

**Estimation of the Routes of Synhospitalic Distribution of
the Genus *Drosophilella* DUDA (Diptera, Drosophilidae),
with Descriptions of Three New Species from
Malaysia and Indonesia**

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Synopsis

OKADA, T. 1986—Estimation of the routes of synhospitalic distribution of the genus *Drosophilella* DUDA (Diptera, Drosophilidae), with descriptions of three new species from Malaysia and Indonesia. *Proc. Japn. Soc. syst. Zool., Tokyo*, No. 33: 32-39.

The routes of synhospitalic distribution of the *Drosophilella* species are estimated with special regard to the host plants. A couple of new synhospitalic species, *baechlii* and *bogneri*, obtained from the flowers of *Homalomena lancifolia* Hook. f. (Araceae) in Malaysia and another new species, *iskandari*, found synhospitalic with *D. colocasiae* DUDA on the flowers of *Colocasia esculenta* SCHOTT (Araceae) in Indonesia are described.

Closely related species of the genus *Drosophilella* DUDA have been frequently found in couple on a host plant flower of Araceae (OKADA, 1975; CARSON & OKADA, 1980; TODA & OKADA, 1983; HONDA-YAFUSO, 1983). The present report deals with further instances found in couple of two new species from Malaysia and also of *D. colocasiae* DUDA and its allied new species from Indonesia. Furthermore, the routes of synhospitalic distribution of *Drosophilella* species are estimated in relation to their host plants.

***Drosophilella baechlii* sp. nov.**

(Fig. 1A-D)

♂, ♀. Body about 1.5 mm in length. Eye dark brownish red, bare. Antenna dark brown, 3rd joint large and rounded. Arista plumose, as long as antenna, with 4 upper and 2 lower branches. Palpus broad, orange brown. Periorbit pruinose black. Frons flat, mat black, anteriorly narrowing and yellowish brown, narrower than median length. Face gray. Carina narrow, high, broad below. Clypeus grayish brown. Cheek narrow, gray. Ocellars outside triangle made by ocelli. Postverticals small, upright. Anterior reclinate orbital minute. Mesoscutum and

scutellum mat brownish black. Thoracic pleura mat gray, with faint dark patches. Acrostichal hairs in 2 rows. Humeral 2. Scutellars divergent, apicals longer than laterals and nearer to each other than to laterals. Sterno-index 0.8. Legs yellowish gray; femora and tibiae darker; 2nd tarsal joint of fore leg (Fig. 1B) distally narrowing, with 10 stout black teeth in 2 rows inferiorly, ultimate tooth twice as long as others. Wing (Fig. 1A) hyaline, slightly fuscous especially anteriorly. C-index 1.5; 4V-index 2.5; 4C-index 1.7; 5x-index 3.0; Ac-index 3.0. C3-fringe absent. Halter yellow, knob large and black. Abdominal tergites mat black, ventrolaterally with large elliptical stigma. Periphallallic organs (Fig. 1C) black; cercus caudally elongate; surstylus absent. Phallic organs (Fig. 1C) black; aedeagus very long and slender, laterally bilobed; paramere absent. Ovipositor (Fig. 1D) oblong, apically with 3 long and a few fine setae.

Holotype ♂, allotype ♀, 3♂ paratypes, Pahang, S of Kuala Medang, Malaysia, 6.VIII.1985 (BOGNER leg.), ex flowers of *Homalomena lancifolia* (Araceae). Types are deposited in the Bavarian State Museum, Munich, paratypes in the National Science Museum, Tokyo.

Distribution. Malaysia.

Relationships. This species resembles *D. toshiokai* OKADA in having plumose arista, weak costal fringe, and in the periphallallic organs, but it differs from the latter in having more numerous teeth of fore tarsus, very slender aedeagus, and in the absence of surstylus.

Remarks. The specific name is dedicated to Dr. Gerhard BÄCHLI of Zoologisches Museum der Universität Zürich, from whom the specimens have been sent to me for investigation.

***Drosophila bogneri* sp. nov.**

(Fig. 1E-H)

♂, ♀. Body about 1.5 mm in length. Eye dark red, bare. Antenna brown. Arista missing (probably plumose). Palpus grayish brown. Frons flat, quadrate, mat black, anteriorly orange brown. Face dark brown. Carina high, narrow. Clypeus grayish brown. Cheek very narrow, grayish yellow. Postverticals minute. Orbitals before middle of frons, anterior reclinate fine. Mesoscutum and scutellum mat brownish black. Thoracic pleura yellowish gray, with a black patch below notopleural region. Acrostichal hairs in 2 rows. Humeral 2. Anterior dorsocentrals much shorter than posteriors, far before middle of mesoscutum. Scutellars parallel; apicals longer than laterals, equally apart from each other and from laterals. Sterno-index about 1.0. Legs yellowish gray; 2nd tarsal joint of fore leg (Fig. 1F) with 10 black

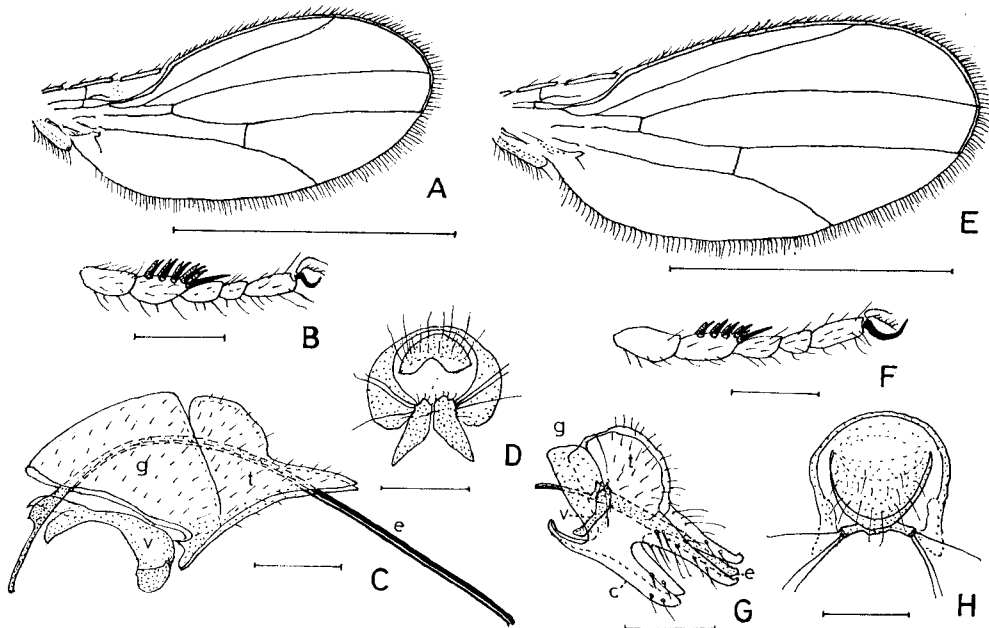


Fig. 1. A-D, *Drosophilella baechlii*; E-H, *D. bogneri*. A, E, Male wing; B, F, fore tarsi; C, G, peripheral organs and phallic organs; D, H, ovipositor and caudal end of abdomen. c, surstylus; e, aedeagus; g, epandrium; t, cercus; v, ventral fragma. Scales 1.0 mm for wings, 0.1 mm for other figs.

stout teeth in 2 rows, ultimate tooth twice as long as others. Wing (Fig. 1E) hyaline, somewhat fuscous. C-index 1.5; 4V-index 2.5; 4C-index 1.6; 5x-index 3.0; Ac-index 3.0. C3-fringe absent. Halter yellowish orange, knob large and black. Abdominal tergites mat black, 6T caudally and 7T in ♀ orange brown. Each tergite laterally with a large elliptical stigma. Peripheral organs (Fig. 1G) black; epandrium smaller than cercus, which has a long process caudally. Surstylus large, long, fused with cercus. Phallic organs (Fig. 1G) black; aedeagus not very slender, without prominent subbasal process. Ovipositor (Fig. 1H) rod-shaped, apically with 3 long setae.

Holotype ♂, allotype ♀, Pahang, S of Kuala Medang, Malaysia, 6.VIII.1985 (BOGNER leg.), ex flowers of *Homalomena lancifolia* (Araceae) together with the foregoing species. Types are deposited in the Bavarian State Museum, Munich.

Distribution. Malaysia.

Relationships. This species resembles the foregoing species in the structure of tarsal teeth of fore leg and caudally elongate male cercus, but it differs from the latter in the palmar thoracic pleura and shorter and stouter aedeagus.

Remarks. The specific name is dedicated to Mr. Josef BOGNER of

Bavarian State Museum, Munich, for collecting material.

***Drosophilella colocasiae* DUDA**

(Fig. 2A-G)

Drosophilella colocasiae DUDA, 1924, *Arch. Naturgesch.*, 90 A 2: 178, 226, 252.

Drosophilella colocasiae: WHEELER et TAKADA, 1964, *Ins. Micronesia*, 14 (6): 2931;

WHEELER, 1969, *Pacif. Ins.*, 23: 544; KRAMADIBRATA et HAMBALI, 1983, *Berita Biol.*, 2: 144.

♂, ♀. Body 1.5–2.0 mm in length. Arista slightly longer than antenna. Wing (Fig. 2A) with costal fringe composed of short setae sparsely intermittent with longer setae. Second tarsal joint of fore leg (Fig. 2B) with 3–5 stout black teeth. Sterno-index about 0.5. Male 6th abdominal sternite with a black conical process (Fig. 2C). Abdominal tergites black or grayish yellow. Periphallalic organs (Fig. 2F) black; epandrium tapering above and anteriorly, with a conical process sub-basally above, caudoventral corner obtuse angular; male cercus large, oval; surstylus small, triangular. Phallic organs (Fig. 2F) black; aedeagus oblong, with a prominent subbasal process. Ejaculatory apodeme (Fig. 2E) with stalk broad, elliptical and flat. Ovipositor (Fig. 2G)

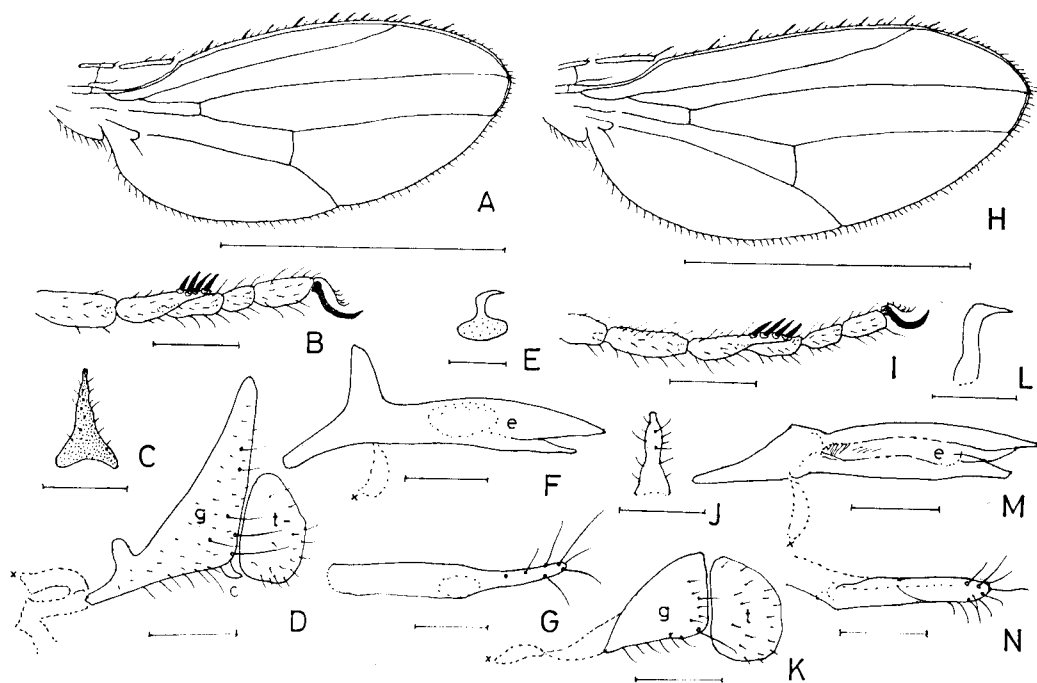


Fig. 2. A-G, *Drosophilella colocasiae*; H-N, *D. iskandari*. A, H, Male wing; B, I, fore tarsi; C, J, conical process of male 6th abdominal sternite; D, K, periphallalic organs; E, L, ejaculatory apodeme; F, M, phallic organs; G, N, ovipositor. Scales and signs as in Fig. 1.

brown, slender, distally tapering, with a few long setae. Other features as described by DUDA (1924) and WHEELER (1969).

Specimens examined. 10♂, 10♀, Bogor, Java, 250 m (ISKANDAR leg.), ex flowers of *Colocasia esculenta* SCHOTT (Araceae).

Distribution. Indonesia.

Remarks. Through courtesy of Mr. B. BRUGGE of Zoological Museum, University of Amsterdam, I could examine ♀ lectotype and a ♀ specimen of this species preserved in that museum. The lectotype was designated by WHEELER (1969). DUDA's record (1924:253) of ♂ seems to be an error. KRAMADIBRATA & HAMBALI (1983) recorded this species from Java, Malaysia, Thailand and Sulawesi, collected from the flowers of *Colocasia gigantea* HOOK as well as of *C. esculenta*. The records outside Indonesia should better be reconfirmed.

***Drosophilella iskandari* sp. nov.**

(Fig. 2H-N)

♂, ♀. Body about 1.5 mm in length. Antenna with 2nd joint grayish brown, 3rd black. Arista pubescent, nearly as long as antenna. Frons mat black, anteriorly slightly paler. Face grayish black. Carina broad. Clypeus gray. Cheek brownish black, half as broad as the greatest diameter of eye. Mesoscutum and scutellum mat brownish black. Thoracic pleura somewhat paler than mesoscutum. Humeral 2, upper longer. Acrostichal hairs in 4 sparse rows. Anterior dorsocentrals 2/3 as long as posteriors, far before the latter. Lateral scutellars 3/4 as long as apicals, which are nearer to each other than to laterals. Sterno-index 0.6. Legs grayish black, femora and tibiae darker. Second tarsal joint of fore leg (Fig. 2I) distally elongate, with 3-4 stout black teeth. Wing (Fig. 2H) hyaline; C reaching M, costal fringe composed of short setae sparsely intermittent with longer setae. C-index 1.8-2.0; 4V-index 2.2; 4C-index 1.2; 5x-index 1.7; Ac-index 2.6-3.2. C3-fringe absent. Halter grayish yellow. Abdominal tergites yellowish brown with more or less developed black caudal bands. Male 6th abdominal sternite with a pale conical process (Fig. 2J). Periphallial organs (Fig. 2K) black; cercus large, oval; surstylus absent; epandrium rectangular at caudoventral corner. Phallic organs (Fig. 2M) black; aedeagus without prominent subbasal process. Ejaculatory apodeme (Fig. 2L) with stalk longer than broad. Ovipositor (Fig. 2N) rather broad, slightly tapering distally.

Holotype ♂, allotype ♀, 1♂ 1♀ paratypes, Bogor, Java, 250 m, 13.III.1986 (ISKANDAR leg.), ex flowers of *Colocasia esculenta* together with the foregoing species. Types are deposited in the National Science Museum, Tokyo.

Distribution. Indonesia.

Relationships. This species resembles the foregoing species, *colocasiae*, in weak costal fringe, structure of 2nd tarsal joint teeth of fore leg, and conical process of male 6th abdominal sternite, but differs from the latter in having pale conical process of 6th abdominal sternite, weak subbasal process of aedeagus, no subbasal process of epandrium, no surstylus, and broader ovipositor with shorter setae.

Remarks. The specific name is dedicated to Dr. Djoko T. ISKANDAR of the Department of Biology, Institute of Technology, Bandung, who has kindly collected samples of this and foregoing species. The foregoing species is more common than this species.

Routes of Synhospitalic Distribution

Three couples of *Drosophilella* species have been known as synhospitalic (parasitic on same host species or even same host individual): *D. alocasiae* OKADA & *D. xenalocasiae* OKADA on *Alocasia odora* C. KOCH; *D. stamenicola* CARSON et OKADA & *D. pistilicola* CARSON et OKADA on *Colocasia esculenta* SCHOTT; *D. monoconica* TODA et OKADA & *D. diconica* TODA et OKADA on *Colocasia esculenta*. Two other synhospitalic couples are discovered in the present study: *D. baechlii* & *D. bogneri* on *Homalomena lancifolia*; *D. colocasiae* & *D. iskandari* on *Colocasia esculenta*. Although these two couples are known only by dried specimens, the first mentioned species of each couple should be stamenicolous and second mentioned one should be pistilicolous in larval habits, same as in the three known synhospitalic couples cited above. This conclusion is resulted from morphological comparison of adult flies: •

Stamenicolous species: Epandrium with subbasal conical process; aedeagus with subbasal conical process; ovipositor very slender.

Pistilicolous species: Epandrium without subbasal conical process; aedeagus without subbasal conical process; ovipositor rather broad.

My previous suggestion (OKADA, 1980) that *D. colocasiae* is pistilicolous was erroneous. Dr. S. TOSHIOKA informed me that the host plant of *D. toshiokai* OKADA in TODA and OKADA is *Homalomena* sp., not *Colocasia esculenta* as reported by me (TODA and OKADA, 1983).

Thus, three routes of synhospitalic distribution of the *Drosophilella* species can be estimated as below (Fig. 3).

1. *Colocasia* Route Hypothetical ancestors (S. China) — *monoconica* (mo), *diconica* (di) (Burma) — *colocasiae* (co), *iskandari* (is) (Indonesia) — *stamenicola* (st), *pistilicola* (pi) (New Guinea).
2. *Alocasia* Route Hyp. — *alocasiae* (al), *xenalocasiae* (xe) (S. China*, Taiwan, Ryukyus).

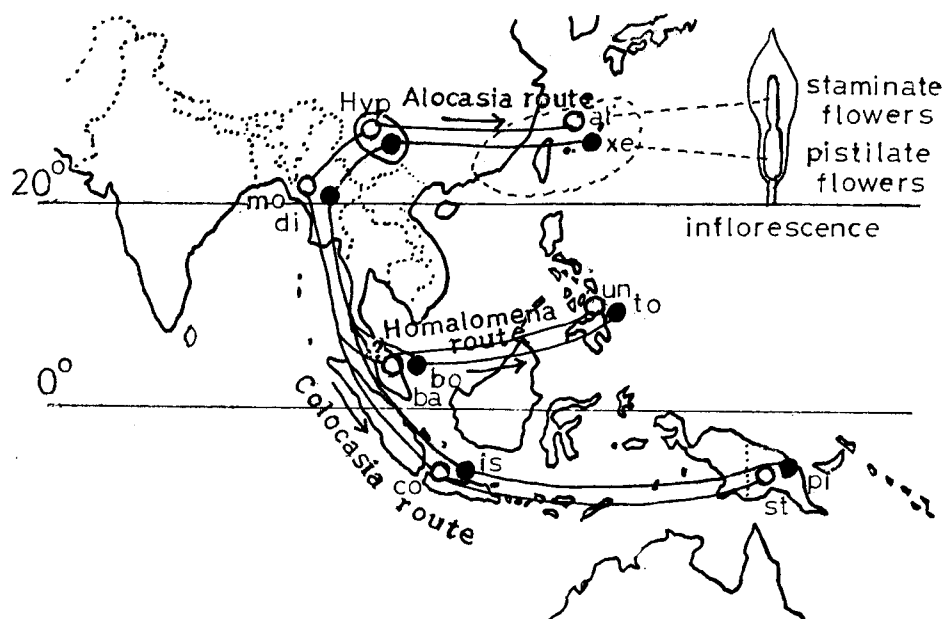


Fig. 3. Presumed routes of synhospitolic distribution of *Drosophilella* species. Open circle, stamencolous species; solid circle, pistilicolous species; Hyp., hypothetical ancestors; for species names see the text.

3. *Homalomena* Route Hyp.—*baechlii* (ba), *bogneri* (bo) (Malaysia) — unknown sp. (un), *toshiokai* (to) (Philippines).

By the way, the term synhospitolic is applied here not in its strict sense, since the pollination role of *Drosophilella* flies for Taro flowers has been often suggested, for example, by KRAMADIBRATA and HAMBALI, 1983. The pollens are found attached on the bodies of dried specimens of *D. colocasiae*, even on the lectotype which was collected 70 years ago. CARSON (in CARSON and OKADA, 1980) concluded from his experiment of bagging inflorescence in Papua New Guinea ~~concluded~~ that the flies were not necessary for full pollination of the flowers, although their role in possible cross fertilization mechanisms could not be discerned.

Acknowledgement

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* (On page 37) Personal informations by Mr. H. Z. CHENG and Dr. M. J. TODA.

NIO of Institute of Technology, Bandung, Dr. S. TOSHIOKA of Dokkyô Dental College, Tochigi, Dr. M. J. TODA of Hokkaido University, and Mr. M. WATADA of Tokyo Metropolitan University, for affording me various informations.

摘 要

岡田豊日（東京都）——タロイモシヨウジヨウバエ属（*Drosophilella*）の共寄主的分布径路の推定と3新種の記載。

Malaysia より2種, Indonesia より1種のタロイモシヨウジヨウバエ属の新種を記載し, 既知種を含めて本属の共寄主的分布径路を, 寄主植物との関連において推定した。すなわち中国南部を起点として, *Colocasia* (タロイモ), *Alocasia* (クワズイモ), *Homalomena* (ニオイズイキ) の3径路が推定された。

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