

Eight new species of micropterous Nabidae (Heteroptera) from the Society Islands, French Polynesia, with consideration of hotspot island speciation patterns

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The family Nabidae has been previously recorded from the Society Islands based on two widespread lowland species, the macropterous *Nabis kinbergii* Reuter and *N. capsiformis* Germar. Based on recent surveys from montane cloud forest habitats, eight new species of *Nabis* Latreille are described herein from the Society Islands as follows: *Nabis raiateana* sp.n. from Raiatea; *Nabis toheia* sp.n., *Nabis mooreana* sp.n., and *Nabis polynesica* sp.n. from Moorea; and *Nabis tahitiensis* sp.n., *Nabis orohena* sp.n., *Nabis tangaroa* sp.n., and *Nabis tiki* sp.n. from Tahiti. All of these new species are micropterous, and represent specialized inhabitants of upland wet forest habitats. A key is provided to all *Nabis* species known to occur in the Society Islands, accompanied by figures of the male parameres and distribution maps for four of the new species occurring on Tahiti.

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Introduction

The genus *Nabis* Latreille, 1802 in the family Nabidae has a demonstrated propensity for exhibiting localized foci of speciation on the remote oceanic archipelagoes of the Pacific. This is well demonstrated in both Hawaii (Zimmerman 1948b) and the Marquesas (Van Duzee 1932, 1935, Polhemus 2002), but to date no similar insular radiation has been documented from the Society Islands. Instead, only two widespread lowland species, the macropterous *Nabis kinbergii* Reuter, 1872 and *Nabis capsiformis* Germar, 1839 have been recorded from the archipelago (Kerzhner 1969, 1981). Recent intensive surveys on Tahiti, Moorea, and Raiatea, however, have now revealed that a similar pattern of insular nabid diversification does indeed occur in the Society Islands, with many unusual micropterous species occurring in the very wet upland forests of this archipelago. These species are described below, followed by a discussion of the local patterns of

endemism evident to date within the Society Island system and consideration of *Nabis* speciation on Pacific hotspot archipelagoes in general.

Material and methods

The new species described herein were discovered during a program of wide-ranging Heteroptera biodiversity surveys on the islands of French Polynesia, funded by the National Science Foundation, Washington, DC, in cooperation with the Délégation à la Recherche, Papeete. Collections at a given site were made by visual searching, hand netting, and localized pyrethrin fogging of fern banks, tree fern trunks, mossy logs, or mossy branch clusters of upland forest trees. In utilizing the latter technique, white sheets were spread below the area to be fogged, pyrethrin mist was applied, and insects were then allowed to drop for one hour and collected from the sheets. Specimens were preserved in 75% ethanol,

then transported to the Bishop Museum in Honolulu, Hawaii (BPBM) for detailed analysis and identification.

The holotype and allotype of each new species are deposited in BPBM, with paratypes deposited in the National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM) where numbers have permitted.

All morphological measurements are given in millimeters. Because many specimens have original locality labels with elevations given in feet, conversions to meters have been provided in the material examined sections, with the original measurements in feet retained within brackets. The CL number in the material examined section refers to a collection locality number series used by the author to cross reference specimens with photographs, field notes, and other metadata.

In the description sections, the term “preocular” refers to the portion of the head lying anterior of the eyes, and the term “postocular” refers to the portion of the head lying posterior of the eyes.

In regard to geographical distinctions for the island of Tahiti, which consists of the remnants of two volcanoes connected by a low isthmus, the larger section of the island is referred to as Tahiti Nui, while the smaller section is referred to as Taiarapu (also known as Tahiti Iti).

Taxonomy

Genus *Nabis* Latreille

Key to males of *Nabis* species occurring in the Society Islands

1. Macropterous species, wings fully formed and extending past the tip of the abdomen . . . 2
 - Micropterous species, wings reduced to small pads that do not extend beyond the posterior margin of the first visible abdominal tergite (Fig. 1) 3
2. Male phallosome with 3 hook-like sclerites in basal section; fore femur with dorsal margin bearing a well developed, shining, dark brown tubercle at subapical angle; length of antennal segment I greater than dorsal length of head *N. capsiformis*
 - Male phallosome with 2 hook-like sclerites in basal section; fore femur with dorsal margin forming a sharp angle subapically, but this angle not bearing a tubercle; length of antennal segment I equal to or less than dorsal length of head *N. kinbergii*
3. Smaller species, body length less than or equal to 8.0 mm 4
 - Larger species, body length exceeding 8.0 mm 6
4. Femora multiannulate with dark brown and dark yellow, lacking spots (Fig. 14); antennal segment III shorter than antennal segment II; Tahiti *N. tiki*
 - Femora predominantly yellowish with numerous contrasting dark spots, bearing only a single broad, dark annulus near distal end (Fig. 13); antennal segments II and III of equal length; Tahiti or Moorea 5
5. Apex of paramere produced into a small process with a subapical notch (Fig. 2); Moorea *N. polynesica*
 - Apex of paramere not produced, lacking a subapical notch (Fig. 5); Tahiti . . . *N. tahitiensis*
6. Hind tibia over 1.3× the length of the hind femur; femora multiannulate with reddish brown and dark yellow when viewed dorsally (Fig. 16); distal section of paramere elongate and sickle-shaped (Fig. 4); Moorea *N. mooreana*
 - Hind tibia 1.2× the length of the hind femur or less (usually less than 1.15× as long); femora spotted or maculate, bearing only a single broad, dark annulus near distal end (Figs 15, 17); distal section of paramere more broadly formed, not sickle shaped (Figs 3, 6, 7, 8); Tahiti, Moorea or Raiatea 7
7. Paramere bidentate on dorsal margin apically, bearing two small processes separated by a broad concavity (Fig. 8); Raiatea *N. raiateana*
 - Paramere bearing only a single, broad process at the extreme apex of distal lobe, not dorsally bidentate; Moorea and Tahiti 8
8. Distal section of paramere massive and greatly enlarged (Figs 3, 6); combined length of rostral segments exceeding 3.5 mm; Tahiti or Moorea 9
 - Distal section of paramere not greatly enlarged, of similar width to basal section, creating a sinuate shape (Fig. 7); combined length of rostral segments less than 3.0 mm; Tahiti *N. tangaroa*
9. Femora orange or yellowish brown, spotted with darker brown; paramere with apical process roughly triangular (Fig. 3); Moorea *N. toheia*
 - Femora reddish, with darker brown maculations (Fig. 15); paramere with apical process broadly rounded (Fig. 6); Tahiti *N. orohena*

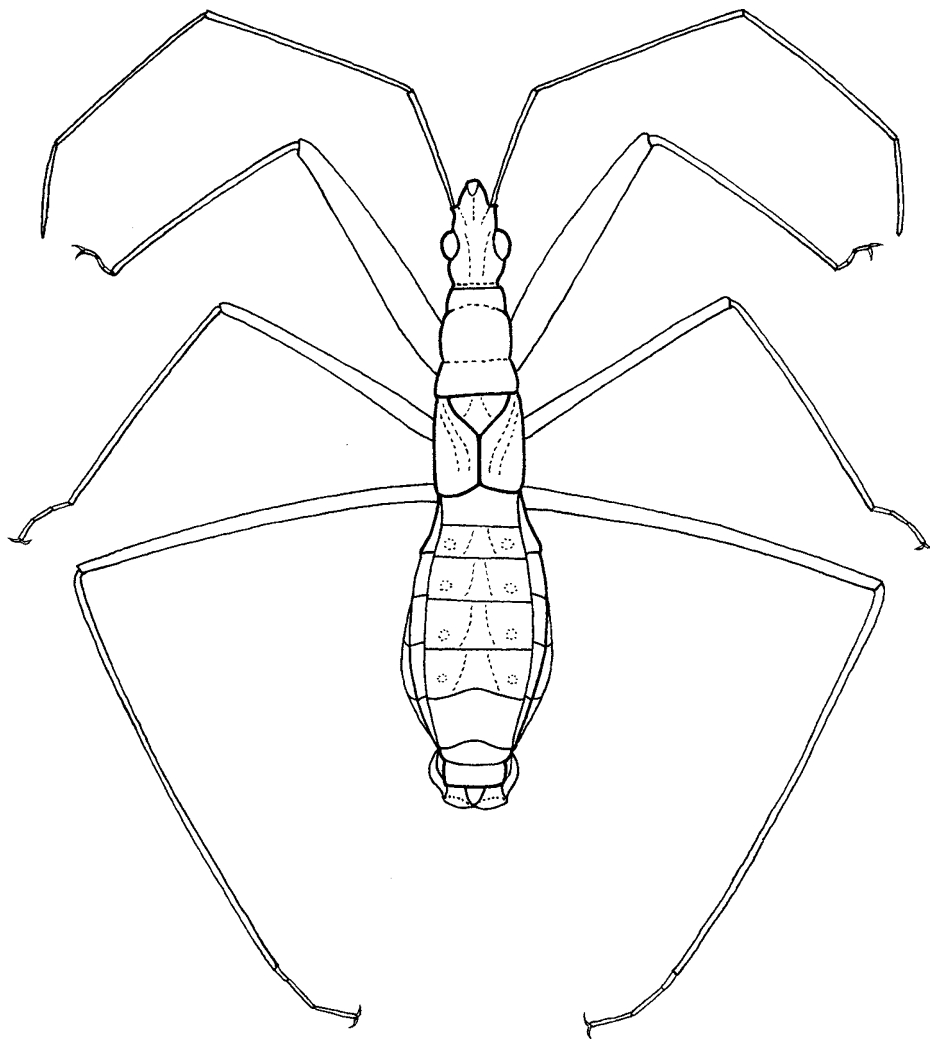


Fig. 1. *Nabis tobeia*, male, dorsal habitus, specimen from Moorea, small gulch head W. of Mt. Toheia summit.

Nabis raiateana sp. n.

Figs 8, 17

Type material. – Holotype, micropterous male: French Polynesia, Society Islands, Raiatea, Temehani Plateau, 660 m. [2165 ft.], 1 September 1977, sweeping understory of moss forest, W.C. Gagne, Bishop Museum Acc. #1977.361 (BPBM). Allotype, micropterous female: French Polynesia, Society Islands, Raiatea, Mt. Toomaru, 805 m. [2634 ft.], 16°49'19"S, 151°27'17"W, 7 February 2006, fogged from mossy *Metrosideros*, R.A. Englund (BPBM). **Paratypes:** French Polynesia, Society Islands, Raiatea: 1 micropterous male, Mt. Toomaru summit area, 915–1005 m. [3000–3300 ft.], 16°49'50"S,

151°27'11"W, 8 February 2006, fogged from *Metrosideros*, R.A. Englund (BPBM); 1 micropterous female, same data as allotype, R.A. Englund (BPBM).

Description of male

Size. Total length 8.60 mm, maximum width (across abdomen) 2.00 mm.

Head length/width = 1.80/1.00; width of vertex 1.33 × the dorsal width of an eye (0.40/0.30); length of preocular portion of head 2.50 × the dorsal length of an eye (1.00/0.40); length of postocular portion of head equal to the dorsal length of an eye (0.40/0.40); length of antennal segments I–IV

= 1.80/2.80/3.00/2.05; rostrum length 3.90, reaching to bases of mesocoxae, lengths of segments I–IV = 0.30/1.50/1.50/0.60. Pronotum length/width = 1.50/1.20. Scutellum triangular, angled slightly upward in an anterior direction, length/width = 0.70/0.80. Legs elongate, with fore coxae $2.00\times$ as long as thick (0.80/0.40); fore femora nearly $7.00\times$ longer than wide (3.80/0.55); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.80/3.30/0.10/0.20/0.30; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.40/3.30/0.10/0.30/0.40; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 4.70/5.30/0.10/0.45/0.55.

Color. General coloration reddish brown, with scattered darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen; legs bearing reticulate darker brown maculations.

Head dark yellow, with brown patches laterally behind eyes; eyes and tylus bright red, central section of vertex bearing a roughly triangular brown patch with apex directed posteriorly, lateral margins of this patch narrowly darker than remainder, posterior apex of this patch laterally expanded immediately behind eyes to form a transverse, anteriorly convex, crescent-shaped marking; antennal segment I bright red, with a narrow, dark red annulation at apex; antennal segment II orange, with a single narrow brown annulation at apex; antennal segments III and IV uniformly dark brown; eyes red.

Pronotum orange, anterior collar and posterior lobe dark yellow, longitudinal midline bearing a broad dark brown stripe, this stripe flanked by a pair (1+1) of similar stripes on anterior collar, and by two pair (2+2) of similar stripes on posterior lobe, additional dense and irregular dark brown maculations present on central tumescence along muscle attachment scars. Scutellum dark red centrally, anterolateral angles brown. Hemelytra medium brown, with costal margin broadly dark yellow.

Legs reddish-orange, with scattered reddish-brown markings; fore femur with anastomosing reddish-brown maculations overlain on basal section of dorsal face by two irregular rows of small, dark brown spots (Fig. 17); middle and hind femora with similar reddish-brown maculations plus a single broad brown annulation at their respective apices; fore, middle and hind tibiae clear reddish-orange, without dark markings, apices infuscated.

Abdomen reddish brown, central sections of tergites III–V with bright red patches along longitudinal midline, lateral sections of all tergites marked with patches of bright red and dark yellow, lateral margins of tergites I–VI broadly brown, with small cream white patches at each anterolateral angle.

Ventral surface brown; central sections of pro-

meso- and metasterna dark brown, lateral sections red; pro-, meso-, and metapleura subtended by an irregular dark brown stripe, this stripe continuing posteriorly as a broad band of dark brown coloration on the lateral sections of the abdominal sternites; abdominal sternites II–VII broadly dark yellow centrally, this pale area mottled and suffused with red posteriorly; venter of genital capsule brown, posterior terminus of genital capsule dark yellow centrally, brown laterally.

Structural characters. Head elongate, well produced both ahead of and behind eyes, bearing pale, recumbent setae, these setae more sparse to either side of longitudinal midline; ocelli absent.

Pronotum campanulate, anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short, posterior margin straight, pronotal surface bearing scattered fine, semi-recumbent pale setae centrally. Scutellum triangular, angled slightly upward in an anterior direction, central section bearing short, pale, recumbent setae, posterior apex rugulose. Hemelytra short, micropterous, reaching to near posterior margin of abdominal segment I, set with scattered, short, pale, semi-recumbent setae; posterior margins broadly rounded, clavus barely defined, venation of corium obscure, membrane not evident.

Legs elongate, fore femora fusiform, bearing a dense fringe of short, pale setae along its inner face; fore tibia slender, widening at tip, inner margin bearing two parallel rows of 20–30 tiny, coarse black teeth bordered by pale, erect setae, outer margin bearing semi-erect pale setae, these setae becoming longer distally; middle and hind femora, tibiae and tarsi slender, covered with moderately long, pale, semi-erect setae, lengths setae on the tibiae equal to or exceeding width of tibiae, inner margin of middle tibia bearing two parallel rows of 30–40 tiny black teeth.

Abdomen with basal segment largely covered by wing pads, all other segments completely exposed, lateral margins broadly arcuate, tergites II–VI lacking raised tumescences medially, abdominal segments VII and VIII narrowed, forming a box-like genital capsule, all tergites covered with short, pale, recumbent setae. Ventral surface covered by a layer of short, pale, recumbent setae; posterior terminus of genital capsule not concave or sulcate, broadly rounded.

Genitalia with distal section of paramere broadly expanded, massive, with tip produced to a rounded process preceded by a small subapical concavity, outer portions of paramere translucent golden brown, central section opaque dark yellow (Fig. 8).

Description of female

Similar to micropterous male in general structure and coloration with following exceptions: length 10.10 mm, maximum width (across abdomen) 2.85 mm. Overall shape larger and more robust than male, with abdomen more broadly expanded; combined abdominal tergites VIII and IX roughly triangular, longitudinally raised medially to form a tube-like structure over upraised tip of retracted ovipositor; reddish ground color more subdued, often trending toward darker yellowish orange; ventral abdomen broadly orange brown centrally with a narrow dark stripe along longitudinal midline running from posterior margin of metasternum to base of ovipositor.

Etymology

The name “raiateana” refers to the island of Raiatea, the type locality.

Distribution

Endemic to the island of Raiatea in the Society Islands.

Comparative notes

Nabis raiateana is a moderately large, robust, micropterous species, predominantly reddish in coloration, and is the only micropterous *Nabis* species so far recorded from Raiatea. It is easily recognized by the distinctive shape of the male paramere, with its diagnostically bidentate dorsal margin (Fig. 8).

Ecological notes

Nabis raiateana has been collected from diverse vegetative assemblages, ranging from stunted upland forest on trachyte-derived soils of the Temehani Plateau of northern Raiatea to dense, mossy upland forests on Mt. Toomaru, the highest massif on the island. This apparent ecological plasticity may have some bearing on why no further micropterous nabid species have been discovered on Raiatea to date, despite moderately extensive collecting.

Nabis toheia sp. n.

Figs 1, 3

Type material. – Holotype, micropterous male: French Polynesia, Society Islands, Moorea, small gulch immediately W. of Mt. Toheia summit [headwaters of Mahaeru River], 1150 m. [3770 ft.], 17°33'04"S, 149°49'22"W, 12 September 2006, 10:40–15:00 hrs., CL 7500, D.A. Polhemus (BPBM). **Paratypes:** French Polynesia, Society Islands, Moorea: 1 micropterous male, same data as holotype, D.A. Polhemus (BPBM); 1 micropterous

male, same data as holotype except leg. C.P. Ewing (BPBM); 1 micropterous male, Mt. Toheia summit area, 1207 m. [3960 ft.], 17°33'02"S, 149°49'20"W, 12 September 2006, 07:30–10:30 hrs., CL 7499, D.A. Polhemus (BPBM).

Description of male

Size. Total length 8.90 mm, maximum width (across abdomen) 2.20 mm.

Head length/width = 1.50/0.90; width of vertex $2.5\times$ the dorsal width of an eye (0.50/0.20); length of preocular portion of head $1.55\times$ the dorsal length of an eye (0.70/0.45); length of postocular portion of head $0.66\times$ the dorsal length of an eye (0.30/0.45); length of antennal segments I–IV = 2.00/2.90/2.80/1.30; rostrum length 3.80, reaching between mesocoxae, lengths of segments I–IV = 0.30/1.50/1.50/0.50. Pronotum length/width = 1.45/1.20. Scutellum length/width = 0.70/0.80. Legs with fore coxae approximately $2.00\times$ as long as thick (0.90/0.45); fore femora $6.50\times$ longer than wide (3.90/0.60); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.90/3.10/0.10/0.15/0.25; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.60/3.70/0.10/0.25/0.40; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 5.20/5.80/0.10/0.50/0.60.

Color. General coloration reddish to orange brown, with scattered darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen, legs bearing limited darker brown markings.

Head red, with blackish brown patches laterally behind eyes, central section of vertex bearing a roughly triangular, elongate, dark brown patch with apex directed posteriorly, lateral margins of this patch narrowly darker than remainder, posterior apex of this patch laterally expanded immediately behind eyes to form a transverse, anteriorly convex, crescent-shaped marking; antennal segment I darker brown basally, antennal segment II with a single narrow brown annulation at apex, antennal segments III and IV uniformly yellowish brown; eyes red.

Pronotum dark red on central tumescence, anterior collar and posterior lobe dark yellow, longitudinal midline bearing a broad dark brown stripe, this stripe flanked by a pair (1+1) of similar stripes on anterior collar, additional scattered, irregular dark brown markings present on central tumescence along muscle attachment scars. Scutellum reddish-orange, central section embrowned, isolating areas of brighter color at posterior apex and anterolateral angles. Hemelytra pale brown, with costal margin dark yellowish.

Legs pale orange, with numerous scattered reddish-brown spots dorsally and laterally, fore femur with a

prominent row of glabrous, vertically ovate spots on outer face, middle femur with similar row of round spots on outer face; all femora bearing a single broad brown annulation at their respective apices; fore, middle and hind tibiae clear reddish-orange, slightly embrowned at apices; lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.90/3.10/0.10/0.15/0.25; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.60/3.70/0.10/0.25/0.40; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 5.20/5.80/0.10/0.50/0.60.

Abdomen dark glabrous red centrally, bright and less shining red laterally, lateral margins of tergites I–VI narrowly pale brown, tergites VII–IX dark brown.

Ventral surface orange-brown, covered by a layer of short, pale, recumbent setae; pro-, meso- and metasterna dark blackish-brown centrally, red laterally; pro-, meso-, and metapleura subtended by an irregular dark brown stripe, this stripe continuing posteriorly as a broad band of dark brown coloration on the lateral sections of the abdominal sternites; venter of genital capsule reddish-orange, posterior terminus of genital capsule deeply concave, isolating two prominent posterolateral lobes.

Genitalia with paramere translucent golden brown, central section opaque dark yellow.

Structural characters. Head elongate, well produced both ahead of and behind eyes, lateral portions thickly set with pale, recumbent setae, these setae more sparse along longitudinal midline; ocelli absent. Pronotum campanulate, anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short, posterior margin straight, pronotal surface bearing scattered semi-recumbent pale setae. Scutellum triangular, angled slightly upward anteriorly, covered by an obscure layer of short, pale, recumbent setae. Hemelytra short, micropterous, covering basal half of abdominal tergite I, set with scattered, short, pale, semi-recumbent setae; posterior margins broadly rounded, clavus and venation of corium well defined, membrane not evident.

Legs elongate; fore femur fusiform, bearing a dense fringe of short, pale setae along its inner face; fore tibia slender, widening at tip, inner margin bearing two parallel rows of 40–50 tiny black teeth bordered by pale, erect setae, outer margin bearing semi-erect pale setae, these setae becoming longer distally; middle and hind femora, tibiae and tarsi slender, covered with moderately long, pale, semi-erect setae, lengths setae on the tibiae equal to or exceeding width of tibiae, inner margin of middle tibia bearing two parallel rows of 20–30 tiny black teeth.

Abdomen with basal segment partly covered by wing pads, all other segments completely exposed, lateral margins broadly arcuate, tergites II–VI slightly

domed, lacking raised tumescences medially, abdominal segments VII and VIII narrowed, forming a box-like genital capsule, all tergites covered with short, pale, recumbent setae.

Ventral surface covered by a layer of short, pale, recumbent setae, posterior terminus of genital capsule deeply concave, isolating two prominent posterolateral lobes.

Genitalia with distal section of paramere broadly expanded, massive, with tip produced to a rounded process (Fig. 3).

Female

Unknown.

Etymology

The name “toheia” is a noun in apposition, and refers to Mt. Toheia, the type locality for this species and to date the only known site of occurrence.

Distribution

Endemic to the island of Moorea in the Society Islands.

Comparative notes

Nabis toheia is a large, robust, micropterous nabid (Fig. 1), predominantly reddish in coloration, endemic to the the highest elevations of Moorea. It is the apparent sister species to *N. orobena* from Tahiti, with both species being large, reddish, and possessing an enlarged, semi-circular distal lobe on the male paramere. *Nabis toheia* may be separated from *N. orobena*, however, by the overall shape of the male paramere (compare Figs 3, 6), and the spotted rather than maculate femora.

Nabis mooreana sp. n.

Figs 4, 16

Type material. – Holotype, micropterous male: French Polynesia, Society Islands, Moorea, small gulch immediately W. of Mt. Toheia summit [headwaters of Mahaeru River], 1150 m. [3770 ft.], 17°33'04"S, 149°49'22"W, 12 September 2006, 10:40–15:00 hrs., CL 7500, D.A. Polhemus (BPBM). **Paratypes:** French Polynesia, Society Islands, Moorea: 1 micropterous male, same data as holotype, D.A. Polhemus (BPBM).

Description of male

Size. Total length 9.10 mm, maximum width (across abdomen) 1.80 mm.

Head length/width = 1.50/1.00; width of vertex 2.50 × the dorsal width of an eye (0.50/0.20); length of preocular portion of head 1.75 × the

dorsal length of an eye (0.70/0.40); length of postocular portion of head $0.75 \times$ the dorsal length of an eye (0.30/0.40); length of antennal segments I–IV = 2.00/2.90/2.90/1.70; rostrum length 3.10, reaching to bases of mesocoxae, lengths of segments I–IV = 0.30/1.10/1.20/0.50. Pronotum length/width = 1.50/1.20. Scutellum length/width = 0.80/0.85. Legs with fore coxae approximately $2.25 \times$ as long as thick (0.90/0.40); fore femora nearly $7.00 \times$ longer than wide (3.80/0.55); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.80/3.00/0.10/0.20/0.30; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.40/3.50/0.10/0.30/0.40; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 4.80/6.30/0.10/0.50/0.60.

Color. General coloration reddish brown, with numerous darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen; legs multiannulate with dark brown and dark yellow. Head dark yellow, tylus and eyes bright red, blackish brown patches present laterally behind eyes, central section of vertex bearing a roughly triangular, elongate, black patch with apex directed posteriorly, posterior apex of this patch laterally slightly expanded immediately behind eyes to form a transverse, anteriorly convex, crescent-shaped marking; antennal segment I clear reddish orange, slightly darker basally, antennal segment II clear reddish orange with a single broad, dark brown annulation at apex, antennal segments III and IV uniformly dark brown; eyes red. Pronotum dark yellowish orange, longitudinal midline bearing a broad dark brown stripe, this stripe flanked by a pair (1+1) of similar stripes on anterior collar and posterior lobe, additional dense and irregular dark brown maculations present on central tumescence along muscle attachment scars. Scutellum black, apex brown. Hemelytra dark brown, with claval vein and costal margin contrasting dark yellow. Legs reddish to yellowish orange, overlain with broad, dark brown annulations and bearing reddish-brown spots laterally; fore, middle and hind femora each bearing 3 broad, brown annulations, one at apex, another centrally, and a third basally; fore femur bearing with a prominent row of glabrous, vertically ovate reddish brown spots on outer face (Fig. 16); middle femur with similar row of round spots on outer face; fore, middle and hind tibiae clear, bright reddish-orange, slightly embrowned at apices.

Abdomen dark brown to black centrally intermixed with reddish maculation, lateral sections with alternating patches of red and pink, lateral margins of tergites I–VI narrowly banded with alternating dark brown and pale yellow patches, tergites VII–IX dark brown.

Ventral surface brown; pro-, meso- and metasterna dark blackish-brown centrally, red laterally; pro-, meso-, and metapleura subtended by an irregular dark brown stripe, this stripe continuing posteriorly as a broad band of dark brown coloration on the lateral sections of the abdominal sternites; venter of pregenital abdomen uniformly medium brown, venter of genital capsule dark brown, posterior terminus of genital capsule with two posterolateral lobes, these lobes dark yellow with dark brown spots in their centers.

Genitalia with paramere translucent reddish brown. **Structural characters.** Head elongate, well produced both ahead of and behind eyes, thickly set with recumbent golden setae; ocelli absent.

Pronotum campanulate, anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short, posterior margin straight, pronotal surface bearing numerous semi-recumbent golden setae. Scutellum triangular, angled slightly upward along extreme anterior margin, set with short, golden, recumbent setae. Hemelytra short, micropterous, covering basal half of abdominal tergite I, set with scattered, short, pale, semi-recumbent setae; posterior margins broadly rounded, clavus partially defined, venation of corium obscure, membrane not evident.

Legs elongate; fore femora fusiform, bearing a dense fringe of short, pale setae along its inner face; fore tibia slender, widening at tip, inner margin bearing two parallel rows of 40–50 tiny black teeth bordered by pale, erect setae, outer margin bearing semi-erect pale setae, these setae becoming longer distally; middle and hind femora, tibiae and tarsi slender, covered with moderately long, pale, semi-erect setae, lengths setae on the tibiae equal to or exceeding width of tibiae, ventral face of middle tibia bearing numerous small, bristly black spinules, inner margin of middle tibia bearing two parallel rows of 30–40 tiny black teeth.

Abdomen with basal segment partly covered by wing pads, all other segments completely exposed, lateral margins broadly arcuate, tergites II–VI slightly domed, lacking raised tumescences medially, abdominal segments VII and VIII narrowed, forming a box-like genital capsule, all tergites covered with numerous short, pale, recumbent setae.

Ventral surface covered by a thick layer of short, pale, recumbent setae; posterior terminus of genital capsule weakly concave, bisected by a shallow sulcus isolating two posterolateral lobes.

Genitalia with distal section of paramere slender and elongate, tip slightly hooked (Fig. 4).

Female

Unknown.

Etymology

The name “mooreana” refers to the island of Moorea, to which this species is endemic.

Distribution

Endemic to the island of Moorea in the Society Islands.

Comparative notes

Nabis mooreana is a moderately large, robust, micropterous nabid species, predominantly reddish in coloration, occurring at high elevations on Moorea, and easily recognized among the suite of endemic Moorean nabids by the distinctively slender, sickle-shaped male paramere (Fig. 4). Based on general habitus, and the narrow male paramere, *Nabis mooreana* is the apparent sister species to *N. tangaroa* from Tahiti. It also bears certain similarities in coloration to *N. tiki*, also from Tahiti, particularly in regard to the multiannulate appearance of the femora when viewed from above (compare Figs 14, 16).

Ecological notes

This species has been collected only on the extreme summit area of Mt. Toheia, the highest peak on Moorea. The two known male specimens were taken via pyrethrin fogging of densely tangled fern banks in a moist headwater gully immediately below the summit, where they occurred syntopically with *N. toheia* and *N. polynesica*.

Nabis polynesica sp.n.

Figs 2, 10

Type material. – Holotype, micropterous male, and allotype, micropterous female: **French Polynesia, Society Islands**, Moorea, Mt. Toheia summit area, 1207 m. [3959 ft.], 17°33'02"S, 149°49'20"W, 12 September 2006, 07:30–10:30 hrs., CL 7499, D.A. Polhemus (BPBM). **Paratypes:** **French Polynesia, Society Islands**, Moorea: 6 micropterous males, 6 micropterous females, same data as holotype, D.A. Polhemus (BPBM); 1 micropterous male, small gulch immediately W. of Mt. Toheia summit [headwaters of Mahaeru River], 1150 m. [3770 ft.], 17°33'04"S, 149°49'22"W, 12 September 2006, C.P. Ewing (BPBM); 2 micropterous males, ridge crest SE of Mt. Toheia summit area, 1100 m. [3608 ft.], 17°33'03"S, 149°49'18"W, 13 September 2006, 08:30–09:15 hrs., CL 7501, D.A. Polhemus (BPBM).

Description of male

Size. Total length 7.20 mm, maximum width (across abdomen) 1.55 mm.

Head length/width = 1.30/0.95; width of vertex $1.14 \times$ the dorsal width of an eye (0.40/0.35); length of preocular portion of head equal to the dorsal length of an eye (0.50/0.50); length of postocular portion of 0.70 \times the dorsal length of an eye (0.35/0.50); length of antennal segments I–IV = 1.60/2.20/2.20/1.50; rostrum length 3.00, reaching to bases of mesocoxae, lengths of segments I–IV = 0.30/1.20/1.10/0.40. Pronotum length/width = 1.30/1.00. Scutellum length/width = 0.80/0.80. Legs with fore coxae approximately $2.0 \times$ as long as thick (0.60/0.30); fore femora $5.8 \times$ longer than wide (2.90/0.50); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 2.90/2.30/0.10/0.20/0.30; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 2.30/2.50/0.10/0.20/0.30; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 4.00/4.60/0.10/0.30/0.50.

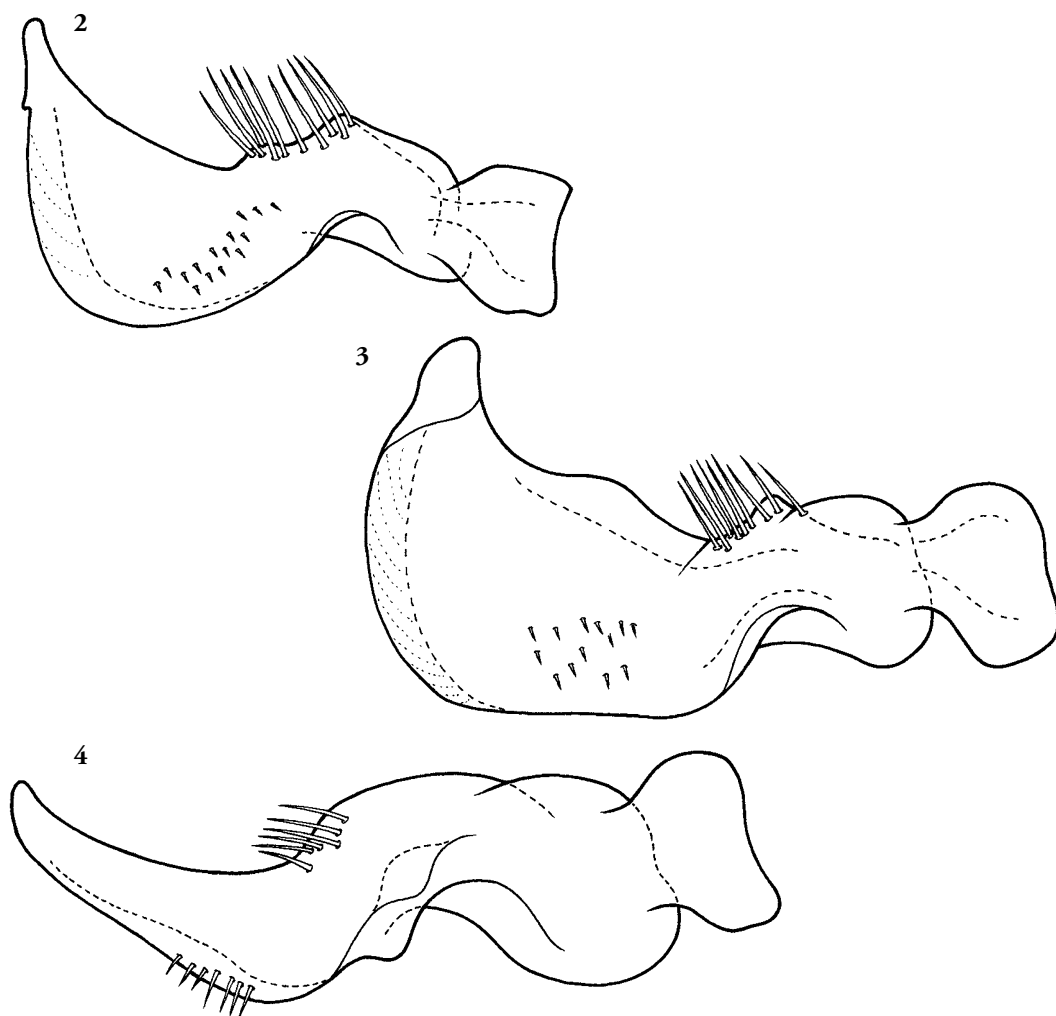
Color. General coloration yellowish brown, with scattered darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen; legs bearing darker brown spots and subapical annulations.

Head dark yellow, with black patches laterally behind eyes, central section of vertex bearing an irregular, medially longitudinal, black patch, central portion of this patch in the form of an elongate triangle with a posteriorly directed apex, extreme posterior apex of this patch laterally expanded immediately behind eyes to form a transverse, reddish marking, tylus pale orange; antennal segments I and II orange brown, segment II narrowly darkened at apex, segments III and IV brown; eyes dark red.

Pronotum dark orange-yellow, lateral margins narrowly pale yellow, anterior collar bearing single broad, dark brown longitudinal midline mark, this dark longitudinal midline stripe not continuing onto swollen anterior lobe; posterior lobe longitudinally trifasciate with dark brown; additional small, scattered brown markings present centrally on anterior lobe at muscle attachment scars.

Scutellum dark yellow centrally, this yellow coloration forming an arrowhead-shaped mark with posteriorly directed apex, this pale central mark bisected by a brown stripe along longitudinal midline, this stripe narrow anteriorly, progressively widening posteriorly; anterolateral angles brown, forming a pair (1+1) of large patches with inwardly convex margins, these inner margins broadly darker than the adjacent anterolateral angles they isolate.

Hemelytra dark yellow centrally, clavus and lateral margins broadly dark brown.



Figs 2–4. Male parameres of micropterous *Nabis* species occurring on the island of Moorea. Left paramere shown for all species in outer lateral view. – 2, *N. polynesica*, specimen from Moorea, Mt. Toheia summit area; 3, *N. toheia*, specimen from Moorea, small gulch head W. of Mt. Toheia summit; 4, *N. mooreana*, specimen from Moorea, small gulch head W. of Mt. Toheia summit.

Legs medium brown overall; fore femur with an interrupted longitudinal row of about 8 small, dot-like brown marks on upper section outer face, this row present basally and distally, absent centrally, a parallel longitudinal row of about 10 evenly spaced, vertically ovate brown marks on lower section of outer face, and a single broad dark brown annulus subapically, flanked on its basal side by a similar width dark yellow annulus; middle femur fore femur with a longitudinal row of about 8 evenly spaced, circular brown marks on lower section of outer face, and a single broad dark brown annulus subapically, flanked on its basal side by a similar width dark

yellow annulus; hind femur lacking spots, bearing only a single broad dark brown annulus subapically, flanked on its basal side by a smaller dark yellow annulus; hind tibia with a single small, dark brown annulus basally; hind tarsi uniformly brown.

Abdomen reddish brown, paratergites narrowly striped with alternating bands of pale yellow and dark brown; abdominal segments VII and VIII narrowed, forming a box-like genital capsule.

Ventral surface dark brown to black, with acetabulae and margins of coxal cavities narrowly dark yellow.

Structural characters. Head elongate, well produced both ahead of and behind eyes, bearing scattered

short, recumbent, gold setae, with tufts of longer gold setae along longitudinal midline; ocelli absent. Pronotum campanulate, covered by an obscure layer of short, gold setae; anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short with posterior margin straight. Scutellum elongate and triangular, very slightly domed centrally, covered by an obscure layer of short, recumbent, gold setae. Hemelytra short, micropterous, not attaining posterior margin of first visible abdominal segment, surface weakly rugulose, bearing scattered very short, recumbent, gold setae.

Legs elongate; fore femora fusiform, bearing numerous semi-erect brown setae on dorsal surface, a few long, slender pale setae ventrally, and a dense fringe of short, pale setae along portion of inner face covered by infolded fore tibia; fore tibia slender, widening at tip, dorsal and lateral faces bearing numerous scattered, slender, erect, pale setae, length of these setae approximately the same as thickness of tibia, ventral tibial margin bearing two parallel rows of about 30 tiny black teeth; middle femur covered with scattered pale setae, these setae semi-recumbent dorsally, erect ventrally, length roughly half the thickness of the femur, ventral surface of femur also set with numerous tiny, sharp black spinules; hind femur simple, slightly bowed, covered with scattered semi-erect pale setae; middle and hind tibiae and tarsi slender, covered with scattered pale, erect setae, lengths of these setae roughly similar to the thickness of the respective segments on which they occur, slightly longer on middle tibia; ventral surface of middle tibia with numerous tiny black denticles. Abdomen with all segments completely exposed, lateral margins weakly arcuate, all tergites covered with fine recumbent gold setae; abdominal segments VII and VIII narrowed, forming a box-like genital capsule.

Ventral surface with pro-, meso-, and metasterna covered with appressed silvery setae, abdominal venter covered by an inconspicuous layer of recumbent gold setae.

Genitalia with distal section of paramere semicircular, bearing an elongate process at tip (Fig. 2); phalotheca with two large hooks in basal section, distal section lacking hooks or combs (Fig. 10).

Description of female

Similar to micropterous male in general structure and coloration with following exceptions: length 7.75 mm, maximum width (across abdomen) 2.00 mm. Overall shape larger and more robust than male, with abdomen more broadly expanded; combined abdominal tergites VIII and IX roughly triangular, longitudinally raised medially to form

a tube-like structure over upraised tip of retracted ovipositor; ventral abdomen dark brown laterally, broadly dark yellow centrally, this dark yellow area bisected by a narrow, black longitudinal fascia running anterad from base of ovipositor.

Etymology

The name “polynesica” refers to Polynesia, the broad geographic region of the Pacific in which this species occurs.

Distribution

Endemic to the island of Moorea in the Society Islands.

Comparative notes

Nabis polynesica is the smallest micropterous *Nabis* species known from Moorea, and is the apparent sister species to *N. tahitiensis* from Tahiti. Both species are relatively small and slender, with body lengths of less than 8.0 mm, are brown in coloration, and possess semi-circular posterior lobes on the male paramere. The two taxa are easily separated by the details of the male paramere structure, in particular the more acuminate apex of the distal paramere lobe in *N. polynesica* with its small subapical notch on the outer margin (compare Figs 2, 5).

Ecological notes

At the Mt. Toheia type locality, *N. polynesica* was found predominantly in open, exposed situations on the mountain summit and adjacent ridge crests, in contrast to *N. toheia* and *N. mooreana*, which occurred in moist, shaded gulch heads. Similar to *N. tahitiensis* on Tahiti, this species appears to occupy a wider elevational range than its other syntopic micropterous congeners, being the only nabid species still encountered as one descended from the immediate summit area on Mt. Toheia.

Nabis tahitiensis sp.n.

Figs 5, 11, 13, 19, 23

Type material. – Holotype, micropterous male, and allotype, micropterous female: **French Polynesia, Society Islands, Tahiti, Mt. Marau, summit area, 1460–1490 m. [4790–4890 ft.], 17°36'32”S, 149°31'59”W, 4 September 2006, 16:00–17:00 hrs., CL 7479, D.A. Polhemus (BPBM).** **Paratypes:** **French Polynesia, Society Islands, Tahiti:** 2 micropterous males, same data as holotype (BPBM); 1 micropterous female, Mt. Marau, near Km. 7 on road to summit, 1125 m. [3690 ft.], 17°37'08”S, 149°33'16”W, 4 September 2006, 10:00–12:00 hrs., CL 7477, D.A. Polhemus (BPBM);

3 micropterous males, 1 micropterous female, Mt. Marau, road to summit, 1380 m. [4525 ft.], 17°36'28"S, 149°32'09"W, 15 September 2006, 13:30–16:00 hrs., CL 7498, D.A. Polhemus (BPBM); 2 micropterous males, 1 micropterous female, Tahiti, Mt. Marau, 1160 m. [3800 ft.], 6 November 1999, D.A. Polhemus (USNM); 1 micropterous male, 1 micropterous female, Tahiti, Mt. Marau, 1340 m. [4400 ft.], 6 November 1999, D.A. Polhemus (USNM); 1 micropterous male, Mt. Marau, 14 April 2007, EMEC 1011818, E.M. Claridge (BPBM); 1 micropterous male, 1 immature, Mt. Marau, 17 December 2006, EMEC 1011830, E.M. Claridge (BPBM); 1 micropterous female, Mt. Marau, low Malaise trap, 4 September 2006, EMEC 1011826, E.M. Claridge (BPBM); 2 micropterous males, 1 micropterous female, Mt. Mauru, fern banks along road from lava tube to upper reservoir, 650–740 m. [2130–2425 ft.], 17°37'45"S, 149°21'11"W, 5 September 2006, 11:00–14:00 hrs., CL 7481, D.A. Polhemus (BPBM); 1 micropterous female, Mt. Mauru, stream on trail to summit, 890 m. [2920 ft.], 17°38'04"S, 149°21'38"W, water temp. 18° C., 6 September 2006, 15:30–15:40 hrs., CL 7487, D.A. Polhemus (BPBM); 5 micropterous males, 1 micropterous female, Mt. Marau, 885 m. [2900 ft.], 10 September 2006, C. Ewing (BPBM); 1 micropterous male, Mt. Marau, along road, 950–960 m. [3085–3150 ft.], 27 August 1977, in native forest, W.C. Gagne (BPBM); 1 micropterous male, Mt. Marau, 1490 m. [4890 ft.], 29–30 June 1977, on *Weinmannia*, P. D. Ashlock (BPBM); 1 micropterous male, 1 micropterous female, Mt. Marau, 1490 m. [4890 ft.], 29–30 June 1977, on TV building, B.H. Gagne, Bishop Museum Acc. #1977.361 (BPBM); 2 micropterous females, Mt. Marau, 1300–1400 m. [4265–4590 ft.], 28 August 1984, G. Pauley, Bishop Museum Acc. #1985.69 (BPBM); 5 micropterous males, Tairapu, Mts Teatara, north slope, 980 m. [3215 ft.], 17°47'38"S, 149°14'31"W, 7 September 2006, 11:40–12:15 hrs., CL 7490, D.A. Polhemus (BPBM); 6 micropterous males, 1 micropterous female, Tairapu, Mts Teatara, plateau on north side, 910 m. [2985 ft.], 17°47'32"S, 149°14'45"W, 7 September 2006, 10:15–11:00 hrs., CL 7488, D.A. Polhemus (BPBM); 4 micropterous males, Tairapu, Mts Teatara, north slope, 980 m. [3215 ft.], 17°47'38"S, 149°14'31"W, 7 September 2006, 11:40–12:15 hrs., CL 7490, D.A. Polhemus (BPBM); 2 micropterous males, Tairapu, Mts Teatara, north slope of summit ridge, 1040 m. [3410 ft.], 17°47'43"S, 149°14'27"W, 7 September 2006, 12:45–13:20 hrs., CL 7486, D.A. Polhemus (BPBM); 1 micropterous male, Tairapu, above Vaufaufa, 900 m. [2950 ft.], 24–25 September 1977,

sweeping, S.L. Montgomery, Bishop Museum Acc. #1977.361 (BPBM).

Description of male

Size. Total length 7.10 mm, maximum width (across abdomen) 1.50 mm.

Head length/width = 1.10/0.90; width of vertex $2.00 \times$ the dorsal width of an eye (0.40/0.20); length of preocular portion of head $1.12 \times$ the dorsal length of an eye (0.45/0.40); length of postocular portion of head $0.62 \times$ the dorsal length of an eye (0.25/0.40); length of antennal segments I–IV = 1.20/2.20/2.20/1.40; rostrum length 2.90, reaching slightly beyond apices of procoxae, lengths of segments I–IV = 0.30/1.10/1.10/0.40.

Pronotum length/width = 1.20/0.90. Scutellum length/width = 0.60/0.60. Legs elongate, with fore coxae $2.00 \times$ as long as thick (0.60/0.30); fore femora fusiform, over $6.75 \times$ longer than wide (2.70/0.40); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 2.70/2.10/0.10/0.15/0.25; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 2.50/2.30/0.10/0.15/0.25; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.40/4.20/0.10/0.30/0.50.

Color. General coloration yellowish brown, with scattered darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen; legs bearing darker brown spots and subapical annulations

Head dark yellow, with black patches laterally behind eyes, central section of vertex bearing an irregular, medially longitudinal, black patch, central portion of this patch in the form of an elongate triangle with a posteriorly directed apex, extreme posterior apex of this patch laterally expanded immediately behind eyes to form a transverse, reddish marking, tylus pale orange; antennal segments I and II orange brown, segment II narrowly darkened at apex, segments III and IV brown; eyes dark red.

Pronotum dark yellow, anterior collar bearing 3 broad, dark brown longitudinal marks, these marks not continuing onto swollen anterior lobe; anterior lobe maculate with brown at muscle attachment scars, midline and a pair (1+1) of callosities to either side of midline orange, lateral margins narrowly pale yellow; posterior lobe longitudinally trifasciate with 3 broad, weakly defined dark brown stripes. Scutellum dark yellow centrally, this yellow coloration forming an arrowhead-shaped mark with posteriorly directed apex, this pale central mark slightly infuscated centrally; anterolateral angles broadly brown, forming a pair (1+1) of large patches with inwardly convex margins. Hemelytra dark yellow centrally, clavus and lateral margins broadly dark brown.

Legs yellowish brown overall; fore femur with a

longitudinal row of about 10 small, evenly spaced, dot-like brown marks on upper section outer face, a parallel longitudinal row of about 10 evenly spaced, vertically ovate brown marks on lower section of outer face, and a single broad dark brown annulus subapically (Fig. 13); middle femur fore femur with a longitudinal row of about 5 small, evenly spaced, dot-like brown marks on upper section outer face, a parallel longitudinal row of about 10 evenly spaced, circular brown marks on lower section of outer face, and a single broad dark brown annulus subapically; hind femur with dark brown maculations on basal $\frac{1}{4}$, plus a single broad, dark brown annulus subapically; hind tibia with a single small, dark brown annulus basally.

Abdomen reddish brown, paratergites narrowly striped with alternating bands of pale yellow and dark brown; abdominal segments VII and VIII narrowed, forming a box-like genital capsule.

Ventral surface yellowish brown, with pro-, meso-, and metasternum and lower sections of corresponding paratergites black, abdominal paratergites and abdominal ventrite VIII dark brown.

Structural characters. Head elongate, well produced both ahead of and behind eyes, bearing scattered short, recumbent, gold setae, with tufts of longer gold setae along longitudinal midline; ocelli absent. Pronotum campanulate, covered by an obscure layer of short, gold setae; anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short with posterior margin very broadly convex posteriorly. Scutellum elongate and triangular, very slightly domed centrally, covered by an obscure layer of short, recumbent, gold setae. Hemelytra short, micropterous, not attaining posterior margin of first visible abdominal segment, surface weakly rugulose, coriaceous, bearing scattered very short, recumbent, gold setae; posterior margins broadly curved, clavus defined by weakly carinate ridge, wing membrane and venation faintly indicated.

Legs elongate; fore femora fusiform, bearing numerous semi-erect brown setae on dorsal surface, a few long, slender pale setae ventrally, and a dense fringe of short, pale setae along portion of inner face covered by infolded fore tibia; fore tibia slender, widening at tip, dorsal and lateral faces bearing numerous scattered, slender, erect, pale setae, length of these setae approximately the same as thickness of tibia, ventral tibial margin bearing two parallel rows of about 30 tiny black teeth; middle femur covered with scattered pale setae, these setae semi-recumbent dorsally, erect ventrally, length roughly half the thickness of the femur, ventral surface of femur also set with numerous tiny, sharp black spinules; hind femur simple, slightly bowed, covered with

scattered semi-erect pale setae; middle and hind tibiae and tarsi slender, covered with scattered pale, erect setae, lengths of these setae roughly similar to the thickness of the respective segments on which they occur, slightly longer on middle tibia; ventral surface of middle tibia with numerous tiny black denticles.

Abdomen with all segments completely exposed, lateral margins weakly arcuate, all tergites covered with recumbent gold setae; abdominal segments VII and VIII narrowed, forming a box-like genital capsule.

Ventral surface with pro-, meso-, and metasternum covered by appressed silvery setae; abdominal venter covered by an obscure layer of short, gold, recumbent setae.

Genitalia with distal section of paramere semicircular, tip slightly produced and angulate (Fig. 5); phallosome with two large hooks in basal section, distal section lacking hooks or combs (Fig. 11).

Description of female

Similar to micropterous male in general structure and coloration with following exceptions: length 7.30 mm, maximum width (across abdomen) 1.60 mm. Overall shape slightly larger and more robust than male, with abdomen more broadly expanded; combined abdominal tergites VIII and IX roughly triangular, longitudinally raised medially to form a tube-like structure over upraised tip of retracted ovipositor; ventral abdomen dark brown laterally, broadly dull yellow centrally, this dark yellow area bisected by a narrow, brown longitudinal fascia running anterad from base of ovipositor.

Etymology

The name "tahitiensis" refers to the island of Tahiti, to which this species is endemic.

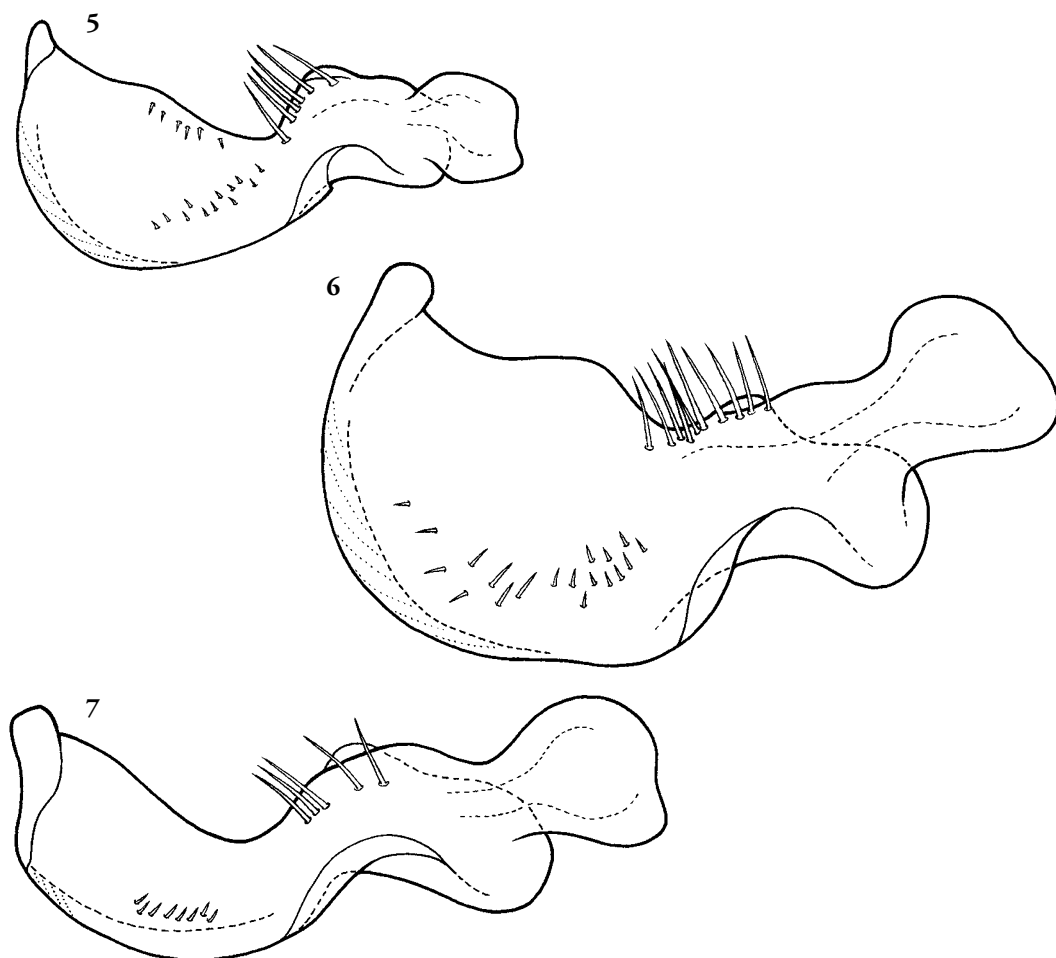
Distribution

Endemic to the island of Tahiti in the Society Islands.

Comparative notes

Nabis tahitiensis is the most commonly encountered endemic nabid on Tahiti, and is found across a wider range of elevations than the other micropterous endemics so far known from the island. Current captures span an elevation range from 650 to 1490 m, in habitats ranging from roadside ferns to intact montane cloud forests (Fig. 23). Individuals are often easily beaten from ferns along trails, accounting for the numerous specimens in museum collections.

This species is very similar in most respects to *N. polynesica* from Moorea, being small, brown in color, and having a semi-circular distal section on the male paramere. The two taxa are easily separated,



Figs 5–7. Male parameres of micropterous *Nabis* species occurring on the island of Tahiti. Left paramere shown for all species in outer lateral view. – 5, *N. tabitiensis*; 6, *N. oroehena*; 7, *N. tangaroa*. All specimens from Tahiti, Mt. Marau.

however, by both their geographic provenance, and the shape of the apex on the male paramere (compare Figs 2, 5).

Ecological notes

Known from the Mt. Marau and Mt. Mauru massifs of Tahiti Nui, and the Mts. Teatara massif of Tairapu (Fig. 19).

Nabis oroehena sp.n.

Figs 6, 15, 20

Type material. – Holotype, micropterous male, and allotype, micropterous female: **French Polynesia, Society Islands, Tahiti, Mt. Oroehena, 2240 m. [7345 ft.], 10–11 September 1988, MV light,**

S.L. Montgomery & B.H. Gagne, Bishop Museum Acc. #1988.333 (BPBM). Paratypes: French Polynesia, Society Islands, Tahiti: 1 micropterous male, 2 micropterous females, same data as holotype (BPBM); 2 micropterous females, Mt. Marau, road to summit, 1380 m. [4525 ft.], 17°36'28"S, 149°32'09"W, 10 September 2006, 13:00–15:30 hrs. and 15 September 2006, 13:30–16:00 hrs., CL 7498, D.A. Polhemus (BPBM); 1 micropterous male, 2 micropterous females, Mt. Marau, 17 December 2006, EMEC 1011821, E.M. Claridge (BPBM); 1 micropterous male, Tahiti, Mt. Marau, 1160 m. [3800 ft.], 6 November 1999, D.A. Polhemus (USNM); 1 micropterous male, Mt. Aorai, summit trail, 1210 m. [3970 ft.], 17°34'10"S, 149°30'27"W, 9 September 2006, 13:00–14:00 hrs., CL 7495, D.A. Polhemus

(BPBM); 1 micropterous male, 1 micropterous female, Mt. Aorai, summit trail, 1300 m. [4265 ft.], 17°35'17"S, 149°30'20"W, 9 September 2006, 14:15–15:30 hrs., D.A. Polhemus CL 7496, (BPBM); 4 micropterous females, Mt. Aorai, trail, 1675–1920 m. [5500–6300 ft.], 15 September 1934, beating ferns, E.C. Zimmerman (BPBM); 1 micropterous female, Mt. Aorai, trail, 1065–1220 [3500–4000 ft.], 13 September 1934, E.C. Zimmerman (BPBM); 3 micropterous females, Mt. Aorai, 2060 m. [6755 ft.], 10–12 September 1988, on *Astelia* at night, S.L. Montgomery, Bishop Museum Acc. #1988.361 (BPBM); 1 micropterous female, Mt. Aorai, 2000 m. [6560 ft.], 10–12 September 1988, S.L. Montgomery (BPBM); 1 micropterous male, E. slope of Mt. Orohena, 1370 m. [4500 ft.], 22 September 1934, F. R. Fosberg (BPBM); 3 micropterous males, Pito Hiti, 2050 m. [6725 ft.], 17°36'47.4"S, 149°27'50.5"W, pyrethrin fog from *Metrosideros* branch, 2 June 2006, EMEC 1011833, E.M. Claridge (BPBM); 2 micropterous males, Pito Hiti, summit campsite, 2118 m. [6950 ft.], 1 June 2006, EMEC 1011834, E.M. Claridge (BPBM); 1 micropterous male, 1 micropterous female, Pito Hiti, below summit, 2080 m. [6820 ft.], 17°36'48.8"S, 149°27'50.5"W, 2 June 2006, EMEC 1011835, E.M. Claridge (BPBM); 1 micropterous male, Mt. Mauru, summit trail, 1100 m. [3615 ft.], 17°08,058'S, 149°22.080'W, on *Cyathea* sp., C.P. Ewing (BPBM); 1 micropterous male, Mt. Mauru, stream on trail to summit, 890 m. [2920 ft.], 17°38'04"S, 149°21'38"W, water temp. 18° C., 6 September 2006, 15:30–15:40 hrs., CL 7487, D.A. Polhemus (BPBM); 1 micropterous female, Mt. Mauru, trail to summit between Pylon 3 and Pylon 4, 1030 m. [3380 ft.], 17°38'04"S, 149°22'04"W, 6 September 2006, 13:30–15:00 hrs., CL 7486, D.A. Polhemus (BPBM); 1 micropterous male, Mts Teatara, north slope of summit ridge, 1040 m. [3410 ft.], 17°47'43"S, 149°14'27"W, 7 September 2006, 12:45–13:20 hrs., CL 7491, D.A. Polhemus (BPBM).

Description of male

Size. Total length 8.85 mm, maximum width (across abdomen) 2.00 mm.

Head length/width = 1.40/0.98; width of vertex $2.00 \times$ the dorsal width of an eye (0.50/0.25); length of preocular portion of head $1.75 \times$ the dorsal length of an eye (0.70/0.40); length of postocular portion of head $0.75 \times$ the dorsal length of an eye (0.30/0.40); length of antennal segments I–IV = 2.00/3.10/2.70/1.70; rostrum length 3.80, reaching to bases of mesocoxae, lengths of segments I–IV = 0.30/1.50/1.50/0.50.

Pronotum length/width = 1.45/1.30. Scutellum length/width = 0.70/0.80. Legs with fore coxae $2.00 \times$ as long as thick (1.00/0.50); fore femora over $7.50 \times$ longer than wide (3.80/0.50); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.80/3.35/0.10/0.18/0.30; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.50/3.60/0.10/0.30/0.40; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 5.10/5.90/0.10/0.50/0.60.

Color. General coloration bright red to reddish brown, with scattered darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen; legs bearing reticulate darker brown maculations.

Head dark red, with blackish brown patches laterally behind eyes, central section of vertex bearing a roughly triangular dark brown patch with apex directed posteriorly, lateral margins of this patch narrowly darker than remainder, posterior apex of this patch laterally expanded immediately behind eyes to form a transverse, anteriorly convex, crescent-shaped marking; antennal segment I darker brown basally, antennal segment II with a single narrow brown annulation at apex, antennal segments III and IV uniformly yellowish brown; eyes red.

Pronotum dark red, broad longitudinal midline stripe dark brown, additional small, scattered brown markings present laterally along muscle attachment scars. Scutellum dark red, central section embrowned, isolating areas of brighter color at posterior apex and anterolateral angles. Hemelytra orange-brown, with veins and costal margin paler.

Legs reddish-orange, with scattered reddish-brown markings; fore femur with anastomosing reddish-brown maculations overlain on basal section of dorsal face by two irregular rows of small, dark brown spots (Fig. 15); middle and hind femora with similar reddish-brown maculations plus a single broad brown annulation at their respective apices.

Abdomen dark red, lateral margins of tergites I–VI narrowly pale whitish.

Ventral surface dark red; central sections of pro-, meso- and metasterna dark brown; pro-, meso-, and metapleura subtended by an irregular dark brown stripe, this stripe continuing posteriorly as a broad band of dark brown coloration on the lateral sections of the abdominal sternites; abdominal sternites II–VII with a broad, dark red, longitudinal midline stripe; venter of genital capsule reddish-orange, posterior terminus of genital capsule bearing two prominent, dark yellow lobes.

Genitalia with outer portions of paramere translucent golden brown, central section opaque dark yellow.

Structural characters. Head elongate, well produced

both ahead of and behind eyes, lateral portions thickly set with pale, recumbent setae, these setae more sparse along longitudinal midline; ocelli absent. Pronotum campanulate, anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short, posterior margin straight, bearing scattered semi-recumbent pale setae centrally. Scutellum triangular, angled upward anteriorly, covered by an obscure layer of short, pale, recumbent setae. Hemelytra short, micropterous, reaching to near posterior margin of abdominal segment I, set with scattered, short, pale, semi-recumbent setae; posterior margins broadly rounded, clavus and venation of corium well defined, membrane not evident.

Legs elongate; fore femora fusiform, bearing a dense fringe of short, pale setae along its inner face; fore tibia slender, widening at tip, inner margin bearing two parallel rows of 40–50 tiny black teeth bordered by pale, erect setae, outer margin bearing semi-erect pale setae, these setae becoming longer distally; middle and hind femora, tibiae and tarsi slender, covered with moderately long, pale, semi-erect setae, lengths setae on the tibiae equal to or exceeding width of tibiae, inner margin of middle tibia bearing two parallel rows of 30–40 tiny black teeth.

Abdomen with basal segment mostly covered by wing pads, all other segments completely exposed, lateral margins broadly arcuate, tergites II–VI slightly domed, lacking raised tumescences medially, abdominal segments VII and VIII narrowed, forming a box-like genital capsule, all tergites covered with short, pale, recumbent setae.

Ventral surface covered by a layer of short, pale, recumbent setae; posterior terminus of genital capsule bisected by a deep medially longitudinal sulcus, isolating two prominent lobes.

Genitalia with distal section of paramere broadly expanded, massive, with tip produced to a rounded process (Fig. 6).

Description of female

Similar to micropterous male in general structure and coloration with following exceptions: length 9.55 mm, maximum width (across abdomen) 2.50 mm. Overall shape larger and more robust than male, with abdomen more broadly expanded; combined abdominal tergites VIII and IX roughly triangular, longitudinally raised medially to form a tube-like structure over upraised tip of retracted ovipositor; dark markings on dorsum of body and femora more extensive than in male, reddish ground color more subdued, often trending toward darker yellowish orange; ventral abdomen broadly orange brown centrally with a discontinuous dark stripe along longitudinal midline running from

posterior margin of metasternum to base of ovipositor.

Etymology

The name “*orohena*” is a noun in apposition and refers to the Mt. Orohena type locality.

Distribution

Endemic to the island of Tahiti in the Society Islands.

Comparative notes

Nabis orohena is a moderately large, robust, micropterous nabid species, predominantly reddish in coloration, occurring on Tahiti, and easily recognized by the distinctive male paramere (Fig. 6), and by the color pattern on the femora, which consists of anastomosing reddish brown maculations over a dark ground color, plus a single broad brown annulation distally near the tip (Fig. 15).

This species occurs on the higher summits of Tahiti, and is similar in many respects to *N. tobeia* from Moorea, which inhabits similar situations on that island, but may be separated by the shape of the male paramere (compare Figs 3, 6), and the maculate rather than spotted femora. Living specimens of *N. orohena* are often strikingly red in coloration, but this color generally fades to dull orange or yellowish brown in preserved specimens. Despite the profound topographical barriers that physically isolate the various Tahitian massifs on which this species occurs, I have been able to find no substantive morphological differences that would warrant separating such local populations into discrete species or subspecies.

Ecological notes

Known from cloud forest habitats on the Mt. Marau, Mt. Aorai, Mt. Orohena, Pito Hiti, and Mt. Mauru massifs of Tahiti Nui, and the Mts. Teatara massif of Taïarapu (Fig. 20).

Nabis tangaroa sp.n.

Figs 7, 12, 21

Type material. – Holotype, micropterous male, and allotype, micropterous female: **French Polynesia, Society Islands, Tahiti, Mt. Marau, road to summit, 1380 m. [4525 ft.], 17°36'28"S, 149°32'09"W, 10 September 2006, 13:00–15:30 hrs. and 15 September 2006, 13:30–16:00 hrs., CL 7498, D.A. Polhemus (BPBM).** **Paratypes: French Polynesia, Society Islands, Tahiti: 3 micropterous males, same data as holotype, CL 7498, D.A. Polhemus (BPBM); 1 micropterous male, same locality as preceding except 2 September 2007, D.A. and J.T. Polhemus (BPBM).**

Description of male

Size. Total length 9.00 mm, maximum width (across abdomen) 1.93 mm.

Head length/width = 1.50/1.00; width of vertex $1.33 \times$ the dorsal width of an eye (0.50/0.30); length of preocular portion of head $1.75 \times$ the dorsal length of an eye (0.70/0.40); length of postocular portion of head $0.75 \times$ the dorsal length of an eye (0.30/0.40); length of antennal segments I–IV = 1.80/2.80/2.60/1.70; rostrum length 2.90, reaching to posterior margin of mesosternum, lengths of segments I–IV = 0.30/1.20/1.00/0.40.

Pronotum length/width = 1.50/1.20. Scutellum triangular, length/width = 0.80/0.80. Legs with fore coxae approximately $2.00 \times$ as long as thick (0.80/0.40); fore femora nearly $7.00 \times$ longer than wide (3.50/0.50); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.50/3.10/0.10/0.20/0.30; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.20/3.30/0.10/0.30/0.40; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 4.70/5.80/0.10/0.40/0.50.

Color. General coloration dark red to reddish brown, with limited darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen; legs distally annulate with dark brown and dark yellow.

Head orange brown, tylus and eyes red, blackish brown patches present laterally behind eyes, central section of vertex bearing a roughly triangular, elongate, black patch with apex directed posteriorly, posterior apex of this patch laterally broadly expanded immediately behind eyes to form a transverse, anteriorly convex, crescent-shaped marking; antennal segment I orange-brown, slightly darker basally, antennal segments II–III uniformly dark brown to blackish, lacking annulations; eyes red.

Pronotum dark red, longitudinal midline bearing a broad, discontinuous dark brown stripe, this stripe flanked by a pair (1+1) of similar stripes on posterior lobe, additional dense and irregular dark brown maculations present on central tumescence along muscle attachment scars. Scutellum orange brown centrally, anterolateral angles broadly black. Hemelytra uniform medium brown.

Legs reddish orange, overlain with broad, dark brown annulations distally and bearing reddish-brown spots laterally; fore, middle and hind femora each bearing a broad, dark brown annulation at the apex, flanked more basally by a dark yellow annulation of half the length, these annulations less pronounced on the fore femur; fore femur bearing with a prominent longitudinal row of glabrous, vertically ovate reddish brown spots on both lateral faces; middle femur with similar row of round spots on outer face; fore,

middle and hind tibiae orange brown, slightly infuscated at tips, lacking annulations.

Abdomen narrowly dark brown to black centrally, lateral sections broadly bright red intermixed with dark yellow patches, lateral margins of tergites I–VI red, tergites VII–IX red.

Ventral surface medium to dark red; pro-, meso- and metasterna dark brown centrally, red laterally; pro-, meso-, and metapleura subtended by an irregular dark brown stripe, this stripe continuing posteriorly as a broad band of dark brown coloration on the lateral sections of the abdominal sternites; venter of pregenital abdomen uniformly red, venter of genital capsule red, posterior terminus of genital capsule with posterolateral lobes reddish ventrally, pale brown dorsally.

Structural characters. Head elongate, well produced both ahead of and behind eyes, set with thick, recumbent golden setae; ocelli absent.

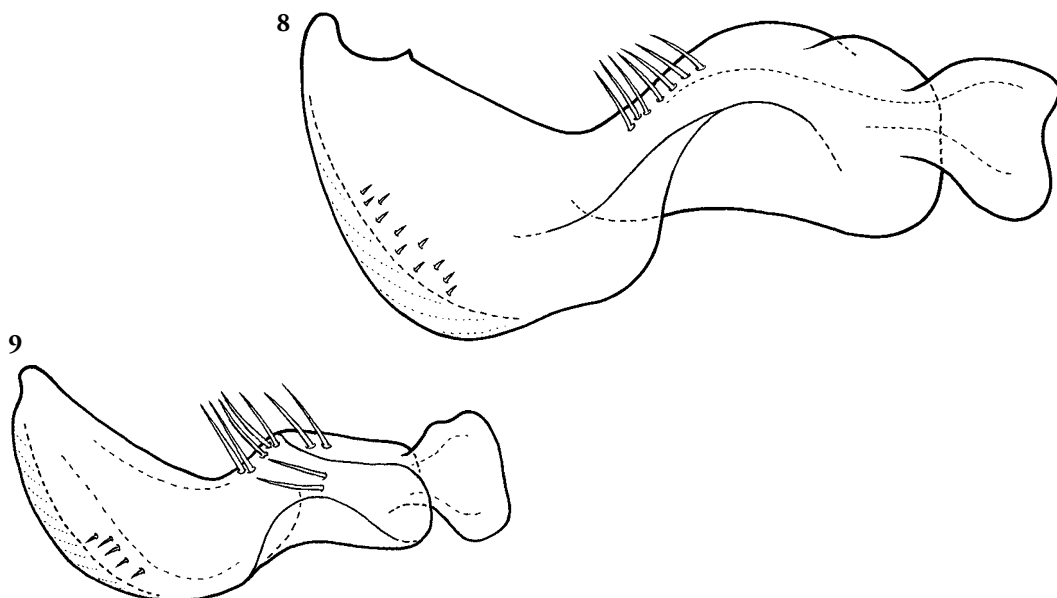
Pronotum campanulate, anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short, posterior margin straight, pronotal surface bearing fine, recumbent pale setae. Scutellum triangular, set with short, golden, recumbent setae centrally. Hemelytra short, micropterous, covering basal half of abdominal tergite I, set with scattered, short, pale, recumbent setae.

Legs elongate, with fore femur fusiform, bearing a dense fringe of short, pale setae along inner face; fore tibiae slender, widening at tip, inner margin bearing two parallel rows of 40–50 tiny black teeth bordered by pale, erect setae, outer margin bearing semi-erect pale setae, these setae becoming longer distally; middle and hind femora, tibiae and tarsi slender, covered with moderately long, pale, semi-erect setae, lengths setae on the tibiae equal to or exceeding width of tibiae, ventral face of middle tibia bearing numerous small, bristly black spinules, inner margin of middle tibia bearing two parallel rows of 30–40 tiny black teeth.

Abdomen with basal segment partly covered by wing pads, all other segments completely exposed, lateral margins broadly arcuate, tergites II–VI slightly domed, lacking raised tumescences medially, abdominal segments VII and VIII narrowed, forming a box-like genital capsule, all tergites covered with numerous short, pale, recumbent setae.

Ventral surface covered by a thick layer of short, pale, recumbent setae; posterior terminus of genital capsule weakly concave, bisected by a shallow sulcus isolating two posterolateral lobes.

Genitalia with paramere broadly sinuate in lateral view, distal section elongate, bearing an expanded, roughly quadrate tip (Fig. 7); phallosome bearing two large hooks in basal half (Fig. 12).



Figs 8, 9. Male parameres of *Nabis* species occurring on the Society Islands. Left paramere shown for both species in outer lateral view. – 8, *N. raiateana*, specimen from Raiatea, Temehani Plateau; 9, *N. tiki*, specimen from Tahiti, Mt. Marau.

Description of female

Similar to micropterous male in general structure and coloration with following exceptions: length 9.00 mm, maximum width (across abdomen) 2.45 mm. Overall shape larger and more robust than male, with abdomen more broadly expanded; fore femur with 4 prominent gold spines basally on inner face; combined abdominal tergites VIII and IX roughly triangular, longitudinally raised medially to form a tube-like structure over upraised tip of retracted ovipositor; dark markings on dorsum of body and femora more extensive than in male, reddish ground color more subdued; ventral abdomen broadly reddish orange centrally with a discontinuous dark stripe along longitudinal midline running from posterior margin of metasternum to base of ovipositor.

Etymology

The name “tangaroa” is a noun in apposition, and refers to the Tahitian deity who was the father of all gods and men.

Distribution

Endemic to the island of Tahiti in the Society Islands.

Comparative notes

Nabis tangaroa is a moderately large, robust, micropterous nabid species, predominantly reddish in

coloration, occurring on Tahiti, and easily recognized by the distinctively elongate male paramere (Fig. 7). This species has to date been taken only from the wet forests near the summit of Mt. Marau, on north-western Tahiti Nui. The relatively slender, sinuate paramere (Fig. 7) will easily distinguish this species from any other endemic Tahitian nabid, as will its relatively short rostrum, which is less than 3.0 mm in length.

Ecological notes

Known only from the Mt. Marau massif of Tahiti Nui (Fig. 21), where it has been taken by pyrethrin fogging of dense fern banks in small gulch heads immediately leeward of the cliffs that break away into the Punaruu River valley. In such situations it has been taken syntopically with *N. tiki* (its most common congeneric associate), *N. orobena*, and *N. tahitiensis*.

Nabis tiki sp.n.

Figs 9, 13, 22

Type material. – Holotype, micropterous male, and allotype, micropterous female: **French Polynesia, Society Islands, Tahiti, Mt. Mauru, trail to summit between Pylon 3 and Pylon 4, 1030 m. [3380 ft.], 17°38'04"S, 149°22'04"W, 6 September 2006, 13:30–15:00 hrs., CL 7486, D.A. Polhemus (BPBM).**

Paratypes: French Polynesia, Society Islands, Tahiti: 1 micropterous male, same data as holotype (BPBM); 2 micropterous males, Mt. Marau, road to summit, 1380 m. [4525 ft.], 17°36'28"S, 149°32'09"W, 10 September 2006, 13:00–15:30 hrs. and 15 September 2006, 13:30–16:00 hrs., CL 7498, D.A. Polhemus (BPBM). 3 micropterous males, same locality as preceding except 2 September 2007, D.A. and J.T. Polhemus, fogged from mossy *Cyathea* tree fern trunks (BPBM); 1 micropterous male, 1 immature, Mt. Marau, 1280 m. [4200 ft.], fog site 1, *Weinmannia* forest, 6 November 1999, D.A. Polhemus (USNM); 1 micropterous female, Pito Hiti, summit campsite, 2118 m., 1 June 2006, EMEC 1011834, E.M. Claridge (BPBM).

Description of male

Size. Total length 7.80 mm, maximum width (across abdomen) 1.70 mm.

Head length/width = 1.30/0.90; width of vertex $1.8 \times$ the dorsal width of an eye (0.45/0.25); length of preocular portion of head $1.50 \times$ the dorsal length of an eye (0.60/0.40); length of postocular portion of head $0.75 \times$ the dorsal length of an eye (0.30/0.40); length of antennal segments I–IV = 1.65/2.50/2.10/1.85; rostrum length 3.05, reaching to bases of mesocoxae, lengths of segments I–IV = 0.30/1.10/1.20/0.45.

Pronotum length/width = 1.30/1.10. Scutellum length/width = 0.60/0.70.

Legs with fore coxae approximately $2.30 \times$ as long as thick (0.70/0.30); fore femora $7.50 \times$ longer than wide (3.00/0.40); lengths of leg segments as follows: fore femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.00/2.60/0.10/0.20/0.30; middle femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 2.80/2.90/0.10/0.20/0.40; hind femur/tibia/tarsal 1/tarsal 2/tarsal 3 = 3.80/4.90/0.10/0.40/0.45.

Color. General coloration reddish brown, with numerous darker brown markings at muscle attachment scars on dorsal head, thorax and abdomen; legs multiannulate with dark brown and dark yellow; antennae reddish brown to dark brown.

Head dark yellow, tylus and eyes bright red, blackish brown patches present laterally behind eyes, central section of vertex bearing a roughly triangular, elongate, black patch with apex directed posteriorly, posterior apex of this patch laterally broadly expanded immediately behind eyes to form a transverse, anteriorly convex, crescent-shaped marking; antennal segment I clear reddish brown, slightly darker basally, antennal segments II–IV uniformly dark reddish brown, lacking annulations; eyes red.

Pronotum dark orange, with lateral sections of anterior collar and posterior lobe trending to dark yellow,

longitudinal midline bearing a broad dark brown stripe, this stripe flanked by a pair (1+1) of similar stripes on anterior collar and posterior lobe, additional dense and irregular dark brown maculations present on central tumescence along muscle attachment scars. Scutellum dark red, basomedial area with a broad V-shaped dark yellow mark, the apex of this marking directed anteriorly, basolateral angles finely rugose. Hemelytra dark brown, with claval vein and costal margin contrasting dark yellow.

Legs dark orange, overlain with broad, dark brown annulations; fore, middle and hind femora each bearing 3 broad, brown annulations, one at apex, another centrally, and a third basally (Fig. 14); fore and middle tibiae orange brown, with a faintly suggested dark yellow annulation sub-basally; hind tibia orange brown, with a faint darker brown annulation at base.

Abdomen dark brown centrally intermixed with reddish maculation, lateral sections with alternating patches of red and dark brown, lateral margins of tergites I–VI narrowly banded with alternating dark brown and pale yellow patches, tergites VII–IX dark brown.

Ventral surface brown; pro-, meso- and metasterna dark blackish-brown centrally, orange laterally; pro-, meso-, and metapleura subtended by an irregular dark brown stripe, this stripe continuing posteriorly as a broad band of dark brown coloration on the lateral sections of the abdominal sternites; venter of pregenital abdomen brown with a broad, roughly ovate orange patch centrally, this patch bisected along its longitudinal midline by a narrow, dark brown stripe; venter of genital capsule dark brown, posterior terminus of genital capsule weakly concave, bisected by a shallow sulcus isolating two posterolateral lobes, these lobes orange centrally with outer margins brown.

Genitalia with paramere translucent reddish brown.

Structural characters. Head elongate, well produced both ahead of and behind eyes, set with scattered recumbent golden setae; ocelli absent.

Pronotum campanulate, anterior collar elongate, anterior lobe swollen and tumescent, posterior lobe short, posterior margin straight, pronotal surface set with scattered recumbent golden setae. Scutellum triangular, slightly raised centrally, central section bearing scattered, short, golden, recumbent setae. Hemelytra short, micropterous, covering basal half of abdominal tergite I; surface coriaceous, set with scattered, short, pale, semi-recumbent setae; posterior margins broadly rounded, clavus partially defined, venation of corium obscure, membrane not evident.

Legs elongate; fore femur fusiform, bearing a dense

fringe of short, pale setae along its inner face; fore tibia slender, widening at tip, inner margin bearing two parallel rows of 40–50 tiny black teeth bordered by pale, erect setae, outer margin bearing semi-erect pale setae, these setae becoming longer distally; middle and hind femora, tibiae and tarsi slender, covered with moderately long, pale, semi-erect setae, lengths setae on the tibiae equal to or exceeding width of tibiae, ventral face of middle tibia bearing numerous small, bristly black spinules, inner margin of middle tibia bearing two parallel rows of 30–40 tiny black teeth.

Abdomen with basal segment partly covered by wing pads, all other segments completely exposed, lateral margins broadly arcuate, tergites II–VI slightly domed, lacking raised tumescences medially, abdominal segments VII and VIII narrowed, forming a box-like genital capsule, all tergites covered with numerous short, recumbent gold setae.

Ventral surface covered by a thick layer of short, pale, recumbent setae; posterior terminus of genital capsule weakly concave, bisected by a shallow sulcus isolating two posterolateral lobes.

Genitalia with distal section of paramere elongate and broadly crescent shaped, bearing a shallow sub-apical indentation on ventral surface (Fig. 9).

Description of female

Similar to micropterous male in general structure and coloration with following exceptions: length 8.10 mm, maximum width (across abdomen) 2.10 mm. Overall shape larger and more robust than male, with abdomen more broadly expanded; middle femur with small, bristly black spinules confined to distal half; combined abdominal tergites VIII and IX roughly triangular, longitudinally raised medially to form a tube-like structure over upraised tip of retracted ovipositor; dark markings on dorsum of body and femora more extensive than in male; ventral abdomen broadly orange brown centrally with a set of dark brown spots along longitudinal midline running from posterior margin of metasternum to base of ovipositor.

Etymology

The name “tiki” is a noun in apposition, and refers to the legendary “first man” in Polynesian lore.

Distribution

Endemic to the island of Tahiti in the Society Islands.

Comparative notes

A moderately small, slender, micropterous species, predominantly brownish in coloration, occurring on Tahiti, and recognized by its multiannulate

femora with alternating bands of dark yellow and brown (Fig. 14), and the shape of the male paramere (Fig. 19).

This is a distinctive taxon endemic to Tahiti, and is easily recognized by its small size (body length less than 8.0 mm), strongly banded femora, and short antennal segment III, the length of which is less than that of segment II. The male paramere of this species, although diagnostic, is relatively unmodified in comparison to other Society Island *Nabis* species (Fig. 9). *Nabis tiki* occurs syntopically in wet upland forests with *N. tahitiensis*, from which it may be separated by its banded rather than spotted femora (compare Figs 13, 14), and *N. orohena*, the latter a much larger, redder species with a very different male paramere shape (compare Figs 6, 9). On Mt. Marau this species also occurred intermixed with *N. tangaroa*, a species that displays incipient banding on the apical femora, but which like *N. orohena* is larger, more reddish in coloration, and has a very differently shaped male paramere (compare Figs 7, 9).

Ecological notes

Known from the Mt. Marau, Pito Hiti, and Mt. Mauru massifs of Tahiti Nui (Fig. 22).

Nabis kinbergii Reuter

Nabis kinbergii Reuter, 1872: 79.

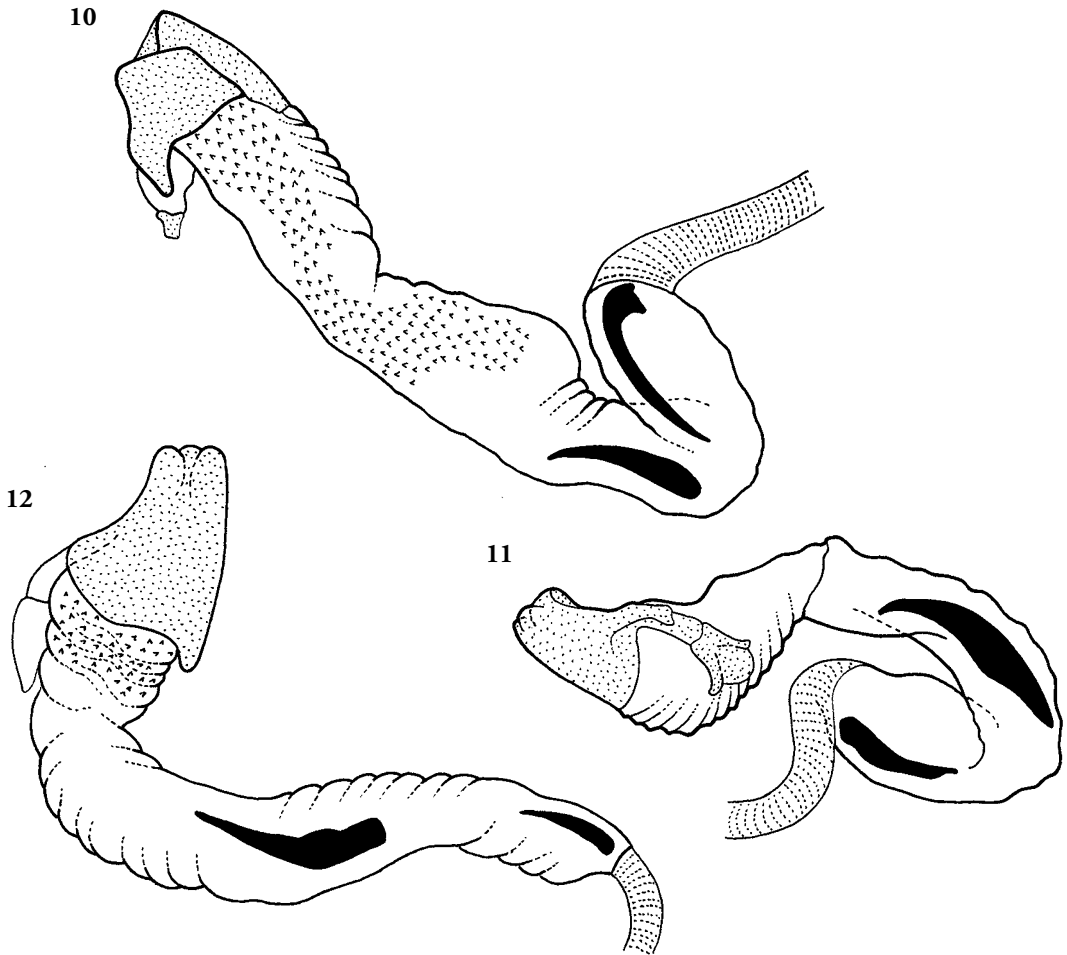
Sastrapada nigrolineata Distant, 1920: 159. Type locality: New Caledonia. Syn. by Kerzhner 1981: 294.

Nabis nigrolineata: Cheesman 1927: 158 (in part).

Nabis tasmanicus Remane, 1964: 257. Type locality: Tasmania. Syn. by Kerzhner 1969: 354.

Discussion

This is a narrow-bodied, macropterous, brown-colored *Nabis* species that is widespread in the southwestern Pacific, occurring throughout Australia, northward to the Bonins and the Ryukyus, and eastward to the Society Islands (Cassis & Gross, 1995). Kerzhner (1961) provided specific details on the geographic range of this species (under the name *N. nigrolineatus*), listing its occurrence in Tasmania, Australia, New Zealand, Lord Howe Island, Norfolk Island, New Caledonia, New Guinea, the Bismarck Archipelago, the Solomon Islands, the New Hebrides, Tonga, the Bonin Islands, the Ryukyu Islands, and the Society Islands. In the latter archipelago, individual specimen records were provided from Tahiti, Raiatea, and Bora Bora, although these have not been re-examined in the course of the current research. It was also noted that *N. kinbergii* was apparently syntopic with *N. capsiformis* on Tahiti and Raiatea, based on specimens Kerzhner



Figs 10–12. Phallosome structures of *Nabis* species occurring on the Society Islands. – 10, *N. polynesica*, specimen from Moorea, Mt. Toheia summit; 11, *N. tahitiensis*, specimen from Tahiti, Mt. Marau; 12, *N. tangaroa*, specimen from Tahiti, Mt. Marau.

had examined in the Copenhagen Museum. He considered the geographical overlap of these two otherwise geographically allopatric species in the Society Islands, and also in New Guinea, to be “remarkable”. Although nearly geographically allopatric, *Nabis kinbergii* and *N. capsiformis* are very similar in terms of external morphology, and not definitively separated except by recourse to dissection of the male endosoma and examination of the number of hook-like internal sclerites (3 in *N. kinbergii*, versus only 2 in *N. capsiformis*). In general, *N. kinbergii* is a larger, more brownish species, whereas *N. capsiformis* is by comparison smaller, narrower, paler, and more delicate in overall appearance. The external characters given in the current key for Society Island nabids appear to be suitable for general separation of the

populations of *N. kinbergii* and *N. capsiformis* occupying the Societies and immediately adjacent archipelagoes, but given the wide geographic range of *N. capsiformis* in particular, it should be anticipated they may not hold stable across the entire range of either species. A further discussion of characters useful for separating these two species is found in Woodward (1982), although it should be noted that the differences in paramere shape cited by Woodward do not seem to hold true throughout the insular Pacific region.

Both of these species, along with *N. consimilis* Reuter and *N. maoricus* Walker, were placed in the subgenus *Tropiconabis* by Kerzhner (1981), who also synonymized *N. nigrolineatus* (Distant) under *N. kinbergii* in that same work (Woodward &

Strommer, 1982). The discovery of new insular *Nabis* species in the Pacific, such as those described herein, has now complicated the subgeneric picture, however, and no subgeneric assignments have therefore been adopted in the current work.

Material examined. French Polynesia, Society Islands, Tahiti: 1 macropterous male, Mt. Mauru, fern banks along road from lava tube to upper reservoir, 650–740 m. [2130–2425 ft.], 17°37'45"S, 149°21'11"W, 5 September 2006, 11:00–14:00 hrs., CL 7481, D.A. Polhemus (BPBM); 3 macropterous males, 1 macropterous female, Papeete, March 1955, N.L.H. Krauss (BPBM); 1 macropterous male, 1 macropterous female, Pare, valley E. of Pirae, 23 March 1934, E.C. Zimmerman (BPBM); 2 macropterous males, Tiupi Bay, Papeari Pt., 3 May 1934, sweeping grasses and low herbage, E.C. Zimmerman (BPBM); 1 macropterous male, Tahiti, Mt. Marau, 1490 m., 29–30 June 1977, on TV building, W.C. Gagné (BPBM); 1 macropterous male, 1 macropterous female, Papeete, 0–100 m., March 1977, N.L.H. Krauss (BPBM); 2 macropterous males, Fataua Valley, 1–100 m., 17 August 1969, N.L.H. Krauss (BPBM); 1 macropterous male, Papenoo Valley, 0–100 m., March 1978, N.L.H. Krauss (BPBM); 1 macropterous male, Punaauia, 0–50 m., 19 March 1977, N.L.H. Krauss (BPBM). Moorea: 6 macropterous males, 5 macropterous females, Tehau Pt., 10 ft., 24 September 1934, sweeping grasses and low herbage, E.C. Zimmerman (BPBM); 2 macropterous females, Mt. Toheia base, Belvedere Trail, 400 m., 18–19 September 1998, S.L. Montgomery and B.H. Gagné (BPBM); 2 macropterous males, 2 macropterous females, Baie de Cook, March 1959, N.L.H. Krauss (BPBM). Huahine: 1 macropterous male, 1 macropterous female, Mt. Turi, 500 m., 6–8 September 1977, at light, W.C. Gagné (BPBM); 4 macropterous males, 3 macropterous females, Fare, 0–100 m., March 1979, N.L.H. Krauss (BPBM). Raiatea: 4 macropterous males, 2 macropterous females, 1 immature, Fetuna, March 1955, N.L.H. Krauss (BPBM).

Nabis capsiformis Germar

Nabis angustus Spinola, 1837: 121. Nomen oblitum. Type locality: India, Bombay.

Nabis capsiformis Germar, 1839: 132. Type locality: Cap Bonae Spei.

Nabis angusta Brullé, 1839: 79 (in Webb & Berthelot). Homonym of *N. angustus* Spinola. Type locality: Canary Islands.

Discussion

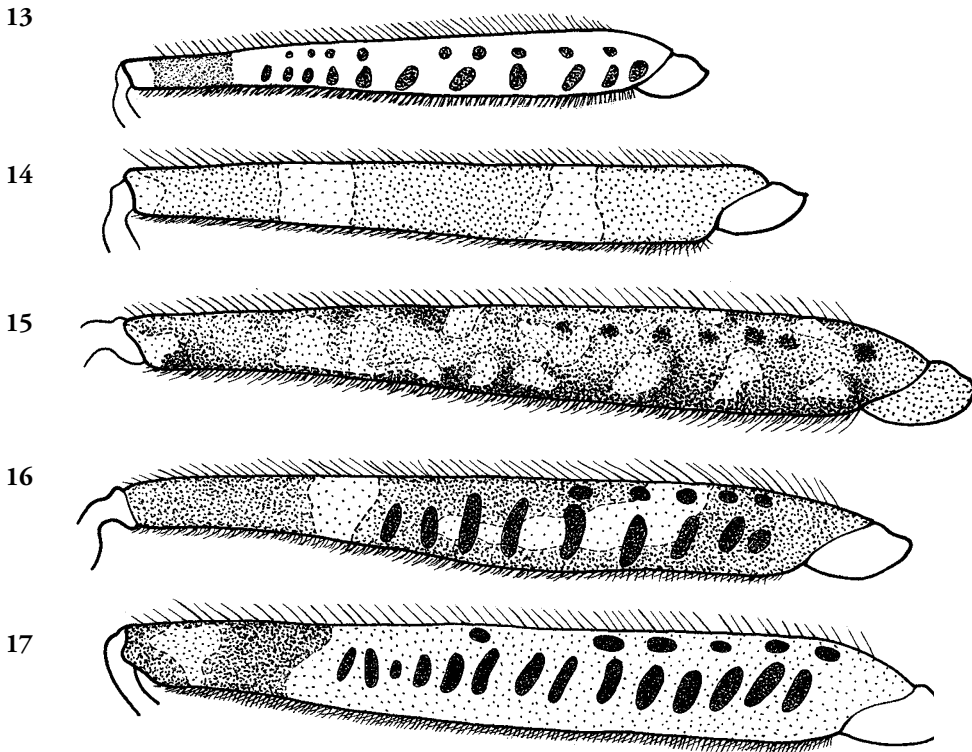
Nabis capsiformis is an extremely widespread species, and as noted above is very similar to *N. kimbergii* in external appearance, the two species most reliably separated by the number of internal sclerites in the phallosome (Woodward 1982). It is likely that the two species have been widely confused in the Society Islands, where their ranges overlap. The distribution of *N. capsiformis*, as given by Kerzhner

(1969, 1981), encompasses the Canary Islands, Crimea, Transcaucasia, Uzbekistan, India, Ceylon, Indonesia (Banka Is.), New Guinea, the Philippines, Fiji, the Caroline Islands, the Marshall Islands, the Society Islands, the Marquesas Islands, the Austral Islands, and the Hawaiian Islands. Specimens are at hand in the Bishop Museum collection from the Mangareva Islands (Mangareva, Aukena, Agakauitai, Taravai), the Austral Islands (Rimatara, Rurutu, Raivavae, Rapa), the Tuamotu Islands (Makatea, Tepoto, Rangiroa, Takapolo), and the Marquesas Islands (Eiao, Nuku Hiva, Ua Huka, Ua Pou, Hiva Oa, Tahuata, Hatutaa, Fatu Hiva), thus validating and expanding upon the distribution as provided by Kerzhner (1969). Zimmermann (1948b) considered *N. capsiformis* to be introduced in the Hawaiian Islands, and it is possible that the wide distribution noted above is in part human-mediated. However, given the presence of this species on many very remote and infrequently visited islands, including the North-western Hawaiian Islands, it is equally possible that the broad range of this species may be natural and indicative of high inherent dispersal ability. Even so, the species appears to be uncommon and localized in the Society Islands, potentially supporting the hypothesis that it was introduced by human commerce.

Discussion

Ecology

The high, wet forests of the isolated Pacific islands such as Hawaii, the Marquesas, and the Societies support distinctive assemblages of predaceous insects, with many common faunal elements. These include *Mecyclothorax* carabid beetles in Hawaii and the Societies, terrestrial Hydrometridae in the Societies and the Marquesas, and micropterous Nabidae in all three archipelagoes. These unusual and unique predaceous species, all of which are flightless, occur almost uniformly at elevations above 1000 m. This is the elevation at which the trade wind inversion provides a nearly continuous moisture source in the form of rain and mist, producing mossy, constantly wet forests with cool temperature regimes. Below 1000 m temperatures are higher, and the inversion cloud deck typically lies above the forest, while at elevations above 1500 m there is a gradual transition to a more arid subalpine zone. The forests lying at elevations between 1000 and 1500 m are also extremely dense, tangled, and mossy, and have therefore historically resisted penetration and adequate biological sampling. With the advent of helicopter-assisted surveys, more advanced camping gear, and



Figs 13–17. Forelegs of *Nabis* species occurring in the Society Islands, illustrating patterns of light and dark markings. – 13, *N. tabitiensis*; 14, *N. tiki*; 15, *N. orohena*; 16, *N. mooreana*; 17, *N. raiateana*

small scale pyrethrin fogging, such forests are now revealing the true extent of their remarkable and highly endemic arthropod biodiversity.

Because most of the specialized faunal elements typical of the wet upland forests on isolated Pacific islands are restricted to a narrow climatic zone, such species become evolutionarily trapped by the predictably sequential formation and erosion of high islands over hot spot plumes. As an island is created, such elements colonize it once it reaches sufficient elevation, then become progressively more isolated as the island erodes away into a set of altitudinally isolated upland remnants. This pattern is clearly seen in Hawaii, as evidenced by geographically circumscribed speciation in Carabidae and Reduviidae (Polhemus 2000, Liebherr & Zimmerman 2000), and is even more strikingly demonstrated in the Society Islands, where a faster rate of erosion has left many species, such as those on Moorea, confined to the apices of mere pinnacles. The fact that such specialized lineages can continue to jump from island to island is an interesting phenomenon that requires further explanation.

Another striking pattern among *Nabis* species is the apparently independent derivation of morphologically similar upland forms in the Society Islands as compared to Hawaii and the Marquesas. In the latter islands, the pattern of phallothecal sclerotization, with a pair of small hooks in the basal section and multiple large combs in the middle section of the phallotheca (see Polhemus 2002, Fig. 4), indicates a derivation from stock allied to *Reuteronabis*, an eastern Palearctic lineage, whereas in the Society Islands the phallothecal sclerite pattern, which consists of a pair of large hooks confined to the basal section of the phallotheca and an absence of combs in the middle section (Figs 10–12), indicates a derivation of the endemic upland species from *Tropiconabis*, an Indo-Australian stock. This implies that the morphological similarities displayed between the Society Island species on one hand and the Hawaii-Marquesas species on the other are the result of common selective pressures for life in perhumid montane Pacific forests, rather than the result of common ancestry. This would further imply common patterns of community assembly for invertebrate faunas

in wet Pacific forests, regardless of phylogenetic history, an important result in regard to the theory of community ecology.

Biogeography

The linear archipelagos of the insular Pacific are hypothesized to represent island chains that formed sequentially above relatively fixed hotspot plumes as the Pacific Plate moved northward and then northwestward during the Late Cretaceous to the present (Wilson 1963, Morgan 1971, 1972). As a result, the eastern Pacific in particular contains a set of northwest-to-southeast trending island groups that record the putative geological signatures of these plate-hotspot interactions. The most prominent of these are the Hawaiian, Society, Marquesas and Austral chains, all of which have been well-investigated geologically.

This pattern of sequential island formation above hotspot plumes also has biogeographic consequences for the biotas of such archipelagos. For instance, sequential speciation of insect species on progressively younger hotspot islands in the Hawaiian chain has been hypothesized by Zimmerman (1948a) and many authors since. Most of the theory and associated field investigations bearing on this question have focused on Hawaii, which provides by far the best delineated and least interrupted illustration of a hotspot process in action. From the newest eruptive volcanic seamount at Loihi, south of the island of Hawaii, to the nearly senescent atoll of Kure in the northwest, the Hawaiian archipelago preserves a 30 million year span of the erosion sequence associated with the formation and subsequent erosion of hotspot-associated islands within an archipelago (Clague 1996).

Other major hotspot associated island chains in the eastern Pacific region possess similar underlying geological dynamics and island age progressions (Dupuy et al. 1989), although in most cases the overall geological patterns are less clearly and explicitly displayed. In the Society Islands, for instance, there has been an apparent lateral “bleed” of magma into fracture zones that run perpendicular to the main axis of the hotspot trace (Guillou et al. 2005). This has resulted in the formation of island pairs of roughly similar age to either side of the putative underlying hotspot track (Bora Bora-Tupai, Raiatea-Tahaa, Maiao-Moorea). In addition, the Society Island chain exhibits a significant half million year hiatus in its central sector, with no extant islands lying between Huahine (2.4 My) and Maiao (1.9 My). Therefore, as compared to the intact geological illustration visible with the Hawaiian archipelago, it represents a much more complicated and less definitive example of the

general hotspot-associated island chain pattern.

Similarly, the case for sequential speciation of insect taxa in the Society Islands has been less explicit than in Hawaii, due in some large degree to a concentration of collection activities on Tahiti. The current study of endemic Nabidae, which incorporates collections from Raiatea, Moorea, and Tahiti, now provides some initial support for a hypothesis of Hawaiian-type sequential speciation in the Society chain as well, at least as far as endemic *Nabis* species are concerned. All eight *Nabis* species endemic to the Society Islands appear to be members of a single monophyletic lineage, and are distributed across three islands with petrological ages ranging from 3.5–0.8 My. As in Hawaii, the highest number of species is found not on the oldest island sampled, but instead on the younger and more topographically complex islands. Clearly, a more definitive evaluation of the significance of such patterns awaits a strict phylogenetic analysis, but at the very least it is now clear that the Society Islands do possess individual island endemism partitioned within an apparently monophyletic insect lineage.

Only one other putative hotspot chain in the Pacific, the Marquesas Islands, has a significant assemblage of endemic Nabidae. The Marquesas, however, provide an imperfect example of hotspot process and pattern due to the irregular age progression among the constituent islands. Although there is a general age progression from older to younger islands, running from Eiao (7.5 My) in the northwest to Fatu Hiva (1.4 My) in the southeast, several islands in the middle of the chain have yielded isotopic dates that span much of the apparent age of the archipelago as a whole. For instance, the lavas of Ua Pou have erupted over a period of four million years, from 5.6–1.6 My (Duncan et al. 1986), and those of Hiva Oa over a period of nearly 900,000 years, from 2.47–1.59 My (Woodhead 1992), thus confounding the predicted age progression. One possible explanation for this is that the hotspot trace moved across an old, inactive subduction zone, which, in a manner somewhat analogous to the Society Islands system, allowed magma to “bleed” upward through a zone of crustal weakness for anomalously long periods of time during the formation of the two aforementioned islands. Whatever the underlying cause, the age progression inconsistencies in the Marquesas render them a far less compelling illustration of the hotspot pattern than is seen in either the Hawaiian or Society archipelagos.

Within the Pacific Plate as a whole, approximately twenty-five linear volcanic chains of alleged hotspot origin have been recognized. Clouard & Bonneville (2005) compiled 1685 published radiometric ages

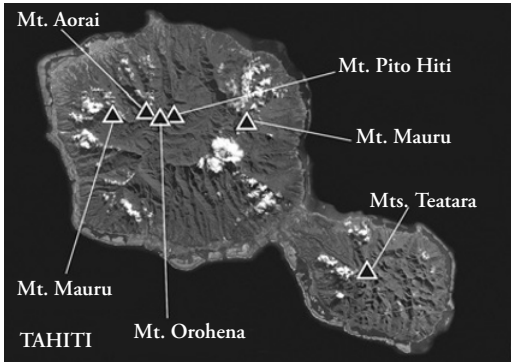


Fig. 18. Locations and names of major mountain massifs on the island of Tahiti from which flightless *Nabis* species have been collected.

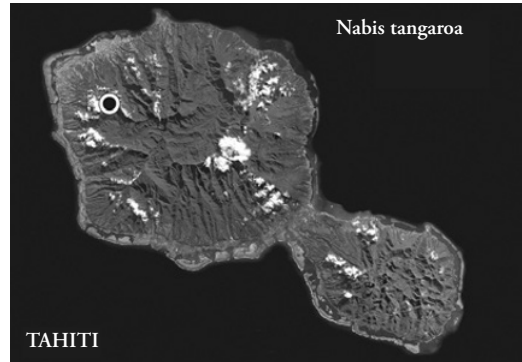


Fig. 21. Distribution of *Nabis tangaroa* on Tahiti.

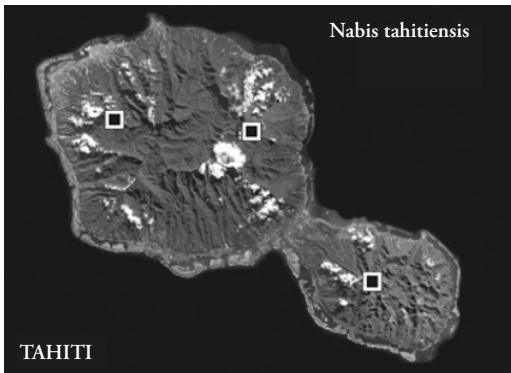


Fig. 19. Distribution of *Nabis tahitiensis* on Tahiti.

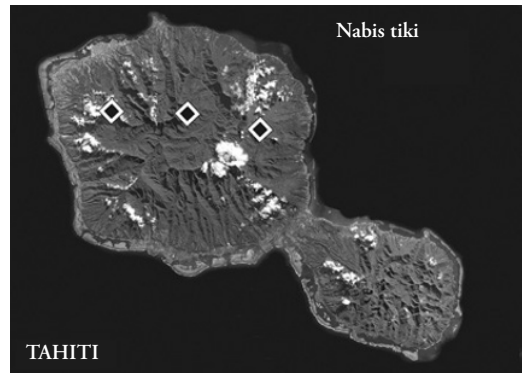


Fig. 22. Distribution of *Nabis tiki* on Tahiti.

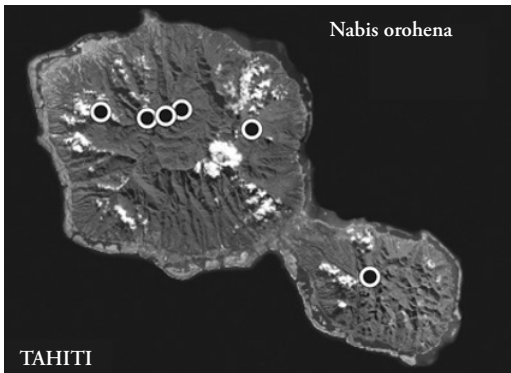


Fig. 20. Distribution of *Nabis orohena* on Tahiti.

for 290 of the volcanic islands contained within these archipelagos in order to determine whether such linear island groupings were likely to represent true hotspot chains. These authors concluded that “Among the twenty-five volcanic chains for

which ages are available, almost all show inconsistencies with the classical fixed-hotspot theory, and more inconsistencies appear as information on ages become available. These inconsistencies include wrong rate of progression (e.g., Pukapuka ridge), a trend incompatible with Pacific absolute plate motion (e.g., Marquesas Islands), lack of an active hotspot for each of the oldest chains except Louisville and Hawaii and even for a younger chain (e.g., Austral Islands), occurrence of several volcanic stages on the same seamount (e.g., Samoa Islands), no age progression at all (e.g., Northwest Pacific seamounts) with clusters of intraplate volcanism (e.g., Line Islands), and geographical distribution of seamounts away from the proposed hotspot track (e.g., Tarava and Musicians seamounts).” The only volcanic chains for which radiometric dating was unequivocally consistent with the hotspot formation hypothesis were the Austral Islands, Easter Island, the Foundation Seamounts, the Louisville chain, the Pitcairn Islands, the Society Islands, and the



Fig 23. Mossy trunks of *Weinmannia parviflora* on the Mts. Teatara massif, Tahiti, from which specimens of *N. tahitiensis* were taken via small scale pyrethrin fogging. Wet cloud forests of this type are the favored habitat for micropterous *Nabis* species throughout the Society Islands.

Hawaii-Emperor chain. As noted above, all of these except the Louisville, Austral, and Hawaii chains now lack an active hotspot. Among the latter three chains, none of the Louisville volcanoes are currently above sea-level, although forty of them were emergent islands at some time in the past (Lonsdale 1988), and the Austral Islands present anomalies in terms of radiometric dating on Rurutu and Tubuai (see discussion in Polhemus & Polhemus 2008).

Given the absence or near-absence of endemic nabid species on the Australs, the Pitcairn Group, and Easter Island, and the geological anomalies noted for the Marquesas, the Society Islands thus represent the best available comparative system for assessing whether sequential speciation of *Nabis* species on hotspot islands is a replicated pattern in the Pacific, or an anomaly restricted to Hawaii. Although the current evidence suggests that sequential nabid speciation has indeed occurred in the Society chain,

a more detailed analysis of species relationships, based on both morphological and molecular techniques, will be necessary to unequivocally accept this hypothesis.

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