

A REVISION AND TAXOMETRIC ANALYSIS OF THE GENUS
AMIOTA LOEW OF JAPAN AND ADJACENT COUNTRIES
(DIPTERA, DROSOPHILIDAE)

TOYOHI OKADA

Department of Biology, Tokyo Metropolitan University, Tokyo

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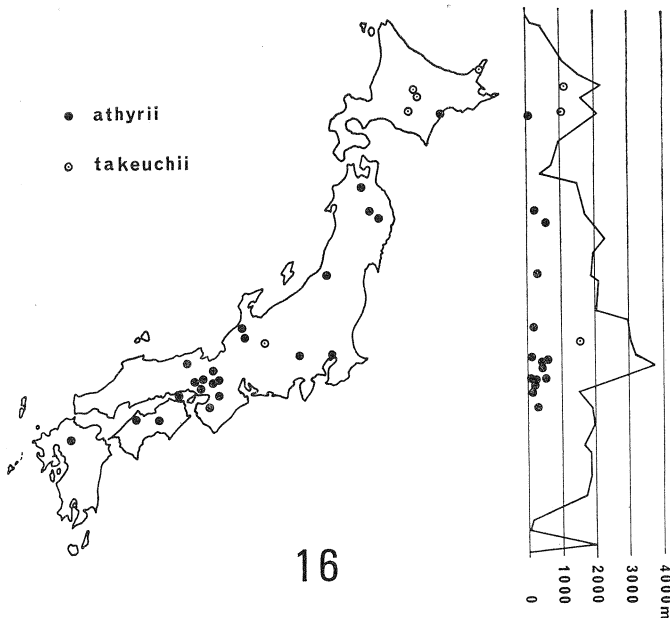


Fig. 16. Map showing horizontal and perpendicular distributions of close relatives in the *minomensis*-group.

in this genus, though the question arises whether or not any reproductive isolation mechanism to prevent their interbreeding has already been definitely established.

The facts described above seem to offer some interesting materials with regard to speciation. It is generally accepted that geographical isolation is a prerequisite for speciation, and the closely allied forms in the *paucipunctatus*- and *minomensis*-groups seem to be the very examples. Some consider that species can also evolve sympatrically, though this idea is not so widely accepted as allopatric speciation. In the close relatives of the *struthiopteridis*-group, there exists sufficient evidence that *sasayamensis* must have derived from *japonicus* sympatrically. *Japonicus* is an only oligophagous species in this genus, while the others are monophagous so far as known. At Sasayama of Hyogo Prefecture, the larvae of *japonicus* are simultaneously found on the leaves of *Polystichum tripterum*, *P. retroso-paleacum*, *P. polyblepharum*, *Dryopteris lacera* and *Cyrtomium fortunei* in natural condition. In laboratory, it has been confirmed that the larvae show a rather strong preference for the same fern that they attack in nature, though the first two are also preferred to the rest by them. Such being the case *japonicus* may have a possibility to split into some ecological races. For further splitting into sympatric speciation such ecological races must be isolated in time, with interchange of genes between them interrupted. In the case of the two species *japonicus* and *sasayamensis* this mechanism is supplied by the difference of germinant time of their host plants, for the adult females must lay eggs soon after ferns put forth leaves, and, therefore, their appearance depends entirely on germination of host plants. They appear in different time in their common range as already stated and are isolated from each other, though it is impossible, in this case, to find out the process of isolation.

The above-mentioned data suggest that sympatric speciation may have occurred in the genus. In general, many sawflies are monophagous and have rather strong host specificity. When they happen to diverge in their feeding habits and to attack different

plants, this may help them to split into ecological races. And it seems reasonable to take this as an essential prerequisite to sympatric speciation of sawflies.

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A REVISION AND TAXOMETRIC ANALYSIS OF THE GENUS AMIOTA LOEW OF JAPAN AND ADJACENT COUNTRIES (DIPTERA, DROSOPHILIDAE)

TOYOHI OKADA

Department of Biology, Tokyo Metropolitan University, Tokyo

Besides two major subgenera (*Amiota* Loew and *Phortica* Schiner), *Erima* Kertész, *Sinophthalmus* Coquillett, *Paraphortica* Duda, and even *Eostegana* Hendel have been included in the genus *Amiota* Loew. *Sinophthalmus* is thought synonymous with *Erima* by Duda (1924: 178), or with *Phortica* by Wheeler (1952: 166). Wheeler (1965: 761)

actually treats *Sinophthalmus* as a subgenus of *Amiota*. Again, *Erima* is treated by Duda (1926: 246) as a subgenus of *Phortica*, s. lat. (= *Amiota*, s. lat.). On the contrary, McAlpine (1968: 516-7) ranks *Sinophthalmus* and *Erima* as distinct genera. *Paraphortica* was established by Duda (1935: 36) as a genus and at the same time (1935: 30) as a subgenus of *Amiota*. Duda (1924) places *Eostegana* in his *Phortica* group, and later (1927) in the genus *Orthostegana* as a subgenus.

In the present study the genus *Amiota* is divided into five subgenera, *Amiota*, *Phortica*, *Erima* (= *Sinophthalmus*), *Paraphortica*, and a new subgenus, while *Eostegana* (= *Stegophortica*) is excluded from this genus, because of its having strong subbasal bristles of mid tibia and distally rather divergent R_{4+5} and M. Several new species are described and the phenetic relationships of the taxa in question are analysed by taxometric procedures.

Subgenus *Amiota* Loew

Amiota (Amiota) lanceolata sp. n. (Figs. 1-3)

♂. Body about 2.5 mm in length. Antenna dark brown, third joint darker and oval. Arista with five upper and five shorter lower branches, without prominent fork. Palpi greyish brown, slender. Ocellar triangle mat black; clypeus deep black. Front subshining deep black, anteriorly slightly narrower than length down middle. Face mat brownish black, lower half milky white. Carina undeveloped. Cheek narrow, greyish brown, black along insertion of orals. Anterior reclinate orbital two-thirds as long as others, twice as apart from posterior reclinate as from proclinate. Vibrissa long but thin, other orals fine. Mesonotum and scutellum subshining deep black. Thoracic pleura mat black, with distinct white spots on humerus and below wing base. Humeral one, prominent. Anterior dorsocentrals two-thirds as long as posteriors. Anterior scutellars somewhat divergent, slightly shorter than posteriors; posteriors divergent, nearer to each other than to anteriors. Sterno-index 0.9. Legs orange yellow, proximal half of fore femur fuscous. Wings hyaline, veins yellow, crossveins clear. R_{2+3} nearly straight; R_{4+5} and M distally convergent; posterior crossveins weakly sinuated. C-index 1.2; 4V-index 3.0; 5x-index 1.5; Ac-index 4.5; Cx-index (see Okada, 1960: 90) 0.6. C3-fringe on basal three-fourths or less. Halteres white. Abdominal tergites mat black; 1T caudally, 2T proximally, orange brown.

Periphallallic organs (Fig. 1): Genital arch black, narrowing above, constricted at mid-dorsal line, truncate below. Anal plate yellow, lower tip black. Clasper globular, distally with about six black long teeth in a straight row. Phallic organs (Figs. 2, 3): Aedeagus* paired, lanceolate, orange brown. Anterior parameres small, fusiform, black, with a few sensilla. Apodeme of aedeagus fan-shaped. Posterior parameres fused, cap-like.

Holotype. ♂, Kitadake, Yamanashi Pref., 24 VII 1968 (Okada). Paratopotype. 1♂, 28 VII 1970 (Hihara).

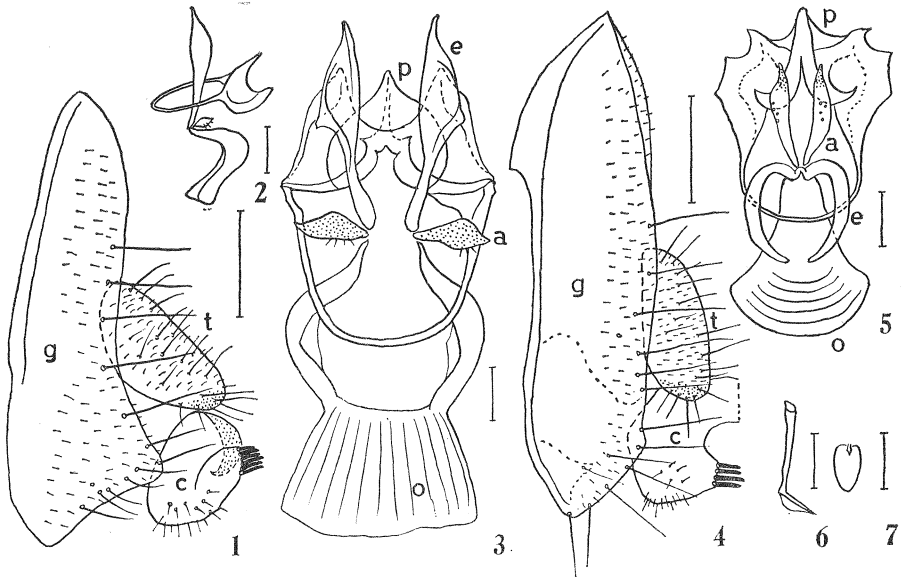
Distribution. Japan (Honshu).

Relationships. Resembles *A. albilabris* (Zetterstedt) of Japan in having aedeagus lobe and anterior paramere clearly separated, but differs in having nearly entirely yellow legs and much longer aedeagus.

Amiota (Amiota) sigma sp. n. (Figs. 4-7)

♂. Body about 2 mm in length. Antenna greyish brown, third joint reddish. Clypeus deep black. Front subshining black, anteriorly narrower than length down mid-

* The aedeagus is absent in the species of the subgenus *Amiota*, according to Dr. Steyskal's personal information. The use of the term *aedeagus* in the present work is therefore tentative.



Figs. 1-3. *Amiota (Amiota) lanceolata* sp. n. 1.Periphallial organs; 2. Phallic organs, lateral aspect; 3. *ibid.*, ventral aspect.

Figs. 4-7. *Amiota (Amiota) sigma* sp. n. 4.Periphallial organs; 5. Phallic organs, ventral aspect; 6, 7. Ejaculatory apodeme. a. anterior paramere; c. clasper; d. decaesternum or bridge connecting claspers; e. aedeagus; g. genital arch; o. apodeme of aedeagus; p. posterior paramere; t. anal plate. Scales 0.1 mm.

dle. Face grey, without prominent white band below; carina undeveloped. Cheek narrow, greyish brown. Mesonotum and scutellum mat black, somewhat blue grey pollinose. Thoracic pleura black. Humeral one, prominent. Posterior scutellars nearer to each other than to anteriors. Legs yellow. Wings hyaline. C-index 1.7; 4V-index 3.3; 5x-index 1.5; Ac-index 7.0; Cx-index 0.4. C3-fringe on basal two-thirds. Halteres white. Abdominal tergites brownish black.

Periphallial organs (Fig. 4): Genital arch narrow, black, paler below. Anal plate oval, pale, lower tip black. Clasper pale, distally narrowing, with about five black teeth. Phallic organs (Fig. 5): Aedeagus pale yellowish brown, paired, slender, vertically looped. Anterior parameres lanceolate, separated from and nearly as long as aedeagus, pale yellowish brown, apically black, medially with a few sensilla. Ejaculatory apodeme as in Figs. 6, 7.

Holotype. ♂, Kitadake, Yamanashi Pref., 24 VII 1968 (Okada and Hihara).

Distribution. Japan (Honshu).

Relationships. Resembles the foregoing species, *lanceolata*, in having aedeagus lobe and anterior paramere separated, but differs in higher Ac-index, larger and sigmoid anterior parameres, and ventrally pale genital arch.

Amiota (Amiota) clavata sp. n.

Amiota (Amiota) alboguttata, forma *clavata* Okada, 1960: 94.

♂. Front anteriorly slightly silvery pollinose. C-index 1.9; 4V-index 2.5; 5x-index 1.4; Ac-index 3.0. Genital arch mid-dorsally constricted. Other features as described and figured by Okada (*op. cit.*).

Holotype. ♂, Sugadaira, Nagano Pref., 10 VIII 1965 (Okada).

Distribution. Japan (Honshu).

Relationships. Somewhat allied to the foregoing species, *sigma*, in having elongate aedeagus and anterior parameres, which are, however, not clearly separated.

***Amiota (Amiota) chungii* sp. n.**

Amiota (Amiota) alboguttata, forma *koreana* Okada and Chung, 1960. Akitu, 9:25.

♂. As described and figured by Okada and Chung (*op. cit.*).

Holotype. ♂, Mt. Sul-Ak, Kang-Won Province, 16 VII 1959 (Chung).

Distribution. S. Korea.

Relationships. Resembles the foregoing species, *clavata*, in having apparently fused aedeagus lobe and anterior paramere, but differs in having them apically pointed, not clavate.

***Amiota (Amiota) furcata* sp. n.**

Amiota (Amiota) alboguttata, forma *furcata* Okada (*part.*), 1960:96.

♂. Body about 2.5–3.0 mm in length. Front largely silvery pollinose in front view. Wing 2.0 mm or more in length. C-index 1.8; 4V-index 2.2; 5x-index 1.7; Ac-index 4.4; Cx-index 0.7. C3-fringe on basal half. Genital arch somewhat narrowing above; clasper with about thirteen teeth in a straight row. Aedeagus and anterior paramere fused to be a thick Y-shaped organ, which is broader than long. Other features as described by the author (*op. cit.*).

Holotype. ♂, Kumotoriyama, Tokyo, 14 VII 1953 (Okada). Paratypes. 3 ♂, Nukabira, Hokkaido, 12 VIII 1966 (Okada); 1 ♂, Nopporo, Hokkaido, 19 VIII 1966 (Okada); 10 ♂, Masutomi, Yamanashi Pref., 11 VII 1961 (Saigusa); 2 ♂, Kitadake, Yamanashi Pref., 24 VII 1968 (Okada and Hihara); 2 ♂, Kirishima, 19 VIII 1968 (Okada).

Distribution. Japan (Hokkaido; Honshu; Kyushu).

Relationships. Resembles the foregoing species, *chungii*, in having completely fused aedeagus lobe and anterior paramere, but the apical free ends of these organs are longer and basal fused portion narrower.

***Amiota (Amiota) subfurcata* sp. n.**

Amiota (Amiota) alboguttata, forma *furcata* Okada (*part.*), 1960:96.

♂. Body about 2.0–2.5 mm in length. Front mat brownish black, anteriorly paler, not silvery pollinose. Wings 2.0 mm or less in length. C-index 1.9; 4V-index 2.2; 5x-index 1.6; Ac-index 4.0; Cx-index 0.8. C3-fringe on basal half. Genital arch not narrowing above; clasper with about six teeth in a row. Aedeagus lobe and anterior paramere fused to be a thin Y-shaped organ, which is longer than broad. Other features as described by Okada (*op. cit.*).

Holotype. ♂, Sugadaira, 24 VI 1970 (Okada). Paratypes. 9 ♂, collected together with the holotype; 23 ♂, Kitakaruizawa, 12–18 VII 1970 (Okada); 1 ♂, Sapporo, 19 VIII 1953 (Okada); 5 ♂, Kyoto, 10 IX 1964 (Okada); 8 ♂, Saitoshi, Miyazaki Pref., VI–X 1962 (Nagata); 2 ♂, Wulai, Taipei County, 10 VIII 1967 (Throckmorton).

Distribution. Japan (Hokkaido; Honshu; Kyushu); Taiwan.

Relationships. Closely allied to the foregoing species, *furcata*, in having Y-shaped organ composed of aedeagus lobe and anterior paramere, but differs in having this organ thinner, genital arch not narrowing above, front not silvery pollinose, and clasper teeth fewer.

Amiota (Amiota) elongata sp. n.

Amiota (Amiota) alboguttata, forma *elongata* Okada, 1960: 95.

♂. C-index 1.8; 4V-index 2.7; 5x-index 1.8; Ac-index 4.0. Genital arch constricted at mid-dorsal line. Other features as described and figured by Okada (*op. cit.*).

Holotype. ♂, Sugadaira, Nagano Pref., 28 VIII 1959 (Okada). Paratypes. 1♂, Takinoyu, Niigata Pref., 28 VIII 1963 (Okada); 1♂, Yunokoya, Gumma Pref., 26 VII 1960 (Okada); 1♂, Tanigawa, Gumma Pref., 16 VIII 1961 (Okada); 3♂, Masutomi, Yamanashi Pref., 11-12 VIII 1961 (Saigusa).

Distribution. Japan (Honshu).

Relationships. Resembles *A. clavata* Okada in having aedeagus and anterior parameres elongate, but differs in having aedeagus pale and slender (black and robust in *clavata*).

Amiota (Amiota) okinawana sp. n. (Figs. 8-10)

♂. Body about 2.5 mm in length. Antenna with second joint orange brown, third brownish black. Arista with five upper and three lower long branches besides a large fork. Palpi grey, slender. Ocellar triangle black, convexed. Periorbits pollinose grey. Front black, anterior two-thirds orange brown. Clypeus black. Face greyish brown, buccal margin broadly milky white. Carina low. Cheek narrow, white. Anterior reclinate orbital slightly shorter than other orbitals, twice as apart from posterior reclinate as from proclinate. Vibrissa rather weak, other orals fine. Mesonotum subshining black, scutellum black, somewhat pollinose grey. Thoracic pleura mostly black. Humeral one, prominent. Anterior scutellars divergent, as long as posteriors, which are nearer to each other than to anteriors. Sterno-index 0.6. Legs yellow, tarsi slightly fuscous. Wings hyaline; R_{2+3} gently curved to costa apically; R_{4+5} distally strongly convergent with M, subbasally somewhat sinuated. C-index 1.5; 4V-index 2.5; 5x-index 1.8; Ac-index 6.0; Cx-index 0.7. C3-fringe on basal four-fifths. Halteres white. Abdominal tergites subshining black; 1T entirely and 2T medially yellow.

Periphallalic organs (Fig. 9): Genital arch black, narrowly constricted mid-dorsally, pale and rounded below. Clasper pale, quadrate, distally with about seven black teeth in a straight row. Phallic organs (Fig. 10): Aedeagus and anterior parameres small, closely apposed to each other, yellowish brown, the former slender, the latter shorter but broader than the former. Apodeme of aedeagus large. Ejaculatory apodeme as in Fig. 8.

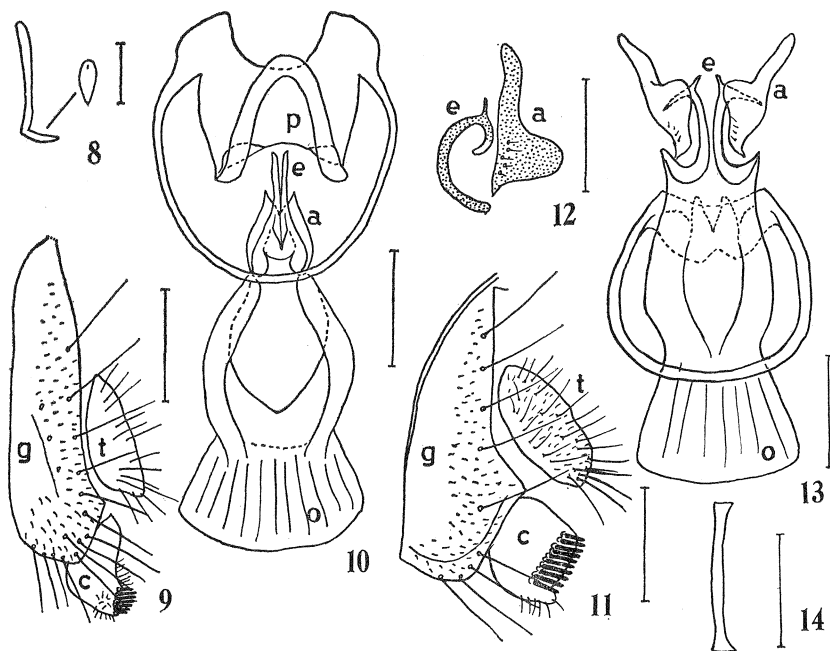
Holotype. ♂, Komi, Iriomote Is., 9 VII 1966 (Okada and Hihara). Paratopotypes 3♂, 9 VII 1966 (Okada and Hihara).

Distribution. Okinawa.

Relationships. Resembles *A. nagatai* in the shape and coloration of aedeagus and anterior parameres, but differs in having smaller Cx-index, mid-dorsally constricted genital arch, and clasper without a finger-like process below teeth row. The types were misidentified by Okada, 1968: 310, as belonging to *A. nagatai*.

Amiota (Amiota) curvistyla sp. n. (Figs. 11-14)

♂. Body about 2.5 mm in length. Antenna dark brown. Arista with five upper and three lower long branches besides a moderate fork. Palpi yellowish brown. Ocellar triangle and periorbits brownish black. Clypeus mat black. Front mat brownish black, anteriorly silvery pollinose. Face dark brown, lower half milky white. Carina low. Cheek narrow, yellow. Anterior reclinate orbital two-thirds as long as others, thrice as apart from posterior reclinate as from proclinate. Second oral weak. Mesonotum and scutellum mat brownish black. Thoracic pleura brownish black. Humeral one, long. Prescutellars slightly longer than anterior dorsocentrals. Anterior dorsocentrals



Figs. 8-10. *Amiota (Amiota) okinawana* sp. n. 8. Ejaculatory apodeme; 9. Peripheralia organs; 10. Phallic organs, ventral aspect.

Figs. 11-14. *Amiota (Amiota) curvistyla* sp. n. 11. Peripheralia organs; 12. Phallic organs, part; 13. *ibid.*, ventral aspect; 14. Ejaculatory apodeme. Signs as in Figs. 1-7. Scales 0.1 mm.

half posteriors. Anterior scutellars divergent, slightly longer than posteriors, which are somewhat nearer to each other than to anteriors. Sterno-index about 0.6. Legs yellow. Wings hyaline, R_{2+3} straight, R_{4+5} and M gently convergent. C-index 1.6; 4V-index 2.1; 5x-index 1.5; Ac-index 4.0; Cx-index 1.0. C3-fringe on basal five-eighths. Halteres white, stalk yellow. Abdominal tergites mat brownish black, 1T pale.

Peripheralia organs (Fig. 11): Genital arch black, narrowly constricted at mid-dorsal line, gently rounded below. Clasper quadrate, pale yellowish brown, distally with a straight row of about ten long black teeth, with a finger-like process below the teeth row and with a crest of fine teeth discally. Anal plate pale yellowish brown. Phallic organs (Figs. 12, 13): Aedeagus black, apically pale, slender and looped, subapically with a short slender process. Anterior parameres black, basal half very thick, ventrally swollen, distal half slender and nearly straight. Posterior parameres apically with a pair of black conical processes. Ejaculatory apodeme (Fig. 14) with long straight stalk and fine plate.

Holotype. ♂, Kitadake, Yamanashi Pref., 28 VII 1970 (Hihara). Paratype. 1 ♂, Tanigawa, Gumma Pref., 16 VIII 1961 (Okada).

Distribution. Japan (Honshu).

Relationships. Somewhat resembles *A. clavata* Okada in having clavate anterior parameres, which are separated from slender aedeagus lobe, but differs in having anterior parameres prominently swollen basally and aedeagus more strongly looped.

Amiota (Amiota) dentata sp. n. (Figs. 15-17)

♂. Body about 2 mm in length. Antenna dark reddish brown, third joint darker. Arista with four upper and four lower long branches besides a fine fork. Palpus dark