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JURASSIC ISOPOD (MALACOSTRACA: PERACARIDA) FROM RANVILLE, NORMANDY, FRANCE

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ABSTRACT—A single specimen of a likely sphaeromatoid isopod is described from the Upper Bathonian of northern France at Ranville, Normandy. The remarkable three-dimensional preservation consists of only the head and first pereionite, but clearly constitutes a new genus and species, *Reboursia ranvillensis*.

INTRODUCTION

THE JURASSIC deposits at Ranville, Normandy, France (Fig. 1), have long been a source of interesting fossil materials (Rioult et al. 1991). A diverse fauna from this region is now known and includes sponges, bryozoans, gastropods, bivalves, ammonite and nautiloid cephalopods, brachiopods, and crinoids. Until now, no arthropods have been recorded from these beds. A single specimen of isopod crustacean with a well-preserved head and part of the first pereionite has now come to light and appears to belong to the superfamily Sphaeromatoidea of the suborder Flabellifera.

The specimen was collected from the basal part (*Discus* Zone, *Discus* Subzone) of the Argiles de Lion, a 4 m thick, argillaceous limestone formation of Upper Bathonian, Middle Jurassic age, about 158 million years before the present. This formation is composed of extremely fine-grained sediments, with negligible amounts of silt, consisting of alternating layers of marl and clayey limestone, with distinct brachiopod assemblages that represent an increasingly shallow sequence upwardly. The two highest clayey beds are thick and contain abundant ammonites and nautiloids (Rioult et al., 1991). The Lion Formation marks the start of the great transition in the sedimentation that subsequently developed to the east of this locality in the Callovian.

This isopod, however, was collected on the ''Surface de Lion'' (Rebours and Hébert, personal commun., 2002), a contact layer between the Argiles de Lion and the underlying Langrune Limestone. The Surface de Lion is an irregular and hardened erosional feature that is perforated by bivalves, encrusted with oysters, and covered in certain places by patchy pyritic to limonitic deposits. The matrix enclosing the isopod corresponds to a bioclastic sandy limestone typically associated with a subtidal environment (G. Fily, personal commun., 2002). The upper Surface de Lion marks the end of the *Hollandi* Subzone (Rioult et al., 1991).

The complete Upper Bathonian stratigraphic sequence of the Caen District (Rioult et al., 1991) exposes the Lion Formation overlying the Langrune Limestone, and these in turn sit on the complex Basse-Ecarde Formation some 6 m thick. Under all of these are the Ranville (about 8 m thick) and Blainville (1.5–2 m thick) formations that mark the bottom of the Upper Bathonian in this region.

SYSTEMATIC PALEONTOLOGY

Suborder FLABELLIFERA Sars, 1883 sensu lato
Superfamily SPHAEROMATOIDEA Latreille, 1825
Family INCERTAE SEDIS
Genus REBOURSIA new genus

Type species.—*Reboursia ranvillensis* new species, by monotypy.

Diagnosis.—Head twice as broad as long, dorsally domed, with eyes placed laterally at posterior margin directly adjacent to pereionite 1. Eyes with many ommatidia, highly compressed on longitudinal axis, vertically elongate, with thin sinuous lobe extending to ventrolateral margin of head. Clypeus (=epistome) placed on anterior margin of head, indurate, broader than high, dorsally tuberculate, with robust inflated lateral lobes. Labrum dorsal section indurate, with pointed lateral margins (ventral section missing). Antennae placed midway between clypeus midpoint and lateral margin of head, projecting laterally along anterior margin of head. Antennular article 1 distinctly narrower than antennal basal articles, length subequal to antennal article 2. Antennal article 1 with curved, ventral, distally quadrate projection extending to distal margin of article 2. Mandibles inserting on anterior margin of foreshortened head, incisor processes blunt, without cusps; lacinia mobilis, spine rows and molar process not observed.

Etymology.—Named in honor of Thierry Rebours, long-time collector of the Jurassic deposits around Ranville, Normandy.

REBOURSIA RANVILLENSIS new species
Figures 2–5

Diagnosis.—Because only one species is currently known, the diagnosis is the same as that of the genus.

Description.—Cuticle dorsal surfaces covered with distinct but contiguous flat plates that become more tuberculate on frontal and lateral margins (Figs. 2–4).

Head not inflated, anterodorsally domed; trilobed in dorsal view (Fig. 2, *top*) faintly expressed as two shallow indentations projecting anteriorly from posterior margin at approximately 70° angle to each other, dividing the dorsal surface into anterior arc and two lateral, more rounded sections; cervical groove absent; highly foreshortened, length half that of width in dorsal view, with large clypeus (=epistome) at anterior margin (Fig. 3, *top*—ep). Clypeus broad, width more than twice height; lateral portions bulbous, with rounded anteriorly projecting tubercles, five tubercles largest on dorsal margin. Dorsal section of labrum present (Fig. 3, *top* and *middle*—la), apparently indurate, with pointed lateral extensions and flattened arclike insertion into labrum; labrum ventral portion apparently missing. Eyes (Fig. 4) well preserved with many rounded facets and ocelli, compressed along posterolateral margin of head, dorsal section bulbous connecting to thin sinuous lateral section, and continuing ventrally to small rounded lobe. Margin of head posterior to eyes and adjacent to anterior margin of pereionite 1 with sinuous row of nine to ten tubercles (Fig. 4, *top*).

Antennula (Fig. 3, *top* and *middle*—AI) inserting lateral to dorsal margin of clypeus; article 1 (AI^1) rectangular and somewhat flattened, at least in anteroventral plane; article 2 (AI^2) quadrate, approximately square, also somewhat flattened; article 3 (AI^3) thin, approximately half thickness of article 2, apparently cylindrical. Distal articles not preserved.

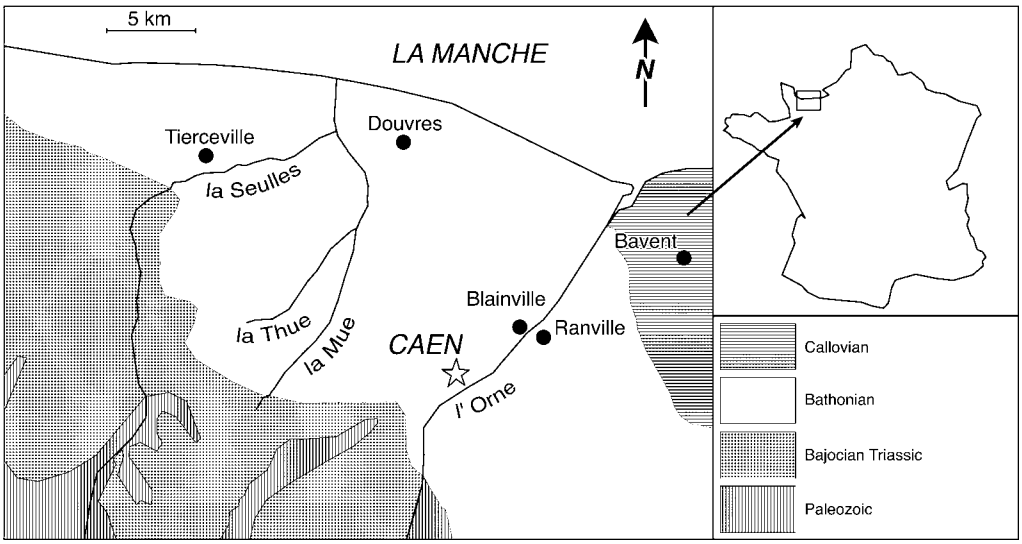

FIGURE *1*—Map of the Ranville area in northern France.

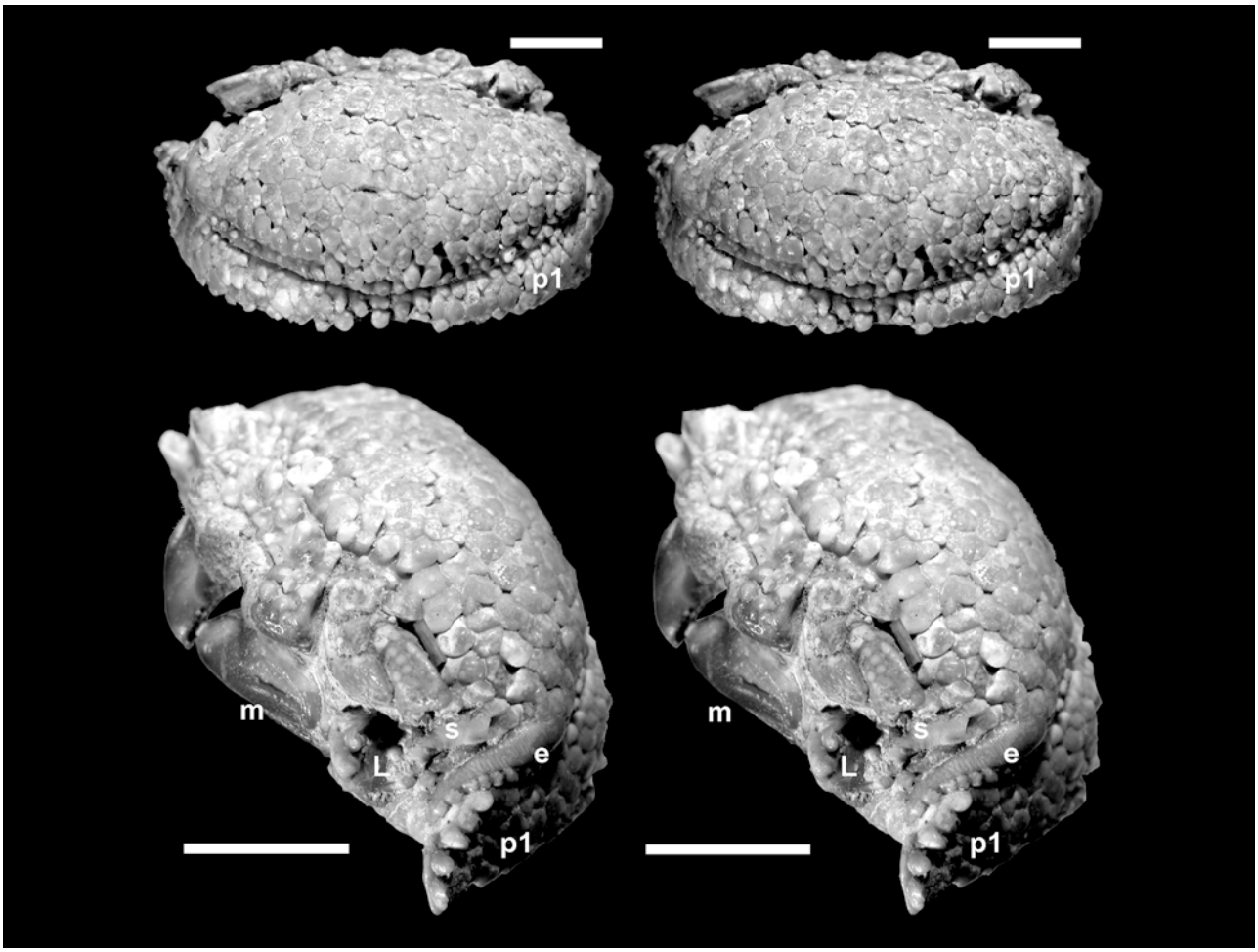

FIGURE *2*—*Reboursia ranvillensis* n. gen. and sp., holotype, R64095, stereo pairs. *Top,* Dorsal view. *Bottom,* Frontal oblique view. p1 = pereionite 1; m = mandible; L = lateral ornament; e = eye; s = serpulid tube. Scale bars 5 mm.

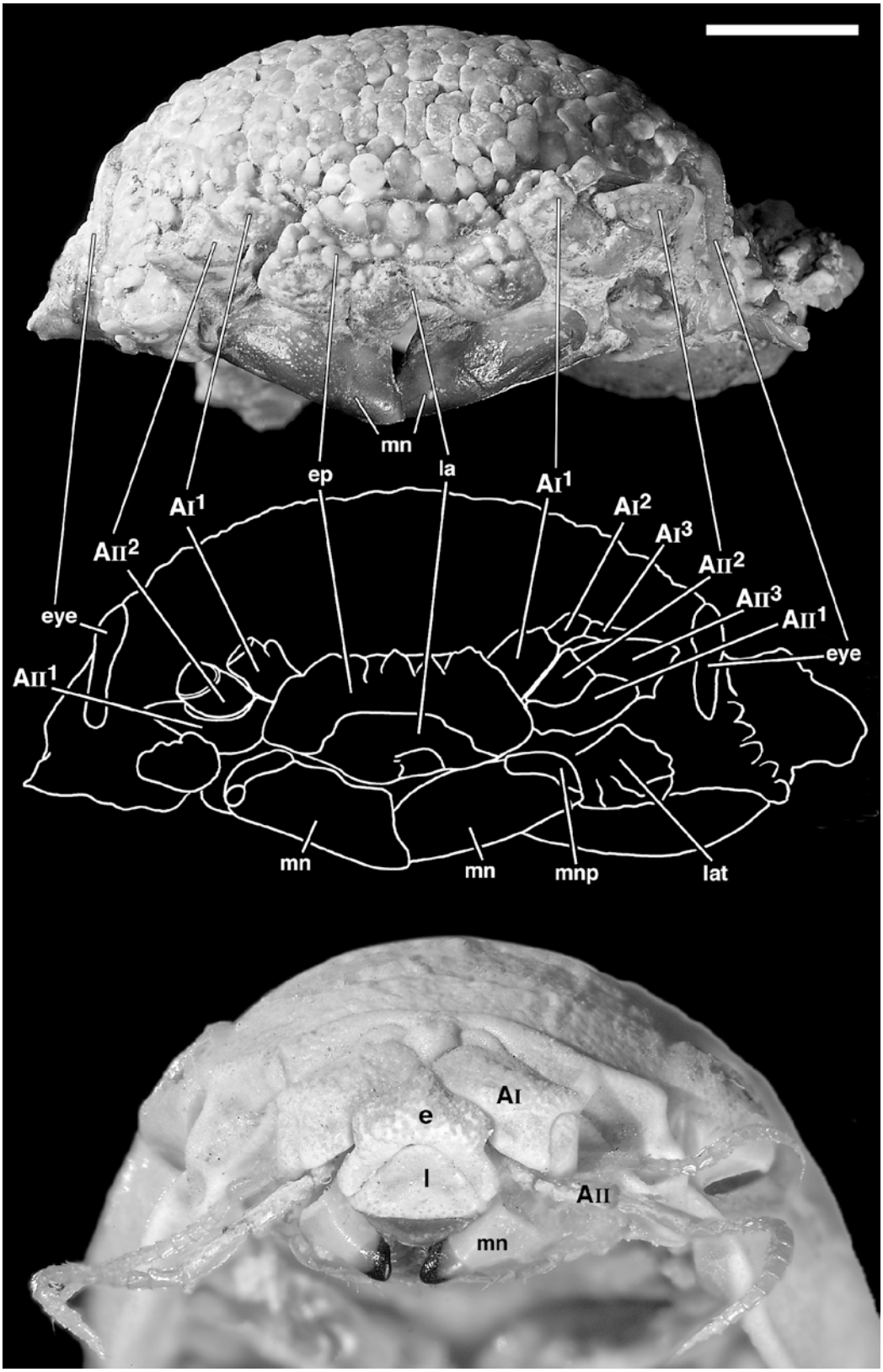

FIGURE 3—Anterior views of sphaeromatoid heads. *Top, Reboursia ranvillensis* n. gen. and sp., scale bar 5 mm. *Middle,* Outline camera lucida drawing of holotype. *Bottom,* View of *Cymodoce* sp. AI $^{1–3}$ = basal articles of antennule; AII $^{1–3}$ = basal articles of antenna; ep = epistome (or clypeus); eye = compound eye; lat = lateral ornament; la = labrum; mn = mandible; mnp = mandibular palp.

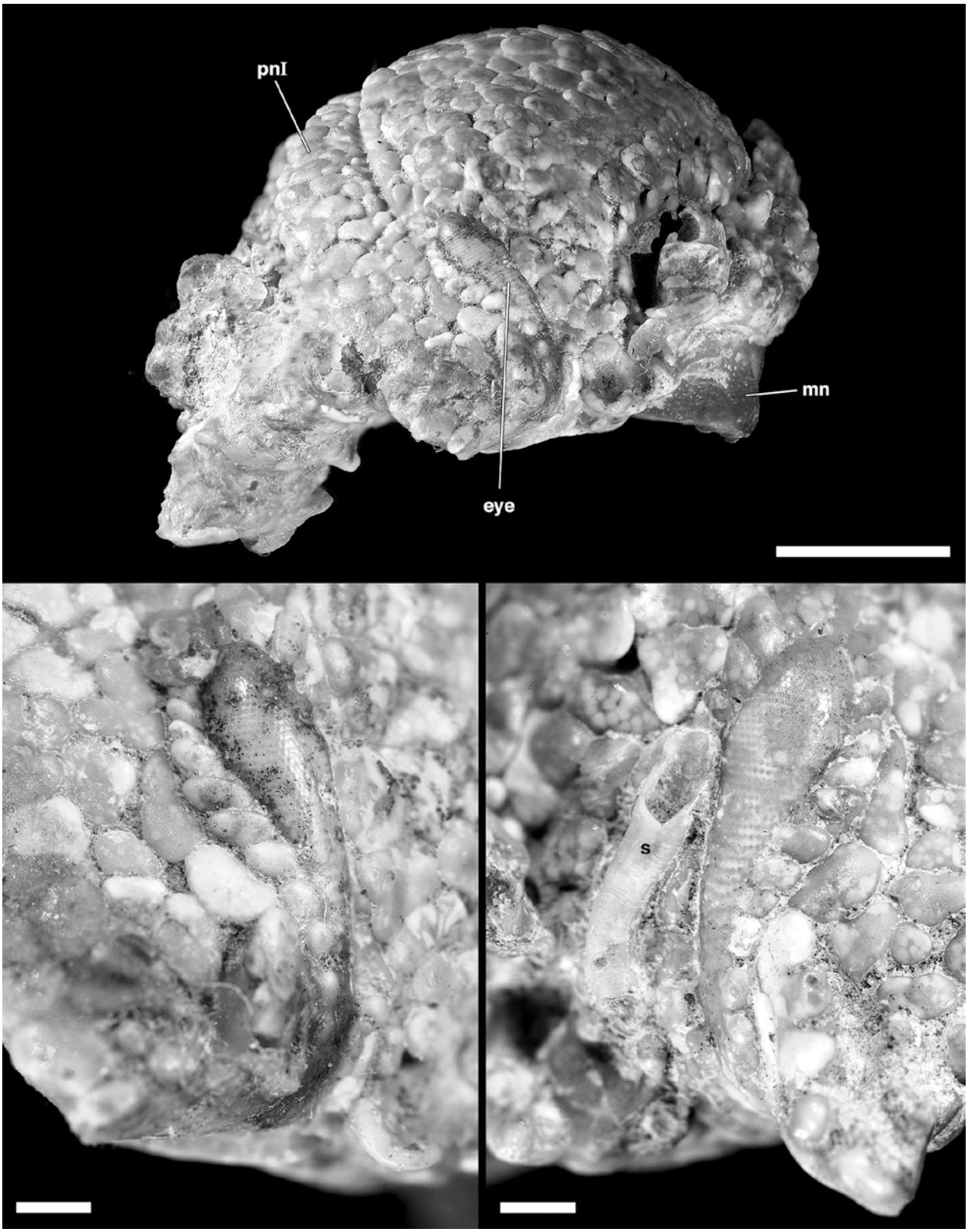

FIGURE 4—Lateral views of *Reboursia ranvillensis* n. gen. and sp. *Top*, Lateral view of whole specimen, scale bar 4 mm. *Bottom right*, Left compound eye showing ommatidial units and adjacent to a serpulid (?) worm tube, scale bar 1 mm; *bottom left*, right eye showing rounded ommatidia, scale bar 1 mm. eye = compound eye; mn = mandible; pnI = first pereionite; s = serpulid worm tube. Scale bars 10 mm.

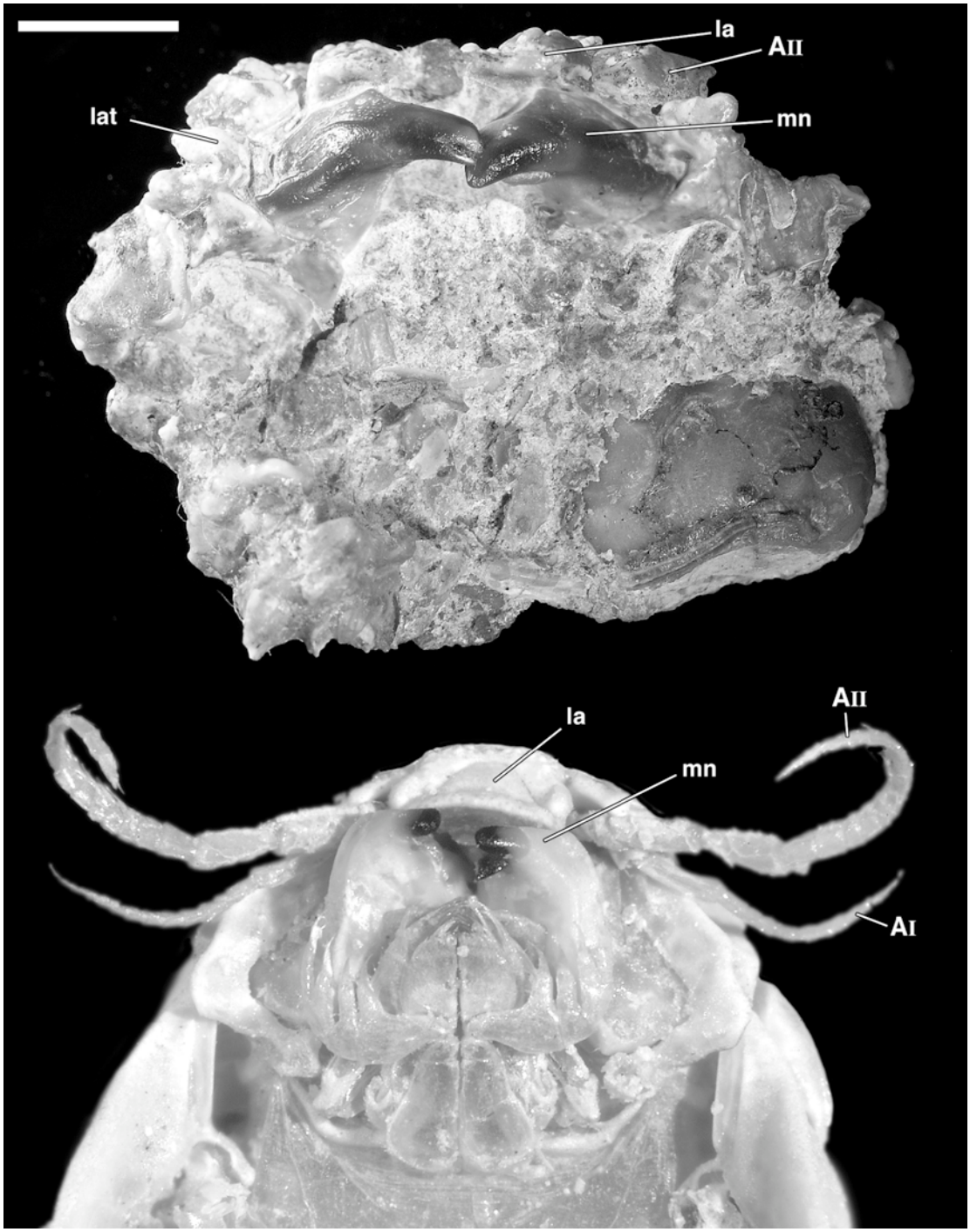

FIGURE 5—Ventral views of sphaeromatoid heads. *Top*, *Reboursia ranvillensis* n. gen. and sp., scale bar 10 mm. *Bottom*, *Cymodoce* sp. Ai = antennule; Aii = antenna; la = labrum; lat = lateral ornament; mn = mandible.

Antenna (Fig. 3, *top* and *middle*—AII) inserting directly ventral to antennulae; basal articles 1–3 on left side approximately 5 mm long, not ringlike; anterior surfaces smooth and shiny, not tuberculate. Article 1 (AII^1) basally short, approximately half length of article 2, with arclike ventrodistal projection forming truncate plate extending to distal margin of article 2. Article 2 (AII^2) robust, apparently rounded in cross section, approximately one-half length of article 3. Article 3 (AII^3) broadening and flattening distally. Protopodal scale absent. Distal articles not preserved.

Mandible (Fig. 3, *top* and 5, *top*—mn) robust, hardened, brownish-colored, with three elongate indentations in external surface, dorsally two grooves forming ''V'' shape, and ventral shelflike groove extending to posterolateral margin of mandible body. Incisor process blunt, lacking cusps. Lacinia mobilis and

spine row absent on both sides; molar process either absent or buried in matrix. Palp present (Fig. 3 *top* and *middle*—mnp), inserting at lateral end of ventral groove of mandible; end of left articles 1–2 and right article 1 preserved; article 3 not preserved.

Pereionite 1 (Fig. 4, *top*—pnI) length on lateral margin 4–5 mm (may be incomplete), with five large tubercles extending laterally to eyes.

Maxillae, maxilliped, and pereiopod I not preserved (Fig. 5).

Posterior parts of body and sex unknown. Length (measured from anterior margin of pereionite 1 to posterior margin of clypeus) in dorsal view 12 mm; width (measured between eyes) 22 mm.

Etymology.—Species named for the locality at Ranville, Normandy, France.

Type.—Holotype, uncompressed head fragment with part of pereionite 1, deposited in the Muséum National d'Histoire Naturelle, Paris, Département Histoire de la Terre (Paléontologie), cat. no. R64095. Collected by T. Rebours and F. Hébert, 11 May 2002. No other specimens known.

Occurrence.—Ranville quarry, Normandy (Calvados), France, Jurassic. The Ranville quarry, still active, is situated in Normandy near the city of Caen on the right bank of the Orne River.

Discussion.—A small worm tube (serpulid-like?) lies adjacent to left eye (Fig. 4, *bottom right*). The underside of impression preserves unknown jumbled shell and arthropod fragments (Fig. 5, *top*) and when compared to a partially dissected specimen of the modern genus *Cymodoce* Leach, 1814 (Fig. 5, *bottom*) reveals similarities between the fossil and a modern sphaeromatoid isopod.

AFFINITIES

For the higher classification of isopods, we follow Martin and Davis (2001) in recognizing the suborder Flabellifera, but as a more inclusive taxon as indicated by the analyses of Wägele (1989) and Brusca and Wilson (1991), and as recognized by Wilson (1998, 2003). This classification uses the superfamilies of Poore (2002), but with the suborders of Wägele (1989), i.e., Cymothoida and Sphaeromatida, changed to superfamilies. *Reboursia ranvillensis* n. gen. and sp. is clearly a sphaeromatoid (cf. Fig. 4, *bottom*), but it cannot be assigned to any of the families in this group because our specimen lacks the posterior part of the body. Other families incorporated in this group, in addition to Sphaeromatidae Latreille, 1825, include the modern taxa Ancinidae Dana, 1853 and Tecticepitidae Iverson, 1982, and the monotypic fossil family Schweglerellidae Brandt, Crame, Polz, and Thompson, 1999. Fossil genera assigned to the Sphaeromatidae by Brandt et al. (1999) include *Cyclosphaeroma* Woodward, 1890, *Protosphaeroma* Bachmayer, 1949 (see also Bachmayer, 1955), *Isopodites* von Ammon, 1882, and *Triassphaeroma* Basso and Tintori, 1995. *Reboursia* n. gen. shares a deep foreshortened head with *Protosphaeroma* and *Cyclosphaeroma*. *Cyclosphaeroma woodwardi* van Straelen, 1928 (recently refigured by Ross and Vannier, 2002) also has the same peculiar cuticular detail and the trilobation of the head. *Cyclosphaeroma uhligi* (Remes, 1903a, 1903b) has an elongate oval eye with a vertical major axis (Remes, 1903b), which is reminiscent of the peculiar eye of *Reboursia* (Fig. 4). This fossil is unlike *Triassphaeroma*, which has a more anterolaterally angular head. The latter genus will almost certainly require further analysis and reclassification. N. L. Bruce (personal commun., 2002) observed that ''*Triassphaeroma magnificum* [Basso and Tintori, 1995: text-fig. 1] is close to *Metacirolana* or *Colopisthus*;'' i.e., a cirolanid-like isopod, not a sphaeromatoid.

As suggested above, several features argue for *R. ranvillensis* being included in the superfamily Sphaeromatoidea. Certainly the lateral eyes placed at the posterior margin of the head and the deep domed head embedded in pereionite 1 are easily recognized features of sphaeromatoids, and are unlike most other isopods (the plesiomorphic state of which can be seen in various Phreatoicidea, e.g., see Wilson and Keable, 1999, 2002). The clypeus, or epistome, and labrum of *Reboursia* show a sphaeromatoid form (Figs. 3–5), being flattened, indurate, and with decoration that is unlike most other flabelliferans. Although the face is not well described for most taxa, a dissection of *Cymodoce* sp. (large specimen from Tasmania, from AM P 41359) (Figs. 3 and 5, *bottom*) shows features that resemble *Reboursia*. The genus *Cymodoce* has the domed head and the flattened clypeus and a labrum divided into two parts (Fig. 3): a hardened dorsal part and a soft flexible ventral section in direct contact with the mandibles. This soft part may be missing in *Reboursia*. The insertion of the mandible into the head of *Reboursia* also is like that of sphaeromatoids (Figs. 3, 5). In most isopods, the mandible inserts into the head without a lateral projection. Because the head of sphaeromatoids has been foreshortened and surrounded by pereonite 1, the more posterior mouth parts (maxillae and maxillipeds) insert medially (Fig. 5, *bottom*), and the mandibular insertion becomes part of the posterolateral margin of the head, along with the eyes. At the posteroventral margin of the head, the mandibular insertion is strengthened laterally, with a distinct projection that can be seen in both *Cymodoce* and *Reboursia* (Fig. 3—lat; Fig. 5, *top*—lat). In the latter, the projection is embellished with three to four tubercles that project laterally, similar to the lateral tubercles of pereionite 1. On the ventral side, the posterior part of the mandibular insertion is a flattened plate having a distinct condylar articulation on the posterior margin of the mandible (Fig. 5—po). This region of the head in other isopods is lateral and external to the mouthparts, but because of the transformation of the sphaeromatoid head, the posterior articulation of the mandibles is fully ventral. At this point, the interpretation of the *Reboursia* mandibular articulation is somewhat uncertain, because the moderately indented margin for the mandibular articulation (Fig. 5) is unlike that of *Cymodoce*, which has a distinctly projecting condyle as in other isopods. However, if the posterior condyle of *Reboursia* is embedded in matrix at the medial margin of the ventral surface of the head, then its mandible is rotated ventrally considerably more than in *Cymodoce*. This rotation, if real, would result in the molar region being buried in the rock matrix, thus not permitting a definitive statement regarding the form of the molar process. Such a position for the molar processes would be unusual because they would be directly behind the labrum, whereas in most isopods only the incisor processes lie posterior to the labrum.

We believe one should be cautious, however, when attempting to classify *Reboursia*, or other similar fossils, within modern taxa. The anterior head and mandibles of *Reboursia* show features that are not seen among modern sphaeromatoids and are not documented clearly in any of the existing fossils, which are mostly body fossils. No Jurassic or Triassic fossil taxa exhibit details that might allow assigning them to a modern family in the Sphaeromatoidea, as was done by Brandt et al. (1999); at least one of the fossils so classified probably should be classified elsewhere (see above). Although the clypeus and labrum of *Reboursia* exhibit a sphaeromatoid shape, it has a broad separation between the antennular basal articles. In most modern taxa, the bases of the antennulae nearly touch (Fig. 3, *bottom*), although a few taxa have a cephalic projection that extends between them, e.g., *Bregmotypta* Bruce, 1994, but are unlike *Reboursia*. The broad frontal region of the *Reboursia* head is similar to that seen in the Oniscidea, but the antennulae are clearly dorsal to the antennae, rather than the medial position of the terrestrial isopods. In addition, the entire mouth field of *Reboursia* is rotated anteriorly so that the clypeus is fully anterior (Figs. 3, 5), while the clypeus and labrum

of *Cymodoce* (Fig. 3, *bottom*) and other sphaeromatoids are somewhat more ventral, with the anteriormost part of the cephalon being the antennulae and the anterior margin of the head. In this regard, *Reboursia* is more plesiomorphic, more similar to basal isopods than to sphaeromatoids. Most, but not all, sphaeromatoids have an enlarged antennal article 1 (Fig. 3, *bottom*), while *Reboursia* has a more plesiomorphic configuration: article 1 of the antennule narrower than the more distal, tubular articles 2 and 3 as well as the basal article of the antenna (Fig. 3, *middle*). *Reboursia* has an enlarged antennal article 1 that has a large ventrolateral quadrate projection, which is unusual for most but not all sphaeromatoids. The eyes of *Reboursia* are highly compressed on the longitudinal axis and curve beneath the head. While modern sphaeromatids may have a view of the substrate, they obtain it by having large laterally projecting eyes (Fig. 3, *bottom*—eye), not by using long, curved, ventral projections of the eye (Fig. 4, *bottom*).

As a result of these differences, and because the posterior parts of the body are missing, we are unable to substantively classify *Reboursia* into a family-level taxon of the Sphaeromatoidea. None of the features noted in Wieder and Feldmann's (1992) paleontological diagnosis of the Sphaeromatidae are available in this single specimen of *Reboursia*. Creating another monotypic family in the superfamily does not seem warranted, but further study of known fossils may reveal evidence that could support the creation of a new family containing several of these taxa.

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