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Chrysopa gibeauxi (Leraut, 1989): reinstatement as valid species and remarks on its distribution (Neuropterida, Chrysopidae)

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Abstract. – A specimen of the green lacewing *Chrysopa gibeauxi* (Leraut, 1989), recorded until now only in the south-east of France, was recently collected in Poland. In the male genitalia of *C. gibeauxi*, the shape of the internal structural differences (gonocristae and entoprocessus) shows valuable characters for unambiguous separation of the two species within the sibling pair *Chrysopa pallens* (Rambur, 1838) and *C. gibeauxi*. Scrutinizing specimens of *C. pallens sensu lato* stored in Bytom's Museum collections showed a distribution larger than appearing, in the Palaearctic ecozone from Finland to Korea.

Résumé. – ***Chrysopa gibeauxi* (Leraut, 1989): rétablissement comme espèce valide et remarques sur sa distribution (Neuropterida, Chrysopidae)**. La Chrysope *Chrysopa gibeauxi* (Leraut, 1989), jusqu'alors connue avec certitude uniquement du sud-est de la France, a été récemment récoltée en Pologne. L'étude des genitalia du mâle, notamment la disposition des gonocristae et la forme de l'entoprocessus, montre des différences utilisables pour permettre une séparation aisée et sans ambiguïté des deux constituants du couple cryptique *Chrysopa pallens* (Rambur, 1838) et *C. gibeauxi*. Une révision des spécimens de *C. pallens sensu lato* déposés en collection au Muséum de Bytom indique une distribution beaucoup plus large qu'il n'y paraissait, couvrant l'écozone paléarctique de la Finlande à la Corée.

Keywords. – Green lacewing, *Chrysopa pallens*, sibling species, gonocristae, entoprocessus, distribution, Poland, Finland, North Korean.

Chrysopa gibeauxi (Leraut, 1989) was described from specimens captured in the occidental slope of the Alps and first described as a subspecies of *Metachrysopa pallens* (Rambur, 1838) by Leraut (1989) (fig. 1). It was raised as "*bona species*" by Leraut (1992) and was later synonymized with the closely related *C. pallens* (Rambur, 1838) by Aspöck *et al.* (2001). It was considered associated with the high-altitude pine-tree *Pinus uncinata* Ramond ex DC. Thus the descriptor himself asserted that this green lacewing inhabits exclusively the alpine zone between 900 and 1900 m where it occurs. This overly restricted altitudinal and horizontal distribution range was later enlarged after detection of the species outside the alpine mountain region, in the south-eastern part of the French Massif Central, in Haute-Loire (Canard *et al*., 2011).

Material and methods

One of the authors (D. T.) collected last summer in Poland on July 12th, 2013, a female of *C. gibeauxi*, in the vicinity of Zwierzyniec, Voivodie of Lublin, on the border of the Roztocze National Park (50°36'30''N - 22°57'43''E, WGS84 system). This protected zone is a forest occupying more than 8,000 ha. It is a Natura 2000 registered ecological reserve, forming part of a larger hilly region spreading from Starachowice in Poland to Lvov in Ukraina. The mean altitude is 350 m. The climate shows a strong continental character (Wilgat & Michalczik, 1987).

The capture was performed by hand net, at 6 pm, on the lower branches of an isolated pine-tree just near a continuous pine forest. During the session, 63 lacewings were collected namely 47 females and 12 males of *Chrysoperla affinis* (Stephens, 1836), 1 female of *Chrysopa gibeauxi*, 1 female of *Hemerobius nitidulus* Fabricius, 1777, and 2 females of *Hemerobius stigma* Stephens, 1836.

The unexpected discovery of *C. gibeauxi*, nice and large green lacewing new to the Polish fauna, incited one of authors (R. D.) to revisit the numerous exemplars of *C. pallens sensu lato* stored in the collection of the Bytom museum in order to detect possible other specimens of this fairly under-recorded species. A first list of occurrence spots of *C. gibeauxi* was established.

Chrysopa gibeauxi (Leraut, 1989), **stat. rev.**

Cited as *Chrysopa septempunctata* Wesmael, 1841 *in* DOBOSZ (1989); as *Chrysopa pallens in* DOBOSZ (1993, 1996 [*partim*], 1999] and BLAIK & DOBOSZ (2010)].

In square brackets: Universal Transverse Mercator coordinates; *: new data; USMB: Upper Silesian Museum in Bytom.

POLAND. 2 ♂ and 3 ♀, Karwia [CF28]; 2 ♂ and 2 ♀, Wisełka [VV78]; 1 ♂ and 1 ♀, Hel Bór [CF55]; 3 ♂ and 2 ♀, Jastarnia [CF46]; 1 ♂, Sulicice [CF27] (BLAIK & DOBOSZ, 2010); *1 ♀, Wolin [VV76], 17.VII.2007, at light, *leg. R. Dobosz*; *12 ♀, 2.5 km W of Piaski II [DF03], pine forest, 15.VII.2009, at light, *leg. R. Dobosz*; Kaleńsko and Kostrzyń [VU63]: *1 ♂, 21.VI.2008, at light, *leg. M. Bunalski* (USMB 002/C9); *2 ♀, 3.VII.2008, at light, *leg. M. Bunalski*; *1 ♀, 27.VII.2008, at light, *leg. M. Bunalski* (USMB 002/G5); *1 ♀, 30.VII.2008, at light, *leg. M. Bunalski* (USMB 008/B9); *1 ♂, 1.VII.2009, at light, *leg. M. Bunalski* (USMB 008/G4); *1 ♂, 12.VI.2010, at light, *leg. M. Bunalski* (USMB 002/J7); *3 ♂ and 1 ♀, 2.VII.2010, at light, *leg. R. Lewandowski* (USMB 009/B6); *1 ♂ and 1 ♀, 4.VII.2010, at light, *leg. M. Bunalski* (USMB 005/H2); *1 ♂, 5.VII.2010, at light, *leg. R. Lewandowski* (USMB 008/F5); *1 ♂ and 1 ♀, 6.VII.2010, at light, *leg. M. Bunalski* (USMB 009/C7); *1 ♂ and 4 ♀, 11.VII.2010, at light, *leg. M. Bunalski* (USMB 002/E1; USMB 002/D4); *1 ♂, 12.VII.2010, at light, *leg. W. Kutaisi*; *4 ♂ and 9 ♀, 18.VII.2010, at light, *leg. R. Lewandowski* (USMB 006/B3; USMB 006/B4); *6 ♀, 23.VII.2010, at light, *leg. M. Bunalski* (USMB 005/J6); *2 ♂ and 13 ♀, 27.VII.2010, at light, *leg. M. Bunalski* (USMB 008/E4; USMB 008/E5); *3 ♂ and 4 ♀, 2.VII.2010, at light, *leg. M. Bunalski* (USMB 005/I7; USMB 005/I8); *1 ♂ and 7 ♀, 4.VIII.2010, yellow bowls, *leg. M. Bunalski* (USMB 006/A7; USMB 006/A8); *1 ♀, 8.VIII.2010, at light, *leg. M. Bunalski* (USMB 005/I1); *2 ♀, 15.VIII.2010, at light, *leg. M. Bunalski*; *1 ♀, 17.VIII.2010, at light, *leg. M. Bunalski*; *1 ♂ and 1 ♀, 31.VIII.2010, at light, *leg. R. Lewandowski* (USMB 008/D6); *1 ♂, 2.IX.2010, at light, *leg. M. Bunalski*; *1 ♂, 17.VII.2011, at light, *leg. R. Lewandowski* (USMB 009/A5); *2 ♀, 10.VIII.2011, at light, *leg. R. Lewandowski* (USMB 009/D6); *1 ♀, 28.V.2012, at light, *leg. R. Lewandowski* (USMB 008/H6); *1 ♂ and 1 ♀, Turtul near Czarna Hańcza river [FF11] Suwalski P.K., 2.VII.1997, 4.VII.1997, *leg. R. Dobosz*; *1 ♀, Błędziszki [FF01], Puszcza Romnicka, 29.VII.2005, *leg. M. Wanat*; Chalin [WU72]: *3 ♂ and 4 ♀, 16-18.VIII.2010, at light, *leg. R. Lewandowski*; *1 ♀, 26.VIII.2011, at light, *leg. R. Lewandowski* (USMB 004/A5); *1 ♀, 8-10.VII.2011, at light, *leg. R. Lewandowski* (USMB 004/F6); *1 ♀, 3-5.VIII.2011, at light, *leg. R. Lewandowski* (USMB 004/E1); *2 ♀, Sobibór ad Włodawa [FC80], Sobiborski P.K., 27.VII.2003, at light, *leg. M. Wanat*; 1 ♂, Białowieża NP (DOBOSZ, 1999); *1 ♂ and 1 ♀, Jagodzin ad Ruszów [WS19], 14.VII.2002, *leg. A. Malkiewicz*; *1 ♀, Ławszowa [WS29] Bory Dolnośląskie, 5.IX.2005, *leg. A. Kokot*; *1 ♂, Lubliniec [CB31], 4.VIII.1986, *leg. R. Dobosz*; *1 ♀, Kokotek ad Lubliniec [CB30], 19.VII.1987, *leg. R. Dobosz*; *1 ♀, Katowice [CA66], 13.VIII.1987, *leg. R. Dobosz*; *1 ♀, Bytom, "Segiet" res. [CA48], 13.VIII.1991, *leg. J. Gorczyca*; *1 ♀, Mysłowice-Ćmok [CA66], black light trap, 8.VIII.2013, *leg. A. Larysz*; 1 ♂, Błędów Desert [CA97], on *Pinus silvestris* L. (DOBOSZ, 1993, 1996); *1 ♂, Częstochowa [CB72], pine forest, 8.VI.1985, *leg. R. Dobosz*; *1 ♂, Wola Justowska [DA24], VII.1986, *leg. J. Kozielec*; *1 ♀, Inowłódz [DC41], 26.VII.1994, *leg. B. Soszyński*; *1 ♀, Pasturka ad Pińczów [DA69], 13.VII.1996, *leg. R. Dobosz*; *1 ♀, "Polana Polichno" res. [DA58], 15.VII.1996, *leg. R. Dobosz*; *1 ♀, "Polana Polichno" res. [DA58], 9.VI.1998, deciduous trees, *leg. R. Dobosz*; *1 ♀, Pasturka ad Pińczów [DA69], 10.VI.1998, *leg. R. Dobosz*; *1 ♀, Gaj-Policzko ad Przedbórz [DB25], 12.VIII.1997, *leg. W. Żyła*; *1 ♂,

Skowronno ad Pińczów [DA69], 9.VI.1998, *leg. R. Dobosz*; *1 ♂, "Piskorzeniec" res. Przedborski P.K. [DB35], peatbog, 15.VI.2007, *leg. M. Wanat*; *1 ♀, env. Kwilina vill. [DB31], *leg. Ł. Mielczarek*; *1 ♀, Psary, Psarska Góra [DB94], 11.VII.2007, *leg. M. Wanat*; 1 ♀, Ustroń [CA40] (Dobosz, 1989); *1 ♂ and 1 ♀, Czarny Dunajec env., "Baligówka", peatbog [DV17], 11.VI.2014, *leg. R. Dobosz*; *3 ♂ and 1 ♀, Zamczysko Mt [DV57], Pieniny Mts, 21.VII.2004, *leg. W. Kubasik*; *1 ♀, Zwerzyniec, Voivodie of Lublin, on *Pinus*, 12.VII.2013, *leg. D. Thierry.* **Finland**. *1 ♂, Hanko 59°50′ N / 22°58′ E, 20.VII.1991, *leg. E. Głowacka*. **North Korea**. *1 ♀, Kumgansan Mts, 38°31'35"N - 128°03'05"E, 16-19.VII.1985, *leg. E. Palik*; 1 ♂ and 6 ♀, Sŏnh'ŏn 39°47'N - 124°55'E, 6-8.VIII.1989, *leg. E. Warchałowska*.

Specific characters and comments

The characters discriminating *Chrysopa gibeauxi* from *C. pallens* are subtle. They consist of differences appearing in morphological characters, summarized in the table I. Material examined was:

– *C. gibeauxi*: several specimens from various parts of Poland (see the map fig. 21), 2 from France, 1 from Finland, and in Asia, 8 from North Korea; some differences appear in North Korean specimens of *C. gibeauxi*, namely meso- and metanotum with bright (white) hairs, more bright hairs on abdomen especially on the dorsal and lateral parts.

– *C. pallens*: in Europe, several specimens from Poland, France and Romania, 5 from Hungary, 5 from Bulgaria, 2 from Ukraine, 1 from Finland, 1 from Greece; in Central Asia, 5 from Kyrgyzstan, 2 from Tajikistan, 1 from Azerbaijan; some specimens of *C. pallens* have more strongly marked head spots, similar to weakly stained specimens of *C. gibeauxi.*

Besides, in male genitalia, some details in the gonocristae were previously mentioned by Leraut (1992). The gonocristae are both organized in three groups and in the central group, the gonocristae are smaller and more numerous in *C. pallens* than in *C. gibeauxi*, as seen on the male holotype of *C. gibeauxi* (fig. 15-16, 18-19). However, examination of fresh male slides of

Table I. – Morphological differences between *Chrysopa gibeauxi* (Leraut) and *C. pallens* (Rambur).

Chrysopa gibeauxi	***Chrysopa pallens***
Ground colour of the body bright green	Ground colour of the body green or pale green
Drawings on the head consisting of seven strong spots most often intensively black (fig. 2, 4).	Drawings on the head of the same lay-out but much gentler, sometimes slightly marked (fig. 3).
Second article of the antenna (pedicel) slightly marked with a terminal fuscous ring (fig. 2, 4).	Second article of the antenna (pedicel) wholly green (fig. 3).
Pronotum with numerous thick black bristles (fig. 5).	Pronotum with slender blond (bright) and blackish brown hairs (fig. 6).
Meso- and metanotum with few (especially on metanotum) black adjacent hairs, rarely blended with some bright hairs (fig. 7).	Meso- and metanotum with few blond (white) hairs (fig. 8).
First costal cross-veinlet of the forewing black (fig. 9), other costal cross-veinlets always fully black except in pterostigma. Subcosta of both wings in the proximal part distinctly darkened (fig. 9).	First costal cross-veinlet of the forewing green (fig. 10), other costal cross-veinlets except in pterostigma partly blackened in the apical part from the costa brightened. Subcosta of both wings in the proximal part green (fig. 10).
Abdomen in its basal part and apex together with the legs with black hairs (fig. 11-12). Bright hairs only on the apex of abdomen in the cercal callus and inner edge of the 9 tergite. Few bright hairs on the apex of (8 + 9) sternite.	Abdomen in its basal part and apex together with the legs only with blond (bright) hairs (fig. 13-14).
In the central group, gonocristae big and scarce (fig. 18-19).	In the central group, gonocristae smaller and more numerous (fig. 15-16).
Lateral outline of the entoprocessus rounded (fig. 20).	Lateral outline of the entoprocessus angular (fig. 17).

the male genitalia of *C. pallens* from France and Transylvania (Romania), and of *C. gibeauxi* from France (specimen from Massif Central) showed further differences. The lateral outline of the entoprocessus of *C. pallens* is angular, already illustrated by PRINCIPI (1949), KIS *et al.* (1970) and MAKARKIN (1990) whilst that of *C. gibeauxi* is more regularly rounded (fig. 17, 20).

Dependence on the gonocristae for separating close species has been already used for the cryptic pair of herbaceous layer inhabiting green lacewings *Chrysopa phyllochroma* Wesmaël, 1841, and *C. commata* Kis & Ujhelyi, 1965 (KIS *et al*., 1970). This character is unanimously

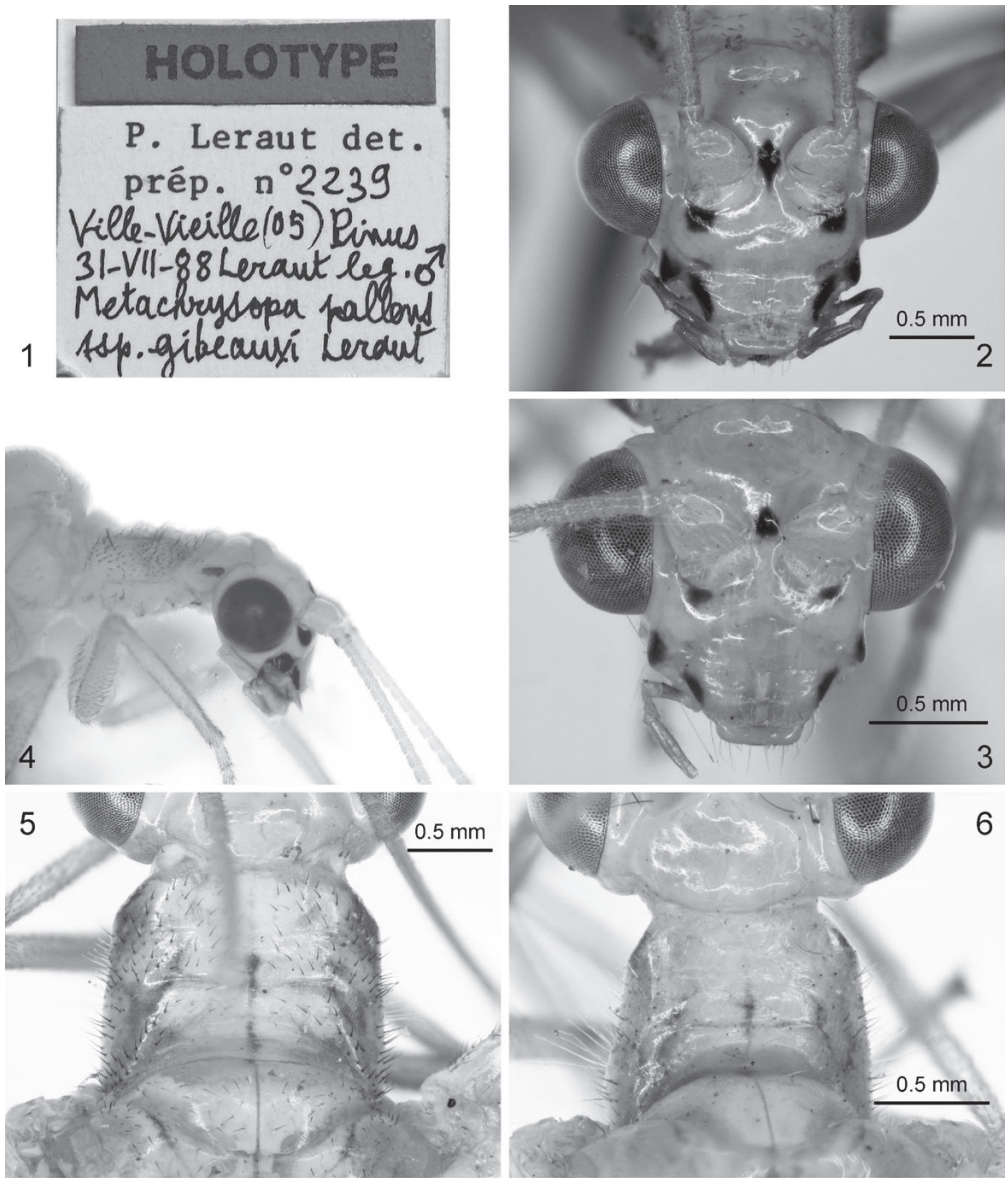

Fig. 1-6. – *Chrysopa spp.* – 1, *C. gibeauxi* (Leraut), holotype label. *(Photograph © P. Tillier)*. – 2-3, Frontal view of the head: 2, *C. gibeauxi* from Poland; 3, *C. pallens* (Rambur) from Poland. *(Photographs © R. Dobosz)*. – 4, *C. gibeauxi* from Poland, lateral view of the head. *(Photograph © D. Thierry)*. – 5-6, Pronotum: 5, *C. gibeauxi* from Poland; 6, *C. pallens* from Poland. *(Photographs © R. Dobosz)*.

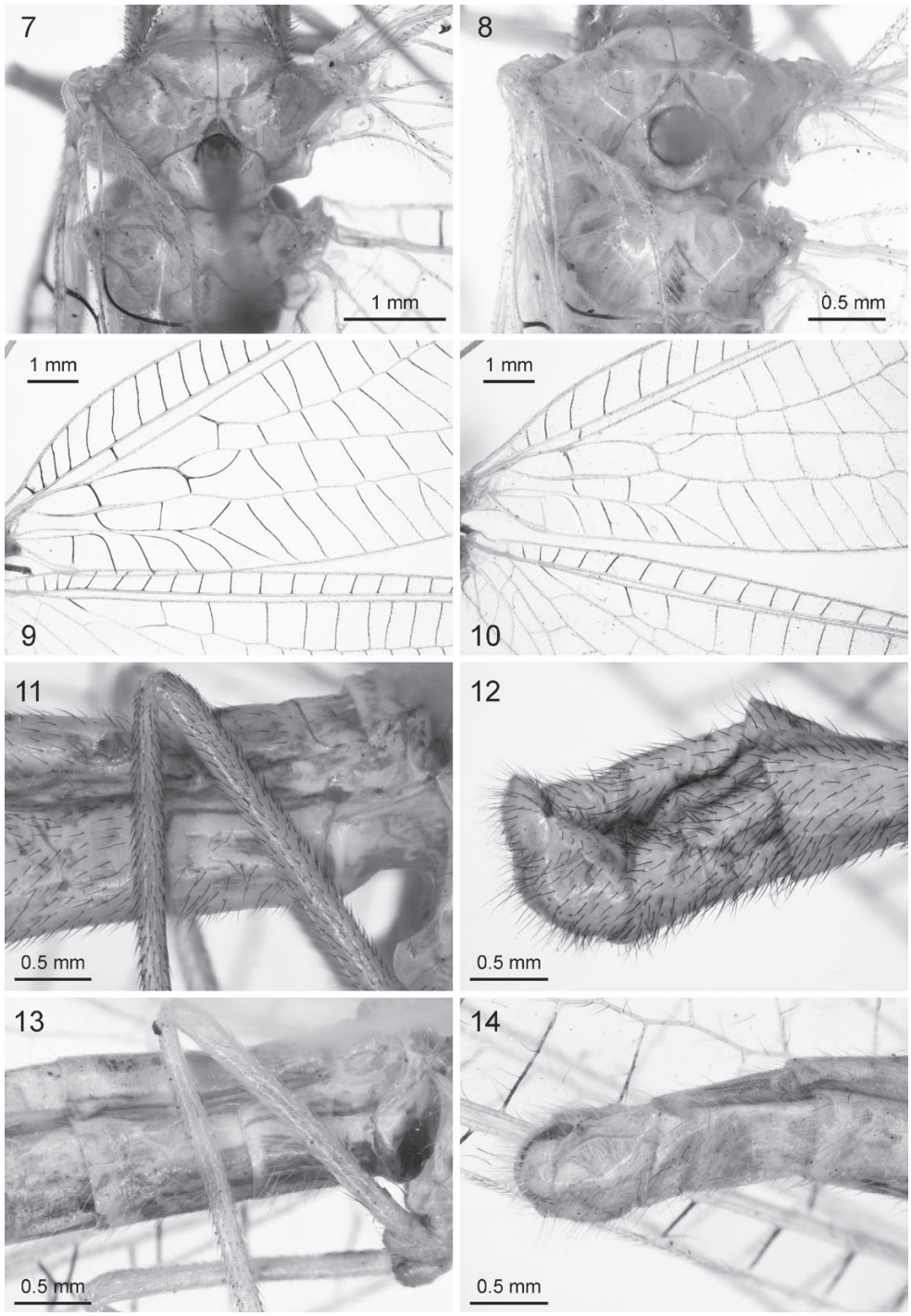

Fig. 7-14. – *Chrysopa spp.* – 7-8, Meso- and metanotum: 7, *C. gibeauxi* (Leraut) from Poland; 8, *C. pallens* (Rambur) from Poland. – 9-10, Proximal parts of the forewing: 9, *C. gibeauxi* from Poland; 10, *C. pallens* from Poland. – 11-12, *C. gibeauxi*, ♀ froml Poland, lateral view of the abdomen: 11, basal part; 12, apex. – 13-14, *C. pallens*, ♂ from Poland, lateral view of the abdomen: 13, basal part; 14, apex. *(Photographs © R. Dobosz)*.

acknowledged as valid and is widely used by the neuropterists' community (*e. g.* ASPÖCK *et al.*, 1980; DOROKHOVA, 1987; CANARD & JACQUEMIN, 2006; etc.). The difference shown in internal genitalia shape confirms the validity of separation of the two species until now included in *Chrysopa pallens sensu lato*. The status of valid species for *C. gibeauxi* is thus firmly established, even if we are in a cryptic species system like in the couple *Pseudomallada prasinus* (Burmeister, 1839) and *P. abdominalis* (Brauer, 1856), another large species associated with conifers.

REMARKS ON THE DISTRIBUTION

The discovery of *C. gibeauxi* in Central Europe extends considerably eastwards its distribution, even if we take into account the dubious specimens collected in Swiss by MCLACHLAN (1886) near Sierre in the Valais and near Meiringen in the Oberland as belonging to. It raises the

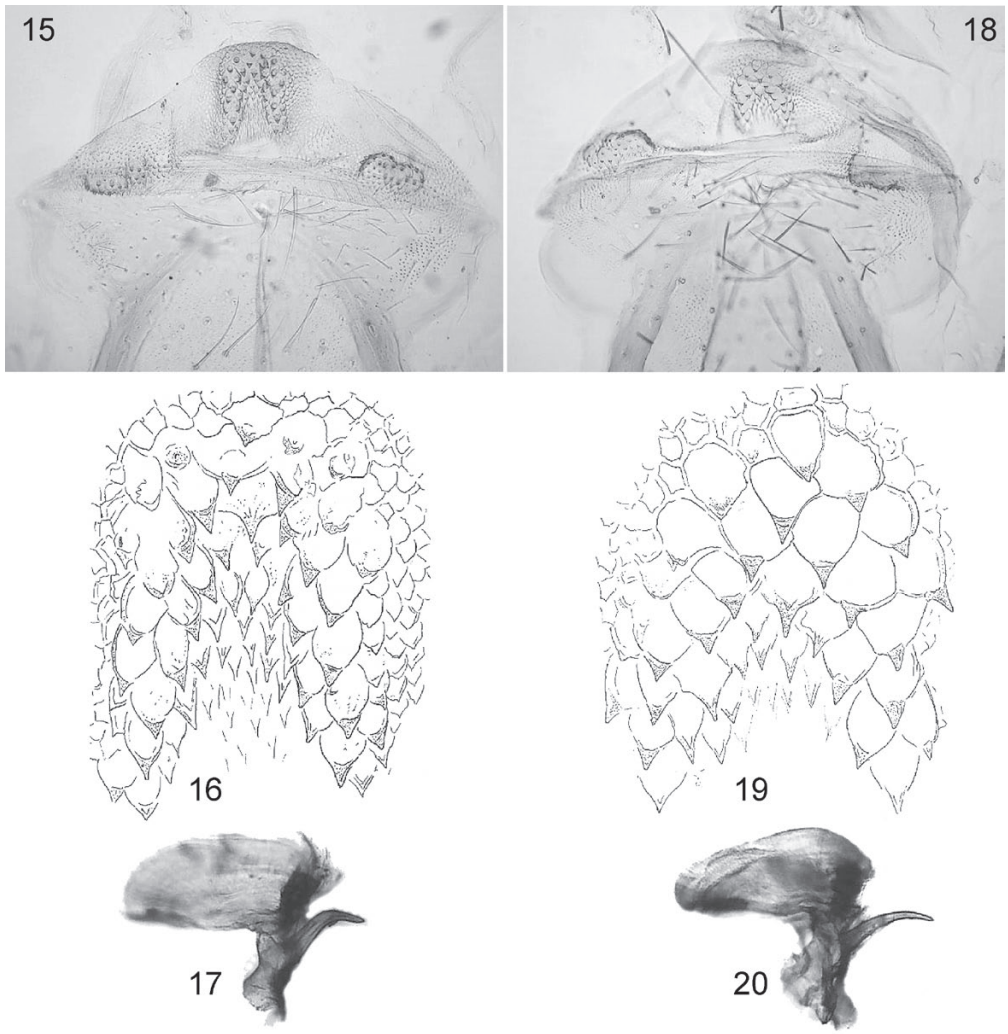

Fig. 15-20. – *Chrysopa spp.* – 15-17, *C. pallens* (Rambur): 15, ventral view of the gonocristae; 16, details of the central group; 17, lateral view of gonarcus and entoprocessus. – 18-20, *C. gibeauxi* (Leraut), mounting of the holotype: 18, ventral view of the gonocristae; 19, details of the central group; 20, lateral view of gonarcus and entoprocessus. *(Photographs and drawings © P. Tillier)*.

number of green lacewings occurring in Poland to 28 species (Czechowska & Dobosz, 1991; Aspöck *et al.*, 2001), including *Chrysoperla carnea* (Stephens, 1836) and *Chrysoperla affinis* of the *carnea*-complex living sympatrically in northern and southern districts of the country (Thierry *et al*., 2011). Considering the large distance between the two spots primarily known for *C. gibeauxi*, it may be possible that this green lacewing is more frequent that it appears until now, remaining hidden because of its similarity to the cosmopolitan and common *C. pallens*. The data given above relative to other specimens undoubtedly identified confirm this opinion.

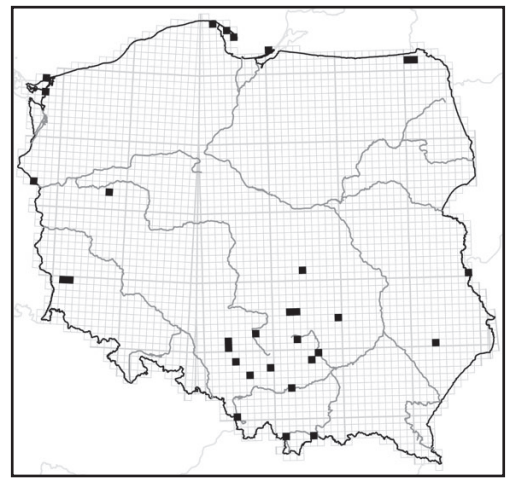

Fig. 21. – Known occurrence places of *Chrysopa gibeauxi* (Leraut) in Poland.

Revision of some green lacewings stored in the collections of the Bytom Museum allows us to consider *C. gibeauxi* as an actual component element of the Neuropteran fauna of the Palaearctic ecozone, from northern Europe (Finland) to East Asian deciduous forest (Korea), as does its sibling partner *C. pallens* (Aspöck *et al.*, 2001). Therefore, the true status of Asian *Chrysopa* needs revision. *Chrysopa gibeauxi* is relatively common in Poland as shown on the map (fig. 21), frequently caught at light, but surprisingly absent in a big sample (240 exemplars) collected by light trapping in Transylvania (Paulian *et al*., 2001).

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