Entomofauna

ZEITSCHRIFT FÜR ENTOMOLOGIE

Band 26, Heft 4: 29-44 ISSN 0250-4413 Ansfelden, 30. April 2005

Taxonomic Status of *Andricus corruptrix, A. amblycerus* and *A. ambiguus* (Hymenoptera, Cynipidae)

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Abstract

Taxonomic problems concerning the species names *Andricus corruptrix* (SCHLECHTENDAL, 1870), *A. amblycerus* (GIRAUD, 1859) and *A. ambiguus* (TROTTER, 1899) are commented. A study of types resulted that *A. ambiguus* is a **syn. nov.** of *A. corruptrix*. The gall of *A. corruptrix* was pictured incorrectly, it is not pointed as it was shown and figured by KIEFFER (1897-1901) after WACHTL (1879), but more or less rounded. SCHLECHTENDAL (1870), HOUARD (1908) and EADY & QUINLAN (1963) among others described more o less correctly the gall, but used the old drawings, and this confused posterior authors. It caused misidentification and confusion in literature. Redescriptions and diagnostic characters of adults and galls of *A. amblycerus* and *A. corruptrix* are given.

Key words: Hymenoptera, Cynipidae, *Andricus*, *corruptrix*, *ambiguus*, *amblycerus*.

Zusammenfassung

Es werden taxonomische Probleme kommentiert, die die Artnamen *Andricus corruptrix* (SCHLECHTENDAL, 1870), *A. amblycerus* (GIRAUD, 1859) und *A. ambiguus* (TROTTER, 1899) betreffen. Beim Studium der Typen wurde festgestellt, dass *A. ambiguus* ein **syn. nov.** von *A. corruptrix* ist. Die Galle von *A. corruptrix* wurde unkorrekt abgebildet, sie ist nicht spitz wie sie KIEFFER (1897-1901) nach WACHTL (1879) gezeigt und abgebildet hat, sondern mehr oder weniger gerundet. SCHLECHTENDAL (1870), HOUARD (1908) und EADY & QUINLAN (1963) haben u.a. die Galle mehr oder weniger korrekt beschrieben,

verwendeten aber die alte Abbildung, was zur Irreführung nachfolgnder Autoren geführt hat. Dies führte zu Fehlbestimmung und Irreführung in der Literatur. Erneute Beschreibung und Merkmale der Imagines als auch der Gallen von *A. amblycerus* und *A. corruptrix* werden präsentiert.

Introduction

Currently Cynipini (Hymenoptera: Cynipidae) are divided into 42 genera (PUJADE-VILLAR et al. 2001, STONE et al. 2002), of which *Andricus* HARTIG, 1840 is the largest, with over 300 described species world-wide. Recent studies proved this genus to be polyphyletic (COOK et al. 1998, DROWN & BROWN 1998, PUJADE-VILLAR et al. 1998), and a detailed revision of this genus is of urgent need. One of the most complicated species groups is the "*kollari*" group, with 11 described species. This group is especially problematic because of high morphological similarity of adult asexual females, and many authors (e.g. MAYR 1882, KIEFFER 1897-1901, TAVARES 1931) haven not found any diagnostic characters for their precise separation, and thus the identification was possible exclusively on the basis of the gall's morphology. Recently new morphological characters in adult wasps were found to be useful for identification of the species, and also some undescribed species in this group were found (BELLIDO, ROS-FARRÉ, MELIKA & PUJADE-VILLAR 2003). Studies on the mitochondrial molecular phylogeny also supports the monophyletic origin of this species group (ROKAS, MELIKA, ABE, NIEVES-ALDREY, COOK & STONE in prep.). The *kollari* species group comprises species, formerly included into *Cynips* sensu authors (not LINNAEUS 1758) (= *Adleria* ROHWER & FAGAN, 1917), with asexual females which have densely pubescent metasoma, especially 3rd and subsequent tergites, and foretibiae with short, applied setae.

Among the 11 known species of the *kollari* group, *Andricus corruptrix* (SCHLECHTENDAL, 1870), *A. amblycerus* (GIRAUD, 1859) and *A. ambiguus* (TROTTER, 1899) were considered as very closely related, not only on the basis of the gall's similarity, but also because of the adult's morphological characters. Originally *A. ambiguus* was described by TROTTER (1899) as a variety of *A. corruptrix*, of which the gall appeared to be more rounded and less lobed, while according to the drawings given by DALLA TORRE & KIEFFER (1910), supposedly taken from SCHLECHTENDAL (1870), the gall of *A. corruptrix* has more pointed lobes. However, number of lobes in these species varies, and lobes on *A. ambiguus* galls can be sharpened also, making the separation of species even more difficult. The third species of the complex, *A. amblycerus*, also has pointed galls very similar to that of *A. corruptrix*.

Material and methods

The type series of *A. corruptrix* from the SCHLECHTENDAL collection (Martin-Luther-Universität Halle, WB Zoologie, Germany) was compared with *A. corruptrix* and *A. ambiguus* specimens collected from different European countries (Austria, France, Hungary, Netherlands, Ukraine). Type material of *A. amblycerus* deposited in GIRAUD's collection in MNHN (Paris) was examined also. We got no answer on our loan request of *A. ambiguus* specimens from the TROTTER collection, deposited at the University of Portici (Italy). In our opinion, after examining many other series and many other galls from different

collectors, we believe that the results would be the same even if the TROTTER material some day is found and examined.

Material was examined from the following institutions: J. PUJADE-VILLAR collection at the University of Barcelona, Spain (UB); collection of the Systematic Parasitoid Laboratory, Köszeg, Hungary (SPL); Hungarian Natural History Museum, Budapest, Hungary (HNHM); Muséum National d'Histoire Naturelle, Paris, France (MNHN); Naturhistorisches Museum, Vienna, Austria (NHMW); Martin-Luther-Universität (zoology), Halle-Wittenberg, Germany (MLU); Universiteit van Amsterdam, Netherlands (UA); Zoological Museum Berlin, Germany (ZMB).

We follow the current terminology for morphological structures as given in FERGUSSON (1995), GIBSON (1985) and RONQUIST & NORDLANDER (1989). Abbreviations for fore wing venation follow RONQUIST & NORDLANDER (1989). The measurements and abbreviations used herein: F1-F12 = 1st and subsequent flagellomeres; POD (post-ocellar distance) = the distance between the inner margins of the posterior ocelli; OOD (ocellar-ocular distance) = the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye; LOD = the distance between lateral and frontal ocellus; transfacial line = distance between inner margins of compound eyes measured across antennal sockets. The width of the radial cell is measured along r2.

SEM pictures were taken at low voltage, without coating.

Andricus corruptrix (SCHLECHTENDAL, 1870)

Cynips corruptrix SCHLECHTENDAL, 1870: 339.♀, gall.
Cynips corruptrix var. *ambigua* TROTTER, 1899: 300. ♀, gall.
Cynips ambigua TROTTER: KIEFFER 1897-1901: 556. ♀, gall, **syn. nov.**
Adleria corruptrix (SCHLECHTENDAL): ROHWER & FAGAN 1917: 359.
Adleria ambigua (TROTTER): ROHWER & FAGAN 1917: 359.
Andricus corruptrix (SCHLECHTENDAL): BENSON 1953: 220.
Andricus ambigua (TROTTER): BENSON 1953: 220.
Andricus corruptrix f. *elianae* (sexual form): MELIKA et al 2000: 269, **Nomen nudum.**
Andricus corruptrix (SCHLECHTENDAL) (sexual form): FOLLIOT et al. in press.

Type material: One pin with 2 asexual females and five pins with 7 galls from SCHLECHTENDAL's collection (MLU). **Lectotype** (here designated): Female on right hand with the following labels: blue square label; white handwriting label "corruptrix Schlechtendal"; white label "MLU Halle, WB Zoologie, S.-Nr., T.-Nr. 3/1/1"; red label "Lectotype. design. Bellido & Pujade-Villar 2001"; white label "Andricus corruptrix ag. (Schlechtendal, 1870) Bellido & Pujade-Villar det. 2001". **Paralectotypes**: Female on the same pin on the left with the same labels as the lectotype; 7 galls without blue label but with labels "Wien" on 2 galls and "Freibg" on another 3 and the same white label "MLU Halle, WB Zoologie, S.-Nr., T.-Nr.", plus a red label "Paralectotype" and a white label "Andricus corruptrix ag. (Schlechtendal, 1870) Bellido & Pujade-Villar det. 2001".

Additional material from different collections examined (47 asexual females and over 60 galls from different European collections): **UB** (15♀♀ of *A. corruptrix*): 1♀ "Téglás (Transcarpathia, Ukraine)", "ex *Q. robur*. 25.V.1993"; 1♀ Tabánpark (Budapest, Hungary), 22.X.1950; 1♀ 1.IV.1957; 1♀ Cesson-Sévigné (France), Exp. 2139-X, VI.1997; 1♀ Cesson-Sévigne, 18.VI.1997; 1♀ Cesson-Sévigne, Exp. 2137-X, 25.VI.1997; 1♀ Exp.

2138-X, VI.1997; 1♀ Rennes (France), 18.VI.1997; 2♀♀ Rennes (France), collected in autumn 1999, reared in 9.VII.2000 and 1♀ 14.VII.2000. **UA** (4♀♀ from DOCTERS VAN LEEUWEN's experimentation (Netherlands): The 4 specimens glue on a big piece of cardboard and it seems there has been another specimen, now lost. A big rectangular label accompanying the pin "*Andricus corruptrix* Schlechtd. f.f. Leersum, 7.VIII.1954. D.v.l.". **SPL** (19♀♀ of *A. ambiguus*): 1♀ "Hungary, Veszprém Co., Várpalóta, ex Q. robur, 18.10. 2000, leg. R. Bailey", "Andricus ambiguus det. G. Melika"; 1♀ "Hungary, Pest Co., Gödöllö, Arboretum, Q. robur, 16.10.00, leg. R. Bailey", "Andricus ambiguus det. G. Melika"; 3♀♀ "Ukraine, Transcarpathia, Bustino, Q. robur, 02.08.994, Melika G.", "Andricus ambiguus, det. Melika G."; 2♀♀ "Ukraine, Transcarpathia, Peresi forest, Q. robur, 02.08. 992, Melika G.", "Andricus ambiguus, det. G. Melika"; 1♀ "Hungary, Vas. Co., Szalafö, Felsöszer, 22.06.994, Melika G.", "Andricus ambiguus det. G. Melika"; 5♀♀ "Hungary, Geszti, Q. sessiflora, 03.10.1938, leg. Méhes Gy.", "Andricus ambiguus. det. Méhes Gy."; 2♀♀ "Hungary, Tábánpark, 01.04.957, leg. Méhes Gy.", "Andricus ambiguus, det. Méhes Gy."; 3♀♀ "Hungary, Kaposvár, 08.10.948, leg. Méhes Gy.", "Andricus ambiguus, det. Méhes Gy.". (5♀♀ of *Andricus corruptrix*): 1♀ "Hungary, Körmend, 18.02.920, Méhes Gy.", "Andricus corruptrix, det. Méhes Gy."; 2♀♀ "Hungary, Somogy Co., Fonyöd-Belatelep, 07.07.941, Méhes Gy."; 1♀ "Hungary, BAZ. Co., Ozd, Tamoda, Q. cerris, 11.07.994, Melika G."; 1♀ "Hungary, Györ-Moson-Sopron Co., Sopron, Harkay plato, Q. cerris, 28.06.994, Melika G.". **HNHM** (6♀♀): 1♀ "Buda. 1937.4.25. Erdös"; 5♀♀ from Méhes material collected in Hungary. **NHMW** (2♀♀): 1♀ with white labels "4.III.1884, Handl. leg.", "Cynips corruptrix. det. Handlirsch"; 1♀ "Wachtl 1876", "Collect. G. Mayr" "C. corruptrix".

Redescription: Length 2.5 - 3.7 mm. Colour of antenna, head, legs, metasoma and mesosoma amber; scutellar foveae darker, propodeum black and veins brown.

Head coriaceous, with sparse white setae, denser around rectangular clypeus; 2.5 - 2.9 times as broad as long in dorsal view; gena coriaceous, slightly broadened behind eye; POD twice OOD; OOD 2.0 - 2.5 times as long as diameter of lateral ocellus and slightly longer than LOD; face with very short and weak radiating striae, never reaching toruli; transfacial line 1.2 - 1.4 times as long as eye height; diameter of toruli nearly 2.0 times the distance in between them and slightly shorter than distance between toruli and inner margin of eye.

Antenna 13-segmented, 0.5 times as long or slightly longer than body; pedicel 2.0 times as long as broad; F1 1.2 times as long as F2 and 2.2 - 2.4 times as long as pedicel; last flagellomeres conspicuously longer than broad, F11 nearly 2.0 times as long as broad.

Mesosoma coriaceous, with sparse white setae, denser laterally; notauli complete and uniformly deep, always reaching pronotum, converge posteriorly; median mesoscutal line absent or only very slightly impressed posteriorly; mesopleuron and pronotum coriaceous (Fig. 7); scutellum rugose, subquadrate, about as long as broad, not marginated laterally and not lobed posteriorly; scutellar foveae ovate, transverse (not oblique), alutaceous, without pubescence inside, not delimited posteriorly by carinae, distinct carina separates them (Fig. 5). Lateral carinae of propodeum uniformly broad, subparallel, slightly converge anteriorly and slightly bent outwards in posterior 1/3, delimited smooth central area with some pubescence along carinae or only prolong carinae (Fig. 3).

Wings hyaline, fore wing margin with short and scattered cilia anteriorly; radial cell 3.5 - 5.0 times as long as broad; r2 angled; areolet large, usually visible. Legs: Tarsal

claws with acute basal lobe, forming close angle. Fore tibia with short and applied setae.

Metasoma slightly shorter than head plus mesosoma, all tergites with a band of white pubescence; 2nd tergite occupies 1/2 to 3/4 of metasoma in dorsal view; ventral spine of hypopygium slender, 4.0 - 5.0 times as long as broad, with short and sparse setae, without forming apical tuft.

Gall (Fig. 1) is in buds, globular, 4-8 mm in diameter, with a number of lobes ranging from 1 to 4, normally 2-3 and rarely 5. The general form of lobes is rounded, sometimes sharpened till apex, but the gall never so triangular as in *A. amblycerus*; the gall brown, with smooth surface, rarely slightly striated. Larval chamber 3-6 mm in diameter, occupying most part of the gall. Adults leave the gall through a round, big and lateral emerging hole below the top. Description of the gall is given by AMBRUS (1974), DALLA TORRE & KIEFFER (1910), HOUARD (1908), KIEFFER (1897-1901), RIEDEL (1910), SCHLECHTENDAL (1870), TAVARES (1930) and WACHTL (1879).

Taxonomic comments: DOCTERS VAN LEEUWEN & DEKHUIJZEN-MAASLAND (1958) mentioned a new form named "*larshemi*" as the sexual generation of *Andricus corruptrix* after an erroneous experimentation (FOLLIOT et al. in press). After the revision of the experimental material used by DOCTERS VAN LEEUWEN & DEKHUIJZEN-MAASLAND (deposited at the Natural History Museum in Amsterdam) a new form was established. We proposed a new name for the sexual form, *Andricus corruptrix* f. *elianae* (MELIKA et al. 2000), but according ICZN (art. 15.2) the denomination "*elianae*" is not valid when it was given under sub-species rank and so it must be considered as a **nomen nudum**.

Distribution: The species is recorded from greatest part of Europe, Asia Minor and North Africa (DALLA TORRE & KIEFFER 1910); nevertheless some of these records must be confirmed. Originally described from Germany (*A. corruptrix*) and Italy (*A. ambiguus*), probably radiated from Eastern Europe (Bulgaria (VASSILEVA-SAMNALIEVA 1985), Hungary (common everywhere), Moldova (PLUGARU 1963), Poland (KIERYCH 1979), Romania (IONESCU 1973), Ukraine (Transcarpathia only, CSÓKA & MELIKA 1973)); but now it is widespread in Europe following the host plant of the sexual generation, *Quercus cerris* (DOCTERS VAN LEEUWEN 1956, DOCTERS VAN LEEUWEN & DEKHUIJZEN-MAASLAND 1958, HAILS & CRAW-LEY 1991, SCHÖNROGGE et al 1998, STONE & SUNNUCKS 1992, 1993, STONE et al. 1995, 2002). Recorded also from Transcaucasus (Azerbaijan) (MAISURADZE 1962).

Biology: Alternate asexual and sexual generations have been recently established (FOLLIOT et al. in press). The gall of the asexual generation develops in buds on *Q. robur*, *Q. petraea*, *Q. pubescens*, and *Q. mirbeckii*. It is also on *Quercus macranthera* (MAISURADZE (1962), most common on *Q. robur*. Galls develop in late summer, mature in late September to October, adult wasps overwintering and emerge next year in May to June. The sexual generation induces bud galls on *Q. cerris* only.

Andricus amblycerus (GIRAUD, 1859)

Cynips amblycera GIRAUD, 1859: 347. ♀, gall.
Adleria amblycera (GIRAUD): ROHWER & FAGAN 1917: 359.
Andricus amblycera (GIRAUD): BENSON 1953: 220.

Type material: 23 specimens deposited in MNHN and 2 specimens in UB. **Lectotype** (herein designated): Deposited in MNHN, Austria with following labels: "Museum Paris

Cynips amblycera G." (white label), "Lectotype" (red label), "*Andricus amblycerus* Giraud, 1859, Bellido et Pujade-Villar, det. 1999". **Paralectotypes**: Deposited in MNHN, Austria (25), ex *Quercus* sp.: 3♀♀ without date; 1♀ 20.II.; 1♀ 29.II.; 2♀♀ 4.V.; 3♀♀ 15.V.; 5♀♀ 1.V.; 6♀♀ 6.V.; 6♀♀ 18.V.; 1♀ 2.III.; 1♀ 14.II.

Additional material from different collections examined: **ZMB** (1 specimen with following labels): White label "typ", red label "type", white label "Coll. H. Rhd.", white label "Zool. Mus. Berlin", white label "amblycera", white label "Andricus amblycerus (Giraud, 1859) agam. gen. Bellido & Pujade-Villar det. 2000". **UB** (11 adults with following labels): White label "Sopron (Hungary) (leg. G. Melika), ex *Q. pubescens*; 28.III.1994 (29.IV.1994)", white label "Andricus amblycerus (Giraud). Bellido & Pujade-Villar det. 2001". **SPL** (26 females): 24 with labels "Hungary, Györ-Moson-Sopron Co., Sopron. 28.03.994. leg. Melika G.", "ex Q. pubescens", "Andricus amblycerus (Schlecht.). det. Melika G. em.10.04.994"; 2♀♀ with white labels "10.8.88", "Cynips amblycera det. Handlirsch". **HNHM**: 3♀♀ "Budapest, Biró. 1921", "Cynips amblycera".

Redescription: Length 2.5 - 4.5 mm. Colour of the head dark brown; ocellar triangle and area around toruli black; mesosoma dark brown to black; veins brown; metasoma light red-brown.

Head granulate, coriaceous, with sparse white setae; 2.4 - 3.2 times as broad as long in dorsal view; gena not punctate, strongly broadened behind eye; POD 2.0 - 2.3 times OOD; OOD 1.5 - 2.5 times as long as diameter of lateral ocellus and slightly longer than LOD; clypeus rather conspicuous, subquadrate or rectangular; face with short and weak radiating striae; transfacial line 1.16 - 1.26 times as long as eye height; diameter of torulus 2.0 times as large as distance in between them, slightly shorter than distance between torulus and inner margin of eye.

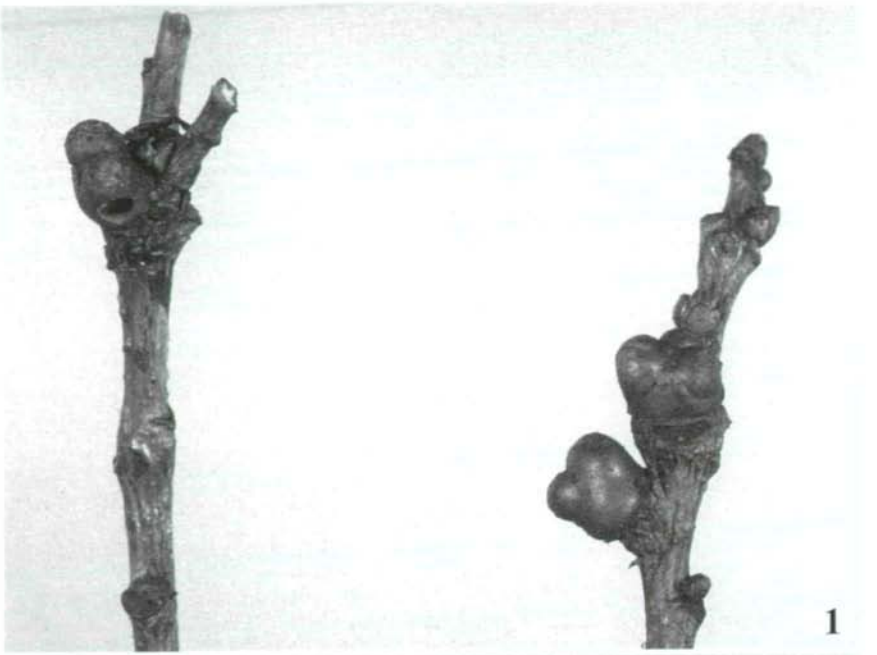
Antenna 13-segmented, nearly 0.5 times as long as body length; pedicel 1.25 - 2.0 times as long as broad; F1 1.2 - 1.5 times as long as F2 and 2.2 - 2.8 times as long as pedicel; last flagellomeres slightly longer than broad, and F11 2.0 times as long as broad.

Mesosoma coriaceous or granular-coriaceous, with sparse white setae. Scutum coriaceous, minutely and uniformly microreticulate; notauli complete, reaching pronotum, posteriorly converge; median mesoscutal line absent or inconspicuous; mesopleuron anteriorly and pronotum posteriorly with poorly defined wrinkles (Fig. 8); scutellum ovate, rugose, 1 - 1.2 times as broad as long, not marginated laterally and normally lobed posteriorly; scutellar foveae (Fig. 6) ovate, transverse, deep, coriaceous, sometimes slightly rugose, without pubescence, separated by carina, posteriorly not limited by carina. Lateral carinae of propodeum thin, uniformly thickened, subparallel, slightly diverge anteriorly and slightly bent in posterior 1/3, internal area without pubescence, with short carina posteriorly (Fig. 4); metascutellum sculptured, lateral parts usually only slightly pubescent (Fig. 4).

Legendes to figures

Figs 1-2: Galls of *Andricus corruptrix* (1) and *A. amblycerus* (2). Ratio 0.62 and 0.83 respectively.

Figs 3-8: Propodeum (3, 4), scutellum and posterior part of scutum (5, 6), mesonotum in lateral view (7, 8) of *Andricus corruptrix* (3, 5, 7) and *A. amblycerus* (4, 6, 8).



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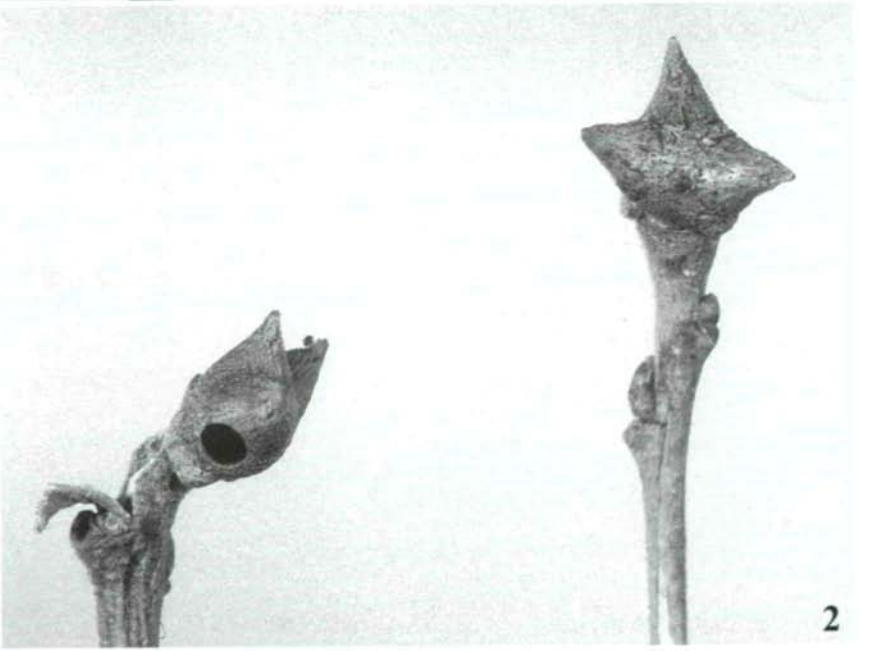

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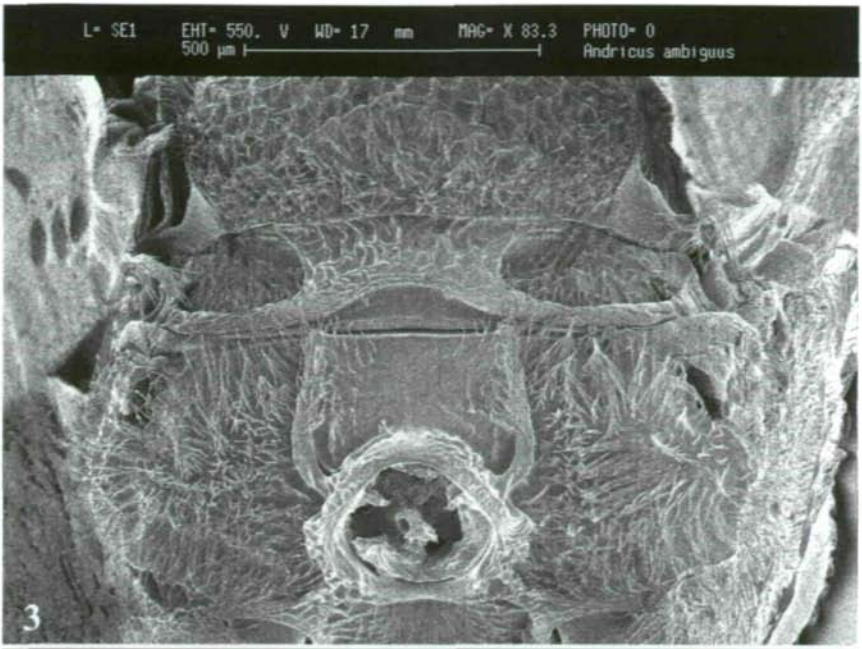
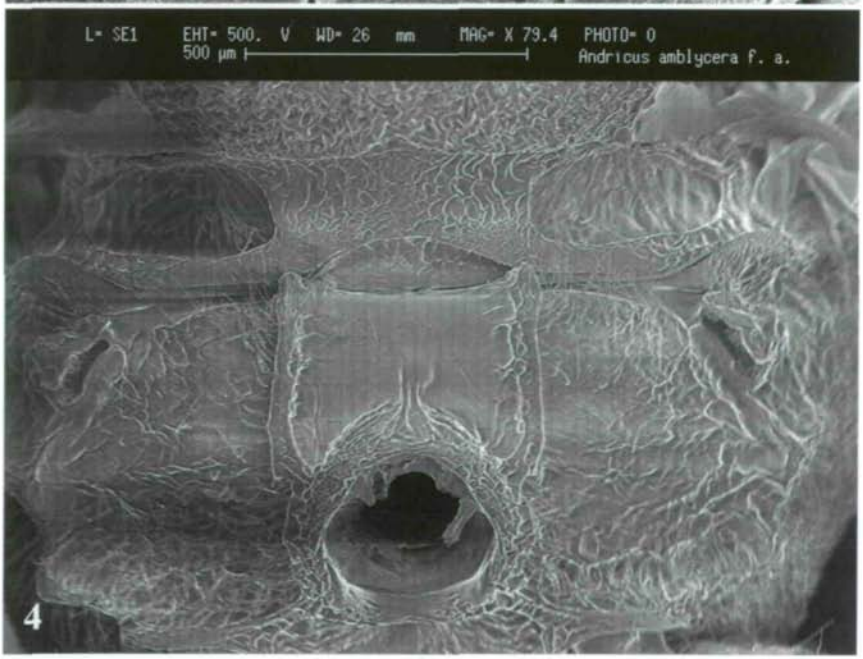
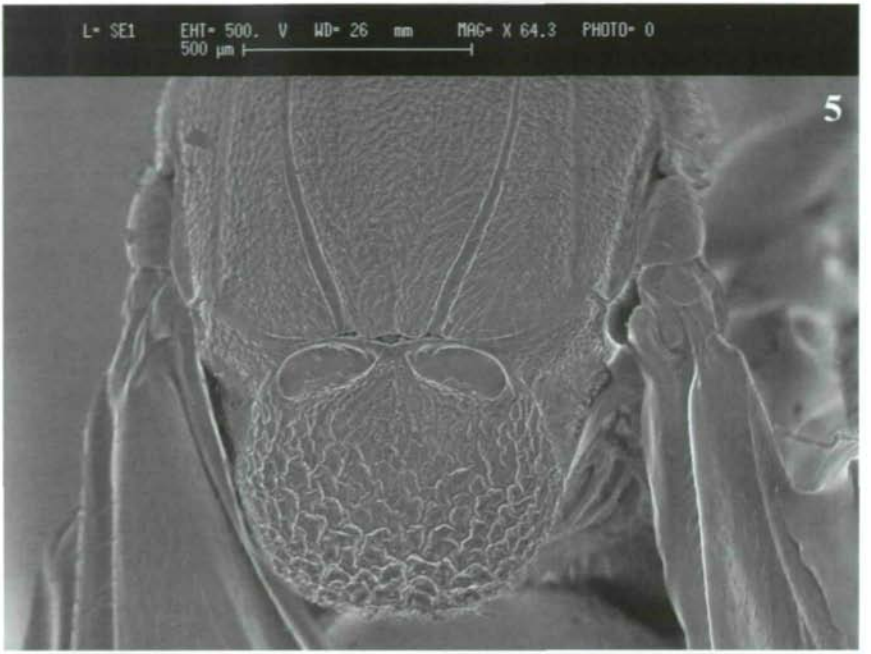
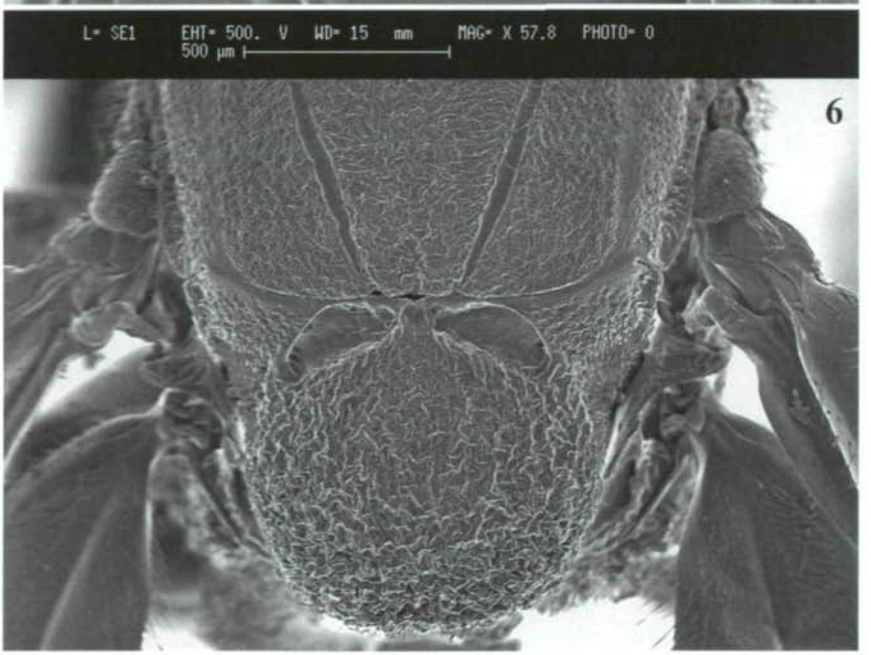
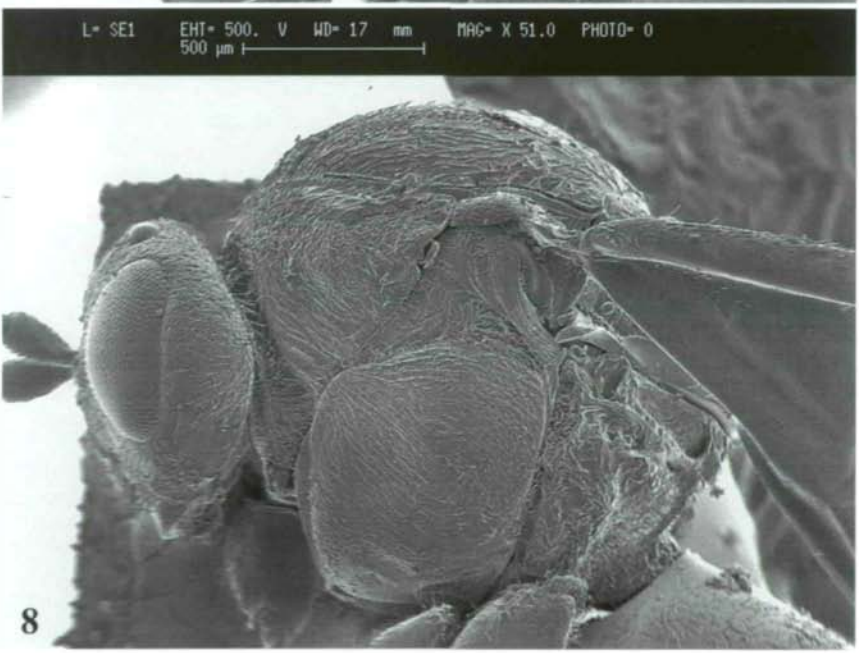








7



8

Wings hyaline; fore wing margin with short and scattered cilia; radial cell 4.5 - 5.5 times as long as broad; r2 strongly angled; areolet large, normally inconspicuous because of blurred veins.

Metasoma only slightly, 0.75 - 0.85 times, shorter than head and mesosoma together; all tergites with lateral band of white pubescence (in some individual pubescence rather scarce but present); 2nd tergite occupies 0.70 - 0.80 of metasoma in dorsal view; 3rd tergite without hair punctures anteriorly; ventral spine of hypopygium slender, 3.0 - 4.0 times as long as broad.

Gall (Fig. 2) is composed of a cylindrical basal part with 3-5 (rarely 2 or even 6) protuberances sharpened at apex. Galls were described by AMBRUS (1974), CSÓKA (1997), DALLA TORRE & KIEFFER (1910), GIRAUD (1859), HOUARD (1908), KIEFFER (1897-1901), MAYR (1870), TAVARES (1930) and WACHTL (1879).

Taxonomic comments: Besides of type series of *A. amblycerus* in GIRAUD's collection (MNHP), another specimen is deposited in the ZMB, labelled with a red label "type". We do not consider this single specimen as belonging to the type series.

Distribution: East and South Europe, recorded from Austria, Hungary, Romania, Bulgaria, Italy (including Sicily), Slovakia and Poland (KIERYCH 1979, data must be confirmed).

Biology: Only the asexual generation is known to induce bud galls on *Q. robur*, *Q. petraea* and *Q. pubescens*. Galls appear in August, mature in autumn and adults emerge next year, in March to June.

Conclusions

Andricus corruptrix galls and adults from the SCHLECHTENDAL collection deposited in Martin-Luther-Universitat Halle, Germany, are designated as types. However, these galls were incorrectly pictured in DALLA TORRE & KIEFFER (1910), they are not so pointed as shown in the drawing. Moreover, SCHLECHTENDAL (1870) never gave the figure of his *corruptrix* gall, as KIEFFER (in ANDRÉ) stated. When he is referring to the nonexistent "dessin de Schlechtendal" on p. 558 and in the caption of his Table XII, Fig. 11 ("d'apres Schlechtendal"), he had evidently forgotten that his artist had copied RIEDEL's drawing of 1895 (RIEDEL 1896). Legends to KIEFFER's figures should be read: Tab. XII, fig. 11 (d'apres RIEDEL 1896), 11a (d' apres WACHTL 1879); Tab. XIII, fig. 8 (d' apres MAYR 1870), fig. 8a (d' apres Wachtl 1879). The quality of figures in KIEFFER is insufficient, giving a simplified and distorted idea of what the galls do look like (WEHRMAKER & KWAST pers. com.).

According to the drawings in literature (see DALLA TORRE & KIEFFER 1910: 422), galls of "typical" *A. corruptrix* are sharpened apically, not rounded, triangularly shaped. On the basis of examinations of large series of galls collected from different countries, we concluded that the gall drawing in DALLA TORRE & KIEFFER belongs to *A. amblycerus*. As we mentioned above, galls of *A. corruptrix* are more or less globular, with only 2-3 lobes or rarely with more. The main difference between *A. corruptrix* and *A. amblycerus* galls concerns the tips (lobes) and the general form, which is normally rounded and globular in *A. corruptrix* (Fig. 1), and acute, sharpened, triangular in *A. amblycerus* (Fig. 2). Another less clear and more variable difference is the gall's surface, nearly smooth in *A. corruptrix*, and distinctly striated in *A. amblycerus*. Parasitization also can modify the gall, beco-

ming smaller in size and more irregularly shaped. Additional differences can occur in bigger sized galls, when in *A. amblycerus* the number of lobes can increase to 4-5.

Andricus amblycerus and *A. corruptrix* belongs to a small group of species (*A. amblycerus, A. corruptrix, A. galeatus* and *A. aries*) within the *kollari* group, which is characterized by subparallel propodeal carina. *Andricus amblycerus* differs from *A. aries* and *A. corruptrix* (= *ambiguus*) (Fig. 7) by the presence of wrinkles (striae) on mesopleuron anteriorly and pronotum posteriorly (Fig. 8). *Andricus galeatus* also possess this character, however, in *A. amblycerus* gena is stronger broadened behind eye, scutellum darker and not marginated.

Adults of *A. amblycerus* differ from *A. corruptrix* by several characters: in *A. amblycerus* the mesosoma is dark brown to black, the scutum uniformly microreticulate; scutellar foveae coriaceous; the mesopleuron anteriorly and lateral part of the pronotum posteriorly wrinkled (striate); propodeal carinae are subparallel, strongly converge posteriorly and delimiting a smooth and bare central area, while in *A. corruptrix* the mesosoma is amber, the scutum coriaceous; scutellar foveae are smooth; the mesopleuron and the lateral part of the pronotum coriaceous; propodeal carinae are stronger bent outwards, central area with setae prolong the lateral propodeal carinae.

Acknowledgements

We thank Dr. Graham N. STONE (University of Edinburgh, Scotland), for valuable comments on taxonomic problems discussed in this paper and for the interpretation of results on molecular studies of gall wasps, and to Dr. Alfred WEHRMAKER and Mr. Eckbert KWAST for their comments regarding SCHLECHTENDAL's original description of *Andricus corruptrix*. We also thank Dr. Claire VILLEMANT (MNHN), Dr. Lajos ZOMBORI (HNHM), Dr. Stefan SCHÖDL (NHMW), Dr. Karla SCHNEIDER (MLU) and Dr. W. HOGENES (UA) for the loan of specimens studied for this paper. Finally we also remain grateful to Albert MASÓ for realisation of gall figures and Palmira ROS-FARRÉ for the SEM pictures.

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Literaturbesprechung

PIES-SCHULZ-HOFEN, R. 2004: Die Tierpflegerausbildung. - Parey Verlag, Stuttgart. 708 S.

Tierpfleger sind mit sehr vielfältigen Aufgaben konfrontiert; es geht nicht nur um Fütterung und Sauberkeit, ein Tierpfleger überwacht den Gesundheitszustand, beobachtet das Verhalten und versucht Revierverbesserungen einzuführen, um die Lebensqualität seiner Schützlinge zu optimieren. Die 3., neubearbeitete und deutlich erweiterte Auflage der "Tierpflegerausbildung" liefert die Grundlagen einer tiergerechten Haltung, Pflege und Versorgung der Tiere sowie deren Vermehrung. Dieses Buch stellt neben der berufspraktischen Ausbildung ein begleitendes Lehrbuch dar, welches auch das Grundwissen biologischer Fachdisziplinen vermittelt. Da sehr breite Spektrum reicht von "Tierischem Verhalten", "Ökologie", "Evolution", "Tiergeographie", "Natur- und Artenschutz", "Anatomie, Morphologie und Physiologie" über die spezielle "Tiergartenbiologie" bis hin zu "Grundlagen der Versuchtierkunde und -pflege" und der "Tierhaltung im Zoo" (betrifft Säugetiere und Vögel). Bemerkensert ist das umfangreiche Literaturverzeichnis, in dem ältere und neuere Hinweise vertreten sind.

Dieses Buch bietet somit allen in der Tierhaltung Tätigen und auszubildenden Tierpflegern, aber auch interessierten privaten Tierhaltern eine Darstellung des Berufsbildes "Tierpfleger". Darüber hinaus stellt es für Studierende vieler Disziplinen eine praktische Arbeitshilfe für zahlreiche zoologische Fragestellungen dar und wird auch als Nachschlagewerk reichlich benutzt werden. R. GERSTMEIER

STORCH, V., WELSCH, U. 2003/2004: Systematische Zoologie. - Spektrum Akademischer Verlag, Heidelberg-Berlin. 853 S.

Systematik basiert auf Erkenntnissen der Morphologie und Entwicklungsgeschichte, aber auch auf Befunden aus Molekularbiologie, Genetik, Biochemie, Physiologie, Verhalten, Evolution und Biogeographie. Eine Übersicht über die etwa 1 Million beschriebenen Tierarten und ihre systematisch-phylogentische Verwandtschaft zu geben ist keine leichte Aufgabe. Ein Standardwerk und Lehrbuch sollte immer noch "handhabbar" sein, also auch in seinem Umfang überschaubar bleiben. Dieser Aufgabe wird die "Systematische Zoologie" seit 1975 in beispielhafter Weise gerecht. Es ist nicht nur ein "Aufzählen" von Bauplänen und morphologischen Details, sondern die Verknüpfung dieser Grunderkenntnisse mit der Vielfalt der Arten und ihrer Lebensräume, der Historie der Tiere im Ablauf der Erdzeitalter, ihre kulturelle Bedeutung (inkl. medizinischer und wirtschaftlicher Konflikte mit dem Menschen), die Vielfalt von Mikrostrukturen und die Vielfalt der Systeme.

Das didaktische Konzept einer bildlichen Darstellung von Lebensräumen wurde in dieser 6. aktualisierten Auflage fortgeführt; die Abbildungen wurden auf 16 Tafeln erweitert und beinhalten somit 250 Tierarten. 300 für den Menschen und insbesondere für mitteleuropäische Landschaften und Städte wichtige oder auffällige Arten werden in Kästchen hervorgehoben, wobei der entsprechende Text vorwiegend deren Biologie berücksichtigt. Eine wesentliche Neuerung der 6. Auflage sind die vorwiegend elektronenmikroskopischen Fotos.

Für alle Studierende und Lehrende der Biowissenschaften an Schulen und Universitäten ein unerlässliches Standardwerk. R. Gerstmeier

CARDE, R.T., MILLAR, J. (eds) 2004: Advances in Insect Chemical Ecology. - Cambridge University Press, Cambridge. 341 S.

Chemische Signale steuern und regulieren das Leben von Insekten in einer Dimension, die für uns visuell orientierte Menschen schwer vorstellbar ist. Das Forschungsgebiet der chemischen Ökologie befasst sich mit der Identifizierung der verantwortlichen Substanzen (Semiochemikalien) und mit der Frage wie diese Substanzen Physiologie und Verhalten von Insekten beeinflussen. Die rasante Entwicklung immer empfindlicherer Analysenmethoden ermöglichen die Identifizierung von geringsten Mengen an Semiochemikalien, wohingegen die genauen Wirkmechanismen und die Bedeutung im ökologischen Zusammenhang weitaus weniger bekannt sind.

In dem vorliegende Buch werden neueste Forschungsergebnisse aus der Chemischen Ökologie der Insekten bzw. Arthropoden zusammenfassend dargestellt. Die acht Kapitel befassen sich mit der chemischen Verteidigung von Pflanzen gegen Herbivore; mit der Bedeutung von volatilen Substanzen für die Bestäubung von Blüten; mit der Wirtsfindung von Parasitoiden, die sowohl durch Gerüche des Wirts als auch der Wirtspflanze gesteuert wird; mit Semiochemikalien und Pheromonen von Milben, Spinnen und Schaben; mit der Bedeutung von Alkaloiden für Larven und Imagines der Arctiidae (Lepidoptera); und mit der Bedeutung von Pheromonsystemen für die Diversität der Lepidoptera. Dabei werden die verschiedensten Aspekte, von der chemischen Struktur bis hin zur Beeinflussung von Selektionsprozessen, beleuchtet. Damit richtet sich das Buch an eine breit gefächertes Publikum mit Interesse an der chemischen Ökologie und Entomologie und kann Forschenden, Lehrenden wie Lernenden wärmstens empfohlen werden. A. GRUPPE

Druck, Eigentümer, Herausgeber, Verleger und für den Inhalt verantwortlich:
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