Keys to the flesh flies of Taiwan, with the description of the second species of *Papesarcophaga* from Tainan (Diptera: Sarcophagidae)

Hiromu Kurahashi* 1), Chiou-Herr Yang2) and Susumu Kakinuma3)

* Corresponding author: MLB15110@nifty.com
1) Department of Medical Entomology, National Institute of Infectious Diseases, Toyama 1–23–1, Shinjuku-ku, Tokyo 162–8640, Japan
2) Department of Forensic Science, Central Police University, 56 Shu-Jen Road, Kueishan, Taoyuan, Taiwan
3) IDD Yamaguchi Lab., Aobadai 11–22, Yamaguchi-shi, Yamaguchi 753–0012, Japan

(Received: 18 March 2017; Accepted: 29 March 2017)

Abstract: A new species of the flesh fly, *Papesarcophaga tainanensis* sp. nov. from Tainan, Taiwan, is described and illustrated. Keys to the 32 genera of Sarcophagidae are provided to include this new species, and an updated check-list is provided.

Key words: Diptera, flesh flies, keys, new species, Sarcophagidae, Taiwan

**Introduction**

The so called carrion flies (Diptera: Calliphoridae and Sarcophagidae) are known to be of medical and forensic importance. The faunal investigation of Sarcophagidae from Taiwan started with the works of Böttcher (1912, 1913a, b), and when Hennig (1941) provided a check-list of all Diptera known from Taiwan at that time, he could list 39 species of flesh flies. Shimada et al. (1961) made a provisional list of medically important fauna in Taiwan and recorded 39 species of sarcophagid flies. Sugiyama et al. (1987) published a revisional paper exclusively on the subfamily Sarcophaginae in Taiwan in which 42 species are recorded. Fan and Pape (1996) listed 56 sarcophagid species from Taiwan in their check-list of the Sarcophagidae. However, the record of *Macronychia griseola* (published under the nomem nudum *Arrenopus aberrans* Hennig, 1941: 184) from Taiwan was a misidentification of *Senotainia albifrons* (Rondani, 1859) (Pape, 1996; Kurahashi et al., 2017). Very recently, *Horiisca hozawai* (Hori, 1954) and *Macronychia polyodon* (Meigen, 1824) were newly recorded from Taiwan (Harusawa, 2014; Kurahashi et al., 2017). Thus to this data a total of 57 sarcophagid flies have been recorded from Taiwan in the available literature.

In the course of the project “Study on taxonomy and bionomics of carrion flies in Taiwan”, conducted with coordination and cooperation from the National Taiwan University in Taipei, flesh flies collected by the present authors at several localities in Taiwan. Among the specimens collected in 2015 we discovered a second species of the genus *Papesarcophaga* Kurahashi & Kakinuma, 2015 and describe it in the present paper. With the addition of one genus and one species, a total 32 genera and 58 species are now recorded from Taiwan as shown in the current check-list. Identification keys to the genera are provided to include these newly recorded ones. The keys include some exotic species, which have not yet been recorded from Taiwan, but which will most probably be found by future surveys.

**Keys**

**Key to the subfamilies of Sarcophagidae**

1. Hind coxa hairy on posterior surface (Kurahashi and Kakinuma, 2015: fig. 5a); notopleural bristles (*n*) 4, two strong primary bristles, two smaller subprimary bristles; sternites 3 to 4 (ST3–4) in male fully exposed and overlapping ventral margins of corresponding tergite. ................. Subfamily SARCOPHAGINAE
   — Hind coxa bare on posterior surface (Kurahashi and Kakinuma, 2015: fig. 5b); *n* 2; ST3–4 in both sexes, more or less concealed by ventral margins of corresponding tergite. ................. 2
2. Arista plumose or pubescent; hypopygium large; male with first genital segment (GS1) amalgamated with tergite 6 (T6) and with row of erect marginal bristles (*mb*). ......................... Subfamily PARAMACRONYCHIINAE, Genus *Goniophyto* Townsend (2 spp.)
   — Arista bare or pubescent; hypopygium small; tergite 6 free, not amalgamated with GS1 in .......................... Subfamily MILTOGRAMMATINAE
Key to the tribes and genera of MILTOGRAMMATINAE
1. Vibrissa situated above lower margin of facial plate; metathoracic spiracle open, without distinct operculum; legs long, bristly, with elongated claws in ♂; parafacialia and gena broad, hairy; oral margin in profile not projecting forward; body covered with pale pollinosity, female sometimes with long, protruding ovipositor; length 5–11.5 mm. ................................................... Tribe Macronychini, Macronychia Rondani, M. polyodon (Meigen) — Vibrissa if present, situated at about lower margin of facial plate; metathoracic spiracle covered with operculum; legs short, usually with short claws, sometimes with elongated ones in male of Senotainiina; colouration variable, often with pale spots in contrast with black bands and spots. ................................................... 2
2. Head hemi-spherical; eyes very large; numerous fine proclinate and 1–2 strong reclinate fronto-orbital bristles (ors) present (Kurahashi, 1970: 95, fig. 1C). ................................... Tribe Amobiini, Amobia Robineau-Desvoidy (2 spp.) — Head subquadrate or conical; eyes usually normal or very large in size; 0–4 (proclinate)+1–3 (reclinate) ors (Kurahashi, 1970: 95, fig. 1A & B). ................................................... 3
3. Head conical; eyes very large; ors 2+3 (Kurahashi, 1970: 95, fig. 1D). ................................................... Tribe Metopiini, Metopia Meigen (3 spp.) — Head subquadrate; eye usually normal in size; ors 0–4+1–2 (Kurahashi, 1970: 95, fig. 1A, B). ........................... 4
4. Claws and pulvilli long in both sexes (Kurahashi, 1970: 97, fig. 2A), sometimes normal in ♀; abdominal tergites with either with three spots or dark marginal band, or with three spots and dark marginal bands forming mountain-shaped marks, or tessellate, sometimes with three dark spots. ................................................... 5
5. Eyes bare, arista not flattened, usually elongate or rod-like; abdominal tergites with dark marginal band or tessellated. ................................................... Tribe MiltoGrammatini ........................................ 7 — Eyes hairy, if bare, then arista flattened, leaf-like in ♂; abdominal tergites with three dark spots. ................................................... 6
6. Arista not flattened in ♂; abdominal tergites with three black elongated, round or triangular spots. — Arista flattened, leaf-like in ♂; abdominal tergites with three dark spots. .................. Tribe Phylloteliini ................................................................... 6 — Tribe Blaesoxipha Macquart, H. linearis Villeneuve — Tribe Senotainiini, Senotainia Miltogramma, S. albifrons (Rondani) — Claws and pulvilli normal in both sexes (Kurahashi, 1970: 97, fig. 2B); abdominal tergites with either with three spots or dark marginal band, or with three spots and dark marginal bands forming mountain-shaped marks, or tessellate, sometimes with three dark spots. ................................................... 5
7. Vibrissa present on vibrissal angle high above oral margin. — Vibrissa present on vibrissal angle low above oral margin. ................................................... Tribe Protodexiini, Blaesoxiphia Loew (3 spp.) — Vibrissa absent. ................................................... Tribe Promiltogramma Townsend, P. stackelbergi (Rohdendorf) — Tribe Miltogramma Meigen (2 spp.)

Key to Tribes and Genera of SARCOPHAGINAE
1. Arista pubescent, hairs not exceeding width of arista; st 1+1; body densely silver-grey dusted; abdomen weakly tessellated. ........................................... Leucomyia Brauer & Bergenstamm, L. alba (Schiner) — Arista long plumose, plumose hairs longer than width of arista; st 1+1+1, rarely median one weakly developed or absent in Helicophasgella melamara (Meigen); body more or less darked, grey pollinose, abdominal pollinosity produce irregular checkered patterns or tessellations, but sometimes dark spots and median stripe in ♀ of Blaesoxipha spp. ................................................... 2 — Tribe Phyllolepis Loew, P. formosana (Townsend) — Tribe Haplocephala Macquart, H. linearis Villeneuve
2. Row of orii nearly straight in dorsal view [No record from Taiwan]. ................................................... Tribe Raviniini, Ravinia Robineau-Desvoidy — Row of orii distinctly diverging at lunule. .................................................................................................................. 3
3. Presutural ac strong, usually arranged in distinct row anteriorly to posteriorly; male cercus distinctly bent back, female ST7–8 fused and often forming sclerotized ovipositor shovel-shaped, blade-like, or recurving beneath abdomen; SPAP vestigial, but with one or more pairs of setulae; male ST5 without spine-like bristles along inner margins of lateral lobes. .............................. Tribe Protodexiini, Blaesoxiphia Loew (3 spp.) — Presutural ac absent, at most relatively weakly developed ac present on anterior and/or posterior prescutellar areas; male ST5 usually with spine-like bristles along inner margins of lateral lobes; male cercus usually curving anteriorly; female ST7–8 of separate sclerites and forming short ovipositor for larviposition; SPAP usually absent. ................................................... Tribe Sarcophagini ................................................................... 4 — Fore tibia with 1 rather strong pd near p medially. ........................................... Sinonipponia Rohdendorf (3 spp.) — Fore tibia without pd, only with single p medially. ................................................... 5
4. Fore tibia with 1 rather strong pd near p medially. ........................................... Sinonipponia Rohdendorf (3 spp.) — Fore tibia without pd, only with single p medially. ................................................... 5
5. Gena entirely clothed in yellowish white hairs. ........................................... Liopygia Enderlein, L. ruficornis (Fabricius) — Gena largely or entirely with black hairs, rarely only a few black ones present on limited area of upper part anteriorly. ................................................... 6
6. Postsutural ac absent. ................................................... Tribe Miltogramma Meigen (2 spp.) — Postsutural ac more or less developed. ................................................... 8
7. Hindmost postsutural dc well developed in contrast to fine anterior ones; mid tibia fringed on apical 1/3 in ♂♂.  
   — Posterior 2–3 of postsuturals (dc 5) well developed; mid tibia not fringed in ♂♂.  
   8. Primary postsutural dc 3, subequally and strongly developed, not counting one or two weak subprimaries.  
   — Postural dc 4–5, hindmost two primary bristles strongly developed.  
   9. Primary postsutural dc 4, subequal in length and strongly developed; anterior 2 usually longer than 1/2 length of 3rd one, not counting subprimary interstitials or small interstitials.  
   — Primary postsutural dc 5 gradually increased in length toward scutellum, anterior 2–3 fine, weakly developed, usually not longer than 3rd one, sometimes 1 small interstitial present between 2nd and 3rd, hindmost two always strongly developed and rarely only two strong prescutellar dc developed.  
   10. First postsutural dc located immediately between transverse suture and 2nd postsutural dc; T3 without median mb; outer vertical bristle (ov) well developed in ♂♂, at least half as long as inner vertical bristle (iv); GS1 largely glossy black, with 2–3 strong erect mb laterally; T6 in ♀ posterovertrally expanded, with row of strong mb on dorsal 1/2 in lateral view; male frons as broad as distance between outer margins of facial ridges; frons index 0.26–0.28 in ♂♂, 0.35–0.38 in ♀; T7–9 in ♀ as a single sclerite small or narrow.  
   — First postsutural dc closer to transverse suture than 2nd postsutural dc; T3 with or without median mb; ov not developed, rarely more or less developed in ♂♂; GS1 usually pollinose, sometimes largely glossy black, with or without mb.  
   11. Tergite 3 with 1 pair of erect median mb, if without mb, then male GS1 largely glossy black, with row of strongly developed lateral (ca. 3) mb; female T8 vestigial, as two lateral narrow sclerites; female abdomen largely black subshining, entirely less pollinose [No record from Taiwan].  
   — Tergite 3 without marginal bristles, if with median mb, then GS1 more or less pollinose, without distinct mb, but sometimes with fine long bristly hairs along posterior margin; female T8 absent.  
   12. Propleuron bare.  
   — Propleuron largely hairy.  
   13. Male ST4 with posterior pad of dense shorter clothing setae or upstanding long hairs; aedeagus with slender lateral stylus.  
   — Male ST4 without pad or upstanding long hairs posteriorly; aedeagus with stout lateral stylus.  
   14. Male ST5 with median protuberance at base of lateral lobes on middle part of ventral surface; female ST7 with shallow incision medially; spermatheca elongate, sculptured.  
   — Male ST5 without such small median protuberance on middle of ventral surface.  
   15. Lateral lobe of male ST5 with triangular dilation along inner margin medially (Kano et al., 1967: plate 11, fig. 18D).  
   — Lateral lobe of male ST5 normal in shape, not lobulated along inner margin.  
   16. Mid tibia without v in ♂♂.  
   — Mid tibia with v in ♂♂.  
   17. Ov at most as long as the longest postorbital bristle or absent in ♂♂; ST7 in ♀ not emarginate posteriorly; gena clothed with yellowish hairs posteriorly.  
   — Ov longer than the longest postorbital bristle in ♂♂; ST7 in ♀ deeply emarginate posteriorly; gena clothed with black hairs only.  
   18. Propleuron hairy.  
   — Propleuron bare.  
   19. Vein R1 setulose [No record from Taiwan].  
   — Vein R1 bare.  
   20. Scutellum without discal scutellar bristle (dsc); male ST4 without remarkable hairs on median part of posterior margin; ventralia not globose, without serration; hind tibia with well developed fringe on posteroventral surface.  
   — Scutellum with one pair of dsc male ST4 with long hairs on median part of posterior margin; ventralia large, globose, with serration and numerous minute spines; hind tibia without fringe on posteroventral surface in ♂♂, rarely with poorly developed fringe in part.  
   21. Mid tibia without fringe in ♂♂; female T6 not prominently protruded from T5; ST4 without mat of hairs in ♂♂.

Vol. 68 No. 1  2017  33
New Taxon

*Papesarcophaga tainanensis* sp. nov

**Diagnosis.** Characteristic in having a peculiar shape of aedeagus. Male hypopygium and female terminalia are similar to *Papesarcophaga kisarazeana* Kurahashi & Kakinuma, 2015 and *Sarcophaga* (s. lat.) *aquila* Sugiyama, 1990. However, the new species is easily distinguished from the latter two by the shape of male surstylus, cercus and aedeagus. In general external morphology, the new species resembles *Helicophagella melanura* (Meigen, 1826), but it is easily separated from the latter in the thoracic chaetotaxy. Only one or two postsutural *dc* are strongly developed and there are no developed postsutural *ac* in both the Taiwanese and Japanese species of *Papesarcophaga*. The widely distributed species, *H. melanura* (Meigen) has three well-developed postsutural *dc*.

**DESCRIPTION.** ♀.—Head: dichoptic; eyes bare; frons index 0.20–0.22 (*M* = 0.20, *n* = 7); frontal stripe blackish, 1.0 × width of parafrontal in front of anterior ocellus, distinctly narrowed toward vertex; parafrontal grey pollinose, slightly yellowish tinged, darkened toward vertex, black setulose, provided with about 9–10 pairs of *ori*, some of them crossed; parafacial yellowish pollinose, blackish setulose on upper half, with row of black setulae along anterior margin of eye on lower 1/2; face silver grey pollinose; *ors* 0 + 1, as preverticals; *ac* developed; *iv* long, well developed; *ov* less developed, less than 1/2 of length of *iv*; *poc* parallel or convergent; facialia with row of bristles on lower 1/4; mediana and vibrissaria narrow, densely grey pollinose; vibrissa well developed; epistome snow-white pollinose; gena rather broad, grey pollinose, largely clothed with black hairs except for yellow ones posteriorly, about 1/4 of height of eye (*HE*); postgena concolorous with *gena*, clothed with yellowish white hairs only; occipit grey pollinose, with 3 rows of postocular bristles; 2nd antennal segment mainly blackish except for apex narrowly reddish, dark grey pollinose; 3rd antennal segment blackish, dark grey pollinose, about 2 × as long as AS2; arista blackish, pale brown medially, plumose on basal 1/2, longest hairs more than 4 × width of arista; palpus slender, black.

Thorax: dark in colour, greyish pollinose, with brownish tinge in part; mesonotum with three broad black stripes, these stripes discolored to brown in certain incidence of light; humerus, postalar callus, and scutellum concolorous with thoracic dorsum; prosternum grey pollinose; propleuron bare, rarely with a few blackish hairs in center; postalar declivity with black hairs in center; supraspiracular convexity bare, grey pollinose; mesopleural hairs black; mesothoracic spiracle yellowish brown; metathoracic one rather small, yellowish; tympanic tuft absent; anterior parasquamal tuft absent. Chaetotaxy: *ac* 0 + 0, rarely fine prescutellars present on one or both sides; *dc* 4–5 + 1–5, only hindmost one strongly developed as prescutellars, anterior ones fine, and variable in number (1–4) and length; *ia* 1 + 2; *h* 2–3; *ph* 2; *prs* 1; *sa* 3; *pa* 2; *st* 1 + 1 + 1; *sc* 3 + 0, 2 *ls* and 1 *asc* strong, and 1 fine *dsc* or submarginals present; *n* 4, 2 strong, 2 small; *pp* 1, strong; *pst* 1, strong.

Wing: hyaline; veins dark brown; epaullet blackish; basicosta yellow; stem vein bare; subcostal sclerite yellowish, pubescent; first longitudinal vein (*R1*) bare; cell R5 open; node of 2nd (*R2+3*) and 3rd (*R4+5*) longitudinal veins with 2–3 setulae above and below; 4th longitudinal vein (*M1+2*) setulose beyond 1/2 way from node to anterior cross vein r–m, bent in a right angle; section of vein *M1+2* from bend to wing margin curved anteriorly at 1/4 and then continuing straight to wing margin; squama pale yellowish white; thoracic one large, bare on upper surface. Haltere basally yellowish, darkened apically.

Legs: black including tarsi; fore tibia with 1 submedian *p* at apical 1/3, 2 strong *ad* on basal 1/3; mid femur with many long hairs on basal 2/3 of ventral to posteroventral surfaces; mid tibia with 2 *ad*, 2–4 *pd*, 1 *p* and 1 *v*, more or less fringed on apical 1/2 on posteroventral surfaces; hind tibia with row of 4–5...
strong and several fine long ad, 2 pd and 1 strong av, apical d developed, with long fringe on anteroventral to posteroventral surfaces.

Abdomen: black, silvery grey pollinose, with ordinary checkered pattern and trace of black median stripe; tergite 1+2 black, grey pollinose; tergite 3 without median mb; tergites 4–5 with strong median mb; hairs on sternite 1 black; hairs on sternites 2–4 black and lateral sides of relevant tergites black; sternite 5 V-shaped, densely beset with strong bristles along inner margin of lateral lobe (Fig. 3c); Hypopygium prominent (Fig. 3a); GS1 black, largely brownish grey pollinose on posterior 2/3, without distinct mb; GS2 black, subshining anteriorly, brownish grey pollinose posteriorly, clothed with rather fine long hairs. Male genitalia as shown in Fig. 4.

♀. —Head: similar to that of male except as follows: fully dichoptic and with frons narrower than width of one eye; index 0.29–0.31 (M=0.30, n=4); ors 2+1; oc well developed; ov and iv developed; poc parallel or divergent; occ 1. —Thorax: dc 1+2, 2–3 small additionals in front of hindmost presutural dc; 3–4 small additionals in front of first postsutural dc. —Abdomen: robust. —Terminalia: Tergite 6 complete,

![Fig. 2](image1.png)  [Papesarcophaga tainanensis sp. nov., male. —a, habitus, dorsal view; b, habitus, lateral view.]

![Fig. 3](image2.png)  [Papesarcophaga tainanensis sp. nov., male copulatory apparatus. —a, male terminalia/hypopygium, lateral view; b, epandrium, cercus and surstylus, caudal view; c, sternite 5, ventral view.]
with two separated rows of \textit{mb}, hairy on posterior 1/2 to 1/3; tergite 7 of complete sclerite, without hairs; tergite 8 absent; sternite 6 as a complete sclerite, with 2 strong \textit{mb}, haired on posterior 1/4; sternite 7 somewhat lobulate on postero-lateral corners, postero-lateral corner with 2 \textit{mb}; sternite 8, with small median projection ventrally (possibly for a guiding structure when laying larvae); sternite 9 as a bi-lobulate sclerite, bare, without \textit{mb}; SBAP subdivided into two lobes, membranous medially, largely haired; SPT elongate, with spherical head and sculptured base, similar to those commonly found in \textit{Parasarcophaga}. Otherwise same as for \textit{Papesarcophaga} \textit{tainanensis} sp. nov. terminalia as shown in Fig. 5.

Length: 7.0–12.0 mm.

Type material. Holotype: \textit{Papesarcophaga tainanensis} sp. nov., \textit{a}, pregonite and postgonite, lateral view; \textit{b}, aedeagus, lateral view; \textit{c}, surstylus and cercus, lateral view.

**Check-List**

The following species list of Taiwanese Sarcophagidae is primarily based upon specimens examined (*), but secondly upon published records [author, year and page] in the case where no material was available.

**Subfamily MILTOGRAMMATINAE**

**Tribe Amobiini**

*Amobia auriceps* (Baranov, 1935) [Fan & Pape, 1996: 238]

*Amobia oculata* (Zetterstedt, 1844)

**Tribe Macronychiini**

*Macronychia polyodon* (Meigen, 1824)

**Tribe Miltogrammatini**

*Miltogramma angustifrons* (Townsed, 1933) [Fan & Pape, 1996: 240]

*Miltogramma iberica* (Villeneuve, 1913) [Fan & Pape, 1996: 241]

*Senotainia albifrons* (Rondani, 1859) [Pape, 1996: 135]

**Tribe Metopiini**

*Hoplacephala linearis* Villeneuve, 1929

*Metopia argentata* Macquart, 1850 [Fan & Pape, 1996: 240]

*Metopia argyrocephala* (Meigen, 1824)

*Metopia sauteri* (Townsend, 1932)

*Phylloteles formosana* (Townsend, 1933) [Fan & Pape, 1996: 242]

*Protomiltogramma stackelbergi* (Rohdendorf, 1935)
Subfamily PARAMACRONYCHIINAE

*Goniophyto formosensis* Townsend, 1928

Goniophyto honshuensis Rohdendorf, 1962 [Fan & Pape, 1996: 244]

Subfamily SARCOPHAGINAE

Tribe Protodexiini

Blaesoxipha formosana Baranov, 1931 [Fan & Pape, 1996: 246]

*Blaesoxipha taiwanensis* Pape, 1994

Tribe Sarcophagini

*Leucomyia alba* Schiner, 1868

*Papesarcophaga tainanensis* sp. nov.

Asceloctella calicifera (Böttcher, 1912) [Fan & Pape, 1996: 247]

Dinemomyia nigribasicosta Chen, 1975 [Fan & Pape, 1996: 249]

*Helicophagella melanura* (Meigen, 1826)

Myorhina caudagalli (Böttcher, 1912) [Fan & Pape, 1996: 255]

Myorhina josephi (Böttcher, 1912) [Fan & Pape, 1996: 248]

Myorhina lini (Sugiyama, 1987) [Fan & Pape, 1996: 248]

*Phallantha fenchihuensis* (Sugiyama, 1987)

Phallantha tsengi (Sugiyama, 1987) [Fan & Pape, 1996: 254]

Sinonipponia concreata (Séguy, 1934) [Fan & Pape, 1996: 257]

*Sinonipponia hainanensis* (Ho, 1936)

Sinonipponia hervebazini (Ho, 1934) [Fan & Pape, 1996: 257]

The postsutural dc 3 group

Burmanomyia taiwanensis Kano & Lopes, 1969 [Fan & Pape, 1996: 251]

Burmanomyia beesoni (Senior-White, 1924) [Fan & Pape, 1996: 251]

Fengia ostindicae (Senior-White, 1924) [Fan & Pape, 1996: 249]

*Horiisca hozawai* (Hori, 1954)

Kramerea schuetzei (Kramer, 1909) [Fan & Pape, 1996: 251]

Lioproctia pattoni (Senior-White, 1924) [Fan & Pape, 1996: 251]

Lioproctia basiseta Baranov, 1931 [Fan & Pape, 1996: 251]

*Parathyrsocnema prosballiina* (Baranov, 1931)

*Phallosphaera gravelyi* (Senior-White, 1924)

*Sarcorohendendorfia antilope* (Böttcher, 1913)

Sarcorophagidae gracilior (Chen, 1975) [Fan & Pape, 1996: 256]

Sarcosolomonia crinita (Parker, 1917) [Fan & Pape, 1996: 256]

The postsutural dc 5 group

*Boettcherisca formosensis* Kirner & Lopes, 1961

*Boettcherisca peregrina* (Robineau-Desvoidy, 1830)

*Hosarcochrysa problematica* (Baranov, 1941)

Liopygia ruficornis (Fabricius, 1794) [Fan & Pape, 1996: 251]

*Parasarcophaga albiceps* (Meigen, 1826)

Parasarcophaga brevicornis (Ho, 1934) [Fan & Pape, 1996: 252]

*Parasarcophaga dux* (Thomson, 1869)

Parasarcophaga idmais (Séguy, 1934) [Fan & Pape, 1996: 252]

Parasarcophaga iwuenis (Ho, 1934) [Fan & Pape, 1996: 253]

*Parasarcophaga membranocorporis* (Sugiyama, 1987)

*Parasarcophaga misera* (Walker, 1849)

Parasarcophaga scopariiformis (Senior-White, 1927) [Fan & Pape, 1996: 252]

*Parasarcophaga taenionota* (Wiedemann, 1819) [= *P. sericea* (Walker, 1853), Fan & Pape, 1996: 254]

Parasarcophaga tuberosa (Pandelle, 1896) [Fan & Pape, 1996: 253]

Parasarcophaga tristylata (Böttcher, 1912) [Fan & Pape, 1996: 253]

*Robineauella anchoriformis* (Fan, 1964)

*Seniorwhitea princeps* (Wiedemann, 1830)

Seniorwhitea phoenicopterus (Böttcher, 1913) [Fan & Pape, 1996: 256]

Acknowledgements

The present authors wish to express their sincere gratitude to Prof. Dr. S.-F. Shiao and Dr. S.-T. Yang, National Taiwan University. The present study is a partial result of the project entitled as "Study on taxonomy and bionomics of carrion flies of forensic importance in Taiwan" and conducted with the coordination and cooperation with the National Taiwan University in Taipei. It was initiated in 2013 when Dr. Yang was sent to National Institute of Infectious Diseases for training and studying Calliphoridae of forensic importance (Representative: Prof. Dr. Shiao). The first author HK is also grateful to Dr. K. Sawabe, Dr. Y. Tsuda and Dr. T. Hayashi, Department of Medical Entomology, NIID, Tokyo for their kindness in providing facilities and critical advices. The present authors are also grateful to Dr. T. Pape, Zoological Museum University of Copenhagen for his constructive comments on this manuscript and to Mr. T. Sasai who helped to collect flies and offered material for the description.

References

Böttcher, G. 1912. H. Sauter's Formosa-Ausbeute. Genus Sarcoptes (Dipt.). Ent. Mitt., 1: 163–170.
Böttcher, G. 1913a. H. Sauter's Formosa-Ausbeute. Einige neue Sarcophaga-Arten. *Annls. hist.-nat. Mus. Natn. Hung.*, 11: 374–381.

Böttcher, G. 1913b. Zum Charakter der Dipterenaufna von Formosa. *Ent. Mitt.*, 2: 99–100.

Fan, Zi-de and Pape, T. 1996. Checklist of Sarcophagidae (Diptera) recorded from China. *Stud. Dipterologica*, 3: 237–258.

Harusawa, K. 2014. Records of muscoid flies from Taiwan (Diptera: Muscidae). *Hana Abu*, 37: 84–87 (in Japanese).

Hennig, W. 1941. Verzeichnis der Dipteren von Formosa. *Ent. Beil. Beitr.*, 8: 1–239.

Kano, R., Field, G. and Shinonaga, S. 1967. Sarcophagidae (Insecta: Diptera). *Fauna Japonica*, 7: xii+168 pp.+41 pls.

Kurahashi, H. 1970. Studies on the calypterate muscoid flies from Japan VII. Revision of the subfamily Miltoramminae (Diptera, Sarcophagidae). *Kontyû*, 38: 93–116.

Kurahashi, H. and Kakinuma, S. 2015. Keys to the flesh flies of Japan, with the description of a new genus and species from Honshu (Diptera: Sarcophagidae). *Med. Entomol. Zool.*, 66: 167–200.

Kurahashi, H., Kakinuma, S. and Huang, Y.-Z. 2017. *Macronychia polyodon* newly recorded from Taiwan (Diptera: Sarcophagidae). *Hana Abu*, 43: 45 (in Japanese).

Shimada, T., Trager, L. W. Jr. and Adams, G. T. Sr. 1961. Provisional list of medically important fauna of Taiwan (Formosa). 60 pp., Special Rep. Pacif. Air Force., San Francisco.

Sugiyama, E. and Kano, R. 1984. Systematics of the Sarcophaginae of the Oriental region based on the comparative morphology of the male genitalia. *Jpn. J. Sanit. Zool.*, 35: 343–356.

Sugiyama, E., Shinonaga, S. and Kano, R. 1987. Sarcophaginae in Taiwan (Diptera: Sarcophagidae). *Sieboldia*, suppl.: 61–81.

Verres, Yu. G. 1986. Family Sarcophagidae. In: Catalogue of Palaearctic Diptera 12 (ed. Soos, A. and Papp, L.). pp. 58–193, Elsevier, Amsterdam.