Description of three species of *Tetrastichus* Haliday (Micro-Hym.), with a host list.

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With 57 figures.

1. **Tetrastichus rufus** n. sp.

Figures 1—28.

On an excursion with "Naturhistorisk Forening for Sjælland" on the 5th of June 1937, material for breeding of the following new species was collected.

Length of female 1.8 mm+ovipositor exserted 0.3 mm = 2.1 mm; length of male 1.4 mm.

Red, metallic shining, abdomen and sides of thorax slightly tinged with green, eyes red, ocelli dark; female antennae hyaline at base, scape and pedicel darkened towards funicle, which is dark as is also the club; male antennae hyaline, yellowish, club dark; legs of female hyaline, yellowish, hind coxae darkened dorsally, tips of tibiae dark, less in fore tibiae, tarsal joints darkened towards apex; legs of male lighter designed. Wings hyaline, with the venation yellowish, tegulae yellowish.

Female: Head slightly broader than thorax, 34:32, subtransverse, cheeks rounded, antennae inserted above the middle of the face, separated more than the breadth of their bases, ocelli in a flat triangle, distance from the compound eyes thrice their breadth. Antennae composed of scape, pedicel, 4 anelli, 3 funicle and 2 claval joints. Radicula quadrate, scape more than four times as long as broad, 75:17, slightly flattened; pedicel conical, nearly half as long as scape, 32:75, ring joints transverse, first ring joint as long as 3 next together,

second ring joint smallest, lamellate, the joints shortened or disappearing dorsally, 3 funicle joints shortened distally, 40:30:25, and slightly broadened distally, 13:14:15, first and second funicle joint widened basally, third joint at the middle, club slender, 57:18, two-jointed with an apical tap, distal joint longest, 22:35; the tap :4. Antennae haired, flagellum with hyaline, basiconic setae, the base of which is oblong or linear, and which are arranged in 2 or 3 irregular rows around each joint, the number

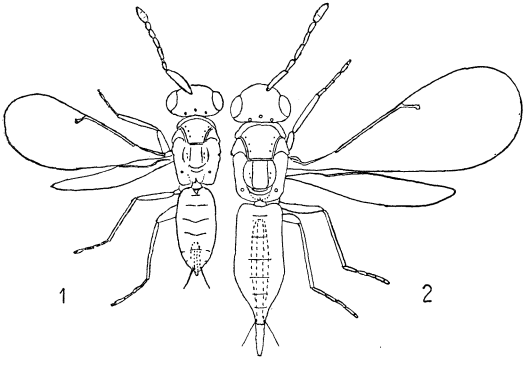

Fig. 1. *Tetrastichus rufus* n. sp. ♂, × 17.
Fig. 2. Do. ♀, × 17.

of setae on the funicle joints, 7, 7, 7, on proximal club joint, 9, on distal club joint 12, in two irregular rows (8, 4). Small presutural styloconic setae are seen on the flagellar joints. Mandibles 3-dentated, the basal tooth broadly dilated, 2 apical teeth pointed, a rounded cross fold on the outside, which also bears 4 hairs, and in the right mandible one hair on the inner side, the mandibles have 2 dental folds as usual for 3-dentated mandibles in the Chalcidids. Maxillary palpi long, 1-jointed, with 2 long and a short bristle, ratio of palpus 21:4, labial palpi 1-jointed, small, short, 4:3, with a long and a short apical bristle, glossa clothed with small rasp-like chitini-

sations, galea with some rather large hairs, and lacinia may be represented by a tuft of fine baseless hairs.

Thorax one and a half times as long as broad, 48:32, broadest before the middle; prothorax forming an arch, linear on the middle, broader laterally, mesoscutum with 6 macrochaetae, 3 on each side along the parapsidal furrows, which are very distinct. Scutellum with 4 furrows, the inner pair distinct, parallel, the lateral pair short; on each side between the furrows with a macrochaeta and caudally-medially to this a placoid sensilla. Behind scutellum a knob-like metanotum. Propodeum of moderate length, with a slight median keel; the anal margin nearly straight, when seen from above, but excavated in the middle when seen from behind, laterally with some hyaline hairs. Phragma reaching nearly to the end of propodeum. Sculpture of body very finely reticulated. Petiole short, transverse, broadest anally. Abdomen together with ovipositor nearly double as long as thorax, 95:48, ovipositor from near the base :82, exserted part :21, abdomen narrower than thorax, 28:32, sides parallel, the apex conically pointed, the sheaths of ovipositor haired unto apex and with a pair of long bristles near the base of the sheath.

Fore wing rather broad, 125:50, evenly rounded at apex, subcosta with 4 or only 3 arched bristles dorsally and a row of 15 hairs ventrally, distally nearer the margin, the row being densest basally; radial vein with 6 hairs dorsally and 5 ventrally; a line of fifty hairs runs along the anal margin, beginning before marginal vein and reaching the rounding of the wing, another line from the same point runs more anally and consists of 27 hairs, which distally fuses with the marginal fringe, a third line from the same point runs obliquely to the base of marginal vein and consists of 7-8 hairs rather confused, a small area basally of these lines bare; the disc of the wing evenly haired, about 30-35 lines across,

the hairs as long as the space between them, or $^1/_{25}$ of the wing breadth; the marginal ciliae consist of 13 longer hairs along the marginal vein, as long as $^1/_7$ of the wing breadth, the rest of the fringe counts about 148 shorter and tighter hairs, those of caudal-distal margin longest, $^1/_{10}$ of the wing breadth; marginal vein with a row of 23 hairs costally, and a similar caudal row on the under side.

Venation slender, ratio of subcosta, marginal vein, postmarginal vein and radius, 27:44:1:7, subcosta overlapping marginal vein :4, marginal vein reaching beyond the middle of wing 67:125, postmarginal nearly absent, forming a triangle at base of radial vein, which is clavate; uncus with a line of 4 placoid sensillae pointed distally, one placoid sensilla on marginal vein opposite the junction of the subcosta, and on the side of subcosta a row of about 20 placoid sensillae with one displaced basally.

Hind wing, ratio, 94:17, naked at base, evenly haired from the base of marginal vein to apex, the wing broadest at the middle, pointed towards apex, costal fringe shorter than in fore wing, $^1/_6$ wing width, anal fringe rather long, about $^3/_8$ of the wing width, 17:7, anal fringe from the base of wing consisting of 79 hairs, the last ones shortening to the costal fringe, which consists of 48 hairs; marginal vein with a hair at base and a row of 13-14 hairs along inner margin, and ventrally with a row of 18 hairs, densest at base and longer. At apex of marginal vein the hamuli, three hooks of which the two distal ones are bent; and more anally a row of 6 trichoid sensillae, densest distally. Near the base of marginal vein two placoid sensillae, dividing the marginal vein in three lengths, 19:15:76; along the side of subcosta a row of about 14 placoid sensillae.

Legs rather slender, anterior coxae subconical, two and a half times as long as broad, 19:7.5, with 4-5 macro-

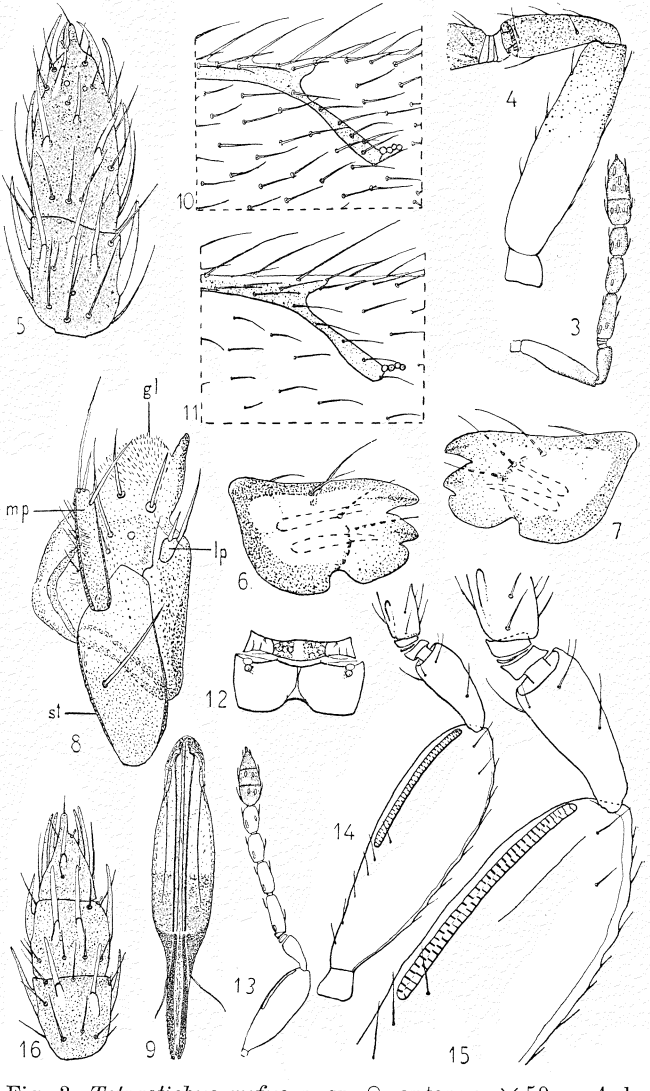

Fig. 3. *Tetrastichus rufus* n. sp. ♀, antenna, × 50. — 4. basal joints of antenna, × 133. — 5. club, × 217. — 6. right mandible, inside view, × 217. — 7. left mandible, inside view, × 217. — 8. maxilla and labium, lateral view; letters, see No. 18, × 217. — 9. ovipositor, × 30. — 10. radial vein, upper side, × 133. — 11. do., lower side, × 133. — 12. ♂, metathorax and propodeum, from behind, × 50. — 13. antenna, × 50. — 14. basal joints of antenna, × 133. 15. do., enlarged, × 217. — 16. club, × 217.

trichiae and a bristle at inner apex; middle coxae smaller, conical and shorter, 12:7, truncate at tip, junction of trochanter laterally at the tip; posterior coxae subconical, largest, 19:9, with two long macrotrichiae near the apex, and one on the opposite side, besides some scattered small ones. Trochanters with 2-3 hairs. The femora slightly swollen, hind ones longest, 27:29:34; fore femora with a row of 7 hairs, and an inner bristle near the apex. Middle femora with a similar bristle near apex, and a lateral row of 4-5 hairs, hind femora with a basal bristle and 2 rows of 8 and 9 hairs. Tibiae straight, hind and middle tibiae longer than fore tibiae, 29:40:42, rather densely haired towards apex, spurs 1, 1, 1. Tarsi densely haired, hind tarsi longest, 23:24:29, in fore tarsi three inner joints equal, 5:5:5, in middle tarsi tapering, 6:5:4.5, and also in hind tarsi, 9:7:6, last joint in fore and middle tarsi the largest one, in hind tarsi equal to metatarsal joint.

Male: Smaller than female, abdomen longer than thorax, 49:39, thorax broader, 25:19. Antennae composed of scape, pedicel, 3 anelli, 4 funicle and 3 claval joints. Radicula quadrate, 12:11, scape broad, flattened, 88:30, scape organ occupying more than distal half, 45:88, and bordered with 32 short hooks on each side of the slit, pedicel conical, one third the length of the scape, 30:88, half as broad as long, 14:30, ring joints transverse, middle ring joint very thin, lamellate, the joints shortened dorsally; the four funicle joints shortening distally, 34:29:26:24, and slightly broader distally, 11:12:13:13, club slender, 48:18, three-jointed with an apical tap, the joints, 18:15:18, the tap :5, second club joint tapering distally, last joint conical; scape and pedicel with a few hairs, flagellum more evenly haired with hyaline hairs and among them basiconic setae, with light linear bases, the number being difficult to count with security and besides it seems to vary, in the funicle joints from 4—5, in the proximal club joint from 4—7,

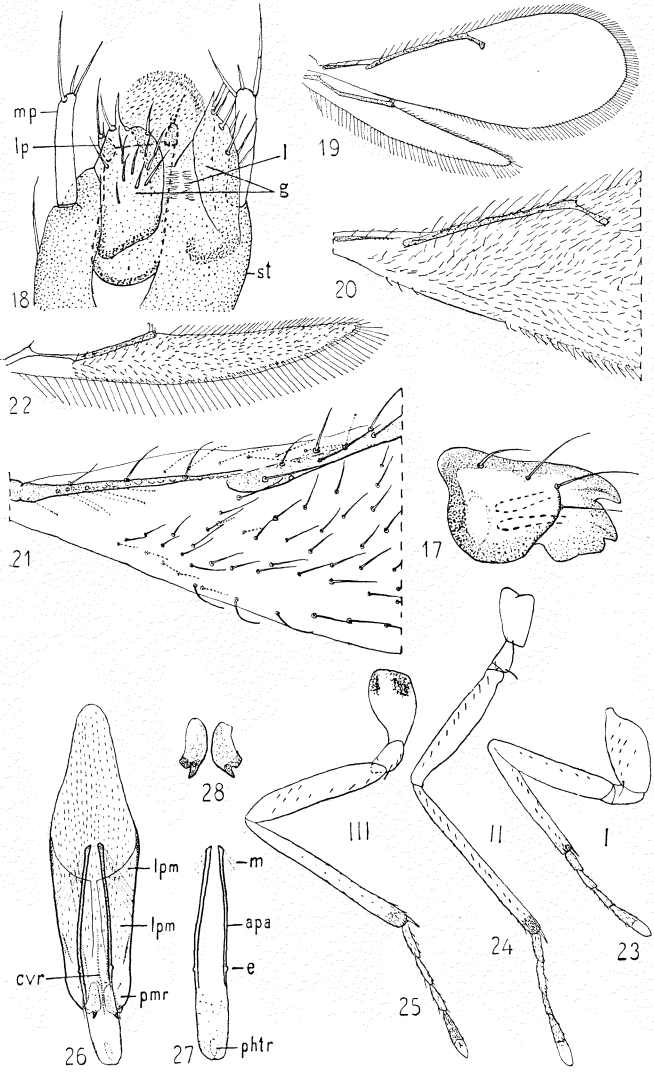

Fig. 17. *Tetrastichus rufus* n. sp. ♂, left mandible, outside view, × 217. — 18. maxilla and labium, g. galea, gl. glossa, l. lacinia, lp. labial palpus, mp. maxillary palpus, st. stipes, × 217. — 19. wings, × 30. — 20. fore wing, basal half, × 50. — 21. fore wing, base, × 133. — 22. hind wing, × 50. — 23—24—25. legs I, II, III, × 50. — 26. phallus, dorsal optical view, × 133. — 27. aedeagus, × 133. — 28. digiti, apa. aedeagal apodemes, cvr. central volcellar ridge, e. ergots, lpm. lamina parameralis, m. muscles, ph. phallotreme, pmr. paramer, × 217.

in the middle club joint also from 4—7, and in the distal joint not more than 4, the number taken from three male specimens. Left mandible like that of the female, right mandible lost. In the labium not found any differences from that of the female. Wings more slender, fore wing, 95 : 35, hind wing, 71 : 10, and with fewer hairs in the three lines, 31, 22, 5; marginal ciliae of 125 hairs, thereof 13 longer and more spread along marginal vein; subcosta with 3 arched bristles dorsally, and ventrally a row of 13 bristles, thereof 6 tight proximally and 7 more spread submarginally distally. Ratio of subcosta, marginal, postmarginal and radius, 19 : 31 : 1 : 6; marginal vein with a row of 16 macrotrichiae dorsally; in hind wings costal fringe $^1/_5$ of the wing width, anal fringe $^2/_3$ of wing width, 10 : 7, consisting of 53 hairs, costal fringe of 35 hairs; marginal vein with one hair at base, a row of 11 hairs inside, and a row of 12 hairs ventrally, the two placoid sensillae dividing the marginal vein in the ratio 14 : 12 : 53. In the legs the fore coxae broadest at the middle, 17 : 7.5, with about 10 spread hairs and a bristle at apex, middle coxae, 11 : 7, hind coxae, 16 : 8; femora nearly alike, 26 : 28 : 29; ratio of tibiae, 26 : 37 : 36; ratio of tarsi, 20 : 21 : 26, inner joints of fore tarsi, 4 : 4 : 4, of middle tarsi, 5 : 4.5 : 4, of hind tarsi, 7 : 6 : 5; otherwise as in female. Phallus broadest at the middle, no basal ring was observed; from the inner wall of the lamina parameralis originates a pair of muscles attached to the bases of the aedeagal apodemes. Aedeagus, which is bent ventrally at apex, bears distally of the middle a pair of small ergots, and near the apex is seen an ovate phallotreme. The moveable digiti are rectangular and somewhat crescent-shaped, with a strong spine at apex and a truncate base for attachment of muscles; between the digiti a bristle-like chitinisation of the volcella. On the sides are seen the parameres, each with a bristle ventrally and an apical one, lying close to the aedeagus.

Type: ♀ on a slide with allotype ♂ from Viemose, South Sealand, Denmark, bred $^{19-24}/_{6}$ 1937 from eggs of *Dytiscus* sp. in stems of *Juncus effusus* L. collected 5. 6. 1937, in all 13 females and 8 males bred. Description further derived from a pair on a slide, paratypes, same data, and a dissected pair on a third slide, paratypes, same data, the rest preserved in spirit. My collection. The material was collected at the slopes of a small marl-pit isolated in a cultivated field.

The species was bred together with *Mestocharis* sp., 333 males, 58 females, the greater part of which was bred from the 14th to the 21st of June, 1937. This species had a very slight shading on the fore wing of the female, and may be synonymous with the variety of *Pleurotropis bimacularis* Thoms. bred by Henriksen (1918, p. 166), conf. Blunck (1923, p. 305).

In the table of Kurdjumov (1913, p. 252) *Tetr. rufus* runs to the genus *Aprostocetus* Wstw., distinguished from *Geniocerus* Rtzbg. by its longer ovipositor, not shorter than $^{1}/_{5}$ of the abdomen. The genus, in the present paper treated as a subgenus, is divided in two groups, the first with the body black, non metallic, the second group with the colour olive-green, green to cyaneous. *Tetr. rufus* with its red brilliant colour may best be placed in the latter group, where we find two species with a short ovipositor, about $^{1}/_{4}$ of the length of the abdomen, *eupatorii* Förster and *adalia* Walker; the ovipositor in *rufus* is a little shorter, the ratio, 95 : 21, but *eupatorii* Förster, which has the fore coxae and femora yellow, like *rufus*, has a distinct line on mesonotum, a line which has not been observable in *rufus*. The other species, *adalia* Walker, may be discerned from *rufus* by the violaceous colour of the body, and by having the femora fuscous in the middle, in *rufus* hyaline, yellowish. In the dark group it may come nearest to *ciliatus* Nees, the ovipositor of this being less than $^{1}/_{2}$ the length of abdomen, while in *rufus* it is much shorter, as said above.

2. **Tetrastichus pseudopodiellus** n. sp.
Figures 29—46.

Undetermined *Chalcidid* [larva] from eggs of *Lestes*(?) Bakkendorf, 1933, Ent. Med. XIX, p. 15—16, figs. 19—21.

During an investigation reported in Ent. Med. XXIII, 1943, p. 31—36 some specimens were found of a larva previously described (loc. cit.), but only determined as Chalcid sp. The description of the imago follows below.

Male: Length 1.25 mm, expansion of fore wings,

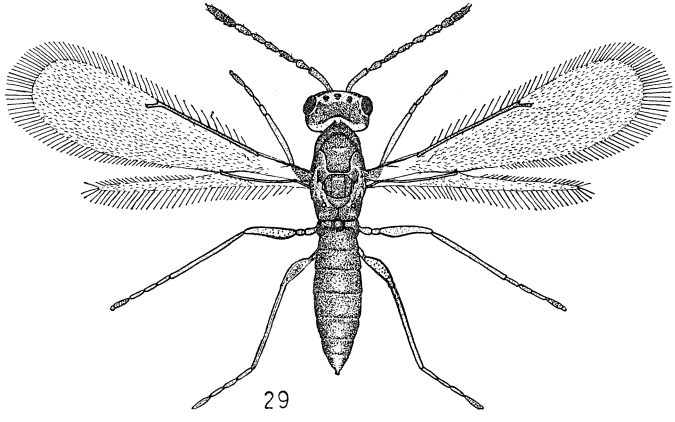

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Fig. 29. *Tetrastichus pseudopodiellus* n. sp. ♂, × 30.

2.4 mm. The body of ♂ dark green, metallic, under side brownish with eyes and ocelli red, antennae and legs yellowish, hind coxae dark, metallic, last joint of tarsi darker, antennae darker towards apex. The head, when designed fresh in spirit, with a yellow stemmatum and from this three convergent lines to the level of the antennae, also the frons yellow. In the specimen prepared in balsam these lines are very difficult to observe, the whole head being dark, when seen by incident light with a dark background, only the stemmatum and frons seems by illuminating from below to be very thin-shelled, also the whole body is rather transparent; it may be

that the specimen has not been fully hardened after the eclosion.

Head transverse, 21:10, broader than thorax, 21:17, eyes small, antennae inserted above the middle of the face, separated twice their breadth at base, ocelli in a flat triangle, distance from the eyes twice their breadth. Antennae longer than thorax+head, 50:44, composed of scape, pedicel, 3 anelli, 4 funicle and 3 claval joints; radicula quadrate, the scape slender, more than 6 times as long as broad, 61:9, scape organ, with 20 spines along, occupying the distal $^5/_6$ of the scape length, 51:61, pedi-

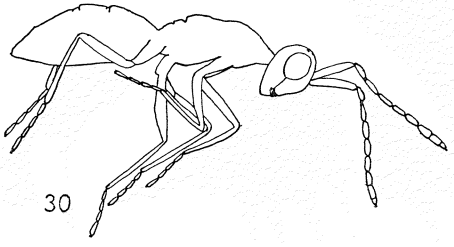

Fig. 30. *Tetrastichus pseudopodiellus* n. sp. ♂, lateral view, × 30.

cel conical, not half as long as the scape, 24:61, ring joints transverse, the first one a little longer ventrally; two proximal joints of funicle longer than two distal ones, 25:25:22:22, slightly widened distally, 7:8:9:10, club slender, 54:12, the joints distinctly separated, distal suture a little oblique, the ratio of length, 19:19:16, last joint ending in a tap :4, ratio of breadth, 11:12:9, proximal club joint rounded at base; antennae haired, flagellum with hyaline basiconic setae with oblong short bases, the number on the funicle joints, 2, 2, 2, 3, on the club joints, 3, 4, 2. Small presutural styloconic setae are seen on the flagellar joints. Mandibles 3-dentated, only seen in female pupa.

Thorax twice as long as broad, 34:17, prothorax transverse, bell-shaped, pointed anteriorly, mesoscutum

much longer than scutellum, 13 : 8, three macrochaetae on each side within the parapsidal furrows, which are distinct, subparallel, anteriorly bent outwards; scutellum with four longitudinal lines, the inner pair weak, outer pair distinct, shorter, a macrochaeta on each side close within outer furrows and a placoid sensilla caudal-medially to this. Metathorax long, propodeum with a median keel, furcated anally into the hind border, which has a rounded incision in the middle; spiracles distinct, circular. Phragma reaching to the incision of the propodeum. The surface of body finely reticulate, nearly smooth, shining. Petiole subtransverse, 4 : 3.

Abdomen one and a half times as long as thorax, 34 : 50, more than three times as long as broad, 50 : 15, the sides subparallel.

Wings slender, the ratio of fore wing, 85 : 24, subcosta with one bristle dorsally, near this two hairs ventrally and a few ones a little distally; from the base of marginal vein runs an anal-proximal line of four hairs to an anal group of 5 hairs; disc of wing evenly haired, about 15 rows across; marginal ciliae rather long, consisting of 12 hairs along marginal vein, their length more than $^1/_3$ of wing breadth, 24 : 9, but issuing at an acute angle to the wing border, rest of the fringe tighter, consisting of 80 hairs of a length about $^1/_3$ the wing breadth, longest at apex anally, and shortening along anal margin to the retinaculous fold, marginal vein with 10-11 hairs both dorsally and ventrally, radial vein with 3 hairs dorsally and 2 ventrally.

Venation slender, ratio of subcosta, marginal vein, postmarginal vein and radius, 18 : 33 : 1 : 6, subcosta overlapping marginal vein : 4, marginal vein reaching beyond the middle of wing, 47 : 85, postmarginal nearly absent, subtriangular, radial vein slightly clavate; uncus with a straight line of 4 placoid sensillae; on marginal vein opposite the junction of subcosta one placoid sensilla, and proximally to this a pustule with a dark point, which

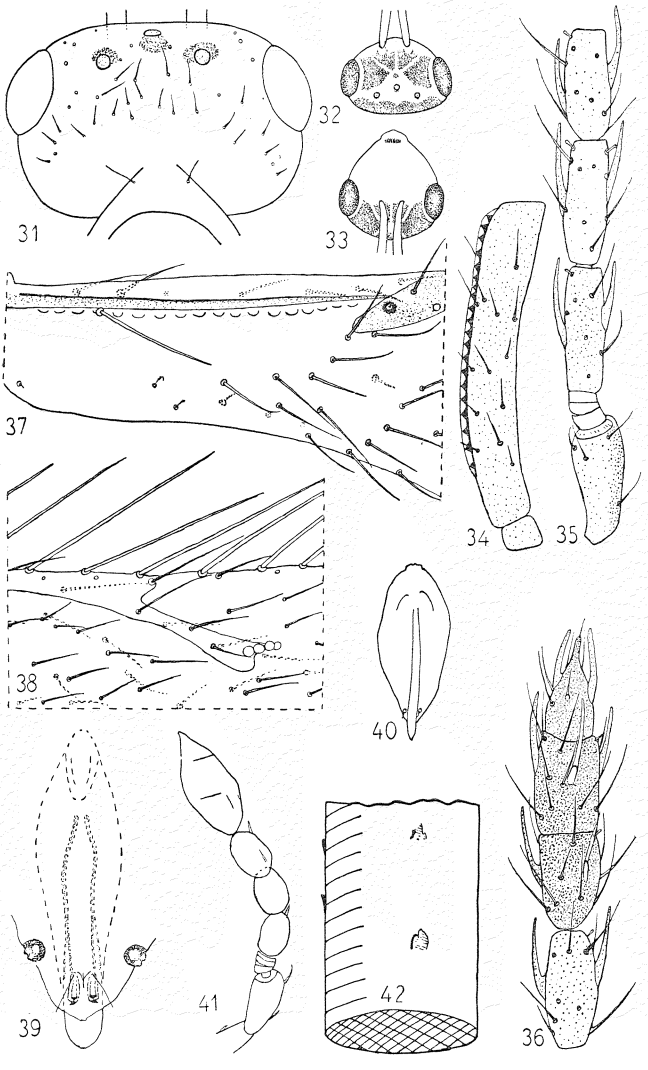

Fig. 31. *Tetrastichus pseudopodiellus* n. sp. ♂, head, dorsal view, × 133. — 32. head, colour design, fronto-dorsal view, × 50. — 33. frontal view, × 50. — 34. antenna, joint I, scape with radicula at base, × 217. — 35. joints II—VIII, × 217. — 36. joints IX—XII, × 217. — 37. fore wing, base, hairs on lower side dotted, × 217. — 38. radial vein, × 217. — 39. apex of abdomen with phallus, dorsal optical view, × 217. — 40. ♀, sketch of imaginal abdomen in pupa, ventral view, × 30. — 41. ♀, sketch of imaginal antenna in pupa, too short, oblique view, × 133. — 42. Stem of *Juncus effusus* L. with 4 egg-incisions of *Lestes* sp. × 5.

may possibly be the base of a lost bristle; along subcosta a row of about 18 placoid sensillae.

Hind wing rather small and slender, ratio, 66:4, broadest at the hamuli, tapering towards apex, evenly haired with about three rows of hairs across, costal fringe of 24 hairs, $^3/_4$ as long as the wing breadth, anal fringe of 36 longer hairs, twice as long as the wing breadth or like those of the fore wing; marginal vein with a hair at base, and a row of 6 hairs along anal margin, and 3 hairs along costal margin ventrally; two placoid sensillae on marginal vein near its base, dividing it in 3 lengths, 10:7:45, on left wing, 12:5:45; anally of the hamuli a row of 4 small trichoid sensillae, subcosta with a side row of about 10 placoid sensillae.

Legs slender, fore coxae subconical, more than twice as long as broad, 11:4.5, middle coxae shorter, 8:5, slightly swollen, hind coxae swollen, conical, 11:5; femora a little swollen, slightly haired; tibiae straight, spurs weak, hind tibiae longest, 21:25:28, fore tibiae sparingly haired, middle and hind tibiae more densely haired towards apex; hind tarsi longest, 16:16:21, length of joints equally proportionated.

Phallus broadest before the middle, occupying $^1/_5$ the length of abdomen, 50:11, aedeagal apodemes of normal chalcid type; two rods, which may be the parameres, terminated by a crescent-shaped sclerite and with a bristle before apex, are seen dorsally to the digiti, which are rectangular, and seem, as far as can be discerned through a shade, to bear a short strong tooth at apex; between the digiti a bristle-like chitinisation of the volcella; the pygostyles are represented by a pair of plates without bristles, but with short protuberances.

Female. This sex was not bred, but from a pupa later lost a sketch of the imaginal abdomen, and of the antennae in a shortened oblique view, was taken; the antennae consist of scape, pedicel, 4 anelli, 3 funicle joints

and a 3-jointed club, the second ring joint very small; ovipositor from near the base of abdomen and a little exserted. The pupa of normal chalcid type.

Type, a male on a slide from a small pond at Tibberup Bridge by Hjortespring in North Sealand, Denmark, the larva collected 12. 9. 1943, imago bred, 9. 10. 1943, found in connection with eggs of the host, *Lestes* sp. in green stems of *Juncus effusus* L. In my collection. The larva has further been found in 2 localities at Torslunde,

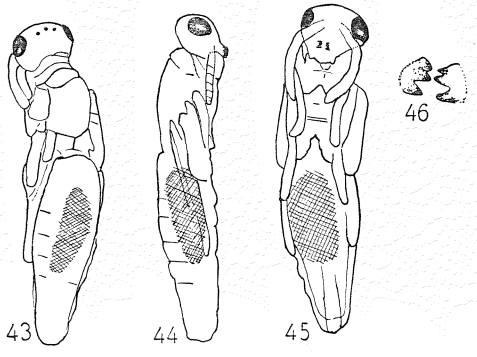

Fig. 43. *Tetrastichus pseudopodiellus* n. sp. ♀, pupa, subdorsal view, × 30. — 44. lateral view, × 30. — 45. ventral view, × 30. — 46. mandibles of pupa, × 133.

the data are Jægersborg Dyrehave 6. 10. 24 and 24. 9. 26, Torslunde 7. 9. 41, all in N. Sealand. A female pupa was found at Tibberup, 21. 10. 45, but damaged and lost before the breeding of imago.

In the table of Kurdjumov (1913, p. 252) of the females of *Tetrastichus,* the species runs to *legionarius* Giraud (1863, p. 1273), but this species is larger, ♀ 2.75 mm, ♂ 2 mm, with the flagellum black and the coxae and femora dark green as the body, not so in *pseudopodiellus,* further *legionarius* is a parasite of *Lipara lucens* on *Phragmites.* In the group with the ovipositor hidden *pseudopodiellus* comes near to *sokolowskii* Kurdjumov

(1912, p. 238), but in this species the funicle of the male has long hairs, one and a half time as long as their joints, the scape organ shorter, $^3/_4$ of the scape length, and the spiracles of ♀ ovate; in *pseudopodiellus* ♂ the spiracles are circular, the scape organ $^5/_6$ the length of the scape, and the funicle with shorter hairs, and further *sokolowskii* is bred from the larvae of *Plutella maculipennis*. The brief description of *Tetr. polynemae* Ashm. (1900, p. 616) does not allow a closer comparison, but it differs by its steel-blue colour with hind femora brown, and the marginal vein $^1/_3$ longer than head and thorax together.

3. **Tetrastichus conomeli** Bkdf.

Figures 47—57.

Anellaria conomeli Bakkendorf, Ent. Med. XIX, 1933, p. 8—15, *comb. nov.*

In a letter of May 24th, 1934, Dr. Ch. Ferrière has already informed me, that this species must belong to the *Tetrastichus* group, and I shall therefore make use of this occasion to give the following more detailed description of it, with some supplying figures.

Length of female 1.25 mm, expansion of fore wings 2.2 mm, length of male 1 mm, expansion of fore wings 2.15 mm. Female and male of the same colour, dark greenish, metallic, base of abdomen lighter, sutures on mesonotum light, eyes red, ocelli dark reddish, tegulae light yellowish, pointed with a black stripe, sclerites at wing bases, venation and legs light yellowish, tarsi darker towards apex, hind coxae and middle coxae except the tip, dark green, metallic, scape and ring joints light, rest of antennae slightly darker towards apex; body finely reticulate.

Female: Head transverse, about double as broad as long, broader than thorax, 23:19, eyes moderate, antennae inserted about at the middle of the face, sepa-

rated twice their breadth at base. Antennae slightly longer than head and thorax together, 43:42, composed of scape, pedicel, 4 anelli, 3 funicle joints and 3-jointed club; radicula quadrate, scape slender, about $4^1/_2$ times as long as broad, 45:10, pedicel subconical, $2^1/_2$ times as long as broad, 25:10, ring joints transverse, distal one largest, double as broad as long, proximal one next in size, 3 times as broad as long, two middle ones thin, the proximal smaller; funicle joints shorter distally, 30:21:20, slightly broader distally, 8:9:10, proximal one subcylindrical, broadest at base, two distal ones slightly rounded, club slender, 48:10, length of joints, 16:14:14, plus an apical tap :4, base of club rounded, last joint conical, largest breadth of the joints, 13:14:12. Flagellum sparingly haired and supplied with basiconic setae with short light bases, the number of setae on funicle joints, 5, 4, 4, on the club joints, 6, 5, 4, some of the hairs have also a light base, but smaller. Small presutural styloconic setae are seen on the flagellar joints. Mandibles 3-dentated, the inner tooth broad, rounded, 2 apical teeth triangular, pointed, 2 dental folds. Palpi 1-jointed, maxillary palpi long, 14:4, with 2 long and a short apical bristle, one bristle at the middle; labial palpi small, short, 3:2.5, with a short and a longer apical bristle.

Thorax more than $1^1/_2$ times as long as broad, 31:19, broadest behind the middle; prothorax transverse, bell-shaped, anteriorly pointed, mesoscutum longer than scutellum, 14:11, parapsidal furrows distinct, nearly straight, within the furrows two widely separated macrochaetae; posteriorly at the corners a little more distant from the sutures a microchaeta. Scutellum roundish with four furrows, the inner ones slight, parallel, the outer ones short, distinct, close to the sides; between the furrows at each side a macrochaeta, and behind this a large placoid sensilla. Metanotum short, slightly angulated in the middle

of the hind border, propodeum with a median suture, spiracles circular. Phragma truncated, reaching the end of propodeum. Petiole transverse, about double as broad as long. Abdomen longer than thorax and head together, 50:42, oblong, broadest behind the middle, conically pointed, ovipositor from near the base, 48:50, forming the pointed end of abdomen. Basal joint of abdomen with a groove as broad as petiole and pointed anally, pygostyles with a pair of long bristles.

Fore wing 3 times as long as broad, 75:25, evenly rounded at apex; subcosta with two bristles dorsally, costal cell ventrally with a row of 8 hairs, proximally reaching the subcosta, radial vein with 4 hairs dorsally and 4 ventrally. Marginal fringe consists of 8 rather long hairs along the marginal vein, as long as $^1/_6$ of the wing breadth, and 93 weaker and tighter hairs around the wing border to the retinaculous fold, longest anally in the rounding of the wing, where they reach the same length as those along the marginal vein. Wing disc evenly haired from the base of marginal vein, the hairs as long as the spaces between them or about $^1/_{20}$ of the wing breadth, about 22 rows across; a line of about 20 hairs runs within the retinaculous fold, beginning at the same level as marginal vein and distally confusing with the submarginal ciliae at anal margin, within this line a bare stripe, like a wanting row of hairs, the border of hairs along the stripe with 30 hairs.

Venation slender, ratio of subcosta, marginal vein, postmarginal vein and radius, 15:28:0.7:5, subcosta overlapping marginal vein :2; marginal vein reaching beyond the middle of wing, 46:75, postmarginal vein nearly absent, triangular, radial vein distinctly clavate, uncus with a line of 4 placoid sensillae, one placoid sensilla on marginal vein opposite the junction of the subcosta, along this a row of about 16 placoid sensillae, sometimes one displaced may be seen basally.

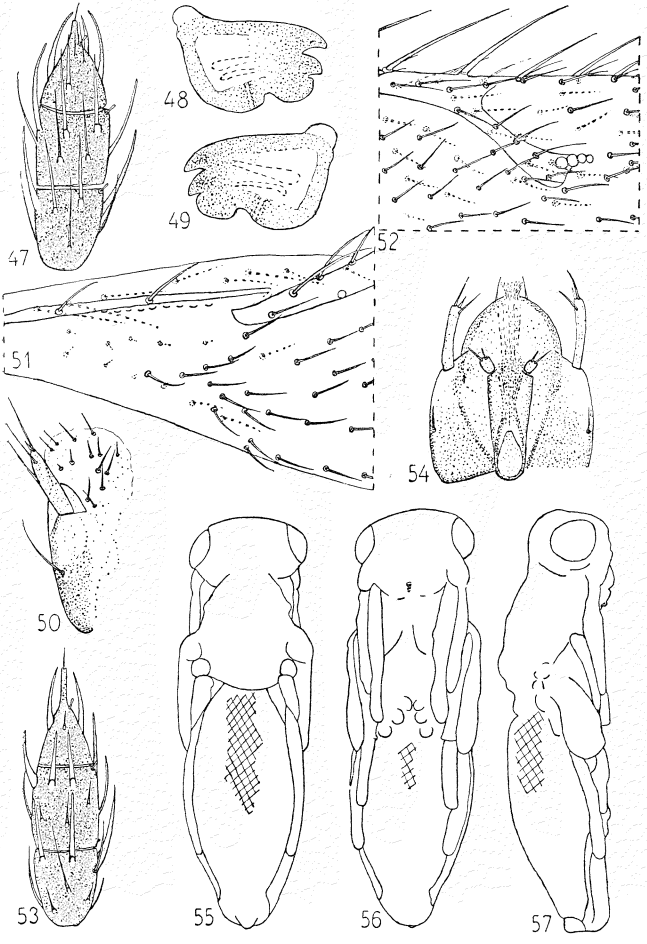

Fig. 47. *Tetrastichus conomeli* Bkdf., ♀, club of antenna, × 217. — 48. left mandible, outside view, × 217. — 49. right mandible, outside view, × 217. — 50. maxilla, × 217. — 51. fore wing, base, hairs on lower side dotted, × 217. — 52. radial vein, × 217. — 53. ♂, club, × 217. — 54. maxilla and labium, shaded, chaetotaxy not visible, × 217. — 55. ♀ pupa, dorsal view, × 30. — 56. ventral view, × 30. — 57. lateral view, × 30.

Hind wing, ratio, 57:7, broadest at the hamuli, anteriorly curved and tapering towards apex, evenly haired with about 6 rows of hairs across, costal fringe of 29 hairs, $^1/_3$ the wing breadth, anal fringe of 44 hairs, $^3/_4$ as long as the wing breadth, marginal vein with a hair at base and a row of 6 hairs along its anal margin and 5 hairs along its costal margin ventrally; two placoid sensillae on marginal vein near its base, dividing it in 3 lengths, 9:7:40, anally of the hamuli a row of 5 small trichoid sensillae, and along subcosta a row of about 6-8 small placoid sensillae.

Legs slender, fore coxae conical, slightly swollen, not double as long as broad, 8:5, middle coxae smaller, conical, truncate at tip, 7:4, hind coxae subcylindrical, swollen, 9:5; all the femora a little swollen, nearly of same length, 14:15:16, fore femora broadest, 4:3.5:3, fore and middle femora with a faint bristle near the apex; tibiae straight, fore tibiae a little swollen and shortest, 17:22:24, sparingly haired, middle and hind tibiae more densely haired towards apex; spurs, 1, 1, 1; hind tarsi longest, 16:17:19, three basal joints of fore tarsi nearly equal, in middle and hind tarsi shortening towards apex, last joint of all tarsi largest.

Male: Smaller than female, abdomen a little longer than thorax, 36:30, and of same breadth, 18:18. Antennae a little longer than thorax and head together, 47:40, composed of scape, pedicel, 3 anelli, 4 funicle joints and a 3-jointed club; radicula quadrate, scape somewhat swollen, $3^1/_2$ times as long as broad, 42:12, scape organ small, of the wart-like type, near the apex, ratio of this and of the scape, 11:42, a bristle at distal end of the organ and two proximally, one bristle near the apex of scape dorsally; pedicel conical, more than half as long as the scape, 27:42, with two bristles basally and 4-5 around the joint near the apex, ring joints transverse, first one largest, 3 times as broad as long, next ones

thin, but not lamellate; proximal joints of funicle longest, 25:23:22:20, the joints broader distally, 7:8:9:9.5, first joint of funicle broadest at base, 3 distal joints broadest at the middle, club slender, 43:12, the length of joints, 15:16:12, plus an apical tap :7, proximal joint rounded at base, distal joint conical, the number of setae on funicle joints, 3, 4, 4, 4, on the club joints, 5, 6, 2. Ratio of fore wing, 71:22, marginal fringe along marginal vein of 8 hairs, the rest around the wing border to retinaculous fold, 86 hairs; wing disc evenly haired with about 18 rows across; ratio of hind wing, 57:7, slightly more curved forward than in female, costal fringe of 25 hairs, anal fringe of 42 hairs as long as the wing breadth, the disc with about 6 rows of hairs across, in right wing the two placoid sensillae of marginal vein close above each other, in left wing (normal) the lengths, 11:8:39. Legs slender, fore coxae swollen, ratio, 7:5, middle coxae subconical, 8:4, hind coxae subconical, swollen, 8:5; all femora slightly swollen, fore and middle femora with a bristle before apex; tibiae straight, fore tibiae shortest, 18:24:25, fore tibiae slightly thickened; length of tarsi, 16:17:20, two basal joints of hind tarsi a little lengthened; tibiae sparingly haired, a little denser towards apex of middle and hind tarsi, spurs weak, 1, 1, 1. Otherwise as in female.

Phallus of normal chalcid type, occupying more than half the length of abdomen, ratio of abdomen and aedeagus with apodemes, 36:26, from apex of aedeagus to ergots :17, from these to base of apodemes :9, digiti slender, subcylindrical, terminated smoothly by a strong tooth, the base of digitus turned, and behind this a sensilla, parameres pointed, with a subapical sensilla and possibly a bristle at apex; around the phallotreme a few sensillae.

Variation in length of paratype females 1.1—1.35 mm, males 1—1.15 mm. Large female with marginal fringe of

104 hairs plus 8 larger hairs along marginal vein, and other numbers of hairs varying comparatively.

Material: A slide with type ♀ and allotype ♂ from Dyrehaven, North Sealand, Denmark, 1. 11. 1925, bred $^{16}/_{1}$—$^{18}/_{3}$ 26 from *Juncus effusus* L. with eggs of *Conomelus limbatus* Fabr. A slide with ♀♂, same data. A slide with paratypes 2 ♀♀, 2 ♂♂, same data. A slide with ♀ and a slide with ♂, same data. A slide with paratype ♂ bred 2. 6. 1925 from stems of *Juncus effusus* L. A slide with phallus of paratype ♂ dissected, February, 1926. All in Zool. Museum, Copenhagen. Moreover a slide with paratype ♂, Ankeveen, Netherlands, 21. 8. 1951, bred from *Juncus effusus* L. 28. 8. 51; in my collection. Further a not preserved pupa designed from Holmegaards Mose, South Sealand, 6. 6. 48.

As remarked above this species must be transferred from the *Entedon* group to the genus *Tetrastichus* Haliday, on account of its general characters. In the key of Kurdjumov (1913, p. 247) on the subg. *Geniocerus* Ratz. it runs to *flavimanus* Thomson, but after Thomson (1878, p. 289) this species has a median line on mesonotum and seems to have a shorter ovipositor ("Valvula ventralis medium haud attingens"), while in *conomeli* no median line is visible and the base of ovipositor is near the base of abdomen and not hidden by the sternites. Further *flavimanus* is larger, 2—3 mm in length.

Host list.

During the present work I have met with some species, of which the host was known; more than 300 species of *Tetrastichus* are described, but only a small part of them is registered. 39 species are to be found in the list of Giraud and Laboulbene (1877). The species of *Tetrastichus* are mainly endoparasitic, and the question of phytophagous species is discussed by Gahan (1922).

The first group is known as egg-parasites, mostly on egg-clusters.

1. *australasia* Gahan (Ferr. 1931, p. 291), host: Cockroaches. (*Blatt.*).

cassidarum Ratz. (Kurdj. 1912, p. 240) — *Cassida nebulosa*, also bred from the larva, see below.

conomeli Bkdf., see above — *Conomelus limbatus* Fabr. (*Hom.*).

giffardii Silv. (1914, p. 122) — *Ceratitis capitata* Wied., *Cer.* spp. *Dacus bipartitus* (Dipt.), attacks eggs or young larvae, bred from puparium.

giffardianus Silv. (Ghesq. 1948, p. 94) — Do.

gardneri Ferr. (1931, p. 291) — *Pentatomidae* sp. on teak (*Het.*).

hagenowii Ratz. (How. 1892, p. 574) — *Blatta germanica* L., supposed by How. to be secondary through *Evania appendigaster* (*Hym.*).

—(Crawf. 1910, p. 223) and (Wolc. 1936, p. 520) — *Periplaneta americana* L.

—(Dalla T. 1898, p. 38) — *Periplaneta orientalis* L. (*Blatt.*).

haitiensis Gah. (Wolc. 1936, p. 521) — *Diaprepes abbreviatus* L. (*Col.*), egg-cluster.

ovivorus Crawf. (1911, p. 448, acc. to Gir. 1914, p. 137) — *Conchyloctenia parummaculata* (*Lep.*).

ovulorum Giraud (G. a. Lab. 1877, p. 434) — *Stilpnotia* (*Leucoma*) *salicis* (*Lep.*) The species name may possibly be a nomen nudum, as such names occur in the posthumous list of Giraud, cf. Ghesquière 1950, p. 39.

ovulorum Ferr. (1930, p. 36) — *Epilachnia chrysomelina* F. (*Col.*).

periplanetae Crawf. (1910, p. 223) — *Periplaneta americana* L. (*Blatt.*).

—(Wolc. 1936, p. 521) — Cockroach egg-capsule (*Blatt.*).

philodromi Gah. (1924, p. 18) — *Philodromus canadensis* (*Arachn.*), egg-capsule.

polynemae Ashm. (1900, p. 615) — *Lestes* sp. (*Odon.*), supposed by Ashm. to be secondary through *Polynema needhami* Ashm. (*Hym.*).

pseudopodiellus Bkdf., see above — *Lestes* sp. (*Odon.*).

pyrillae Crawf. (Ferr. 1931, p. 291) — *Pyrilla aberrans* (*Hem.*).

rufus Bkdf., see above — *Dytiscus* sp. (*Col.*), bred with *Mesocharis* sp. (*Hym.*).

schoenobii Ferr. (1931, p. 291) — *Schoenobius bipunctifer* Wlk., *Spodoptera mauritia* Boisd. (*Lep.*); (Shir. 1917) — *Sch. bip.* (*Tetr.* sp.).

vaquitarum Wolc. (1936, p. 300, 522) — *Lachnopus coffeae* Marshall (*Col.*), egg-cluster.

whitmani (*Aprostocetus*) Girault (1916) — *Physonota unipunctata* (*Col.*).

xanthomelaenae Rond. (Masi 1908, p. 133) — *Galerucella luteola* Müll. (*Col.*).

sp. (Ferr. 1931, p. 291) — *Attacus atlas* L. (*Lep.*), also supposed to be larval parasite, see below.

sp. — *Adimonia tanaceti,* egg-cluster (*Col.*), bred by the late J. P. Kryger and R. W. Schlick, in my collection.

sp. (Forsius 1915, p. 138) — *Monoctenus juniperi* L. (*Hym.*).

The following species is an egg-parasite, which issues from the host larva before this has pupated, though a pupal cell is constructed.

2. *asparagi* Crawf. (Johnst. 1915, acc. to Imms 1925, p. 555) — *Crioceris asparagi* (*Col.*).

The following species are recorded as larval parasites.

3. *atrocoeruleus* Nees (Fors. 1915, p. 137) — *Hylotoma* (*Arge*) *rosae* L. (*Hym.*), also recorded in the group 8. below.

cassidarum Ratz. (Kurdj. 1912, p. 240) — *Cassida nebulosa* (*Col.*), also above, as egg-parasite.

cyclogaster Ratz. (Ferr. 1952, p. 40), and (Rusch. 1924, p. 15) — *Rhynchaenus* (*Orchestes*) *fagi* L. (*Col.*), and from lepidopterous leaf miners — *Lithocolletes lautella* F. and *L. roboris* F.

— var. *obscurata* Rusch. (1924, p. 15) — *Rhynchaenus testaceus* Müll. (*Col.*).

sculpturatus Waterst. (1915-16, p. 240) — *Neptis agatha* Crawf. (*Lep.*).

sokolowskii Kurdj. (1912, p. 238) — *Plutella maculipennis* (*Lep.*), also from cocoons of its parasite *Apanteles plutellae* (*Hym.*).

sp. (Ferr. 1931, p. 291) — *Euproctis* sp. (*Lep.*), also as egg-parasite above.

The following species attack the larvae, which pupate, while the parasites are later bred from the pupae.

4. *coccinellae* Kurdj. (1912, p. 240) and (Oglobl. 1913, p. 41) — *Coccinella septempunctata* (*Col*).

epilachnae Giard (Masi 1908, p. 136) — *Coccinellidae, Epilachna argus* and *Exochonus quadripustulatus* (*Col.*), also bred from the larvae.

giffardii Silv., see above, group 1.

legionarius Giraud (1863, p. 1273) — *Lipara lucens* (*Dipt.*).

The following species are recorded as bred from the pupae.

5. *balteatus* Waterst. (1915-16, p. 241) — Lymantriid moth (*Lep.*).

brevistigma Gah. (1936, p. 76) — *Galerucella xanthomelaena* (Schr.) (*Col.*).

glossinae (Syntomosphyrum) Waterst. (1915-16, p. 81) — *Glossina palpalis* and *Gl. morsitans* (*Dipt.*), the species attacks the pupa, possibly secondary, see below.

oxyurus Silv. (1914, p. 123) — *Ceratitis tritea* (*Dipt.*).

pospelovi Kurdj. (1912, p. 237) — *Hyponomeuta malinella* (*Lep.*), also secondary, see below.

rapo Wlk. (Kr. a. Schm. 1938, p. 88) — small Braconid (*Apanteles*) (*Hym.*).

The following species are recorded from the said hosts and may be considered as bred from the larvae or pupae.

6. *agrilorum* (*Aprostocetus*) Ratz. (Fors. 1925, p. 69) — *Agrilus mendax* Mann. (*Col.*).

annulatus Foerst. (Gah. 1942, p. 9) — an Itoniid, *Amblardiella tamaricum* (Kieff.).

antiguensis Crawf.? (Wolc. 1936, p. 520) — a leaf miner, *Tischeria heliopsisella* Champers (*Lep.*).

arundinis Giraud (1863, p. 1274) — *Lasioptera arundinis* and *Perrisia inclusa* (*Dipt.*) in Phragmites.

bruchivorus Gah. (1942, p. 8) — *Bruchus brachialis* Fahraeus (*Col.*).

bruchophagi Gah. (1913, p. 439) — *Bruchophagus* sp. (*Hym.*), in seed of Alfalfa, *Medicago sativa* L.

clypeatus Gah. (1925, p. 102) — *Dynopsylla robusta* Crawf. (*Psyll.*).

dacicida Silv. (Waterst. 1915-16, p. 244) — *Dacus* sp. (*Dipt.*).

esurus (*Syntomosphyrum*) Riley (Stellw. 1921, p. 89, 90) — *Euproctis chrysorrhoea* L. and *Lymantria dispar* L. (*Lep.*).

evonymellae Bouché (Rusch. 1924, p. 16). — *Hyponomeuta padellus* L. (*Lep.*).

gerstaeckeriae Gah. (1936, p. 485) — *Gerstaeckeria porosa* Le Conte (*Col.*).

gratus Giraud (1863, p. 1275) — *Perrisia inclusa* (*Dipt.*) in *Phragmites.*

muricolaris Ghesq. (1948, p. 133) — from a rat, phoresy? or dipterous parasite?

obscuratus Foerst. (Ghesq. 1950, p. 38) — galls of *Trioza centranthi* Vall. (*Cherm.*) on *Centranthus angustifolius* D. C.

phaeosoma (Syntomosphyrum) Waterst. (1915-16, p. 244) — *Sylepta derogata* (*Lep.*).

strobilense (Aprostocetus) Ratz. (Forsius 1925, p. 69) — *Cecidomyia strobi* Winn. (*Dipt.*).

xanthops Ratz. (Ferr. 1952, p. 40) — foliage with *Lyonetia clerckella (Lep.).*

The following species are recorded as secondary parasites.

7. *blepyri* Ashm. (= *detrimentosus* Gah.) (Gah. 1924, p. 19) — *Phenococcus cavalliae* Cockerell (*Cocc.*), secondary through *Blepyrus phenacocci* Ashm. (*Hym.*),
— *Pulvinaria bigeloviae* Cockerell (*Cocc.*) through *Microterys* sp. (*Hym.*).
— *Physokermes insignicola* (Crawf.) (*Cocc.*), probably through *Aphycus physokermes* Timberl. (*Hym.*).
— *Saissetia oleae* Bernard (*Cocc.*), also believed secondary,
— *Coccinella sanguinea* (*Col.*), probably through *Homalotylus terminalis* Say (*Hym.*).

glossinae (Syntomosphyrum) Waterst. (1915-16, p. 392) — *Glossina palpalis* and *Gl. morsitans* (*Dipt.*), pupal parasite, probably secondary through *Mutilla glossinae* Turn. (*Hym.*).

populi Kurdj. (1913, p. 251) — *Pemphigus ovato-oblongus* Kessl., recorded as secondary on the gall-making Aphid on *Populus pyramidalis.*

pospelovi Kurdj. (1912, p. 237) — recorded as secondary on *Anthonomus pomorum (Col.)*, and from lepidopterous pupae, see above group 5.

sp. (Silv. 1907, acc. to Stellw. 1921, p. 83) — *Prays oleellus* Fabr. (*Dipt.*), secondary through *Elasmus flabellatus* Fonsc. (*Hym.*).

sp. (How. 1892, p. 575) — cocoons of *Chrysopa* sp. (*Neur.*), supposed to be secondary.

The following species are mentioned by Riedel (1910) from cynipid galls, it is nearly the same hosts as in Giraud (1877).

8. *atrocoeruleus* Nees — *Neuroterus baccarum* L.
brevicornis Ratz. — *Rhodites eglanteria* Htg.
caudatus (Aprostocetus) Wstw. — *Rhodites rosae* L., *Rh. eglanteria* Htg.
ecus Wlk. (as *aurantiacus* Ratz.) — *Rhodites spinosissima* Gir., *Rh. eglanteria* Htg., *Aylax hieracii* Bouché.
melanopus Foerst. — *Cynips conglomerata* Giraud.
quercus Wlk. — *Andricus radicis* Fabr., *Aylax hieracii* Bouché.
rosarum Foerst. — *Rhodites spinosissima* Gir., *Rh. rosarum* Gir.
terminalis Thoms. — *Biorrhiza pallida* Olivier.

The following species is recorded from an Acarid.

9. sp. (Ghesq. 1948, p. 133 note) — endoparasitic upon an Acarid (gall-mite).

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