AN URDIDID ISOPOD FROM THE LOWER CRETACEOUS OF SOUTH-EAST ALEXANDER ISLAND

By BRIAN J. TAYLOR

ABSTRACT. An Aptian urdidid isopod with a well-preserved pleotelson from a locality near Fossil Bluff, south-east Alexander Island, represents the first *Urda* outside Europe and only the fourth fossil isopod occurrence in the Southern Hemisphere. The specimen is similar to *Urda cretacea* Stolley (Upper Aptian–Lower Albian), which was destroyed during World War II. The Urdidae probably represent ancestral cirolanids from which extant gnathiids were derived.

BECAUSE of their small size (usually less than 30 mm. long) and delicate structure, isopods seldom occur as fossils, although some may have been inadvertently overlooked either in the field or in museum collections. As many of the known fossil isopods were discovered and described during the latter half of the nineteenth century (Kunth, 1870; Woodward, 1870, 1879, 1898; von Ammon, 1882; Carter, 1889), only a few have since been recorded. Several of these occur in Pleistocene peat bogs in Sweden and Lower Austria (Frey, 1964, p. 59). So far as the author is aware, the only other fossil isopods from the Southern Hemisphere are *Protamphisopus* [*Phreatoicus*] *wianamattensis* Chilton from the Triassic–Jurassic of Australia (Chilton, 1917), (?) *Palaega* from the Lower Cretaceous of Queensland (personal communication from R. R. Hessler) and the sphaeromid *Unusuropode castroi* Duarte and Santos from the Turonian of Brazil (Duarte and Santos, 1962).

Isopods are mainly herbivorous and all of the Mesozoic forms were aquatic, the earliest undoubted terrestrial isopod occurring in Baltic amber from the Upper Eocene or Lower Oligocene (van Straelen, 1928; Van Name, 1936).

Material from Alexander Island

The only isopod so far known from Alexander Island (and British Antarctic Territory) was collected from a dark grey siltstone of Aptian age at the northern end of locality G, due west of Fossil Bluff (Fig. 1). The specimen (KG.5.16) is small, elongate, dorso-ventrally compressed and partly sheared as the thorax underlies the cephalon. It was found in a marine sediment comprising terebratulids, *Rhabdocidaris*, *Inoceramus*, belemnite guards, *Entolium*, *Rotularia* and a mixed floral assemblage of cone scales and cycadophyte fronds. The abundant flora and occurrence of beach or offshore bar conglomerates at Fossil Bluff indicate the proximity of the locality to the postulated Lower Cretaceous shoreline.

Measurements

	Overall	*Cephalon*	*Thorax (or pereion)*	*Pleon (including pleotelson)*
Length (mm.)	18*	4	3*	11
Breadth (mm.)	5	5	5	6

* Incomplete measurements.

FAMILY URDIDAE KUNTH 1870

Genus *Urda* Münster 1840

Type species: *Urda rostrata* Münster

Urda cf. *cretacea* Stolley 1910

Description

The body, which is elongate and with sub-parallel sides, is divisible into three parts: a cephalon, thorax (or pereion) and an abdomen (or pleon). The cephalon, which appears to be as broad as the pleon, is feebly convex transversely and is defined posteriorly by a narrow punctate band. On the right side, part of the lateral margin is visible. Flattened medially, the

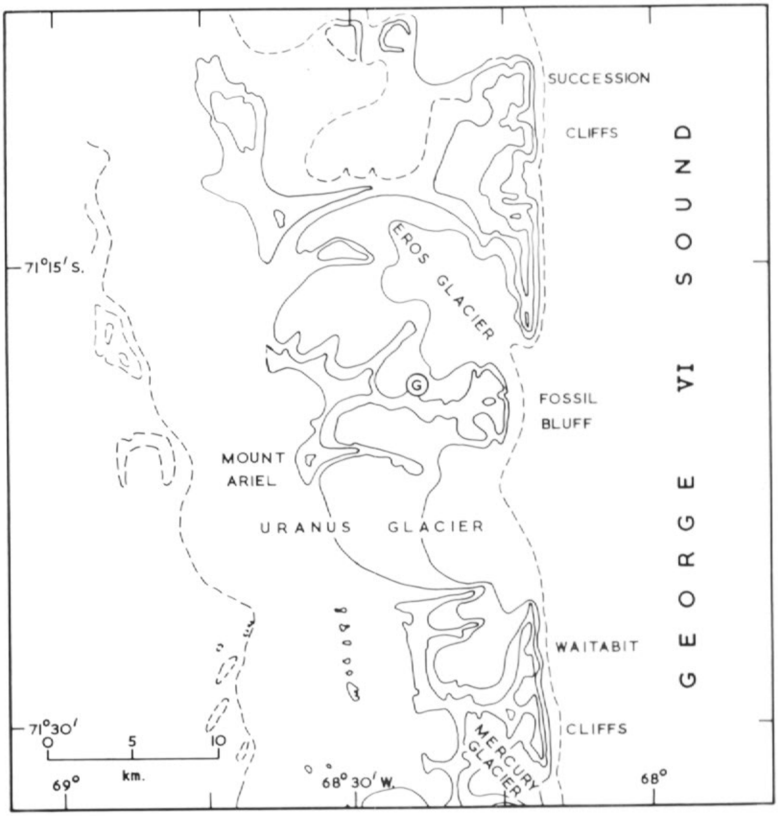

Fig. 1. Sketch map of Alexander Island showing the locality where the fossil isopod was collected.

cephalon is not fully exposed anteriorly and no eyes, mouth parts or appendages are seen. No ornament is preserved, although there are crescentic depressions which may or may not be original structures.

The cephalon, lying at an acute angle, appears to overlap much if not all of the pereion which is the most poorly preserved part of the whole specimen. However, it seems as though the pereionites were as wide transversely as the pleonites. Only one pereionite and some ornamentation are visible, the latter comprising punctae which appear to underlie tubercles on the cuticular surface.

The pleon, the best preserved part of the carapace, comprises five imbricately arranged and equal-sized pleonites together with a large emarginate pleotelson. The pleonites are relatively flat transversely but inclined obliquely backwards and downwards towards the lateral margins and the epimeres. On the left side of the specimen near the first pleonite is a stout pleopod composed of at least four joints, the terminal one being elongated, obtusely rounded and proportionately much larger than the others. This terminal joint, if it is part of the same appendage and not a dissociated part of the exoskeleton, resembles the chela of several isopod species. The pleopod is bent towards the cephalon. The pleonites appear to have been tuberculate.

The pleotelson, which is slightly broader than the pleonites, is subquadrate and bounded by a 1 mm. wide punctate and finely denticulate margin. The removal of some of the cuticle (Fig. 3; lower right) has fortuitously exposed the ventral side of the pleotelson together with a biramous lamellar uropod comprising two caudal cerci 2·5 and 3 mm. long, respectively, the outermost being the shorter of the two. These cerci, which appear to be finely denticulate laterally, must have moved mesially to occupy an entirely ventral position. Adhesive partly obscures their articulating joints.

Antero-dorsally, the pleotelson is ornamented by irregular depressions which seem to be joined to one another by ridges or wrinkles, whereas postero-ventrally the surface is punctate. The punctae, approximately 0·07 mm. in diameter, are randomly arranged and may have been inclined to the cuticular surface as they are deeper anteriorly. They may correspond to what Van Name (1936, p. 11) referred to as "very minute pores".

As their function is unlikely to have been purely ornamental, they probably represent the locations of gland or setal ducts which may have been occupied by tactile hairs. In several species of modern terrestrial isopod, numbers of "pits" inclined at about 60° to the surface and only 0·007 mm. in diameter have been interpreted as sense organs of a specialized kind (Jans and Ross, 1963, p. 347). Unfortunately, it has not been possible to examine the cuticle of the fossil isopod in thin section.

Remarks

Because the exact number of pereionites in Fig. 2 (and therefore the true dimensions) are not known and only one appendage is preserved, the specimen could either be regarded as a

Fig. 2. *Urda* cf. *cretacea* Stolley from south-east Alexander Island, showing the principal sub-divisions of the body, the inclination and posterior margin of the cephalon (A), the pleopod (B), the anterior margin of the pleon (C), the notation of the pleonites (1–5) and the medio-ventral position of the cerci (D). The apex of the pleon is incomplete and therefore appears to be retuse; approx. × 7.

Fig. 3. A coated latex mould of part of the pleon and the ventral side of the pleotelson, showing the punctae on both the caudal cerci and the lateral and posterior margins of the pleotelson; × 13.

stomatopod or an isopod. It is not unlike some Cretaceous stomatopods such as *Sculda* and *Pseudosculda* which are similar in size. However, stomatopods are usually much longer (normally 38–340 mm.) than isopods (usually less than 30 mm.), the first five thoracopods are sub-chelate (von Zittel, 1913, p. 768) and the uropods are much more robust and often extend some distance below the pleotelson, as in *Sculda spinosa*. The pleon of many stomatopods is also longer and the cephalon is wider than the thorax. Because much of the thorax (Fig. 2) is buried under the cephalon, overall size is not a reliable criterion in this instance, although both the author and Professor F. Bachmayer (Naturhistorisches Museum, Wien), who examined Fig. 2, are agreed that the specimen is an isopod.

Comparison with Palaega

Professor Bachmayer (personal communication) has suggested that the Antarctic isopod either belongs to the cirolanid *Palaega* (the commonest isopod genus in the Cretaceous of Europe and North America (Roger, 1953)) or to a related genus. The arrangement of the specimen's cerci, the finely denticulate margins of the cerci and the pleotelson, and the punctate ornament, certainly compare with some forms of *Palaega*, notably *P. scrobiculata* von Ammon from the Upper Oligocene of Austria (von Ammon, 1882) and *P. guadalupensis* and *P. williamsonensis* from the Upper Cretaceous of Texas (Rathbun, 1935).

The two Texan species are represented mainly by abdominal fragments showing the characteristic finely punctate ornament. Both pleons are proportionately wider than that of the

Antarctic isopod and *P. guadalupensis* has a well-rounded carinate and mucronate pleotelson (Rathbun, 1935, p. 59, pl. 12, figs. 3 and 4). However, the carina* in *P. williamsonensis* is considered an artefact. Although there is therefore an overall similarity between specimen KG.5.16 and the palaegids, the absence of a keel, the more subquadrate pleotelson and more elongate shape suggest that it is more akin to *Urda*.

Comparison with the Urdidae

Urda, a mainly Jurassic isopod, was first described from the Portlandian Lithographic Limestone of Solenhofen, Bavaria (Münster, 1840). The only Cretaceous species so far known is *U. cretacea* Stolley from the Acanthohopliten Clay (Upper Aptian–Lower Albian) of Hannover (Stolley, 1910, pl. VI, figs, 2, 2a, 3, 3a, 4 and 4a).

The isopod from Alexander Island is similar in shape, size and relative proportions to the Jurassic Urdidae, particularly *U. rostrata*. Although the pleotelson of *U. rostrata* is large and subquadrate, the apex is retuse, the margin is probably entire rather than emarginate and the postero-lateral angles are less well-rounded than those of the Alexander Island specimen. Moreover, the pereionites are broader longitudinally, the cerci are spatulate rather than elongate and large elongate eyes extend along the cephalic flanks (Kunth, 1870, pl. XVIII, figs. I–II). The ornament of the pleotelson of *U. rostrata* was not described by Kunth. The pleotelson of *Urda punctata* is not preserved but its shape and size are assumed to be similar to those of *U. rostrata* (Kunth, 1870, pl. XVIII, fig. III).

Urda liasica Frentzen (Lower Pliensbachian), which is also incomplete, differs from the Antarctic specimen in having only four equidimensional pleonites and an acutely terminated pleotelson with a median linguiform protuberance at the anterior end. It also has a straight and feebly indented transverse furrow near the posterior pleonite (Frentzen, 1937, fig. 1b).

Like *U. liasica*, *U. moravica* from the Bathonian of Czechoslovakia is composed of three pereionites but there are five pleonites and a subquadrate pleotelson with a retuse apex (Remes, 1912, fig. 4). The tubercles on the pereion, pleon and pleotelson are arranged in rows rather than randomly as in specimen KG.5.16.

Urda cretacea, which is almost twice as large as the Antarctic isopod, comprises three specimens. At least two of them have well-preserved cephalons and thoraces, whereas the only pleotelson is poorly preserved and has no uropods. Because of these differences in preservation, only the respective abdomens of specimen KG.5.16 and *U. cretacea* can be compared.

The abdomen of *U. cretacea* is similar to that of the Antarctic isopod in being punctate and possessing five pleonites, i.e. one less than *U. rostrata* (Stolley, 1910, p. 214). The pleotelson is comparable in overall shape but the margin may either have been entire as in *U. rostrata* (Stolley, 1910, p. 213) or only denticulate apically.

While there is an overall similarity between *U. cretacea* and specimen KG.5.16, the poor preservation of the cephalon and thorax of the Antarctic isopod, and the poor preservation and absence of uropods in *U. cretacea*, prevents a direct comparison from being made. Unfortunately, it has not been possible to re-examine the type specimens of *U. cretacea* as these were destroyed during World War II (personal communication from E. Engel). Nevertheless, there seems little doubt that the Antarctic isopod was closely allied if not conspecific with this species. It is interesting that *Urda* has not previously been recorded outside Europe.

Without knowing the form of the isopod's eyes and mouth parts, it is difficult to determine whether the Alexander Island isopod was predaceous, omnivorous or herbivorous. However, the relatively strong abdominal limb which is preserved suggests that the specimen was a vagrant benthonic form. The cylindrical shape of the cerci suggests that these may have had an ambulatory function.

Affinities of the Urdidae

Whereas many fossil isopods are thought to closely resemble living forms (*Proidotea* from the Oligocene of Rumania has been compared with *Mesidotea*, a genus in the Valvifera (von

* A longitudinal keel bisecting the pleotelson was regarded by Woodward (in his original diagnosis) as a diagnostic feature of *Palaega* (Woodward, 1870, pl. XXII, figs. 3, 4 and 6).

Zittel, 1913, p. 758)), other fossil isopods may have no living counterparts. The Urdidae may be in the latter category.

Both Kunth (1870) and von Ammon (1882) regarded the Urdidae as a *Mischtypus* with some of the characters of the Cymothoidea (sub-tribe Cirolanoidea of Menzies (1962*b*)) and others of typical male Anceidae or Gnathiidea.

Subsequently, Stolley (1910, p. 215) considered that the Urdidae could not be compared with any known genera because there were insufficient diagnostic features, but he suggested that the Urdidae were probably very different from any extant family.

More recently, Monod (1926, p. 640), mainly on the basis of the large eyes, segmentation and non-imbricate junction of the pleotelson with the pleon, suggested that *Urda* was more like a cymothoid (some of which have subquadrate pleotelsons and projecting labrums, e.g. *Rocinela cubensis* Richardson; Richardson, 1905, p. 197, figs. 183 and 184) than a gnathiid, which have smaller pleons and less well-developed and usually more linguiform labrums. Moreover, he maintained that the living form *Gnatholana mandibularis* Barnard (Barnard, 1920) with its projecting trapeziform labrum and pincer-like mandibles (a unique association amongst the Flabellifera) was an urdidid. Menzies (1962*a*) likewise thought that the nearest living relative to *Urda* was probably *Gnatholana* and that the Gnathiidea (highly specialized fish parasites) were derived from a cirolanid-like ancestor resembling *Urda*.

Although it has been suggested that the mandibles of *Urda* are not comparable with those of *Gnatholana* because they may represent peraeal claws pushed forward by fossilization (Barnard, 1940, p. 391), their almost invariable occurrence in the *same* pre-oral location suggests that they are in life position. Nevertheless, *G. mandibularis* is quite different from *Urda* in other respects, notably the relatively small eyes (a characteristic feature of most Gnathiidea), lozenge-shaped head, triangular pleotelson and globular cerci, and both Barnard (1940, p. 391) and Professor Monod (personal communication) have since suggested that *Gnatholana* and the Urdidae are probably not related.

Because so few Urdidae are preserved and several of them (including the Antarctic one) are incomplete, it is difficult to evaluate the merits of these opposing views, although on balance the Urdidae appear to have more in common with the cirolanids than the gnathiids. Certainly, the few species known to date suggest that the family evolved in Europe during the Jurassic and that some forms (together with perhaps closely related genera such as *Palaega*) may have become more cosmopolitan in the Cretaceous.

It is evident that within the genus *Urda* there was some variability, particularly with respect to the number and size of the pereionites, the number of pleonites, the ornamentation and overall shape of the pleotelson, the shape of the cerci and the presence or absence (possibly in *U. punctata*) of mandibles. If *Urda* does represent an ancestral type of cirolanid with some gnathiid affinities, those with mandibles probably represent males.

ACKNOWLEDGEMENTS

The field work was carried out between 1961 and 1963 from the British Antarctic Survey field station at Fossil Bluff with the willing co-operation of my colleagues to whom I am greatly indebted. I also wish to thank Professor F. W. Shotton for facilities in the Department of Geology, University of Birmingham, and Dr. R. J. Adie for guidance in preparing the paper. The work has benefited from correspondence with Professor T. Monod (Muséum National d'Histoire Naturelle, Paris). Mr. L. W. Vaughan assisted in preparing Fig. 2.

MS. received 14 September 1970

REFERENCES

AMMON, L. VON. 1882. Ein Beitrag zur Kenntniss der vorweltlichen Asseln. *Sber. bayer. Akad. Wiss.*, **12**, 507–50.

BARNARD, K. H. 1920. Contributions to the crustacean fauna of South Africa. *Ann. S. Afr. Mus.*, **17**, Pt. 5, 319–438.

———. 1940. Contributions to the crustacean fauna of South Africa. XII. Further additions to the Tanaidacea, Isopoda, and Amphipoda, together with keys for the identification of the hitherto recorded marine and fresh-water species. *Ann. S. Afr. Mus.*, **32**, Pt. 5, 381–543.

CARTER, J. 1889. On fossil isopods, with a description of a new species. *Geol. Mag.*, N.S., Decade 3, **6**, No. 5, 193–96.

CHILTON, C. 1917. A fossil isopod belonging to the fresh-water genus *Phreatoicus*. *J. Proc. R. Soc. N.S.W.*, **51**, 365–88.

DUARTE, L. *and* R. DA S. SANTOS. 1962. Fósseis do Arenito Açu. *Anais Acad. bras. Cienc.*, **34**, No. 1, 57–68.

FRENTZEN, K. 1937. Neue Funde von Isopoden (Asseln) im Lias Südwestdeutschlands. *Beitr. naturk. Forsch. SüdwDtl.*, **2**, Ht. 1, 100–03.

FREY, D. G. 1964. Remains of animals in Quaternary lake and bog sediments and their interpretation. (*In* ELSTER, H.-J. *and* W. OHLE, *ed.* Ergebnisse der Limnologie, Ht. 2. *Arch. Hydrobiol.*, Nr. 2, 1–114.)

JANS, D. E. *and* K. F. A. ROSS. 1963. A histological study of the peripheral receptors in the thorax of land isopods, with special reference to the location of possible hygroreceptors. *Q. Jl microsc. Sci.*, **104**, Pt. 3, 337–50.

KUNTH, A. 1870. Ueber wenig bekannte Crustaceen von Solenhofen. *Z. dt. geol. Ges.*, **22**, Ht. 4, 771–802.

MENZIES, R. J. 1962*a*. The isopods of abyssal depths in the Atlantic Ocean. (*In* BARNARD, J. L., MENZIES, R. J. *and* M. C. BĂCESCU. *Abyssal Crustacea*. New York and London, Columbia University Press, 79–206.) [Vema Research Series, No. 1.]

———. 1962*b*. The zoogeography, ecology, and systematics of the Chilean marine isopods. *Acta Univ. lund.*, N.S., Avd. 2, **57**, Nr. 11, 162 pp. [Reports of the Lund University Chile Expedition 1948–49, No. 42.]

MONOD, T. 1926. Les Gnathiidae: essai monographique (morphologie, biologie, systématique). *Mém. Soc. Sci. nat. phys. Maroc*, No. 13, 668 pp.

MÜNSTER, G. 1840. Ueber einige Isopoden in den Kalkschiefern von Bayern. *Beitr. Petrefactenkunde*, Pt. 3, 19–23.

NAME, W. G. VAN. 1936. The American land and fresh-water isopod Crustacea. *Bull. Am. Mus. nat. Hist.*, **71**, 1–535.

RATHBUN, M. J. 1935. Fossil Crustacea of the Atlantic and Gulf coastal plain. *Spec. Pap. geol. Soc. Am.*, No. 2, 160 pp.

REMEŠ, M. 1912. *Urda moravica* n. sp. z doggeru Chřibů. *Čas. morav. zemsk. Mus.*, **12**, 173–77.

RICHARDSON, H. 1905. A monograph on the isopods of North America. *Bull. U.S. natn. Mus.*, No. 54, 727 pp.

ROGER, J. 1953. Sous-classe des Malacostracés (Malacostraca Latreille 1806). (*In* PIVETEAU, J., *ed. Traité de paléontologie. Tome III. Les formes ultimes d'invertébrés: morphologie et évolution; Onychophores, Arthropodes, Échinodermes, Stomocordés.* Paris, Masson et Cie, 309–78.)

STOLLEY, E. 1910. Über zwei neue Isopoden aus norddeutschem Mesozoikum. *Jber. niedersächs. geol. Ver.*, **3**, 191–216.

STRAELEN, V. VAN. 1928. Contribution a l'étude des Isopodes méso- et cénozoïques. *Mém. Acad. r. Belg. Cl. Sci. 4°*, Sér. 2, **9**, Art. 5, 68 pp.

WOODWARD, H. 1870. Contributions to British fossil Crustacea. *Geol. Mag.*, **7**, No. 77, 493–97.

———. 1879. On the occurrence of *Branchipus* (or *Chirocephalus*) in a fossil state, associated with *Eosphæroma* and with numerous insect-remains, in the Eocene Freshwater (Bembridge) Limestone of Gurney Bay, Isle of Wight. *Q. Jl geol. Soc. Lond.*, **35**, No. 138, 342–50.

———. 1898. On the discovery of *Cyclosphæroma* in the Purbeck Beds of Aylesbury. *Geol. Mag.*, N.S., Decade 4, **5**, No. 9, 385–88.

ZITTEL, K. A. VON. 1913. *Text-book of paleontology. Vol. I.* 2nd revised edition. London, Macmillan and Co., Limited.