

**CRANOLOGONA DALENSI MAURIÈS, 1965 NEW FOR THE UK FROM SOUTH WALES (DIPLOPODA; CHORDEUMATIDA: ANTHOGONIDAE)****Steve J. Gregory<sup>1</sup>, Christian Owen<sup>2</sup> and Jörg Spelda<sup>3</sup>**<sup>1</sup> 4 Mount Pleasant Cottages, Church Street, East Hendred, Oxfordshire, OX12 8LA, UK.E-mail: [stevegregory@btopenworld.com](mailto:stevegregory@btopenworld.com)<sup>2</sup> 75 Lewis Street, Aberbargoed, CF8 19DZ, UK.E-mail: [christianowen158@yahoo.com](mailto:christianowen158@yahoo.com)<sup>3</sup> Zoologische Staatssammlung München, Münchhausenstr. 21, 81247, München, Germany.E-mail: [spelda@zsm.mwn.de](mailto:spelda@zsm.mwn.de)**ABSTRACT**

The millipede *Cranogona dalensi* Mauriès is reported new for the UK from a colliery spoil heap in south Wales. A description with figures is provided to enable identification. Information about micro-sites inhabited and associated species is given. It is considered inconclusive as to whether *C. dalensi* is an over-looked British native or an accidental introduction.

**INTRODUCTION**

The millipede family Anthogonidae was established by Ribaut in 1913 and today includes seven genera within two geographically separated groups; subfamilies Acherosomatinae and Macrochaetosomatinae occur across the Balkan Peninsula, while subfamily Anthogoninae occurs in Western Europe (mainly Pyrenean) (Antić, *et al.*, 2015). Previously, the sole representative of this family in Britain was *Anthogona britannica* Gregory, Jones & Mauriès, 1994, described from south-west England. Ten species of *Cranogona* are listed by Fauna Europaea (<https://fauna-eu.org/>: accessed 25<sup>th</sup> June 2017); eight from France and two from Spain. Brolemann (1935) describes the then known French species as having Pyrenean distributions and inhabiting both subterranean and epigeal habitats.

During a recent collecting trip by CO to a colliery spoil heap in the Rhondda Valleys (south Wales) specimens of *Cranogona dalensi* Mauriès, 1965 were collected. Details of its discovery and a description based on material collected from south Wales is provided below.

**DISCOVERY**

On 22<sup>nd</sup> December 2016 CO (in the company of Liam Olds and Chris Lawrence) undertook a survey of invertebrates occurring at Cwm Coal Tips, north-east of Beddau in the Rhondda Valleys (ST069861, VC 41, Glamorganshire; 3.3445°W 51.5661°N, WGS84). A number of small white millipedes were collected from beneath stones. In the field these were superficially similar in appearance to *Brachychaeteuma melanops* Brade-Birks & Brade-Birks, 1918 in terms of size, lack of pigmentation and reduced number of well pigmented ocelli. However, the specimens differed in having eyes comprising 7-8 ocelli (instead of 6) and the body bearing long stout curved macrochaetae. Microscopic examination of the gonopods suggested this was indeed a species new for the UK.

Two males and four female specimens were sent to JS for genetic bar-coding. These were subsequently identified by JS, on the basis of male morphology, as *Cranogona dalensi* Mauriès, 1965. An informal account of the discovery is given by Olds (2017). This is the first recorded occurrence of this species in the UK.



**FIGURE 1: *Cranogona dalensi*, specimens from Cwm Coal Tips**

A) Male, live specimen (image © Keith Lugg). B-E) Female: B) Anterior body rings, lateral view; C) Head showing typical arrangement of ocelli; D) Anterior body rings showing paratergal keels and macrochaetae, dorsal view; E) Female, mid-body rings showing paratergal keels, lateral view.

## IDENTIFICATION

### Taxonomy

ORDER Chordeumatida Pocock, 1894

SUBORDER Craspedosomatidea Cook, 1895

FAMILY Anthogonidae Ribaut, 1913

SUBFAMILY Anthogoninae Ribaut, 1913

GENUS *Cranogona* Ribaut, 1913

*Cranogona dalensi* Mauriès, 1965

### Diagnosis

*Cranogona dalensi* is a small off-white millipede (< 6mm in length), with body bearing long stout curved macrochaetae and eye comprising 7-8 ocelli arranged in an acute triangle. Mature male specimens may be readily identified by the distinctive shape of the coxae and trochanters of the seventh pair of legs and the male gonopods, especially in anterior view. Using Blower (1985), *C. dalensi* will key to *Brachychaeteuma melanops* Brade-Birks & Brade-Birks, 1918 due to its very small size, absence of pigmentation and well pigmented ocelli. However, it differs in the arrangement of the ocelli and length of the body. It is more similar in appearance to an un-described *Typhlopsychrosoma* sp. found by CO in south Wales (see Gregory, 2016), but at 10 mm this is a noticeably larger millipede.

### Description

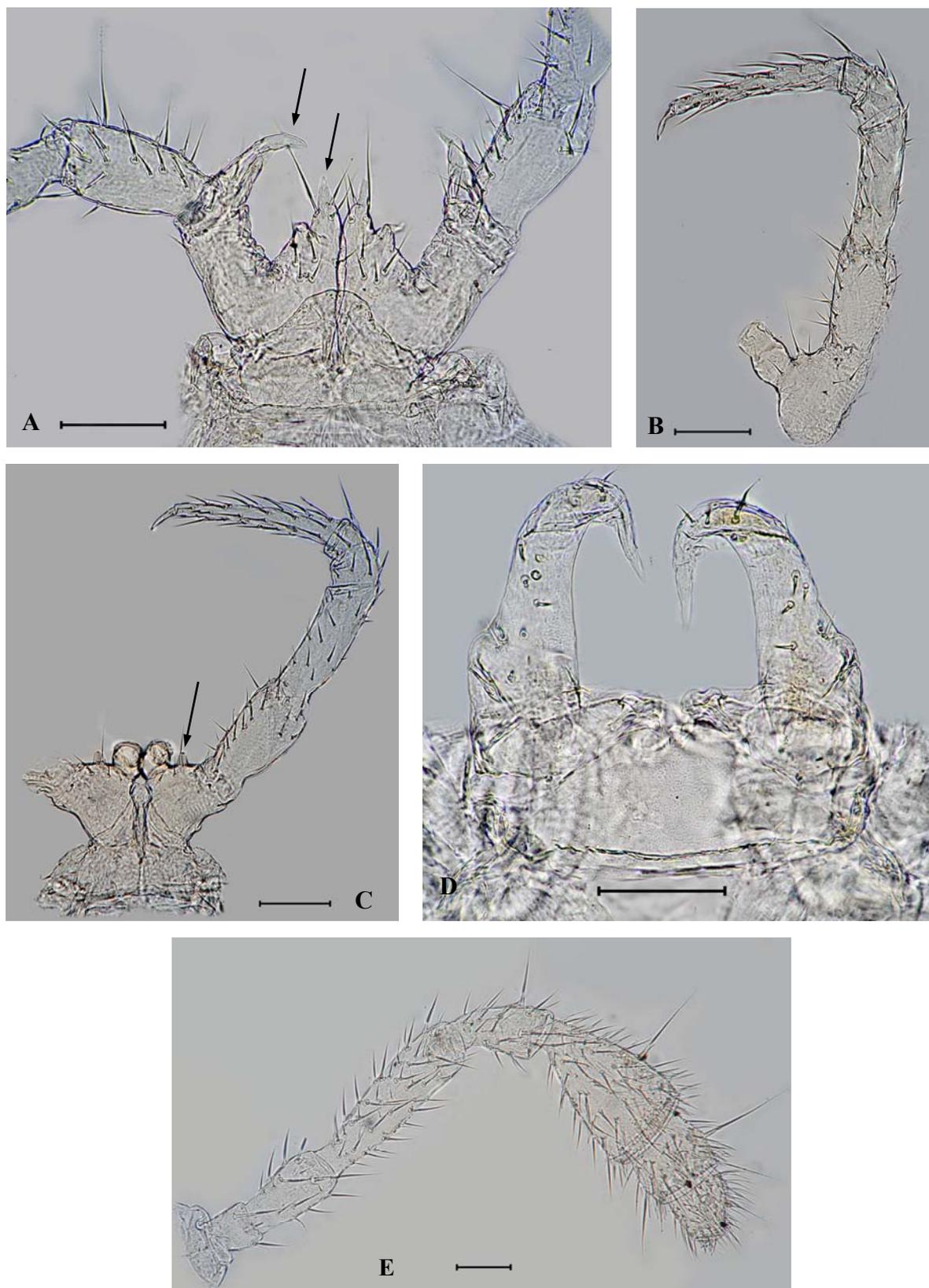
This description is based on one male and one female collected by CO from Cwm Coal Tips on 22<sup>nd</sup> December 2016 and preserved in 96% ethanol, examined by JS, and a second male and female collected by SJG on 25<sup>th</sup> February 2017, preserved in 70% IDA.

Adults with 30 body rings (pleurotergites). Body lacking pigment, appearing yellowish white in life (Fig. 1A). Male 5 mm in length, body height 0.5 mm (15<sup>th</sup> body ring); female 5.5 mm in length, body height 0.55 mm. Eye (Figs. 1B-C) comprises 7-8 well pigmented ocelli arranged in an acute triangle typically arranged in vertical rows of 2(3);2;2(1);1;(1). Antenna (Fig. 2E) about 1 mm long with pronounced apical club 3 times longer than wide.

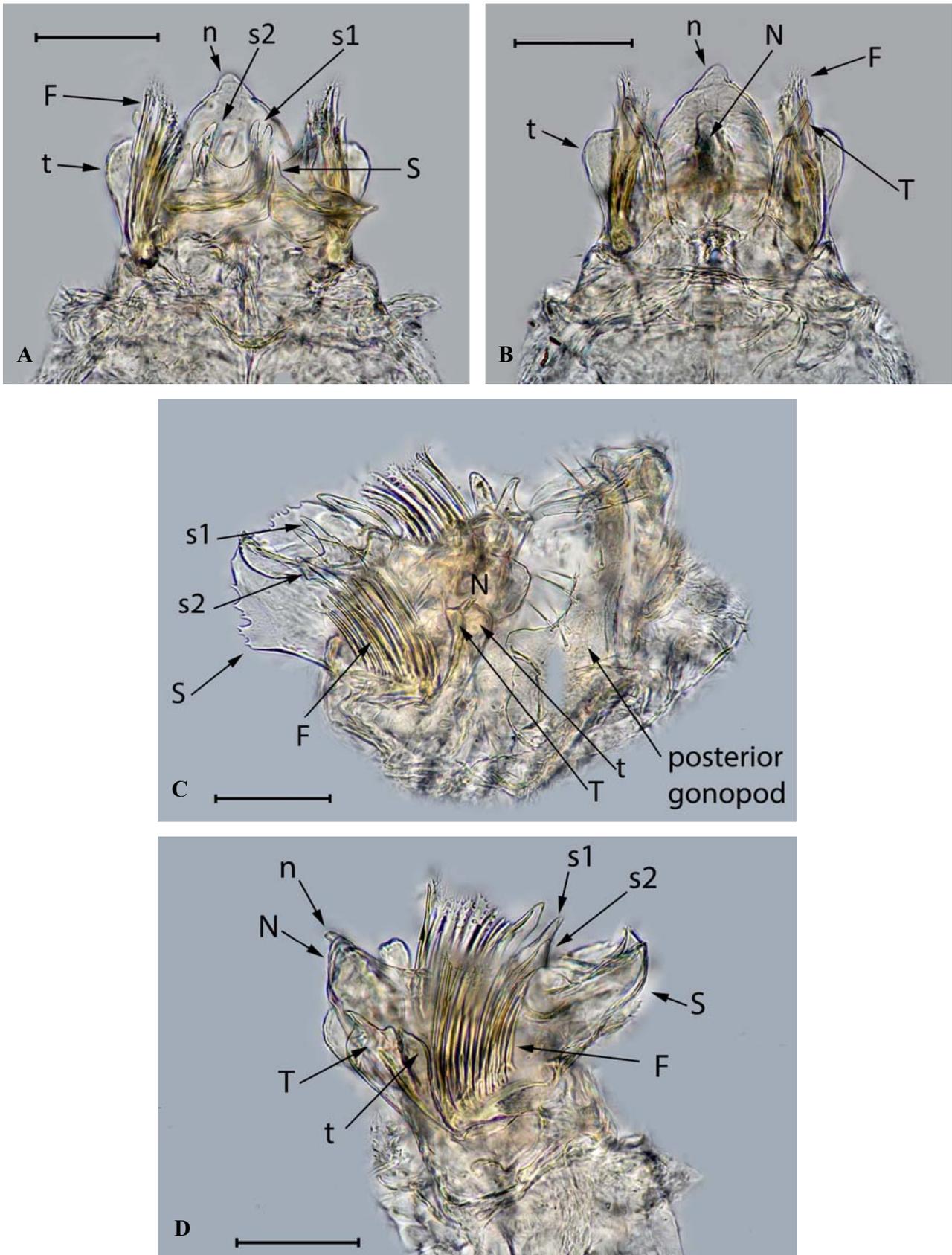
Lateral paratergal keels (paranota) (Figs. 1D-E) prominent in dorsal view, situated low on the sides of the body, about two thirds down from the dorsal surface. Tergites each with three pairs of macrochaetae mounted on low bumps; each macrochaeta (Fig. 1D) elongated and gently curved to a fine point. The length of the longest exceeds the length of the associated metazonite. The external and median macrochaetae sit laterally on the paranotal keel. The internal macrochaeta sits dorsally above the main bulge of the paranota. Angle formed by bases of the three macrochaetae about 90-100° (15<sup>th</sup> body ring). Distance between bases of external and median macrochaetae about the same as the distance between bases of median and internal macrochaetae. The distance between medial suture and base of internal macrochaeta more than double the distance between bases of median and internal macrochaetae.

#### *Male: sexual characters*

Leg pair 7 (Figs. 2A & 4A) with coxae bearing an inward facing basal projection comprising two lobes, the innermost bearing a stout hyaline 'horn' towards its tip. Trochanter with prominent curved medially directed projection that tapers to a rounded tip. Leg pairs 10 and 11 (Figs. 2B-C; 4B) with medially directed coxal gland on their internal face. Leg pair 11 also bears a cone-shaped 'horn' on the coxa, towards the apex of the internal face.



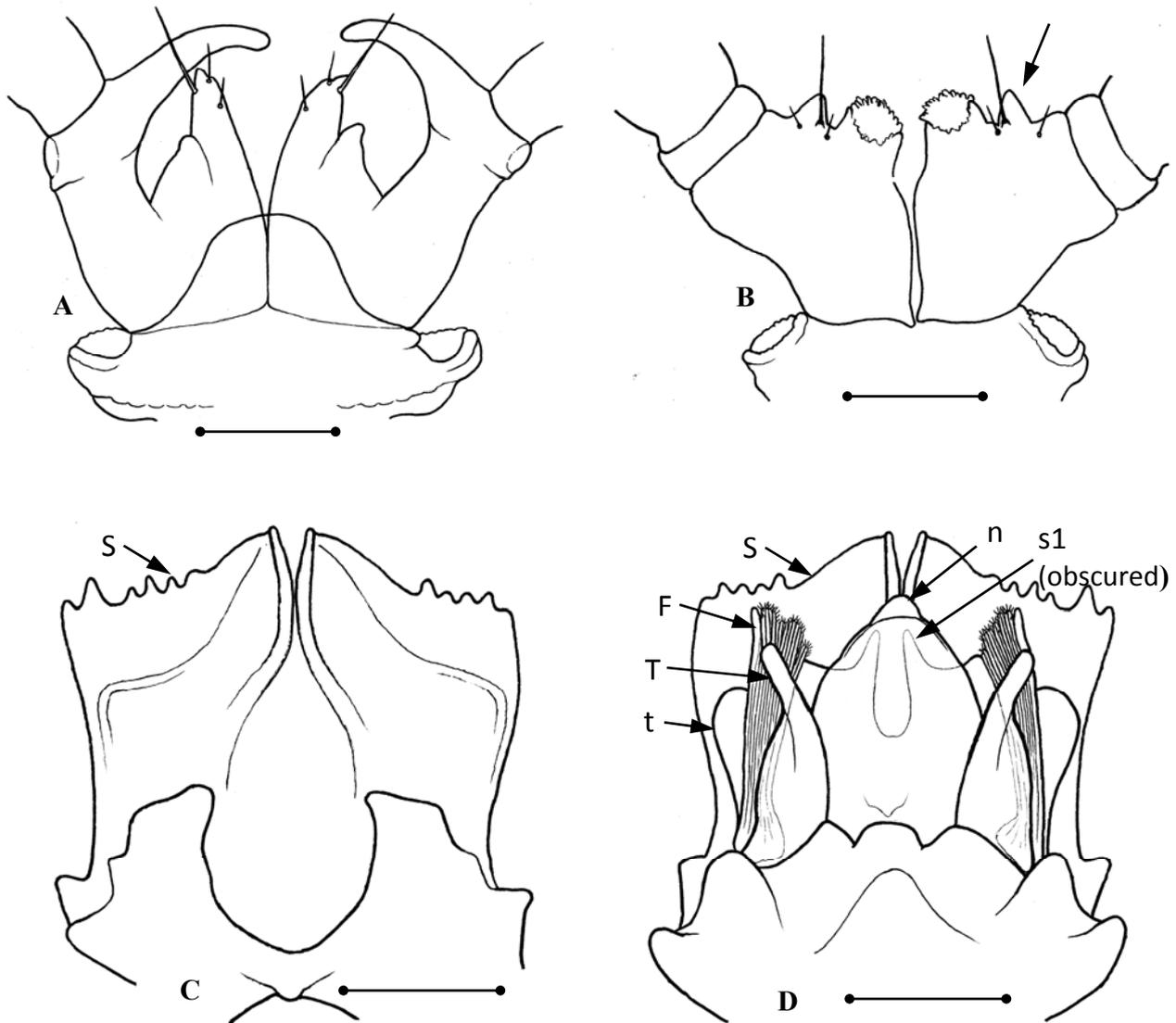
**FIGURE 2:** *Cranogona dalensi* male, specimen from Cwm Coal Tips, December 2016  
A) Basal articles of 7th leg pair (coxal and trochantal projections arrowed); B) 10th leg; C) 11th leg (coxal horn arrowed); D) Posterior gonopods, anterior view; E) Antenna. Scale bars 100 µm



**FIGURE 3: *Cranogona dalensi* male, specimen from Cwm Coal Tips, December 2016**

A) Gonopods, anterior view (here ‘S’ appears to be deflected anteriorly to reveal structures behind; cf Fig. 4C); B) Gonopods, posterior view; C) Gonopods, ventral lateral view; D) Gonopods, lateral view.

Scale bars 100µm.



**FIGURE 4: *Cranogona dalensi* male, specimen from Cwm Coal Tips, February 2017**

A) 7th leg pair, coxae and trochanter, posterior view; B) 11th leg pair, coxae and trochanter, posterior view (coxal horn arrowed); C) Gonopods, anterior view (in this view 'S' obscures the gonopods structures that lay behind; cf Fig. 3A); D) Gonopods, posterior view. Scale bars 100  $\mu\text{m}$ .

*Male: anterior gonopods*

In anterior view the gonopods are dominated by the syncolpocoxite (S) which comprises a pair of sub-rectangular colpocoxites that entirely obscures the other gonopodal structures that lie posteriorly (Fig. 4C). The colpocoxites are fused towards their bases and each bears a small number of irregular teeth along their distal margin. Mauriès (1965) comments that this is quite unlike the equivalent structures seen in other species of *Cranogona* and is the only character figured in Demange (1981; fig. 113). However, the syncolpocoxite (S) is not obvious in Fig. 3A since it appears to be deflected anteriorly, revealing the gonopods structures that lie behind. The syncolpocoxite (S) can be clearly seen in Fig. 3C.

In posterior view (Figs. 3B & 4D) the telopodites (T) taper gently from their broad bases and then narrow abruptly in their apical third to become parallel sided and gently curving outwards. From the telopodite arises a hyaline structure (t) about  $\frac{3}{4}$  of its height. Between the telopodites lies the medial

dome (N). A broad bristle apparatus (F), which comprises a row of many long bristles, lies on the coxites between the telopodite (T+t) and the medial dome (N+n). Each bristle bears many fine denticles along its anterior margin. The bristle apparatus is developed to a greater or lesser extent in other species of *Cranogona* and *Anthogona* (Antić, *et al.*, 2015).

In lateral view (Fig. 3D) the gonopods form a shallow ‘V’ shape; the syncolpocoxite (S) to the anterior and the medial dome (N+n) to the posterior. Between lies the bristle apparatus (F). The two projections (s1 and s2) that arise from the posterior face of each colpocoxite are most easily seen in lateral view.

#### *Male: posterior gonopods*

The posterior gonopods (Fig. 2D) lack segmentation, comprising a pair of well-developed curved blade-like coxal extensions that taper towards their apex before terminating in an anteriorly curved hook. Lacking a medial sternal process.

#### *Female characters*

Female vulvae were not examined. These are figured by Mauriès (1965; figs. 11-12).

### **Genetic analysis**

Genetic analysis of one male and one female has been undertaken by sequencing the classical barcode fragment, the mitochondrial cytochrome c oxidase subunit I (COI), following the methodology described by Spelda *et al.* (2011). Barcodes of full length (658 base-pairs) were obtained in both specimens. The sequences generated can be accessed in the Barcode of Life Data System (BOLD; Ratnasingham & Hebert 2007, <http://www.boldsystem.org>) via DOI [dx.doi.org/10.5883/DS-CRANDALE](https://doi.org/10.5883/DS-CRANDALE), under the BOLD Process IDs GOMYR262-17 (female, Genbank: MG699451) and GOMYR274-17 (male, Genbank: MG699450). Both sequences differ only in a single base and have been assigned to the BIN “BOLD:ADF7910”. This will enable future comparison with continental populations, once fresh material becomes available.

### **DISTRIBUTION AND HABITATS**

#### **Occurrence in South Wales**

To date, *Cranogona dalensi* has only been recorded from the Cwm Coal Tips, north-east of Beddau, in the Rhondda Valleys. This colliery spoil-heap, associated with the former Cwm colliery and coking works, has been left to naturally re-vegetate following closure of the colliery in 1986 and the coke works in 2002. Covering an area of c. 8ha, the site now supports an interesting mix of habitats including bare ground, flower-rich grassland, scrub, secondary woodland, calcareous flushes, a lake and secondary wetland (Olds, 2017).

The first specimens of *C. dalensi* were collected from under stones, but subsequently it was found to be widespread and rather abundant under rocks and deadwood across the entire Cwm Coal Tips site. As a rule, the species was collected from areas devoid of vegetation, such as wheel ruts on tracks, where few other species were observed.

Due to this unusual habitat few associated species were recorded. In one area the trichoniscid woodlouse *Haplophthalmus mengii* Zaddach was present and elsewhere the millipede *Ceratosphys amoena* form *confusa* Ribaut was found; another millipede recently discovered in south Wales (Telfer, *et al.*, 2015).

## Foreign distribution and habitats

*Cranogona dalensi* was originally described by Mauriès (1965) from the commune of Aïnharp in the Pyrénées-Atlantiques, where specimens were collected from beneath stones partially embedded in soil on a north facing non-wooded slope. Here it was associated with the trichoniscid woodlouse *Metatrichoniscoides fouresi* Vandel, 1950.

Golovatch and Kime (2009) consider *C. dalensi* to be a species restricted to topsoil and possibly also to mesovoid shallow substratum (MSS). Certainly, heaps of compacted colliery spoil as found at Cwm Coal Tips, could be described as an example of MSS. This species may benefit from specific microclimatic conditions associated with MSS, such as the absence of light and amelioration of temperature and humidity extremes.

## Native or Introduced?

*Cranogona dalensi* was originally described from the western Pyrenees and it is therefore possible that it is an over-looked native species with an Atlantic distribution. Certainly, other species originally described from the Pyrenees (e.g. *Anthogona variegata*), have proved to be more widespread in north-western France (Gregory, *et al.* 1994), if not Britain. However, on current evidence *C. dalensi* would appear to be restricted to a single synanthropic site, suggesting an introduction beyond its natural range, probably in recent years. Additional field-work in south Wales and south-west England could help clarify the situation.

## ACKNOWLEDGEMENTS

CO thanks Liam Olds, of the Colliery Spoil Biodiversity Initiative, for his encouragement to survey invertebrates occurring at Cwm Coal Tips.

Keith Lugg kindly allowed the use of his image of the live animal in this paper.

Jerome Moriniere (Munich) and the team of the Canadian Center for DNA Barcoding at the University of Guelph undertook the genetical analysis.

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