Morphometric study of the species *Hypocoprus latridioides* Motschulsky, 1839 and *H. quadricollis* Reitter, 1877 (Coleoptera: Atomariinae)

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Most of the characters used in the literature to distinguish *H. latridioides* Motschulsky, 1839 from the closely related taxon *H. quadricollis* Reitter, 1877 are not diagnostic. The present morphometric study indicates that there is no evidence to support the status of the latter as a separate species. A new description of *H. latridioides* is presented.

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1. Introduction

Phenotypic variability is an observable characteristic of all animal species. Somatometric studies aid assessment of the extent to which the observed variability should be considered intraspecific, as opposed to interspecific and thus of value for species discrimination (Prat 1985). Furthermore, they can reveal geographic patterns of morphometric variation (Casteig & Escala 1988), and in some cases — in comparisons of populations of sympatric species — detect niche variation (Martín Cantarino & Seva Roman 1991). It is thus not surprising that numerous studies of this type exist in the literature (e.g. Bach & Cardenas 1985, Cardenas *et al*. 1998, Desender & Crappe 1983, Prat 1985, Savage & Saponis 1983, Reyes 1986).

In the genus *Hypocoprus*, there is some uncertainty as regards the taxonomic status of the species *H. latridioides* Motschulsky, 1839 and *H. quadricollis* Reitter, 1877. Some authors argue for their consideration as two separate species (Reitter 1911, Jansson 1940), while others consider them as synonyms (Vogt 1967, Silfverberg 1992, Jelinek 1993). Reitter (1911) distinguishes between the two on the basis of pronotum-to-elytron length ratio, while Jansson (1940) adds other diagnostic characters: pilosity coloration and thickness, and geographic distribution (*H. latridioides* in Finnish and Swedish Lapland, *H. quadricollis* in southern Scandinavia, France and Madeira).

The present study is a morphometric analysis of specimens collected in Finnish and Swedish Lapland, southern Sweden, Siberia, and central and southern Europe, with the aim of assessing patterns of variation and identifying possible species groups. In addition, a new description of *H. latridioides* Motsch. is provided, since the existing description is incomplete.

2. Material examined

Abbreviations used. CA: coll. Angelini, Francavilla Fontana, Italy (F. Angelini); DEI: Deutsches

Entomologisches Institut, Eberswalde, Germany (Dr. L. Zerche); HNHM: Hungarian Natural History Museum, Budapest (Dr. O. Merkl); MNCN: Museo Nacional de Ciencias Naturales, Madrid (Dr. I. Izquierdo); MZLU: Museum of Zoology, Lund University (Dr. R. Danielsson); Dr. J. Guitian, Universidad de Santiago de Compostela, Spain.

H. latridioides Motschulsky, 1839

Type material. I have not been able to study the original *H. latridioides* material. Unfortunately, repeated loan requests submitted to the Moscow Museum and relevant researchers have received no reply. The concept of this distinctive species as treated by previous authors has been accepted (e.g. Vogt 1967).

SPAIN, Marbella, 1–12.VII.62, 22 ex (T. Palm); Pyrinees, La Molina, 11–16.VII.63, 14 ex (T. Palm) (MZLU); ITALY, Basilicata, La Maddalene, 7–9.VII.87, 2 ex (F. Angelini) (CA); Corsica, 1 ex (MNCN); Puglia, Acquaviva, 2.X.68, 4 ex (L. De Marzo); MACEDONIA, Ljuboten, 4.VII.55, 1 ex (Fodor); SIBERIA, Irkutsk, 1 ex (E. Bokor) (HNHM); SWEDEN, Gotska Sandön, 4 ex (A. Jansson); Gotl. Sundre, 31.V.61, 2 ex (Wiren); Gstr. Hedesunda, 1 ex; Öland, Greby, 8–19.V.50, 6 ex (T. Palm); Öland, Vickleby Allvar, III.39, 1 ex (N. Bruce); Overkalix, 1 ex (S. Lundberg); Pajala, Muonionalusta, 19.VI.55, 22 ex (G. Israelson); Sandhammaren, 12 ex (E. Kangas); Stoby, 9.VII.58, 2 ex (G. Israelson); Torhamn, 17.VI.44, 1 ex; Tornetrask, Abisko, 11 ex; Tornetrask, Katta., 18 ex (Sellman); Vinslövs, 4.VII.58, 18 ex; 31.V.59, 22 ex.; 31.IX.59, 9 ex (G. Israelson); Vittskövle, 18.VIII.70, 8 ex (R. Baranowski); FINLAND, V.Nauvo, 5.VII.47, 2 ex (E. Kangas) (MZLU).

H. quadricollis Reitter, 1877

In Reitter's (1877) original article, the type locality indicated is Gallia mer., not Slovakia. Equally, the specimens studied were accompanied by labels marked "Gallia mer.".

Type Material. Lectotypus (m) (HNHM, examined) (by present designation). Labelled: Gallia mer., leg. Bauduer [handwritten probably by Csiki], coll. Reitter\ Holotypus [is printed with red], Hypocoprus quadricollis Reitter\ 4collis m, Gall. Mer., Bauduer [probably with Reitter's original handwriting].

Paralectotypus (h) (HNHM, examined) (by present designation). Labelled: Gallia mer., leg. Bauduer [handwritten probably by Csiki], coll. Reitter\Paratypus [is printed with red], Hypocoprus quadricollis Reitter\4collis m, Gall. Mer., Bauduer [probably with Reitter's original handwriting].

Comment. In the catalogue of De La Fuente (1927, p. 112), *H. hispanus* is cited *in litteris*. However, all other sources consulted indicate that this is an unpublished name. DEI (coll. Heyden) has a specimen (Heyden Collection Types Catalogue # 635) with the label "*Hypocoprus hispanus* Reitter. Hisp. mer. Reitter" handwritten by Heyden, a second printed label "Süd-Spanien. Algeciras. Simon", and a third red-printed label "histor. Exempl. vielleicnt. Type". This specimen concords precisely with *H. latridioides* Motsch.

3. Methods

All measures were determined with an Olympus SZX12 stereomicroscope equipped with a Micro Image system (vers. 4.0 for Windows 98) using a 32-bit-resolution digital camera. The following characters were determined:

— TL: Total length — from the anterior border of the head to the posterior border of the elytron.
— HL: Head length — from the anterior border of the head to the posterior border of the eyes.
— HW: Head width — maximum head width.
— EL: Eye length.
— EW: Eye width.
— PL: Pronotum length — maximum pronotum length, measured from the anterior to the posterior border in a plane parallel to the sagittal.
— PW: Pronotum width — maximum pronotum width, measured perpendicular to length.
— EL: Elytron length — distance between the anterior border of the scutellum and the posterior border of the elytron.
— EW: Elytron width — maximum elytron width.

The following indices were also calculated:

— HW/HL: Ratio of head width to head length.

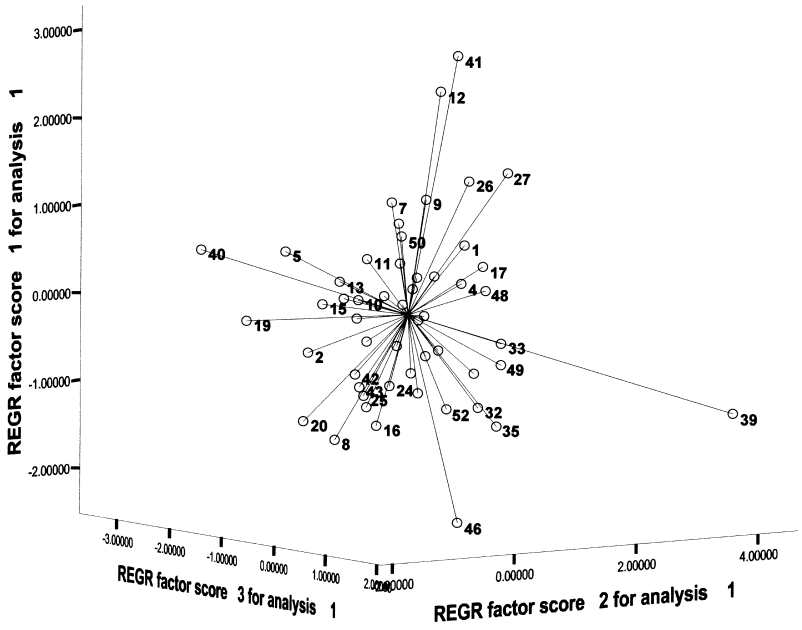

Fig. 1. The positions of the 53 specimens in the ordination space, defined by the first three factors extracted in the factor analysis.

— PW/PL: Ratio of pronotum width to pronotum length.
— EW/EL: Ratio of elytron width to elytron length.
— EL/PL: Ratio of elytron length to pronotum length.

Finally, I recorded:

— GO: geographical origin (1 = Finnish or Swedish Lapland; 2 = southern Scandinavia, Siberia, or central or southern Europe).

The specimens studied are listed in Appendix, showing the number codes used in Fig. 1.

The data were investigated using various exploratory multivariate techniques (factor analysis, multivariate analysis of variance, and logistic regression). Relationships between the 13 morphometric characters were evaluated by correlation analysis, which allows the identification of dependence relations. All statistical analyses were performed using SPSS 10.0 for Windows.

4. Results and Discussion

For the factor analysis we considered the full set of 53 specimens and 13 morphological characters. Taken together, the first five components explain 89.67% of the accumulative variance (Table 1). Table 2 details the loading factors for each of the components. Of the variance, 41.31% is absorbed by the first component, in which the size factors stand out, with values greater than 0.882: elytron length (EL), maximum pronotum width (PW), elytron width (EW), total length (TL), and pronotum length (PL).

The rest of the variance is absorbed by other four axes that are related to head, pronotum and elytron length/width ratio factors. Fig. 1 shows the projection of the specimens as a function of the respective numerical values of the first three components, without it being possible to clearly establish a correspondence between the morphological data and the origin of the specimens examined.

Table 1. Variance explained by the first five factors extracted in the factor analysis of the morphometric data.

Factor	Total	Variance explained (%)	Cumulative variance (%)
1	5.371	41.316	41.316
2	2.208	16.981	58.297
3	1.796	13.814	72.111
4	1.269	9.762	81.873
5	1.014	7.797	89.670

Two analyses were perfomed — multivariate ANOVA (Wilks' Lambda) and a logistic regression — to determine whether any relationship exists between the significant factors of Table 2 and the origin (GO) of the specimens examined. These analyses (Tables 3–4) detect a separation of the specimens as a function of the second component in which the highest loadings correspond to the pronotum length/width relation (PW/PL) and to lesser extent in relation to EL/PL ($p = 0.002$). The scatter plots of GO in relation to PW/PL and EL/PL show in both cases that all the specimens are distributed within a wide range, possibly indicating interspecific allometry. In conclusion, there do not appear to be any morphometric grounds to support the consideration of these specimens as belonging to two separate species. Likewise, there is no evidence that specimens from Lapland show any consistent differences with respect to specimens from elsewhere in Eurasia. However, my findings provide evidence of significant geographical variation in shape (notably pronotum width-to-length ratio, and elytron-to-pronotum length ratio), suggesting the existence of some sort of intraspecific variation, perhaps reflecting environmental separations.

Table 2. The loadings of the 13 morphometric variables on each of the first three factors extracted in the factor analysis of the morphometric data.

	Component		
Variable	1	2	3
TL	0.909	–0.157	–0.075
HL	0.612	0.076	–0.664
HW	0.601	0.189	0.513
EL	0.482	0.435	–0.187
EW	0.424	0.442	–0.066
PL	0.882	–0.441	0.100
PW	0.930	0.016	0.151
EL	0.938	–0.078	0.121
EW	0.913	0.155	0.010
HW/HL	–0.065	0.073	0.973
PW/PL	–0.172	0.886	0.082
EW/EL	0.025	–0.440	0.202
EL/PL	0.081	0.739	0.063

5. Redescription

Hypocoprus latridioides (Motschulsky, 1839)

Upocoprus lathridioides MOTSCHULSKY, 1839. Bull. Moscou, XII: 73

Myrmecinomus hochuthii CHAUDOIR, 1845. Bull. Moscou, XVIII (2): 207

Monotoma caucasicum KOLENNATI, 1845. Melet. Ent., III: 43

Hypocorpus quadricollis REITTER, 1877. Verh. zool-bot. Ges. Wien, XXVII: 180

Length. 1.0–1.2 mm. Body elongated and slightly convex. Coloration yellowish brown to blackish brown; legs and antennae yellowish brown or dark brown. Body finely pubescent, setae moderately long (L = 23.43–24.44 mm). Metathoracic wings developed.

Head. Temples parallel and shorter than eyes; eyes small (L = 0.039–0.077 mm), scarcely extending beyond the lateral margin of the face; ocular facets (Ø = 6.02–6.68 mm) of similar size

Table 4. The results of logistic regression with GO (geographical origin: Lapland, or elsewhere in Eurasia) as the dependent variable, and scores on the five factors extracted by factor analysis (F1–F5) as candidate predictor variables.

Factor	Score	p
F1	0.217	0.641
F2	9.472	0.002
F3	0.631	0.427
F4	3.303	0.069
F5	0.282	0.596
Overall model	13.905	0.016

Table 3. The multivariate contrasts.

Effect		Value	F	Hypothesis df	Error df	p
Intercept	Wilks-Lambda	0.928	0.715	5	46	0.615
V15	Wilks-Lambda	0.733	3.358	5	46	0.011

to pronotum punctures. Antennae (Fig. 2a) not reaching the posterior edge of the pronotum. 3rd antennomere ~25% shorter than 2nd; 5th thicker than preceding, and ~33% longer than the 4th; 6th, 7th and 8th of equal length. The latter three form an elongated club.

Pronotum (Fig. 1a). Wider than long (PW/PL = 1.00–1.18); anterior and posterior angles rounded; base not edged; puncturation fine and diffuse, the punctures separated by a distance approximately equal to their diameter (Ø = 6.02–6.68 mm).

Elytra. 2.0–2.6 times longer than pronotum. Without striae. 1st ventrite as long as the 2nd and 3rd together; 2nd and 3rd ventrites of the same length (ventrite length measured medially).

Aedeagus (Fig. 2c).

Spermatheca (Fig. 2d).

Geographical distribution. Eurasia (Leschen 1996).

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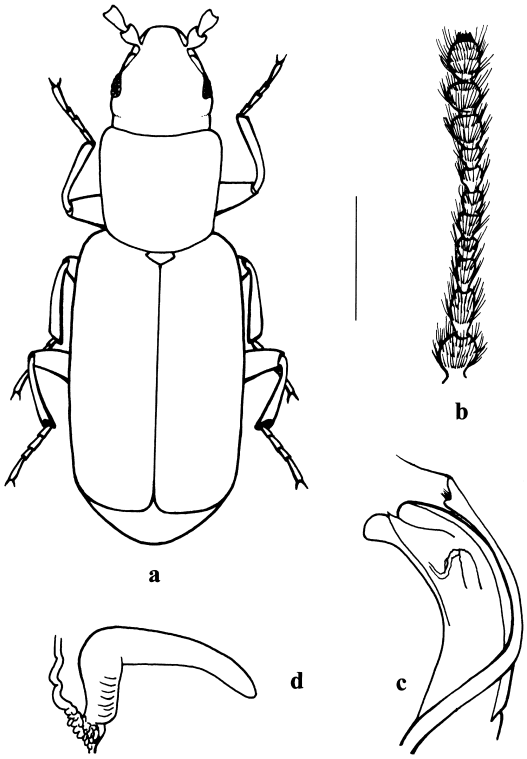

Fig. 2. *Hypocoprus latridioides* (Motschulsky, 1839). — a. Habitus (scale = 0.280 mm). — b. Antenna (scale = 0.190 mm). — c. Aedeagus (scale = 54.9 μm). — d. Spermatheca (scale = 31.28 μm).

References

Bach, C. & Cardenas, A. M. 1985: Estudio biométrico de *Micrositus* (*Platyolus*) *longulus* (Muls. & Rey, 1854) (Coleoptera: Tenebrionidae). — Actas II Congresso Ibérico de Entomologia: 469–480.

Cardenas, A. M., Hidalgo, J. M. **Y??** Ruiz, M. M. 1998: Estudio morfométrico de *Dendarus elongatus* (Mulsant, 1854) (Coloptera, Tenebrionidae). — Nouvelle Revue d'Entomologie 15: 155–164.

Casteig, F. J. & Escala, M. C. 1988: Morfometría de *Sorex coronatus* Millet, 1828 (Insectivora, Mammalia) en Navarra. — Miscelánea Zoológica 12: 309–317.

De La Fuente, J. M. 1927: Catálogo sistemático de los Coleópteros observados en la Península Ibérica, Pirineos y Baleares. — Boletín de la Sociedad Entomológica de España X (6–7): 85–117.

Desender, K. & Crappe, D. 1983: Larval and adult morphology and biometry of two sibling species, *Bembidion lampros* (Herbst) and *B. properans* Stephens (Coleoptera, Carabidae). — Biologisch Jaarboek Dodonaea 51: 36–54.

Jansson, A. 1940: Die Arthropodenfauna von Madeira nach den Ergebnissen der Reise von Prof. Dr. O. Lundblad Juli-August 1935. XXIX. Coleoptera: Sämtliche Familien unter Ausschluss der Familie der Carabidae, Dytiscidae, Hydrophilidae und der Gattung *Cryptophagus* Herbst aus der Familie Cryptophagidae. — Arkiv För Zoologi 32 A (24): 1–67.

Jelinek, J. 1993: Check-list of Czechoslovak Insects IV (Coleoptera). — Folia Heynovskyana, Suppl. 1: 98–99.

Leschen, R. A. B. 1996: Phylogeny and Revision of the Genera of Cryptophagidae (Coleoptera: Cucujoidea). — The University of Kansas. Science Bulletin 55: 549–634.

Martin Cantarino, C. & Seva Roman, E. 1991: Morphological indices and resource partitioning in a guild of Coleoptera Tenebrionidae at the coastal sand-dunes of Alicate (SE Spain). — Advances in Coleopterology: 211–222.

Prat, N. 1985: Variabilidad morfológica de las poblaciones de *Cladotanytarsus mancus* (Walker, 1856) de los embalses españoles (Diptera, Chironomidae). — Graellsia 41: 65–89.

Reitter, E. 1877: Coleopterorum species novae. — Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien 27: 165–194.

Reitter, E. 1911: Fauna Germanica. Die Käfer des Deutschen Reiches.III. Edit. K.G.Lutz' Verlag. Stuttgart. 128 pp.

Savage, H. M. & Soponis, A. R. 1983: Wing character variation in the nearctic species of *Orthocladius* (*Orthocladius*) van der Wulp (Diptera: Chironomidae): a Principal Components Analysis. — Memoirs of the American Entomological Society 34: 299–308.

Silfverberg, H. 1992: Enumeratio Coleopterorum Fennoscandiae, Daniae et Baltiae. Helsinki. 94 pp.

Vogt, H. 1967: Familie Cucujidae. In: Die Käfer Mitteleuropas. Band 7. Clavicornia. Edit. Goecke and Evers. Krefeld.

Appendix. The values of the measured characters for specimens of *Hypocoprus latridioides* and *H. quadricollis* (linear values expressed in micrometers).

Location	TL	HL	HW	EL	EW	PL	PW	EL	EW	HW/HL	PW/PL	EW/EL	EL/PL	GO
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.151	0.134	0.239	0.061	0.033	0.281	0.29	0.659	0.406	1.783	1.032	1.623	2.345	1
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.287	0.136	0.259	0.056	0.027	0.306	0.309	0.754	0.454	1.904	1.009	1.66	2.464	1
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.178	0.141	0.237	0.053	0.023	0.292	0.292	0.664	0.401	1.608	1	1.655	2.273	1
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.273	0.142	0.251	0.053	0.024	0.297	0.301	0.703	0.424	1.767	1.013	1.658	2.367	1
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.268	0.124	0.251	0.053	0.025	0.313	0.32	0.731	0.44	2.024	1.022	1.661	2.335	1
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.271	0.164	0.243	0.056	0.028	0.299	0.297	0.705	0.422	1.481	0.993	1.67	2.357	1
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.284	0.147	0.261	0.058	0.024	0.318	0.327	0.752	0.438	1.775	1.028	1.716	2.364	1
Sweden, Pajala, Muonionalusta, 19.VI.55 (Israelson)	1.311	0.156	0.249	0.065	0.034	0.299	0.304	0.729	0.442	1.596	1.016	1.649	2.438	1
Sweden, Overkalix (Lundberg)	1.109	0.136	0.228	0.054	0.024	0.269	0.275	0.613	0.358	1.676	1.022	1.712	2.278	1
Sweden, Stoby, 9.VII.58 (Israelson)	1.219	0.156	0.259	0.06	0.03	0.31	0.329	0.73	0.463	1.66	1.061	1.576	2.354	2
Sweden, Stoby, 9.VII.58 (Israelson)	1.18	0.161	0.237	0.064	0.03	0.275	0.288	0.669	0.401	1.472	1.047	1.668	2.432	2
Sweden, Vinslövs, 31.V.59 (Israelson)	1.208	0.153	0.249	0.06	0.028	0.299	0.302	0.708	0.438	1.627	1.01	1.616	2.367	2
Sweden, Vinslövs, 31.V.59 (Israelson)	1.343	0.169	0.276	0.07	0.032	0.323	0.346	0.768	0.482	1.633	1.071	1.593	2.377	2
Sweden, Vinslövs, 31.V.59 (Israelson)	1.203	0.155	0.242	0.061	0.026	0.293	0.303	0.669	0.429	1.561	1.034	1.559	2.283	2
Sweden, Vinslövs, 4.VII.58 (Israelson)	1.132	0.126	0.239	0.063	0.024	0.291	0.296	0.654	0.399	1.896	1.017	1.639	2.247	2
Sweden, Vittskövle, 18.VIII.70 (Baranowski)	1.224	0.149	0.242	0.065	0.028	0.295	0.299	0.652	0.396	1.624	1.013	1.646	2.21	2
Sweden, Vittskövle, 18.VIII.70 (Baranowski)	1.104	0.14	0.238	0.051	0.023	0.267	0.281	0.618	0.371	1.7	1.052	1.665	2.314	2
Sweden, Vittskövle, 18.VIII.70 (Baranowski)	1.298	0.137	0.251	0.059	0.024	0.293	0.318	0.715	0.44	1.832	1.085	1.625	2.44	2
Sweden, Vittskövle, 18.VIII.70 (Baranowski)	1.22	0.147	0.252	0.056	0.028	0.292	0.309	0.678	0.422	1.714	1.058	1.606	2.321	2
Sweden, Öland, Borgholm, 20.VII.69 (Baranowski)	1.266	0.151	0.241	0.052	0.022	0.302	0.293	0.673	0.396	1.596	0.97	1.699	2.228	2
Sweden, Öland, Borgholm, 20.VII.69 (Baranowski)	1.093	0.152	0.228	0.059	0.022	0.258	0.265	0.59	0.38	1.5	1.027	1.552	2.286	2
Sweden, Torneträsk (E. Sellman)	1.137	0.132	0.241	0.047	0.021	0.286	0.29	0.659	0.382	1.825	1.013	1.725	2.304	1
Sweden, Torneträsk (E. Sellman)	1.255	0.141	0.243	0.056	0.02	0.304	0.304	0.717	0.422	1.723	1	1.699	2.358	1

Sweden, Torneträsk (E. Sellman)	1.259	0.137	0.246	0.048	0.019	0.304	0.309	0.699	0.424	1.795	1.016	1.648	2.299	1
Sweden, Torneträsk (E. Sellman)	1.148	0.131	0.238	0.042	0.025	0.286	0.289	0.671	0.408	1.816	1.01	1.644	2.346	1
Sweden, Goti. Sundren, 31.V.61 (Wiren)	1.121	0.144	0.242	0.049	0.022	0.272	0.279	0.636	0.401	1.68	1.025	1.586	2.338	2
Sweden, Goti. Sundren, 31.V.61 (Wiren)	1.386	0.148	0.273	0.054	0.027	0.314	0.334	0.754	0.464	1.844	1.063	1.625	2.401	2
Finland, V. Nauvo, 5.VII.47 (Kangas)	1.323	0.147	0.273	0.065	0.028	0.311	0.332	0.762	0.468	1.857	1.067	1.628	2.45	2
Finland, V. Nauvo, 5.VII.47 (Kangas)	1.212	0.137	0.246	0.062	0.027	0.303	0.307	0.723	0.431	1.795	1.013	1.677	2.386	2
Sweden, Torneträsk (E. Sellman)	1.284	0.141	0.252	0.052	0.025	0.309	0.318	0.738	0.426	1.787	1.029	1.732	2.388	1
Sweden, Torneträsk (E. Sellman)	1.209	0.134	0.244	0.045	0.026	0.302	0.302	0.707	0.393	1.82	1	1.798	2.341	2
Sweden, Öland, Greby, 8-19.V.50 (Palm)	1.215	0.14	0.24	0.065	0.031	0.281	0.29	0.682	0.389	1.714	1.032	1.753	2.427	2
Sweden, Öland, Greby, 8-19.V.50 (Palm)	1.105	0.13	0.237	0.055	0.028	0.265	0.286	0.642	0.381	1.823	1.079	1.685	2.422	2
Spain, Marbella, 1-21.VII.62	1.164	0.12	0.249	0.063	0.025	0.295	0.306	0.687	0.417	2.075	1.037	1.647	2.328	2
Spain, Marbella, 1-21.VII.62	1.229	0.141	0.239	0.067	0.031	0.283	0.286	0.682	0.406	1.695	1.01	1.679	2.409	2
Spain, Marbella, 1-21.VII.62	1.088	0.124	0.255	0.056	0.027	0.258	0.272	0.629	0.382	1.814	1.054	1.646	2.437	2
Spain, Pyrinees, La Molina, 11-16.VII.63	1.144	0.131	0.254	0.066	0.021	0.302	0.304	0.648	0.413	1.938	1.006	1.569	2.145	2
Spain, Pyrinees, La Molina, 11-16.VII.63	1.135	0.136	0.239	0.066	0.021	0.274	0.286	0.652	0.44	1.757	1.043	1.481	2.379	2
Spain, Pyrinees, La Molina, 11-16.VII.63	1.174	0.132	0.255	0.062	0.027	0.304	0.306	0.685	0.411	1.931	1.006	1.666	2.253	2
Gallia mer. (Reitter)	1.055	0.129	0.251	0.062	0.027	0.232	0.29	0.629	0.399	1.945	1.25	1.576	2.711	2
Spain, Cadiz, Algeciras (Simon)	1.333	0.147	0.166	0.061	0.021	0.302	0.32	0.725	0.453	1.129	1.059	1.6	2.4	2
Sweden, Vinslövs, 4.VII.58 (Israelson)	1.395	0.154	0.29	0.077	0.029	0.35	0.35	0.832	0.493	1.883	1	1.687	2.377	2
Italy, Córcega (MNCN)	1.143	0.136	0.224	0.058	0.022	0.282	0.289	0.678	0.393	1.647	1.024	1.725	2.404	2
Siberia, Irkutsk	1.16	0.138	0.24	0.055	0.027	0.279	0.283	0.627	0.38	1.739	1.014	1.65	2.247	1
Macedonia, Ljuboten, 4.VII.75 (Fodor)	1.174	0.141	0.253	0.053	0.03	0.279	0.295	0.626	0.393	1.794	1.057	1.572	2.243	2
Italy, Basilicata, La Madd., 7.VII.87 (Angelini)	1.231	0.147	0.253	0.061	0.03	0.289	0.307	0.673	0.427	1.721	1.062	1.576	2.328	2
Italy, Basilicata, La Madd., 7.VII.87 (Angelini)	1.084	0.111	0.207	0.048	0.023	0.246	0.263	0.609	0.352	1.864	1.069	1.73	2.475	2
Italy, Puglia, Acquaviva, 2.X.69 (Angelini)	1.137	0.131	0.24	0.066	0.026	0.267	0.281	0.636	0.413	1.832	1.052	1.539	2.382	2
Sweden, Torhamn, 17.VI.44	1.252	0.143	0.255	0.058	0.027	0.281	0.306	0.687	0.426	1.783	1.088	1.612	2.444	2
Sweden, Gotska Sandön (Jansson)	1.125	0.147	0.244	0.059	0.025	0.256	0.293	0.642	0.399	1.659	1.144	1.609	2.507	2
Sweden, Ivö, 4-6.VI.44 (Palm)	1.259	0.155	0.251	0.068	0.024	0.295	0.309	0.726	0.436	1.619	1.047	1.665	2.461	2
Sweden, 12.VII.60 (Lundberg)	1.137	0.131	0.242	0.058	0.024	0.279	0.29	0.648	0.38	1.847	1.039	1.705	2.322	2
Sweden, H.Vaderö, 9.V.65 (Lundberg)	1.167	0.122	0.238	0.054	0.023	0.274	0.286	0.613	0.413	1.95	1.043	1.484	2.237	2