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Kensleylana briani, a new genus and species of freshwater cave-dwelling cirolanid (Crustacea: Isopoda) from Spain

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Abstract.—*Kensleylana briani*, new genus, new species, is described from freshwater in the karst caves of the Miravet Ravine, northern Spain. The monotypic genus is characterised by extreme reduction of the pleon, which has all pleonites fused to the pleotelson, with only one short suture marking the division between the pleon and the pleotelson. The genus and species is further characterised by the uropod peduncle being elongate, round in cross-section, extending to the posterior margin of the pleotelson and terminating in a single short stub-like ramus. The appendage morphology is otherwise similar to that of *Faucheria* Dollfus & Viré, 1905, a monotypic, freshwater, cave-dwelling genus known only from southern France.

The aquatic isopod fauna of Europe's caves is rich and diverse (Botosaneanu 1986), and the family Cirolanidae is represented by 13 species in five genera, as well as several subspecies. The three largest genera are *Sphaeromides* Dollfus, 1897, *Turcolana* Argano & Pesce, 1980, and *Typhlocirolana* Racovitza, 1905, each with five species in Europe. Eleven species have been described since 1980, a result of considerable collecting activity by speleologists and biologists. Seven species of cave-dwelling cirolanids, in two genera, are known from Spain (Botosaneanu 1986, Jaume & Garcia 1992, De Grave et al. 2003). This contribution records a further genus and species from caves at Ullal de la Rambla de Miravet, the same cave system from which a recently described cirolanid isopod, *Typhlocirolana troglobia* de Grave & Herrando-Pérez, 2003, is also known.

Material and Methods

The species description was prepared in DELTA (Descriptive Language for Taxonomy: Dallwitz et al. 1997) using a general cirolanid character set.

Type material, including permanently mounted microscope slides, has been deposited at the Museo Nacional de Ciencias Naturales, Madrid (MNCN), The Natural History Museum, London (BMNH) and Oxford University Museum of Natural History (OUMNH), UK.

Abbreviations.—CP—circumplumose; PMS—plumose marginal setae; RS—robust seta/setae.

Terminology.—In characterising some isopod families, much is made of the state of the dactylus of the anterior legs (e.g., Aegidae) or all legs (e.g., Cymothoidae), these being routinely termed 'prehensile'. The alternate state is usually termed 'ambulatory' (e.g., most Cirolanidae and Sphaeromatidae). The definition of that term is usually that the dactylus is longer than the propodus, and rarely refers to the degree of curvature. Most recently, the term prehensile was used by Brandt & Poore (2003), but in conjunction with 'strongly curved'. Bruce (1993) defined the term ''haptorial'' for the

state where the pereopod dactylus is clearly as long or longer that the propodus, grasping or clasping in action, but not strongly curved. That term is applied to the anterior pereopods of the new genus and species described here.

Site description.—The Miravet Ravine is in the Paraje del Desierto de las Palmas Nature Park, located to the south-east of the Iberian System, a mainly Mesozoic karst (limestone) cordillera that crosses the northern half of Spain in a northwest–southeast direction. This area is predominantly Triassic sandstone, with relatively abundant cretacic limestone in which numerous caves have developed, forty-five having being cataloged to date (Arenós 2000). The Ullal de la Rambla de Miravet is the only cave within the park known to have permanent water, which is subjected to partial drying and gradual fragmentation principally through the summer. This cave is 144 m above sea level and is in a typical *polje* ('large flat-floored closed karst depression'; see Anonymous 2002 for definitions), and consists of a 25.5 m deep pool bifurcating in a horizontal single gallery running perpendicular to the coastline, some 7 km distant. To date only 206 m of the horizontal gallery have been explored (Arenós 1997). The cave apparently has a rich aquatic crustacean fauna (see Herrando-Pérez et al. 2003).

Suborder Cymothoida Wägele, 1989
Family Cirolanidae Dana, 1852
Kensleylana, new genus

Type species.—*Kensleylana briani*, new species, here designated.

Diagnosis.—Head with rostral process. Frontal lamina anteriorly ovate, posteriorly stemmed; clypeus blade-like, medially projecting antero-ventrally. Pereopods 1–3 with ischium superior distal margins not produced, sparsely setose; merus anterodistal margin not produced, sparsely setose, not overriding propodus; pereopod 1 propodus robust, subchelate, dactylus haptorial; pereopods 2–7 dactylus slender, elongate [6.13(P1)–7.88(P7) times as long as proximal width]; pereopods 5–7 basis slender, without long PMS. Paired flat, rectilinear penial processes present. Pleon wholly fused to anterior margin of pleotelson; laterally indicated by single short, ventral suture; no visible dorsal segmentation. Pleopod 1 small, 0.7 times as long as pleopod 2, both rami narrow; pleopod 2 endopod 0.5 times as wide as exopod, appendix masculina basally inserted, curving laterally around the ramus, apex narrowly rounded. Pleopods 3–5 rami rounded, exopod with entire transverse suture, endopod less than half size of exopod; without PMS; pleopod 5 exopod with 1 PMS; peduncle 1–5 without coupling hooks. Uropod peduncle cylindrical, elongate, about 5 times as long as wide, extending beyond pleotelson posterior margin, with single terminal stub-like ramus.

Description of male.—Head narrow, deeply set into and approximately 52% as wide as pereonite 1, anterior margin not medially indented, with rostral point. Body about 1.7 times as long as greatest width, pereonites unornamented; pereonite 1 medially about 1.3 times as long as pereonite 2. Pleotelson 35% TL, strongly vaulted; posterior margin without PMS or RS.

Antennule peduncle articles collinear, not fused; articles 1–3 progressively increasing in length; flagellum longer than peduncle, without callynophore. Antenna peduncle comprised of 4 articles, peduncular article 1 shortest, articles 3 and 4 subequal in length, longest; flagellum as slightly shorter than peduncle.

Mandible incisors wide, right incisor tricuspidate; spine row with 7–9 RS; molar process shorter than incisor width. Maxillule mesial lobe with 3 slender, weakly CP RS. Maxilliped palp articles 3 and 4 each with mesial margin weakly lobed; lateral margins of articles 1, 2 and 4 without setae, 3 and 5 each with distal seta; endite with 1 or 2 coupling hooks.

Pereopods 1–3 dactylus with slender sec-

ondary unguis present. Pereopod 7 ischium and merus not flattened, distal margin not expanded.

Females.—No ovigerous females present in the material at hand. Non-ovigerous females similar to males.

Remarks.—The genus and species, known only from the type locality, is readily identified by the fusion of all pleonites to the pleotelson, giving the appearance that there is no pleon. The uropod morphology, one elongate cylindrically shaped peduncle with a minute terminal ramus, is also unique within the Cirolanidae.

Etymology.—Named in honor of the late Brian Kensley (19 April 1944–19 January 2004) who was to have been co-author of this contribution. The naming of this new genus and species recognises Brian, the person and the scientist, who made such a huge contribution to our knowledge of the isopod and decapod Crustacea.

Kensleylana briani, new species
Figs. 1–4

Material.—Holotype: female (4.2 mm), Ullal de la Rambla, Miravet, Miravet Ravine, 40°06.80′N, 00°03.67′E, March–April, 2003, coll. S. Herrando-Pérez (MNCN 20.04/5914).

Paratypes: male (2.5 mm), 5 females (4.0, 3.9 [dissected, NLB] 3.0, 2.8, 2.6 mm), same data as holotype (MNCN 20.04/5915; BMNH 2004.2659). Female (4.2 mm), same locality but collected in 2001 (OUMNH 2002.23.004). male, same data as holotype, but collected in baited trap, February 2004, (MNCN 20.04/5916).

Description.—Female: Body 2.3 times as long as greatest width, dorsal surfaces smooth, widest at pereonite 4, lateral margins subparallel. Pereonite 1 and coxae 2–3 each with posteroventral angle rounded; coxae 5–7 without oblique carina. Pleotelson 1.1 times as long as anterior width; lateral margins convex, smooth, posterior margin evenly rounded, without median point, without RS.

Antennule peduncle article 2 about (1.1) as long as article 1, article 3 1.3 times as long as article 2, 2.4 times as long as wide; articles 1 and 2 each with single anterodistal seta, article 3 with anterodistal cluster of 4 simple setae, one seta mid-length; flagellum with 8 articles, extending to middle of pereonite 1. Antenna peduncle article 3 1.4 times as long as wide, 1.3 times as long as article 2, inferior margin with 1 plumose seta, and 3 simple setae; article 4 1.2 times as long as article 3, 2.2 times as long as wide, inferior margin without pappose setae, anterodistal angle with 1 plumose seta, posterodistal angle with 5 simple and 1 plumose setae; flagellum with 7 articles, extending to posterior of pereonite 1.

Frontal lamina longer than greatest width, anterior margin rounded, without small median point; lateral margins concave.

Mandible molar process anterior margin with 6–7 flat teeth; without proximal cluster of long simple setae; spine row composed of 7 spines; palp article 2 with 6 biserrate distolateral setae and one distomesial seta, article 3 with 5 robust biserrate setae, distal seta longest. Maxillule lateral lobe with 9 RS, 3 of which are serrate. Maxilla lateral lobe with 2 long simple setae; middle lobe with 3 long simple setae; mesial lobe with 3 distal simple setae and 2 plumose setae. Maxilliped palp article 2 mesial margin with 2 slender setae, lateral margin distally without slender setae; article 3 mesial margin with 4 slender setae, lateral margin with 1 biserrate seta; article 4 mesial margin with 6 slender setae, lateral margin without slender setae; article 5 distal margin with 6 setae, 2 of which are serrate, lateral margin with 2 long simple setae; endite with 2 long CP setae and 2 short simple setae.

Pereopod 1 basis 2.9 times as long as greatest width, superior distal angle without setae; ischium 0.5 times as long as basis, inferior margin without setae, superior distal angle with 1 slender seta; merus inferior margin without molariform RS, superior distal angle with 2 slender setae; carpus in-

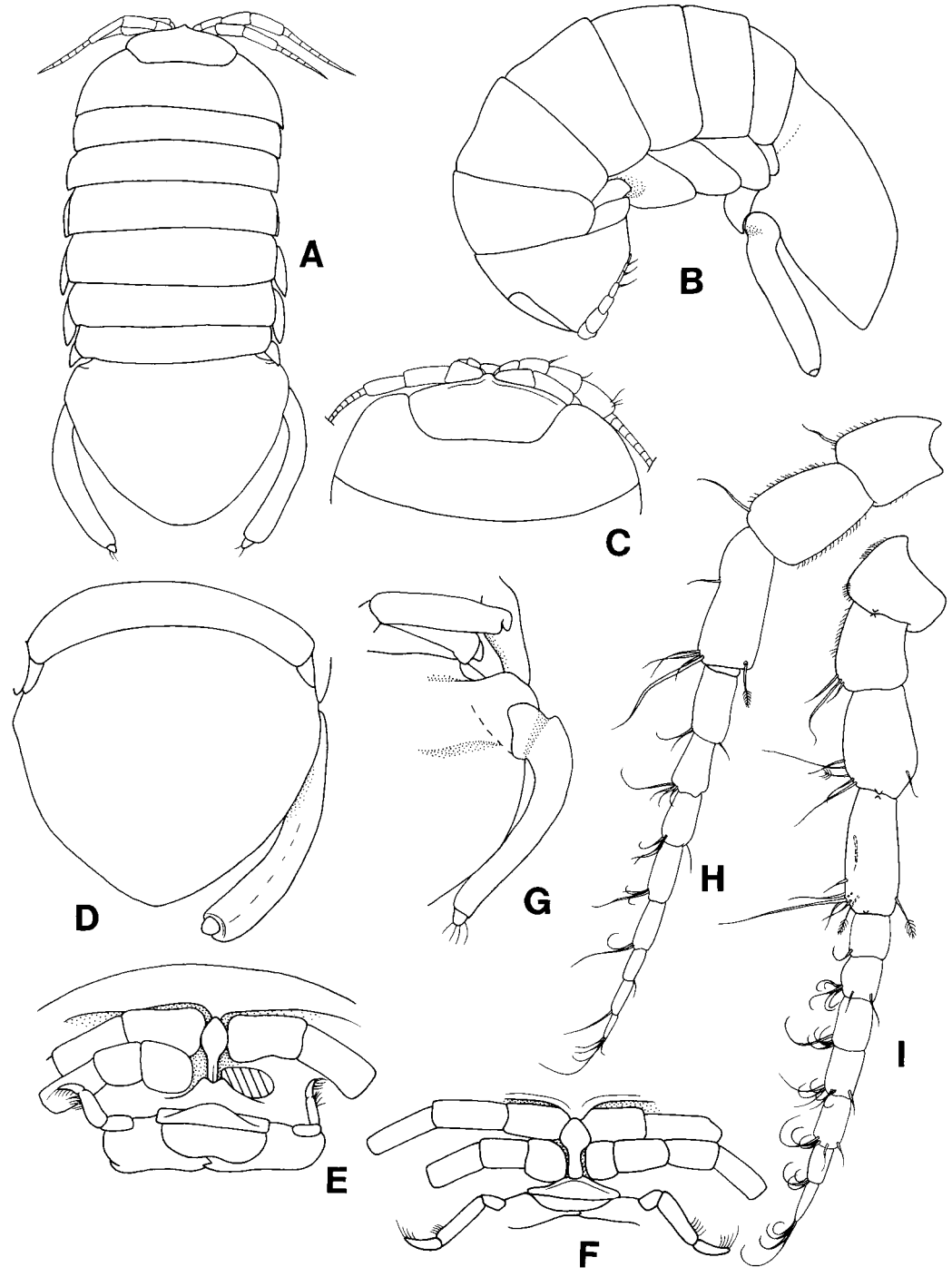

Fig. 1. *Kensleylana briani*. A, paratype MNCN 20.04/5916, B–E, holotype, remainder dissected paratype. A, dorsal view; B, lateral view; C, head, pereonite 1, dorsal view; D, pleotelson and uropod, dorsal view; E, frons (holotype); F, frons (paratype); G, posterior pereonites (showing basis of pereopods 6 and 7) and pleotelson, ventral view; H, antennule; I, antenna.

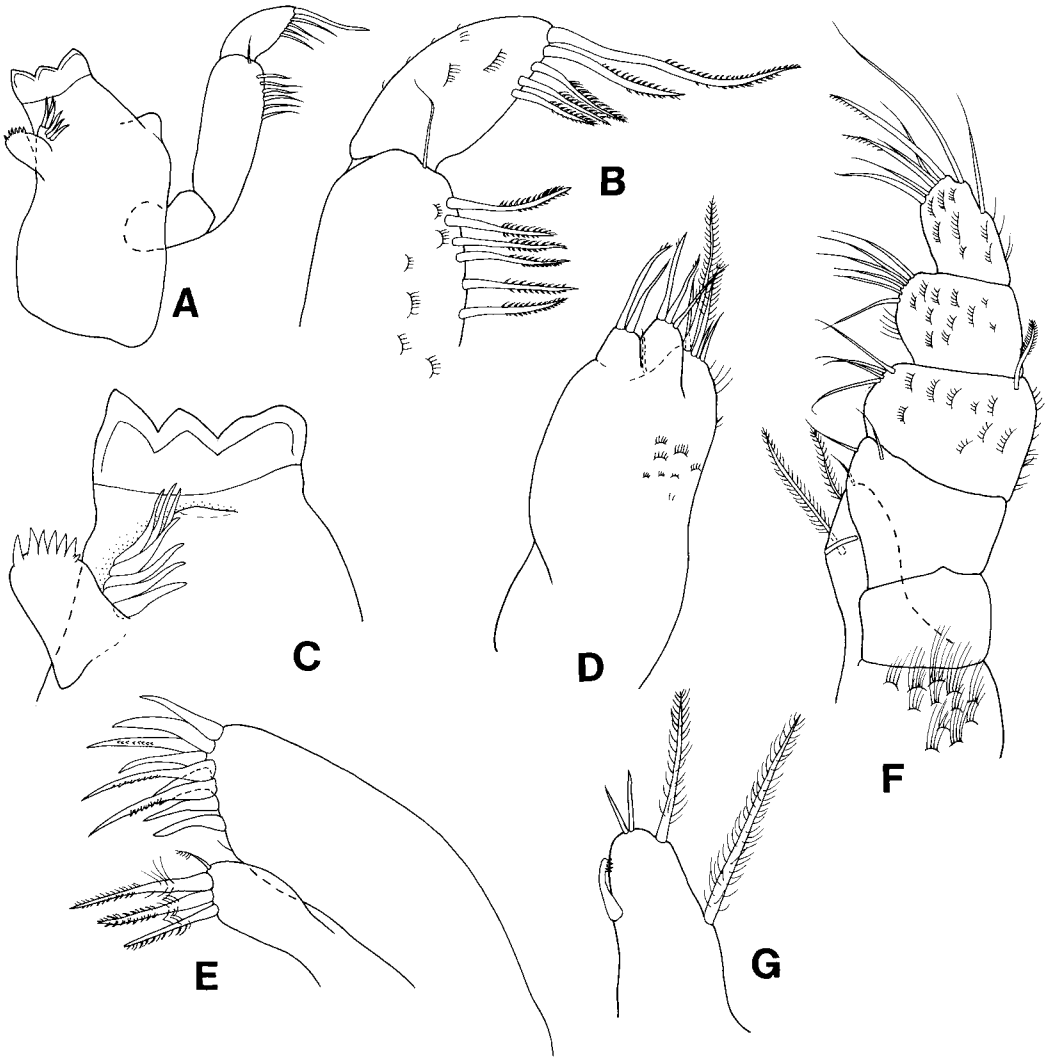

Fig. 2. *Kensleylana briani*. Paratype. A, mandible; B, mandibular palp, article 3; C, mandibular incisor and molar; D, maxilla; E, maxillule; F, maxilliped; G, maxilliped endite.

ferior margin with 1 distal robust seta and 1 slender seta; propodus 2.0 times as long as wide, inferior margin with 2 RS (1 midlength; 1 distal trilobed); dactylus as long as propodus, 1.7 times as long as inferior margin, extending to merus. Pereopod 2 similar to pereopod 1, but propodus slender, 2.8 times as long as wide. Pereopod 3 similar to pereopod 2. Pereopod 6 similar to pereopod 7. Pereopod 7 basis 5.2 times as long as greatest width, inferior margin without setae; ischium 0.7 as long as basis, inferior margin without RS, with 1 slender seta, superior distal angle with 1 RS, inferior distal angle with 2 RS; merus 0.5 as long as ischium, 1.9 times as long as wide, inferior margin without RS, superior distal angle with 2 RS, inferior distal angle with 3 RS; carpus 0.6 as long as ischium, 2.6 times as long as wide, inferior margin without RS, superior distal angle with 2 slender setae, inferior distal angle with 4 RS; pro-

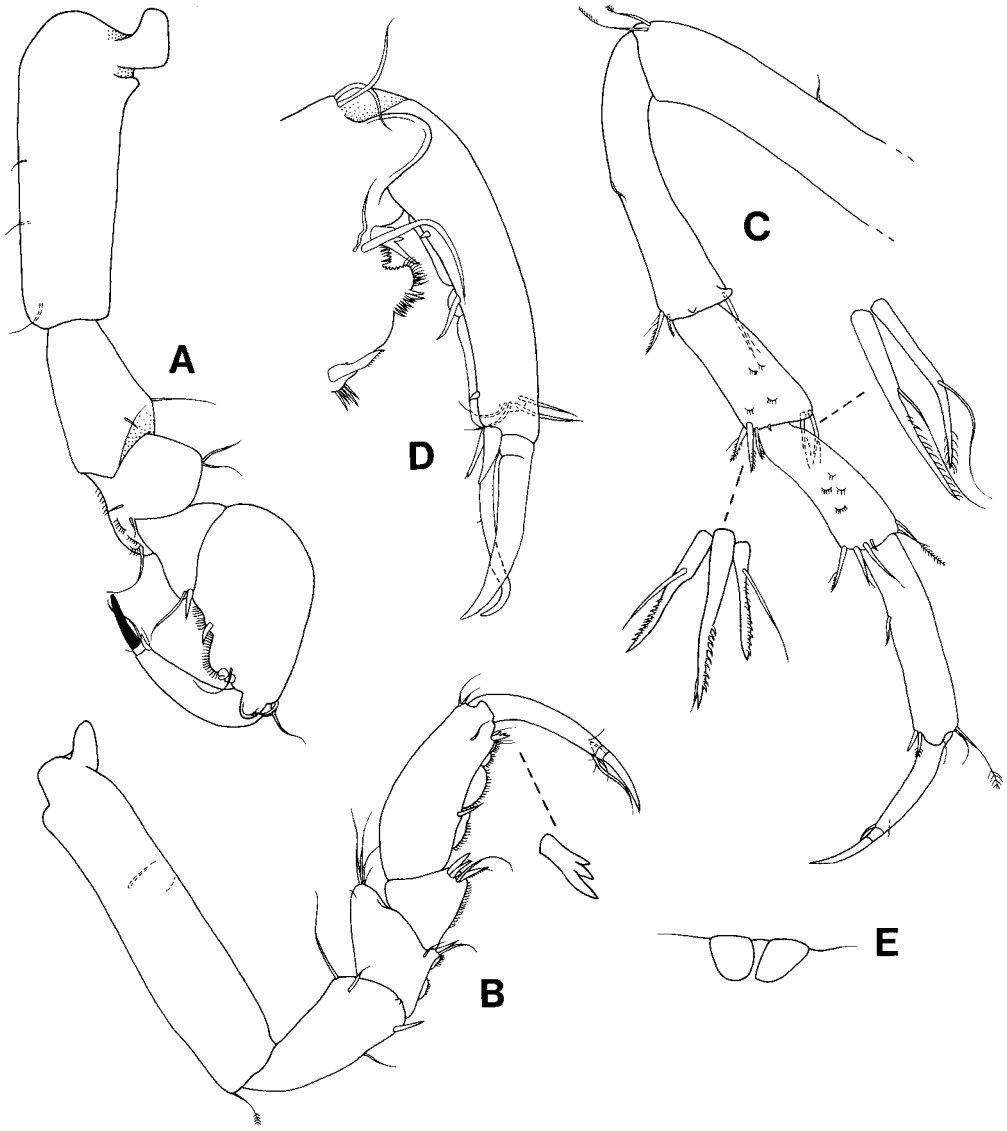

Fig. 3. *Kensleylana briani.* Paratype. A–C, pereopods 1, 2, 7 respectively; D, pereopod 1 dactylus; E, penial process, in situ.

podus 0.8 as long as ischium, 4.6 times as long as wide, inferior margin with 1 RS, superior distal angle with 2 slender setae, inferior distal angle with 2 RS.

Pleopod 1 exopod 4.5 times as long as wide, distally narrowly rounded, lateral margin weakly concave, mesial margin weakly convex, with 6 PMS; endopod 5.5 times as long as wide, distally subtruncate, lateral margin convex, with 2 PMS; peduncle 0.8 times as wide as long; mesial margin without coupling hooks, with 1 simple acute RS. Pleopod 2 exopod with 16 PMS, endopod with 1 PMS. Pleopod 3 exopod with 16 PMS. Pleopod 4 exopod with 12 PMS. Pleopod 5 exopod with 3 PMS.

Uropod peduncle with few simple setae; terminal ramus with 7 distally bifid simple setae.

Male similar to female. Pleopod 2 *ap-*

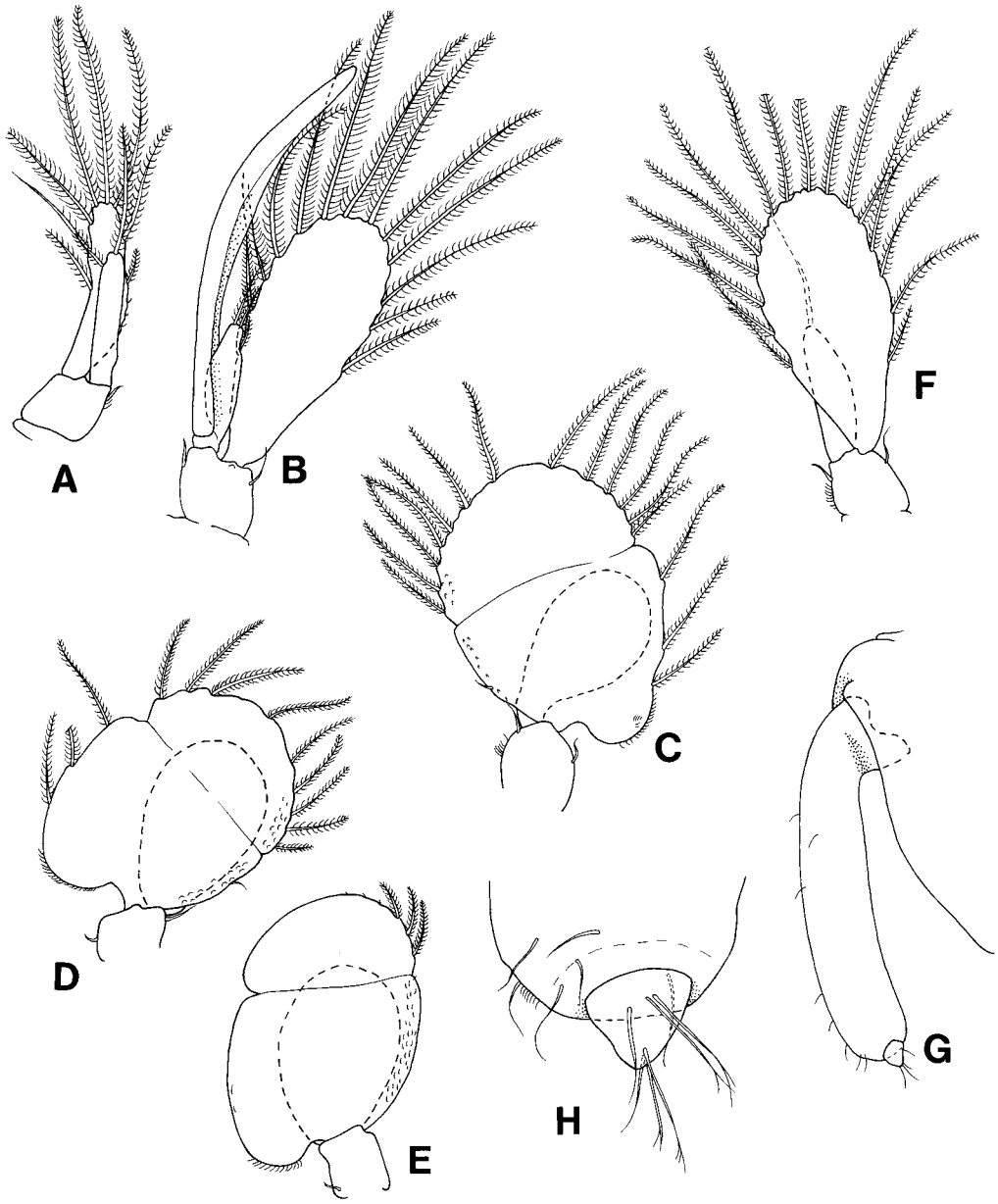

Fig. 4. *Kensleylana briani*. A, B, male paratype; C, H, holotype; remainder female paratype. A–E, pleopods 1–5 respectively; F, pleopod 2, female; G, uropod; H, uropod apex, detail.

pendix masculina (Fig. 4B) with parallel margins, 3.4 times as long as endopod, distally narrowly rounded; exopod with 12 PMS, endopod with 3 PMS. Penial processes about as long as wide (examined *in situ*) distally sub-truncate.

Etymology.—For Brian Kensley.

Discussion

The new genus *Kensleylana* is unique within the family in being the only genus in which the pleon is reduced with all segments fused to the pleotelson (see Bowman 1975 for a summary of pleonal morphology

to that date). The only indication of the pleon, dorsally, laterally or ventrally, is a short suture anterior to the uropod peduncle that is visible under transmitted light (Fig. 1G). The species is immediately identified and distinguished from all other cirolanids, both freshwater and cave dwelling, by this character and also by the elongate and cylindrical uropod peduncle, the apex of which bears a single stub-like ramus.

Faucheria Dollfus and Viré, 1905, a monotypic, freshwater, cave-dwelling genus known only from France [type species *Faucheria faucheria* (Dollfus and Viré, 1900)], is most similar, with a nearly identical morphology of the antennules, antenna, frontal lamina, clypeus, mouthparts, pereopods, penial processes and pleopods. *Faucheria* does have uniramous uropods, but these differ in being wide and dorsoventrally flattened; the pleonites are fused, but the segments are apparent, two being visible dorsally, five ventrally, in contrast to *Kensleylana*, which has no visible pleonites dorsally or ventrally, and only a short lateral suture that indicates the remnant of a pleon.

Kensleylana and *Faucheria* both have an anteriorly-dilated frontal lamina and the clypeus with a weak but distinct transverse blade, both character states being typical of those genera similar to *Metacirolana* Kussakin, 1979. Other similarities include the slender robust setae on the maxillule mesial lobe, single coupling on the maxilliped endite, rectilinear shape of the maxilliped palp articles, slender pereopods, ornamented robust seta opposing the base of the dactylus of pereopod 1, somewhat expanded pereopod 1 propodus, and flattened penial processes. Two species of *Metacirolana* are cave-dwelling (Jaume & Garcia 1992, Botosaneanu & Iliffe 2002), and other cave-dwelling genera that share some of these character states are *Arubolana* Botosaneanu & Stock, 1979 and *Bermudalana* Bowman & Iliffe, 1983. We consider that these characters may indicate that the ancestor of both *Kensleylana* and *Faucheria* is a taxon similar to *Metacirolana*. Cave isopods are often highly adapted to their habitat and show high levels of homoplasy, some such as loss of pigment, lack of eyes and presence of grasping legs being well known (Botosaneanu 2001). This, together with the absence of existing phylogenetic hypotheses for the genera of the family, limits any further phylogenetic, evolutionary or biogeographic appraisal at this time.

Kensleylana and *Faucheria* are both monotypic, and generalisations concerning the defining characters and affinities can be made only in the context of a wider knowledge of generic-level characters in the family. Our decision to establish a new genus for this distinctive species is based on the knowledge that pleon and uropod morphology is consistent within cirolanid genera. Such differences are accepted as being diagnostic and of generic merit, forming an integral part of generic descriptions and concepts (e.g., Bruce 1981, 1986, 1993, 1996; Brusca et al. 1995; Moore & Brusca 2003; Riseman & Brusca 2002).

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