

A PRELIMINARY SURVEY OF THE COLLEMBOLA OF SKOKHOLM

By H. J. GOUGH

51a Westbourne Terrace, Reading, Berkshire RG3 2RP

Over 30 species of Collembola are recorded from the island of Skokholm, Pembrokeshire, Wales, of which three were not previously known from Britain. A key to the species is included and the range of habitats in which each species was found is listed. Variation in some species is described.

INTRODUCTION

THE microarthropods of Skokholm have been little studied. The only published record of Collembola from the island (Green, 1956) refers only to two littoral species. One of these, *Anurida maritima* (Guérin, 1836), is common on British coasts. The other, *Anuridella marina* Willem, 1906, is not common and I did not find it on the island.

Of the thirty-four species identified in this work three are new to the British list and another is recorded for the first time from this country under a new name.

The samples varied from a single specimen to large numbers of specimens extracted from litter or moss placed in Tullgren funnels. I collected them during the period 27 August to 5 September 1969.

Some specimens have been sent to specialists working on particular genera. Others are deposited in the British Museum (Natural History), but the bulk of the specimens are in my collection.

SAMPLE DATA

The samples are grouped together according to habitat. The letters are used later in the paper to refer back to the sample data and readily show whether a species is restricted to one type of habitat or can live in a range of habitats.

Group 1: under stones or pieces of wood on the ground.

- (a) Under stones near house 30/8/69.
- (b) With ants under stones near Half Way Dyke 3/9/69.
- (c) Under stones near Gate Rock 4/9/69, 5/9/69.
- (d) West Garden Rocks under stone 3/9/69.
- (e) Under stones constituting wall near N. Pond 30/8/69.
- (f) Under pieces of wood near house 30/8/69.

Group 2: in soil or leaf litter.

- (g) In soil and litter under *Teucrium* near house 5/9/69.
- (h) In soil and litter under *Calluna* near house 5/9/69.
- (i) On/in almost dry muddy bed of S. Pond 5/9/69.
- (j) In soil on top of cliff at Crab Bay 5/9/69.
- (k) The Knoll in soil and litter under *Pteridium* 5/9/69
- (l) Under sea campion on rocks near cutting 3/9/69.
- (m) In grass/soil mixture from Northern Plain 5/9/69.
- (n) Under sea campion on rocks at top of Mad Bay 3/9/69.

Group 3: in moss.

- (o) In moss/grass mixture from side of road near winter pond 5/9/69.
- (p) On exposed rocks in South Haven 5/9/69.
- (q) On Garden Rocks 5/9/69.

Group 4: on vegetation.

- (r) On long grass at north end of West Bog Dyke 2/9/69.
- (s) At south end of Sugar Loaf on *Pteridium* 1/9/69.
- (t) On *Pteridium* at the Knoll 30/8/69.
- (u) On long grass north of N. Pond 1/9/69.
- (v) On short vegetation near lighthouse 30/8/69.
- (w) On *Teucrium* near house 1/9/69.
- (x) On *Teucrium* at the pedestal 1/9/69.
- (x¹) On bog vegetation 30/8/69.

Group 5: littoral.

- (y) On rocks and pools on upper parts of rocky shores 30/8/69.

Group 6: on surface of fresh water.

- (z) On surface of stream near Gate Rock 3/9/69.

CLASSIFICATION

I have used the classification in the 9th edition of Imms (full reference below). However, there have been two modifications to this system.

In 1967 Massoud divided those of the Hypogastruridae without a grinding molar plate on the mandible into a separate family—the Neanuridae.

In 1970 Betsch and Massoud divided the family Sminthuridae into the families Sminthuridae and Sminthurididae. The latter family differs from the former in three major characters: the males have antennae modified for clasping; the females lack subanal appendages; a tibiotarsal organ is present in most genera.

SPECIES DISTRIBUTIONS

The letters indicate in which of the above samples each of the species was found.

Family HYPOGASTRURIDAE

<i>Hypogastrura denticulata</i> (Bagnall)	z
* <i>Xenylla acauda</i> Gisin	h, o, q
<i>X. maritima</i> Tullberg	e, x ¹

Family NEANURIDAE

<i>Friesea truncata</i> Cassagnau	c, g, h, j, m, q
<i>Pseudachorutes boernerii</i> Schött	q
<i>Anurida maritima</i> (Guérin)	y
<i>Micranurida pygmaea</i> Börner	h
<i>Neanura muscorum</i> (Templeton)	g, k, m

* Species new to the British list (Gough, 1971).

Family ONYCHIURIDAE

* <i>Onychiurus meridiatus</i> Gisin	c, j, k, m
<i>Tullbergia callipygos</i> Börner	k
<i>T. krausbaueri</i> (Börner)	c, h, j, k, m, q
<i>T. quadrispina</i> (Börner)	h

Family ISOTOMIDAE

* <i>Folsomia bisetosa</i> Gisin	i, (?) q
<i>F. quadrioculata</i> (Tullberg)	c, h, j, m, o, q
<i>Isotomiella minor</i> (Schäffer)	g, i, k, m
<i>Isotomina scapellifera</i> Gisin	q
<i>Isotoma notabilis</i> Schäffer	g, h, j, k, m, o, q
<i>I. sensibilis</i> (Tullberg)	q
<i>I. viridis</i> Bourlet	a, b, c, d, f, h, j, m, n, p, q, y

Family ENTOMOBRYIDAE

<i>Entomobrya albocincta</i> (Templeton)	e, f, n, q
<i>E. multifasciata</i> (Tullberg)	f
<i>E. nicoleti</i> (Lubbock)	f, g, n, r, t, v, w
<i>Willowsia nigromaculata</i> (Lubbock)	i
<i>Lepidocyrtus cyaneus</i> Tullberg	f, g, h, n, q, v
<i>L. lignorum</i> (Fabricius)	g
<i>Pseudosinella alba</i> (Packard)	b, c, j
<i>Cyphoderus albinus</i> Nicolet	a, b, m

Family TOMOCERIDAE

<i>Tomocerus longicornis</i> (Müller)	b, f, g
---------------------------------------	---------

Family NEELIDAE

<i>Megalothorax minimus</i> Willem	h
------------------------------------	---

Family SMINTHURIDIDAE

<i>Sphaeridia pumilis</i> (Krausbauer)	c, g, h, m, o, q
<i>Sminthurides</i> c.f. <i>malmgreni</i> (Tullberg)	i

Family SMINTHURIDAE

? <i>Sminthurinus</i> sp. immature	c
<i>Bourletiella arvalis</i> (Fitch)	v
<i>Deuterosminthurus repandus</i> (Ågren)	r, s, t, w, x
<i>Dicyrtomina</i> c.f. <i>saundersi</i> (Lubbock) sp. dub.	h
<i>Dicyrtomina</i> sp. immature	h

KEY TO SPECIES

- | | |
|--|-------------------------------|
| 1. Body globular, segments fused | 2. |
| — Body attenuate, at most last three segments fused | 8. |
| 2. White to pale brownish, antennae shorter than head | <i>Megalothorax minimus</i> . |
| — Body pigmented, eyepatches dark, antennae longer than head | 3. |

3. Anogenital segment not distinctly divided from rest of abdomen 4.
 — Anogenital segment distinctly divided from rest of abdomen 6.
4. Tibiotarsal organ present *Sminthurides* c.f. *malmgreni*.
 — Tibiotarsal organ absent 5.
5. Antenna of male with clasping organ; tibiotarsus III of female with serrate setae
Sphaeridia pumilis.
 — Not so ? *Sminthurinus* sp. 7.
6. Antenna IV shorter than III 7.
 — Antenna IV longer than III 8.
7. Abdomen. anterior to anogenital segment with a short longitudinal band of dark pigment which is crossed by several transverse dark bands
Dicyrtomina saundersi.
 — This pattern absent *Dicyrtomina* sp.
Bourletiella arvalis.
8. Yellow; abdomen convex dorsally
 — Yellow with darker yellow dorsally; dorsum of abdomen somewhat flattened
Deuterosminthurus repandus.
9. Spines present dorsally on abdomen VI 10.
 — Spines absent dorsally on abdomen VI 17.
10. Two spines, or two large posterior ones and two small anterior ones 11.
 — Three spines (up to five in abnormal specimens), all of equal size; very short springer present
Friesea truncata.
11. Body white, eyes absent 12.
 — Body pigmented, eyes present in dark patch of pigment 15.
12. Four spines on abdomen VI *Tullbergia quadrispina*.
 — Two spines on abdomen VI 13.
13. Body more or less parallel-sided, flattened dorsally; abd. VI depressed dorsally; anal spines about as long as claw
Onychiurus meridiatus.
 — Body slender, more or less spindle-shaped; abd. VI not depressed dorsally 14.
14. Anal spines shorter than claw III; dorsally on each side of abd. VI a curved line of coarse tubercles
Tullbergia krausbaueri.
 — Anal spines longer than claw III, on distinct papillae; abd. VI as in *krausbaueri* but with, in addition, two raised humps, each bearing a seta *T. callipygos*.
15. Anal spines nearly as long as claw
Hypogastrura denticulata.
 — Anal spines minute 16.
16. Springer entirely absent *Xenylla acauda*.
 — Springer present: mucro fused with dens *Xenylla maritima*.
17. Springer entirely absent 18.
 — Springer present 19.
18. Eyes: 2+2; length less than 0.5 mm. *Micranurida pygmaea*.
 = Eyes: 3+3; abd. VI bilobed *Neanura muscorum*.
 — Eyes: 5+5; up to 3 mm. long; six thick setae dorsally on abd. VI
Anurida maritima.
19. Springer short; clavate setae on abdomen *Pseudachorutes boernerii*.
 — Springer long, often reaching legs III; no clavate setae on body 20.
20. Scales present on body 21.
 — Scales absent on body 26.
21. Mucro with numerous setae; antenna III and IV annulated
Tomocerus longicornis.

- Mucro without numerous setae; antennae not annulated 22.
22. Scales pointed; pigment pattern on body *Willowsia nigromaculata*.
- Scales rounded; pigment pattern absent 23.
23. Mucro much longer than wide; dens with large scales, the distal one as long as the mucro *Cyphoderus albinus*.
- Mucro not much longer than wide; no specially large scales 24.
24. Eyespot very small; two ocelli, one above the other on each side of the head; claw with large, wing-like teeth *Pseudosinella alba*.
- Eyespot large, rectangular, longer than wide; teeth on claw small 25.
25. Body purple *Lepidocyrtus cyaneus*.
- Body white, except bluish pigment on coxae and antennae *Lepidocyrtus lignorum*.
26. Entirely white, eyes absent 27.
- Eyes present in dark patch of pigment 29.
27. Postantennal organ present 28.
- Postantennal organ absent; abd. V and VI fused *Isotomiella minor*.
28. Abd. IV to VI fused *Folsomia bisetosa*.
- Abd. V and VI fused *Isotomina scapellifera*.
29. Abd. IV to VI fused; two eyes on each side of the head, widely separated and each pigmented black *Folsomia quadrioculata*.
- A clear suture between abd. IV and V 30.
30. Abd. IV distinctly longer than other abdominal segments 31.
- All abdominal segments of subequal length 33.
31. Body dark blue, thorax mostly white, anterior half of abd. IV yellowish *Entomobrya albocincta*.
- Body mostly yellowish with some dark pigment 32.
32. Dorsum of some body segments with a dark transverse stripe near the posterior edge which crosses the mid line *Entomobrya multifasciata*.
- No such pattern; pigment on most segments restricted to lateral regions and not crossing mid line, except on abd. V and VI *Entomobrya nicoleti*.
33. Tibiotarsi distally with clavate setae; abd. V and VI fused *Isotoma sensibilis*.
- Clavate setae absent; all abdominal segments free 34.
34. Eyespot square or triangular, small; claw without teeth *Isotoma notabilis*.
- Eyespot elongate, large; claw with two inner teeth *Isotoma viridis*.

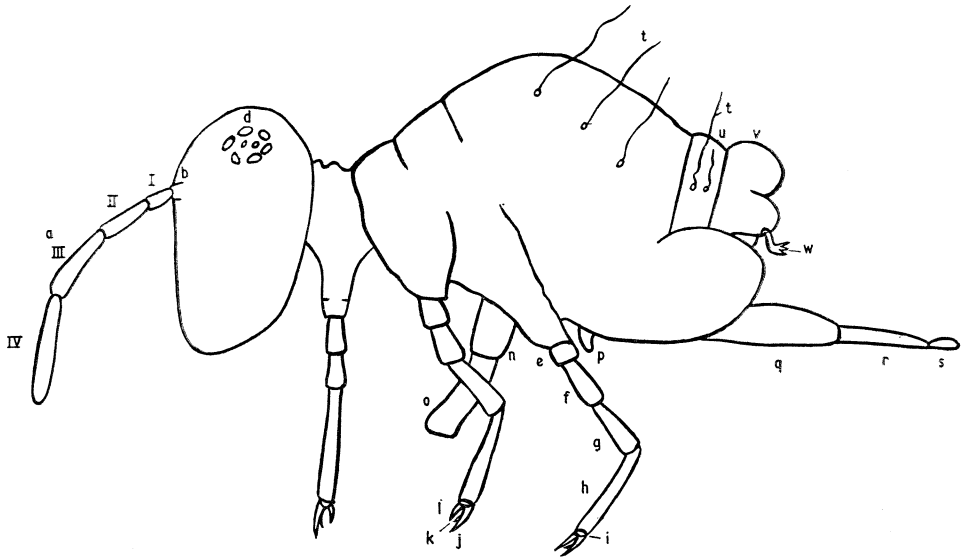
Notes on certain species

Hypogastrura denticulata

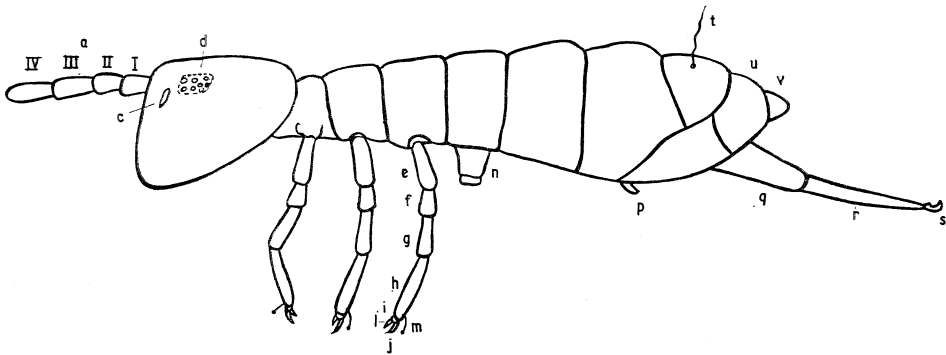
Only one sample was collected, and all the specimens were immature. However, there was much variation in the form of the empodium which was variously distorted or reduced. The form differed even on different legs of the same individual. There was no apparent explanation for this variation.

Friesea truncata

Earlier records of this species have been under the name of *F. mirabilis* var. *truncata*. In 1958 Cassagnau gave this form a new name and full species status. About 50 per cent of the specimens from Skokholm had four or five anal spines instead of the usual three. This kind of variation is common in this species but it is unusual for such a large proportion of a population to be abnormal.



SYMPHYPLEONA



ARTHROPLEONA

Legend for figures of generalized Symphypleona and Arthropleona:

- | | |
|-------------------------|------------------------------------|
| (a) Antenna | (m) Knobbed or clavate tenent hair |
| (b) Antenna base | (n) Ventral tube |
| (c) Postantennal organ | (o) Filaments of ventral tube |
| (d) Eyes (ocelli) | (p) Tenaculum |
| (e)-(m) Legs | (q)-(s) Springer |
| (e) Coxa | (q) Manubrium |
| (f) Trochanter | (r) Dens |
| (g) Femur | (s) Mucro |
| (h) Tibiotarsus | (t) Trichobothrium |
| (i) Pretarsus | (u)-(v) "Anogenital segment" |
| (j) Claw | (u) Abdomen V |
| (k) Inner tooth of claw | (v) Abdomen VI |
| (l) Empodium | (w) Subanal appendage |

Entomobrya nicoleti

Most specimens were pale with only traces of pigment pattern.

Cyphoderus albinus

This species is myrmecophilous and was found under stones where ants often occur on the island.

Deuterostminthurus repandus

Very large females had very broad, ragged lamellae on the subanal appendages. Mills noted a similar condition in North American specimens.

SUGGESTIONS FOR FURTHER WORK

This survey was by no means exhaustive. Some habitats were not sampled, e.g. nests of birds and mammals, corpses, vegetable compost, fruiting bodies of fungi, and buildings. It is likely that there are more species to be discovered in the littoral zone or on the surface of fresh water. Sampling at other times of the year may also yield more species.

ACKNOWLEDGEMENTS

I wish to thank Dr. M. M. da Gama who checked the *Xenylla* spp., Dr. W. G. Hale who identified *Onychiurus meridiatus*, Mr. P. N. Lawrence who identified *Isotomina scapellifera*, and Dr. A. South who identified *Entomobrya nicoleti*. I wish also to thank Mr. C. Britton for his interest in my work during my stay on the island.

GLOSSARY

Anatomy

Richards, W. R. (1968) gives a good account of the external anatomy of the Sminthuridae (sensu Imms), much of which is applicable to Collembola in general.

Gisin (1960) includes many useful diagrams, and Imms covers points not dealt with by Gisin or Richards.

Anal spines: highly modified spine-like setae on the dorsal side of the last (sixth) abdominal segment.

Anogenital segment: the last two segments of the abdomen which in the Sminthuridae are more or less delimited from the rest of the abdomen.

Clavate: with a knobbed or broadened and flattened tip.

Coxa: basal segment of leg.

Dens (plural *dentes*): the dentes form the "fork" of the springer.

Empodium: movable claw opposite fixed upper claw.

Eye: ocellus or simple eye.

Eye patch: pigment in and around the ocelli.

Mucro: the claw-like appendage on the distal end of the dens.

Postantennal organ: organ of varied structure between base of antenna and eyes.

Subanal appendages: modified setae (one on each side) on ventral side of last abdominal segment of females.

Tibiotarsus: long distal segment of leg.

Tibiotarsal organ: a pair of bulbous sensillae guarded by a strong seta and situated distally on the tibiotarsus.

REFERENCES

- CASSAGNAU, P. (1958). Les Espèces Européens du Genre *Fricsea*. *Bull. soc. Hist. nat. Toulouse* **93**, 17-29.
- GISIN, H. (1947). Notes taxonomiques sur quelques espèces suisses des genres *Hypogastrura* et *Xenylla*. *Mitt. schw. ent. Ges.* **20**, 341-344.
- GISIN, H. (1952). Notes sur les Collemboles, avec démembrement des *Onychiurus armatus*, *ambulans* et *finetarius* auctorum. *Mitt. schw. ent. Ges.* **25**, 1-22.
- GISIN, H. (1953). Collembola from Jan Mayen Island. *Ann. Mag. nat. Hist.* (12) **6**, 228-234.
- GISIN, H. (1960). *Collembolenfauna Europas*, Geneva: Museum d'Histoire Naturelle.
- GOUGH, H. J. (1971). *Entom. mon. mag.* (in the press).
- GREEN, J. (1956). Insects and arachnids from Skokholm Island, Pembrokeshire. *Entom. mon. Mag.* **92** (7), 283.
- IMMS, A. D. (1925). *A General Textbook of Entomology* (9th edition, revised 1957). Methuen, London.
- MASSOUD, S. (1967). *Monographie des Néanuridae, Collemboles a Pièces Buccales Modifiées*. Biologie de l'Amérique Australe III 7-399 C.N.R.S. Paris
- MILLS, H. (1934). *A Monograph of the Collembola of Iowa*. Monograph No. 3, Div. Ind. Sci. Iowa State Coll.
- RICHARDS, W. R. (1968). Generic Classification, Evolution, and Biogeography of the Sminthuridae of the World (Collembola). *Mem. ent. Soc. Canada* No. 53 1-54. Ottawa.
- SOUTH, A. (1961). The taxonomy of the British species of Entomobrya. *Trans. R. ent. Soc. Lond.*, **113**(13), 387-417.
- STACH, J. (1956). The Apterygotan Fauna of Poland in relation to the World-Fauna of this Group of Insects. Family: Sminthuridae. *Polska Akad. Nauk. Inst. Zool.*, 1-287.