



***Tropidosteptes pacificus* (Van Duzee, 1921), another Nearctic mirid in Europe (Hemiptera: Heteroptera: Miridae: Mirinae)**

BEREND AUKEMA¹, MICHAEL D. SCHWARTZ² & KEES DEN BIEMAN³

¹Zoölogisch Museum, Afdeling Entomologie, Plantage Middenlaan 64, 1018 DH Amsterdam, The Netherlands.
E-mail: baukema@hetnet.nl

²Research Associate, Division of Invertebrate Zoology, American Museum of Natural History c/o Biodiversity Theme ECORC, Agriculture and Agri-Food Canada, Ottawa, Ontario K1A 0C6, Canada. E-mail: mschwartz@amnh.org

³t Hofflandt 48, 4851 TC Ulvenhout, The Netherlands. E-mail: cdbieman@planet.nl

The establishment of European Miridae in North America is a frequent occurrence. Wheeler and Henry (1992) listed 55 European mirids adventive to North America in their synthesis of Holarctic Miridae. The most likely pathway for these introductions is with the importation of nursery stock from Europe. Establishment of Nearctic species in Europe, on the contrary, is very rare and thus far limited to only one species, *Tupiocoris rhododendri* (Dolling), described from England and also established in The Netherlands, Belgium, and Germany (Aukema et al., 2007; Rabitsch, 2008). In this paper, *Tropidosteptes pacificus* (Van Duzee) is reported from The Netherlands, and represents a second case.

The genus *Tropidosteptes* Uhler, 1878 includes 52 species and is restricted to the Nearctic and Neotropical Regions (Schuh, 1995). There is no comprehensive key to the genus. Here we redescribe *T. pacificus*, provide a dorsal habitus photograph, illustrate the male genitalia, and give information on its distribution and biology.

Abbreviations used: CNCI—Canadian National Collection of Insects, Ottawa, Canada; USNM—United States National Museum of Natural History, Washington, D.C., USA.

***Tropidosteptes pacificus* (Van Duzee)**

Neoborus amoenus: Parshley, 1921: 20 (note); Downes, 1927: 13 (list).

Neoborus pacificus Van Duzee, 1921: 121 (type locality: Corvallis, Oregon, USA); Slater, 1950: 20, pl. 1, fig. 8 (female genitalia).

Tropidosteptes pacificus: Wheeler and Henry, 1974 (biology); Schwartz and Scudder, 2000: 255 (discussion); Maw et al., 2000: 14 (list).

Diagnosis. Recognized by uniform pale green to pale reddish brown coloration with dark brown spot on each callus, variable, dispersed, short dark stripes on the distal lateral portion of the femora, and “knee” spot at base of tibia, the densely punctate dorsum, especially on the periphery and midline of the frons and on the pronotum including between and anterior of the calli, the impunctate collar, and the genitalia. With European Mirini keys (Southwood, 1959; Stichel, 1958; Wagner, 1974) it runs to the genus *Camptozygum* Reuter, 1896, from which it can be easily distinguished by its coloration given above, the short distance between the calli, and the male genitalia.

Redescription. *Male* (Fig. 1). Coloration: Uniform pale green to pale reddish brown, sometimes with diffuse brown markings; head with apex of clypeus dark brown, sometimes more extensive mark on clypeus and centrally on mandibular plate; first antennal segment pale yellow, often with a longitudinal brown streak dorsally, sometimes brown; second segment usually all brown, third and fourth segments dark brown, narrowly pale at joints; labium pale green to pale reddish brown with apex black. Pronotum uniform pale green to pale reddish brown; each callus with central dark brown spot; collar and posterior margin pale yellow; mesoscutum pale green to pale yellow; scutellum pale green to pale yellow with side margins and tip yellowish, sometimes with diffuse brown pair of bilateral marks. Hemelytra uniform pale green to pale yellow, sometimes corium widely brown apically; membrane pale with veins pale green to pale yellow, sometimes base of anal vein and membrane distal to large areole dusky brown. Legs pale yellow; femora usually with two brown subapical bars dorsally; tibiae brown basally, often with short brown dash dorsally in basal half; last tarsomere apically dark brown. Venter pale green to pale reddish brown; thoracic pleura dorsally reddish brown to

brown. Surface and vestiture: Dorsum closely and coarsely punctate; with dense, short, golden, decumbent vestiture; antennal segment I glabrous, other segments with both short and long semidecumbent setae. Head ventral to antennal insertion, frons laterally, and temporal areas smooth, otherwise closely punctate. Pronotum strongly punctate; punctate between calli and collar; calli and collar impunctate; scutellum closely punctate with apex less punctate; hemelytra strongly punctate. Structure: Moderately large, obovate. Head short and vertical, transverse basal carina distinct; eyes large and prominent, projecting well beyond pronotal anterior angle; antennal segment about half width of scutellum, antennal segment I slender; labium reaching to hind coxae, first segment swollen. Pronotum trapeziform, collar prominent, lateral margins of pronotum rounded or carinate; ostiolar peritreme large. Male genitalia (Figs 2–5): genital segment without tubercles dorsal to paramere insertions; phallosome with well sclerotized, prominent flange projection from right dorsal margin; endosoma with ductus seminis expanded subdistally, secondary gonopore wide, oval, large trough distal to secondary gonopore deep and forming apex of broad basal process left of secondary gonopore; spinose spicule right of secondary gonopore, straight and longer than membrane; left paramere sparsely setose, sensory lobe moderately prominent, steep-sided, apex narrow pointed; right paramere elongate, slightly thickened medially, apex small, glabrous.

Measurements: (n = 2; average and range in mm): Total length 4.75 (4.30–5.10); width 1.84 (1.73–2.00). Head width 1.05 (1.00–1.07); vertex width 0.45 (0.42–0.48). Length of antennal segment I, 0.41 (0.37–0.47); II, 1.10 (1.00–1.38); III, 0.42 (0.37–0.47); IV, 0.34 (0.33–0.37). Labium length 1.43 (1.35–1.53). Pronotal width 1.67 (1.53–1.77). Note: measurements of the two males collected in The Netherlands fully match these measurements.

Female: As in male except body larger, vertex wider.

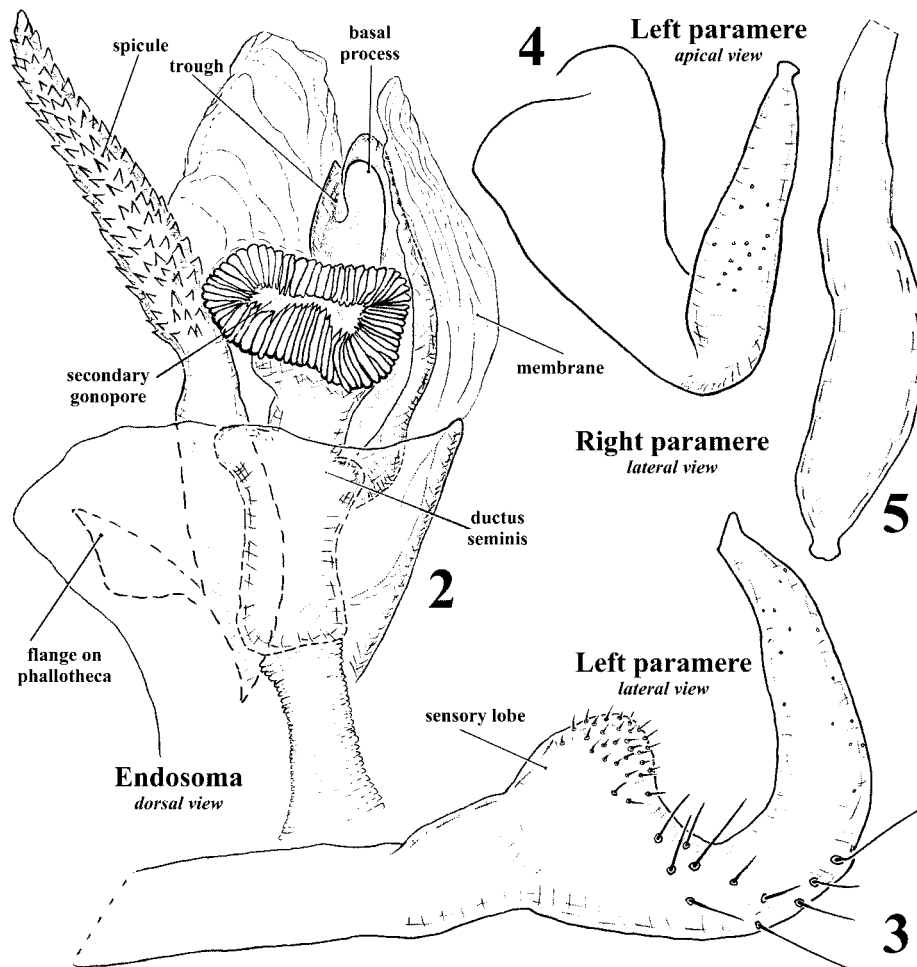
Coloration: Antennal segment II yellow basally and with up to apical third dark brown. Thoracic pleura dorsally less reddish brown to brown than in male; abdominal sterna often with fuscous C-shaped marks laterally. Structure: Abdomen flattened. Female genitalia: sclerotized rings as documented in Slater (1950) for *T. cardinalis* Uhler; posterior wall illustrated in Slater (1950; pl.1, fig. 8).

Measurements: (n = 10; average and range in mm): Total length 4.70 (4.40–5.80); width 2.12 (2.00–2.30). Head width 0.99 (0.97–1.02); vertex width 0.53 (0.50–0.55). Length of antennal segment I, 0.43 (0.42–0.43); II, 1.14 (1.07–1.20); III, 0.42 (0.40–0.43); IV, 0.33 (0.30–0.33). Labium length 1.35 (1.33–1.37). pronotum width 1.56 (1.50–1.60).

Specimens examined. CANADA: British Columbia: Victoria [48.43333°N 123.35°W], 10 Oct 1927, W. Downes, *Fraxinus* sp. (Oleaceae), 3♀ (CNCI); 10 Jul 1931, W. H. A. Preece, 1♂, 5♀ (CNC). **USA: California: Alameda Co.:** Oakland Hills [37.7581°N 122.1204°W], 21 May 1950, W. F. Barr, 1♂ (CNCI). **Humboldt Co.:** Shively [40.43083°N 123.96861°W], 19 Jun 1959, Kelton and Madge, 2♀ (CNCI). **Tuolumne Co.:** Oakland Recreation Camp [38.00222°N 120.13611°W], 20 Jul 1928, R. L. Usinger, 1♂, 3♀ (CNCI). **Oregon: Benton Co.:** Corvallis [44.56472°N 123.26083°W], 20 Jun 1925, W. Downes, 3♀; 15 May 1941, Schuh and Gray, *Fraxinus* sp. (Oleaceae), 1♀ (CNCI). **Polk Co.:** Independence [44.85139°N 123.18556°W], 03 Jul 1934, N. P. Larson, 1♀ (CNCI). **THE NETHERLANDS: Province of Noord-Brabant:** Chaam, Nature Reserve Chaamse Beek, 15 Jun 2007, K. den Bieman, *Fraxinus excelsior*, 1♂ (K. den Bieman); 20 Jun 2008, K. den Bieman, *F. excelsior*, 1♂ (B. Aukema).



FIGURE 1. Dorsal habitus of *Tropidosteptes pacificus* (Van Duzee) from the Netherlands (Photo: Theodoor Heijerman, Wageningen).



FIGURES. 2-5. 2. Endosoma. 3, 4. Left paramere. 5. Right paramere, Canada.

Distribution. In North America from British Columbia south in the Pacific northwestern United States to northern California. The records from Arizona and Utah reported in Henry and Wheeler (1974) should be confirmed in light of the discussion below. Reported as introduced into Pennsylvania with nursery stock from the Pacific Northwest (Wheeler & Henry, 1974). In Europe introduced into The Netherlands province of Noord-Brabant.

Wheeler and Henry (1974) based the distribution of *T. pacificus* on specimens retained in the United States National Museum. However, specimens housed in the CNCI from Arizona (Sierra Vista), California (Palo Cedro), Colorado (Colorado Nat'l. Mon.), and Durango, Mexico - which superficially resemble *T. pacificus* in general color and dark brown markings - are correctly identified as *T. vittifrons* (Knight). The overall size of the latter species is smaller (σ : 4.20 and ♀ : 4.50 mm) and more narrow (σ : 1.65 and ♀ : 1.80 mm) than in *T. pacificus*; and in the endosoma of the former species, the trough is more narrow, the basal process is smaller, and the spicule is shorter (not reaching beyond the membrane). In paratypes of *T. vittifrons* the frons is marked with a narrow black medial stripe, not found in the CNCI specimens nor in *T. pacificus*. It is our contention that the natural distribution of *T. pacificus* is more or less restricted to the Pacific Northwest and not in states of the intermountain west. Only reexamination of the USNM material will clarify this issue.

Biology. Collected on ash (*Fraxinus* sp.) in British Columbia. Parshley (1921) and Downes (1927) reported this species as *T. amoenus* Reuter on poplar (*Populus* sp.) and maple (*Acer* sp.) trees near the docks in Victoria; this record was repeated in Henry and Wheeler (1988) and clarified by Schwartz and Scudder (2000). Found on Oregon ash (*F. latifolia* Benth.) and velvet ash (*F. velutina* Torr.) in California (Usinger, 1945) and introduced into Pennsylvania on green ash (*F. pennsylvanica* Marsh.) (Wheeler & Henry, 1974). Collected on European ash (*F. excelsior* L.) in The Netherlands.

Tropidosteptes pacificus has two annual generations in the USA and overwinters in the egg stage. Eggs are inserted in the petioles or along the midribs of the leaves (first generation) or in the woody tissue (second generation).

Overwintered eggs hatch in late February to early March and adults mature in April. The second generation disappears in July.

The species is known as a pest of ornamental ashes in the western United States. Feeding produces distinct spotting and bleaching of foliage (foliar chlorosis), curling of leaves, and wilting of branches. Temporarily defoliation may incidentally occur when populations are large (Usinger, 1945; Wheeler & Henry, 1974; Wheeler, 2000, 2001), but apparently ash trees usually tolerate the sucking damage (Dreistadt, 1994).

Discussion. *Tropidosteptes pacificus* was collected in 2007 and 2008 on the same European ash trees in a natural environment. The origin of the introduction is not clear, but the most probable pathway seems to be as eggs in imported plant material of North American ash trees. Ornamental trees of, for instance, *Fraxinus pennsylvanica*, are for sale in the Netherlands, but usually grown from seed or imported from nurseries in Italy or Spain, and not imported directly from the USA or Canada. It remains to be seen if the species will spread and become a nuisance.

Acknowledgements. Natuurmonumenten gave permission for research in Nature Research De Chaamse Beek, and Theodoor Heijerman (Wageningen) made the habitus photo.

References

- Aukema, B., Bruers, J. M. & Viskens, G. M. (2007) Nieuwe en zeldzame Belgische wantsen II (Hemiptera: Heteroptera). *Bulletin de la Société Royale Belge d'Entomologie*, 143, 83–91.
- Downes, W. (1927) A preliminary list of the Heteroptera and Homoptera of British Columbia. *Proceedings of the Entomology Society of British Columbia*, 23, 1–22.
- Dreistadt, S. H. (1994) Pests of landscape trees and shrubs: an integrated pest management guide. *University of California, Division of Agriculture and Natural Resources Publication*, 3359, i–iv, 1–327.
- Henry, T. J. & Wheeler, Jr., A. G. (1988) Family Miridae Hahn. In: Henry, T. J. & Froeschner, R. C. (Eds), *Catalog of the Heteroptera, or true bugs of Canada and the continental United States*. E. J. Brill, Leiden, pp. 251–507.
- Maw, H. E. L., Footitt, R. G., Hamilton, K. G. A. & Scudder, G. G. E. (2000) *Checklist of the Hemiptera of Canada and Alaska*. NRC Research Press, Ottawa, Ontario, Canada, 220 pp.
- Parshley, H.M. (1921) A report on some Hemiptera from British Columbia. *Proceedings of the Entomology Society of British Columbia*, 18, 13–24.
- Rabitsch, W. (2008) Alien True Bugs of Europe (Insecta: Hemiptera: Heteroptera). *Zootaxa*, 1827, 1–44.
- Schwartz, M. D. & Scudder, G. G. E. (2000) Miridae (Heteroptera) new to Canada, with some taxonomic changes. *Journal of the New York Entomological Society*, 108, 248–267.
- Schuh, R.T. (1995) *Plant bugs of the world (Insecta: Heteroptera: Miridae): Systematic catalog, distributions, host list, and bibliography*. Entomological Society, New York, xii, 1329 pp.
- Slater, J. A. (1950) An investigation of the female genitalia as taxonomic characters in the Miridae (Hemiptera). *Iowa State College Journal of Science*, 25, 1–81.
- Southwood, T. R. E. & Leston, D. (1959) *Land and water bugs of the British Isles*. Warne, London, xi, 436 pp.
- Stichel, W. (1958) *Illustrierte Bestimmungstabellen der Wanzen. II. Europa. (Hemiptera-Heteroptera Europae)* 2. Stichel, Berlin-Hermsdorf, pp. 705–907.
- Usinger, R. L. (1945) Biology and control of ash plant bugs in California. *Journal of Economic Entomology*, 38, 585–591.
- Van Duzee, E. P. (1921) Characters of some new species of North American hemipterous insects, with one new genus. *Proceedings of the California Academy of Sciences* (4), 11, 111–134.
- Wagner, E. (1974) Die Miridae Hahn, 1831, des Mittelmeerraumes und der Makaronesischen Inseln (Hemiptera, Heteroptera), Teil 1. *Entomologische Abhandlungen herausgegeben vom Staatlichen Museum für Tierkunde Dresden*, 37, Suppl. (1970-1971), i–ii, 1–484.
- Wheeler, A. G. Jr. & Henry, T. J. (1974) *Tropidosteptes pacificus*, a western ash plant bug introduced into Pennsylvania with nursery stock (Hemiptera: Miridae). *United States Department of Agriculture Cooperative Economic Insect Report*, 24, 588–589.
- Wheeler, A. G. Jr. & Henry, T. J. (1992) *A synthesis of the Holarctic Miridae (Heteroptera): distribution, biology, and origin, with emphasis on North America*. Entomological Society of America, Lanham, Maryland, v, 282 pp. (Thomas Say Foundation Monographs XV).
- Wheeler, A. G. Jr. (2000) Plant bugs (Miridae) as plant pest. In: Schaefer, C.W. & Panizzi, A. R. (Eds), *Heteroptera of economic importance*. CRC Press, Boca Raton etc., pp. 37–83.
- Wheeler, A. G. Jr. (2001) *Biology of the plant bugs (Hemiptera: Miridae). Pests, Predators, Opportunists*. Cornell University Press, Ithaca and London, xv, 507 pp.