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TEMPYRA BIGUTTULA (HEMIPTERA: HETEROPTERA: RHYPAROCHROMIDAE), A NEW ALIEN SPECIES IN THE FAUNA OF CROATIA

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Kment, P.: ***Tempyra biguttula*** **(Hemiptera: Heteroptera: Rhyparochromidae), a new alien species in the fauna of Croatia. Nat. Croat., Vol. 33, No. 1., 149-158, 2024, Zagreb.**

Tempyra biguttula Stål, 1874 (Hemiptera: Heteroptera: Lygaeoidea: Rhyparochromidae: Rhyparochrominae: Udeocorini) is a minute seed bug species native in the USA, Mexico and Caribbean. The first record of this alien species in Croatia is provided here based on a single specimen attracted to light in the Pelješac Peninsula (southern Dalmatia) in 2023. This finding is in accordance with the current spread of the species in the Mediterranean area from west to east. A review of the available data concerning the biology and distribution of the species is provided. The identification of *T. biguttula* within Euro-Mediterranean fauna is addressed and its distribution in that area is mapped. The unusual teratological case of the bilateral asymmetrical oligomery of the antennae of the examined specimen is described.

Key words: Hemiptera, Heteroptera, Rhyparochromidae, antenna, invasion, new record, oligomery, teratology, Croatia, Palaearctic Region

Kment, P.: ***Tempyra biguttula*** **(Hemiptera: Heteroptera: Rhyparochromidae), nova strana vrsta u hrvatskoj fauni. Nat. Croat., Vol. 33, No. 1., 149-158, 2024, Zagreb.**

Tempyra biguttula Stål, 1874 (Hemiptera: Heteroptera: Lygaeoidea: Rhyparochromidae: Rhyparochrominae: Udeocorini) je sitna vrsta stjenice koja potječe iz SAD, Meksika i Kariba, a hrani se sjemenkama. Rad donosi prvi nalaz jednog primjerka te strane vrste za Hrvatsku, privučenog svjetlom na Pelješcu (južna Dalmacija) 2023. godine. Nalaz je u skladu s trenutnim širenjem vrste sa zapada na istok Sredozemlja. Daje se pregled dostupnih podataka o biologiji i rasprostranjenosti vrste. Raspravlja se o determinaciji *T. biguttula* u fauni europskog dijela Sredozemlja te je kartirana njena rasprostranjenost na tom području. Kod uhvaćenog primjerka opisan je neobični slučaj deformacije, oligomerije ticala.

Ključne riječi: Hemiptera, Heteroptera, Rhyparochromidae, ticalo, invazija, novi nalaz, oligomerija, teratologija, Hrvatska, Palaearktik

INTRODUCTION

The biodiversity changes in the warming world receive a lot of attention usually in connection with invasive alien species introduced from distant areas by human assistance (e.g., Walther *et al.*, 2009; Pyšek *et al.*, 2020). The fauna of Croatia is not an exception with six exotic true bug species recorded from the country in the past two decades: *Leptoglossus occidentalis* Heidemann, 1910 (Coreidae) (first record in 2004; Tescari, 2004; Kment & Baňař, 2008), *Corythucha arcuata* (Tingidae) (2013; Hrašovec *et al.*, 2013), *Halyomorpha halys* (Pentatomidae) (2017; Šapina & Šerić Jelaska, 2018),

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Belonochilus numenius (Say, 1832) (Lygaeidae) (2019; Martinović *et al*., 2019) and *Zelus renardii* Kolenati, 1857 (Reduviidae) (2019; Kment & van der Heyden, 2022; Kulijer *et al*., 2024). In this paper I provide the first record of another alien true bug species, a representative of the genus *Tempyra* Stål, 1874 (Rhyparochromidae: Rhyparochrominae: Udeocorini). It is represented by two described species: *T. testacea* Barber, 1949, limited to south-west USA (Arizona and California) (Barber, 1949; Ashlock & Slater, 1988), and *Tempyra biguttula* Stål, 1874. The latter species was described from Texas (Stål, 1874) and later recorded from other areas of the USA, Canada and Caribbean, but also introduced to other parts of the world, Hawaiian Islands, the Galapagos, Argentina as well as the Mediterranean (e.g., Kirkaldy, 1910; Froeschner, 1985; Ashlock & Slater, 1988; Carpintero *et al*., 2006; Baena & Torres, 2012).

MATERIALS AND METHODS

Photographs were made using a Canon MP-E 65 mm macro lens attached to a Canon EOS 550D camera. Final images were stacked from multiple layers using Helicon Focus 5.1 Pro software. Uncoated specimens were examined by a Hitachi S-3700N environmental scanning electron microscope at the Department of Paleontology, National Museum, Prague. The images were edited using Adobe Photoshop CS (Version 8.0). The distribution map was created using SimpleMappr (Shorthouse, 2010). The terminology concerning antennal teratology follows Štusák & Stehlík (1978).

RESULTS

***Tempyra biguttula* Stål, 1874**

(Figs. 1–7)

Tempyra biguttula Stål, 1874: 157 (original description)

Tempyra biguttata (incorrect subsequent spelling): Froeschner (1944: 664)

Epelytes drapetes Kirkaldy, 1910: 119 (original description). Synonymised by Zimmerman (1948: 119).

Epelytes draptes (incorrect subsequent spelling): Usinger (1936: 209), Zimmerman (1948: 119)

Material examined. CROATIA: Dubrovačko-Neretvanska County: Pelješac Peninsula, Žuljana, Vučine bay, 42.887271°N 17.449646°E, campsite, 19.ix.2023, 1 male, P. Kment lgt. & det. (coll. National Museum of the Czech Republic, Prague). The single specimen was attracted to a computer screen at about 23:00.

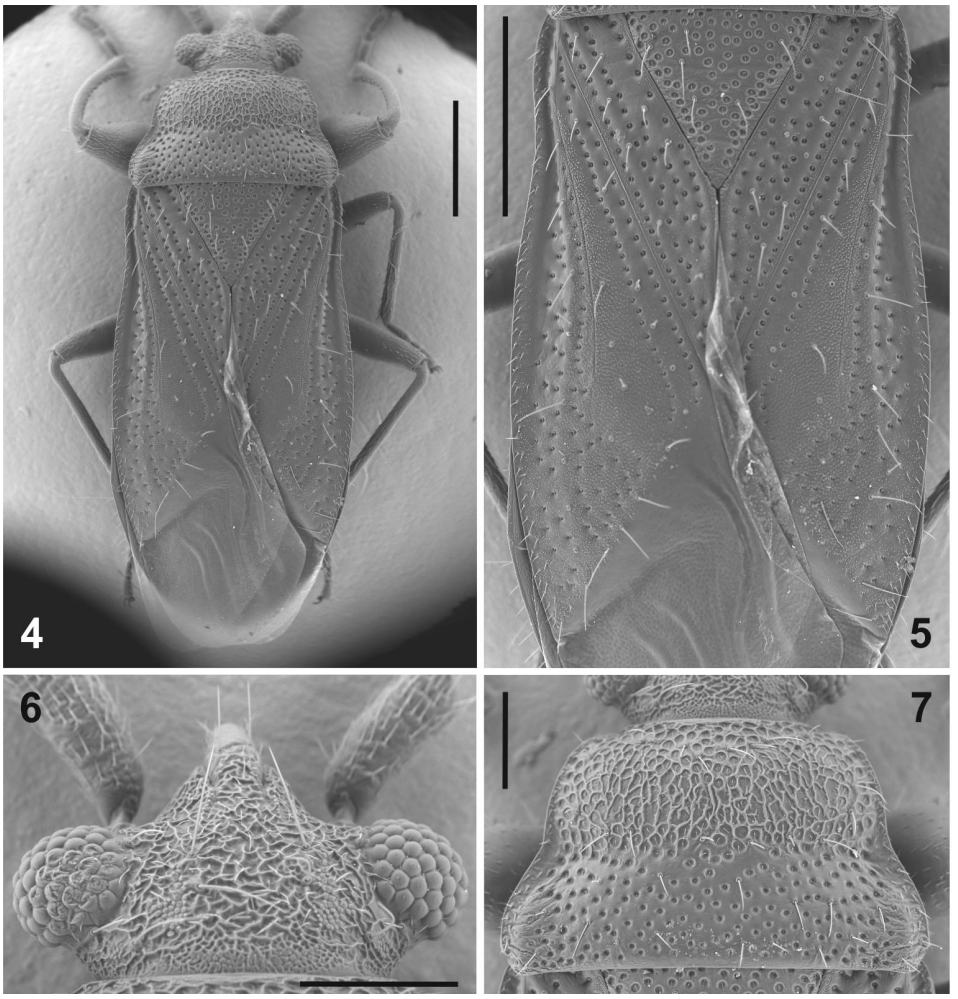
Teratology. The antennae of the examined specimen show an unusual case of bilateral but asymmetrical oligomery. The left antenna is unsegmetnted (monomerous) (Figs 1, 2), morphologically resembling the normally spindle-shaped antennomere IV, but considerably longer and slightly bent laterally. The right antenna is trimerous with apparent anarthrogenesis of the fused antennomere II+III (Figs 1, 3).

Identification. For identification within North American fauna see generic keys and redescriptions by Blatchley (1926) and Torre-Bueno (1946) and distinguishing characters of *T. biguttula* and *T. testacea* by Barber (1949). For a key to Caribbean fauna see Baranowski & Slater (2005), for the Galapagos see Froeschner (1985) and for the fauna of Hawaii see Zimmerman (1948). The habitus drawing was provided by Zimmerman (1948: 118, Fig. 43) and photos e.g. by Baena & Torres (2012: Fig. 1), Henry *et*

Figs. 1–3. *Tempyra biguttula* Stål, 1874, male from Croatia: Žuljana (body length 3.00 mm). 1 – dorsal habitus; 2–3 – scanning electron micrographs of oligomerous antennae: 2 – monomerous left antenna (magnification 200×); 3 – trimerous right antenna (90×). Scale bars: 0.2 mm.

al. (2015: Fig. 36), Maurel & Porteneuve (2018: Fig. 2), Rattu & Dioli (2018: Fig. 1), Dioli *et al.* (2021: Fig. 1), and Çerçi *et al.* (2021: Fig. 36B). Body length of adults is 3.0–3.2 mm (Blatchley, 1926; Cervantes Peredo & Brailovsky, 2004).

Tempyra biguttula is the only European representative of the tribe Udeocorini. This is a rather small tribe of Rhyparochrominae including 17 genera distributed mostly in the Australian Region (11 genera); four genera are distributed in America and one genus occurs in Africa (*Serranegra* Lindberg, 1958) and one in India (*Fontejanus* Breddin, 1904) (Slater, 1964; Sweet, 1967; Slater & O'Donnell, 1995; Dellapé *et al.*, 2023).



Figs. 4–7. *Tempyra biguttula* Stål, 1874, male from Croatia: Žuljana. scanning electron micrographs: 4 – body in dorsal view (magnification 42×); 3 – scutellum and hemelytra (75×); 6 – head in dorsal view (210×); 7 – pronotum in dorsal view (130×). Scale bars: 4–5 – 0.5 mm, 6–7 – 0.2 mm.

The key to the tribes of Euro-Mediterranean Rhyparochromidae was provided by Péricart (1999a: 111–112). This key must be modified as follows (cf. Sweet, 1967; Maurel & Porteneuve, 2018):

17 (18) Abdominal stigma III ventral; only two vestiges of larval evaporative areas, respectively on the sutures of tergites IV–V and V–VI. Abdomen often black and strongly sclerotized. Tribe 8. Gonianotini (p. 397)

18 (17) Abdominal stigmata III and IV dorsal; generally 3 vestiges of larval evaporative areas on the sutures of tergites III–IV, IV–V and V–VI, respectively (exceptions: gen. *Icus* Fieber, 1861 and *Proderus* Fieber, 1861, Megalonotini). 18a

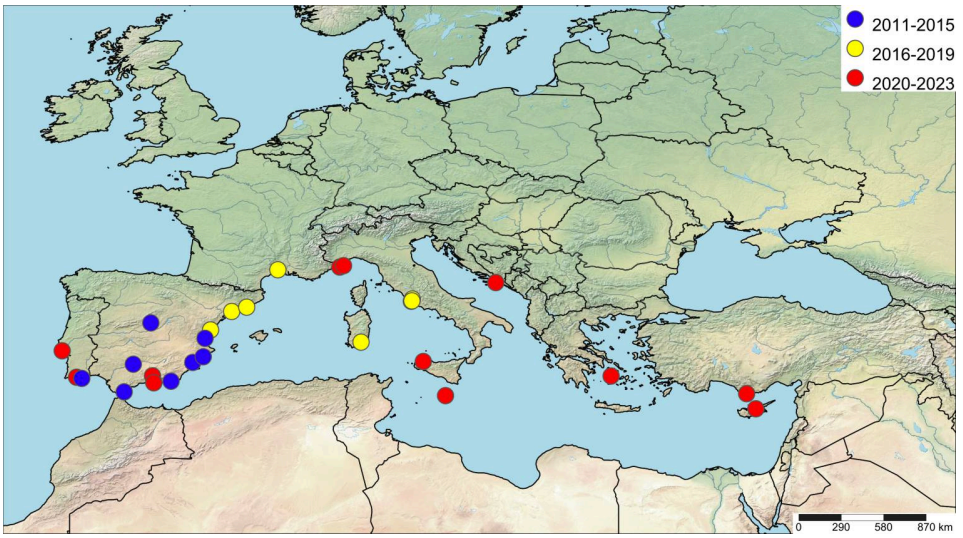


Fig. 8. Current distribution of *Tempyra biguttula* Stål, 1874 in the Mediterranean.

18a (18b) Abdominal stigma II dorsal. (Pronotum carinate laterally, inner laterotergites present.) . . . . . Tribe Udeocorini

18b (18a) Abdominal stigma II ventral. (Pronotum carinate laterally, inner laterotergites present.) 19

19 (20) Pronotum not rimmed laterally or with only a thin rim. Suture of abdominal tergites III–IV simple, like the following. . .Tribe 9 Megalonotini (vol. 3: p. 83) (See also myrmecomorph gen. *Bledionotus* Reuter, 1878, Geocoridae: Bledionotinae, p. 106).

20 (19) Lateral borders of the pronotum broadly lamellar along the entire length. Suture of the abdominal tergites III–IV forming a groove which is clearly distinguishable from the sutures of the following tergites (Péricart 1999a: fig. 181d). . . . . Tribe 10 Rhyparochromini (vol. 3 p. 185)

Among the Euro-Mediterranean fauna of Rhyparochromidae the genera *Taphropeltus* Stål, 1872 and *Notochilus* Fieber, 1864 (both Drymini) may resemble *Tempyra* in shape and size, but they differ by the position of abdominal stigmata and trichobothria specific for their tribe as well as the colouration pattern, especially of antennae, pronotum and hemelytra (see Péricart, 1999a). *Tempyra biguttula* (Fig. 1) is characterised by pale antennae and legs, dark pronotum (with posterior lobe slightly paler), black scutellum, clavus and anterior third of corium cinnamomeous, corium in posterior two thirds black with white round spot situated anteapically-laterally, and dark membrane with paler apex. The Eremian *Anepsiocoris encaustus* (Puton, 1869) (Megalonotini) has a similar general colouration pattern, but it is slightly larger (3.5–4.6 mm), much paler (especially head, pronotum and scutellum being brownish, not black) and is also differentiated by the tribal characters (Péricart, 1999b; Linnavuori *et al.*, 2014).

Biology. In its native range *Tempyra biguttula* seems a rare species, its biology and ecology being virtually unknown (see Sweet, 1977; Baranowski & Slater, 2005). Zim-

merman (1948) speculated about it having predatory habits, which are rather improbable. Most often it is collected near lights, sometimes several specimens at once, as has been documented throughout its distributional range: Caribbean Islands (blacklight trap or mosquito light trap; Baranowski & Slater, 2005), Hawaii (Zimmerman, 1948), Galapagos (UV blacklight; Froeschner, 1985), Argentina (Melo *et al.*, 2011; Dellapé & Carpintero, 2012), Italy (UV light; Rattu & Dioli, 2018), Spain (Biodiversidad Virtual, 2023) and Croatia (on a laptop screen, this paper).

In Hawaiian Islands it was found in a pod of *Canavalia* sp. (Fabaceae) (Kirkaldy, 1910; Zimmerman, 1948). Hunter *et al.* (1913) reported a single specimen incidentally associated with cactus in April in Texas. In the USA it was intercepted twice in orchid shipments from Mexico (Wheeler *et al.*, 1950, in *Laelia anceps*; Hunt, 1956, unspecified orchid).

The adults occur throughout the year (e.g., Dioli *et al.*, 2021; Biodiversidad Virtual, 2023), hibernating in the northern areas of its distribution. Barber (1914) reported two specimens hibernating under sycamore (*Platanus occidentalis*) tree bark in Maryland. Froeschner (1944) found a single dead specimen of this species in a hole in one of the shelf fungi (polypores) on February 29 in Missouri. In the southern areas the species is probably active throughout the year. The only record and picture of larvae was taken on September 25 at Ostia Antica, Italy (Dioli *et al.*, 2021: Fig. 1b).

Outside of the native range the species has often been found in or near human dwellings. In Argentina it was collected at ranger house in Chaco N.P. (Melo *et al.*, 2011). The first European specimen was found in October by the sifting of the decomposed remains of harvested vegetables (Baena & Torres, 2012). The first French specimen was collected in a flat (Maurel & Porteneuve, 2018) as were many of the Spanish records (Biodiversidad Virtual, 2023). The first Italian record resulted from an ultraviolet light trap in the periphery of an urban area (Rattu & Dioli, 2018). Additional Spanish records were found mostly in urban or suburban areas, in gardens, orchards or fields, sometimes abandoned, ruderal vegetation and scrubland (Dioli *et al.*, 2021; Biodiversidad Virtual, 2023) but also in bushes along the coastline, in forest and ravines (Biodiversidad Virtual, 2023). The first Croatian record was captured in a tourist campsite situated near a small village (this paper). A group of adults and larvae was observed under a dead trunk resting on sandy soil (nearby, but at least 100 meters away, there were pine trees and *Eucalyptus*) (Dioli *et al.*, 2021: Fig. 1b). In Italy it was twice (in August and December) collected under the bark of the non-native *Eucalyptus* (Dioli *et al.*, 2021: Fig. 1a). Also in Spain, in one case specimens of *T. biguttula* were spotted under trunks in a thicket near the dunes of Castellón (Dioli *et al.*, 2021).

Distribution. Native range: USA: ?Arizona (BugGuide, 2023; Baena & Torres, 2012), ?California (BugGuide, 2023), ?Colorado(BugGuide, 2023), Florida (Baranowski & Slater, 2005, no exact record), Kansas (Ashlock & Slater, 1988, no exact record), Maryland (Barber, 1914; Ashlock & Slater, 1988), Missouri (Froeschner, 1944; Ashlock & Slater, 1988), South Carolina (BugGuide, 2023); Texas (Stål, 1874; Hunter *et al.* 1913; Blatchley, 1926; Scudder, 1977; Ashlock & Slater, 1988); Mexico: Baja California Sur (Slater & Brailovsky, 2000, no exact record), Coahuila (H. Brailovsky, pers. comm.), Hidalgo (H. Brailovsky, pers. comm.), Jalisco (Slater & Brailovsky, 2000; Cervantes Peredo & Brailovsky, 2004), Morelos (H. Brailovsky, pers. comm.), Nayarit (H. Brailovsky, pers. comm.), Oaxaca (Slater & Brailovsky, 2000, no exact record), San Luis Potosí (Slater & Brailovsky, 2000, no exact record), Sinaloa (Slater & Brailovsky,

2000, no exact record), Tamaulipas (H. Brailovsky, pers. comm.), Veracruz (Slater & Brailovsky, 2000, no exact record); Bahamas: Eleuthera (Baranowski & Slater, 2005, as Eleuthra); Cuba (Baranowski & Slater, 2005); Jamaica (Baranowski & Slater, 2005); Puerto Rico (Baranowski & Slater, 2005); Turks and Caicos Islands: Providenciales (Baranowski & Slater, 2005). Introduced to Argentina: Buenos Aires (Dellapé & Carpintero, 2012), Chaco (Melo *et al*., 2011), Chubut (Carpintero *et al*., 2006), Entre Rios (Carpintero *et al*., 2006); Galapagos Islands: Santa Cruz (Froeschner, 1985); Hawaii: Kauai (Kirkaldy, 1910, as *Epelytes drapetes*; Zimmerman, 1948), Niihau (Beardsley & Tuthill, 1959), Oahu (Usinger, 1936, as *Epelytes draptes*; Zimmerman, 1948); France (Maurel & Porteneuve, 2018), Croatia (this paper), Greece (van der Heyden, 2023), Italy (including Sardinia and Sicily) (Rattu & Dioli, 2018, Dioli *et al*., 2021), Malta (van der Heyden, 2023), Portugal (Maurel & Porteneuve, 2018; Dioli *et al*., 2021); Spain (Baena & Torres, 2012; Maurel & Porteneuve, 2018; Dioli *et al*., 2021); Cyprus (van der Heyden, 2023), Turkey (Anatolia) (Çerçi *et al*., 2021).

BugGuide (2023) includes also records of *T. biguttula* from Arizona, California and Colorado, but they may refer to the similar *T. testacea*, a species not included on that web page (for habitus photo of the holotype of *T. testacea* see Dellapé *et al*., 2023).

DISCUSSION

The species was introduced to the Hawaiian Islands (prior to 1908, Zimmerman, 1948), Galapagos (prior to 1970, Froeschner, 1985) and probably also to Argentina (prior to 1980, Carpintero *et al*., 2006; Henry *et al*., 2015). In Europe it was found for the first time in 2011 in Spain (Baena & Torres, 2012), subsequently spreading west to Portugal and eastwards through the northern Mediterranean up to Anatolia (see Tab. 1). Concerning its arrival in Europe, Baena & Torres (2012) suggested that the most probable route of entry was via the importation of fruit and vegetables for human consumption or via ornamental plants. According to Baena & Torres (2012) the first Spanish records are associated with important transport hubs: Almería is home to major fruit and vegetable importers and exporters, La Línea is very close to a large commercial port and Córdoba is an important railway junction. Similarly, Rattu & Dioli (2018) mentioned that the first record in Sardinia was found near to Cagliari, a city with commercial port, an intercontinental airport and a large fruit and vegetable market. Also for the environs of Rome Dioli *et al.* (2021) hypothesised colonization starting from airports or from the surrounding fruit and vegetable markets and spreading to the farms in the Roman countryside, with the accumulation of waste material left outdoors. Finally, they linked the presence in Liguria with the commercial port of Imperia where many nursery products intended for local as well as national market are unloaded (Dioli *et al*., 2021). Such assumptions receive some support from the earlier findings of *T. biguttula* intercepted in orchid shipments from Mexico to the United States (Wheeler *et al*., 1950; Hunt, 1956) but this is far from decisive. The first Croatian specimen was found in a sea-side camp at the outskirts of a small village far from any transport hub (i.e., 59 km to Dubrovnik and 107 km to Split as the crow flies) but with intensive tourism in the area. (One of the first Croatian specimens of another alien true bug, *Zelus renardii*, was collected in the same camp two years earlier – Kment & van der Heyden, 2022). Considering its miniature size, occurrence in synanthropic habitats, attraction to light and the affinity of the species for crevices and similar cryptic microhabitats, it may easily travel in any kind of goods, luggage or vehicle in which

it has (accidentally) hidden. The spread of *Tempyra biguttula* is very similar to that of another alien species that lives in concealment, the East Palaearctic *Amphiareus obscuriceps* (Poppius, 1909) (Hemiptera: Heteroptera: Anthocoridae), which, largely unnoticed, occupied Europe and North America, without any evidence of the means of its spreading (e.g., Kment *et al*., 2023; Henry *et al.*, 2008).

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REFERENCES

Ashlock, P.D. & Slater, A., 1988: Family Lygaeidae Schilling, 1829. 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, New York, København, Köln, pp. 167-245. [Book pagination: xix + 958 pp.]

Baena, M. & Torres, J. L., 2012: Nuevos datos sobre heterópteros exóticos en España y Francia: *Tempyra biguttula* Stål, 1874, *Belonochilus numenius* (Say, 1832) y *Zelus renardii* (Kolenati, 1856) (Heteroptera: Rhyparochromidae, Orsillidae, Reduviidae). Boletín de la Asociación Española de Entomología **36** (3-4), 351-360.

Baranowski, R. M. & Slater. J. A., 2005: The Lygaeidae of the West Indies. University of Florida, IFAS Florida Agricultural Experimental Station, Gainsville, x + 266 pp.

Barber, H. G., 1914: New Hemiptera-Heteroptera, with comments upon the distribution of certain known species. Journal of the New York Entomological Society **22**(2), 164-171.

Barber, H. G., 1949: Some new Lygaeidae chiefly from the United States (Hemiptera: Heteroptera). Pan-Pacific Entomologist **24**(4) [1948], 201-206.

Beardsley, J. W. & Tuthill, L. D., 1959: Additions to the known insect fauna of Niihau. Proceedings of the Hawaiian Entomological Society **17**(1), 56-61.

Biodiversidad Virtual, 2023: *Tempyra biguttula*. URL: https://www.biodiversidadvirtual.org/insectarium/Tempyra-biguttula-img1453280.html (accessed on 12 October 2023)

Blatchley, W. S., 1926: Heteroptera or true bugs of eastern North America, with especial reference to the faunas of Indiana and Florida. Nature Publishing Company, Indianapolis, 1116 pp.

BugGuide, 2023: *Tempyra biguttula*. URL: https://bugguide.net/node/view/276532/data (accessed on 3 October 2023)

Carpintero, D. L., Dellapé, P. M. & Melo, M. C., 2006: New records of Heteroptera (Hemiptera) from Argentina. Zootaxa **1129**, 1-22.

Çerçi, B., Gorczyca, J. & Koçak, Ö., 2021: Description of new Miridae and Tingidae species (Hemiptera: Heteroptera) and new records from Southern Turkey. Zootaxa **4949**(2), 312-332.

Cervantes Peredo, L. & Brailovsky, H., 2004: Listado de Lygaeidae (Heteroptera). In García Aldrete, A. N. & Ayala, N. y R. (eds.), Artrópodos de Chamela. Instituto de Biología, Universidad Nacional Autónoma de México, México, pp. 83-105. [Book pagination: 227 pp.]

Dellapé, P. M. & Carpintero, D. L., 2012: Relevamiento de los Heteroptera (Insecta: Hemiptera) de las Sierras de Tandil, provincia de Buenos Aires, Argentina. Revista de la Sociedad Entomológica Argentina, N. S. **14**(1), 125-134.

Dellapé, P. M., Henry, T. J. & Eades, D. C., 2023: *Tempyra testacea*. Lygaeoidea Species Files. URL: http://lygaeoidea.speciesfile.org/Common/basic/ShowImage.aspx?TaxonNameID=1215240&ImageID=211989 (accessed on 8 October 2023)

Dioli, P., Lenzini, L. & Salvetti, M., 2021: Sulla presenza in Italia, Spagna e Portogallo di *Tempyra biguttula* Stål, 1874 (Heteroptera, Rhyparochromidae), Rivista del Museo Civico di Scienze Naturali "Enrico Caffi" **34**, 41-43.

Froeschner, R. C., 1944: Contributions to a synopsis of the Hemiptera of Missouri, Pt. III. Lygaeidae, Pyrrhocoridae, Piesmattidae, Tingididae, Enicocephalidae, Phymatidae, Ploiariidae, Reduviidae, Nabidae. American Midland Naturalist **31**(3), 638-683.

Froeschner, R. C., 1985: Synopsis of the Heteroptera or True Bugs of the Galápagos Islands. Smithsonian Contributions to Zoology **407**, i-iii + 1-84.

Henry, T. J., Dellapé, P. M. & Paula, A. S. de, 2015: The Big-Eyed Bugs, Chinch Bugs, and Seed Bugs (Lygaeoidea). In Panizzi, A. R. & Grazia, J. (eds.), True Bugs (Heteroptera) of the Neotropics. Springer, Doderecht, Heidelberg, New York, London, pp. 459-514. [Book pagination: xxii + 901 pp.]

Henry, T. J., Wheeler, A. G. jr. & Steiner, W. E. Jr., 2008: First North American records of *Amphiareus obscuriceps* (Poppius) (Hemiptera: Heteroptera: Anthocoridae), with a discussion of dead-leaf microhabitats. Proceedings of the Entomological Society of Washington **110**, 402-416.

Heyden, T. van der, 2023: First records of *Tempyra biguttula* Stål, 1874 (Hemiptera: Heteroptera: Rhyparochromidae) in Cyprus, Greece and Malta. Journal of the Heteroptera of Turkey, **5**(2), 219-221.

Hrašovec, B., Posarić, D., Lukić, I. & Pernek, M., 2013: First record of oak lace bug (Corythucha arcuata) in Croatia. Šumarski List **9-10**, 499-503.

Hunt, J., 1956: List of intercepted plant pests, 1955. Bureau of Entomology and Plant Quarantine, 63 pp.

Hunter, W. D., Pratt, F. C. & Mitchell, J. D., 1913: The principal cactus insects on the United States. United States Department of Agriculture, Bureau of Entomology – Bulletin **113**, 1-71.

Kirkaldy, G.W., 1910: Further notes on Hemiptera, chiefly Hawaiian. Proceedings of the Hawaiian Entomological Society **2**(3), 118-123.

Kment, P. & Baňař, P., 2008: Additional records of the invasive Nearctic bug *Leptoglossus occidentalis* (Heteroptera: Coreidae) in Croatia. Natura Croatica **17**, 141-147.

Kment, P., Bryja, J., Jindra, Z., Hradil, K. & Baňař, P., 2003: New and interesting records of true bugs (Heteroptera) from the Czech Republic and Slovakia II. Klapalekiana **39**, 257-306.

Kment, P. & Heyden, T. van der, 2022: *Zelus renardii* (Hemiptera: Heteroptera: Reduviidae): first records from Croatia, Montenegro, and an accidental introduction to the Czech Republic. Heteroptera Poloniae – Acta Faunistica **16**, 7-14.

Kulijer, D., Dender, D. & Martinović, M., 2024: Zelus renardii (Hemiptera: Reduviidae), the first record for Bosnia and Herzegovina and the earliest occurrence in Croatia. Entomologia Croatica **22** (1), 21–26.

Linnavuori, R.E., Kment, P. & Carapezza, A., 2014: Order Hemiptera, suborder Heteroptera. Infraorder Pentatomomorpha, superfamily Lygaeoidea. In Harten, A. van (ed.), Arthropod fauna of the United Arab Emirates. Vol. 5. Multiply Marketing Consultancy Services, Abu Dhabi, pp. 192-246. [Book pagination: 744 pp.]

Martinović, M., Gjeldum, A. & Koren, T., 2019: *Belonochilus numenius* (Say, 1832) (Heteroptera: Lygaeidae), a new invasive species in Croatia. Natura Croatica **29**(2), 479-482.

Maurel, J.-Ph. & Porteneuve, J.-J., 2018: *Tempyra biguttula* Stål, 1874 une nouvelle punaise invasive découverte en Occitanie (Heteroptera; Lygaeidae; Rhyparochrominae). Carnets Natures **5**, 47-50.

Melo, M. C, Dellapé, P. M., Carpintero, D. L. & Montemayor, S. I., 2011: Heteroptera (Hemiptera) from the Chaco National Park (Argentina). Zootaxa **2999**, 1-19.

Péricart, J., 1999a: Hémiptères Lygaeidae Euro-Méditerranéens. Faune de France et régiones limitrophes. Vol. 84B. Fédération Française des Sociétés de Sciences Naturelles, Paris, iii + 453 pp + 9 pls.

Péricart, J., 1999b: Hémiptères Lygaeidae Euro-Méditerranéens. Faune de France et régiones limitrophes. Vol. 84C. Fédération Française des Sociétés de Sciences Naturelles, Paris, vi + 487 pp + 11 pls.

Pyšek, P., Hulme, Ph. E., Simberloff, D., Bacher, S., Blackburn, T. M., Carlton, J. T., Dawson, W., Essl, F., Foxcroft, L. C., Genovesi, P., Jeschke, J. M., Kühn, I., Liebhold, A. M., Mandrak, N. E., Meyerson, L. A., Pauchard, A., Pergl, J., Roy, H. E., Seebens, H., Kleunen, M. van, Vilà, M., Wingfield, M. J. & Richardson, D. M., 2020: Scientists' warning on invasive alien species. Biological Reviews **95**, 1511-1534.

Rattu, A. & Dioli, P., 2018, *Tempyra biguttula* Stål, 1874, una specie esotica di origine americana, nuova per l'Italia (Hemiptera: Rhyparochromidae). Revista Gaditana de Entomología **9**, 315-320.

Šapina, I. & Šerić Jelaska, L., 2018: First report of invasive brown marmorated stink bug *Halyomorpha halys* (Stål, 1855) in Croatia. Bulletin OEPP/EPPO Bulletin **48**(1), 138-143.

Scudder, G. G. E., 1977: The world Rhyparochrominae types (Hemiptera: Lygaeidae) XIII. The Stål types. Entomologica Scandinavica **8**, 29-35.

Shorthouse, D. P., 2010: SimpleMappr, an online tool to produce publication-quality point maps. URL: https://www.simplemappr.net (accessed on 2 June 2022)

Slater, J. A., 1964: *A catalogue of the Lygaeidae of the World. Volume II*. University of Connecticut, Storrs, pp. 779-1668.

Slater, J. A. & Brailovsky, H., 2000: Lygaeidae (Hemiptera). In Llorente Bousquets, J., González Soriano, E. & Papavero, N. (eds.), Biodiversidad, taxonomía y biogeografía de artrópodos de México: Hacia una síntesis de su conocimiento. Volumen II. Universidad Nacional Autónoma de México, México D.F., pp. 319-333. [Book pagination: 676 pp.]

Slater, J. A. & O'Donnell, J. E., 1995: A catalogue of the Lygaeidae of the World (1960-1994). New York Entomological Society, New York, xv + 410 pp.

Stål, C., 1874: Enumeratio Hemipterorum. Bidrag till en förteckning öfver alla hittils kända Hemiptera, jemte systematiska meddelanden. 4. Kungliga Svenska Vetenskapsakademiens Handlingar **12**(1), 1-186.

Štusák, J.M. & Stehlík, J.L., 1978: Second contribution to the teratology of Tingidae (Heteroptera). Antennal anomalies. Acta Musei Moraviae, Scientiae Naturales **63**, 89-105.

Sweet, M. H., 1967: The tribal classification of the Rhyparochrominae (Heteroptera: Lygaeidae). Annals of the Entomological Society of America **60**(1), 208-226.

Sweet, M.H., 1977: The systematic position of the seed bug genus *Neosuris* Barber, 1924 (Hemiptera: Lygaeidae) with a discussion of the zoogeographical significance of the genus and notes on the distribution and ecology of *N. castanea* (Barber, 1911) and *N. fulgida* (Barber, 1918). Journal of the Kansas Entomological Society **50**(4), 569-574.

Tescari, G., 2004: First record of *Leptoglossus occidentalis* (Heteroptera: Coreidae) in Croatia. Entomologia Croatica **8**, 73-75.

Torre-Bueno, J. R., 1946: A synopsis of the Hemiptera-Heteroptera of America North of Mexico. Entomologica Americana, **26**(1), 1-141.

Usinger, R. L., 1936: New distributional records of Hawaiian Heteroptera. Proceedings of the Hawaiian Entomological Society **9**(2), 209-210.

Walther, G.-R., Roque, A., Hulme, Ph. E., Sykes, M. T., Pyšek, P., Kühn, I., Zobel, M., Bacher, S., Botta-Dukát, Z., Bugmann, H., Czúcz, B., Dauber, J., Hickler, T., Jarošík, V., Kenis, M., Klotz, S., Minchin, D., Moora, M., Nentwig, W., Ott, J., Panov, V. E., Reineking, B., Robinet, Ch., Semenchenko, V., Solarz, W., Thuiller, W., Vilà, M., Vohland, M. & Settele, J., 2009: Alien species in a warmer world: risks and opportunities. Trends in Ecology and Evolution **24**(12), 686-693.

Wheeler, W. H., Hunt, J. & Reagan, E. P. 1950: List of intercepted plant pests, 1948. Bureau of Entomology and Plant Quarantine, 58 pp.