

No. 5399
T. OKADA

27

Acta ent. bohemoslov., 74 : 115—130, 1977
ISSN 0001—5601

[29 IV 1977]

With best regards,

J. Máca

Revision of Palaearctic species of *Amiota* subg. *Phortica*
(Diptera, Drosophilidae)

JAN MÁCA

District Museum, Soběslav

Amiota 4 sp. n., morphology, ecology, parasitological importance

Hitherto, three species of the subgenus *Phortica* were known from the Palaearctic subregion: *Amiota (Phortica) variegata* (FALLÉN), *A. (P.) oldenbergi* (DUDA) and *A. (P.) magna* OKADA; the first is also recorded from the Oriental region (e.g. OKADA, 1956). These species seem to be well differentiated from other members of the subgenus, which are distributed mainly in the Oriental region. The Oriental species were keyed by OKADA (1971a). Other species are known from the Nearctic subregion and from the Ethiopian and Australian regions.

The study of the variability of specimens from different parts of the Palaearctic which have been placed under *A. variegata* has shown that "*A. variegata*" is, in reality, a complex of several forms, being well distinguishable from each other by the morphology of the male genitalia. There are additional differences in the colour pattern and sometimes also in the structure of various parts of the body, but these are comparatively slight and sometimes of a merely statistical character. It is thus advisable to confirm any determination of male specimens by examination of their genitalia. In some forms it was found that the female genitalia also provide good taxonomic characters. Although a great deal of material has been studied, no specimens having intermediate characters of genitalia have been found, even where some forms were collected simultaneously at the same locality. This indicates reproductive isolation among these forms, and therefore I consider them to be separate species of the "*variegata* complex".

The non-Palaearctic specimens of the complex were not taken into account. Besides, Prof. T. Okada informed me that another species occurs in Japan, which he intends describing in the near future. Consequently, it is probable that the number of species of the "*variegata* complex" will be further increased.

Various authors have held *Phortica* SCHINER to be a separate genus. I am not in a position to decide whether this conception is right or not.

MATERIAL AND METHODS

A total of 198 specimens, mostly pinned, belonging to the subgenus *Phortica*, from different parts of the Palaearctic subregion was studied. Where sufficient material was available, 15 males and 15 females of each species were measured in order to determine mean values of measurements and indices. When the variance of characters was greater than 5 %, maximum and minimum values are stated. Where there were fewer specimens available, all were measured. Wing length was measured always from the distal break on the base of R vein to the apex of wing.

Nomenclature of bristles is after DUDA (1935) and for other morphological nomenclature the terminology of OKADA (1956) is adopted, if not stated otherwise.

In the list of material of particular species, information is quoted in the following sequence: locality, date, number of specimens ($\sigma\sigma$, ♀♀), collector name (not mentioned when material was collected by me), deposition (not mentioned when the material was processed for microscopical preparations), and finally, in parentheses, code number of known data about the way of collecting. These data are:

Beer traps (1), see MÁČA (1973), mostly suspended. Date of emptying traps is stated, but the traps were exposed about 14 days previously to this date. Ground traps with formol (2). Sweeping of herbs and shrubs (3). Collecting on the tree sap (4). Collecting of specimens flying about human eyes or sucking beads of perspiration (5).

The following abbreviations are used for the indication of museums and other institutions: IBP — Institute for International Biological Program, Brno-Soběšice. ITB — Institut für Pflanzenforschung, Abteilung Taxonomie der Insekten, Berlin-Finow. MBe — Zoologisches Museum an der Humboldt-Universität zu Berlin. MBu — National Museum, Department of Zoology, Budapest. MP — National Museum, Department of Entomology, Praha-Kunratic. MSo — District Museum, Soběslav. MSt — Royal Museum of Natural History, Stockholm. ZLu — Zoological Institute, Department of Systematics, Lund.

Subgenus *Phortica* SCHINER, 1862

Phortica SCHINER, 1862, Wien. ent. Monatschr., 6 : 433.

Type-species: *Drosophila variegata* FALLÉN, 1823, Dipt. Suc. Geomyz.: 5; by original designation.

This subgenus is a rather distinctive one; originally it was described as a separate genus, now it is placed in the genus *Amiota* LOEW, 1862 by most authors. The species of the subgenus have plumose arista (at least on the upper side), males of two Oriental species have arista bare and apically expanded. Second orbital bristle short, as well as the postvertical bristles. Face, humerus and pteropleura without milky white spots. Mesonotum with a pollinose pattern (Fig. 10). Each tibia usually with three dark transverse bands. Wings with transverse vein R_{4+5} -M well behind middle of the discoidal cell. Abdominal tergites yellowish, with dark pattern.

Periphallic organs (Fig. 9): Epandrium with an indication of longitudinal suture medially (in species studied by me) and with a robust apodeme along anterior edge. Several bristles arising at posterior margin. Heel swung to the forward and above, toe inconspicuous, bare. Anal lamellae with fine bristles only. Clasper anteriorly with a lobular enlargement bearing short bristles, some of them wedge-shaped, but without dentiform bristles which are usual for other Drosophilidae. The claspers of *A. (P.) oldenbergi* seem to be bare, those of *A. (P.) magna* have a strong, inwards directed spine. Decasternum arched dorsad, its caudal end with a small transversal sclerite attached at least in *A. (P.) oldenbergi*. Hypandrium is a narrow arch.

Phallic organs (Figs. 1–2) have a complicated structure; the terminology used by OKADA (1956, 1971a) is followed here but with some modifications. Apodeme mostly rather weak. Vertical rod well developed. Anterior parameres at least with a subapical bifurcation, in the species of *variegata* complex they are trilobed, with branches directed mediad, dorsad and caudad, respectively. These parameres are rather movable, they may tilt cranially to more than 90° . The proper aedeagus is deeply bifurcated and \pm straight in *A. oldenbergi*; other species have aedeagus bent ventrad with apical part hidden under 6th sternite but movable outwards, and with basal part with or without basal processes below; sclerotized rods are sometimes attached to proper aedeagus laterally. The construction of aedeagus might be theoretically

inferred from the "quinaria type" defined by NATER (1953) in that of the original sclerotized tubular formation only the medial rod, sometimes with lateral rods remains; the rest of tubular aedeagus is membranous, as may be seen in fresh uncleared material (the membranous parts are shown only in Figs. 1—2). The membranous parts reach up to the spoon-shaped lobe of the posterior paramere; the paramere is bent cranial in the middle and bifurcated above. The connections of posterior paramere, epandrium, hypandrium and clasper are rather complicated and hardly can be properly shown in two-dimensional figures. Ejaculatory apodeme small, spoon-shaped.

♀♀: The first seven abdominal segments have usual construction for *Drosophilidae*. The following tergite is contracted in the middle and has a longish bristle each side and several short hairs. Anal conus (terminology of ANDERSON, 1976, is followed): supraanal plate small, with cerci distinctly separated from it and from one another; subanal plate concave on the base. The egg-guides are (imperfectly) separated on the base, and with unmodified bristles. Pregenital lamellae are rather large and show good taxonomic characters (compare Figs. 3—4, 12—13). There is a pair of minute sclerites just dorsad to the genital porus. This pair of sclerites may be homological with "subanale Plättchen" of some *Drosophila* spp., figured by NATER (1953); they should better be called perineal sclerites. Spermathecae spherical, not giving good taxonomic characters.

Notes on imaginal ecology and on early stages

The males of *variegata* complex are known to often fly about the eyes of man or to suck perspiration (DUDA, 1935; OKADA, 1956). In this way they may transfer parasitic *Nematoda* of the family Thelaziidae, as was mentioned by NAGATA (1959, 1960) and BRITZ (1968, p. 630). It seems necessary to redetermine the particular species concerned in this habit and to pay attention to this behaviour in the future (See also note at *A. okadae*).

The females of the *variegata* complex do not behave in such a way, as a rule. They may be readily baited in beer traps hung in the tree canopy. Egg-laying ♀♀ were recorded on fermenting sap of *Betula* (by DUDA, 1935), *Castanea* (by OKADA, 1968) and *Quercus* (by OKADA, 1968 and from my own observations).

As for ontogeny, there is only an observation of larva found in the sap of *Salix* by SÉGUY (1934) and a paper by OKADA (1968) describing all pre-imaginal stages of *A. variegata*, but identifications of the species are not certain. I found fully developed eggs within the inner genitalia of the two species *A. variegata* (in July—August) and *A. semivirgo* (in May). The eggs were never found in other seasons, although almost all females studied were dissected. I often used to find several mature eggs together; in the abdomen of one ♀ *A. semivirgo* I found altogether 34 mature eggs. The eggs were not found to show any characters distinguishing both species. They correspond to the description of eggs given by OKADA (1968) but are somewhat larger (length 0.85—0.90 mm) and their surface, mainly between longitudinal vena, is nipped rather than reticulous.

Key of the Palaearctic species of the subgenus *Phortica*

- 1 Frontal hairs rather strong. Scutellum with a pair of fine bristles proximad to lateral pair of bristles. Abdominal tergites dark, with light patches in posterior half. Male genitalia

- as in Figs. 23—26. German Dem. Rep. *Amiota (Phortica) oldenbergi* (DUDA, Frontal hairs fine. Scutellum proximad to lateral bristles bare. Abdominal tergites light, with dark caudal bands 2
- 2 (1) Dark bands of the abdominal tergites straight or constricted medially. Male genitalia as in Figs. 20—21. Anterior parameres spoon-shaped. Japan *A. (P.) magna* OKADA
- Dark bands of abdominal tergites dilated medially. ♂♂: Anterior parameres trilobed (*variegata* complex) 3
- 3 (2) Scutellum yellowish to tannish, its ground colour lighter than the ground colour of mesonotal scutum. 6th sternite \pm pentagonal (Fig. 19). Apodeme of aedeagus with triangular dilatation at apex. Lateral rods absent or attached to apex of medial rod 4
- Major part of scutellum dark, of same ground colour as mesonotal scutum. 6th sternite \pm quadrate, with broadly rounded fore corners (Fig. 11). Apodeme of aedeagus not conspicuously swollen. Lateral rods attached to medial rod before its apex 5
- 4 (3) Tibiae with only slight indications of darker transverse bands. Length ratio of first tarsal segment to other four segments altogether less than 0.7 on fore and hind tarsi. Male genitalia as in Figs. 15—16. Medial rod with apically attached lateral rods, each of them with 4 thorn-like projections. Bulgaria *A. (P.) crinacca* sp. n.
- Each tibia with three distinct transverse bands. Length ratio of first tarsal segment to other segments exceeding 0.7 on fore and hind tarsi. Male genitalia as in Figs. 17—19. Medial rod apically bifurcated, lateral rods absent. Japan *A. (P.) kappa* sp. n.
- 5 (3) Dark caudal bands of abdominal tergites 3 to 5 not reaching lateral margins of tergites (exceptionally, a narrow dark connection to lateral margin developed on some tergites). Male genitalia as in Figs. 5—6. Lateral rods simple, attached to apex of medial rod. Japan *A. (P.) okadai* sp. n.
- Each of dark caudal bands of abdominal tergites 3 to 5 bifurcated to two strips on each side; at least hind strips reaching lateral margins 6
- 6 (5) Tarsi with last joint, at least half of the penultimate joint and often apices of other joints darkened. Occiput with lighter strip along whole hind margin of eye. Male genitalia (Figs. 7—9): Lateral rods shorter than medial rod. Female genitalia (Figs. 12—13) with U-shaped structure between pregenital lamellae. Czechoslovakia *A. (P.) semivirgo* sp. n.
- Whole tarsi yellow, exceptionally last joint darkened. Mature specimens with lighter strip at hind margin of eye not reaching below upper half of eye. Male genitalia (Figs. 1—2): Lateral rods extending beyond tip of medial rod and with ventral branch subapically. Female genitalia (Figs. 3—4) without structures between pregenital lamellae. Sweden, Great Britain, Czechoslovakia, Hungary, Bulgaria *A. (P.) variegata* (FALLÉN)

Note: Two additional forms from Japan will be described by Okada; they differ from all the above-mentioned species by the shape of phallic organs which is analogous in both forms. Medial rod strong and unbranched apically, with a strong ventral spine subbasally. Lateral rods absent. Both forms shall be classified as subspecies of a new species.

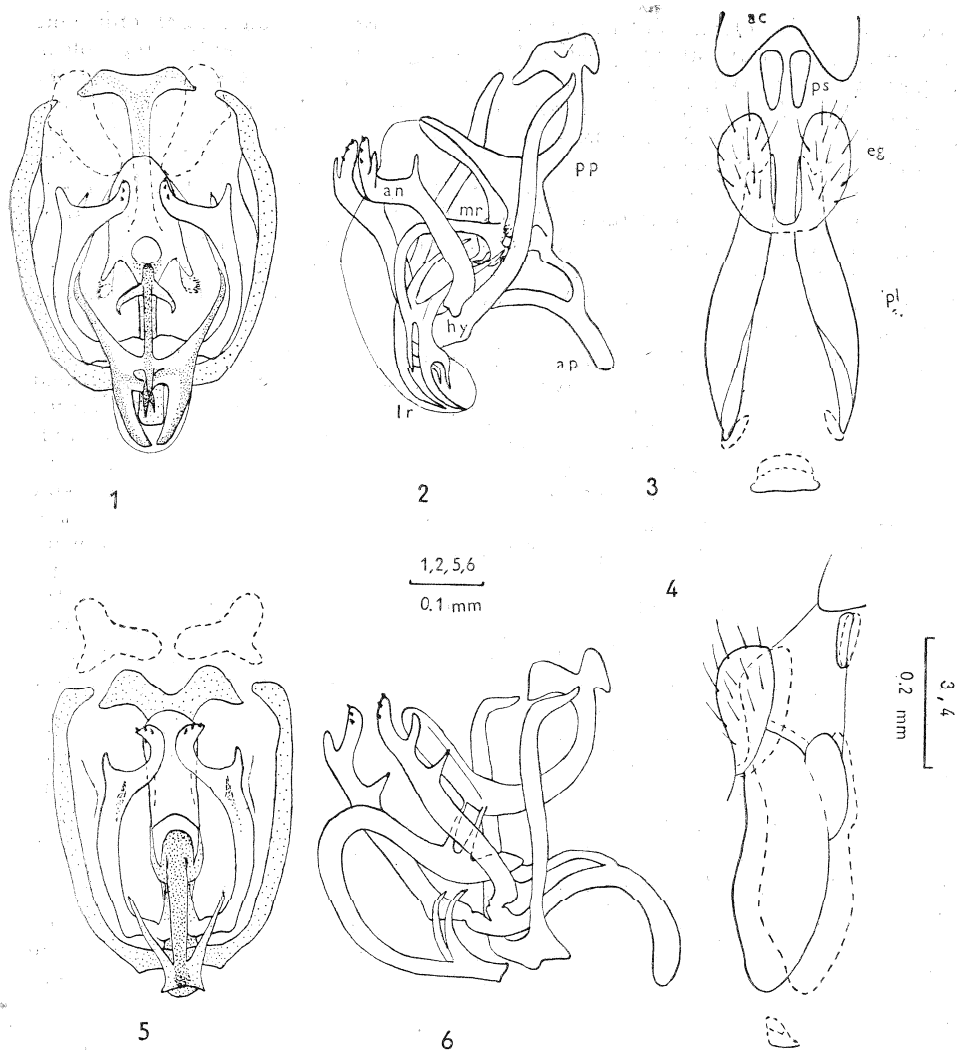
✓ *Amiota (Phortica) variegata* (FALLÉN, 1823)

(Figs. 1—4)

Drosophila variegata FALLÉN, 1823, Diptera Suec. Geomyz.: 5.

This species was redescribed by DUDA (1935), but some additions and corrections are now deemed necessary, and a revised description is given below.

♂♂: Face tannish, carina small, pollinose, not reaching the edge of mouth cavity. Frons yellowish to orange anteriorly and dark brown posteriorly; this dark area extends to the level of 2nd orbital bristle laterally and protrudes almost to the lunula medially. Rarely (in the teneral adults) also the area between orbits and ocellar triangle is light tannish. Several inconspicuous microtrichiae in dark area of frons. Ocellar triangle blackish brown. Periorbits yellowish white up to the level of 3rd (hind) orbital bristle, darkened posteriorly. A short row of 4—6 microtrichiae in front of 1st orbital bristle and one additional microtrichia between 1st and 2nd orbitals. Length ratio of the orbital bristles (from front to rear) about 2.4 : 1 : 2.1. Ocellar



Figs. 1—4. *Amiota variegata* (Fallén): 1 — Phallic organs, ventral aspect. 2 — Phallic organs, lateral aspect. 3 — Female terminalia, ventral aspect. 4 — Female terminalia, lateral aspect. Figs. 5—6. *Amiota okadae* sp. n.: 5 — Phallic organs, ventral aspect. 6 — Phallic organs, lateral aspect.

Lettering: ac — subanal plate of anal conus, an — anterior parameres, ap — apodeme of aedeagus, eg — egg-guides, hy — hypandrium, lr — lateral rods, mr — medial rod, pl — pregenital lamellae, pp — posterior paramere, ps — perineal sclerites.

bristles and both inner and outer verticals about the same length as first orbital bristles. Postverticals very fine, shorter than $\frac{1}{4}$ of length of ocellar bristles; several additional short hairs on the ocellar triangle. Occiput dark except for two triangular lighter patches, each of which has the base-line between bases of postvertical and inner vertical bristles and apex directed

downwards. Sometimes both light patches are confluent and much enlarged (teneral adults?). A pale strip along hind margin of eye, not extending below upper half of eye. Only in teneral specimens may it be extended along whole hind margin of eye, on the contrary, it may be almost absent in some very dark males. The cheeks are dark. Eyes red, oval, their longer axis almost rectangular to body axis. One strong vibrissa, an equally long bristle in the buccal angle, other peristomals short. Clypeus yellow in the middle, dark brown laterally. Proboscis dark. Palpi yellow, on the outer side subbasally darkened, with three bristles (the apical being strongest) and some basal hairs. Antennae tan, the second segment with 2—3 short bristles in addition to the normal hairs. Arista with 3—5 longer rays above, without end fork and without lower rays.

Mesonotum brownish (usually dark brown), subshining, with rather indistinct pollinose pattern. Acrostichal area with a pair of several times interrupted pollinose longitudinal strips which are strongly curved mediad at level of dorsocentral macrochaetae. Outside of the dorsocentral line each side with further indistinct strip. Sides of mesonotum with very indistinct pollinose spots. Mesonotal pattern often indeterminable (poorly preserved specimens?). Humeral callus light yellowish to rufous, lateral part of the mesonotal suture and the range of hind notopleural bristles usually yellowish or rufous. The precincts of praescutellar and strong dorsocentral bristles may be rufous in teneral specimens. The area behind the lateral part of mesonotal suture mostly dark and not lightened. Eight rows of acrostichal bristles, and several extra bristles. Length of dorsocentral macrochaetae: 0.35 and 0.60 mm (anterior and posterior bristle, respectively). Praescutellars as long as anterior pair of dorsocentral macrochaetae. About six short dorsocentral bristles between suture and anterior macrochaetae, some of them enlarged. Humeral bristle and anterior notopleural bristle equally long, posterior notopleural bristle shorter. Praealar bristle very short, the supraalar one as long as the humeral, the postalar bristle much longer. Scutellum dark at major part, paramedially at base with a pair of yellowish grey pollinose patches, each with a darker spot inside. Further light patches usually at apex of scutellum and sometimes also at insertions of bristles. Scutellar index about 1.1. Scutellum has no bristles in front of the laterals. Pleurae unicolorously brown or very indistinctly marmorate. Two sternopleural macrochaetae, the posterior one longer, and several hairs. Prosternum pollinose, with a longitudinal furrow medially.

Legs yellow; coxae (and trochanters, in most cases), femora (except at base and apex) and three transverse bands on each tibia are dark brown; exceptionally, the last tarsal joint of legs is darkened. Fore femur with 5—8 strong bristles in a posteroventral row which continues with several shorter bristles to the base of femur. Praeapical bristles present on all tibiae, but indistinctly differentiated. Middle tibia with a pair of rather strong, unequal apical bristles. Middle tarsus with a row of peg-like bristles on both inner and outer sides. Hind tarsus with such bristles only on the outer side and with a row of about 10 recurved hairs on metatarsus ventrad of these bristles. Length ratio of metatarsus to the other tarsal joints altogether: 0.8; 1.0; 0.7—0.8 (on fore, middle and hind tarsi, respectively).

Wings clear, with yellow or brownish veins. R_1 and stem of R usually darker brown. Microtrichiae of wing membrane rather clustered along trans-

verse veins so that the surroundings of these veins seem to be dark. Extreme base of C with a patch of densely clustered microtrichiae; two similar patches on the base of R. Wing length: 2.9—3.4 mm at North and Mid European specimens, 2.2—2.85 mm at specimens from Bulgaria which are generally the smaller size; Asahina's rule (ASAHINA, 1950; OKADA, 1971b) may apply. Wing indices are also geographically variable being dependent upon the wing length to a great extent (OKADA, 1959, 1960). C-index 2.1 to 2.9; 4V-index 3.0—3.3; 4C-index 1.5—1.6; 5x-index 0.8—1.0. Apical bristles of the C₁ indistinct. C₃ range 0.7. Halteres yellowish.

First abdominal tergite narrow, tannish. Second tergite yellowish, semilaterally with a dark spot and mainly with lateral margin darkened. Tergites 3 to 5 yellowish, each with medially and semilaterally protruding caudal band. Laterally, the band is bifurcated to two strips which lead to anterior and posterior corner of tergite, respectively. As the lateral margin of tergite is dark, a closed lighter patch remains above it; sometimes this patch is darkened too. 6th tergite dark, with lighter areas paramedially at anterior margin. Epandrium dark. Sternites 1 to 5 of the type usual in the genus *Amiota* (see WHEELER, 1960). 6th sternite without bristles, drawn into a socket so that only its hind margin is visible in uncleared abdomen. It is about 1.5 times longer than wide, \pm tetragonal with very broadly rounded fore corners. Abdominal spiracles on 1st to 6th segments. Four rectal papillae, rectal index 2.5.

Anal lamellae with bristles of uniform length. Phallic organs (Figs. 1—2): Anterior parameres with three sensillas on medial branch and one sensilla on dorsal branch. Lateral rods strong and each with a ventral branch subapically. Medial rod apically pointed, basally with two bent thorns, which converge ventrally.

♀♀: Similar to males but somewhat larger (wing length 2.9—3.8 mm) and with light patches above lateral margins of tergites 3 to 5 usually open on the anterior side. Postabdomen with modifications usual for the females of *Phortica* spp. Pregenital lamellae as in Figs. 3—4.

Distribution: Sweden, Great Britain, Czechoslovakia, Hungary, Bulgaria.

Material studied (82 ♂♂, 17 ♀♀).

Lectotype (hereby designated): ♀, without locality label, bearing small white label with numeral 8, red label "*Drosophila variegata* Fln. /Lectotype/ Selected by E. B. Basden 1955"; also Basden's determination label and my celluloid label with the preparation of genitalia; deposited in Coll. Fallén, MSt.

Other material studied: Sweden: 2 ♀♀, without locality label (designated by Basden, in coll., as syntypes of *Drosophila variegata* FALL.), in Coll. Fallén, MSt. Lärketorp, 2 ♂♂ (only one of them with locality label), Coll. Zetterstedt, ZLu.

Great Britain: Brockenhurst, Hants., 15. 8. 1954 — 1 ♂, 1 ♀, E. A. Fonseca lgt.

Czechoslovakia: Ševětín (Bohemia mer.), 1. 10. 1974 — 1 ♂, 1 ♀, MSo (1). Val (Bohemia mer.), 15. 8. 1973 — 1 ♀, MSo (1). Český Jiřetín (Bohemia sept.), 30. 8. 1972 — 1 ♀, K. Schön lgt. (2). Janov u Litvínova (Bohemia sept.), 12. 6. 1972 — 1 ♂, 27. 9. 1972 — 1 ♂, 1 ♀, K. Schön lgt. Kopisty (Bohemia sept.), 6. 6. 1972 — 1 ♀, 26. 9. 1972 — 1 ♂, 2 ♀♀, K. Schön lgt. (2). Lednice (Moravia mer.), 12. 5. 1971 — 1 ♀, 7. 6. 1971 — 1 ♂, J. Vaňhara lgt., IBP (3). Znojmo (Moravia mer.), 29. 6. 1952 — 1 ♂, V. Martinek lgt.

Hungary: Lampás-völgy (Meesek-hg.), 29. 7. 1958 — 1 ♂, Zsirkó lgt., MBu. Magyarkút (Börzsöny-hg.), 10.—13. 7. 1957 — 1 ♂, Székessy lgt., MBu. Mátraháza, 26. 6.—6. 7. 1957 — 1 ♂, 25. 7. 1969 — 1 ♂, Mihályi lgt., MBu. Tárdi-patak völgye (Bükk-hg.), 2. 8. 1958 — 1 ♂, S. Tóth lgt.

Bulgaria: Arkutino nr. Primorsko. 17. 7. 1968 — 12 ♂♂, 1 ♀. 23. 7. 1968 — 26 ♂♂, 24 ♀♀. 1968 — 30 ♂♂, 1 ♀, J. Ježek lgt., MP (5).

Note: I have designated the lectotype on the basis of the following facts:

(a) Fallén's description of *Drosophila variegata* words: "Mas, femina... a Cel. Zetterstedt bei Lärketorp parocia Mjölby sat frequenter...".

(b) A lectotype could be selected from specimens in Coll. Fallén or in the Coll. Zetterstedt since Zetterstedt got Fallén's collection after Fallén's death and kept part of the material (Cain et al., 1952).

(c) Original determination labels, as well as the locality label, seem to be written by Zetterstedt (c.f. Horn & Kähle, 1935—1937). One of the females from Fallén's collection is designated as "♂ *D. variegata*" on this original label.

(d) It is obvious from coincidence in the geographical distribution and from mutually corresponding structure of the genitalia in both sexes that ♂♂ and ♀♀ from the abovementioned collections are conspecific.

It is obvious that Fallén probably used the material now deposited in his own collection as well as the material now deposited in Zetterstedt's collection for the original description. Only material from Zetterstedt's collection includes a specimen with locality label, on the other hand the material from Fallén's collection must be a part of the type series because of reference to a female. Therefore I decided to designate as lectotype the same specimen that had already been indicated in an unpublished (in coll.) note by Basden.

Amiota (Phortica) okadai sp. n.

(Figs. 5—6)

Amiota (Phortica) variegata: OKADA, 1956.

As only two specimens of this species are at my disposal, the extent of variability within this species cannot be discussed here. An outline of the morphology of this species was presented by OKADA (1956), but some specific characters of a related species were apparently included, e.g. reference to arista having up to two ventral rays, which was later negated by OKADA (1971a) in his key of East Asian species. Seasonal size and colour variability have been observed in this species: specimens collected in summer are smaller and lighter than those collected in cooler periods (letter communication, Prof. T. Okada).

♂♂: Agreeing with *A. variegata* in majority of characters. A yellowish strip between ocellar triangle and orbits connects yellow anterior part of frons with light patches in the upper part of occiput (similarly as in teneral adults of *A. variegata*). Occiput diffusely lighter behind eyes and in the lower part. Length ratio of orbital bristles 2.5 : 1 : 2.6. Mesonotum mat, tannish, with pollinose pattern similar as that of *A. variegata* but somewhat more distinct. Lateral parts of mesonotum behind the suture not conspicuously paler than the disc of mesonotum. Scutellar index 1.0. Wing length 2.2—3.5 mm. C-index 2.5—2.7; 4V-index 2.9—3.2; 4C-index 1.5; 5x-index 0.8—1.1. C₃ range 0.7. Dark bands on tibiae rather conspicuous, tarsi yellow or with last joint darkened. Length ratio of metatarsus to other tarsal joints: 0.8 (on fore and hind tarsi; middle tarsi not preserved). Dark caudal bands of abdominal tergites 3 to 5 mostly not reaching lateral margins of tergites. 6th tergite light brown, with a dark patch medially. 6th sternite heart-shaped.

Bristles on upper half of anal lamellae slightly longer than these on lower half. Genitalia (Figs. 5—6). Anterior parameres with three sensillas on medial branch and one sensilla on dorsal branch. Spoon-shaped lobe of the posterior paramere long, narrow. Medial rod without basal processes, apically with a square flap, having a long recurved spur (lateral rod) both sides.

Distribution: Japan.

Material studied (2 ♂♂).

Holotype (♂): Susugaya (Kanagawa Pref.), 29. 6. 1970, T. Okada lgt., MP. Genitalia in a tube with glycerine, on the same pin.

Other material studied: Koonodai (Chiba), 3. 7. 1972 1 ♂, K. Suzuki lgt.

Note: About 15 years ago, Y. NAGATA of Miyazaki University, Japan, was engaged in the study of "*A. variegata*" which he found to transfer *Nematoda*, parasites on the eyes of dogs. Determination of the species was revised by T. OKADA recently and it was found to be *A. okadai* (according to a communication of Prof. T. OKADA). Summary of the investigations was published by NAGATA; it is possible that they formed a basis for the statement of BRITZ (1968) — see "Notes on imaginal ecology and on early stages" in the present paper.

✓ *Amiota (Phortica) semivirgo* sp. n.

(Figs. 7—14)

Similar to *A. variegata* but the undermentioned characters make its differentiation possible.

♂♂: Length ratio of orbital bristles 2.4 : 1 : 2.2. Light strip along whole hind margin of eye. Mesonotum pattern rather conspicuous, the pollinose pattern is distinct also laterally of dorsocentral bristles (Fig. 10). Whole disc of mesonotum rather mat. Scutellar index 1.0—1.1. Wing length 2.9—3.4 mm. C-index 2.7; 4V-index 3.1—3.2; 4C-index 1.5—1.6; 5x-index 0.8—1.1. C₃ range 0.7. Last segment and at least half of the penultimate segment of all tarsi darkened, the apices of other tarsal joints often also darkened. Other parts of legs with the same pattern as in *A. variegata*. The darkening of the legs is usually more conspicuous on their outer side. Length ratio of metatarsus to other tarsal joints: 0.8; 1.0; 0.7 (on fore, middle and hind tarsi, respectively). Abdominal pattern as in *A. variegata*, but light patches above lateral margins of tergites always distinct (Fig. 11).

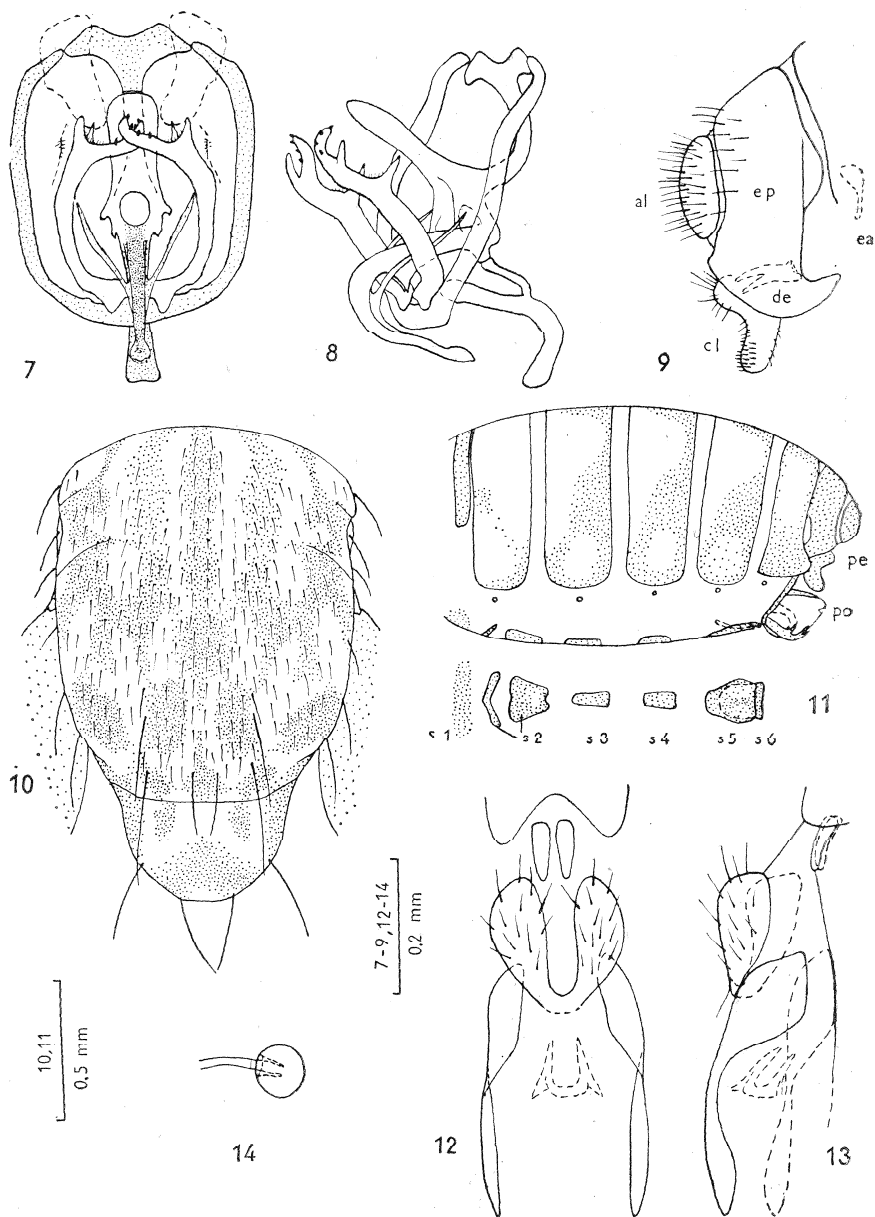
Anal lamellae with bristles of uniform length (Fig. 9). Phallic organs (Figs. 7—8): Anterior parameres with 3—5 sensillas (usually 4) on medial branch and one sensilla on dorsal branch. Lateral rods much shorter than the medial rod and apically attached to it about its mid-length. Medial rod basally with two short thorns close together, apically with a slight discoidal dilation.

♀♀: Agreeing with males in all characters except for larger average size (wing length 3.0—3.9 mm), for the abdominal pattern which is the same as that of ♀♀ *A. variegata*, and for the modifications of postabdomen usual for the females. In structure of genitalia it differs from ♀♀ *A. variegata* in the shape of pregenital lamellae (Figs. 12—13).

Distribution: Czechoslovakia.*

Material studied (25 ♂♂, 55 ♀♀).

* After finishing of this paper, *A. semivirgo* was found also in Roumania: Turda, 8. 7. 1976 — 2 ♂♂, 8 ♀♀, Máca lgt. et coll. (4).



Figs. 7—14. *Amiota semivirgo* sp. n.: 7 — Phallic organs, ventral aspect. 8 — Phallic organs, lateral aspect. 9 —Periphallallic organs. 10 — Mesonotum. 11 — Abdomen of male (bristles)

Holotype (♂): Veselí n. Luž., nr. nature reserve Doubí (Bohemia mer.), 18. 7. 1975, MSo (3).

Paratypes: Týnec n. Labem (Bohemia centr.), 5. 7. 1972 — 1 ♂, V. Martinek lgt., MP. Chábory (Bohemia or.), 11. 8. 1966 — 1 ♀, V. Martinek lgt., MP (this specimen was recorded as *A. variegata* by MARTINEK, 1973). Strážnice (Moravia mer.), 28. 6. 1972 — 1 ♂, V. Martinek lgt., MP.

Other material studied: Borkovice (Bohemia mer.), 24. 5. 1973 — 5 ♀♀, 15. 9. 1973 — 1 ♀, MSo (1). Dražice nr. Tábor (Bohemia mer.), 6. 7. 1972 — 1 ♂ (3). Purkarec (Bohemia mer.), 22. 5. 1975 — 1 ♀, MSo (4). Ševětín (Bohemia mer.), 28. 8. 1972 — 2 ♂♂, 19. 7. 1973 — 1 ♂, 24. 7. 1973 — 1 ♂, 22. 8. 1973 — 2 ♂♂, 10 ♀♀, 4. 9. 1973 — 1 ♀, 13. 9. 1973 — 3 ♂♂, 3 ♀♀, 15. 8. 1974 — 1 ♀, 10. 9. 1974 — 4 ♂♂, 8 ♀♀, 1. 10. 1974 — 3 ♂♂, 13 ♀♀, MSo (1, 5). Val (Bohemia mer.), 7. 8. 1973 — 1 ♀, 6. 9. 1973 — 4 ♀♀, MSo (1). Veselí n. Luž. — Žižovská stráž (Bohemia mer.), 2. 9. 1975 — 1 ♀, MSo (1). Janov nr. Litvínov (Bohemia sept.), 30. 8. 1972 — 2 ♀♀, 27. 9. 1972 — 1 ♂, K. Schön lgt. Klíny nr. Litvínov (Bohemia sept.), 30. 8. 1972 — 1 ♀, K. Schön lgt. Kopisty (Bohemia sept.), 20. 9. 1972 — 1 ♀, K. Schön lgt. Halín (Bohemia or.), 20. 8. 1965 — 1 ♂, V. Martinek lgt. Lednice (Moravia mer.), 26. 5. 1971 — 1 ♂, 30. 5. 1971 — 1 ♂, 29. 7. 1971 — 1 ♂, 5. 8. 1971 — 1 ♂, J. Vaňhara lgt., IBP (3).

Amiota (Phortica) erinacea sp. n.

(Figs. 15—16)

As in the foregoing species, especially characters enabling separation from *A. variegata* are given.

♂♂: Arista bare on ventral side, with 2—3 rays on dorsal side. Pattern of frons mainly the same as in *A. okadai*. Length ratio of orbital bristles 2.4 : 1 : 2.1. A light strip along whole hind margin of eye. Mesonotum subshining, with very indistinct pattern similar to that of *A. variegata*. Lateral parts of mesonotum behind the suture usually broadly yellowish (teneral specimens?). Discal part of scutellum yellowish, with darker parabaasal and marginal spots. Scutellar index 1.0. Wing length 2.3—2.9 mm. C-index 2.7—2.8 (rather great in comparison to other *Phortica* spp. of similar size); 4V-index 3.1—3.2; 4C-index 1.4—1.5; 5x-index 1.0. C₃ range 0.7. Microtrichiae of the wing membrane not conspicuously clustered along transverse veins, so that the membrane does not appear to be darkened there. Femora not darkened, tibiae without dark bands or with only indications of apical and eventually subbasal darkenings (*A. variegata* has tibial bands well darkened even in teneral specimens). Tarsi not darkened. Fore femora posteroventrally with a row of bristles not conspicuously descending in length basally. Length ratio of metatarsus to other tarsal joints: 0.6; 1.0; 0.6—0.7 (forc, middle and hind tarsi, respectively). Abdominal pattern indistinct mainly in lateral area.

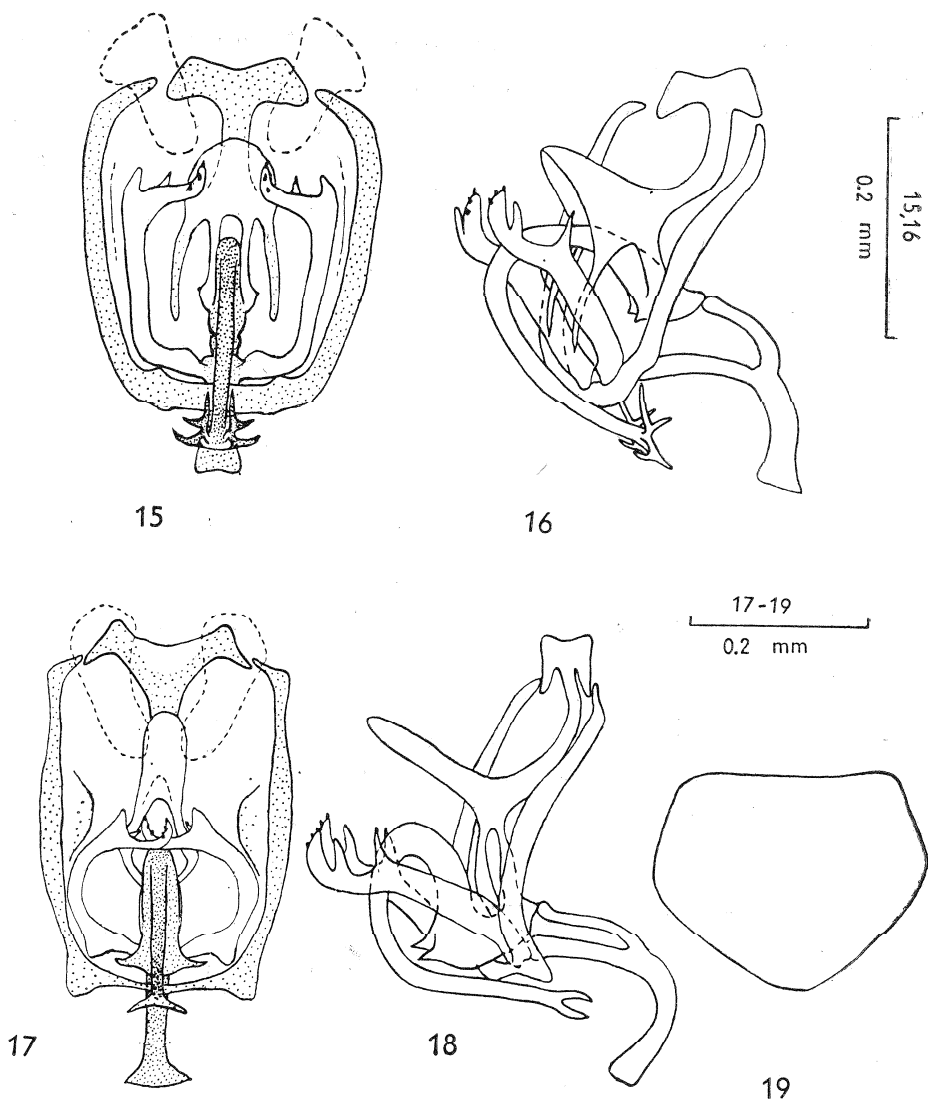
Genitalia (Figs. 15—16): Anterior parameres with 3 sensillas on medial branch and one sensilla on dorsal branch. Spoon-shaped lobe of posterior paramere short and wide, with a downward directed projection each side (base of lateral rods?). Medial rod apically with an attached formation composed of eight spines (apex of lateral rods?).

Distribution: Bulgaria.

Material studied (8 ♂♂).

omitted), lateral aspect, with ventral aspect of sternites. 12 — Female terminalia, ventral aspect. 13 — Female terminalia, lateral aspect. 14 — Spermatheca.

Lettering: al — anal lamella, cl — clasper, de — decasternum, ea — ejaculatory apodeme, ep — epandrium, pe — periphallal organs, po — phallic organs, s (1 to 6) — sternites 1 to 6.



Figs. 15—16. *Amiota erinacea* sp. n.: 15 — Phallic organs, ventral aspect. 16 — Phallic organs, lateral aspect. Figs. 17—19. *Amiota kappa* sp. n.: 17 — Phallic organs, ventral aspect. 18 — Phallic organs, lateral aspect. 19 — 6th sternite of male.

Holotype (♂): Arkutino nr. Primorsko, 23. 7. 1968, J. Ježek lgt., MP (5). Genitalia in a tube with glycerine, on the same pin.

Other material studied: Arkutino nr. Primorsko, 17. 7. 1968 — 1 ♂, 23. 7. 1968 — 6 ♂♂. J. Ježek lgt., MP (5).

✓ *Amiota (Phortica) kappa* sp. n.

(Figs. 17—19)

This species seems to be rather close especially to *A. erinacea* but the structure of the phallic organs is distinct.

♂♂: Dark patch of frons not very protruding medially so that a rather broad yellow strip remains above lunula. Length ratio of orbital bristles 2.1 : 1 : 1.2. Lighter strip along hind margin of eye may be developed only along the upper half of eye or may continue along the lower half. Second segment of antennae with 2—3 rather strong bristles in addition to normal hairs. Arista with 3—5 rays above, bare below. Mesonotum dark brown, subshining, light pollinose strips seemingly narrower than in preceding species. Scutellum tannish, with usual yellowish grey pollinose pattern, only on hind margin are there sometimes dark brown spots. Scutellar index 0.95—1.0. Wing length 3.0—3.3 mm. C-index 2.3—2.6; 4V-index 3.1—3.4; 4C-index 1.5—1.8; 5x-index 0.9. C₃ range 0.75. Fore coxae and femora almost entirely dark, middle and hind coxae and femora with only indistinct darkenings. Tibial dark bands well developed. Tarsi yellow, last joint sometimes slightly darkened. Length ratio of metatarsus to other tarsal joints: 0.8; 1.0; 0.8 (on fore, middle and hind tarsi, respectively). Abdominal pattern as in *A. semivirgo* but dark strips on middle tergites leading to their posterior corners are broader and more expressive than these leading to anterior corners. Anterior corner of tergites usually light coloured. 6th sternite pentagonal (Fig. 19).

Bristles on upper half of anal lamellae longer than these on lower half. Phallic organs (Figs. 17—18): Anterior parameres with three sensillas on medial branch and one sensilla on dorsal branch. Lateral rods undeveloped. Medial rod with a dilated base bearing two caudally directed pointed projections. Behind the base, medial rod is bent above and backwards, then at about one-third of its length down and forwards ($\frac{3}{4}$ of a coil altogether); apex is bifid.

Distribution: Japan; according to personal (in a letter) communication of T. Okada it is distributed mainly in the highlands.

Material studied (4 ♂♂).

Holotype (♂): Hatonoyu (Ishikawa), 10. 8. 1972, K. Suzuki lgt., MP. Genitalia in a tube with glycerine, on the same pin.

Other material studied: Hatonoyu (Ishikawa), 10. 8. 1972 — 3 ♂♂, K. Suzuki lgt.

Note: Simultaneously, another new species was found at the same locality and will in due course be described by T. Okada.

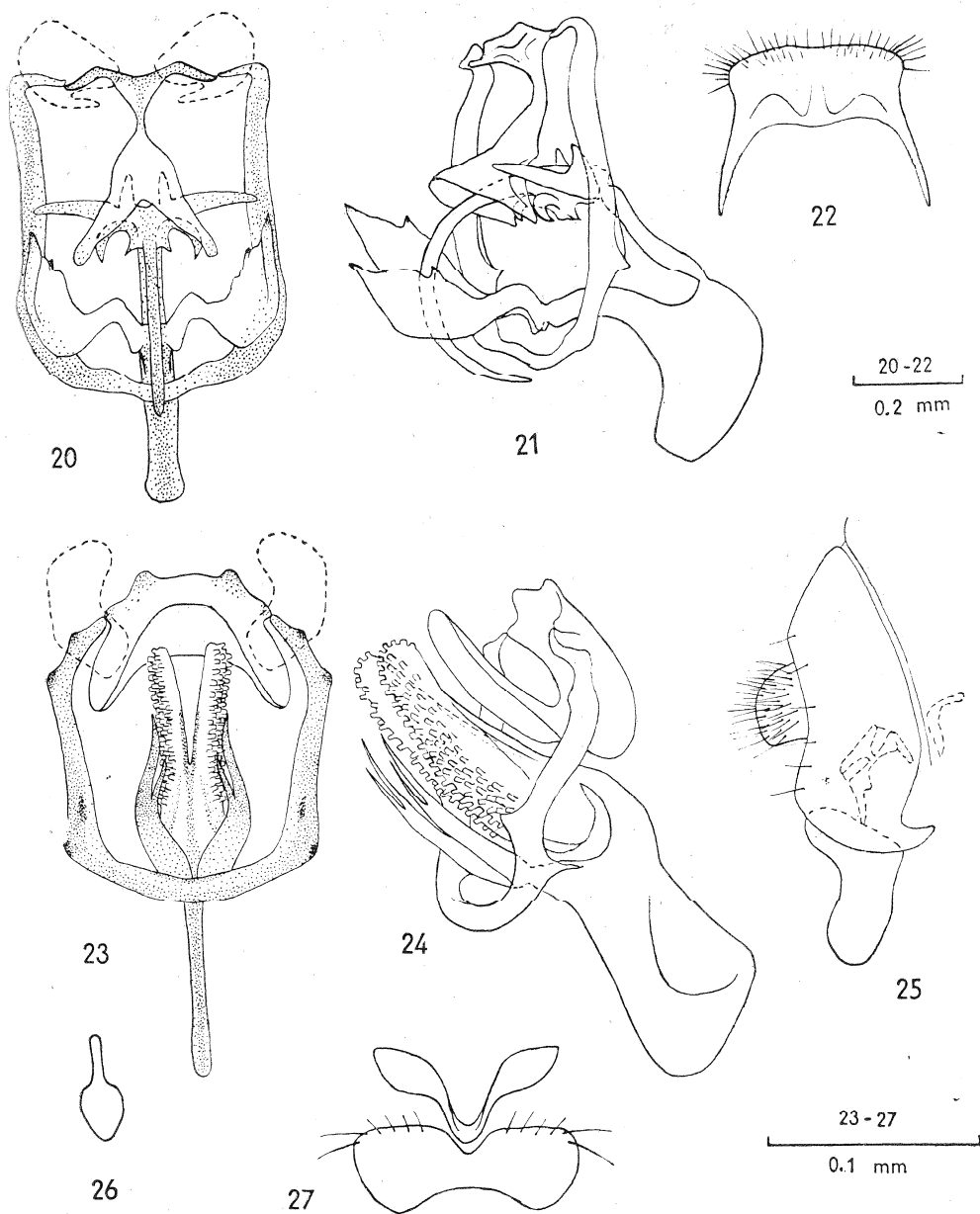
Derivation of name: Kappa means in Japanese a hypothetical kind of creature dwelling in moist environments, which corresponds to presumable tree sap inhabiting habit of larvae of this species.

♂ *Amiota (Phortica) magna* OKADA, 1960

(Figs. 20—22)

Amiota (Phortica) magna OKADA, 1960, Mushi, 34 : 99.

As the original description of this species is precise and recent, I do not propose to give a redescription. The species differs from other Palaearctic species in abdominal pattern: dark caudal bands of abdominal tergites are medially straight or somewhat contracted, not projecting forwards. The male genitalia (Figs. 20—21) are also very characteristic. 6th sternite in male is bristled along caudal margin, with a cranially directed pointed projection each side (Fig. 22).



Figs. 20—22. *Amiota magna* OKADA: 20 — Phallic organs, ventral aspect. 21 — Phallic organs, lateral aspect. 22 — 6th sternite of male. Figs. 23—27. *Amiota oldenbergi* (DUDA): 23 — Phallic organs, ventral aspect. 24 — Phallic organs, lateral aspect. 25 —Periphallic organs. 26 — Ejaculatory apodeme. 27 — Last sternite(s) of male.

Distribution: Japan.

Material studied (1 ♂, 1 ♀).

Kitadake (Yamanashi Pref.), 24.—27. 7. 1968 — 1 ♀, T. Okada et al. lgt. Mt. Yumibari (Saseho), 9. 10. 1970 — 1 ♂, T. Okada lgt. (4). Both specimens were determined by T. Okada.

Amiota (Phortica) oldenbergi (DUDA, 1924)

(Figs. 23—27)

Phortica oldenbergi DUDA, 1924, Arch. Naturg., 90 A: 183.

Strikingly different from other species of the subgenus in having a supernumerary pair of scutellar bristles and in the abdominal pattern: tergites 2 to 5 are dark, each with two pale patches paramedially at posterior margin and with additional pair of light patches semilaterally behind middle of tergite. A detailed description was given by Duda (1935). Additional diagnostic characters: middle orbital bristle rather long (length ratio of orbital bristles: 1.8 : 1 : 1.4), 5x-index low (about 0.6). Last (sixth) sternite of male (Fig. 27) divided into a bristled plate proximally and a V-shaped bare formation distally. This V-shaped formation may represent remnants of the 7th sternite which were not hitherto found in other Drosophilidae males (see WHEELER, 1960) or it may be a secondary sclerotization.

Male genitalia (Figs. 23—26): Periphallallic organs minute, of usual construction. Clasper seemingly bare. Phallic organs: Anterior parameres tapering and apically bifid. Posterior paramere broad, not narrowed at middle. Aedeagus straight, laterally bifid, covered by small nipples, with a laterally flattened apodeme.

Distribution: Environs of Berlin, German Dem. Republic.

Material studied (1 ♂, 1 ♀).

Lectotype (♀): Berlin-Pichelsberg, 6. 8. 1908, Coll. Oldenberg, ITB. The specimen bears a locality label, Duda's determination label "*Phortica Oldenbergi* n. sp. ♀", a printed label "Coll. Oldenberg", a small black square card, a red label "Typus" and my label designating it a lectotype. DUDA (1935) erroneously mentioned this specimen to be a male.

Other material studied: Spandau, 16. 7. 1924 — 1 ♂, Coll. Duda, MDe (with a blank red label).

Note: Only three specimens mentioned by DUDA (1935) seem to be known. As DUDA (1924) did not mention locality in the original description, the collecting date of the specimen has been taken as an indication in selecting the lectotype. Only a specimen from Coll. Oldenberg was collected previously to the date of issue of the description, which was June, 1924.

Acknowledgement

I should like to express my sincere thanks to Univ. Prof. emer. Toyohi Okada (Gotokuji, Tokyo) for his kindly loaning me the material from Japan and for permission to describe the two new Japanese species and also for his valuable comments during the preparation of this paper. My thanks are also due to Mr. E. B. Basden (Bonnyrigg) who made me available some of his records about specimens in the collections of the classic European dipterologists. I am grateful to E. A. Fonseca (Bristol) and to Dr. P. Laštovka (Prahá) for making available to me specimens from their collections. For enabling me to study material of relevant collections I am grateful to Drs. H. Andersson (ZLu), J. Ježek (MP), Prof. G. Morge (ITB), L. Papp, CSc. (MBu), P. I. Persson (MSt), H. Schumann (MBe) and J. Vaňhara (IBP).

LITERATURE

- ANDERSSON H., 1976: Revision of the Anthomyza species of Northwest Europe (Diptera, Anthomyzidae), I. The gracilis group. *Ent. scand.*, **7** : 41—52.
- ASAHINA S., 1950: Correlation between body-size and latitudinal distribution represented by southern and northern forms. *Kontyû*, **18** : 23—24 (in Japanese; Engl. abstr.).
- BRITZ L., 1968: Gesundheitsschädlinge des Menschen und seiner Nutztiere. In FRITSCH R., GEILER H. & SEDLAG U.: *Angewandte Entomologie*, pp. 595—638, VEB G. Fischer, Jena.
- CAIN A. J., COLLIN J. E. & DEMEREC V. R., 1952: Correct application of the name *Drosophila obscura* Fallén and notes on the type of *D. tristis* Fallén (Dipt., Drosophilidae). *Ent. mon. Mag.*, **88** : 193—196.
- DUDA O., 1924: Beitrag zur Systematik der Drosophiliden unter besonderer Berücksichtigung der paläarktischen und orientalischen Arten. *Arch. Naturgesch.*, **90 A** : 172—234.
- DUDA O., 1935: Drosophilidae. In LINDNER E. (ed.): *Die Fliegen der paläarktischen Region*. **118** pp., E. Nägele, Stuttgart.
- HORN W. & KÄHLE I., 1935—1937: Über entomologische Sammlungen, Entomologen und Entomomuseologie. *Ent. Beih., Berl. - Dahlem*. 2—4, VI + 536 pp., 38 plates.
- MÁČA J., 1973: On the collecting Drosophilids by trapping and its results. In: *Metody používané při studiu hospodářsky důležitých dvoukřídlých*, pp. 58—62, 170. ÚVTI Praha, Publ. No. 131 (in Czech, Engl. abstr.).
- MARTINEK V., 1973: Nálezy zajímavějších druhů dvoukřídlých v okolí Dobrušky a v pásmu Orlických hor (Diptera of Orlické hory Mts.). (In Czech.) *Orlické hory, Podorlicko*, **5** : 34—58, Rychnov n. Kněžnou.
- NAGATA Y., 1959: The discovery of eye-worm, *Thelazia callipaeda*, VIII. — *Jap. J. vet. Sci.*, **21** : 103.
- NAGATA Y., 1960: The discovery of eye-worm, *Thelazia callipaeda*, IX.—X. — *Jap. J. vet. Sci.*, **22** (Suppl.) : 475.
- NATER H., 1953: Vergleichend-morphologische Untersuchung des äusseren Geschlechtsapparates innerhalb der Gattung *Drosophila*. *Zool. Jahrb. Syst.*, **81** : 437—486.
- OKADA T., 1956: Systematic study of Drosophilidae and allied families of Japan. 183 pp., Gihodo Co., Tokyo.
- OKADA T., 1959: Interspecific and intraspecific variations of the wing indices in the genus *Drosophila*. *Kontyû*, **27** : 21—34.
- OKADA T., 1960: Allomorphosis of the wing-veins vs. wing-membranes in insects. *Nat. Sci. Rep. Ochanomizu Univ.*, **11** : 35—50.
- OKADA T., 1968: Systematic study of the early stages of Drosophilidae. 188 pp., Bunka Zugeisha Co., Tokyo.
- OKADA T., 1971a: A revision and taxometric analysis of the genus *Amiota* Loew of Japan and adjacent countries (Diptera, Drosophilidae). *Kontyû*, **39** : 82—98.
- OKADA T., 1971b: Morphological and biogeographical relationships of closely related species of the genus *Amiota* (Diptera, Drosophilidae). *Kontyû*, **39** : 327—332.
- SÉGUY E., 1934: Muscidae acalypterae et Scatophagidae. Faune de France, 28; 832 pp., Lechevalier. Paris.
- WHEELER M. R., 1960: Sternite modification in males of the Drosophilidae (Diptera). *Annls Ent. Soc. Am.*, **53** : 134—137.

Received February 19, 1976; accepted June 30, 1976

Author's address: RNDr. J. Máca, Chmelnice 276, 391 81 Veselí n. Luž. I, Czechoslovakia.