margin, just posterior to inner orbital tooth, a much larger tooth with subacute tip; on abaxial side of this larger tooth, supraorbital margin concave to first of 2 deep, closed fissures parallel to the main axis; orbital tooth broadly rectangular, its anterior margin transverse and rimmed with small, bead-like granules. Anterolateral teeth sharp-tipped and triangular in shape; teeth 1 through 6 anteriorly directed, 7 anterolaterally directed, 8

Figures 2–7. *Cancer wahkiakumensis*, new species.

Fig. 2. Holotype, UWBM 74400: carapace, dorsal view, x 1.2
Fig. 3. Holotype, UWBM 74400: chelipeds, outer view, x 1.2
Fig. 4. Paratype, USNM 448195: ventral view, abdomen and sternum, x 1.6
Fig. 5. Paratype, LACMIP 8284: carapace, dorsal view, x 1
Fig. 6. Referred specimen, LACMIP 8287: carapace, dorsal view, x 1.5
Fig. 7. Paratype, UWBM 74404: right cheliped, inside view, x 1.75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