A revision of the Palearctic Ilybius crassus-complex (Coleoptera, Dytiscidae)

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The three species of the Palearctic *Ilybius crassus* complex are revised. A lectotype is designated of the West Palearctic species *I. crassus* Thomson, 1856. *Ilybius nakanei* sp. n. is described from South Sakhalin and Hokkaido. *Ilybius weymarni* J.Balfour-Browne, 1947, is made a junior synonym of *I. chishimanus* Kôno, 1944, syn. n. This species is known from East Siberia, Primorye, North Kuril Islands, and Northeast China. *Ilybius subaeneus* Erichson, 1837, is reported from Mongolia for the first time.

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Introduction

Ilybius crassus Thomson, 1856, was long regarded as a strictly central and northern European species, providing a scholar example of a boreoalpine distribution (Holdhaus & Lindroth 1939, Dettner 1977). Quite surprisingly, Zaitzev (1953) recorded the species from "Siberia to the Far East" (of Russia). Previous to Zaitzev's widening of the range of *I. crassus*, Kôno (1944) had described *I. chishimanus* from the North Kuril Islands, and Balfour-Browne (1947) had described *I. weymarni* from Manchuria as being very close to *I. crassus*.

For a long period the question seemed open whether the East Palearctic populations were conspecific with *I. crassus* or not. Guéorguiev (1968, 1972) erroneously recorded *I. crassus* from Mongolia (see below), and Satô & Nilsson (1988) synonymized *I. chishimanus* with *I. crassus*. The presence of *I. crassus* in the Far East was also verified by Lafer (1989).

The status of I. *weymarni* has remained unclear, and Larson (1987) suggested that it was a junior synonym of *I. crassus*. On the other hand, Nakane (1989) redescribed *I. weymarni* from Sakhalin and Hokkaido, including illustrations of male genitalia evidently different from those of European *I. crassus*.

The study of a large material from Siberia, Primorye, Sakhalin and Hokkaido has convinced me of the presence of three different species in the *crassus*-complex. The true *I. crassus* is seemingly European, and two species occur in the Far East, of which one has to be described as new. As I have not seen any material from West Siberia it is still an open question which species of the complex, if any, that occurs in this region.

Abbreviations

The following abbreviations are used for museums and other collections cited: (BML) The Natural History Museum, London, (CAL) coll. Angus, London, (CNU) coll. Nilsson, Umeå, (CTC) coll. T. Nakane, Chiba, (NSMT) National Science Museum, Tokyo, (SMNH) Swedish Museum of Natural History, Stockholm, (TMB) Természettudományi

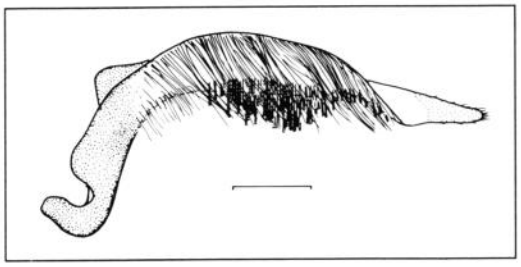


Fig. 1. ***Ilybius chishimanus*** *Kôno, paramere, internal view. Scale bar 0.5 mm.*

Hanens paramer sedd från insidan.

Múzeum, Budapest, (ZIS) Zoological Institute (Academy of Sciences), St. Petersburg, (ZIV) Zoological Institute (Academy of Sciences), Vladivostok, (ZML) Zoological Museum, Lund.

Characterization of the crassus-complex

The following combination of characters separates the *crassus*-complex from other species of *Ilybius*. Characters are given as plesio- (P) or apomorphic (A) within the genus using Larson's (1987) polarity decisions: (1 P) antenna without apical infuscation, (2 P) body black, (3 A) body with dorsal surface aeneous, (4 ?) body of medium size, total length 10-12.5 mm, (5 A) metasternal wing relatively narrow, (6 A) metacoxal plate with longitudinal strioles frequently intersecting, (7 P) metatibia with ventral face punctate, (8 A) male sternum 6 rugose with posteromedial keel reduced, (9 A) paramere with sucker setae on mesal face (Fig. 1), (10 ?) male metatarsomeres 1-3 provided with ventral setal fringe, (11 A) male metatarsomeres 1-4 ridged, (12 A) male anterior metatarsal claw blade-like with ventral margin more or less straight, (13 A) female sternum 6 with marginal bead obsolete on outer angle of medial emargination.

Key to species of crassus-complex for males

1. Penis in lateral view more strongly tapering subapically to blunt apex (Figs 3, 5); dorsal groove ending on right side of apex (Figs 2, 4). Male anterior metatarsal claw apically truncate (Figs 8-9). Rugosity of male abdominal sternum 6 more strongly reduced medially. Metasternal wing relatively narrower, WC/WS > 3.0 in most specimens 2

- Penis in lateral view less strongly tapering to blunt apex (Fig. 7); dorsal groove ending on left side of apex (Fig. 6). Male anterior metatarsal claw apically pointed (Fig. 10). Rugosity of male abdominal sternum 6 present also medially. Metasternal wing relatively broader, WC/WS 3.0 or less in most specimens ..... *nakanei*

2. Penis more evenly tapering to apex in lateral view (Fig. 3); dorsal groove not broadly visible subapically when viewed from right side (Fig. 2) ..... *crassus*

- Penis more abruptly tapering to apex in lateral view (Fig. 5); dorsal groove broadly visible when viewed from right side (Fig. 4)..... *chishimanus*

Descriptions of species

Ilybius crassus Thomson

Dytiscus fenestratus Fabricius, 1781: var. c Gyllenhal, 1808:498 (misident.); var. b Zetterstedt, 1828:215 (misident.); vars. b and c Zetterstedt, 1837:131 (misident.).
Ilybius crassus Thomson, 1856:224 (orig. descr.); Zimmermann & Gschwendtner 1935:83 (descr.); Holdhaus & Lindroth 1939:148 (distr.).

Type locality. "Lappland" (Sweden).

Type material. Lectotype ♂ here designated in coll. Thomson (ZML) labelled: black square, "♂", and my lectotype label. - Paralectotypes 8♂7♀ here designated in coll. Zetterstedt (ZML) under "Dytiscus fenestratus", all except 1♂ provided with black square and the following additional labels: 1♂ "Var. b. ♂.", 1♀ "Var. b. ♀.", 1♂ "Var. c. ♂.", 1♀ "Var. c. ♀.", 1♂ "Var. d. Var. b. Zett. Fn. Lapp.", 1♂ "Var. c. Zett. Fn. Lapp. Lycksele" (without black square), 1♂ "65.", "Colymb. fenestratus c. Gyll. a Schönh. Lapp.", 1♀ "65. Sch.", and my paralectotype labels.

Additional material. Forty specimens from northern Sweden in CNU were examined.

Notes. Thomson's description of *crassus* was based on specimens collected by Zetterstedt in Lapland, i.e. types may be found in both coll. Thomson and coll. Zetterstedt. Only one male in coll. Thomson can without doubt be connected with Zetterstedt. This male, selected as lectotype above, is provided with a minute black square, used by Zetterstedt for the material collected on his 1832 expedition to South Lapland (now Ly lpm) (Danielsson in litt.). The five specimens in coll. Thom-

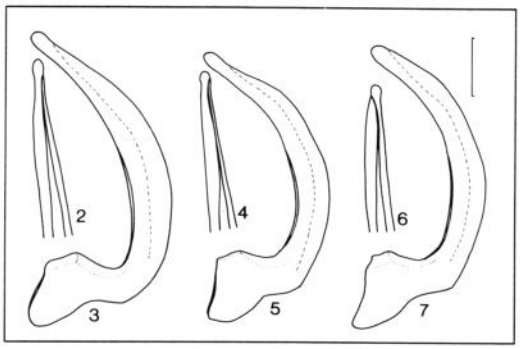
son seen by Brinck (1942) are not part of the type material, and one male belongs to *I. quadriguttatus* (Lacordaire, 1835).

Based on his "Insecta Lapponica" collection (ZML), the *Dytiscus fenestratus* of Zetterstedt (1837) is identical with *I. subaeneus* Erichson, 1837, whereas his varieties b and c refer to *I. crassus*.

Seidlitz (1887) and Scholz (1915) both listed *I. ovatus* Hochhuth, 1871, as a junior synonyn of *I. crassus*. However, as shown by Zaitzev (1908) Hochhuth's name is a junior synonym of *I. similis* Thomson, 1856.

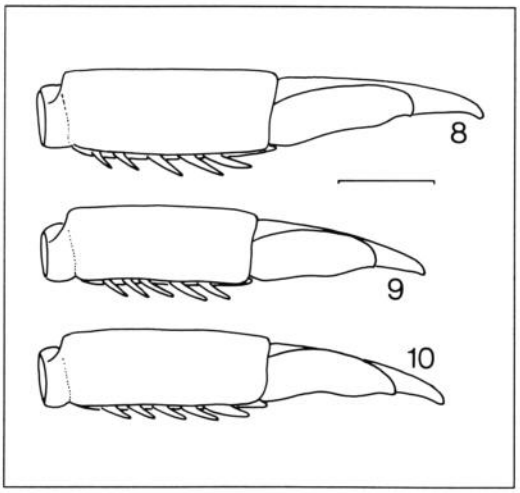
Description. Measurements and ratios as in Table 1. Metasternal wing relatively narrow. Male sternum 6 with rugosity reduced medially. Male anterior metatarsal claw apically truncate (Fig. 8). Penis (Figs 2-3) evenly tapering to rounded apex; dorsal groove ending on right side of apical knob, invisible in lateral view.

Distribution. Central and North Europe east to the Urals. Germany (Dettner 1977, Braasch 1989), Austria (Schaeflein 1989), Poland (Galewski 1966), Czechoslovakia (Ríha 1992), Denmark (Holmen 1979), Fennoscandia (Lindroth 1960), Russia. The easternmost literature records found are from Mezen in the Arkhangelsk Prov. (Poppius 1908), and from Kuznetsk in the Penzensk Prov. (Zaitzev 1928). Moreover, Zaitzev (1915) reported on one specimen in coll. Motschulsky labelled "Ural", considered by Zaitzev to originate from the central part.



Figs 2-7. ***Ilybius,*** *penis apex in dorsal view (2, 4, 6) and penis in lateral view (3, 5, 7). -2-3.* ***I. crassus*** *Thomson, Sweden. -4-5.* ***I. chishimanus*** *Kôno, Primorye. -6-7.* ***I. nakanei*** *sp. n., Sakhalin. Scale bar 0.5 mm.*

Hanens penis sedd från sidan (3, 5, 7), resp penisspetsen sedd uppifrån (2, 4, 6).



Figs 8-10. ***Ilybius,*** *male protarsomere 5 with claws, anterior view. -8.* ***I. crassus*** *Thomson, Sweden. -9.* ***I. chishimanus*** *Kôno, Primorye. -10.* ***I. nakanei*** *sp. n., Sakhalin. Scale bar 0.2 mm.*

Hanens sista baktarssegment med klor sett framifrån.

Ilybius chishimanus Kôno

Ilybius ater (De Geer, 1774): Kano 1933:97 (misident.); Kamiya 1935:506 (misident.); Kamiya 1938:40 (in part, misident.).
Ilybius crassus Thomson, 1856: Zaitzev 1953:278 (in part, misident.); Satô & Nilsson 1988:126 (misident.); Nakane 1989:28 (misident.); Lafer 1989:249 (in part, misident.).
Ilybius chishimanus Kôno, 1944:80 (orig. descr.).
Ilybius weymarni J.Balfour-Browne, 1947:446 (orig. descr.), syn. n.

Type locality: of *chishimanus* "Suribachi Bay, Paramusir Island" (here translated) (Russia, North Kuril Islands); of *weymarni* "Manchuria, Kaolintsu" (China, Heilungkiang Prov.).

Type material. Holotype ♀ of *chishimanus* seen in NSMT. - Holotype ♂ of *weymarni* in BML labelled: "Holotype", "Kaolintsu, Manchuria 20.VIII.-40 M. Weymarn", "Ilybius weymarni Holotype! J. Balfour-Browne det.", "Brit. Mus. 1948- 339." Paratype ♀ in BML labelled: "Allotype", "Chengchin, Lesser Khingan, Manchukuo", "20.VI.38 M. Weymarn", "Brit. Mus. 1948-339", "Ilybius weymarni sp.n. J. Balfour-Browne det."

Additional material. Russia: Transbaikalien 1♂

leg. Leder & Reitter (TMB); 45 km S of Irkutsk 13.viii.1968 1♂2♀ leg. Lindroth (ZML); Tibelti, Irkut valley, 28 km W of L. Baikal 8-15.vi.1970 1♀ Leg. R.B.Angus (CAL); Primorye: 5 km W Zanadvorovka 11.vii.1992 3 inds.; 10 km N Slavyanka 11.vii.1992 1 ind.; 6 km W Ryazanovka 15.vii.1992 2 inds.; Ussuriski Reserve, Kaminushka 18-19.vii.1992 49 inds.; 22 km N Vladivostok, Sputnik Station 25.vii.1992 9 inds.; 35 km NW Vladivostok 25.vii.1992 8 inds. leg. A.N. Nilsson (CNU, SMNH); 22 km N Vladivostok, Sputnik Station 13.vi.1993 7 inds. leg. S. Kholin & A.N. Nilsson (CNU); Paramusir Island, Noda Bay, Chishima, 27.vii.1926, 1♂ leg. H. Doi (CTC).

Description. Measurements and ratios as in Table 1. Metasternal wing relatively narrow. Male sternum 6 with rugosity more or less reduced medially. Male anterior metatarsal claw apically truncate (Fig. 9). Penis (Figs 4-5) more abruptly tapering to rounded apex; dorsal groove ending on right side of apical knob, broadly visible in lateral view.

Distribution (Fig. 12). East Russia and North China. In Russia known from Irkutsk to South Primorye and from Paramusir of the North Kuril Islands.

Natural history. In Primorye, *I. chishimanus* was collected in various ponds, ditches and stagnant parts of streams. Most specimens were hiding among dense vegetation or debris. Seemingly most abundant in forest.

Note. The identity of *I. chishimanus* was fixed by examination of a topotypic male in CTC.

Ilybius nakanei sp. n.

Ilybius ater (De Geer, 1774): Kamiya 1938:40 (in part, misident.).
Ilybius crassus Thomson, 1856: Lafer 1989:249 (in part, misident.).
Ilybius chishimanus Kôno, 1944: Nakane 1964:6 (misident.); Satô 1985:194 (misident.).
Ilybius weymarni J.Balfour-Browne, 1947: Nakane 1989:29 (misident.); Mori & Kitayama 1993:120 (misident.).

Type locality. Shevtjenko Valley, Kholmsk, Sakhalin, Russia.

Type material. Holotype ♂ labelled "Russia, Sakhalin, Kholmsk, Shevtjenko, 21.vi.1993 Leg. S. Kholin/ A.Nilsson" and my holotype label. Paratypes 20♂10♀: 3♂ with same locality label as holotype; 2♂ "Russia: Sakhalin, Pionery 9.ix.92 S. Kholin"; 1♂ "Russia, Sakhalin, Kholmsk, Pionery P7, 9/9-93 S. Kholin"; 1♂ "Russia, Sakhalin, Kholmsk P12, 14/9-93 S.Kholin"; 1♂1♀ "Russia, Sakhalin, Kholmsk nr P11, 10/9-93 S.Kholin"; 1♂ Russia, Sakhalin, Kholmsk: Pionery 22-26.vi.1993 Leg. S. Kholin/A. Nilsson"; 1♂ "Saghalin Oguma"; 1♂1♀ "Iwaobetsu, Shari T., Abashiri, Hokkaido, Japan, 29th, August, 1988, leg. Y. & T. Abe"; 8♂8♀ "Aizankei 17 AUG '54 M.Inoue"; 1♂ "Chiruwatsunai, Hokkaido, 25.VIII.1989 K. Ijima", and my paratype labels. Holotype deposited in ZIS; paratypes three in ZIV, one in SMNH, 11 in CNU, and 16 in CTC.

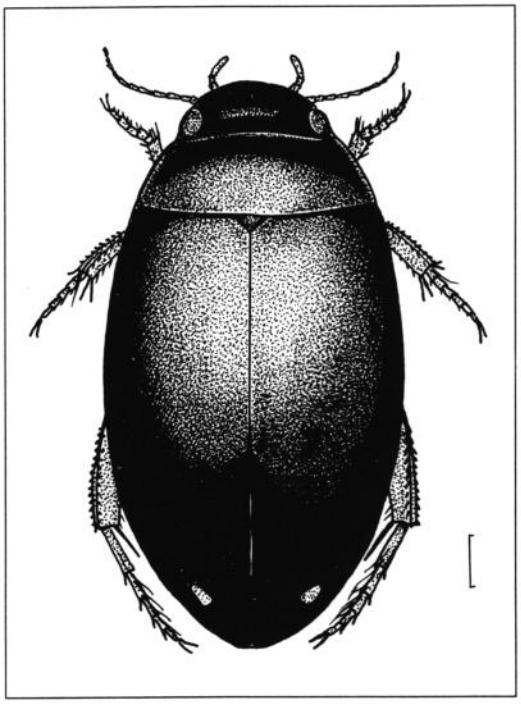


Fig. 11. ***Ilybius nakanei*** *sp. n., habitus of male paratype from Hokkaido. Scale bar 1.0 mm. Del. G. Marklund.*

Habitusteckning av dykaren ***Ilybius nakanei*** *vilken här beskrivs från södra Sakhalin och Hokkaido. Arten har sedan 1938 felaktigt förts in under fyra andra arter. Dess endemiska status kunde fastslås först efter egna insamlingar på Sakhalin och lån av material från japanska kollegor.*

Etymology. The specific epithet is a noun in the genitive case derived from the name of Dr T. Nakane, Chiba, who first recognized *I. nakanei* as a separate species and illustrated the genitalia (as *I. weymarni*).

Description. Habitus as in Fig. 11. Measurements

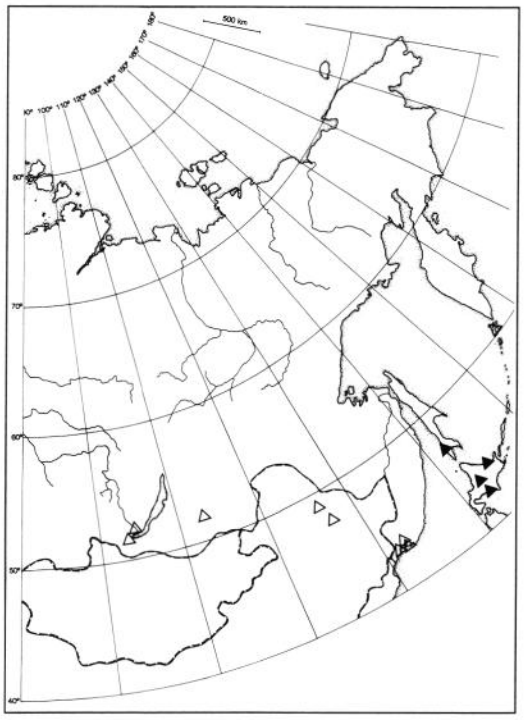


*Fig. 12. Known records of **Ilybius chishimanus** Kôno (open triangles) and **I. nakanei** sp. n. (filled triangles).*

*Kända fynd av **I. chishimanus** (ofyllda trianglar) och **I. nakanei** (fyllda trianglar).*

and ratios as in Table 1. Metasternal wing relatively broad. Male sternum 6 with rugosity present also medially. Male anterior metatarsal claw apically pointed (Fig. 10). Penis (Figs 6-7) subapically broad and very slightly tapering to rounded apex; dorsal groove ending on left side of apical knob, invisible in lateral view.

Distribution (Fig. 12). Known only from South Sakhalin in Russia and Hokkaido in Japan.

Natural history. On Sakhalin specimens were found among moss or emergent vegetation at the margin of ponds and in seeping water in a fen.

Discussion

Larson (1987) suggested that *I. crassus* belonged to the same clade as the Holarctic *I. subaeneus* Erichson, 1837, and the Nearctic *I. pleuriticus* LeConte, 1850. All three species of the *crassus*-complex share Larson's synapomorphies attributed to this clade,

*Tab. 1. Selected measurements (mm) and ratios (mean ± SD) for the three species in the **Ilybius crassus** complex: (TL-h) total body length without head, (MW) maximum body width, and (WC/WS) ratio between width of metacoxa and width of metasternum. Values represent five specimens of each sex.*

*Några mått (mm) och kvoter (medelvärde ± SD) för **Ilybius crassus**-komplexets tre arter: (TL-h) total kroppslängd utan huvud, (MW) maximal kroppsbredd, och (WC/WS) kvot mellan bredd av bakhöftplatta och bakbröstets sidoflygel.*

Species	TL-h	MW	TL-h/MW	WC/WS
chishimanus	10.3 ± 0.7	6.0 ±0.5	1.71 ± 0.03	3.35 ± 0.22
crassus	10.5 ± 0.2	6.1 ± 0.1	1.72 ± 0.02	3.28 ± 0.19
nakanei	10.3 ± 0.2	5.9 ± 0.1	1.75 ± 0.03	3.02 ± 0.07

except that the presence of striolate punctures on ventral face of metafemur is more poorly developed. The reduced medial carina on male sternum 6 of the crassus-complex species suggests that *I. subaeneus* is the sister-species, whereas the reduced bead on lateral angles of female sternum 6 suggests a closer relationship with *I. pleuriticus*.

Balfour-Browne (1947) gave the following three characters to separate his *weymarni* from European crassus: (1) prosternal process more produced behind, (2) male anterior protarsal claw more slender, and (3) rugosity of male abdominal sternum 6 more distinct. When comparing series of *I. crassus* and *I. chishimanus* I have found that intra- and interspecific differences among these characters cannot be separated from each other. However, *I. nakane* differs from the two other species in the third character as short rugae are present also medially on sternum 6.

Guéorguiev (1968, 1972) recorded a single male of I. crassus from Mongolia. I have examined this male (in TMB) and identified it as *I. subaeneus* Erichson. This is the first record of this species from Mongolia.

No significant interspecific differences were found in body length among the species of the *crassus-complex* (Tab. 1). *I. nakanei* had a significantly lower length to width ratio than the two other species (t-test, p= 0.04 for *crassus* and 0.01 for *chishimanus*). The relative width of the metasternal wing (WC/WS, Tab. 1) was significantly lower in *I. nakanei* than in the two other species (t-test, p= 0.001).

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Sammanfattning

Ilybius crassus Thomson är en medelstor svart dykare som ursprungligen beskrevs från Sverige. Med tiden utvidgades artens kända utbredningsområde till att gälla hela norra Eurasien. Jag har tittat på det tillgängliga materialet av arten från Asien inklusive typmaterial av *I. chishimanus* Kôno från norra Kurilerna och av *I. weymarni* J.Balfour-Browne från nordöstra Kina. Min slutsats är att "*crassus*" är ett artkomplex bestående av tre arter: (1) *crassus* i Europa, (2) *chishimanus* (= *weymarni*) på det asiatiska fastlandet, och (3) *nakanei* vilken här beskrivs från den ryska stillahavsön Sakhalin och från Hokkaido, Japans nordligaste ö. De tre arterna skiljer sig huvudsakligen åt i formen på hanens könsorgan. De djur som tidigare uppgivits som *crassus* från Mongoliet tillhör istället *I. subaeneus* Erichson, tidigare ej känd från Mongoliet. Kunskapen om flertalet insekters utbredning och taxonomi i Asien är fortfarande dålig. Då många arter anses vara gemensamma med Europa och Sverige innebär detta även att vi fortfarande vet rätt lite om många av våra arters världsutbredning.

Ny bok om jordlöparlarver

Luff, M.L. 1993. *The Carabidae (Coleoptera) larvae of Fennoscandia and Denmark.* Fauna Entomologica Scandinavica 27. 186 sidor, 586 svartvita teckningar. Baserad på ett manuskript av S.G. Larsson. ISBN 90 04 09836 4. Pris ca 400 SEK.

Jag noterade tidigt att olika skalbaggslarver behandlades mycket professionellt i serien Danmarks Fauna, och samtidigt relativt anonymt, som i en bisats. För vissa grupper som jordlöpare fanns här länge den i särklass bästa presentationen av europeiska larver - skriven på danska!

Bakgrunden till detta förhållande ges i Niels P. Kristensens förord till föreliggande volym. Han presenterar här den långa danska traditionen av högkvalitativa larvstudier och lyfter speciellt fram Sven Gisle Larssons stora betydelse. Vi får bl a veta att arbetet med föreliggande bok påbörjades redan 1940 och att den nu tack vare Martin Luffs genomgripande omarbetning av Larssons manuskript kan ges en internationell publik.

Vikten av att kunna identifiera larver har ökat i och med jordlöparnas framträdande plats inom den ekologiska forskningen. Jag tänker då speciellt på Den Boer-skolans populationsekologiska arbeten, liksom på studiet av livshistoriestrategier (sammanfattade av Thiele 1977). Jag vill minnas att det var John Spence som tidigt påpekade vikten av att titta på larverna i studier av olika arters samexistens och eventuella konkurrens. Detta främst pga larvernas