Faune de Belgique / Fauna van België

Bulletin S.R.B.E./K.B.V.E., 147 (2011) : 15-19

Exotic species of Aradidae and Miridae (Insecta: Hemiptera, Heteroptera) recently found in Antwerp Harbour, Belgium

by F. CHÉROT[1, 2], B. AUKEMA[3], J. BRUERS[4] & G. VISKENS[4]

[1] Département de l'Etude du Milieu naturel et agricole, DGO3 Agriculture, Ressources naturelles et Environnement, Service public de Wallonie, 23 avenue Maréchal Juin, B-5030 Gembloux. Belgique. U.E. (e-mail: frederic.cherot@spw.wallonie.be) (Author for correspondence).

[2] Université Libre de Bruxelles, Laboratoire de Systématique et d'Ecologie animales, CP 160/13, Av. F.D. Roosevelt, 50. 1050 Bruxelles. Belgique. U.E. (e-mail: fcherot@ulb.ac.be)

[3] Zoölogisch Museum, Afdeling Entomologie, Plantage Middenlaan 64, 1018 DH Ansterdam, Nederland (e-mail: baukema@hetnet.nl)

[4] Koninklijk Instituut voor Natuurwetenschappen, Afdeling Entomologie, Vautierstraat 29, 1000 Brussel (e-mail: j.bruers@telenet.be)

Abstract

Three exotic species of true bugs (Insecta, Heteroptera) were recently found on trunks from central Africa stored in Antwerp, the largest Belgian maritime harbour and the 17th largest in the world: *Neuroctenus lestoni* KORMILEV, 1966 (Aradidae), *Fulvius anthocoroides* (REUTER, 1875) and *Fulvius subnitens* (POPPIUS, 1909) (both Miridae, Cylapinae). Data on taxonomy and world-scale distribution of these species are provided.

Keywords: Exotic Heteroptera, Aradidae, Miridae, *Fulvius*, *Neuroctenus*.

Introduction

There are growing concerns about biological invasions and their influence on biodiversity and natural ecosystems. Introduction of exotic (i.e., alien or non native) species in a country can be a major cause of changes in biological communities.

Not every introduced species, intentionally or accidentally, becomes established, i.e., a non native species able to maintain wild self-sustaining populations in the recipient country. According to the so-called "ten rule", one of 10 introduced species appears in the wild, one of 10 such species becomes established, and one of 10 of the established species becomes an invasive pest, but this rule suffers many exceptions (WILLIAMSON & FITTER, 1996; JOSENS et *al.*, 2005).

RABITSCH (2008) recognized forty-two Heteroptera as established exotics in various European countries, of which 24 were translocated within Europe, six were of unknown origin and, 18 were imported from outside Europe. They belong mainly to the families Miridae, Tingidae and Anthocoridae. Since 1990, an arrival rate of about seven Heteroptera species per decade has been observed and introductions from North America would be increasing (RABITSCH, *op. cit.*).

Since Rabitsch's publication (2008), at least six additional species of exotic Heteroptera become established in Europe (RABITSCH, *in litt.*). For example, *Tropidosteptes pacificus* (VAN DUZEE, 1921), a Nearctic mirid, was recently discovered in The Netherlands (AUKEMA et *al.*, 2009).

The most important pathways of accidental introduction for the Heteroptera are as contaminants, usually with ornamental plants,

Fig. 1. Antwerp loading quay where exotic Heteroptera were collected.

and as stowaways in international commerce. Natural dispersal is also important in explaining changes in the European Heteroptera fauna (RABITSCH, 2008).

Harbours are important places for accidental introductions of insects (cf. WHEELER et *al.*, 2006: 999).

Since 2006, the third author (JB) has frequently visited the Antwerp harbour, the largest Belgian maritime harbour and the 17th largest in the world, looking for exotic animals on and around trunks imported from Africa. He did note numerous species during his inspections, mainly on the large partially bark-covered roots, belonging to the following taxa: Aranea, Coleoptera (apparently Scolytidae and Curculionidae), Collembola, Dermaptera, Diptera, Myriapoda, Orthoptera and a few Heteroptera.

The collected specimens of Heteroptera are preserved in the collections of Royal Belgian Institute of Natural Sciences (Brussels, Belgium) and of Zoölogisch Museum, University of Amsterdam (Amsterdam, The Netherlands).

Results

Five species of Heteroptera were found: two unidentified Anthocoridae (not analyzed hereafter), one Aradidae of the genus *Neuroctenus* FIEBER, 1860 – *N. lestoni* KORMILEV, 1966 – and two Miridae, subfamily Cylapinae, of the genus *Fulvius* STÅL, 1862 – *F. anthocoroides* (REUTER, 1875) and *F. subnitens* (POPPIUS, 1909). They were found on and around trunks loaded in Matadi (Democratic Republic of Congo) and stored on an unloading quay (Fig. 1) at Antwerp. Unfortunately, the exact origin of the trees remains unclear. Their origin could be Gabon.

Fig. 2. *Neuroctenus lestoni*, specimen collected at Antwerp.

Neuroctenus lestoni KORMILEV, 1966 [Fig. 2]

Available data. 8♂♂, 11♀♀, one nymph and two moults, 17.X.2009, 5 nymphs (all females), 30.X.2009 and one ♀, 31.X.2009. All specimens were collected on the inferior side of the trunks, where bark did subsist, when they were tilted to manage humidity effects.

Distribution. Neuroctenus lestoni KORMILEV, 1966 was described from the Mount Arewa, Ghana. The species is known from Cameroon (E. Heiss, *in litt.*).

Fig. 3. *Fulvius anthocoroides*, specimen collected at Antwerp.

Fulvius anthocoroides (REUTER, 1875) [Fig. 3]

Available data. 3♂♂ and 2♀♀, 22.IX.2008, 2♀♀, 17.V.2009. The seven specimens were found on totally barked tree trunks attacked by Coleoptera larvae still alive. JB notes narrow and deep holes in the wood, surrounded by fresh fine sawdust. The specimens of *Fulvius* were moving around the holes and even leaving some of them, probably hunting Coleoptera larvae. The food habits of Cylapinae have been the subject of

discussions for many years. Several *Fulvius* species apparently have unspecialized predaceous habits. An undescribed African species was reared in laboratory at Paris Museum on eggs and caterpillars of Mediterranean flour moth *Anagasta kuehniella* (ZELLER, 1879; Lepidoptera, Pyralidae) and larvae of the flour beetle genus *Tribolium* (Coleoptera, Tenebrionidae) (D. Pluot-Sigwalt, personal communication). *Fulvius imbecilis* (SAY, 1832) was observed feeding on dipterous and coleopterous larvae (cf. GORCZYCA, 2006). Certain other Cylapinae are known to include both fungi and animals in their diets (WHEELER, 2001).

Distribution. Fulvius anthocoroides (REUTER, 1875) was described from Rouen Harbour (France), where specimens were found on a ship coming from Senegal. It is widely distributed in the Old and New World: Africa (Ghana, Ivory Coast, Malawi, Nigeria, Senegal), Indian Ocean (Seychelles Islands), Asia (India, Sri-Lanka, Taiwan), Central and South America (Bahamas Islands, Brazil, Chile, Costa Rica, Cuba, Jamaica, Martinique Island, Panama, Trinidad Island, Venezuela), The United States (Florida, Hawaii) and Pacific Ocean (Bonin, Christmas, Mariana and Samoa Islands, but also Galapagos Islands) (GORCZYCA, 2000).

Identification. From the other *Fulvius* species known from Africa, *F. anthocoroides* is recognized by the following combination of character states: (a) the eyes contiguous or slightly removed from the pronotal collar, (b) the body coloration, including head and pronotum, neither brown, nor orange to yellowish almost uncolored, (c) the hemelytral coloration dark brown with yellowish areas at apex of coria and at base but not at apexes of clavi, without pale patch in middle of coria, (d) the hemelytral pilosity black, dense, relatively stiff, not scale-like, (e) the hemelytra devoid of pale, longitudinal stripes running from base, (f) the scutellum uncolored brown (cf. GORCZYCA, 2000: 64-65).

Relationships. Fulvius anthocoroides (REUTER, 1875) belongs to a large group of species, the *anthocoroides*-group, easily recognized by the combination of the following character states: (a) first antennal segment usually relatively short, shorter than width of head in dorsal view, (b) eyes usually contiguous or only slightly removed from pronotal collar, reaching gula below, in lateral view, (c) relatively short rostrum reaching at least metacoxae, (d) short, two-segmented tarsus with undivided second segment, (e) apices of first and second valvulae slightly rounded or straight, (f) membranous structure between second valvulae always present, (g) male genital capsule almost symmetrical, with genital opening located apically, (h) socket of left paramere opens, (i) supragenital bridge *sensu* KONSTANTINOV (2003) well developed, (j) parameres relatively large, slightly asymmetrical and (k) vesica frequently with some sclerotized, pointed, relatively short spines or thorny lobes, which usually are located apically (SADOWSKA-WODA, CHÉROT & GORCZYCA, 2008; SADOWSKA-WODA, CHÉROT & MALM, 2008).

Fig. 4. *Fulvius subnitens*, specimen collected at Antwerp.

***Fulvius subnitens* (POPPIUS, 1909) [Fig. 4]**

Available data. 1♀, 06.VI.2009. The specimen was collected on a trunk attacked by Coleoptera larvae.

Distribution. Fulvius subnitens POPPIUS, 1909 was described from Papua New Guinea, Bujakori, maybe in Central Province (CARVALHO & LORENZATO, 1978), from other places in Papua New Guinea (Astrolabe Bay, Madang Province; Paumomu River, Moroka, Central Province), from Indonesia (Mentawai Archipelago, Sipora Island; Ighibirei, Papua Barat), and probably from Philippine Islands ("Engano, Malakonni", maybe Engano Cape on Palaui Island). It is widely distributed from Africa (Tanzania, Togo) and Seychelles to Taiwan and Pacific Islands and from Malaysia to Papua New Guinea (CARVALHO & LORENZATO, 1978, GORCZYCA, 2006). In Malaysia, the species was recorded on *Hevea* (GORCZYCA,

2006).

Identification. From the other *Fulvius* species known from Africa, *F. subnitens* is distinguished by the following combination of character states: (a) the eyes contiguous or slightly removed from the pronotal collar, (b) the body coloration, (c) the hemelytral coloration, dark brown with yellowish areas at base and apex of clavus and at apex of corium but without pale patch in middle of coria, (d) the hemelytral pilosity white, dense, flexible, not scale-like, (e) the hemelytra devoid of pale, longitudinal stripes running from base, (f) the scutellum brown uncolored (cf. GORCZYCA, 2000: 64-65).

Relationships. Fulvius subnitens POPPIUS, 1909 belongs to a small group of six species from Southeastern Asia, the "*bifenestratus*-group" (SADOWSKA-WODA, CHÉROT & GORCZYCA, 2008; SADOWSKA-WODA, CHÉROT & MALM, 2008), easily separated from the other *Fulvius* species by the combination of the following character states: (a) eyes removed from pronotal collar, (b) rostrum long, often reaching genital segment of abdomen, (c) tarsi two-segmented, long, second segment usually divided, (d) claws slender, usually without subapical tooth, (e) shape of the apices of first and second valvulae usually slightly rounded or straight, (f) membranous structure between second valvulae always absent, (g) male genital capsule distinctly longer than wide, with genital opening located subapically, (h) socket of left paramere usually closed, (i) supragenital bridge reduced, (j) parameres asymmetric, the right strongly reduced, (k) vesica membranous. The monophyly of the "*bifenestratus*-group" is corroborated by an analysis of DNA sequences data from a mitochondrial gene, cytochrome oxidase I (SADOWSKA-WODA, CHÉROT & MALM, 2008). The relationships of species in this species group are unknown.

Discussion

Consequences of importations, such as those reported in this paper, are difficult to predict, particularly when the biology of the species is practically unknown. As already pointed out, in general, the number of imported species able to maintain wild self-sustaining populations in the recipient countries is relatively low and the number of these established species becoming invasive is lower still.

Different levels of potential ecological impacts of exotic taxa are considered in the literature (RABITSCH, 2008): (1) impacts on individual of native species (direct competition, predation, parasitism, introduction of diseases...), (2) impacts on populations of native species (by the sum of the impacts on individuals but eventually also by a genetic impact if hybridizations occur), (3) impacts on communities and (4) impacts on the ecosystems.

In the case of exotic Heteroptera introduced in Europe, these different potential impacts remain poorly investigated or unknown still (RABITSCH, 2008). They are practically unknown for our two species of *Fulvius* and for our species of *Neuroctenus*. Additional investigations will be necessary to follow their eventual establishment and its consequences.

However, if we agree to apply the classification criteria of the simplified environmental impact assessment protocol (*ISEIA*, available online http://ias.biodiversity.be/documents/ISEIA_protocol.pdf) of the information system on non-native invasive species in Belgium, originally provided for established invasive species, we should allocate our three Heteroptera in the risk category C. Category C includes species not considered as a threat to native biodiversity and ecosystems (low environmental risk).

Acknowledgements

Prof. D. I. Dr E. Heiss (Innsbruck University, Innsbruck, Austria) and Prof. Dr J. Gorczyca (Silesian University, Bankowa, Poland) confirm to us respectively the identifications of *Neuroctenus lestoni* and *Fulvius anthocoroides*.

Dr W. Rabitsch (Institut für Zoologie, Vienna, Austria) and Dr D. Pluot-Sigwalt (Museum national d'Histoire naturelle, Paris, France) kindly gave to the first author additional original information.

Dr R. Cammaerts (Free University of Brussels, Brussels, Belgium), Dr T. Henry (Systematic Entomology Laboratory, ARS, USDA, National Museum of Natural History, Smithsonian Institution, Washington D.C., United States of America) and Mrs S. Dudfield provided useful comments on earlier versions of the manuscript.

References

AUKEMA B., SCHWARTZ M. D. & DEN BIEMAN K., 2009.- *Tropidosteptes pacificus* (VAN DUZEE, 1921), another Nearctic mirid in Europe (Hemiptera: Heteroptera: Miridae: Mirinae). *Zootaxa*, 2135: 65-68.

CARVALHO J. C. M. & LORENZATO L. M., 1978.- The Cylapinae of Papua New Guinea (Hemiptera, Miridae). *Revista Brasileira de Biologia*, 38 (1): 121-149.

FIEBER, F. X., 1860.- *Die europäischen Hemiptera. Halbflüger* (Rhynchota Heteroptera). Gerold's Sohn, Vienne. i-iv + 112 pp.

GORCZYCA J., 2000.- *A systematic study on Cylapinae with a revision of Afrotropical Region (Heteroptera, Miridae).* Prace Naukowe Uniwersytetu Śląskiego w Katowische n° 1863, Wydawnictwo Universytetu Śląskiego, Bankowa. 176 pp

GORCZYCA J., 2006.- The catalogue of the subfamily Cylapinae KIRKALDY, 1903 of the World (Hemiptera, Heteroptera, Miridae). *Monographs of the Upper Silesian Museum*, 5: 1-100.

JOSENS G., BIJ DE VAATE A., USSEGLIO-POLATERA P., CAMMAERTS R., CHÉROT F., GRISEZ F., VERBOONEN P. & VANDEN BOSSCHE J-P., 2005.- Native and alien Amphipoda and other Peracarida in the river Meuse: new assemblages emerge from a fast changing fauna. *Hydrobiologia*, 542 (1): 203-220

KONSTANTINOV F., 2003.- Male genitalia in Miridae (Heteroptera) and their significance for suprageneric classification of the family. Part I: general review, Isometopinae and Psallopinae. *Belgian Journal of Entomology*, 5 (1-2): 3-36.

KORMILEV N.A., 1966.- On some Aradidae from Africa and Polynesia. Hem. Heteroptera. *Eos*, 41: 387-394.

POPPIUS B., 1909.- Zur Kenntnis der Miriden-Unterfamilie Cylapina Reuter. *Acta Societatis Scientiarum Fennicae*, 37 (4): 1-46.

RABITSCH W., 2008.- Alien true bugs of Europe (Insecta: Hemiptera: Heteroptera). *Zootaxa*, 1827: 1-44.

REUTER O.M., 1875.- Genera Cimicidarum Europae disposuit. *Bihang till Kungliga Svenska Vetenskapsakademiens Handlingar*, 3 (1): 1-66.

SAY T., 1832.- *Descriptions of new species of heteropterous Hemiptera of North America.* New Harmony, Indiana. 39 pp. (not seen).

SADOWSKA-WODA I., CHÉROT F. & GORCZYCA J., 2008.- Preliminary data about *Fulvius* phylogeny (Heteroptera, Miridae, Cylapinae). XXIII[d] International Congress of Entomology, Durban, 6-11/07/2008. (Poster, available).

SADOWSKA-WODA I., CHÉROT F. & MALM T., 2008.- A preliminary phylogenetic analysis of the genus *Fulvius* STÅL (Hemiptera: Miridae: Cylapinae) based on molecular data. *Insect Systematics & Evolution*, 39: 407-417.

STÅL C., 1862.- Hemiptera Mexicana enumeravit speciesque novas descriptis. *Entomologische Zeitung*, 23 (1-3): 81-118, (7-9): 289-325 (continuatio).

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.

WHEELER A.G. (Jr), 2001.- *Biology of the Plant Bugs (Hemiptera: Miridae). Pests, Predators, Opportunists.* Cornell University Press, Ithaca, New York. 507pp.

WHEELER A.G. JR., HENRY T. J. & HOEBEKE E. R., 2006.- Palearctic Plant Bugs (Hemiptera, Miridae) in Newfoundland, Canada: First North American Records for *Phytocoris longipennis* FLOR and *Pilophorus cinnamopterus* (KIRSCHBAUM), new records of eight other species, and review of previously reported species. *In* RABITSCH, W. (ed.).- Hug the Bug – For the love of true bugs. Festschrift zum 70. Geburtstag von Ernst Heiss. *Denesia*, 19 [Zugleich Kataloge der Oberösterreichischen Landesmuseen, N.S. 50]: 997-1014.

WILLIAMSON M. & FITTER A., 1996.- The varying success of invaders. *Ecology*, 77: 1661–1666.

ZELLER P.E., 1879.- Lepidopterologische Bemerkungen. *Entomologische Zeitung*, 40: 462-473.