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# *Naupactus xanthographus* (Germar) species group (Curculionidae: Entiminae: Naupactini): a comprehensive taxonomic treatment

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## ABSTRACT

We undertake a taxonomic revision of *Naupactus xanthographus* (Germar 1824) (grape-fruit weevil) and the putative related species *N. navicularis* Boheman 1840, *N. dissimilis* Hustache 1947, *N. mimicus* Hustache 1938, *N. dissimulator* Boheman 1840 and *N. marvaldiae* new species. This species group mainly differs from other *Naupactus* by the presence of a pair of tubercles at the apex of the elytra. It ranges in Argentina, southern Brazil, Bolivia, Paraguay and Uruguay, in areas that belong to the biogeographic provinces of Atlantic, Araucaria and Paraná forests, Yungas, Chaco and Pampa. *Naupactus xanthographus* is broadly distributed in Argentina, mainly in the Pampean province, and it was introduced in central Chile, where it is considered a serious pest of grapes and several fruit trees. The remaining species are partially sympatric in the subtropical forests of southern Brazil, and *N. dissimulator* ranges along the gallery forests of Paraná and Uruguay rivers, down to La Plata River. It has been reported damaging citrus and ‘yerba mate’, like *N. navicularis* and *N. dissimilis*. The new species *N. marvaldiae* ranges in southern Brazil and north-eastern Argentina (Misiones), and differs from *N. dissimulator*, mainly by the very short elytra, the apical tubercles welldeveloped in males and females, the broader front femora, and the different shape of the apex of the penis. The other four species are probably more closely related and they separate from the pair *N. dissimulator*–*N. marvaldiae* because of the slightly widened front femora, well-developed corbels of the hind tibiae, and short to indistinct nodulus of the spermatheca.

<http://zoobank.org/urn:lsid:zoobank.org:pub:051587DD-37C2-4216-AA61-0E563BB44D64>

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## Introduction

*Naupactus* Dejean 1821 (Entiminae: Naupactini) is a Neotropical genus of broad-nosed weevils, with about 200 species distributed from southern Mexico to Argentina (O’Brien and Wibmer 1982; Wibmer and O’Brien 1986). It is the most speciose genus of the tribe Naupactini and the species number is probably about twice as high as previously known. However, after a thorough revision, some species currently assigned to *Naupactus* (see catalogues by Morrone 1999; Yunakov et al. 2017) should probably be transferred to other naupactine genera.

For the revision of *Naupactus* we decided to separate it into different species groups in order to facilitate its systematic treatment (Lanteri and Marvaldi 1995). In this paper we undertake a taxonomic study of *Naupactus xanthographus* (Germar 1824) and the putative related species *N. dissimilis* Hustache 1947, *N. mimicus* Hustache 1938, *N. navicularis* Boheman 1840, *N. dissimulator* Boheman 1840 and *N. marvaldiae* n. sp. All of them are easily distinguished from other *Naupactus* based on the presence of a pair of tubercles near the apex of elytra. The group as a whole is distributed in southern Brazil, north-central Argentina, Paraguay, Bolivia and Uruguay. This area corresponds mainly to the biogeographical provinces of the Atlantic, Araucaria and Paraná forests, Chaco, Yungas and Pampa, *sensu* Morrone (2014).

The most harmful and well-known species is *N. xanthographus*, accidentally introduced in Chile, where it is currently widespread throughout the main agricultural areas, causing severe damage on grape, peach, nectarine and other deciduous fruit trees, as well as alfalfa, potatoes, and other plants of economic importance (Caballero 1972; Ripa 1983, 1986a; Elgueta 1993; Artigas 1994). *Naupactus xanthographus* is a quarantine pest in Japan and the USA (Pinto and Zaviezo 2003) and several measures have been established to intercept this weevil from grape exports from Chile to Peru (<http://www.agromeat.com/81114>). Moreover, *N. xanthographus* causes damage in grape vineyards in the most productive areas of Argentina (Mendoza) and Brazil (Rio Grande do Sul), where it also attacks deciduous fruit trees and garden plants (Lanteri et al. 2002a). In these countries the damage is not as severe as in Chile, probably due to the presence of natural enemies (Lanteri et al. 1998; Ripa and Larral 2008). Other species of the group also cause damage in fruits, mainly oranges, in Argentina and Brazil; for example, *N. dissimulator* Boheman and *Naupactus dissimilis* Hustache in Entre Ríos and Misiones provinces (Argentina) (Lanteri et al. 2002a), and *N. navicularis* Boheman in São Paulo state (Brazil) (Lanteri et al. 2002b; Guedes Carús et al. 2005).

The main objectives of this contribution are to diagnose the species of the *N. xanthographus* species group, including the new species *N. marvaldiae*; to provide detailed information on their type material, geographic distributions and host plants; to give a key for their identification; to describe their geographic variation; to illustrate their habitus and characters of the genitalia; and to discuss the diversity of the group in a biogeographical context.

## Material and methods

This study is based on the examination of more than 2000 specimens deposited in the following entomological collections:

American Museum of Natural History, New York, NY, USA (AMNH). Dr Lee Herman.  
Charles W. O'Brien Collection, Green Valley, AZ, USA (CWOB). Dr Charles O'Brien.  
Coleção Entomologica do Instituto Oswaldo Cruz (CEIOC), Rio de Janeiro, Brazil. Dr Jane Costa.

Departamento de Zoologia da Universidade Federal do Paraná, Curitiba, Brazil (DZUP).  
Dr Germano Rosado-Neto.

Fundación e Instituto Miguel Lillo collection (FIML), San Miguel de Tucumán, Argentina.  
Dr Carolina Berta.

Museo de La Plata, La Plata, Argentina (MLP). Dr Analía Lanteri.

Museu Nacional do Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ). Dr Marcela Monné.

Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (MZSP). Dr Sergio Vanin.

Muséum National d'Histoire Naturelle, Paris, France. Dr Hélène Perrin.

Natural History Museum, London, UK. Dr Max Barclay.

United States National Museum, Washington, DC, USA (USNM). Dr David Furth.

Universidad de la República del Uruguay Collection (URUC), Montevideo, Uruguay. Ing. Enrique Morelli.

Dissections of female and male genitalia were made according to standard entomological techniques (Lanteri and O'Brien 1990). Characters of the genitalia were drawn using a camera lucida adapted to a Nikon SMZ800 stereoscopic microscope (Tokyo, Japan). Measurements were taken with an ocular micrometer attached to this microscope. The acronyms used for the measurements are as follows: WP, maximum width of pronotum; WE, maximum width of elytra; LE, length of elytra along midline; WF1, maximum width of front femora; and WF3, maximum width of hind femora.

We provide a complete description for the new species and synoptic redescriptions for the remaining species of the group, adding morphometric characters and characters of the genitalia that were never described and illustrated. We also provide habitus photographs of females and males, including their main geographic variants. The terminology used for morphological structures follows Marvaldi et al. (2014).

Holotype and allotype of the new species will be deposited at the Museu de Zoologia da Universidade de São Paulo (MZSP), and paratypes, at the Museu Nacional de Rio de Janeiro (MNRJ) and Museo de La Plata (MLP).

For the distribution maps we used the package QGIS 2.8.2 (QGIS Development Team 2015).

## Results

### *Naupactus xanthographus* species group

#### *Description*

Species medium sized (females 10–16 mm; males 8–11.5 mm), brown or greyish, with similar pattern of white and/or yellow stripes along pronotum and elytra (Figures 1, 2). Disc of pronotum with pair of lateral light stripes or a single stripe along midline; elytra often with white stripes along suture, anterior half of 5° interval and along 7–8° intervals, the latter obliquely curved towards intervals 4–5° on posterior half or almost confluent near suture. Vestiture consisting of moderately sparse round-oval scales and short, fine and recumbent setae; venter denuded along midline. Rostrum 1–1.25× as long as wide at apex; lateral carinae usually strong, squamose or denuded, subparallel or slightly convergent towards forehead; setae forming semi circles on each side of anterior half of median sulcus. Forehead 1.25–1.45× as wide as rostrum at apex. Eyes round, convex. Antennae slender, setose; scape usually

reaching anterior margin of pronotum; funicular article 2, 1.5–2× as long as article 1; articles 3–7, 2.5–3× as long as wide at apex; club 2.5–3.25× as long as wide. Pronotum subcylindrical, wider than long in female and about as long as wide in male. Elytra oval or navicular, 1.36–1.70× (females) and 1.55–2.05× (males) as long as wide; apical margin thickened; humeri indistinct; apex with one distinct tubercle on each side, at level 3–4° intervals; punctures of striae of variable size, with a short, fine seta on bottom; intervals flat about 2–4× as wide as punctures. Metathoracic wings reduced. Scutellum sparsely setose or squamose. Legs long; front coxae not separated from each other, lacking denticles; front femora 2.50–3.35× as long as wide, and 1.1–1.5× as wide as hind femora; front tibia with large, acute mucro and about 7–10 denticles on inner margin; middle tibiae with small mucro and usually with minute denticles; hind tibiae usually without mucro and denticles (except males of *N. xanthographus*); corbel of hind tibiae well-developed or lacking (= metatibial apex simple); dorsal comb about as long as distal comb. Ventricle 5 slightly shorter than ventrite 2 in females, 1–2× as long as ventrite 2 in males.

### **Female genitalia**

Sternite VIII subrhomboidal, with V-shaped sclerotization near base and apical tuft of long setae; spiculum ventral about 2.5–3× as long as VIII sternite. Ovipositor about  $\frac{3}{4}$  to slightly shorter than abdomen, with or without rows of 3–5 long setae on distal third, near coxites, on external side of baculi; coxites slightly sclerotized; styli usually well-developed, latero-dorsally directed. Spermatheca subcylindrical, either with very short nodulus (*xanthographus* type, [Figure 3e–h](#)) or with long, tubular nodulus (*dissimulator* type, [Figure 3i, j](#)); spermathecal duct thin, not spiral form, sclerotized, 2–6× as long as spermatheca.

### **Male genitalia**

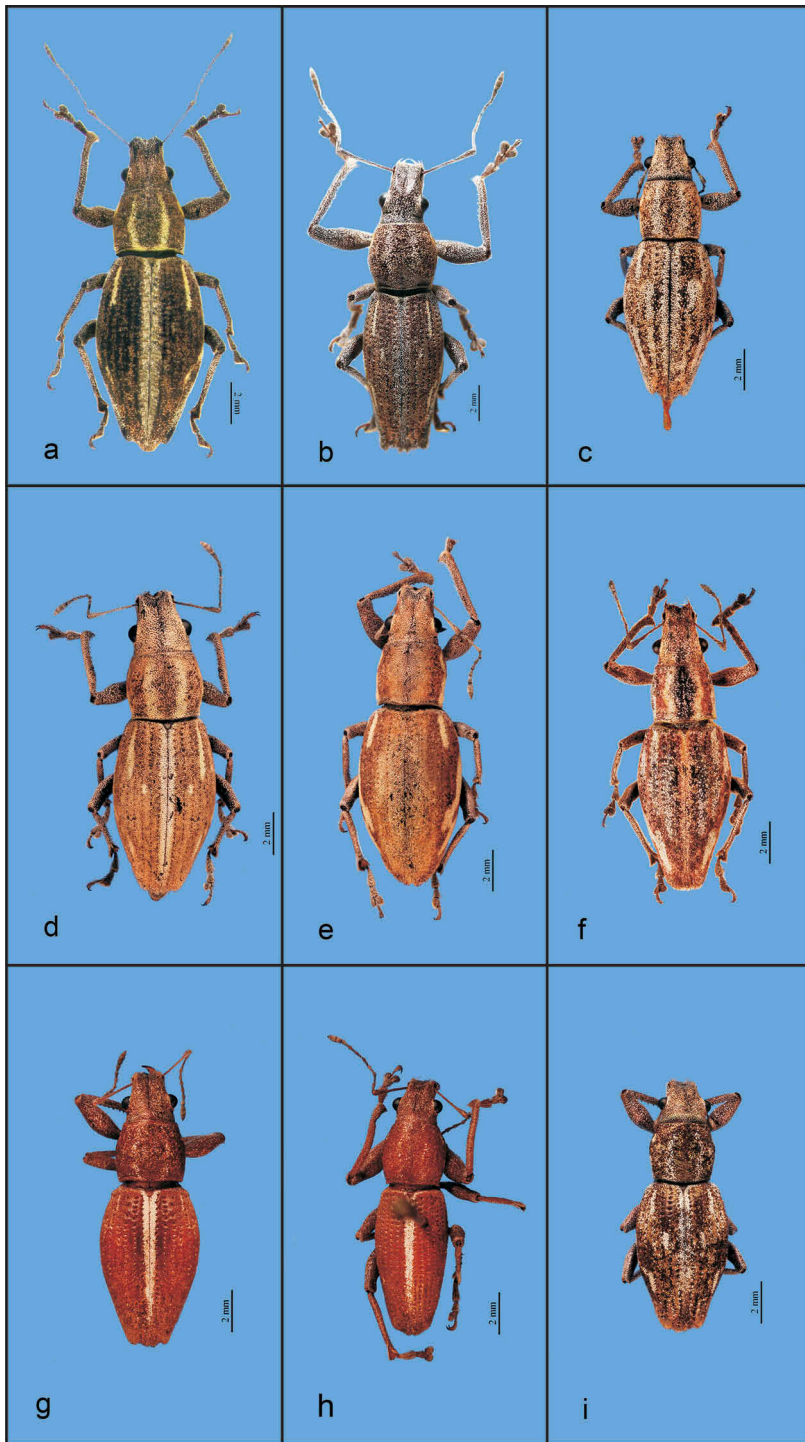
Penis longer than abdomen, slightly expanded towards apex; apex with distinct cuticular striation, either subacute ([Figure 4e, i, k](#)) or arrow-shaped ([Figure 4a, c, g](#)); ostium of variable size (1 to 5× as long as wide); penis apodemes usually shorter than body of penis; endophallus with distinct spiny area, and with or without sclerites consisted on a pyriform central piece and two winged-like lateral pieces ([Figure 4j, l](#)).

### **Remarks**

Within the species group under study we distinguished two different subgroups, one including *N. xanthographus*, *N. dissimilis*, *N. navicularis* and *N. mimicus* ([Figure 1a–i](#)), and the other, *N. dissimulator* and the new species *N. marvaldiae* ([Figure 2a–d](#)). In the former, the pronotum and the elytra are more elongate, the front femora are slender and slightly wider than the hind femora, the corbel of the hind tibiae is well-developed and squamose; the ovipositor lacks long setae on the distal third; the spermatheca has short nodulus and the penis lacks conspicuous sclerites in the endophallus ([Figure 3e–h](#)). In the second subgroup the pronotum and the elytra are shorter; the front femora is very widened compared to the hind femora; the corbel of the hind tibiae lacking; the ovipositor has 3–5 long setae on the distal third; the spermatheca is larger compared with the size of the abdomen than in the other subgroup, and has tubular long nodulus; and the penis bears typical sclerites in the endophallus ([Figures 3\(d, i, j\), 4\(j, l\)](#)).

**Key to species of the *N. xanthographus* species group**

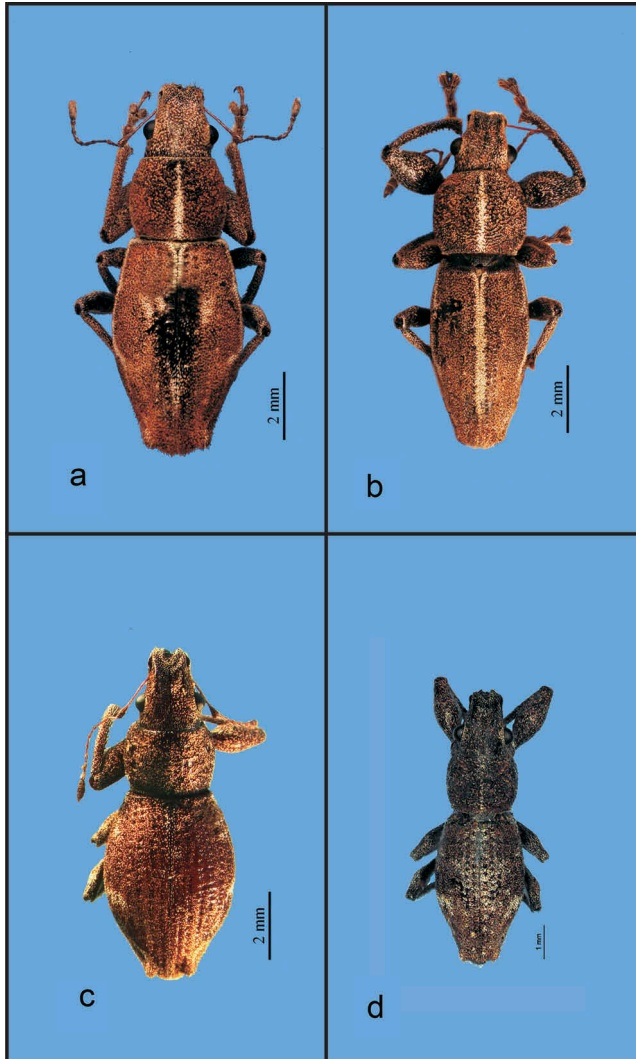
1. Pronotum lacking white stripe along midline, usually smooth. Corbel of hind tibiae welldeveloped, squamose. Front femora slightly wider than hind femora (WF1/WF3 1.10–1.30). Nodus of spermatheca short to indistinct (Figure 3e–h). Apex of penis usually arrow-shaped (Figure 4a, c, g) ..... 2
- 1'. Pronotum with white stripe along midline, disc rugose (with confluent punctures). Corbel of hind tibiae lacking. Front femora distinctly wider than hind femora (WF1/WF3 1.35–1.50). Nodus of spermatheca tubular, long (Figure 3i, j). Apex of penis not arrow-shaped (Figure 4e, i, k)..... 5
2. Vestiture brown with pinkish iridescence. Sides of pronotum almost straight. Elytra very acute at apex and very thin in lateral view. Antennal scape not reaching hind margin of pronotum. Ventricle 5 of males slightly longer than ventricle 2, not bent at apex. Apex of penis subacute, slightly asymmetrical..... *N. navicularis* (Figure 1f)
- 2'. Vestiture brown or grey. Sides of pronotum curved. Elytra neither acute at apex nor very thin in lateral view. Antennal scape reaching hind margin of pronotum. Ventricle 5 of males 1.50 – 2× as long as ventricle 2, apex slightly bent. Apex of penis arrow-shaped (with two lateral points) (Figure 4a, c, g)..... 3
3. Elytra with white stripe along suture very distinct and lacking yellow stripes on anterior third of 5° interval and along 7–8° intervals. Pronotum slightly rugose. Intervals of elytra about 2× as wide as punctures of striae. Denticles of front tibiae large. Corbel of hind tibiae slender. Ostium of penis about 3–4× as long as wide (Figure 4g)..... *N. mimicus* (Figure 1g–i)
- 3'. Elytra with vanished white stripe along suture and yellow stripes on anterior third of 5° interval and along 7–8° intervals. Pronotum smooth to finely punctate. Intervals of elytra about 3–5× as wide as punctures of striae. Denticles of front tibiae small. Corbel of hind tibiae broad. Ostium of penis 1–2× as long as wide..... 4
4. Maximum width of pronotum near base (females). Elytra navicular, strongly widened relative to pronotum (WE/WP about 1.50×) and abruptly narrowed near apex; apical tubercles large. Males with row of denticles on inner margin of hind tibiae, the distal one very large. Apex of penis slightly pronounced beyond lateral points; ostium about as long as wide (Figure 4a)..... *N. xanthographus* (Figure 1a–c)
- 4'. Maximum width of pronotum near middle (females). Elytra oval, slightly widened relative to pronotum (WE/WP about 1.30×) and uniformly curved on sides; apical tubercles small to indistinct. Males without denticles on hind tibiae. Apex of penis distinctly pronounced beyond lateral points; ostium about twice as long as wide (Figure 4c) ..... *N. dissimilis* (Figure 1d, e)
5. Elytra moderately long relative to width in females (LE/WE 1.50–1.60×), moderately narrowed near apex; disc flat; apical tubercles distinct only in females; white stripe along suture distinct, particularly in males; lateral white stripes ascending towards 4–5° intervals near distal third. Pronotum of males convex, about as wide as maximum width of elytra. Front femora less than 1.5× as wide as hind femora (WF1/WF3 1.35–1.45×). Ventricle 5 of males longer than ventricle 2. Aedeagal apex subacute, with wavy sides (Figure 4i) .  
..... *N. dissimulator* (Figure 2a, b)



**Figure 1.** Habitus, dorsal views. (a) *Naupactus xanthographus*, female; (b) *N. xanthographus*, male; (c) *N. xanthographus*, variety, female; (d) *N. dissimilis*, female; (e) *N. dissimilis*, variety, female; (f) *N. navicularis*, female; (g) *N. mimicus*, female; (h) *N. mimicus*, male; (i) *N. mimicus*, variety, female.

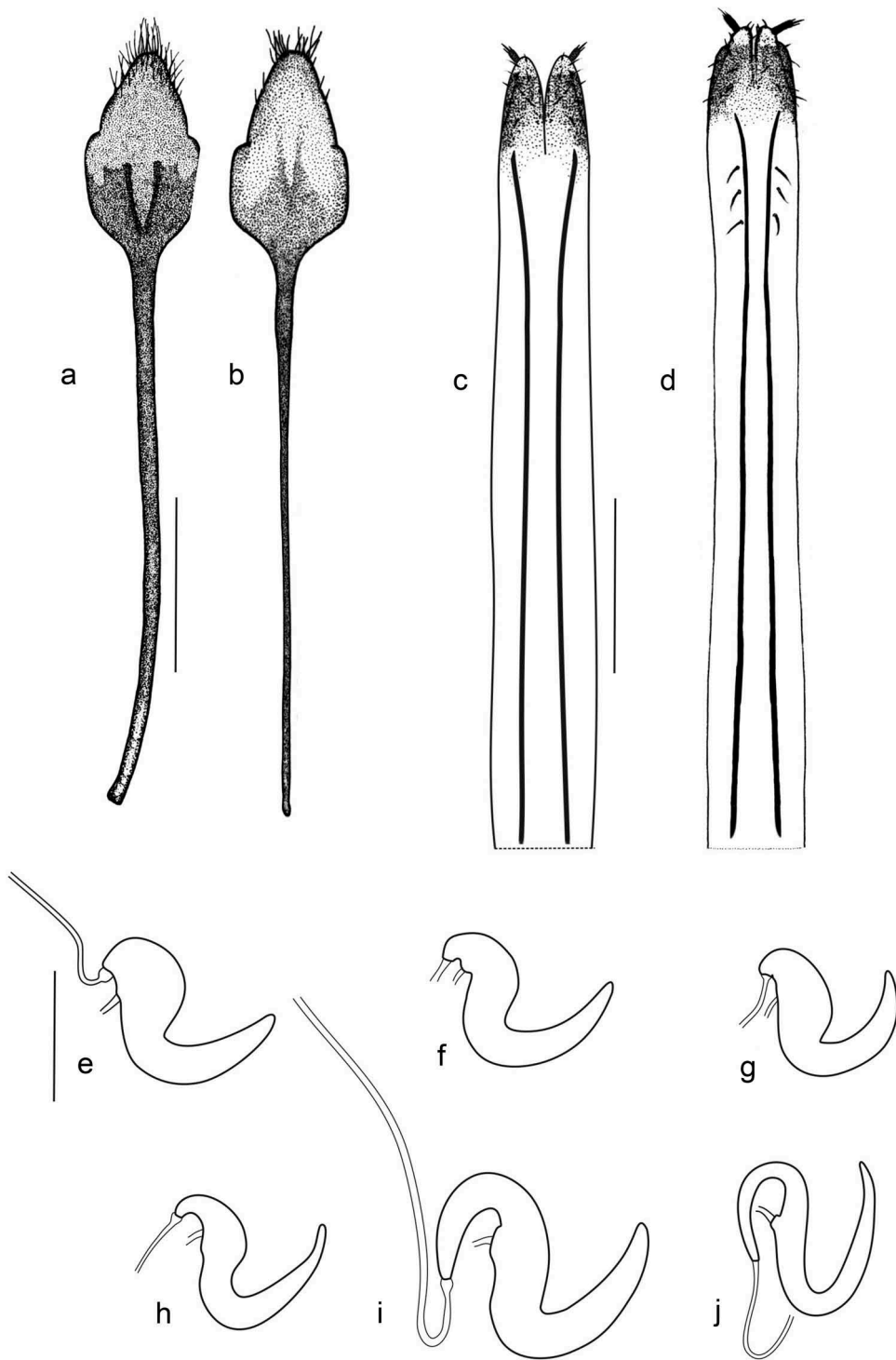


- 5'. Elytra very short relative to width in females (LE/WE 1.36–1.45), strongly narrowed near apex; disc slightly convex; apical tubercles distinct in both sexes; white stripe along suture indistinct; lateral white stripes ascending towards 2–3° intervals (almost confluent on disc). Pronotum of males flat, slightly narrower than maximum width of elytra. Front femora more than 1.5× as wide as hind femora (WF1/WF3 1.51–1.56). Ventrite 5 of males about as long as ventrite 2. Aedeagal apex without waved sides (Figure 4k) .....  
 ..... *N. marvaldiae* n. sp. (Figure 2c, d)

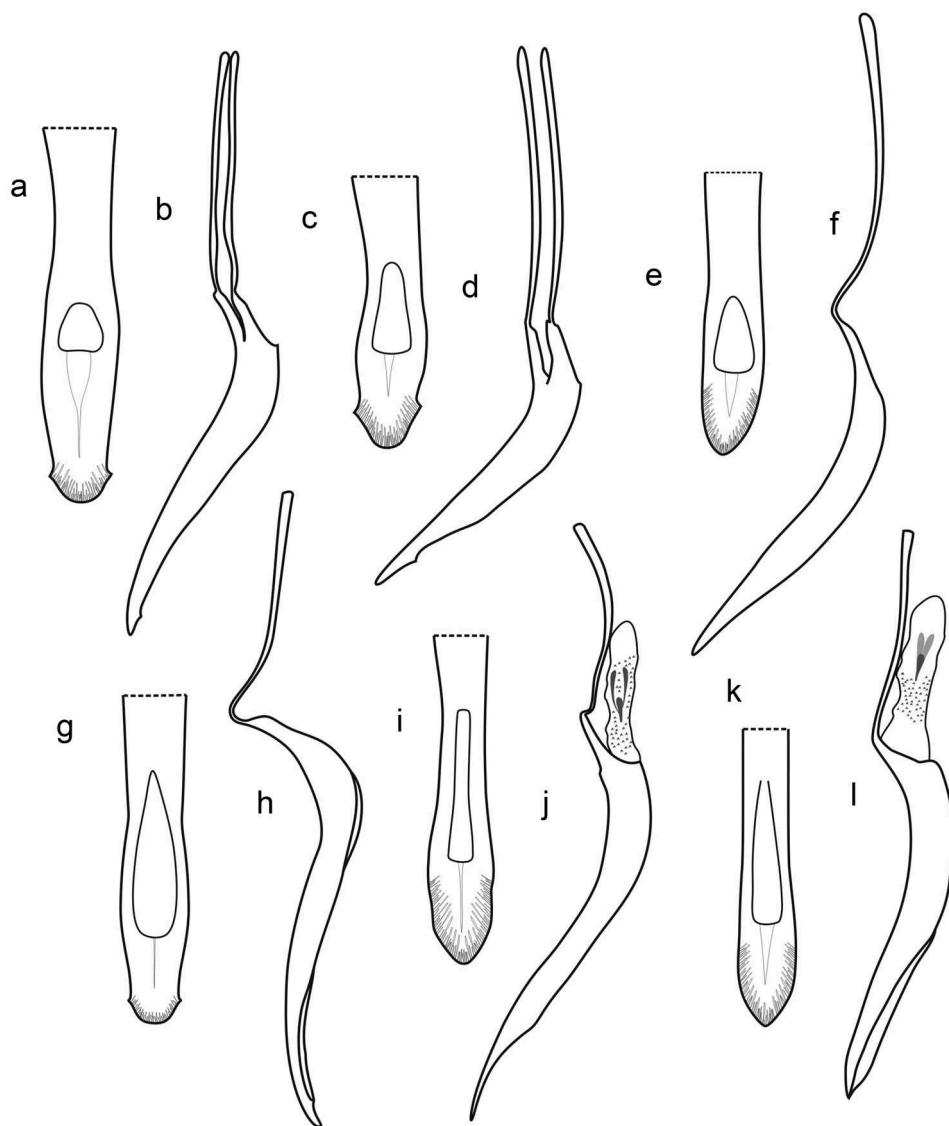


**Figure 2.** Habitus, dorsal views. (a) *Naupactus dissimulator*, female; (b) *N. dissimulator*, male; (c) *N. marvaldiae*, holotype female; (d), *N. marvaldiae*, allotype male.





**Figure 3.** Female genitalia. Sternite VIII. (a) *Naupactus xanthographus*; (b) *N. marvaldiae*. Ovipositor. (c) *N. xanthographus*; (d) *N. marvaldiae*. Spermathecae. (e) *N. xanthographus*; (f) *N. dissimilis*; (g) *N. navicularis*; (h) *N. mimicus*; (i) *N. dissimulator*; (j) *N. marvaldiae*.



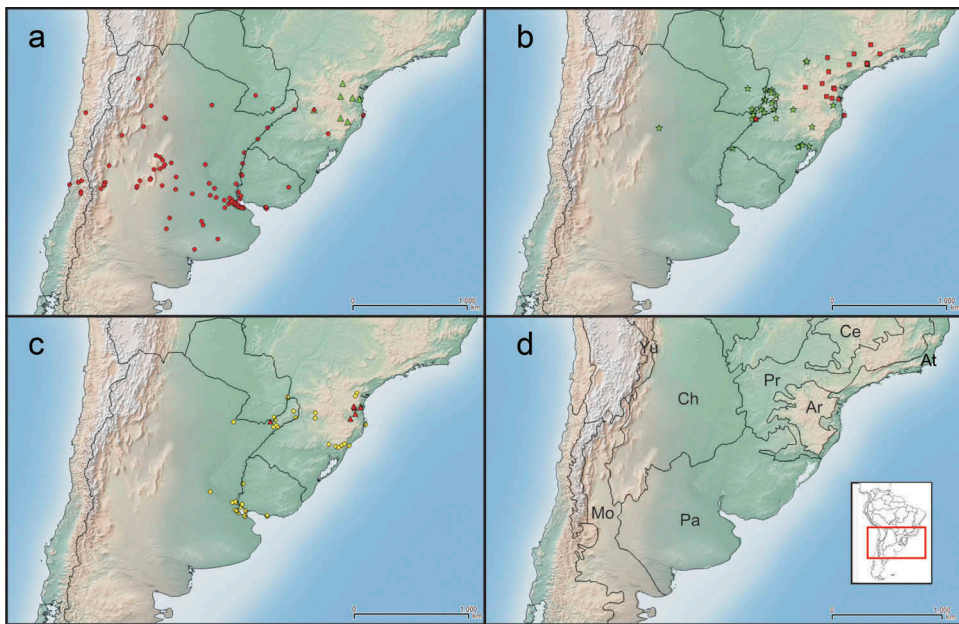
**Figure 4.** Male genitalia. Aedeagi, ventral and lateral views. (a, b) *N. xanthographus*; (c, d) *N. dissimilis*; (e, f) *N. navicularis*; (g, h), *N. mimicus*; (i, j) *N. dissimulator*; (k, l) *N. marvaldiae*.

***Naupactus xanthographus*** (Germar)

(Figures 1(a–c), 3(a, c, e), 4(a, b), 5a)

*Leptocerus xanthographus* Germar 1824, p. 424. Type material: from Buenos Aires, Argentina, probably in Halle, Germany (not seen).

*Naupactus xanthographus*: Schoenherr 1833, p. 571; Schoenherr 1840, p. 7; von Dalla Torre et al. 1936, p. 24 (catalogue); Blackwelder 1947, p. 795 (checklist); Hustache 1947, p. 39 (in key); Wibmer and O'Brien 1986, p. 62 (checklist).



**Figure 5.** Maps of middle South America. (a–c) Geographic distributions of the six species of the *Naupactus xanthographus* species group. (a) *N. xanthographus* (red circles) and *N. mimicus* (green triangles); (b) *N. dissimilis* (green stars) and *N. navicularis* (red squares); (c) *N. dissimulator* (yellow circles) and *N. marvaldiae* (red triangles). Symbols on the maps indicate the localities mentioned under material studied for each species. (d), Biogeographic provinces *sensu* Morrone (2014), inhabited by the six species of the *N. xanthographus* species group. Abbreviations: Ar, Araucaria Forest; At, Atlantic Forest; Ce, Cerrado; Ch, Chaco; Mo, Monte; Pa, Pampa; Pr, Paraná Forest; Yu, Yungas.

### **Redescription. Female** (Figure 1a, c)

Body length 12–16 mm. Vestiture brown or grey-brown, with pattern of whitish or whitish/yellow stripes on pronotum and elytra; pronotum with two pairs of longitudinal yellowish or whitish stripes, one on disc and another on margins; elytra with whitish stripe along suture, yellow stripes along anterior third of 5° interval and along 7–8° intervals, the latter obliquely curved towards 3–4° intervals on posterior third; middle half of 3° interval with small white macula (typical form) or long stripe (Brazilian populations). Rostrum 1–1.15× as long as wide at apex; lateral carinae strong, slightly convergent towards forehead. Eyes round, convex. Scape reaching to slightly exceeding anterior margin of pronotum; funicular article 2, about twice as long as article 1. Pronotum subcylindrical, 1.10–1.20× as wide as long; sides slightly divergent towards base; disc smooth, flat. Elytra navicular, 1.55–1.60× as long as wide; sides strongly curved and narrowed towards apex; apical tubercles large; intervals about 3× as wide as punctures of striae. Front femora 3.05–3.35× as long as wide and 1.10–1.25× as wide as hind femora. Front tibiae with large mucro and 8–10 small denticles on inner margin; middle tibiae with smaller mucro and minute denticles; hind tibiae lacking mucro and denticles; corbel of hind tibiae broad, squamose. Ventrite 5 slightly shorter than ventrite 2.

### *Female genitalia*

Sternite VIII as in Figure 3a. Ovipositor slightly shorter than abdomen, lacking rows of long setae on posterior third, on external side of baculi (Figure 3c). Spermatheca (Figure 3e) subcylindrical, small (0.63 mm), strongly sclerotized on proximal half of body; nodulus and ramus almost indistinct; spermathecal duct about 6× as long as spermatheca.

### *Male (Figure 1b)*

Body length 11–13 mm. Smaller and more slender than female. Rostrum about 1.25× as long as wide. Pronotum about as wide as long; disc slightly convex; sides not divergent towards base. Elytra about twice as long as wide; sides slightly curved. Hind tibiae with row of denticles on inner margin, the distal one very large, with the appearance of a proximally mucro displaced. Ventrite 5, 1.70–2× as long as ventrite 2, apex slightly inwardly bent.

### *Male genitalia (Figure 4a, b)*

Body of penis 1.4–1.5× as long as penis apodemes; apex arrow-shaped, rounded and slightly protruding beyond lateral points; ostium about as long as wide; endophallus with distinct spiny area but lacking internal pieces.

### *Material examined*

**ARGENTINA. Buenos Aires:** Bragado, 1 November 2006, G del Rio (1f MLP- IBOL); Capital Federal, 26 March 1979, O Salomon (1f USNM); idem, O de Ferraris (2f MLP); Flores, 21 April 1912 (1m MLP); Florencio Varela, 23 October 1949, O de Ferraris (1m MLP); Haedo, February 1926, Harrington (1f 1m USNM); Hurlingham, Biocontrol Lab., 20 January 1972 (1f MLP); Isla Martín García, 1 May 1935, M Viana (1m MLP); idem, November 1937, J Costa (1m MLP); José C Paz, 13 January 1940, PA Berry (1m USNM); idem, 1937, Maldonado (8f MLP); La Plata, 23 November 1977, S Tuler (1m MLP); idem, AR Bezzi (6f 5m MLP); idem, 12 April 2014, A Lanteri (1m MLP); Lomas de Zamora, 1 November 1919 (1f MLP); Luján, 18 December 1938 (1f 1m USNM); Pacheco, 22 October 1925, Bridarolli (1m MLP); Parque Pereyra Iraola, 11 January 1991, A Marvaldi (2f 1m MLP); Pilar, 18 September 1938, Castillo (1m MLP); Punta Lara (2f MZSP); idem, 10 April 1938, Maldonado (3f 2m MLP); Quilmes, 13 February 1991, A Marvaldi (1f 1m MLP); A Martínez (2f MLP); San Antonio de Areco, 16 December 1942, PA Berry (1f 1m USNM); idem, 22 December 1938, PA Berry (1m USNM); San Fernando, 25 November 1932, Arroyal (2f 1m MLP); San Isidro, April 1957, Molinari (1f USNM); idem, III March–April 1954, IV April–May 1955 (3f 1m MLP); San Nicolás, 33° 21' S, 60° 13' W, 18 m, 8 March 2006, D Carpintero (1f MLP, IBOL); Sierra de la Ventana, 20 October 1965, Ronderos (2f MLP); Tigre, 12 May 1950, M Viana (1f MLP); idem, 28 September 1968, CW O'Brien (1m MLP); Villa Calzada, 1 April 1940 (1f 1m MLP); Villa Elisa, 15 December 1979, O Flint (1m USNM); Zelaya, 18 February 1968, O Flint (1f USNM); idem, 24 April 1927, Kraliuk (1m USNM). **Catamarca:** no loc. (3f 6m MLP). **Córdoba:** Bajo Grande, 14 August 1939, Maldonado (1f MLP); Camino 60 cuerdas, 29 January 1953 (1f USNM); Capilla del Monte, 1000 m, 31 January 1981, C Bordón (1f USNM); Cruz del Eje, 28 April 1950, Maldonado-Bruzzzone (1m MLP); El Sauce, January 1962, M Viana (1f 1m MLP); Las Rabonas, 27 February 1997 (1m MLP); Puente Río de

los Espinillos, Embalse Los Molinos, 31° 29' 40" S, 64° 34' 35" W, 925 m, 27 February 2006, D Carpintero (3m MLP, IBOL); Río Cuarto, Arroyo del Gato, 28 February 1941, M Birabén (1f MLP); Río Primero, 21 May 1953 (1f USNM); Villa Nueva, 1 January 1939 (1m MLP). **Corrientes:** Santo Tomé (1m MLP). **Chaco:** Roque Saenz Peña (1f MLP). **Entre Ríos:** Colón (1f MLP); Concordia, Salto Chico, February 1951, Nuñez-Regueiro (1m MLP); Gualaguaychú (1f MLP). **La Pampa:** General Pico, 21 September 1942, PA Parker (1f USNM; 1f MZSP). **La Rioja:** Chilecito, 20 February 1939, Birabén-Scott (3f 4m MLP). **Mendoza:** Agrelo, Luján, 10 January 1947, s/papa, Torres (2f 1m MLP); Las Heras, 15 March 1945, Torres (1f 2m MLP); Pedro Vidal, Tupungato, 14 January 1947, Torres, s/papa (21f 33m MLP); Mendoza, C Bruch (2f 2m MLP); no loc. (12 ex MNHN). **San Juan:** San Juan, December 1938, PA Berry (3f USNM). **San Luis:** Concarán, 11 February 1960, Vidal-Trotta (7f 9m MLP); San Luis, 1 January 1934, Vignatti (1f MLP); San Pablo, 13 March 1960, Vidal-Trotta (1m MLP); Sierras de San Luis, 1 February 1933, Vignatti (3f 1m MLP); Suyuque, 1 December 1933, Vignatti (2f MLP). **Santa Fe:** Esperanza, 1 December 1989, P Stock (2m MLP); Rosario (3m MZSP). **Santiago del Estero:** Beltrán, October 1942, MLP); Maldonado (1f Dto. Capital, 2 February 1940 (1m MLP); Kenti Taco, Sumapampa, 25 November 1944, Maldonado (1m MLP); Santiago del Estero, Wagner (15f 15m MLP). **Tucumán:** San Miguel de Tucumán, Moznette (1f USNM). **BRAZIL. Río Grande do Sul:** Nova Padua, 21 September 2000, on videira var. Niagara rosada (1f 1m MZSP). **Santa Catarina:** Florianópolis, 19 January 2004, A Cordeiro (1f 2m MZSP); Nova Teutonia, November 1945, 300–500 m, 27° 11' S, 52° 23' W, F Plaumann (6f MZSP, 9f 1m CWOB, 1m MLP); idem, 18 July 1939, F Plaumann (1f 1m MLP); idem, October 1935 B Pohl (2f 1m MZSP); idem, 20 October 1962, F Plaumann (3f MNRJ); idem November 1980, F Plaumann (2f 1m MZSP); November 1981, F Plaumann (1f MZSP); idem, March–May 1966, F Plaumann (5f MZSP). **CHILE. Atacama:** Copiapó, 3 December 1960, Oakley (1m USNM). **Región Metropolitana:** Linderos, 12 November 1942 (1f 1m USNM); San Bernardo, 29 November 1960, on nectarine, Oakley (1f USNM). **Valparaíso:** Llay Llay, 27 April 1948, on grape (1f USNM); idem, 26 November 1960, Oakley (1f 1m USNM); Santa María, March 1967, Latta (1f 1m USNM); Valparaíso, 6 February 1905 (1f USNM). **PARAGUAY. Itapúa:** Hohenau, Richter (6f MLP). **Paraguarí:** Ybycuí (25 km SE), Ybycuí National Park, 12–24 April 1980, PJ Spangler et al. (1f 1m USNM). **URUGUAY. Artigas:** Isla Rica, 9 February 1978, L Zolessi, E Morelli & F Rodríguez (2m URUC). **Colonia:** Barra Arroyo El Chileno, 11 January 1970, GJ Wibmer (1m CWOB). **Montevideo:** Millán, 13 April 1958, MA Monné (1f URUC); Montevideo, Palermo, 18 March 1922, Marshall (1f 1m USNM); idem, 28 April 1940, PA Parker (1m USNM); idem, 26 April 1943, PA Berry (1f USNM); Montevideo, Tremoleras (8f 3m MLP); Sayago, 2 May 1932 (1f MLP); idem, 25 February 1967, MS Moratorio, CS Morey & MA Monné (1m CWOB); Colón, 10 March 1931, Montoro Cuarch (1f MLP); idem, 15 March 1929 (1f MLP); Montevideo, Pocitos, 22 October 1932, C Carbonell (1m URUC); idem, 4 May 1958, R Praderi (1f CWOB); Punta Carreta, 4 January 1959, M Lozaudo (1m URUC). **Soriano:** Colonia Concordia, 8 July 1959, JC Zorrilla & MA Monné (2m URUC). **Treinta y Tres:** Río Olimay, November 1958, MA Vignoli (1f URUC).

### **Geographic distribution** (Figure 5a, d)

*Naupactus xanthographus* is distributed mainly in the Pampean biogeographic province. It was recorded for Argentina (Buenos Aires, Catamarca, Córdoba, Corrientes, Chaco,



Entre Ríos, La Pampa, La Rioja, Mendoza, Misiones, San Juan, San Luis, Santa Fe, Santiago del Estero and Tucumán), southern Brazil (Rio Grande do Sul and Santa Catarina), Paraguay (Itapúa and Paraguari), and Uruguay (Artigas, Colonia, Montevideo, Soriano and Treinta y Tres). It was introduced in Chile in 1942 (Durán 1944), where is currently widespread from Atacama to Valparaiso, and also occurs in Juan Fernández islands.

D'Araujo e Silva et al. (1968) cited *N. xanthographus* for Paraná and São Paulo (Brazil); however, we did not find any material from these Brazilian states. We suspect that it could be a misidentification with either *N. navicularis* or *N. mimicus*.

### Host plants

One of the main native hosts of *N. xanthographus* is *Erythrina crista-galli* L. (Fabaceae), native tree from north-eastern and central-western Argentina, eastern Bolivia, southern Brazil and a great part of Paraguay (Burkart 1952; Izaguirre and Beyhaut 1998). The distribution of the weevil follows, approximately, the range of this host plant, which has been introduced in central Chile as ornamental and also in south-eastern USA.

About 50 agricultural plants have been cited as hosts of *N. xanthographus*; the most important is *Vitis vinifera* L. (Vitaceae), because of the damage produced in Chile, Argentina (Mendoza) and Brazil (Rio Grande do Sul) (Caballero 1972; González 1982; Ripa 1986a; González et al. 1992; Lanteri et al. 2002a; Ripa and Larral 2008). Other fruit plants damaged by *N. xanthographus* in Chile are *Prunus persica* var. *nectarine*, *Prunus armeniaca* L., *Pyrus communis* L., *Malus domestica* Borkh. (Rosaceae), *Juglans regia* L. (Juglandaceae), *Persea americana* Mill. (Lauraceae), and *Citrus* × *sinensis* Osbeck (Rutaceae) (Elgueta 1993; Artigas 1994). In Argentina it is usually associated with alfalfa (Lanteri 1994), garden plants, e.g. *Ligustrum* sp. (Oleaceae) (Lanteri et al. 2002a), berries and cherries, e.g. *Prunus avium* L., *Prunus cerasus* L. (Rosaceae) and *Ribes* sp. (Grossulariaceae) in some valleys of Patagonia (del Río et al. 2010), potatoes in Mendoza, and most recently, with soybean in the central area of the country. An olfactometer bioassay for the analysis of the behavioural and nutritional ecology of this weevil demonstrated that starved males and females showed no preference to volatiles of grapes; however, non-starved males and females preferred grape volatiles (Vera et al. 2016).

### Biology

Due to its economic importance, *N. xanthographus* is one of the best-studied South American broad-nosed weevils (Caballero 1972; González 1982; Ripa 1986a; González et al. 1992; Ripa and Larral 2008). The adults feed on the aerial parts of the plants, mainly leaves, flower buds, and in some instances, fruits (e.g. grapes in vineyards). The females lay eggs in clusters (Marvaldi 1999), usually in crevices of the upper parts of the plants (trunks, large branches, rolled leaves) but not in calices of orange fruits, such as *N. cervinus* Boheman, 1840 (Olivares et al. 2014). Egg laying includes 12–50 eggs (Caballero 1972).

First instar and mature larvae of *N. xanthographus* have been described and compared with other Entiminae larvae by Loíacono and Díaz (1992), Marvaldi and Loíacono (1994), and Marvaldi (1998). The larvae cause damage to the rootlets and roots of the plants and in some instances reach the phloem; the life cycle is completed in 12–16 months (González 1983; Ripa 1986b).

Several natural enemies are known for *N. xanthographus*, including pathogenic fungi and nematodes, and parasitic wasps (Lanteri et al. 1998). *Centistes* sp. (Braconidae) is a parasite of adults; *Fidiobia asinus* Loíacono (Platygastridae) and *Grassator viator* De Santis (Eulophidae) are parasites of eggs (De Santis 1948; Loíacono 1982). Mejías (2003) investigated the biological control of *N. xanthographus* by means of *Beauvaria bassiana* (Bals.) Vuill., *Metarhizium anisopliae* (Metchnikoff) Sorokin and *Steinernema* sp. in Chile. Several chemical control strategies have been applied and are still under study in this country (Ripa 1985, 1987; Sazo and Gerstle 1989; Ripa and Berhó 1990; Pinto and Zaviezo 2003). Moreover, a PCR-based diagnostic system has been developed to identify *N. xanthographus* at the egg stage (Aguirre et al. 2015).

### Remarks

*Naupactus xanthographus* shows a remarkable sexual dimorphism. Males are smaller and more slender than females, legs and antennae are longer, and the hind tibiae bear a row of denticles on the inner margin, the distal one with the appearance of a proximally displaced mucro. The species also shows geographic variation. The typical form (type material from Buenos Aires, Argentina) is widespread throughout the Pampas of Argentina and Uruguay, and it is also present in central Chile and Paraguay. The specimens from Brazil differentiate from those of the typical form because they are slightly smaller, narrower and with different colour pattern. The scaly vestiture is greyish-whitish instead of brownish, with more extended white stripes on the elytra, especially along the 3° interval, and the yellow stripes characteristic of the typical form are lacking (Figure 1c). Moreover, in the Brazilian populations we did not find males.

*Naupactus xanthographus* was recovered as the sister species of *N. navicularis* in a cladistic analysis using molecular data (COI sequences), in which *N. dissimilis* and *N. mimicus* were not included (Scataglini et al. 2005). The characters of the male genitalia (apex of penis arrow-shaped) suggests that *N. dissimilis* and *N. mimicus* might be closer to *N. xanthographus* than *N. navicularis*.

### *Naupactus dissimilis* Hustache (Figures 1(d, e), 3f, 4(c, d), 5b)

*Naupactus dissimilis* Hustache 1947, p. 69. Type material: male labelled as *typus*, Argentina, Río Paraná, Misiones, at MNHN, Hustache collection, herein designated as lectotype. Body length: 10 mm.

*Naupactus dissimilis* Hustache 1947, p. 40 (in key); Wibmer and O'Brien 1986, p. 59 (checklist).

### Redescription. Female (Figure 1d, e)

Body length 11–14 mm. Vestiture brown or grey-brown with pattern of yellow or yellow/white stripes; pronotum with two pairs of longitudinal white stripes, one on disc and another on margins; elytra usually with white stripe along suture (typical form), and yellow/whitish stripes on anterior third of 5° interval, middle half of 3° interval (typical form), and 7–8° intervals, the latter obliquely ascending towards 5° interval on posterior third. Rostrum 1.05–1.20× as long as wide at apex; lateral carinae moderate, squamose,



subparallel. Eyes round, convex. Scape reaching anterior margin of pronotum; funicular article 2, about twice as long as article 1. Pronotum subcylindrical, 1.05–1.15× as wide as long; sides curved, not divergent towards base; disc flat, smooth. Elytra oval, 1.65–1.75× as long as wide; sides moderately curved and not abruptly narrowed towards apex; apical tubercles small to indistinct; intervals about 4× as wide as punctures of striae. Front femora elongate, 3.10–3.35× as long as wide, slightly wider than hind femora (WF1/WF3 1–1.25×). Front tibiae with mucro and 8–10 small denticles on inner margin; middle tibiae with smaller mucro and minute denticles; hind tibiae lacking mucro and denticles; corbel of hind tibiae broad, squamose. Ventrite 5 slightly shorter than ventrite 2.

### *Female genitalia*

Ovipositor slightly shorter than abdomen, lacking rows of long setae on posterior third, on external side of baculi. Spermatheca (Figure 3f) subcylindrical, small (0.54 mm); nodulus almost indistinct and ramus (prominence at gland entrance) incipient; spermathecal duct about 4× as long as spermatheca.

### *Male*

Body length 9–13 mm. Smaller and more slender than females. Pronotum about as wide as long. Elytra about twice as long as wide. Ventrite 5 about 1.70× as long as ventrite 2, apex slightly inwardly bent.

### *Male genitalia* (Figure 4c, d)

Body of penis slightly longer than penis apodemes; apex arrow-shaped, rounded and more protruding beyond lateral points than in *N. xanthographus*; ostium about twice as long as wide; endophallus with distinct spiny area but lacking internal pieces.

### *Other material examined*

**ARGENTINA. Misiones:** Aristóbulo del Valle, 1 December 1957, Birabén (1f MLP); NW Apóstoles, Rt 10, 27° 52' 27" S, 55° 39' 30" W, 3 March 2010, 146 m, G del Río (1f MLP); Campo Grande, 30 November 1957, Birabén (1f MLP); El Dorado, 3 March 1987, HE Erb (1f MLP); idem, October 1959, Jenjes (1f MLP); idem, January 1958 (1f BMNH); Iguazú, November 1944, M Birabén (1f MLP); Loreto, April 1931, J Bosq (2f MLP); September 1955, J Bosq (1f MLP); idem, Ogloblin (1f MLP); idem, January 1956 (1f BMNH); Parque Provincial Cruce Caballero, 26° 31' 11" S, 53° 59' 11" W, 621 m, 6 March 2010, G del Río (2f MLP-IBOL); Parque Provincial Moconá, 27° 09' 11" S, 53° 54' 04" W, 342 m, 5 March 2010, G del Río (3f MLP-IBOL); idem, 27° 07' 37.4" S, 53° 56' 55.5" W, 1 April 2012, 365 m, P Dellapé & S Montemayor (1f MLP-IBOL); Oberá, 30 December 1957, Birabén (1f MLP); Pindapoy, March 1936, s/pomelo (2f MLP); idem, 14 February 2001, s/*Coniza albida* (2f MLP); Puerto Piray, Alto Paraná, 31 March 1986, HE Herb (1f MLP); idem, PA Berry, s/yerba mate (13f USNM); Puerto Victoria, October 1938 (1f MLP); San Antonio, 4–5 December 1957, Birabén (1f MLP); San Ignacio, December 1956, 240m, JE Montes (1f MLP); San Pedro, November 1958, 550m, Montes (1f MLPC); Santa María, May 1960, October 1961, M Viana (2f MLP); Teju Cuaré, ER Wagner, 1911 (2f MNHN); Uruguay-í, 25° 51' 15" S, 54° 10' 24" W, 29 September 2010, 159m, G del Río (1f MLP-IBOL); 2 de Mayo, January 1986, O Mitre (4f BMNH); 25 de Mayo, 1 December 1957, Birabén (1f MLP); no loc. (2f MLP). **Santiago del Estero:** Río Salado (1f paralectotype MNHN). **BRAZIL. Paraná:** Arapongas,

December 1951, A Maller (1f MNRJ); Cascavel, 9 March 1999, P Silvie (1f MZSP); Curitiba, 1911, P Lombard (1f MNHN); Parque Nacional Iguazú, November 1992 (1f CEIOC); Rolândia, November 1949, Dirings (4f MZSP). **Rio Grande do Sul:** Butiá, 27 May 1982, Gastal (3f 1m USNM); idem, 1 April 1982, Buckup (3f USNM); idem, 28 May 1982, Rosenau (3f USNM); General Câmara, 25 March 1982, V Pitoni & L Ayres (2f 3m USNM); idem, 30 September 1982, Hennig (3f USNM); idem, 3 April 1982 (1f USNM); Porto Alegre, 1939, PA Berry (1f 1m USNM); Minas do Leão, January 2006, I Oliveira (1f MLP); Santo Augusto, December 1968, O Roppa (13f 2m CWOB); São Jerônimo, 29 April 1982, Becker (1f 1m USNM); idem, 30 September 1982, Becker (2f 2m USNM); idem, 8 July 1982, Becker (1f 1m USNM); Vaccaria, March 2001, M Botton, on *Zea mays* (7f MZSP); no loc. 3 February 1983 (6f MLP). **Santa Catarina:** Nova Teutonia, March 1999, P Silvie (1f MZSP); Timbó, March 1957 (1f MZSP). **PARAGUAY. Alto Paraná:** Ciudad del Este, 8 October 1968, at night, CW & L O'Brien (12f CWOB). **Caaguazú:** Caaguazú, 1 December 1950, LE Peña (2f CWOB). **Itapúa:** Hohenau (15f paralectotypes MNHN). **URUGUAY. Artigas:** Río Cuareim, Picada del Negro Muerto, Sepulturas, 16 December 1957, CS Carbonell (1f CWOB).

### Geographic distribution (Figure 5b, d)

*Naupactus dissimilis* occurs mainly in the southern Paraná forest. It is the most common species of the *N. xanthographus* group in north-eastern Argentina (Misiones province) and also occurs in Brazil (Paraná, Rio Grande do Sul and Santa Catarina), Paraguay (Alto Paraná, Caaguazú and Itapúa) and Uruguay (Artigas). Uruguay is a new country record.

### Host plants

*Conyza sumatrensis* (Retz.) E. Walker (syn. *C. albida*) (Asteraceae), annual herb native to South America, and *Ilex paraguariensis* Saint Hill. (Aquifoliaceae), arboreal species distributed along the Paraná, Paraguay and Uruguay rivers, commercialized for infusion ('yerba mate') in Argentina, southern Brazil, Paraguay and Uruguay. It causes minor damage on *Ilex paraguariensis* plantations, *Citrus maxima* (Burm.) Merr. (Rutaceae) and *Zea mays* L. (Poaceae) (Lanteri et al. 2002a).

### Remark

*Naupactus dissimilis* was described based on a series of specimens (= syntypes) from Argentina (Misiones and Santiago del Estero provinces) and Paraguay (Alto Paraná) (Hustache 1947, p. 69). The male from Misiones labelled as typus was herein designated as lectotype, and the remaining specimens of the type series deposited in Hustache's collection (one female from Río Salado, Santiago del Estero, and 15 females from Paraguay, Alto Paraná, Hohenau) are herein considered paralectotypes.

*Naupactus dissimilis* shows a distinct geographic variation, the typical form (Figure 1d) occurs in north-eastern Argentina (type from Misiones province), Paraguay, Santa Catarina and Paraná states in Brazil. The specimens from Rio Grande do Sul (Butiá, General Câmara and Porto Alegre) and Uruguay (Artigas) (Figure 1e) are slightly narrower, with smaller elytral tubercles and different colour pattern on the elytra. The vestiture is greyish instead of light brown, with vanished white stripe along suture and indistinct macula on middle half of 3° interval. Males are unknown for the typical populations, of which females are infected with *Wolbachia*, a bacterium involved in the origin of parthenogenetic reproduction in Naupactini (Rodríguez et al. 2010).

*Naupactus dissimilis* distinguishes from *N. xanthographus* because the lateral carinae of the rostrum are less prominent, subparallel and squamose; the elytra are narrower and bear small to indistinct tubercles; the middle and hind tibiae of males do not bear denticles; the spermatheca is not strongly sclerotized in its proximal half and is slightly prominent near the gland entrance (= ramus incipient); the penis apodemes are slightly longer relative to the body of penis; the ostium is longer and the apex is more pronounced beyond lateral points than in *N. xanthographus*.

***Naupactus navicularis* Boheman**  
(Figures 1f, 3g, 4(e, f), 5b)

*Naupactus navicularis* Boheman 1840, p. 23. Type material: female labelled as *typus*, Brazil, at the NHRS, herein designated as lectotype. Body length: 11.5 mm.  
*Naupactus navicularis*: von Dalla Torre et al. 1936, p. 21 (catalogue); Blackwelder 1947, p. 794 (checklist); Wibmer and O'Brien 1986, p. 60 (checklist).

**Redescription. Female** (Figure 1f)

Body length 11–14 mm. Vestiture brown with pinkish iridescence and pattern of white or white-pinkish stripes along pronotum and elytra: pronotum with two pairs of longitudinal whitish stripes, one on disc and another on margins; elytral suture pinkish-white, anterior third of 5° interval, middle half of 3° interval, and 7–8° intervals whitish, the latter stripes interrupted on middle-length and obliquely ascending towards 4–5° intervals, on posterior third. Rostrum 1.05–1.20× as long as wide; lateral carinae strong and slightly convergent towards forehead. Eyes round, convex. Scape not reaching anterior margin of pronotum; funicular article 2 about twice as long as article 1. Pronotum subcylindrical, about 1.10× as wide as long; sides straight, slightly divergent towards base; disc flat, slightly rugose. Elytra navicular, very thin in lateral view, 1.70–1.75× as long as wide; sides moderately curved and abruptly narrowed in posterior third; apical tubercles small; intervals about twice as wide as punctures of striae. Front femora 2.75–2.95× as long as wide and 1.20–1.30× as wide as hind femora. Front tibiae with large mucro and 6–8 small denticles along inner margin; middle tibiae with small mucro and lacking denticles; hind tibiae lacking mucro and denticles; corbel of hind tibiae narrow, squamose. Ventricle 5 slightly shorter than ventricle 2.

**Female genitalia**

Ovipositor slightly shorter than abdomen, lacking rows of setae on posterior third, on external side of baculi. Spermatheca (Figure 3g) subcylindrical, small (0.55 mm); nodulus and ramus indistinct; spermathecal duct 3–4× as long as spermatheca.

**Male**

Body length 10–11 mm. Smaller and more slender than females. Pronotum about as wide as long. Elytra about twice as long as wide. Ventricle 5 about 1.10× as long as ventricle 2, apex curved.

### **Male genitalia** (Figure 4e, f)

Body of penis slightly longer than penis apodemes; apex acute, lacking lateral point; ostium about twice as long as wide; endophallus with distinct spiny area but lacking internal pieces.

### **Other material examined**

**ARGENTINA. Misiones.** Santa María, October 1944, M. Viana (1f MLP); no loc., Richter (2f MLP). **BRAZIL. Minas Gerais:** Poços de Caldas, February 1958 (1f MZSP); Santa Rita de Caldas, Pe Pereira, December 1953 (1f DZUP). **Paraná:** Castro, 1919, ED Jones (5f BMNH); Cachoeirinha, February 1953 (1f MZSP); Curitiba, 19 November 1985, TJ Henry (1m USNM); idem, December 1937 (3f MZSP); Guarapuava, November 1956, M Schneider (1f MZSP); Ponta Grossa, January 1952 (1f DZUP); idem, December 1937 (1f CEIOC); idem, December 1968, CA Camargo (2f MZSP); idem, September 1944, Pedreira, guarda chuva (1f DZUP); Rolândia, November 1949, Pohl (1f MZSP); São José de Pinhais, 40 km S Curitiba, 22 November 1985, TJ Henry (2f USNM). **Rio de Janeiro:** Barra de Pirahy, February 1934 (1f MZSP). **Rio Grande do Sul:** Villa Oliva, 18 February 1947, P Buck (3f 2m CEIOC). **Santa Catarina:** Joinville, February 1954, Dirings. (3f MZSP); Mafra, 800 m (1f DZUP); Mafra, 26° S, 50° W, December 1928, 800m (1f BMNH); Timbó, April 1964, Dirings. (1f MZSP). **São Paulo:** Campos do Jordão, 10 December 1961, J Halik (1f USNM); idem, 4 January 1960, J Halik (1f USNM); idem, 4 February 1963, J Halik (1f USNM); idem, 10 September 1964, J Halik; idem, 17 April 1962, J Halik (1f USNM); Cantareira, April 1967, J Halik (2f MZSP); Ipiranga, December 1936 (1f MZSP); Cerqueira Cesar, January 1899, E Gounelle (1f BMNH); Itapetininga, on citrus, Citrovida, J Guedes (1f MZSP); Piracicaba, January 2000, J Guedes, on orange (6f MLP); Santana, 10 November 1961, J Halik (1m USNM); idem, 10 May 1960, J Halik (1f USNM); idem, 4 November 1962, J Halik (1f USNM); idem, 17 April 1962, J Halik (1f USNM); idem, 13 January 1963, J Halik (1f MZSP); São Joaquim, 1400m, 28° 15' S, 49° 51' W, F Plaumann (1f MZSP); São Paulo, 26 November 1965, VN Alin (1f USNM); Val du Rio Pardo, December 1898 (4f 1m MNHN); Xavantés, 25–31 January 1974, Reichard (1m MZSP); no loc. (1f MNHN). **PARAGUAY. Itapúa:** Hohenau (1m MNHN).

### **Geographic distribution** (Figure 5b, d)

*Naupactus navicularis* is distributed in the Atlantic, Araucaria and Paraná forests, and reaches the northernmost distribution of the *N. xanthographus* species group. It occurs in north-eastern Argentina (Misiones), Brazil (Minas Gerais, Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina and São Paulo) and Paraguay (Itapúa). Paraguay is a new country record.

### **Host plants**

This species is harmful for *Citrus* in Brazil (São Paulo), especially oranges (Lanteri et al. 2002b; Guedes Carús et al. 2005).

### **Remarks**

Boheman (1840) did not specify the number of specimens of the type series. We consider that the only specimen of *N. navicularis* deposited at the NHRS, labelled as *typus*, is a syntype. In this paper we designate this syntype as lectotype.

*Naupactus navicularis* distinguishes from *N. xanthographus* because the elytra are thinner in lateral view, more pointed at apex and with smaller tubercles; the hind tibiae of males do not bear denticles, and the apex of the body of penis is subacute instead of arrow-pointed. Females are more common than males throughout the range of this species. We have not seen distinct geographic variation.

***Naupactus mimicus* Hustache**  
(Figures 1(g–i), 3h, 4(g, h), 5a)

*Naupactus mimicus* Hustache 1938, p. 268. Type material: male labelled as *typus*, S. Catarina, Brazil, Schramm col, at the MNHN, Hustache collection, herein designated as lectotype. Body length: 10.5 mm.

*Naupactus justus* Bondar 1949, p. 176. Type material: male labelled as *cotype*, Ponta Grossa, Paraná, Brazil at AMNH, herein designated as lectotype. Body length: 11 mm. Synonymy by Kuschel 1955, p. 279.

*Naupactus mimicus*: Blackwelder 1947, p. 794; Wibmer and O'Brien 1986, p. 60.

**Redescription. Female** (Figure 1g, i)

Body length 12–13 mm. Vestiture uniformly brown or grey-brown with white stripes on pronotum and elytra; pronotum with two pairs of whitish stripes, one on disc and the other on margins; elytra with contrasting white stripe along suture (typical form, Figure 1g) or greyish-brown, with less contrasting stripe along suture, and white stripes on middle half of 3° interval, anterior third of 5° interval, and 7–8° intervals, the latter stripe interrupted near middle-length and curved towards 4–5° intervals on posterior third (variety, Figure 1h). Rostrum 1.05–1.10× as long as wide at apex; lateral carinae strong, subparallel. Eyes round, convex. Scape reaching anterior margin of pronotum; funicular article 2, about twice as long as article 1. Pronotum 1.15–1.20× as wide as long in females; sides curved; disc flat, slightly rugose. Elytra oval, 1.50–1.60× as long as wide; sides moderately curved and not abruptly narrowed towards apex; apical tubercles large; intervals about 2–2.5× as wide as punctures of striae. Front femora 2.95–3.10× as long as wide and 1.20–1.30× as wide as hind femora. Front tibiae with large mucro and 9–10 large denticles on inner margin; middle tibiae with small mucro and lacking denticles; hind tibiae lacking mucro and denticles; corbel of hind tibiae narrow, squamose. Ventricle 5 slightly shorter than ventricle 2.

**Female genitalia**

Ovipositor slightly shorter than abdomen, lacking rows of long setae on posterior third, on external side of baculi. Spermatheca (Figure 3h) subcylindrical, small (0.5 mm); nodulus conical, short; ramus indistinct; spermathecal duct about 4× as long as spermatheca.

**Male** (Figure 1h)

Body length 10.5–13 mm. Smaller and more slender than females. Pronotum about as wide as long. Elytra about twice as long as wide, with smaller apical tubercles. Ventricle 5 about twice as long as ventricle 2, apex slightly inwardly curved.

### *Male genitalia* (Figure 4g, h)

Body of penis about 1.90–2× as long as penis apodemes; apex arrow-shaped, slightly truncate; ostium about 3× as long as wide; endophallus with distinct spiny area but lacking internal pieces.

### *Other material examined*

**BRAZIL. Paraná:** Guaraúna, June 1937, J Pinheiro & Machado (1f MZSP); Ponta Grossa, 5 December 1938, Camargo (1f 1m DZUP); December 1937, CA Camargo (2m CEIOC); idem, December 1938, CA Camargo (14f 16m MZSP); idem, 7 December 1939, 9 December 1939, Camargo (1f 1m MZSP); Rio Negro, M Leitão (1f MNRJ); idem, November 1923, M Witte (1m MNRJ). **Santa Catarina:** Joinville, 27° 51' S, 50° 48' W, F Plaumann (3f 5m MZSP); Lages, 13 February 1973 (1f DZUP); Nova Teutonia, January 1961, F Plaumann (1f MZSP); idem, April 1936, F Plaumann (2f MZSP); idem, September 1966, F Plaumann (5f 3m MZSP); São Bento do Sul, January 1051, Dirings. (1f MZSP); Tres Barras, 26 November 1961, WA Bishop (1f MNRJ); no loc. (1f paralectotype MNHN). No loc. (2m MNHN).

### *Geographic distribution* (Figure 5a, d)

*Naupactus mimicus* is endemic to Brazil (Paraná and Santa Catarina states) and occurs mainly in the Araucaria forest, close to the limit with the Atlantic forest.

### *Remarks*

*Naupactus mimicus* was described based on a series of specimens (= syntypes) from Brazil, Santa Catarina. The male from this location labelled as *typus* is herein designated as lectotype. Along with this specimen there is a female with the same data, herein considered a paralectotype. *Naupactus justus* was described based on a series of specimens (= syntypes), females and males, from Brazil, Paraná, deposited in the author's collection (currently at the American Museum Natural History) and the Chicago Natural History Museum. We designated the male of the AMNH as lectotype.

*Naupactus mimicus* differentiates from *N. xanthographus* because the pronotum is slightly wider and more rugose, the elytra are shorter and with smaller apical tubercles, the denticles of the front tibiae are larger, the corbel plate of the hind tibiae is narrower, the nodulus of the spermatheca is slightly longer, the apex of the penis is more truncate between the lateral points and slightly longer relative to its penis apodemes, and the ostium is also longer.

The types of *N. mimicus* (Santa Catarina) and *N. justus* (Paraná) are uniformly brown, with a contrasting white stripe along the suture of elytra and without other white stripes visible from dorsal view (Figure 1g, h). In other specimens from Santa Catarina the vestiture is greyish, with less contrasting white stripe along suture, but with distinct white stripes along 3° and 5° intervals, and the distal half of the lateral stripe visible from dorsal view (Figure 1i). This pattern is similar to that of the Brazilian variety of *N. xanthographus* (Figure 1c).

***Naupactus dissimulator* Boheman**  
(Figures 2(a, b), 3i, 4(i, j), 5c)

*Naupactus dissimulator* Boheman 1840, p. 8. Type material: male labelled as *typus*, Buenos Aires, at NHRS, herein designated as lectotype. Body length: 10 mm.

*Naupactus fallax* Boheman 1840, p. 9. Type material: female labelled as allotype (error), Brazil, at NHRS, herein designated as lectotype. Synonymy by Kuschel in Wibmer and O'Brien 1986, p. 59. Body length: 11.5 mm.

*Naupactus dissimulator*: von Dalla Torre et al. 1936, p. 19 (catalogue); Blackwelder 1947, p. 794 (checklist); Hustache 1947, p. 39 (in key); Wibmer and O'Brien 1986, p. 59 (checklist).

**Redescription. Female** (Figure 2a)

Body length 10–12.5 mm. Vestiture brown, with pattern of white stripes on pronotum and elytra, and elytral disc usually rubbed; pronotum with distinct white stripe along midline, extended along whole elytral suture; middle half of 3° interval with white maculae (female); 7° interval with white stripe on anterior third, obliquely curved towards 5° interval in posterior half. Rostrum about as long as wide at apex; lateral carinae very strong, denuded, subparallel. Eyes round, convex. Scape reaching anterior margin of pronotum; funicular article 2, 1.5–1.9× as long as article 1. Pronotum sub-cylindrical, 1.20–1.25× as wide as long; disc flat, rugose. Elytra oval, 1.60–1.70× as long as wide; disc flat and usually rubbed; sides moderately curved and narrowed towards apex; apical tubercles large; intervals about 3× as wide as punctures of striae. Front femora 2.60–2.70× as long as wide and 1.40–1.45× as wide as hind femora. Front tibiae with large mucro and about 10 large denticles on inner margin; middle tibiae with smaller mucro and lacking denticles; hind tibiae lacking mucro and denticles; corbel of hind tibiae lacking. Ventrite 5 slightly shorter than ventrite 2.

**Female genitalia**

Ovipositor about  $\frac{3}{4}$  as long as abdomen, with rows of 3–5 setae on posterior third, on external sides of baculi (see Figure 3d). Spermatheca (Figure 3i) subcylindrical, large (0.7 mm); nodulus tubular, long, and ramus incipient; spermathecal duct 2–3× as long as spermatheca.

**Male** (Figure 2b)

Body length 8–11 mm. Rostrum 1.15–1.20× as long as wide. Pronotum about as wide as long; disc slightly convex. Elytra 1.80–1.90× as long as wide; maximum width similar to maximum width of pronotum; apical tubercles very small, almost indistinct. Ventrite 5 about 1.20× as long as ventrite 2, apex rounded.

**Male genitalia** (Figure 4i, j)

Body of penis about twice as long as penis apodemes; apex acute, with waved sides, but not arrow-pointed; ostium about 4–5× as long as wide; endophallus with spiny area and large, strongly sclerotized internal armature, consisted on a pyriform central piece and two lateral wing-shaped pieces.



**Other material examined**

**ARGENTINA. Buenos Aires:** Delta, 1945, M Viana (1f MLP); Delta Paraná, Río Luján, Monrós (2f FIML); Delta, 6 April 1927, on orchids, Kisliuk (1f USNM); Delta, Carapachay, October 1940, Monrós (1m BMNH); Delta, Paraná Guazú, December 1952 (3f 4m BMNH); Dique Luján, November 1938, Daguerre (3f 2m USNM); Isla Martín García, June 1936, M Viana (2f 3m MLP); idem, January 1938, M Viana (2f 1m MLP, 1f MNHN); idem, April 1938, M Viana (1m MLP); Isla Paulino, 22 December 1977, Cicchino (3f 2m MLP); idem, 18 December 2009, G del Río (1f MLP, IBOL); Isla Santiago, 21 April 1945, Olivier (1m MLP); idem, 18 January 1919 (1f MNHN); La Plata, (2f 3m MLP); idem, AR Bezzi (2f 2m MLP); idem, 1939, Costa (1m MLP); idem, C Bruch (1m MLP); Palermo, 20 December 1915, J Bosq (1m MLP); idem, 18 March 1922, Marshall (1f USNM); Punta Lara, December 1931, Bosq (1f 3m MLP); idem, 15 March 1958, Aguirre (4f USNM); idem, January 1958, Aguirre (5f 1m USNM); idem, December 1931, J Bosq (4m MLP); idem, 30 December 1969 (1f BMNH); San Fernando, 25 November 1932 (1f 2m MLP); idem, December 1939 (1m MLP); idem, 8 January 1950, JB Daguerre (1f 1m USNM); San Ignacio, Villa Lutecia, 1910, ER Wagner (1f 3m MNHN); San Isidro, 26 March 1927, on peach, Kisliuk (1f USNM); idem, 3 January 1932, J Bosq (2f MLP); idem, 6 January 1932, J Bosq (1f 3m MLP); March 1932 (2f 2m MLP); Tigre, 1935, M Viana (1f 1m MLP); idem, November 1958, Daguerre (2f 1m USNM); no loc. 20 March 1906, C Bruch (4m MLP); no loc., Richter (5f 3m MLP); no loc. J Bosq (4f MLP). **Corrientes:** Corrientes city, July 1934, J Bosq (1m MLP). **Entre Ríos:** Brazo Largo, May 1940, Castillo 1f MLP); Gualeguaychú, JA Haedo Rossi (1f FIML); Villa Paranacito, July 1939, Castillo (1m MLP). **Misiones:** NW Apóstoles, Rt 10, 27 52.451 S, 55 39.514 W, 3 March 2010, 146 m, G del Río (1f MLP); Campo Viera, 1952 (1f BMNH); Colonia Taranco, Dto. Candelaria, 20 November 1948, Viana (6f MLP); Iguazú, November 1944, M Birabén (2f MLP); Iguazú, 13 March 1945, Hayward-Willink (2f 2m FIML); Loreto, September 1955, J Bosq (1f MLP); Parque Provincial Las Araucarias, 26° 37' 52" S, 54° 06' 13" W, 546 m, 6 March 2010, G del Río (1f 2m MLP-IBOL); Parque Provincial Moconá, 27° 07' 37.4" S, 53° 56' 55.5" W, 1 April 2012, 365 m, P Dellapé & S Montemayor (3f 1m MLP-IBOL); Puerto Bemberg, 30 March 1945, Hayward Willink & Golbach (2m FIML); Santa Ana, August 1952, 160m (1f 1m BMNH); San Ignacio, Villa Lutecia, ER Wagner, 1910 (1f 3m MNHN); Santa María, December 1947 (1f MLP); no loc. C Berg (1m MLP). **Santa Fe:** Rosario, September 1961, A. Martínez col (1f 4m MZSP). **BOLIVIA. Cochabamba:** Yungas del Palmar, A. Martínez (1f MZSP). **BRAZIL. Paraná:** Bocaiuva, December 1963 (1f 1m MZSP); Curitiba, December 1937 (4f MZSP); idem, December 1939, Guerin (1f MNRJ); idem, March 1938 (5f USNM); idem, 7 October 1936 (1f BMNH); idem, 13 January 1969, CW & L O'Brien, Araucaria forest (5f CWOB); near Curitiba, 9 January 1963, Blake & Cochran (7f USNM); 3km Foz do Iguazú, 9 October 1968, CW & L O'Brien (2f CWOB). **Rio Grande do Sul:** Canela, 2 March 1976, Lise (1f USNM); Farroupilha, November 1960 (1f USNM); São Francisco de Paula, January 1955, Buckup (1f USNM); Tainhas, April 1959, F Plaumann (1m MZSP); Tainmezinho, PN dos Aparados da Serra, February 1960 (2f USNM); Torres, 21 November 1976, Lise (1f USNM). **Santa Catarina:** Bom Jesus, 28° 40' S, 50° 12' W, 1200m, December 1962, F Plaumann (1f 1m MZSP); Florianópolis, Lagoa Pequena, Pós Duna, *Ocotea punchella* (Lauraceae), 26 May 2007, F F Albertoni (1f 1m MZSP); Joinville, September 1942, B Pohl (3f 1m MZSP); Nova Teutonia, April 1966, F Plaumann (1m MZSP); Nova Teutonia, 27° 11' S 52° 23' W, 300–500 m, April 1954, F Plaumann (1m MZSP); São Bento do Sul, 26° S 50° W, 800m, September 1923, A Maller (1f

BMNH). **PARAGUAY. Itapúa:** Hohenau (1f MLP, 5f 3m MNHN). **URUGUAY. Colonia:** Barra Arroyo El Chileno, 11 January 1970, GJ Wibmer (4f 1m MLP); camino a Salto (2f USNM); Colonia, 7 December 1942 (1f USNM); Playa Arenisca, 6 January 1979, GJ Wibmer (1f MLP, 1f CWOB). **Maldonado:** Cerro Negro, 27° 51' S, 50° 48' W, 900 m, December 1962, F Plaumann (1f MZSP). **Montevideo:** Montevideo, Palermo, 18 March 1922, Marshall (1f USNM); Sayago, 8 January 1969, MS Moratorio & GJ Wibmer (1f MLP, 2f CWOB). **Paysandú:** Paysandú, Puerto Pepe Ají, 21–25 January 1970, MA Monné, G Wibmer & CE Cassini (1f CWOB).

### *Geographic distribution* (Figure 5c, d)

*Naupactus dissimulator* occurs mainly in the southern Paraná forest and extends along the gallery forests of Paraná River, down to the banks of La Plata River. It has been recorded for Argentina (Buenos Aires, Corrientes, Misiones and Santa Fe), Bolivia (Cochabamba), southern Brazil (Paraná, Santa Catarina and Río Grande do Sul), Paraguay (Itapúa) and Uruguay (Colonia, Maldonado, Montevideo and Paysandú). Bolivia is a new country record. This finding indicates that *N. dissimulator* also inhabits the Yungas forest.

### *Host plants*

One of the native hosts of *N. dissimulator* is *Ocotea punchella* (Nees & Mart.) Mez (Lauraceae), a semideciduous tree distributed in Argentina, Paraguay, central-eastern and southern Brazil, throughout the Atlantic and the Paraná forests. This weevil causes damage on *Citrus* sp. (Rutaceae), *Ilex paraguariensis* Saint Hill (Aquifoliaceae) and *Prunus persica* (L.) Batsch (Rosaceae), in north-eastern Argentina (Bosq 1943; Lanteri et al. 2002a). Eggs and oviposition habits of this species have been studied by Marvaldi (1999).

### *Remarks*

Boheman (1840) did not specify the number of specimens of the type series of *N. dissimulator*, consequently we designate the only specimen at the NHRS labelled as *typus* as the lectotype. In the case of *N. fallax*, the author described male and female. In the collection of the NHRS we found only the female (one of the syntypes), that was erroneously labelled as allotype. In this paper we designate this female as lectotype.

The populations from Argentina and Uruguay are equal to the typical *N. dissimulator* (type material from Buenos Aires, Argentina) and slightly different from those occurring in southern Brazil, Bolivia and Paraguay. The latter are usually smaller, the pronotum and elytra are slightly narrower, and the disc of the elytra are less flat and not rubbed. In the type female of *N. fallax* (from Brazil), the apical tubercles are more reduced than in the females of *N. dissimulator* from Argentina and Uruguay.

A previous cladistic analysis of a set of *Naupactus* and *Pantomorus* Schoenherr from South America (Scataglini et al. 2005) suggested that *N. dissimulator* is the sister species of *N. cervinus*; however, based on the new material studied herein it might be possible that the closest species is *N. marvaldiae*. *Naupactus cervinus* is a parthenogenetic species also harmful for citrus and other fruit trees (Lanteri et al. 2002b; Rodriguero et al. 2016), easily distinguished from *N. dissimulator* because it is smaller, without tubercles at the apex of the elytra, the eyes are more convex, the pronotum is smooth and the front femora are slightly wider than the hind femora. The

ovipositor and spermatheca are similar in both species, but in *N. cervinus* the spermathecal duct is longer and very wide.

***Naupactus marvaldiae* sp. nov.**  
(Figures 2(c, d), 3(b, d, j), 4(k, l), 5c)

***Type material***

Holotype female, with the following labels [BRASIL/Joinville /Sta. Catarina/Dirings], [MZSP] label green, [HOLOTYPE/*Naupactus marvaldiae* /Lanteri & del Río, 2017], label red. Body length: 10 mm.

Paratype. Allotype male with the following labels [BRASIL/Rio Vermelho/Sta. Catarina/III-1960 Dirings], [MZSP] label green, [ALLOTYPE/*Naupactus marvaldiae* /Lanteri & del Río, 2017], label red. Body length: 9 mm.

***Holotype female*** (Figure 2c)

Body length 10 mm. Integument light brown, slightly sclerotized, loosely covered with sparse, round scales and short recumbent setae. *Vestiture* light brown with characteristic pattern of white stripes on pronotum and elytra. Pronotum with slender white stripe along midline and pair of marginal stripes interrupted on middle; elytra with two slender white stripes, one starting at humeri and curved towards anterior third of 6° interval and another extended along 7–8° intervals and curved towards posterior half of 2–3° intervals; middle half of 3° interval without white maculae; venter denuded along midline. *Rostrum* about as long as wide at apex; epistome large, sparsely covered with very small round scales; lateral carinae strong, denuded, slightly convergent towards forehead; rostral sulcus slender, reaching level of posterior margin of eyes; setae forming semi-circles on each side of anterior half of sulcus and subparallel on posterior half; forehead about 1.40× as wide as apex of rostrum. *Eyes* round, convex. *Antennae* slender, setose; scape reaching about anterior margin of pronotum; funicular article 2, about 1.80× as long as article 1; articles 3–7, about 3× as long as wide at apex; club about 3× as long as wide. *Pronotum* subcylindrical, 1.30× as wide as long; disc flat, rugose (with confluent large punctures); sides slightly curved. *Scutellum* sparsely squamose. *Elytra* oval, about 1.36× as long as wide, 2.50× as long as pronotum, and 1.40× as wide as pronotum; apical margin thickened; humeri absent; disc slightly convex and slightly elevated regarding disc of pronotum; intervals flat, about twice as wide as punctures of striae; apex with pair of large tubercles at extreme of 3° interval. *Metathoracic wings* vestigial. *Legs*. Front coxae not separated from each other, twice as close to anterior than posterior margin of pronotum; front femora about 2.5× as long as wide and 1.5× as wide as hind femora; front tibiae with large, acute mucro and 8–10 large denticles on inner side; middle tibiae with small mucro and stiff setae; hind tibiae lacking mucro and denticles; corbel of hind tibiae lacking; dorsal comb about as long as apical comb. *Ventrite 5* slightly shorter than ventrite 2.

***Female genitalia***

Sternite VIII (Figure 3b) subrhomboidal, with V-shaped sclerotization near base and apical tuft of long setae; spiculum ventral about 3× as long as VIII sternite. Ovipositor

(Figure 3d) about  $\frac{3}{4}$  as long as abdomen, with two lines of 4–5 long setae on posterior third, on external side of baculi; distal coxites slightly sclerotized, styli long, laterodorsally directed. Spermatheca (Figure 3j) subcylindrical, large (0.8 mm); nodulus tubular, long; ramus incipient; cornu strongly curved, about as long as spermatheca; spermathecal duct sclerotized, not spiral form, very thin, about 3× as long as spermatheca.

#### *Allotype male* (Figure 2d)

Body length 9 mm. Smaller and more slender than female. Rostrum 1.15× as long as wide at apex. Forehead 1.35× as wide as rostrum at apex. Pronotum about 1.20× as wide as long. Elytra 1.40× as long as wide, 2.45× as long as pronotum, and 1.35× as wide as pronotum. Ventrite 5 about as long as ventrite 2.

#### *Male genitalia* (Figure 4k, l)

Body of penis about twice as long as penis apodemes; apex slightly acute, lateral points vanished, flat in lateral view; ostium about 4× as long as wide; endophallus with spiny area and large, strongly sclerotized internal armature, consisted on a pyriform central piece and two lateral wing-shaped pieces.

#### *Other material examined*

More than 100 paratypes deposited at the MZSP, MNRJ and MLP, from the following locations: **ARGENTINA. Misiones.** no loc., Richter (2m MLP). **BRAZIL. Santa Catarina.** Blumenau, 2–5 December 1975, Exp. Dep. Zool. (1f MZSP); Corupá, Alto da Serra, Estrada São Bento, 3 May 1967, Biasi (2f MZSP); Corupá, October 1951, August 1953, October 1953, November 1953, January 1954, A Maller (2f 5m MNRJ); Joinville, January 1923 (1f MNRJ); Joinville, December 1954, April 1955, October 1955, January 1956, July 1959, Dirings. (20f 5m MZSP); Rio Natal, March 1957, Dirings. (5f 5m MZSP); Rio Vermelho, January 1945, November 1948, January 1950, March 1950, January 1952, January 1953, March 1954, December 1955, December 1956, January 1958, March 1960, December 1961, January 1962, March 1962, February 1963, March 1963, March 1964 (100f 50m MZSP); São Bento, March 1952, B Pohl (1f MZSP); idem, January 1923 (1f MNRJ); Timbó, February 1956, November 1956, December 1956, March 1961, December 1961, February 1962, May 1962, May 1963, February 1964, Dirings. (20f 10m MZSP).

#### *Geographic distribution* (Figure 5c, d)

*Naupactus marvaldiae* occurs mainly in the southern Atlantic forest. It is distributed in southern Brazil (Santa Catarina) and in Argentina (Misiones).

#### *Etymology*

The name *Naupactus marvaldiae* is dedicated to the outstanding weevil expert Adriana E. Marvaldi, from the Museo de La Plata, Argentina.

#### *Remarks*

The new species differentiates from *N. dissimulator* because it is usually smaller (8–10 mm long), with less sclerotized integument, broader front femora and larger denticles on the inner margin of the front tibiae. The elytra are shorter, broader and more narrowed towards apex; the striae show larger punctures, and the white marginal stripes

of 7–8° intervals are obliquely extended on disc and reach the posterior third of 2–3° intervals. The pronotum of the males shows less curved flanks and is narrower than in *N. dissimulator*; the apical tubercles are well-developed and the white stripe along suture is indistinct (in males of *N. dissimulator* this stripe is always distinct). The spermathecal duct of *N. marvaldiae* is slightly shorter than in *N. dissimulator* and the apex of the penis is not waved on its sides.

Some specimens of *N. marvaldiae* have been misidentified in entomological collections as *Naupactus curtus* Boheman 1833, probably because of the short elytra and the similar colour pattern. The latter is easily distinguished because it lacks tubercles in the apex of elytra; the pronotum is smooth instead of rugose and very convex, particularly in males; the front tibiae are longer, strongly curved near apex, and bear a hook-like mucro and large denticles on inner margin.

## Discussion

*Naupactus xanthographus* shows the most southern and western distribution within the group under study (Figure 5a). It inhabits areas probably not suitable for the remaining species, which are almost exclusively associated to subtropical forests. According to Guzmán et al. (2012), the highest genetic diversity of *N. xanthographus* is in Buenos Aires province, near La Plata River, where there are the optimal environmental conditions for its occurrence. Outside this area, there is a single haplotype that seems to be adapted to drier environments, such as those in the biogeographic provinces of Espinal, Chaco and Monte (Figure 5a, d). Even though *N. xanthographus* mainly inhabits lowlands, it reaches more than 1000 masl in the mountain systems of central and western Argentina (Tandilia, Ventania, Córdoba, San Luis, Mendoza).

The humid valleys of central Chile, where *N. xanthographus* was introduced through commercial trade and/or different kinds of passive transport, also show optimal environmental conditions for this species (Guzmán et al. 2012). Other areas suitable for the occurrence of *N. xanthographus* outside South America are western USA, southern Africa, and southern Australia (Guzmán et al. 2012).

The remaining species of the group occur in the Atlantic and the Paraná forests *sensu* Cabrera and Willink (1973), or in the Atlantic, the Paraná and the Araucaria forests *sensu* Morrone (2014) (Figure 5a–d). *Naupactus dissimulator* was recorded for the southern Paraná forest and for the Yungas (Figure 5c), a cloud forest and seasonal dry montane forest extended from Peru to north-western Argentina, that would have been connected with the Atlantic-Paraná forests in the past (Vaschetto et al. 2015; Vergara and Acosta 2015). In the Pampean province, *N. dissimulator* only inhabits the gallery forests of Paraná and Uruguay rivers, down to La Plata River (see Figure 5c), where there is the southernmost distribution of the Paraná forest (del Río et al. 2015). These rivers have played an important role as biogeographical corridors for several groups of the tropical biota that were able to reach temperate latitudes (e.g. Menalled and Adámoli 1995; Nores et al. 2005; Arzamendia & Giraudo 2009). Indeed, palaeocommunities of subtropical to tropical flora may have grown as gallery forests, providing new environments for the diversification of phytophagous insects (Rodríguez et al. 2016).

Near La Plata River, *N. dissimulator* is partially sympatric with *N. xanthographus*, and all the species under study are partially sympatric in southern Brazil, in the boundaries of

the Atlantic, Paraná and Araucaria forests (Figure 5b–d). *Naupactus navicularis* reaches the northernmost distribution within the group and is present in the three biogeographic provinces previously mentioned (Figure 5b). *Naupactus dissimilis* seems to be restricted to the southern Paraná forest, although it does not reach the southernmost distribution of this forest, near La Plata River, as *N. dissimulator* does (Figure 5b). *Naupactus mimicus* would be almost restricted to the Araucaria forest (Figure 5a) and *N. marvaldiae*, to the southern extreme of the Atlantic forest (Figure 5c).

The subtropical forests of south-eastern Brazil, eastern Paraguay and north-eastern Argentina have deserved high priority for conservation during the last two decades (Di Bitetti et al. 2003), because they harbour a high diversity of plants and animals, with several genetic lineages of recent evolution (Lanteri and del Río 2003, 2016; Duarte et al. 2014; Rodriguero et al. 2016). Some genetic analyses have contributed to identify Plio-Pleistocene refugia in these forests and in the delta of Paraná River, near the mouth of La Plata River (Márquez et al. 2006; Speranza et al. 2007; Porto et al. 2013; Rodriguero et al. 2016). Coincidentally, most members of the *N. xanthographus* species group co-occur and show high morphological and/or genetic variation in these areas (Guzmán et al. 2012).

We believe that the patterns of geographic distribution and variation of the species herein studied, and of other groups of Naupactini can contribute to shed light on the evolution of the Neotropical biota (del Río et al. 2015), particularly on the Atlantic-Paraná forests, since the Plio-Pleistocene age.

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