THE GENERA *CYRTHYDROLAELAPS* BERLESE AND *GAMASOLAELAPS* BERLESE *(ACARINA — MESOSTIGMATA)*

BY

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The family *Veigaiaidae* comprises three closely related genera, *Veigaia* Oudms., *Cyrthydrolaelaps* Berlese and *Gamasolaelaps* Berlese which are readily distinguished from other parasitoids by the presence of a hyaline appendage anterior to the specialised seta on the tarsus of the pedipalp (EVANS, 1957). The Veigaiaids are most closely related to members of the family *Parasitidae,* especially in the morphology of the immature stages. All the known species are free-living in soil and decaying organic matter, or in rock crevices and under stones on the seashore. They are considered to be predominantly predacious in habit although little is known of their biology.

The genus *Veigaia,* the largest and most widely distributed of the three genera, has been revised recently by FARRIER (1957) who also referred to the genus *Cyrthydrolaelaps* and proposed a new genus *Gorirossia* for *Gorirossia whartoni* Farrier. The object of this work is to review our present knowledge of the genera *Cyrthydrolaelaps* and *Gamasolaelaps.*

Family *Veigaiaidae* Oudms., 1939.

Synonym : *Gamasolaelaptidae* Oudms., 1939 and *Cyrtolaelaptidae* Cooreman, 1943.

Key to Genera.

Females.

1. Internal malae small, may be divided but never fringed with setae-like processes (figs 29 and 30)..... *Gamasolaelaps* Berl.
— Internal malae large and fringed with numerous setae-like processes (fig. 3).. 2.

2. Each metasternal seta situated on a compound metasternal-endopodal shield ; claws of legs II-IV never enlarged, pulvilli not acutely lobate..... *Veigaia* Oudms.
   — Metasternal setae free on unsclerotised cuticle or situated on the sternal shield (figs. 2 and 14) ; claws of legs II-IV often enlarged, pulvilli acutely lobate..... *Cyrthydrolaelaps* Berl.

Males.

1. Venter with holoventral shield, anal shield never free ; leg II with spurs. *Veigaia* Oudms.
   — Anal shield free..... 2.
2. Sterniti-genital and ventral shields fused (fig. 9) ; genital orifice situated on the anterior margin of the « sternal » shield, usually in front of the first pair of sternal setae ; leg II with or without spurs..... *Cyrthydrolaelaps* Berl.
   — Sterniti-genital and ventral shields not fused (fig. 25) ; genital orifice situated behind the anterior margin of the « sternal » shield, usually posterior to the first pair of sternal setae ; legs II unarmed..... *Gamasolaelaps* Berl.

Cyrthydrolaelaps Berlese.

Cyrthydrolaelaps BERLESE, A. (1905). *Redia* 2 : 19.
Type : *Cyrthydrolaelaps hirtus* Berlese, 1905.

The mites of this genus have a divided dorsal shield. In the female the metasternal setae are free or situated on the sternal shield. The male has a sterniti-ventral shield and a separate anal shield with or without accessory setae. The internal malae in the female are large and fringed with setae-like processes but in the male they are relatively simple. The four gnathosomal setae on either side of the ventral groove form a longitudinal row. All the legs are long and, with the exception of legs II in the male, slender. The pulvilli of ambulacra II-IV are actuely lobate. Only two species have been described and these may be distinguished as follows :

1. Female with anterior margin of posterior dorsal shield entire (fig. 1) ; both sexes with claws of legs II-IV markedly enlarged ; female with metasternal setae free..... *C. hirtus*
   — Female with anterior margin of the posterior dorsal shield deeply incised (fig. 13) ; both sexes with claws on legs II-IV ; female with metasternal setae situated on the sternal shield..... *C. incisus.*

Cyrthydrolaelaps hirtus Berlese.

Gamasus sp. TIETZE, F. (1899) in CANESTRINI, Pros. Acarofauna Ital. *VIII a* : 948 (in part).

Cyrthydrolaelaps hirtus BERLESE, A. (1905). *Redia* 2 : 20 ; HALBERT, J, N. (1915). *Proc. R. Irish Acad.* 31 : 60-62 ; HULL, J. E. (1918) *Trans. nat. Hist. Soc. Northumb.* 5

(n. s.) : 75 ; HALBERT, J. N. (1920) *Proc. R. Irish Acad.* 35 : 113 ; EVANS, G. O. (1955) *Proc. zool. Soc. Lond.* 125 : 585 ; FARRIER, M. H. (1957) *N. Carolina Agr. Exp. Stat. Tech. Bul., No.* 124 : 87.

Female : Dorsum with two large shields and three small pygidial shields. Anterior shield (approx. 730 × 710 μ) with 18 pairs of setae ; posterior shield (450 × 550 μ) with nine pairs (fig. 1). Both shields with lightly sclerotised areas. Chaetotaxy of the lateral striated cuticle as figured.

Ventrally, sternal shield rectangular in outline ; anterior margin concave (fig. 2). Metasternal setae free. Vaginal sclerites conspicuous. Genital shield large and bearing 9-10 simple setae. Anterior portion of the genital shield narrow and terminating in an inverted U-shaped sclerotised strip. Anal shield relatively small and with one or two setae in addition to the paranals and postanal seta. Peritrematal shield weakly developed ; peritreme extending to the level of coxa I.

Venter of the gnathosoma with the normal four pairs of setae arranged in two longitudinal rows, one on either side of the ventral groove so that the internal posterior rostrals lie between the rostrals and the external posterior rostrals (fig. 3). The internal malae are strongly developed and provided with setae-like processes. The chaetotaxy of the three basal movable segments of the pedipalp is normal. The internal setae of the palpgenu are spatulate distally ; the palptarsal seta is three pronged and has the associated hyaline process (fig. 4). Median process of the tectum long, usually undivided ; lateral processes bi- or trifid (fig. 5). Both digits of the chelicera weakly dentate (fig. 6).

All legs with ambulacra. Claws on legs II-IV markedly enlarged ; pulvilli of all legs acutely lobate (fig. 7).

Male : Anterior dorsal shield (847 × 825 μ) with twenty pairs of simple setae ; posterior dorsal shield (680 × 690 μ) with from 22 to 23 pairs of setae of which one pair is extremely short and spur-like. The chaetotactic pattern of the dorsal shields is shown in fig. 8.

Sterniti-geniti-ventral shield strongly sclerotised and bearing nine pairs of simple setae (fig. 9). Pre-endopodal shields small, triangular ; genital orifice presternal. Anal shield pear-shaped with accessory seta (or setae). Peritreme as in the female.

Gnathosomal setae arranged in two longitudinal rows ; internal malae simple (fig. 10). Chaetotaxy of the pedipalp and form of the tectum essentially the same as in the female. Fixed digit of the chelicera dentate ; movable without teeth but with a short spermatophoral process (fig. 11).

Ambulacra of legs II-IV with acutely lobate pulvilli and large claws. Leg II crassate ; femur with two distinct spurs (fig. 12).

Distribution : This species has been recorded from a number of localities in Europe, usually below tide marks on rocky seashores. The material upon which the above re-description is based was collected by Mr. J. HOBART at L. W. M. at Rhosneigr and Rhoscolyn, Anglesey, North Wales.

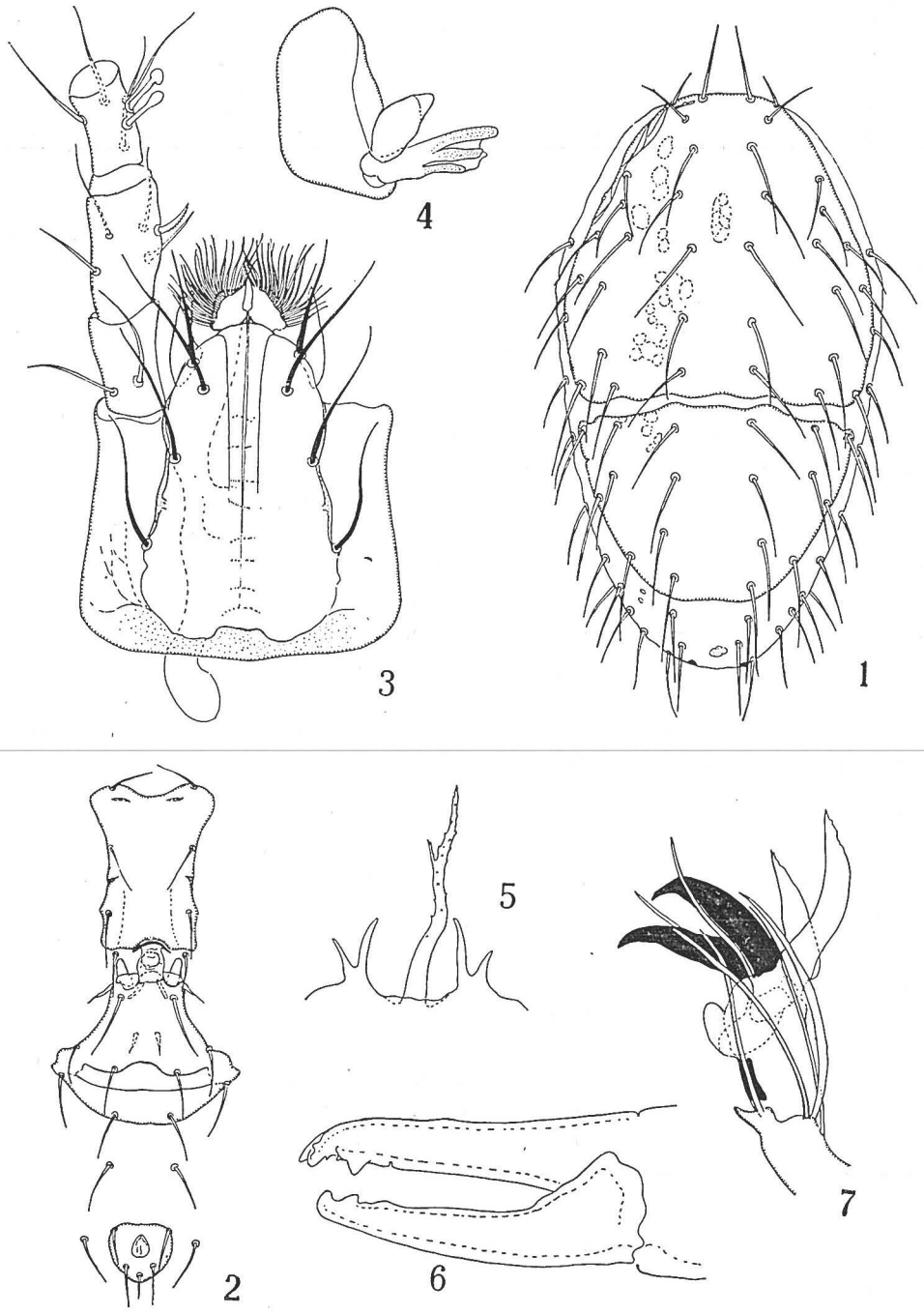

FIG. 1-7. — *Cyrthydrolaelaps hirtus* Berlese, female. Fig. 1. Chaetotaxy of the dorsum. Fig. 2. Ventral shields. Fig. 3. Venter of the gnathosoma. Fig. 4. Specialised seta on the palptarsus. Fig. 5. Tectum. Fig. 6. Chelicera. Fig. 7. Ambulacrum of leg. II.

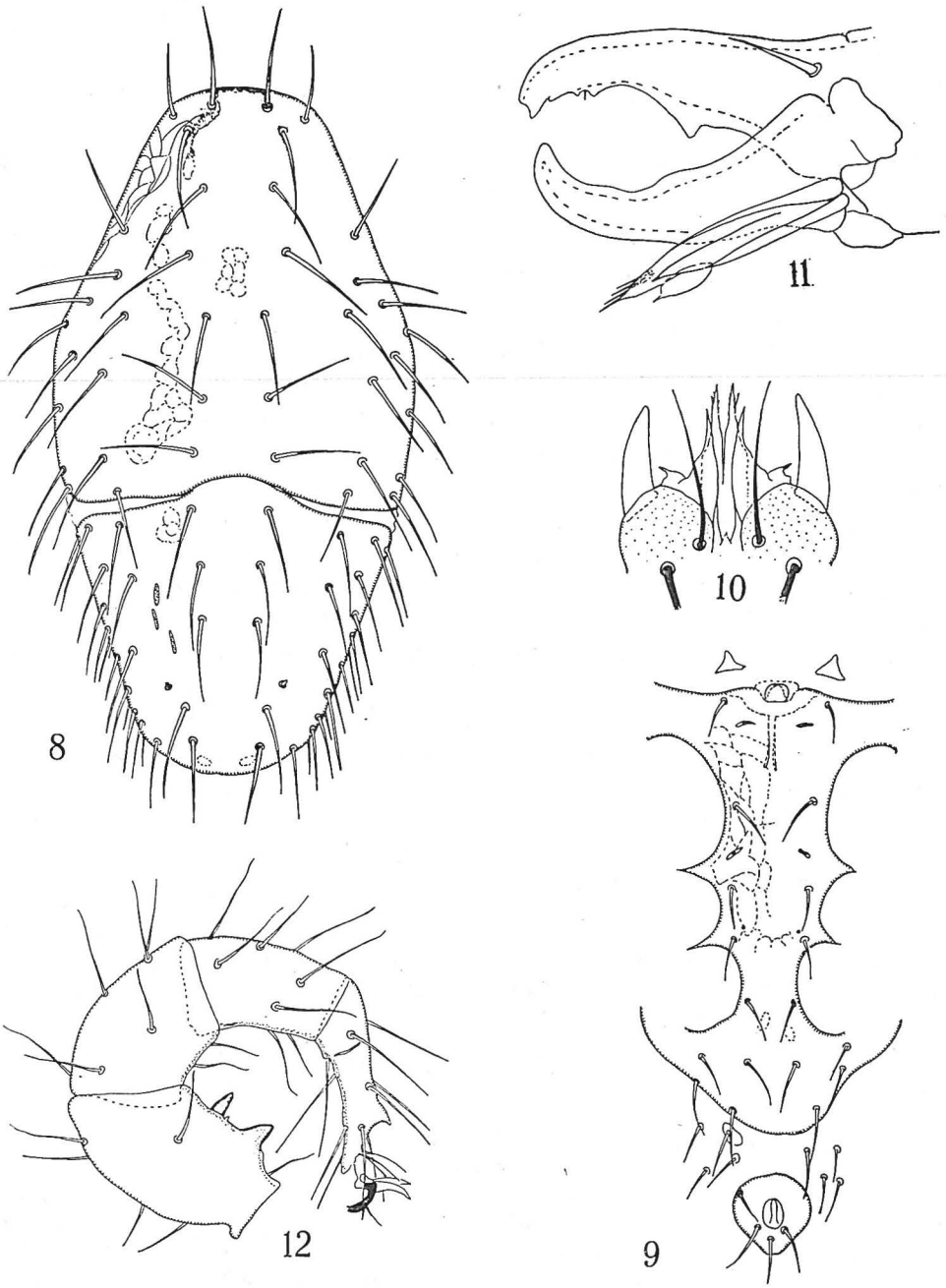

FIG. 8-12. — *Cyrthydrolaelaps hirtus* Berlese, male. Fig. 8. Chaetotaxy of the dorsal shields. Fig. 9. Ventral shields. Fig. 10. Corniculi and internal malae. Fig. 11. Chelicera. Fig. 12. Leg II.

Cyrthydrolaelaps incisus Evans.

Gamasus sp. TIETZE, F. (1899) in CANESTRINI *Pros. Acarofauna Ital. VIII a* : 948 (in part).

Cyrthydrolaelaps hirtus. HALBERT, J. N. (1915) ; *Proc. R. Irish Acad., 31*, 39ii : 61, figs. 8e-j (in part).

Cyrthydrolaelaps incisus EVANS, G. O. (1955). *Proc. zool. Soc. Lond., 125* : 585 ; FARRIER, M. H. (1957). *N. Carolina Agr. Exp. Stat. Tech. Bul.* No. 124 : 89.

Female : Dorsum partially covered by two shields (fig. 13). Anterior shield (405 × 375 µ) with 19 pairs of simple setae. Posterior shield smaller (190 × 245 µ) and with a deep incision in its anterior margin. The chaetotaxy of this shield varies according to the degree of sclerotisation of the posterior margin of the shield ; in the specimen under study, the posterior shield bears 21 setae. There are three small oval pygidial shields.

The sternal shield carrying four pairs of setae is weakly sclerotised except for the strongly sclerotised locking mechanism which engages with the tongue-like anterior portion of the epigynial shield when the genital shield is in the closed position (fig. 14). A small striated shield lies immediately in front of coxa II. The geniti-ventral shield is provided with five pairs of simple setae. The podal shields posterior to coxae IV are free. The pear-shaped anal shield carries the usual three setae associated with the anus. The peritreme is well-developed and extends beyond coxa I. A short simple seta is situated posterior to the stigma.

The gnathosoma is normal for the genus with the gnathosomal setae arranged as in *C. hirtus*. The internal setae on the palpgenu are spatulate distally and the specialised seta on the tarsus is three-pronged. The form of the tectum is shown in fig. 15. The movable digit of the chelicera is bidentate and the fixed digit has about four small teeth in its distal half (fig. 16).

All the legs have ambulacra ; leg I, approximately 840 µ in length, has a well-developed pretarsus. The dorsal lobes of the pulvillus of leg II are broad, membraneous and pointed at their extremities (fig. 17).

Male : I have not examined this sex. The following description is taken from HALBERT (1915) :

« Length 500 µ. to 570 µ., breadth 308 µ. Shape as in the female, dorsal shields larger, especially the second one, which is not incised in front and closes the sides of the body. The streno-genital plate widens out beyond the fourth legs and extends in a broadly rounded extremity to the anal plate. Peritreme a bowed line, stigma opposite the fourth coxae. Legs very similar to those of the female, second pair unarmed. The epistome (fig. 8i) differs from that of the female, in having a short central spine reaching only a little beyond the side processes, the latter may have two or four spines on each side. The chelicerae (fig. 8j) are very small, fixed chela straight with two distinct teeth, free chela more slender, armed with one tooth at a little distance from the apex, a large hyaline process springs from its base. »

Distribution : The type locality is in rock crevices on the seashore at Wembury near Plymouth. HALBERT (1920) states that this species (he considered it a protonymph of *C. hirtus*) « occurs commonly in the upper parts of the intertidal area, usually in the Pelvetia zone » on the Dublin coast and at Malahide. TIETZE (1899) appears to have included *hirtus* and *incisus* in his description and figures of a *Gamasus* sp. from Malamocco (Venezia), Italy.

The figure of the tectum of *C. hirtus* given by FARRIER (1957) refers to this species.

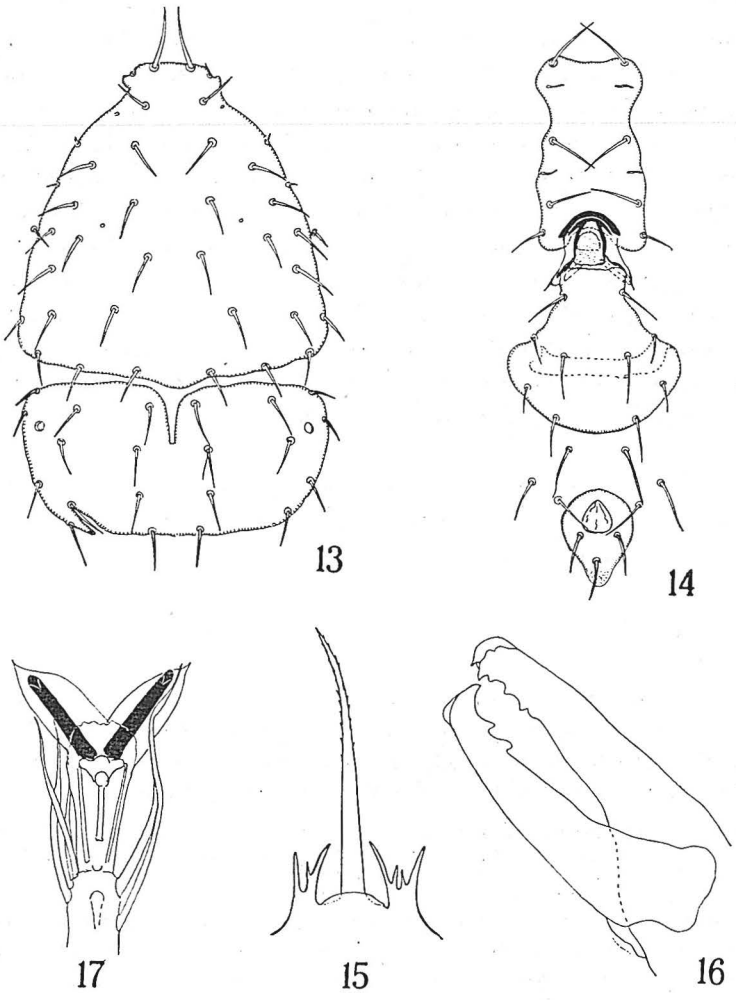

FIG. 13-17. — *Cyrthydrolaelaps incisus* Evans, female. Fig. 13. Dorsal shields. Fig. 14. Ventral shields. Fig. 15. Tectum. Fig. 16. Chelicera. Fig. 17. Ambulacrum of leg II.

Gamasolaelaps Berlese.

Gamasolaelaps BERLESE, A. (1904). REDIA 1 : 241.

Metaparasitus OUDEMANS, A. C. & VOIGTS, H. (1904). *Zool. Anz. 27* : 655.

Gorirossia FARRIER, M. H. (1957). *N. Carolina Agr. Exp. Stat. Tech. Bul.*, No. 124 : 89 *syn. nov.*

The dorsum may be covered by a single laterally incised shield, or by two subequal shields. In the female, the sternal shield bears three pairs of setae ; the metasternals being situated on compound metasternal-endopodal shields. The geniti-ventral shield is similar to that in *Veigaia* except for its smaller size. The anal shield is free in both sexes. The intercoxal region is occupied by a strongly sclerotised shield carrying four pairs of setae. The ventral shield is never fused with the sterniti-metasternal or the anal shield although it may be fused with the podals in the region of coxae IV. Both sexes have small internal malae which are not fringed with setae-like processes. The gnathosomal setae usually show the normal parasitoid arrangement in that the posterior rostrals form a transverse row between the rostrals and the capitulars. The tectum is basically two- or three-pronged. All legs have well-developed ambulacra. Leg II in the male is unarmed.

At present, five species belonging to this genus have been described of which *Gamasolaelaps arcuatus* Berlese, 1910, based on a deutonymph from « Java », is excluded from the following key.

Key to Adults.

1. Both sexes with dorsum almost entirely covered by two subequal shields (fig. 18) ; sternal region weakly sclerotised ; palptarsal seta three-pronged.... *G. excisus.*
   — Both sexes with single dorsal shield provided with lateral incisions ; sternal region uniformly sclerotised ; palptarsal seta three or four-pronged..... 2.
2. Gnathosomal setae forming a longitudinal row on either side of the ventral groove (fig. 29) ; palptarsal seta four-pronged (fig. 31) ; tectum characteristically shaped (fig. 32)..... *G. cerviformis.*
   — Gnathosomal setae not forming a longitudinal row on either side of the ventral groove, posterior rostrals forming a transverse row between the rostrals and the capitulars (fig. 39) ; palptarsal seta three-pronged..... 3.
3. Tectum bispinate ; tarsus I with a long trichobothrium in its basal third ; movable digit of the chelicera with four teeth ; pulvillus entire. Male unknown.....
   G. whartoni
   — Tectum trispinate (fig. 41) ; tarsus I without trichobothrium ; movable digit of the chelicera in both sexes with two teeth ; pulvillus reduced, divided.....
   G. bellingeri.

Gamasolaelaps excisus L. Koch.

Sejus excisus KOCH, L. (1879). *Sv. Ak. Handl. 16*, No. 5 : 122 fig.
Cyrtolaelaps excisus, TRAGÅRDH, I. (1904). Fauna Arctica *4* : 34 fig. 27.
Metaparasitus suboles VOIGTS, H. & OUDEMANS, A. C. (1904). *Zool. Anz.* 27 : 655.
Cyrtolaelaps aurantiacus BERLESE, A. (1904). *Redia, 1* : 241.
Gamasolaelaps aurantiacus, HALBERT, J. N. (1915). *Proc. R. Irish. Acad. 31* : 58.
Gamasolaelaps excisus, HALBERT, J. N. (1920). *Proc. R. Irish Acad. 35* : 114.

Female : Dorsum partially covered by two subequal shields. Anterior shield with lateral margins incised in the scapular region and bearing 18 pairs of simple setae distributed as in fig. 18. Posterior shield irregular in outline owing to the occurrence of a band of weakly sclerotised cuticle laterally and posteriorly.

Sternal shield weakly sclerotised except for four well-sclerotised areas in the region of sternal setae II and III. Metasternal setae situated on compound metasternal-endopodal shields (fig. 19). Geniti-ventral shield flask-shaped and usually carrying five setae ; epigynial portion of the shield conspicuous. A short seta occurs on either side of the geniti-ventral. The podals posterior to coxae IV are free and have pore-like structures. Anal shield pear-shaped with three setae. The chaetotaxy of the unsclerotised cuticle posterior to coxae IV is shown in the figure. Gnathosomal setae arranged so that the internal posterior rostrals lie almost in line with the externals and the four setae form a transverse row (fig. 20). Internal malae relatively small but divided. Internal setae on the genu stout ; anterior seta bifid distally (fig. 21). Palptarsal seta with three prongs, hyaline appendage well-developed. Tectum basically three-pronged but each prong divided into a variable number of small processes (fig. 22). The digits of the chelicera are short ; the movable being bidentate and the fixed tridentate (fig. 23).

All legs with well-developed ambulacra (fig. 24). Legs I and IV long and slender ; Leg I approximately 1260 μ and Leg IV about 1700 μ in length.

Male : Dorsum with two uniformly sclerotised shields. Anterior shield (400 × 450 μ) with lateral margins entire and bearing 20 pairs of simple setae. Posterior shield (256 × 380 μ) usually with 20 pairs of setae. Pygidial shield small, weakly sclerotised.

Sterniti-genital shield with five pairs of setae. Anterior margin of shield incised ; genital orifice situated slightly posterior to the first pair of sternal setae (fig. 25). Ventral shield irregular in outline and with about eight setae. Anal shield and chaetotaxy of the region posterior to coxae IV as in the figure.

Chaetotaxy of the gnathosoma and the form of the tectum similar to that in the female. Dentition of the chelicera and shape of the spermatophoral process as in fig. 26.

Leg I measures about 1040 μ and leg IV about 1235 μ. Leg II is unarmed.

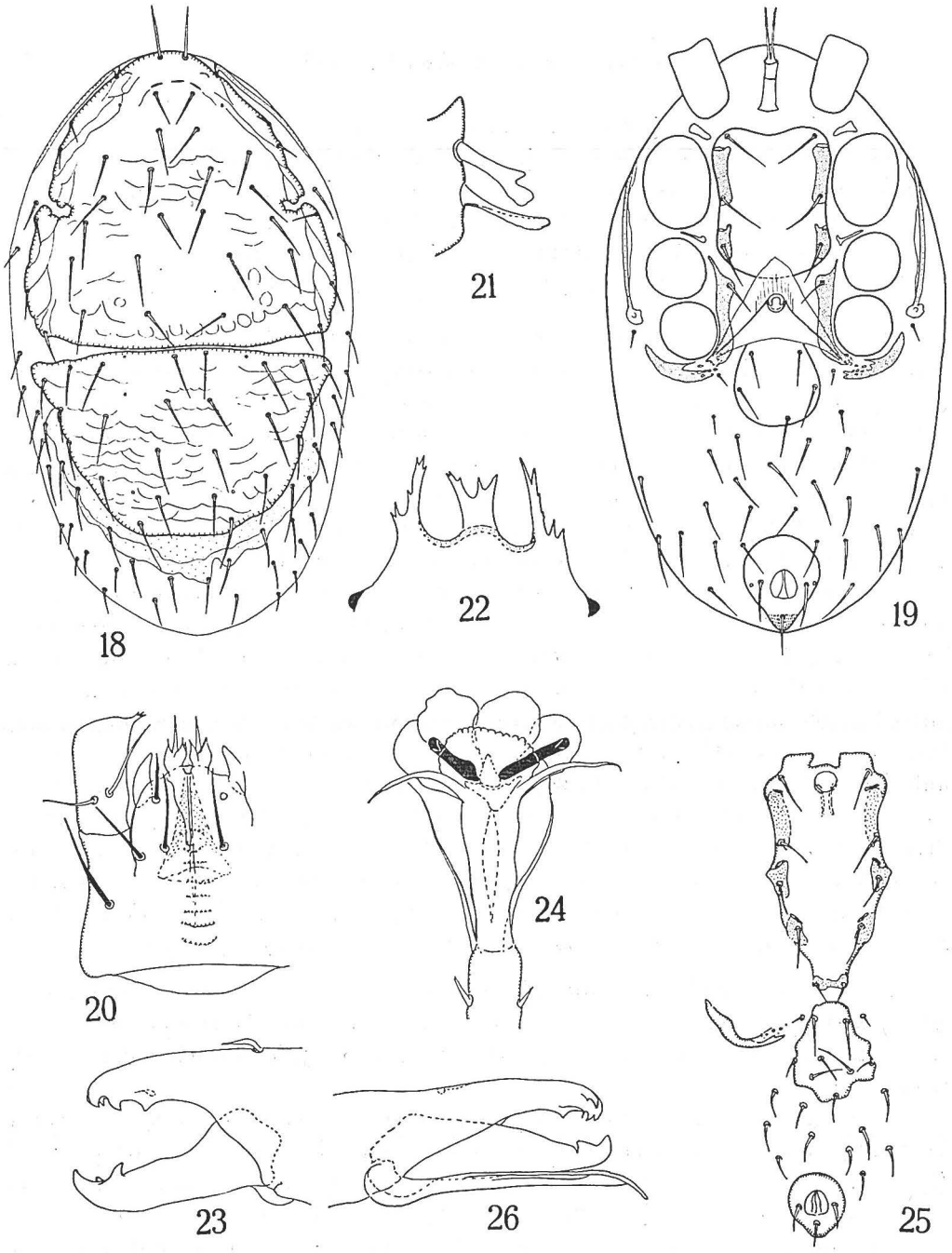

FIG. 18-26. — *Gamasolaelaps excisus* (L. Koch). Fig. 18. Dorsum of female. Fig. 19. Venter of female. Fig. 20. Venter of the gnathosoma (female). Fig. 21. Internal setae on the palpgenu (female). Fig. 22. tectum (female). Fig. 23. Chelicera of the female. Fig. 24. Ambulacrum of leg II in the female. Fig. 25. Ventral shields of the male. Fig. 26. Chelicera of the male.

Distribution : This species is widely distributed in Europe and has been recorded from Italy, Germany, Austria and the British Isles. The type locality is « Jenissej S. ven Troitzkoj (lat. 65 45') » in Siberia, KOCH (1879).

Gamasolaelaps cerviformis Berlese.

Gamasolaelaps cerviformis BERLESE, A. (1916). *Redia*, 12 : 159 : EVANS, G. O. (1955). *Proc. zool. Soc. Lond.*, *125* : 585.

Female : Dorsal shield (590 × 340 μ) with strong lateral incisions ; posterior region of the shield irregular (fig. 27). Lateral and posterior regions more heavily sclerotised than the remainder of the shielf as indicated by stippled areas in the figure. The anterior shield carries 18 pairs simple of setae and the posterior shield 14 pairs.

Tritosternum with a short base and a pair of finely pilose laciniae ; pre-endopodals conspicuous and triangular in outline. Sternal shield with three pairs of setae and two pairs of elongate « pores » (fig. 28). Metasternals situated on a compound metasternal-endopodal shield. Geniti-ventral shield with a pair of strong setae and flanked by two pairs of short setae ; endopodals free and with four or five circular pore-like structures internally. Epigynial portion of the geniti-ventral shield as figured. Anal shield pearshaped and with the usual three setae. There are two pairs of setae on the unsclerotised cuticle between the geniti-ventral and anal shields. Peritrematal shield poorly developed ; peritreme extending to the level of coxa I. A short simple seta is present posterior to the stigma.

The four pairs of gnathosomal setae are arranged in two longitudinal rows with the internal posterior rostrals lying between the rostrals and the external posterior rostrals (fig. 29). The ventral groove is provided with eight transverse rows of denticles. The corniculi are relatively short and the internal malae are produced into a number of short processes. Chaetotaxy of the trochanter, femur and genu normal (2-5-6). The internal seta on the palp femur is as in fig. 30. Both internal setae on the palpgenu are spatulate and comb-like in their distal third. The specialised seta on the palptarsus is four-pronged and the hyaline process is well-developed (fig. 31). The tectum is characteristically shaped (fig. 32). Movable digit of the chelicera unidentate ; fixed digit as in fig. 33.

All legs are slender and provided with ambulacra ; pretarsus of leg I extrem ly long. Ambulacrum of leg II as in fig. 34.

Male : Dorsal shield (530 × 270 μ) without lateral incisions ; posterior of the shield deeply incised. Chaetotaxy of the shield essentially the same as in the female.

Sternit-genital shield with five pairs of setae ; genital orifice posterior to the first pair of sternal setae (fig. 35). Posterior margin of shield deeply emarginate. Ventral shield with four pairs of setae. Podals posterior to coxae IV free and with pore-like structures. Anal shield pear-shaped as in the female.

Chaetotaxy of the gnathosoma and the form of the palps as in the female. Tectum basically the same as in the female. Spermatophoral process on the chelicera simple (fig. 36). Leg II unarmed.

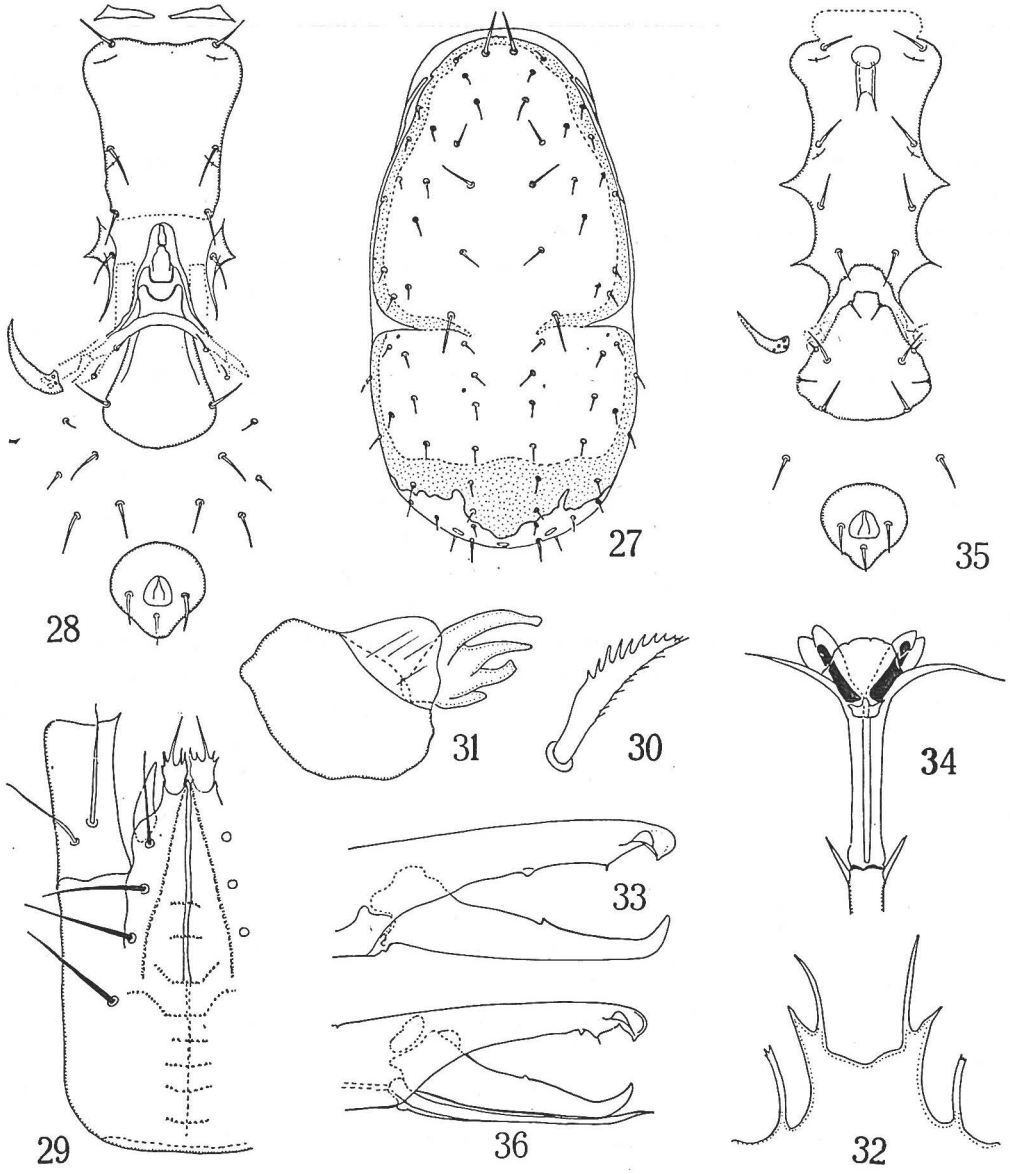

FIG. 27-36. — *Gamasolaelaps cerviformis* Berlese. Fig. 27. Dorsum of female. Fig. 28. Venter of female. Fig. 29. Venter of the gnathosoma (female). Fig. 30. Internal seta on palpfemur (female). Fig. 31. Specialised seta on the palptarsus (female). Fig. 32. Tectum (female). Fig. 33. Chelicera of the female. Fig. 34. Ambulacrum of leg II of the female. Fig. 35. Ventral shields of the male. Fig. 36. Chelicera (male).

Distribution : This species is previously known only from the type locality, « in Africa orientali » (BERLESE, 1916). The above re-description of both sexes is based on material collected from grass and soil in moderately wet ground at Nyamleju (10, 500 ft.) and two females from litter under bamboo near Nyinabitabu (9,000 ft.), Ruwenzori, Uganda.

Gamasolaelaps whartoni (Farrier).

Gorirossia whartoni FARRIER, M. H. (1957). *N. Carolina Agr. Exp. Stat. Tech. Bul.* No. 124 : 91.

FARRIER (1957) proposed a new genus, *Gorirossia*, for this species but the character by which he distinguished the genus from other Veigaiaids, namely, the form of the ambulacra on legs II-IV, does not, in my opinion, warrant its separation from *Gamasolaelaps*. The original description of *G. whartoni* is adequate for its identification. The following three additions may be made to Farrier's description :

1. The genital shield is present although in the prepared specimens I have examined it was folded back over the ventral shield (cf. fig. 38).

2. A long trichobothrium is present on the basal third of tarsus I.

3. The gnathosomal setae are so arranged that the posterior rostrals form a transverse row between the rostrals and the capitulars.

The male is unknown.

Distribution : It is known from the type localities in North Carolina, U. S. A.

Gamasolaelaps bellingeri sp. n.

Female : Dorsal shield (528 × 340 μ) with strong lateral incisions and bearing 22 pairs of simple setae distributed as in fig. 37. Stippled areas in the figure indicate regions of heavier sclerotisation.

Sternal shield uniformly sclerotised and bearing three pairs of setae (fig. 38). Metasternal setae on fused metasternal-endopodal shields. Ventral shield small, rectangular in outline and provided with two pairs of setae of which the posterior pair are the longer. The epigynial flap was difficult to figure since it was lying over the ventral shield in all the specimens examined. The pear-shaped anal shield has three setae.

The posterior rostral setae form a transverse row between the rostrals and capitulars (fig. 39). Internal malae lobed but without fringe of « setae ». Chaetotaxy of the palptrochanter, femur and genu normal (2-5-6). Internal setae on the palp-genu as figured (fig. 40). Palptarsal setae with four prongs and a distinct hyaline appendage. Tectum with its anterior margin produced into three slender processes of about equal length (fig. 41). Digits of the chelicera relatively long and slender ; movable digit bidentate ; fixed digit weakly dentate (fig. 42).

All legs with ambulacra ; pulvilli of legs II-IV weakly lobate (fig. 43). Leg I and IV respectively 630 and 740 μ in length. Coxa I with a strong protuberance externally and a weaker one internally.

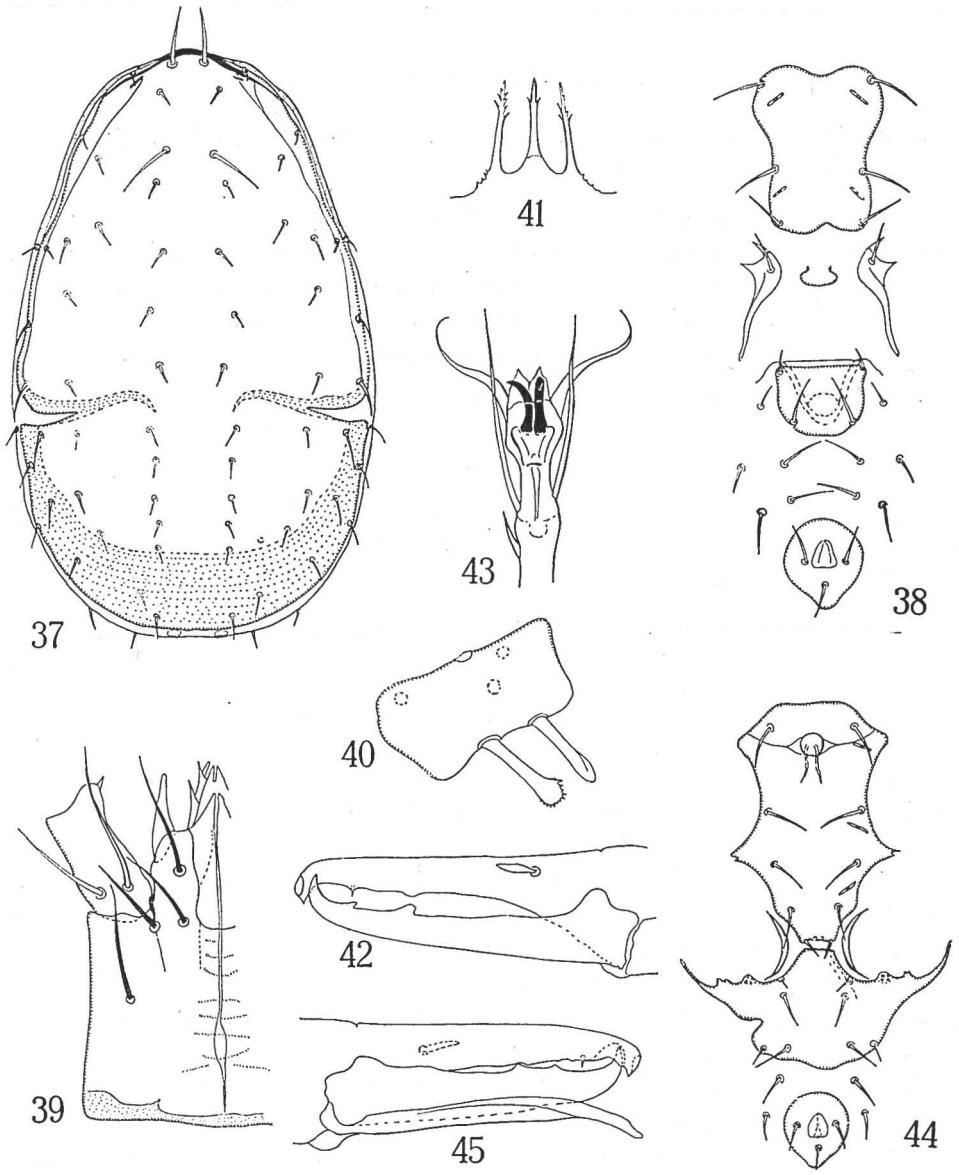

FIG. 37-45. — *Gamasolaelaps bellingeri* sp. n. Fig. 37. Dorsum of female. Fig. 38. Ventral shields of the female. Fig. 39. Venter of the gnathosoma (female). Fig. 40. Internal setae on palpgenu (female). Fig. 41. Tectum (female). Fig. 42. Chelicera of female. Fig. 43. Ambulacrum of leg II (female). Fig. 44. Ventral shields of male. Fig. 45. Chelicera of male.

Male : Dorsal shield (440-410 μ × 240-250 μ) with lateral incisions ; chaetotactic pattern of the shield essentially the same as in the female.

Sterniti-genital shield strongly sclerotised and bearing five pairs of setae ; genital orifice situated posterior to the first pair of sternal setae (fig. 44). Ventral shield large, fused with podal shields posterior to coxae IV, and carrying four pairs of setae. Anal shield pear-shaped. Peritremes well-developed, extending to the vertex. Gnathosoma, pedipalps and tectum as in the female. Chelicera with elongate digits ; movable digit bidentate with a stout, simple spermatophoral process (fig. 45).

Leg II in the male unarmed.

Locality : A single female (Holotype : 1959 : 2 : 16 : 1 :) and four males (Allotype : 1959 : 2 : 16 : 2 ; Paratypes 1959 : 2 : 16 : 3-5) from moss and wet leaf litter, St. Thomas, Jamaica (Coll : P. F. BELLINGER, 1956).

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