

On the Taxonomic Position of *Cicindela resplendens* Dokht. (Coleoptera, Carabidae) within the Genus *Cicindela* L.

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Received March 10, 1997

Abstract—The structure of male and female genitalia, and that of the internal sac of aedeagus in particular, show, together with some external characters, that *Cicindela resplendens* Dokht. belongs to the *maritima* lineage of the *hybrida* group of the nominotypical subgenus.

Cicindela resplendens was described by Dokhturoff (1988) from N China (Ordos), on the basis of examination of material collected by the expedition of G.N. Potanin. Because of the peculiar distinct white elytral pattern, V.V. Dokhturoff related the described species to *C. (Cephalota) elegans* var. *decipiens* F.-W.

In the monograph on the Palaearctic species of the genus *Cicindela*, Horn and Roeschke (1891) related *C. resplendens* Dokht. to species of the subgenus *Cephalota* Dokht. (*C. schrenki* Gebl. and *C. jakowlewi* Sem.), based on the bright coloration and extensive white elytral pattern. However, they correctly noted that *C. resplendens* differs from all other species of the subgenus in the glabrous pronotum, shape of labrum, and longer legs.

Later, Horn (1915) related *C. resplendens* to the *paludosa–elegans–luctuosa* and the *nox–brevipilosa* complexes. In his catalogue, *C. resplendens* was included in group VIII, being positioned between *C. galatea* Thiem. (group VII) and species of the subgenus *Cylindera* West. (group IX).

The taxonomic position of *C. resplendens* was first revised by Rivalier (1950), who included it in the nominotypical subgenus, on the basis of the structure of internal sack in aedeagus. Rivalier noted that the bright coloration and wide white margination of elytra clearly distinguish *C. resplendens* from other Palaearctic species of the subgenus. However, the structure of the internal sack of aedeagus allows placement of *C. resplendens* in the subgenus *Cicindela* (s. str.). In Rivalier's opinion, the weakly developed and only partly sclerotized median tooth of the internal sack

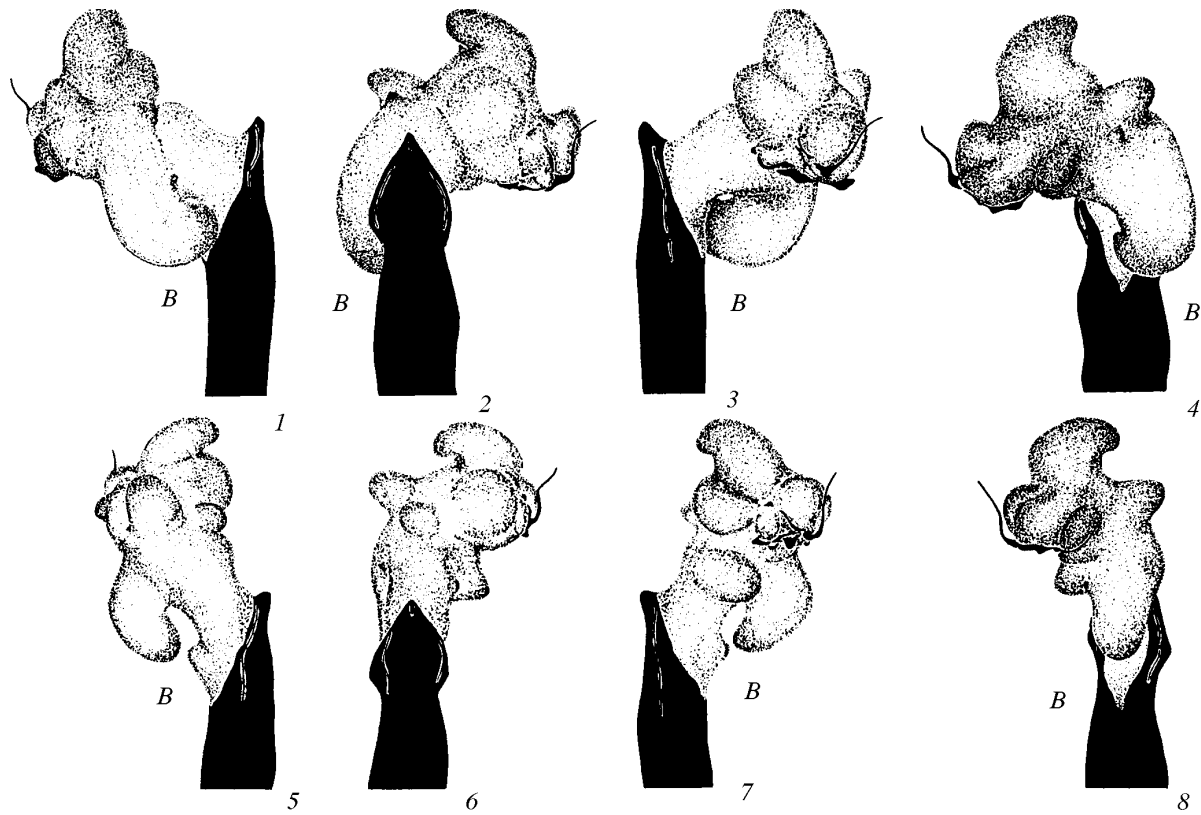
relates *C. resplendens* to *C. transbaicalica* Motsch. (group III; Rivalier, 1950: 225).

Later, Cassola and Van Nidec (1984) also related, following Rivalier, *C. resplendens* to *C. transbaicalica* in the annotated list of Palaearctic *Cicindela*.

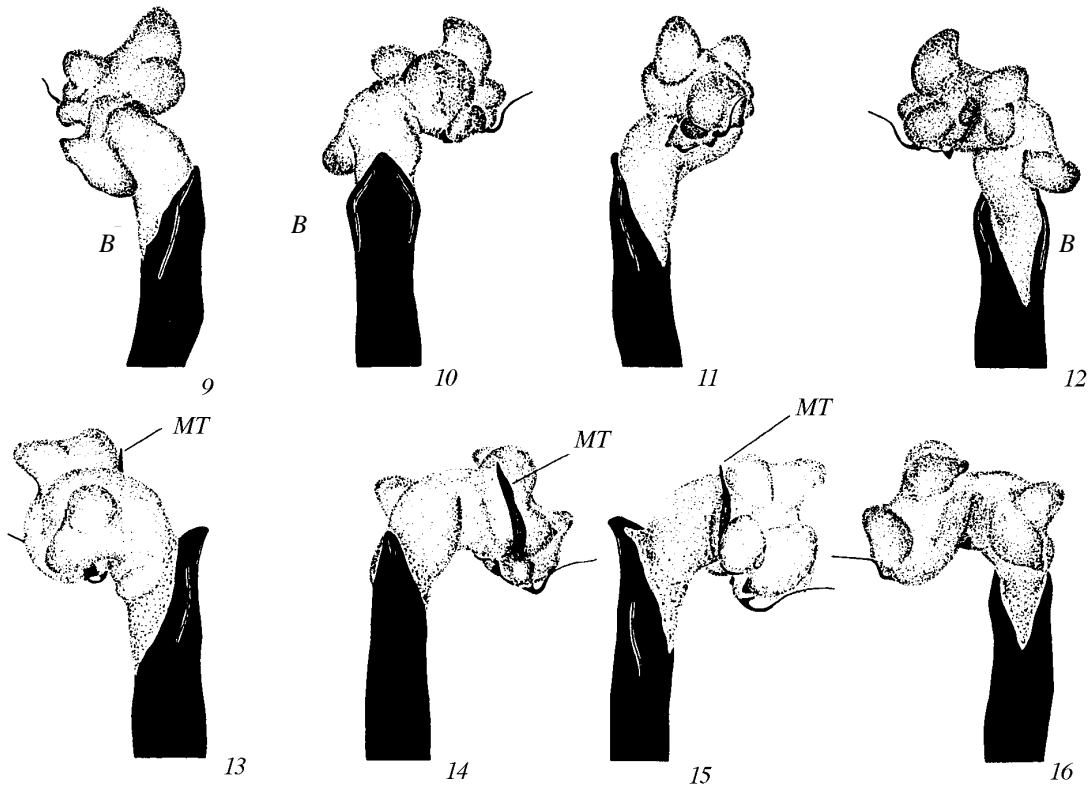
In their catalogues of tiger beetles of the World, Werner (1991, 1992) and Wiesner (1992) also included *C. resplendens* and *C. transbaicalica* in the same group. Neither Horn (1930) nor Mandl (1935, 1936) mentioned *C. resplendens*. The species was not mentioned, either, in the recent revision of the *hybrida* group of the Palaearctic (Gebert, 1996).

Such a discrepancy in opinions is unsatisfactory. The goal of the present study was to accurately determine the taxonomic position of *C. resplendens* within the genus. In addition to details of the external morphology, I have examined the structure of genitalia in both sexes and also morphological peculiarities of the internal sack in aedeagus. The internal sack was not detached as previously (Rivalier, 1950), but was gradually blown out under flow of hot air.

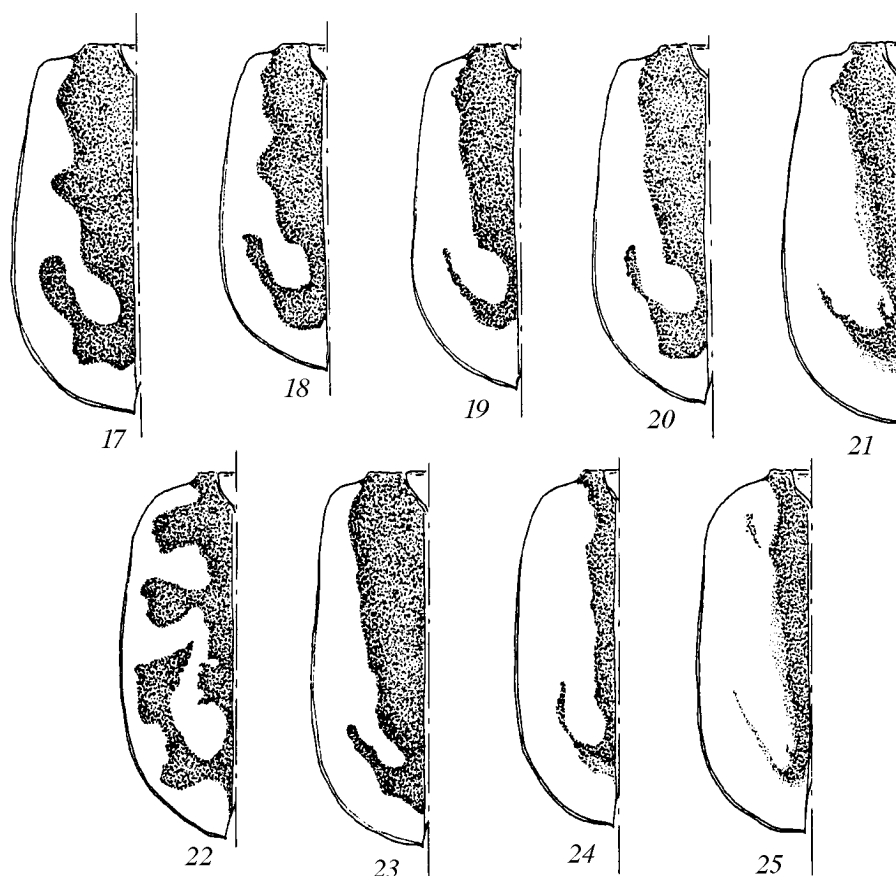
Material. Lectotype (designated here), ♂, "Ordos. 1884. G. Patanin," "China," "Type Dokhturov," "*Cicindela Resplendens* N. sp. Dokht.," "Holotypus. *Cicindela resplendens* Dokht. [Kryzhanovskij design.]" (ZIN); 17 paralectotypes (designated here), including: 1 ♂, "Ordos. 1884, G. Patanin," "*Resplendens* Dokht.," "Type Dokhturov," 10 ♂, 3 ♀, "Ordos. 1884. G. Patanin," "*resplendens* Dokht. Tschitscherin det.," 1 ♀, "Ordos. 1884. G. Patanin," "*resplendens* Dokht. ♀ VIII. A. Semenov det.," 1 ♂, "Ordos. 1884. G. Patanin," "*Cicindela resplendens* Dokht. ♂ G. Suvorow det.," "[collection] c. of G. Suvorow," "Topotypus."



Figs. 1-8. *Cicindela* L., internal sack of aedeagus in left (1, 5), dorsal (2), right (3, 7), and ventral (6) view. (1-4) *C. resplendens*; (5-8) *C. restricta* F.-W. B—basal lobe.



Figs. 9-16. *Cicindela* L., internal sack of aedeagus in left (9, 13), dorsal (10, 14), right (11, 15), and ventral (12, 16) view. (9-12) *C. maritima* Dej.; (13-16) *C. transbaicalica* B—basal lobe; MT—median tooth.



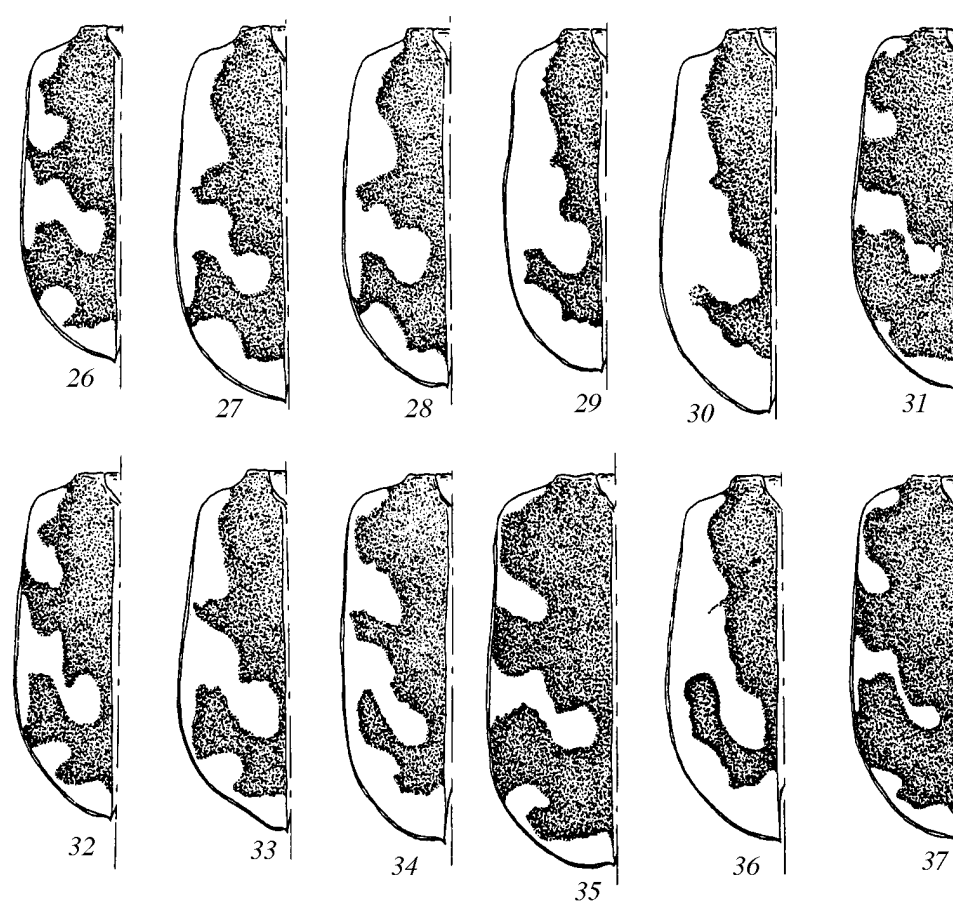
Figs. 17–25. *Cicindela* l., elytral pattern: (17–21) *C. resplendens*; (22) *C. elegans* F.-W.; (23) *C. schrenki* Gebl.; (24, 25) *C. jakowlewi* Sem.

The data obtained confirm the assignment of *Cicindela resplendens* Dokht. to the nominotypical subgenus. The following characters support this conclusion: glabrous clypeus (in contrast to the pubescent clypeus in *Lophyridia* Jean.); scattered vestigial pubescence on lateral margins of abdominal sternites [contrasted to the appressed dense pubescence in *Cephalota* or entirely glabrous margins of sternites in *Eumecurus* Motsch. (= *Cylindera* West.)]; glabrous disc of pronotum [in contrast to the densely laterally pubescent disc in *Cicindina* Ad. Et Merkl (= *Eugrapha* Riv.) or to the disc pubescent along anterior and posterior margins in *Cephalota*]; presence of subapical 3–4 chaetae on the first antennal segment (against a single subapical chaeta in *Cephalota*); metallic tint of epipleura of elytra (in contrast to pale epipleura without metallic tint in *Cephalota*); elongate aedeagus (in contrast to the short and swollen aedeagus in *Cephalota*), and also the structure of female genitalia.

Within the nominotypical subgenus, *C. resplendens* belongs to the *hybrida* group in the broad sense (Mandl, 1935, 1936). *C. resplendens* differs from spe-

cies of the *campestris* group in the convex frons with fine grooves, non-depressed vertex and occiput, and the shape of pronotum; from the species of the *sylvatica* group, in the apically serrate elytra, rather short hind legs (tarsus to tibia length ratio 0.75–0.80), and the narrow labrum not projecting forward.

In the strict sense, *C. resplendens* undoubtedly belongs to the *maritima* lineage (sensu Freitag, 1965). The following characters relate this species to the *maritima* lineage: the narrow, slender (3.0–3.2 mm wide; apical tooth to distal part of mandible length ratio 0.65–0.75), strongly bent mandibles, with curvature coefficient (mandible length to curve radius ratio) of 3.0–3.2 (in species of the *hybrida* lineage this coefficient being 4.0–5.5). The characteristic apex of penis with small but distinct lobes (Figs. 1–4), general configuration and transverse orientation of the internal sack of aedeagus, and the absence of the median tooth (MT) in this sack (after Spanton, 1988) also relate *C. resplendens* to the *maritima* lineage. It is noteworthy that in *C. transbaicalica*, the species related to *C. resplendens* by Rivalier (1950), the median tooth in



Figs. 26–37. *Cicindela* L., elytral pattern: (26) *C. sahlbergii sahlbergii* F.-W.; (27) *C. sahlbergii* f. *gebleri* F.-W.; (28) *C. sahlbergii* f. *laterals* F.-W.; (29) *C. sahlbergii* f. *karelini* F.-W.; (30) *C. sahlbergii* f. *pallasi* F.-W.; (31–33) *C. maritima* Dej.; (34) *C. nitida selengensis* Mandl; (35) *C. nitida nitida* Licht.; (36) *C. reitteri* W. Horn; (37) *C. restricta* F.-W.

the internal sack is well developed (Figs. 13–16); this character, together with the shape of penis and mandibles, relates *C. transbaicalica* to the *hybrida* lineage. In my opinion, *C. resplendens* is more similar to *C. restricta* F.-W. and the closely related *C. reitteri* W. Horn than to *C. maritima* Dej. The following characters confirm this assumption: the long and slender penis tube and strongly developed, one-pointed basal lobe of the internal sack, bent backwards and downwards (Figs. 5–8), contrasted with the short and more stumpy penis tube and small and perpendicularly oriented two-pointed basal lobe in *C. maritima*. (Figs. 9–12).

At present, only preliminary assumptions can be made concerning the possible origin of *C. resplendens*. Apparently, an ancestral form of this species had separated from the general branch of the lineage during its expansion to the south. The subsequent isolation and habitation in arid landscapes of S Mongolia and N

China could be the reason for the convergent similarity in the pattern of elytra between *C. resplendens* (Figs. 17–21) and species of the subgenus *Cephalota* (Figs. 22–25); *C. resplendens* had long been assigned to this subgenus (Horn and Roeschke, 1891; Semenov, 1895; Horn, 1915).

It is necessary to note that similar trends in the development of a pale elytral pattern are found in some species of the *hybrida* group (sensu Mandl, 1935, 1936), distributed within a wide latitudinal range. For example, the area of the white elytral pattern is larger in comparison with that in the typical form in some populations of *C. sahlbergii* F.-W. (Figs. 26–30) and *C. maritima* (Figs. 31–33); it is also increased in *C. nitida selengensis* Mandl., compared with *C. nitida nitida* Licht. (Figs. 34, 35), and in *C. reitteri* as compared with *C. restricta* (Figs. 36, 37). This tendency becoming most clearly pronounced in going south-

wards, the greater area of white elytral pattern is probably an adaptation to increased insolation.

ACKNOWLEDGMENTS

The work was financially supported by the Federal Center for Science and Technology Programs "Biological Diversity."

REFERENCES

1. Cassola, F. and Brouerius van Nidec, C.M.C., Checklist of *Cicindela* (s. auct.) of the Palaearctic Region (Coleoptera: Cicindelidae), *Cicindela*, 1984, vol. 16, nos. 1–2, pp. 7–17.
2. Dokhturoff, W., Insecta a cl. G.N. Potanin in China et in Mongolia novissime lecta: II. Cicindelidae, *Horae Soc. Ent. Ros.*, 1888, vol. 22, pp. 138–146.
3. Freitag, R., A Revision of the North American Species of the *Cicindela maritima* Group with a Study of Hybridization between *Cicindela duodecimguttata* and *oregona*, *Quaest. Ent.*, 1965, vol. 1, pp. 87–170.
4. Gebert, J. Revision der *Cicindela* (s. str.) *hybrida*-Gruppe (sensu Mandl 1935/36) und Bemerkungen zu einigen äußerlich ähnlichen paläarktischen Arten (Coleoptera, Cicindelidae), *Mitt. Münch. Ent. Ges.*, 1996, vol. 86, pp. 3–32.
5. Horn, W., Coleoptera Adephaga. Fam. Carabidae, Subfam. Cicindelinae, *Genera Insectorum*, 1915, vol. 82c, pp. 209–486.
6. Horn, W., Über die geographische Verbreitung der Rassen von *Cicindela campestris* und *hybrida* (nebst ergänzender Beschreibung von *C. campestris javeti* Chd.). II. *Cicindela hybrida* L., *Ent. Bl.*, 1930, vol. 26, no. 2, pp. 49–56.
7. Horn, W. and Roeschke, H., *Monographie der paläarktischen Cicindelen. Analytisch bearbeitet mit besonderer Berücksichtigung der Variationfähigkeit und geographischen Verbreitung*, Berlin, 1891.
8. Mandl, K., Vorarbeiten für eine monographische Neubearbeitung der paläarktischen Cicindelen. Revision der *Cicindela hybrida*-Gruppe (*C. hybrida*, *C. coerulea*, *C. transbaicalica*, *C. altaica*, *C. maritima*): Zugleich 5. Beitrag zur Kenntnis paläarktischen Cicindelen unter besonderer Berücksichtigung des Materials des Deutschen Entomologischen Instituts in Berlin-Dahlem, *Arb. morph. taxon. Ent.*, Berlin-Dahlem, 1935, vol. 2, no. 4, pp. 306–383.
9. Mandl, K., Vorarbeiten für eine monographische Neubearbeitung der paläarktischen Cicindelen. Revision der *Cicindela hybrida*-Gruppe (*C. hybrida*, *C. coerulea*, *C. transbaicalica*, *C. altaica*, *C. maritima*): Zugleich 6. Beitrag zur Kenntnis paläarktischen Cicindelen unter besonderer Berücksichtigung des Materials des Deutschen Entomologischen Instituts in Berlin-Dahlem, *Arb. morph. taxon. Ent.*, Berlin-Dahlem, 1936, vol. 3, no. 1, pp. 5–32.
10. Rivalier, E., Demembrement du genre *Cicindela* Linne. (Travail préliminaire limite à la faune paléarctique), *Rev. Fr. Ent.*, 1950, vol. 17, pp. 217–244.
11. Semenov, A.P., De *Cicindela* Schrenki Gebl. ejusque cognatis, *Horae Soc. Ent. Ros.*, 1895, vol. 29, pp. 328–335.
12. Spanton, T.G., The *Cicindela sylvatica* Group: Geographical Variation and Classification of the Nearctic Taxa, and Reconstructed Phylogeny and Geographical History of the Species (Coleoptera: Cicindelidae), *Quaest. Ent.*, 1988, vol. 24, pp. 51–161.
13. Werner, K., Cicindelidae regionis Palaearcticae. Megacephalini: Megacephala: Cicindelini 1. *Cicindela-Lophyridia*, *Die Käfer der Welt, The Beetles of the World*, Sciences Nat. France, vol. 14, 1991.
14. Werner, K., Cicindelidae regionis Palaearcticae. Cicindelini 2: *Cosmodela-Platydelia - Lophyridia - Habrodera - Chaetodera - Neolaphyridia - Cephalota - Cassolai - Homodela - Cylindera - Eugrapha - Myriochile - Salpingophora - Hypaeth - Abroscelis - Callytron*, *Die Käfer der Welt, The Beetles of the World*, Sciences Nat. France, vol. 15, 1992.
15. Wiesner, J., *Checklist of the Tiger Beetles of the World (Coleoptera, Cicindelidae)*, Keltern: Erna Bauer Verlag, 1992.