Records of the Australian Museum (2009) Vol. 61: 73–87. ISSN 0067-1975
doi:10.3853/j.0067-1975.61.2009.1523

Two New Species of *Gnathothlibus* Wallengren from Fiji and Samoa and a New Species of *Theretra* Hübner from New Guinea (Lepidoptera: Sphingidae)

ROBERT B. LACHLAN

Research Associate, Australian Museum,
6 College Street, Sydney NSW 2010, Australia
hawkmoth@bigpond.com

ABSTRACT. Two new species of hawk moths from Fiji and Samoa, respectively *Gnathothlibus fijiensis* n.sp., and *G. samoaensis* n.sp., are described and figured, and distinguished from *G. vanuatuensis* Lachlan & Moulds, *G. saccoi* Lachlan & Moulds and *G. eras* (Boisduval). A new species of *Theretra, T. tabubilensis* n.sp. from Papua New Guinea is described and figured. The new species is distinguished from the sympatric *T. indistincta papuensis* Joicey & Talbot and *Theretra clotho celata* (Butler), and the lectotype of *T. i. papuensis* is designated.

LACHLAN, ROBERT B., 2009. Two new species of *Gnathothlibus* Wallengren from Fiji and Samoa and a new species of *Theretra* Hübner from Papua New Guinea (Lepidoptera: Sphingidae). *Records of the Australian Museum* 61(1): 73–87.

Three species of *Gnathothlibus* Wallengren, 1858 have been described from the southwestern Pacific region. *Gnathothlibus eras* (Boisduval, 1832) is reported, as a subspecies of *G. erotus* (Cramer, 1777), to occur from the Australian Region to Tahiti (D'Abrera, 1987), *G. saccoi* Lachlan & Moulds, 2001 [= *G. malleti* Schmit, 2002 (Schmit, 2003)] and *G. vanuatuensis* Lachlan & Moulds, 2003 are known only from Vanuatu (Lachlan & Moulds, 2001, 2003; Schmit, 2002).

Two undescribed species of *Gnathothlibus*, both closely resembling *G. eras*, and both previously confused with it, have been collected. One was collected in Fiji on the main island of Viti Levu in April, 2008, the other was collected on the island of Upolu, Samoa, in November, 2008. They are described in the present work.

In the early 1990's the author also collected a large series of males and females of another sphingid genus *Theretra* Hübner, [1819], from the Tabubil area of the Western Province, Papua New Guinea. This collection could readily be classified into two species *Theretra indistincta* (Butler, 1877) and a closely related but undescribed species. The two taxa are consistently distinct, no evidence of morphological intergradation was found despite several years of sampling and examination of large numbers of specimens. Evidently, sympatry has not resulted in hybridization.

Bibliographic information and notes on the generic diagnoses of *Gnathothlibus* and *Theretra* are given by D'Abrera (1987).

Materials and methods

All specimens sampled at the various localities were collected using mercury vapour lights run from sunset to just before sunrise. The specimens were then deep frozen before being set for examination. All measurements are given in millimetres. This study was based on extensive material in the author's private collection, (RBLC), and material in the Australian Museum, Sydney, (AM). Some specimens have been deposited in the Natural History Museum, London, (BMNH). Wing venation is that used by D'Abrera (1987). Morphological terminology used in this paper is based on that used by Kitching & Cadiou (2000).

Taxonomy

Genus *Gnathothlibus* Wallengren, 1858

Type species: *Gnathothlibus erotoides* Wallengren, 1858.

Gnathothlibus fijiensis n.sp.

Figs 1–4, 14

Type material. HOLOTYPE ♂, FIJI: 3 km E of Komave, south coast of Viti Levu, 18°13'36.2"S 177°46'25.7"E, 16 April 2008, R.B. Lachlan, AM K266025. PARATYPES 9♂♂, 2♀♀: 7♂♂ with same data as holotype but 2 dated 8 April 2008 in RBLC, 1 (AM K266026) dated 9 April 2008, 1 dated 13 April 2008, 1 dated 15 April 2008, 1 dated 16 April 2008 and 1 dated 7 December 2008 in RBLC. 2♂♂ H. Phillips, Vunidawa, Fiji, 18.8.1932, Lautoka, Fiji, 19.6.27, H. Phillips in AM. 2♀♀ with same data as holotype, 1 dated 16 April 2008 in RBLC, 1 (AM K266027) dated 6 December 2008 in AM.

Diagnosis. In male, olive green ground colour on forewings. Ventral surface of head, thorax and abdomen olive green. Mauve lateral stripe on the outer edges of the tegulae above both wings. A prominent dark, mostly straight, post median line runs from costa, where it is curved slightly distally, to inner margin. Female forewings brown with prominent dark, mostly straight, post median line as in male. Genitalia with uncus, in lateral view, long, slender, parallel-sided for nearly the whole of its length, slightly arched with the distal margin slightly convex and slightly angled backwards dorsally with a small dorsal crest. The distal margin has a small, dark ventral tooth.

Description. Male. (Figs 1,2,14). Antennae creamy-brown above, dark brown below; palpi olive green above, contrasting off white below; dorsal surface of head and prothorax darker olive green, remainder of thorax and abdomen uniform olive green; small dark median spot with posterolateral orange-brown on prothorax; thin lateral creamy-olive stripe from base of antennae to forewing, continuing as mauve on the outer edges of the tegulae above both wings. Thorax ventrally with creamy, light brown patch immediately posterior to palpi, remainder of median band creamy-olive along thorax dissipating as it reaches upper abdominal segments. Abdominal segments laterally each with orange-brown posterior margin contrasting with olive green ground colour, abdomen with four small lateral black spots surrounded clearly by white. Fore-tibae covered in long creamy-olive hair scales; proximal three segments of fore-tarsi covered in shorter creamy-olive hair scales, shortest on distal segment, longest on proximal segment.

Forewing upperside as in Fig. 1. Forewing length 38–41 mm, mean 39.6 mm (n = 7). Ground colour olive green (brighter in fresh specimens) with darker markings; some specimens exhibit less green; small black stigma with light coloured centre at end of discal cell; irregular, oblique, submarginal dark line from costa to vein M_3, wider between veins M_2 and M_3; a prominent dark, mostly straight, post median line runs from costa, where it is curved slightly distally, to inner margin; a short, irregular, subbasal band edged on each side by dark lines and curved distally, runs from costa to the dark basal patch below vein 1A+2A. Forewing underside as in Fig. 2. Ground colour burnt orange, lighter basad with two short, antemedian orange-brown streaks near costa and one near base; distally darker brown with usually two dark, irregular, parallel post median lines from costa to vein M_1; these lines may be vestigial or well developed in some specimens.

Hindwing upperside as in Fig. 1; ground colour orange; a slightly variable dark brown terminal band from apex to tornus at least 2 mm wide, slightly thinner at apex; inner margin of band slightly irregular with brown scales along veins M_1 to M_3 for about 2 mm. Hindwing underside (Fig. 2) with ground colour light orange-brown, heavily speckled with dark brown; marginal area darker from apex to tornus; dark, mostly straight, median line, thickest at costa, curving proximad from costa to vein M_1 and usually reaching vein CuA_1 but does not touch distal edge of cell; a much less prominent, small, parallel dark post median line to vein R_s, vestigial in most specimens.

Male genitalia (Fig. 14). Uncus in lateral view, long, slender, parallel-sided for nearly the whole of its length, slightly arched, distal margin slightly convex and slightly angled backwards dorsally with small rounded dorsal crest, distal margin with, dark ventral tooth; gnathos in lateral view thin, straight, distal margin tapering to a small, slightly upturned point; in dorsal view gnathos is wide basally with slightly curved sides tapering evenly to a point; valvae dorsal margin straight proximally then slightly convex, then distally straight, distal margin rounded, ventral margin gently convex; sacculus process well developed; harpe robust, distal end smooth surfaced and spine-like, upturned; aedeagus in lateral view with distal end tapered to a bluntly rounded apex with backward directed dorsal fishhook-like barb, ventrally with a small, similar barb, a little proximad of dorsal barb.

Female (Figs 3–4). Forewing length 40–44 mm. Head and tegulae dark brown. Median area of thorax and abdomen above medium brown. Thin lateral cream stripe from base of antenna to posterior edge of tegula above hindwing, not mauve as in male. Thorax below uniform orange-brown; abdomen ventrally pale pinkish-brown with four well-developed lateral white spots with small black centres. Fore-tibae covered in short hair scales, light brown on anterior edge and cream on posterior edge; fore-tarsi without hair scales.

Forewing upperside as in Fig. 3; ground colour and pattern in shades of darkish-brown, lacking green colour of male; small dark brown stigma with light centre at end of discal cell; a prominent dark brown, almost straight, post median line runs from costa and curved slightly distally to inner margin as in male. Forewing underside as in Fig. 4; ground colour medium brown, distinctly speckled with dark brown distally; a dark brown irregular, submarginal line runs from apex to tornus; two variable dark brown parallel post median lines from costa often reaching vein CuA_2.

Hindwing upperside (Fig. 3) orange as in male, but dark brown terminal band broader, with inner margin generally quite straight and suffused with orange scales; hindwing underside (Fig. 4) ground colour same as forewing but more heavily speckled with dark brown; yellowish streak along proximal side of vein 1A+2A.

Etymology. The specific name *fijiensis* is derived from the Pacific island nation of Fiji, the only known locality for the species.

Distribution. At present *G. fijiensis* is known only from the main island of Viti Levu, Fiji.

Discussion

Gnathothlibus fijiensis is readily distinguished from *G. saccoi, G. vanuatuensis* and the sympatric *G. eras* by the distinctive olive green colour on the forewings of the male, particularly in fresh specimens. It is a brighter green than seen on the forewings of *G. saccoi* males and most males of *G. vanuatuensis*. *Gnathothlibus eras* males from Fiji do not exhibit any green colouring to this degree and usually not at all. Elsewhere in the Australian-Pacific region, they are brown. Also, the forewings of *G. fijiensis* are much less heavily patterned than *G. saccoi* and it is a much smaller species than *G. saccoi*. The oblique line on the forewing of *G. fijiensis* is clearly straighter on all specimens examined than seen on *G. eras*. The forewings of the female of *G. fijiensis* easily distinguish it from the females of *G. saccoi, G. vanuatuensis* and *G. eras* by being less heavily patterned and the prominent dark brown post median line on *G. fijiensis* is angled distad slightly more than seen on the other three species and is very clearly much straighter. This is also the case in the males of *G. fijiensis*.

The distinctive mauve lateral stripe on the outer edges of the tegulae above the wings on the males of *G. fijiensis* is not seen on the other three species; they all have creamy-white lateral stripes. The hindwing dark marginal band on male and female *G. fijiensis* is not as narrow at the apex of the hindwing as seen on *G. saccoi* and *G. vanuatuensis*. This dark brown marginal band is always much narrower overall in *G. eras*, particularly in males where it is often very thin. In *G. fijiensis* and *G. saccoi* this marginal band does not spike inwardly along vein 1A+2A as clearly as it does in *G. eras* and *G. vanuatuensis*. This situation is the same in the females of each of the four species.

The fore-tarsi of *G. fijiensis* are covered in long hair scales; in *G. vanuatuensis* they are without such hair scales. On the underside of the hindwings of both male and female *G. fijiensis* the short, dark brown median line, beginning at the costa, does not touch the end of the discal cell as it does in *G. saccoi* and *G. vanuatuensis*. In *G. eras* this line is vestigial or entirely lacking in most specimens.

The male genitalia of *G. fijiensis* (Fig. 14) differ from those of *G. vanuatuensis* (Fig. 17) in having the uncus, in lateral view, narrower, less arched, parallel-sided for nearly the whole of its length and lacks the distally enlarged apex. *Gnathothlibus vanuatuensis* also has a larger dorsal crest. When compared to *G. fijiensis*, the uncus of *G. saccoi* (Fig. 19), in lateral view, is more steeply arched, slightly wider and distally enlarged without a dorsal crest. The sacculus process is not as robust as it is in *G. eras* (Fig. 18) and *G. vanuatuensis* and the upturned distal end of the harpe is slightly more needle-like and straight-sided than in either *G. vanuatuensis* or *G. eras*. The valvae are clearly narrower between the dorsal and ventral margins than in *G. vanuatuensis* and *G. eras. G. eras* also has a clearly concave dorsal margin which is straight in *G. fijiensis*.

When placed in series, or side by side as individuals, all four species are readily separated by their different external morphological characters.

Gnathothlibus samoaensis n.sp.

Figs 5–9, 16

Type material. HOLOTYPE ♂, SAMOA: Approx. 10 km S-W of Apia, Upolu Is. Alt. 410 m. 13°52'53.9"S 171°49'26"W 18 Nov. 2008, R.B. Lachlan, AM K266028. PARATYPES 52♂♂, 4♀♀, all with same data as holotype but dated between 13th and 19th November, 2008. 4♂♂ and 1♀ (AM K266029–K266032, and K266033♀) in AM, remainder in RBLC.

Other material examined. 3♂♂, WESTERN SAMOA: Mulivai Beach area, central south coast of Upolu Island, 9, 12 May, 1985, R.B. Lachlan, in RBLC.

Diagnosis. Head, thorax and abdomen uniform olive-green. Forewing upperside olive green in colour with prominent darker markings. The unicolorous band enclosing the stigma is about 5 mm wide along vein CuA_1. Hindwing upperside ground colour orange; a dark, slightly variable, well-developed terminal band from apex to tornus at least 2 mm wide with most specimens exhibiting some dark scaling along inner margin from tornus. Female forewing upperside with ground colour and pattern in shades of darkish brown, lacking olive green tinge of male but with a lustrous appearance in fresh specimens, particularly on the median and marginal areas of wing.

Description. Male. (Figs 5,6,9,16). Antennae creamy-brown above, brown below; palpi olive green above, contrasting off white below; dorsal surface of head and prothorax darker olive green, remainder of thorax and abdomen uniform olive green; small dark median spot with vestigial posterolateral orange-brown on prothorax; thin lateral creamy-olive stripe from base of antenna to costa of forewing, continuing as creamy-white on the outer edges of the tegula above both wings. Thorax ventrally with creamy, light brown patch immediately posterior to palpi, remainder of narrow median band creamy-olive edged laterally with reddish-brown pilosity, dissipating as it reaches upper abdominal segments. Abdominal segments laterally (Fig. 9) each with distinct orange-brown posterior margin contrasting with olive green ground colour; abdomen with three small lateral black spots surrounded clearly by white. Fore-tibae covered in long, creamy, light olive hairs cales with very distinct dark, distal, ventral edge; proximal three segments of fore-tarsi covered in short, creamy hair scales above, edged ventrally with cream hair scales suffused with dark scales, shortest on distal segment, longest on proximal segment.

Forewing upperside as in Fig. 5. Forewing length 35.4–44.3 mm, mean 40.4 mm (n = 68). Ground colour olive green (brighter in fresh specimens) with darker markings on distal area of wing; some specimens appear browner but dark olive-green scaling is still clearly present on the forewings and body to varying degrees; small black stigma with light coloured centre at end of discal cell; small, dark, postmedian line from costa to vein M_1 becoming a line of dark dots on each vein to vein 1A+2A; irregular submarginal patch of dark scales from vein M_1 to vein CuA_1; this patch is variable; a prominent, dark, straightish oblique median line runs from costa, where it is curved distally, to inner margin; a short, irregular, subbasal band edged on each side by thin dark lines and curved gently distally, runs from costa to the dark basal

Fig. 1. *Gnathothlibus fijiensis* n.sp. holotype male, upperside.

Fig. 2. *Gnathothlibus fijiensis* n.sp. holotype male, underside.

Fig. 3. *Gnathothlibus fijiensis* n.sp. paratype female, upperside.

Fig. 4. *Gnathothlibus fijiensis* n.sp. paratype female, underside.

Fig. 5. *Gnathothlibus samoaensis* n.sp. holotype male, upperside.

Fig. 6. *Gnathothlibus samoaensis* n.sp. holotype male, underside.

Fig. 7. *Gnathothlibus samoaensis* n.sp. paratype female, upperside.

Fig. 8. *Gnathothlibus samoaensis* n.sp. paratype female, underside.

Fig. 9. *Gnathothlibus samoaensis* n.sp. holotype male, lateral view showing colouration of abdominal segments.

patch below vein 1A+2A. The unicolorous band enclosing the stigma is about 5 mm wide along vein CuA_1. Forewing underside as in Fig. 6; ground colour burnt orange basad, distally overlaid heavily with darker olive-brown scales with usually two distinct dark, irregular, parallel post median lines from costa to veins CuA_1 or CuA_2 and a single distinct, dark, irregular, submarginal line from apex to tornus; all three lines are usually well developed, particularly the submarginal line but may be reduced in some specimens.

Hindwing upperside as in Fig. 5; ground colour orange; a dark, slightly variable, well-developed terminal band from apex to tornus at least 2 mm wide, slightly thinner near apex with most specimens exhibiting some dark scaling along inner margin from tornus; inner edge of terminal band clearly spikes basally along vein 1A+2A. Hindwing underside as in Fig. 6; ground colour orange-brown, very heavily speckled with dark brown and olive scales; marginal area darker from apex to tornus; dark, mostly straight, median line, thickest at costa, curving distad from costa to vein RS and usually reaching vein CuA_2 but does not touch distal edge of cell; a much less prominent, small, parallel, dark post median line to vein M_1, well developed in many specimens, vestigial in some specimens.

Male genitalia as in Fig. 16. Uncus, in lateral view, long, slender, parallel sided for the basal half of its length, slightly but clearly arched, distal end swollen, distal margin clearly convex with rounded, slightly pointed dorsal crest; small, sharply pointed ventral tooth at distal margin; gnathos, in lateral view, thin, almost straight, dorsal surface tapering to a small, slightly upturned point at distal margin, ventral surface slightly concave; valva dorsal margin straight proximally then clearly upwardly convex, distal margin rounded, ventral margin slightly convex; sacculus well developed; harpe robust, distal end smooth surfaced and spine-like, upturned; aedeagus in lateral view, with distal end tapered to a bluntly rounded apex with backward directed dorsal fishhook-like barb, ventrally with a small, similar barb, a little proximad of dorsal barb.

Female. (Figs 7,8). Forewing length 43.6–46 mm, mean 44.7 mm (n = 4). Head, thorax and tegulae dark brown. Abdomen above dark grey-brown. Thin lateral creamy-yellow stripe from base of antenna to posterior edge of tegulae above hindwings. Thorax below reddish-brown suffused ventrally with mauve hair scales; abdomen ventrally mauve-brown, each segment with orange-brown hair scales on posterior margin with four well-developed lateral white spots with small black centres. Fore-tibiae covered in short cream hair scales with some dark scales on distal posterior edge; fore-tarsi without hair scales.

Forewing upperside as in Fig. 7; ground colour and pattern in shades of darkish brown, lacking olive green tinge of male but with a lustrous appearance in fresh specimens, particularly on the median and marginal areas of wing; small dark brown stigma with light centre at end of discal cell; a distinct lighter, lustrous brown band, enclosing the stigma, runs from costa to inner margin, marginal band from apex to tornus, with inner irregular line, of same colour. Forewing underside as in Fig. 8; ground colour reddish-brown, marginal band from apex to tornus mauve-brown and often overlaid distinctly with olive scales, a dark brown, irregular, submarginal line runs from apex to tornus; two variable dark brown parallel post median lines run from costa, often reaching vein CuA_2.

Hindwing upperside as in male but dark brown terminal band much broader, with inner margin slightly irregular and suffused with orange scales, this dark band spikes distinctly basad along vein 1A+2A. Hindwing underside as in Fig. 8; ground colour slightly more mauve than forewing and heavily speckled along costa with dark scales; slightly variable yellowish streak, mostly along proximal side of vein 1A+2A.

Etymology. The specific name *samoaensis* is derived from the Pacific Island nation of Samoa, formally Western Samoa, the only recorded locality for the species.

Distribution. At present *G. samoaensis* is only recorded from the island of Upolu, Samoa, but being a common species it would certainly be found on the nearby larger island of Savai'i, just 22 km west of Upolu.

Discussion

Although similar in overall appearance, the males of *G. samoaensis* are readily distinguished from *G. fijiensis* males by a variety of constant morphological differences. On the forewings, the prominent dark, post median oblique line that runs from the costa to the inner margin, is clearly straighter and less curved distally near the costa in *G. fijiensis*. The unicolorous median band enclosing the stigma that runs from the costa to the inner margin, is approximately 2–3 mm wider, on average, on *G. fijiensis*.

On the hindwings of *G. samoaensis* the inner edge of the dark terminal band is more irregular and less even than seen on *G. fijiensis*. The inner edge of this band clearly spikes basally along vein 1A+2A with some brown scaling basad along the inner margin past the tornus in almost all specimens examined. Neither characters appears on *G. fijiensis*.

The very distinctive mauve lateral stripe on the outer edges of the tegulae above the wings of *G. fijiensis* is creamy-white on *G. samoaensis*. Immediately behind this creamy-white lateral stripe is a small, distinctive, patch of long orange-brown hair scales. These are cream to olive-cream in *G. fijiensis*.

The underside of both wings of *G. samoaensis* are darker with generally more prominent post median and submarginal dark brown lines on the forewings than seen on *G. fijiensis*. On the underside of the thorax the ventral creamy-olive median band is shorter and narrower on *G. samoaensis* than seen on *G. fijiensis* where it is clearly longer and wider. *Gnathothlibus samoaensis* has fore-tibiae that are slightly lighter with a more distinctive dark, distal, ventral edge. The mid and hind legs are also lighter in colour than seen on *G. fijiensis*.

The male genitalia of *G. samoaensis*, Fig. 16, differ from those of *G. fijiensis*, Fig. 14, in having the uncus, in lateral view, more arched, more enlarged distally with a larger, more robust rounded dorsal crest and a clearly smaller, more pointed ventral tooth at the base of the distal margin. The distal margin is clearly concave and not angled backwards as seen in *G. fijiensis*. The sacculus process and harpe are slightly larger with a thicker, upturned spike in *G. samoaensis*. The upturned spike is finer and more needle-like in *G. fijiensis*. The valva of *G. samoaensis* differ from *G. fijiensis* primarily in having a very clear convex distal bulge on the dorsal margin. In *G. fijiensis* this dorsal margin is very slightly concave.

As in the males, the females of *G. samoaensis* differ from those of *G. fijiensis* on the forewings in having a less straight prominent, oblique, dark brown, post median line and narrower unicolorous median band enclosing the stigma. On the hindwings, the dark brown terminal band on *G. samoaensis* has a more irregular inner edge than *G. fijiensis* and also spikes clearly basally along vein 1A+2A. The additional brown scaling along the edge of the inner margin basally from the tornus is also far more evident in *G. samoaensis*. The creamy-yellow lateral stripe from the antenna to the posterior margin of the tegula above the hindwings in *G. samoaensis* is much whiter in *G. fijiensis*. Immediately behind this stripe is a small, distinct patch of long orange-brown hair scales in *G. samoaensis*; these are creamy-yellow in *G. fijiensis*. The underside of the forewings and hindwings tend to be darker in *G. samoaensis*. The fore-tibae hair scales of *G. samoaensis* are cream with some dark scales; in *G. fijiensis* the cream is usually heavily suffused with pinkish-brown scales.

Gnathothlibus samoaensis is readily distinguished from *G. eras* by the distinctive olive green colouring and more prominent markings, including the stigma, on the forewings of the male. The head, thorax, dorsal and lateral surfaces of the abdomen of the male are also olive green, these are brown in *G. eras*, as are the forewings. Even in specimens of *G. samoaensis* that show reduced overall green coloration, there is clear evidence of some degree of greenish scaling on the wings and body. Behind the thin lateral creamy-white stripe above the wings is a small distinctive patch of orange-brown hair scales on each side of the abdomen of *G. samoaensis*, these patches are creamy in *G. eras*. The dark brown terminal band on the hindwings of the males tends to be slightly wider in most specimens of *G. samoaensis* than seen on *G. eras* where it is often very narrow. Some brown scaling is also evident along the inner margin basally from the tornus in *G. samoaensis*. The dark brown terminal band stops at vein 1A+2A in *G. eras*.

The long hair scales on the fore-tibae and fore-tarsi are slightly shorter on *G. samoaensis* than seen on *G. eras*. On the underside of the males of *G. samoaensis* the two dark, irregular, parallel, post median lines and the irregular submarginal line from apex to tornus on the forewings and the median and less obvious post median line on the hindwings are usually very evident to varying degrees. In *G. eras* usually only the dark submarginal line on the forewing is visible and often only to vein M_3. The others are almost always vestigial or absent.

The male genitalia of *G. samoaensis* (Fig. 16) differ from those of *G. eras* (Fig. 18) in having the uncus, in lateral view, longer, less distally enlarged, with a more rounded dorsal crest, a more concave apical margin and a smaller, pointed ventral tooth; in *G. eras* the dorsal crest is higher and more pointed and the apical margin is clearly straighter. Gnathos, in lateral view, slightly shorter and lacks the small upturned distal point seen in *G. eras*; in dorsal view, *G. samoaensis* has straighter sides and a blunt point, in *G. eras* the sides are clearly convex tapering to a sharper point.

The specimens of *G. samoaensis* examined that showed less green appeared to be generally older which suggests that the green coloration may fade, to some degree, with age and exposure to light.

Given that large numbers of only *G. samoaensis* were collected and sighted in November 2008 and other specimens in May 1985, it appears that *G. eras* does not occur on the Samoan islands despite being recorded from as far east as Tahiti.

It should be noted that the closest populations of *G. eras* and *G. fijiensis* are to be found on the Fijian islands, some 800 km southwest of Samoa. When placed in series, or side by side as individual specimens, all three species can be readily separated by their external morphological characters alone.

Fig. 10. *Theretra tabubilensis* n.sp. holotype male, upperside.

Fig. 11. *Theretra tabubilensis* n.sp. paratype female, upperside.

Fig. 12. *Theretra indistincta papuensis* lectotype male, upperside.

Fig. 13. *Theretra indistincta papuensis* lectotype male, underside.

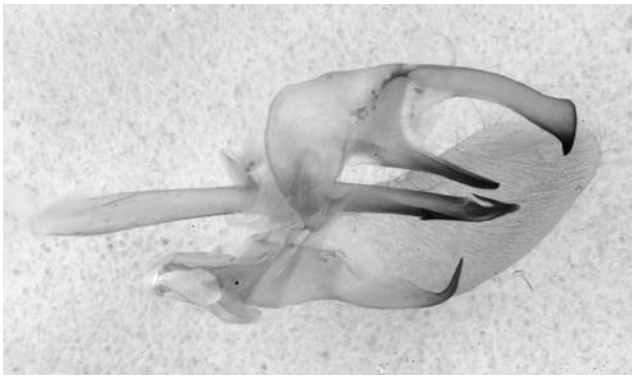

Fig. 14. *Gnathothlibus fijiensis* n.sp.

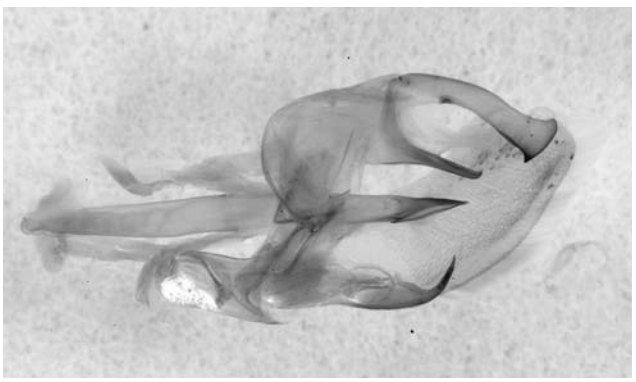

Fig. 15. *Gnathothlibus australiensis*.

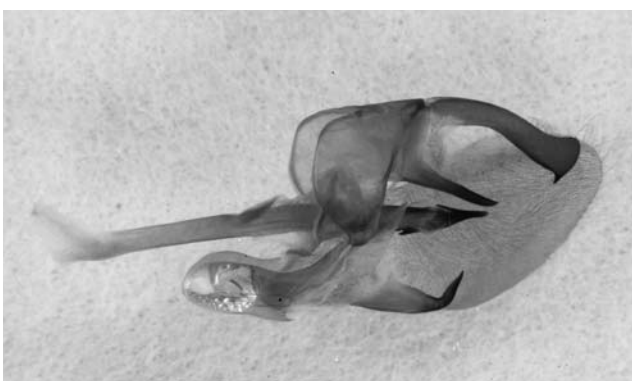

Fig. 16. *Gnathothlibus samoaensis* n.sp.

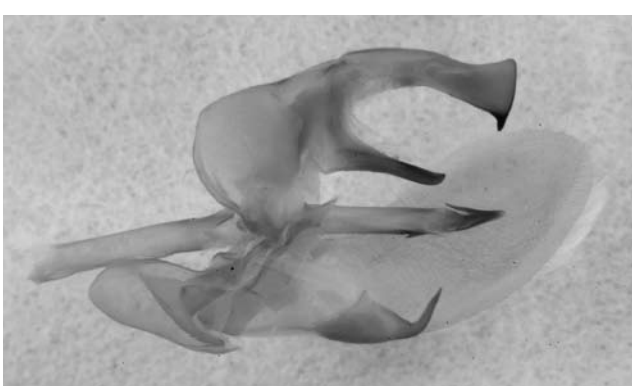

Fig. 17. *Gnathothlibus vanuatuensis*.

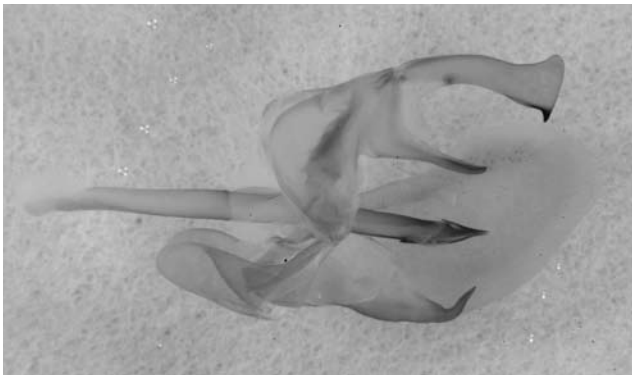

Fig. 18. *Gnathothlibus eras*.

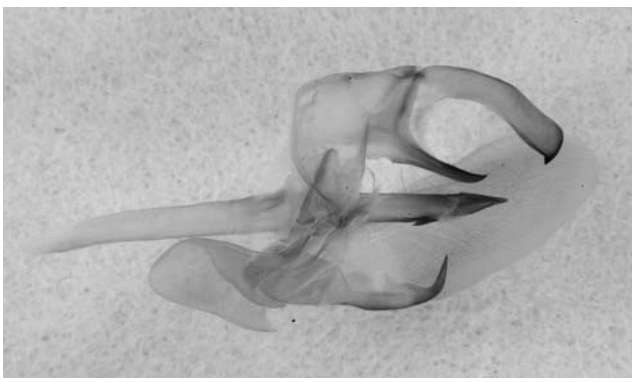

Fig. 19. *Gnathothlibus saccoi*.

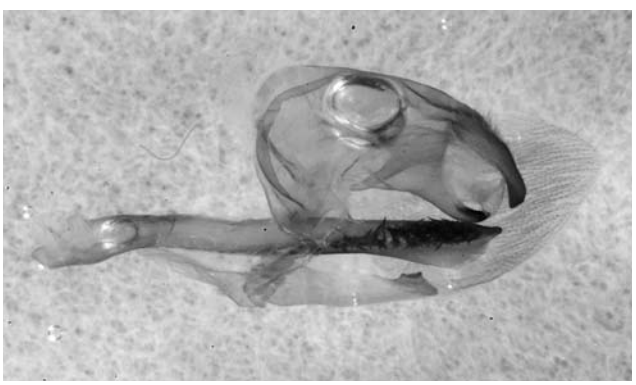

Fig. 20. *Theretra tabubilensis* n.sp.

Fig. 21. *Theretra indistincta papuensis*.

Genus *Theretra* Hübner, [1819]

Type species: *Choerocampa indistincta* Butler, 1877.

Lectotype designation for *Theretra indistincta papuensis* Joicey & Talbot

Figs 12, 13

Joicey and Talbot (1921) described *papuensis* as a subspecies of *Theretra clotho*. Later, Jordan (1926) synonymized *Theretra clotho papuensis* placing it as a subspecies of *Theretra indistincta*.

Theretra clotho papuensis was described from a series of six males and five females from "Wandammen Mountains, Dutch New Guinea, 3000–4000 ft., November, 1914, A., C. & F. Pratt, 6♂♂, 4♀♀; 6000 ft., 1♀". Of these, five males and three females from 3000–4000 feet, and the female from 6000 feet, have been located in the BMNH. The remaining pair has not been found and it is likely that they were exchanged by Joicey in the 1920s. Indeed, only four of the males and two of the females from 3000–4000 feet arrived at the BMNH by being presented by J.J. Joicey in 1931 (BMNH accession number 1931-444); the remaining pair and the female from 6000 feet arrived later in 1941 as part of the Levick bequest (BMNH accession number 1941-83).

Of the syntypes of *Theretra clotho papuensis* in the BMNH, two males and two females agree with the concept of *Theretra indistincta papuensis* as I here restrict it; the other three males and two females (including that from 6000 feet) are *Theretra tabubilensis* n.sp. The syntype series is thus mixed, and so to stabilize the nomenclature, I hereby designate as lectotype the male in the BMNH, which agrees with the concept of *Theretra indistincta papuensis* (Figs 12,13), with the following labels: "LECTO-/TYPE" (small, circular, printed, purple-bordered label); "Wandammen Mts./ 3–4000 ft. D. N. Guinea./ Nov. 1914. A. C & F. Pratt" (rectangular [printed label); "Theretra/ clotho/ papuensis J. & T./ TYPE. H. T." (rectangular handwritten label); "Presented by/ J.J.M Joicey, Esq./ Brit. Mus. 1931-444." (rectangular, printed label).

Theretra tabubilensis n.sp.

Figs 10, 11, 20

Type material. HOLOTYPE ♂, PAPUA NEW GUINEA. Tabubil, Western Province, 5°15'S 141°13'E. Alt. 650 m. 22 Sept. 1992, R.B. Lachlan AM K266034. PARATYPES 3♂♂ same data as holotype except dated 28 Oct. 1992, 19 Nov. 1992, 29 Nov. 1992; 1♂ SE slopes of Mt Akrik (Ian), 15 km NW of Tabubil, W.P., 5°10'S 141°09'E, Alt. 1625 m, 14 Apr. 1994, R.B. Lachlan; 1♂ Kiunga, north Fly River, W.P. 6°08'S 141°17'E, 15 Nov. 1992, R.B. Lachlan; 1♂ 30 km E of Tari, S. H. P. 5°58'S 143°07'E, Alt. 2300 m, 3 Oct. 1992, R.B. Lachlan; 11♀♀ same data as holotype except dated 15 Mar. 1991, 5 Nov. 1991, 27 Mar. 1992, 11 Oct. 1992, 28 Oct. 1992, 8 Nov. 1992, 22 Mar. 1993, 4 Oct. 1993, 12 Nov. 1993, 5 Apr. 1994, 10 Jan. 2000; 1♀ Matkomrae (Matkomnai) Catholic Mission, 50 km NNW of Kiunga, W.P. 5°49'S 140°09'E, Alt. 60 m, 6 Nov. 1993, R.B. Lachlan, all specimens in RBLC; 2♀♀ Kiunga, north Fly River, W.P. 6°08'S 141°17'E, 15 Nov. 1992, R.B. Lachlan AM K266035 and RBLC.

Other material examined. 2♂♂, 3♀♀, same data as holotype except dated 29 Mar. 1992 (2), 3 Nov. 1992, 11 Nov. 1993 (2); 1♂ Se slopes of Mt Akrik (Ian), 15 km NW of Tabubil, W.P. 5°10'S 141°09'E, Alt. 1625 m, 26 Sept. 1993, R.B. Lachlan, all in BMNH.

Other material. 1♀ "B.C. New Guinea, Mount Kebea, 6,000 ft., March-April 1903, A.E. Pratt", 1♂ "B.C. New Guinea, Mount Kebea, 3,600 ft., July 1903, A.E. Pratt", 1♂ "B. New Guinea, Mafalu, 6,000 ft., September 1903, A.E. Pratt", 1♀ "N. Dutch New Guinea, Waigeu, Camp Nok, 2,500 ft., v.1938, L.E. Cheesman" and 1♀ "Dutch New Guinea, Central Arfak Mts., Ninay Valley, 3500 ft., Nov '08 to Jan. '09", all in BMNH.

Diagnosis. Forewing with single, almost straight, olive-brown oblique line from apex to near centre of inner margin. Small, diffuse, dark patch distad of stigma near costa, not reaching oblique line. Anal area of hindwing light creamy-brown, remainder of wing dark brown with lighter creamy-brown patch at distal end of vein CuA_2. Aedeagus, viewed laterally, with convex distal margin and a line of dense, short spines angled backwards from the dorsal surface of distal margin to lateral surface. Female almost identical to male, often slightly darker.

Description. Male. Fig. 10. Antennae creamy-pink above, ventrally light brown; palpi olive-brown above, suffused with cream below; upper surface of head and thorax uniform olive-brown, slightly lighter on dorsal surface of abdomen with lightly scattered suffusion of black scales; small dark spot on prothorax; thin lateral creamy-olive brown stripe above palpi to base of tegulae above hindwings. Thorax, laterally, with dense darker olive-brown pilosity from head to base of forewings, small patch of orange-brown pilosity near base of forewings; creamy-brown along length of abdomen with diffuse, dark, lateral patch extending distally from near base of hindwing about 10 mm along abdomen; ventral abdominal segments light creamy-brown suffused with black scales. Fore-tibae creamy-olive brown, fore-tarsi without long hair scales.

Forewing upperside as in Fig. 10. Forewing length 32.5–38.7 mm, mean 35.9 mm (n = 10). Ground colour in shades of lighter and darker olive-brown, slightly variable; very small dark olive-brown stigma at distal end of discal cell; single prominent, almost straight, olive-brown line from apex, where it curves slightly distally, to just distad of halfway point of inner margin; this line unbroken at apex in almost all specimens examined; costa dark olive-brown, proximal side of oblique line slightly lighter than distal side of oblique line; small, diffuse, darkish patch just distad of stigma; proximal half of forewing very lightly speckled with dark scales, distal half more heavily speckled; single, faint, irregular, darkish subbasal line from costa to vein 1A+2A; small, rounded darkish patch at base on posterior half of forewings, continuing as flattened light then darkish wedge-like marking along inner margin, its point almost touching the dark oblique line. Forewing underside with dark tan region basally extending past discal cell, medium tan on remainder of proximal half of wing, light tan on submarginal area from apex to tornus, whole underside, except dark basal region,

clearly speckled with black scales.

Hindwing upperside as in Fig. 10. Ground colour darkish brown, small, pale, creamy-brown patch between veins CuA_2 and 1A+2A, then darkish brown streak to tornus; thin, pale, creamy-brown patch from tornus along inner margin to base. Hindwing underside with basal region pale tan, distal region darker as in distal region of forewing but with faint pinkish tinge, speckled, as in forewing, with a row of oblique, post median darkish dots from costa, where they curve distally, down to vein CuA_2.

Male genitalia. Fig. 20. Uncal lobe, in lateral view, gently arched, slender centrally with slightly enlarged distal region, ventral surface of distal margin with blunt, downward point; gnathos short, evenly curved upwards, dorsal surface slightly serrated at distal end; aedeagus, in lateral view, long, slender, parallel sided, distally enlarged with a line of dense, short spines angled from the dorsal surface to the lateral surface; distal margin with small blunt point at tip of dorsal surface, then angled backwards with small inward curve then clear convex bulge to ventral surface; harpe small, volcano-like with tiny serrations on concave dorsal surface.

Female. Fig. 11. Forewing length 34.2–40.7 mm, mean 38.2 mm (n = 17). Overall appearance, upperside and underside, is identical to male but ground colour usually slightly darker.

Etymology. The specific name, *tabubilensis*, is derived from the mining town of Tabubil in the Western Province of Papua New Guinea, where most specimens were collected.

Distribution. At present most specimens have been recorded from the Tabubil area in the central far west of PNG near the border with Indonesia, 3 specimens have been recorded approximately 90 km to the south at Kiunga on the Fly River and 1 specimen from approximately 30 km east of Tari in the Southern Highlands Province, some 200 km ESE of Tabubil. Other specimens held in The Natural History Museum, London, include specimens from Waigeu Island, just off the northwest coast of New Guinea and the Arfak Mountains in the far northwest of Indonesian New Guinea. It appears to be primarily a mountain species.

Discussion

Theretra tabubilensis most closely resembles the sympatric species *Theretra indistincta papuensis*. Over a period of several years both species were regularly collected together with no intergrade specimens encountered during the survey period. *Theretra tabubilensis* was found to be less common. There are a number of constant external morphological differences that readily separate the two species.

Theretra tabubilensis is a clearly smaller species than *T. i. papuensis* particularly in regard to the females. This is very noticeable when both species are placed in series together. *Theretra i. papuensis* is a quite unicolorous grey species whereas *T. tabubilensis* is a lighter species with forewings that have differing colour tones on each side of the dark oblique line. A distinct difference is the dark oblique line on the forewing. On *T. tabubilensis* it is a distinct, almost always unbroken line as seen on *T. clotho celata* but in *T. i. papuensis* it is much fainter and usually both broken at the radial vein immediately above vein M_1 and faint near the apex. Also, this oblique line often curves slightly towards the costa in *T. i. papuensis* but in *T. tabubilensis* it often curves slightly towards the termen. In *T. tabubilensis* the small diffuse dark marking on the forewing, distad of the stigma near the costa, does not reach the dark oblique line. In *T. i. papuensis* this diffuse dark marking is much larger and wider and reaches the tornal area of the forewing. These markings are the same on both sexes in each species.

In *T. tabubilensis* males and females, the distal point of the narrow, dark, basal streak along the inner margin of the forewing, touches, or nearly touches, the dark oblique line. In *T. i. papuensis* this thin dark basal streak does not reach the oblique line and the distal point is usually several millimetres proximad of the oblique line. This applies to both sexes. The dark basal spot on the forewing of both sexes of *T. i. papuensis* is both paler and reduced in size on both sexes of *T. tabubilensis*. On the hindwing of both sexes of *T. tabubilensis* the light creamy-brown area from the base to the tornus between the inner margin and vein 1A+2A is the same as seen on *T. clotho celata*, although not as yellow-brown. In *T. i. papuensis* this area on both sexes is clearly suffused, to varying degrees, with darker scales giving a shaded appearance.

The abdomen of *T. tabubilensis* has a longer diffuse darkish patch extending laterally halfway down the abdominal segments from near the base of the hindwings. In *T. i. papuensis* this darkish patch is reduced to a spot and does not extend laterally along the abdominal segments. On the underside of *T. tabubilensis* there is small, isolated lateral patch of orange-brown pilosity near the base of the forewings. On *T. i. papuensis* this patch is not as distinct and when visible, is a lighter salmon-pink which also usually occurs in small lateral patches along the sides of the abdomen. There is no such lateral colouring on the abdomen of *T. tabubilensis*.

The male genitalia is very similar to that of *T. clotho celata*, including the convex distal margin of the aedeagus. In *T. i. papuensis* (Fig. 21) this distal margin on the aedeagus is slightly concave. In *T. tabubilensis* the gnathos, in lateral view, appears slightly longer and thinner than seen in *T. i. papuensis* and *T. clotho celata* where it is shorter and slightly thicker.

Clearly all three species are closely related when their genitalia are examined, but there are notable, constant external morphological differences separating the three species.

ACKNOWLEDGMENTS. For comments on the manuscript and the compilation of all the information and photographs of the lectotype of *T. indistincta papuensis*, I sincerely thank Dr Ian Kitching (The Natural History Museum, London). For additional comments on the manuscript and helpful discussions I also sincerely thank Dr Max Moulds (Research Fellow, Australian Museum, Sydney). I would also like to acknowledge the assistance of Scott Ginn, Sue Lindsay and Dr David Britton, all of the Australian Museum, Sydney, in the production of the digital images of the adults and genitalia. Jeff Brown (professional photographer, Gold Coast) also provided several digital images of the adults.

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Manuscript submitted 13 February 2009, revised 18 March 2009, and accepted 18 March 2009.