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HELOPHORIDAE: The *Helophorus* species of China, with notes on the species from neighbouring areas (Coleoptera)

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Abstract

An account is given of the 20 *Helophorus* species known or suspected to occur in China, with additional notes on the 43 non-Chinese species known from the surrounding area. One new subgenus, *Thaumhelophorus* subgen.n., is erected, and four new species are described: *H.* (*Thaumhelophorus*) *inexpectatus* sp.n. [Assam], *H.* (s.str.) *jaechi* sp.n. [China], *H.* (*Rhopalhelophorus*) *kazakhstanicus* sp.n. [Kazakhstan], and *H.* (*R.*) *laferi* sp.n. [Primorye]. *Helophorus* (*R.*) *matsumurai* NAKANE is redescribed and its aedeagophore figured. *Helophorus lamicola* ZAITZEV is designated as the type species of the subgenus *Lihelophorus* ZAITZEV, and lectotypes are designated for *H. lamicola* and *H. ser* ZAITZEV. *Helophorus mukawaensis* WATANABE, 1983 is synonymized with *Helophorus sibiricus* MOTSCHULSKY, 1860. It is noted that the *Helophorus* fauna becomes attenuated in the Far East, especially in the Primorye and Japan, and it is suggested that the 20 species so far listed from China may represent about two thirds of the actual fauna.

Key words: Coleoptera, Helophoridae, *Helophorus*, China, east Palearctic, Oriental, new species, new subgenus

Introduction

Within the Palearctic region, China occupies an important and unique position. Important because it fills the southeastern portion of the region, and unique because here alone the border between the Palearctic and Oriental regions becomes vague in the absence of geographical barriers comparable with the mountains and deserts further west.

Despite the obvious interest of the Chinese fauna, there has been no work devoted to its study as a unit, but rather a series of taxonomic publications which have included Chinese species. Such papers as do exist on the fauna of this region deal with areas to some extent peripheral to China, mainly the "Tibetan Plateau" [= Qing Zang Gaoyuan] (Tibet and Qinghai). These include the works by ZAITZEV (1908), based on material collected by Sven Hedin and the Russian expedition of Kozlov and Roborovsky; KNISCH (1910), based on Zugmayer's material, and d'ORCHYMONT (1943), the most comprehensive paper which, though based on material collected in Ladakh by a Yale University expedition, goes on to review the Hydrophiloidea of the Tibetan Plateau [= Qing Zang Gaoyuan].

This work seeks to bring together all that is known about the species of *Helophorus* F. at present known from China. To this end, and because the Chinese fauna appears grossly underinvestigated, the work is presented in two sections. Firstly the Chinese species are discussed, with such distributional and taxonomic detail as I have been able to discover. One species is described as new. Secondly, the fauna of the surrounding regions is enumerated.

The order in which the subgenera and species are placed is based on ANGUS (1992), where a key to the subgenera is given.

Material & Acronyms

All records included here, unless otherwise stated, are based on specimens I have seen. The main collections I have studied are listed below.

CKB	Coll. Kodada, Bratislava
CMM	Coll. Matys, Magadan
CNK	Coll. Nakane, Kagoshima
CNU	Coll. Nilsson, Umeå
CWBS	China Water Beetle Survey
IBV	Institute of Biology and Pedology, Russian Academy of Sciences, Vladivostok (G. Lafer)
MHNL	The Natural History Museum, London (S. Hine) [formerly: British Museum (Natural History)]
MHNG	Muséum d'Histoire naturelle, Genève (I. Löbl)
MNHNP	Muséum national d'Histoire naturelle, Paris (Y. Cambefort)
MRHNB	Institut royal des Sciences naturelles de Belgique, Bruxelles (A. Capart)
NMW	Naturhistorisches Museum, Wien (M.A. Jäch)
RBA	Coll. Angus, London
TMAB	Természettudományi Múzeum, Budapest (O. Merkl)
ZIL	Zoological Institute (Academy of Sciences), St. Petersburg (Leningrad) (B.A. Korotyaev)

CWBS loc. 79: **Jilin Province**; Yanbian Korean Autonomous Prefecture; Antu County; Changbai Shan Biosphere Reserve; near Hongsi Forest Station, ca. 30 km NE Baihe City; shallow pool with muddy edges; 17.VIII.1994; leg. Jäch, Ji & Wang

CWBS loc. 89: **Jilin Province**; Yanbian Korean Autonomous Prefecture; Antu County; Baihe City, Baohujü District; surroundings of Changbai Mountain Research Station, along the road to Changbai Mountain; unshaded roadside pools, ca. 750 m a.s.l.; 19.VIII.1994; leg. Jäch

CWBS loc. 93: **Jilin Province**; Yanbian Korean Autonomous Prefecture; Antu County; Baihe City, Baohujü District; near Power Plant of Baihe City; unshaded, springfed pools, cold water, ca. 750 m a.s.l.; 19.VIII.1994; leg. Jäch

CWBS loc. 99: **Liaoning Province**; Jinzhou City Region; Beizhen County; Yiwulü Shan, ca. 17 km NW Beizhen City; Sandao Gou He; several shallow pools, rain water or ground water, unshaded, mud, sand; 23.VIII.1994; leg. Jäch, Ji & Wang

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I. Annotated check list of the Chinese *Helophorus* species

In the following account references to key works are given for each subgenus or, in the absence of keys to species of a subgenus, to descriptions or partial accounts which will enable the species to be identified.

Subgenus *Orphelophorus* d'ORCHYMONT, 1927

Type species: *H. wandereri* d'ORCHYMONT, 1927 (= *H. obscurellus* POPPIUS, 1907), by monotypy.

Key to species: ANGUS (1970a).

***Helophorus* (*O.*) *obscurellus* POPPIUS, 1907**

Known in China from one specimen from the upper Huang He, from the Kozlov-Roborovsky expedition (ZIL). Outside China it occurs in the mountains of Central Asia (Russian Altai, central Tian Shan, Mongolia) and in northern and eastern Siberia, west to the Kanin Peninsula on the Arctic coast of European Russia. It is a frequent component of cold faunas from the British Pleistocene (ANGUS 1970a). It is a terrestrial species.

Subgenus *Transithelophorus* ANGUS, 1970b

Type species: *H. crinitus* GANGLBAUER, 1901, by monotypy.

Key to species: ANGUS (1984).

***Helophorus* (*T.*) *crinitus* GANGLBAUER, 1901**

China: Tibetan Plateau [= Qing Zang Gaoyuan] - Amdo [Anduo Xian, ca. 300 km N Lhasa], Ordos, "Kuku Nor" [= Qinghai Hu] (types); Gansu (ZIL). Manchuria - Harbin (types of *H. karadakoffi* STÖCKLEIN, 1954).

Outside China this species is known from Siberia and the Primorye in Russia - W. Siberia: northern Kulunda steppe; E. Siberia: Irkutsk, Malta Station; Primorye: Ussuri; Lake Khanka. (ZIL).

This species appears to be at least semiterrestrial and according to N.B. Nikitsky, Moscow (pers. comm. 1982) it is common in the Primorye and flies to light.

Subgenus *Gephelophorus* SHARP, 1915

Type species: *Helophorus auriculatus* SHARP, by original designation.

Key to species: ANGUS (1970a).

***Helophorus* (*G.*) *auriculatus* SHARP, 1884.**

This appears to be by far the most widely distributed species of *Helophorus* in China. Sharp's Chinese material is from "Da-laen-sen near Nong-po", and "Kiu-kiang" [= Jiujiang, ca. 120 km N Nanchang City, Jiangxi], and from the islands of Luhwang and Tygosan in the "Chusan Archipelago" [= Zhoushan Qundao], near Shanghai. Bedel's collection (MNHNP) has material from Yünnan, and d'Orchymont's collection (MRHNB) has it from Xinjiang and Jiangsu ("Soochow"
[= Suzhou]). Dr. Juanjie Tan (Academia Sinica, Beijing) (in. litt. 1985) tells me that they have material, determined by d'Orchymont, from the following provinces: Heilongjiang, Xinjiang, Qinghai, Beijing, Anhui, Jiangsu, Zhejiang and Guangxi.

This is a very distinctive species, with raised tubercles on the elytra (sometimes rather weak or even absent in some Yünnan specimens), the lateral margins of the pronotum excised behind the anterior angles, and the subgeneric character of the suprapleural area of the pronotum narrowed posteriorly. It could perhaps be confused with *H.* (s.str.) *jaechi* sp.n., but the pronotal characters give a clear distinction. *Helophorus jaechi* lacks any trace of elytral tubercles. *Helophorus auriculatus* var. *chinensis* SHARP cannot be distinguished clearly from typical *H. auriculatus*. Outside China, *H. auriculatus* is known only from Japan.

***Helophorus* (*G.*) *sibiricus* MOTSCHULSKY, 1860** (= *H. mukawaensis* WATANABE, 1983 syn.n.)

The synonymy of *H. sibiricus* is discussed by ANGUS (1970a). I have not seen type material of *H. mukawaensis* from Hokkaido (Japan), but the original description and figures all agree clearly with *H. sibiricus*.

In China this species appears to be common in Heilongjiang (Harbin area, leg. P.M. Hammond 1965). Apart from these northeastern specimens, the only Chinese material I have seen is a

specimen labelled "Yunnan-sen" [= Yünnan province] in the MNHNP (Bedel collection).

Outside of China, this species ranges from Scandinavia eastwards over Siberia and Mongolia to Japan and in North America from Alaska to the Yukon and the Mackenzie delta in Canada. It is a frequent component of British Pleistocene faunas.

Subgenus *Helophorus* FABRICIUS, 1775

Type species: *Silpha aquatica* L., 1758, designated by LATREILLE (1810).

Key to species: ANGUS (1970a)

Helophorus (s.str.) *manchuricus* SHARP, 1915

Helophorus manchuricus is known only from the holotype, an immature female labelled "China bor. Mancha Adams". It is immediately distinguished from all other eastern Palearctic species by the fine but distinct teeth on the seventh abdominal sternite (ANGUS 1970a). In that paper I noted that the type appeared to differ from "*H. aquaticus*" (= *H. aquaticus* (L.) and *H. aequalis* THOMSON) in its noticeably small pronotum. However, both these species vary in this character, and as the *H. manchuricus* type does look very like *H. aequalis* I am left wondering, in the absence of any other material, whether *H. manchuricus* might in fact be a wrongly labelled *H. aequalis*.

Helophorus (s.str.) *hammondi* ANGUS, 1970a

This species was described from Heilongjiang (Harbin). It occurs also on the Tibetan Plateau [= Qing Zang Gaoyuan] ("Nan Shan" [= Qinghai Nanshan] and "Ala Shan" [= Ela Shan, SW of Qinghai Hu] in the east (ZIL) and in Ladakh in the southwest), where d'ORCHYMONT (1943), on the basis of one female, recorded it as *H. aquaticus* most resembling subspecies *maritimus* REY. A male from Ladakh (Tso Bar), also ex. Hutchinson, in coll. d'Orchymont (MRHNB), but not mentioned by d'ORCHYMONT (1943), confirms this identification. Outside China (and Ladakh), *H. hammondi* is known from eastern Siberia and Mongolia, with a very isolated population in the Kalmyk Republic in European Russia (ANGUS 1992).

This may be the species recorded by KNISCH (1910) as *H. aquaticus* from west Tibet.

Helophorus (s.str.) *kozlovi* ZAITZEV, 1908

This species was described from the "Amnen Kor" [= A'nyêmaqên Shan (or Animaqing Shan), SE Qinghai], and to date all known material has been from the type collection, and all female. I now have one male from Uzbekistan, western Tian Shan, River Jurasai, leg. T.N. Vereshchagina, sent to me in 1989. The puncturation on the pronotal disc is a little coarser than in Amnen Kor material, but otherwise the specimen is very similar. The aedeagophore (Fig. 14) is remarkably like that of *H. aequalis*, but the absence of any teeth on the seventh abdominal sternite precludes any confusion.

Helophorus (s.str.) *jaechi* sp.n.

Holotype ♂ (MRHNB): "Szechuan [= Sichuan], China. Em. Reitter" / "Tatsienlu [= Kangding Xian] Tjiji. Urwald Rodungen [Forest clearings]". **Paratypes**: 3 ♂♂, 9 ♀♀ (MRHNB) data and location as holotype; 2 ♂♂, 1 ♀ (MRHNB), "Mukue Tatsienlu Szechuan China. Em. Reitter"; 1 ex. (CNK), undissected, data as holotype; 1 ♂ (NMW), "China, Sichuan pr. Kangding distr. Tagu 3500 m. 27-30.vii1992. leg. R. Dunda."; 1 ♀, pale (MRHNB), "Foochow [= Fuzhou], Fukien [= Fujian], China".

General appearance (Fig. 1): The general, rather gangling, appearance of this species resembles *H. auriculatus* (A. d'Orchymont had identified the Fujian specimen as *H. auriculatus* and the Sichuan ones as ? *H. manchuricus*), but the pronotal sides are not at all excised behind the anterior angles, and the even tapering of the rather narrow suprapleural area distinguishes it from any *Gephelophorus*. Further, although the alternate elytral interstices are raised in weak ridges, there is no trace of restriction of these ridges to form tubercles, as in *H. auriculatus*. The general form

of the aedeagophore (Fig. 13) is like those of *H. auriculatus* and *H. hammondi*, though slightly longer, length about 0.95 mm as against 0.83 - 0.88 mm in *H. auriculatus* and about 0.85 mm in *H. hammondi*. *Helophorus hammondi* is a more compact beetle and lacks the elytral ridging.

Length: 5.1 - 5.9 mm, width: 2.1 - 2.5 mm. A rather elongate *Helophorus* with a noticeably small pronotum, elytra distinctly rounded laterally and widest medially, and long legs.

Head (Fig. 5) black with greenish bronze reflections, the surface shining, granulate to punctate, the Y-groove with its stem fairly narrow, weakly expanded anteriorly. Maxillary palpi yellowish brown, the apical segment asymmetrical; antennae 9-segmented, yellowish brown with darker clubs.

Pronotum (Fig. 5) brown-bronze, moderately arched, the internal intervals sometimes depressed medially, distinctly narrowed basally, the sides rounded over the anterior two thirds, straightened posteriorly, more or less parallel in basal quarter. Intervals distinctly granulate, the granules with median pits bearing short setae. The granulation may be obsolete over the middle of the internal intervals. Grooves distinct, midgroove straight, sometimes slightly widened medially; submedians angled or curved outwards medially, sinuate a quarter of the way from each end; submarginals a little wider, more or less straight and weakly divergent anteriorly; marginals wider medially, more or less effaced posteriorly and narrowed anteriorly, their inner margins irregular due to the strong granules of the external intervals. Lateral margins narrowly raised, weakly crenulate. Supra-pleural area (pronotal epipleura) rather narrow, tapering basally over the posterior half.

Elytra dark brown (in one specimen brownish with darker mottling), strongly striate with the intercalary striae well developed. Sides rounded, widest point at middle of elytra, apex narrowly rounded. Interstices about 1.5 times as wide as striae, the suture and alternate interstices weakly raised. Flanks rather wide, opposite the metasternum as wide as the epipleura.

Legs long, brown, tarsomere five darkened apically.

Seventh abdominal segment without teeth.

Distribution: Although most of the material is from Sichuan, the Fuzhou specimen suggests that this species may be widely distributed.

Etymology: This species is named after Dr. Manfred A. Jäch, whose drive and initiative are responsible for the current project to study the water beetles of China.

Subgenus *Lihelophorus* ZAITZEV, 1908

Type species: *Helophorus lamicola* ZAITZEV, 1908, here designated.

ZAITZEV (1908) erected the subgenus *Lihelophorus* for two species, *H. lamicola* and *H. ser* ZAITZEV, both endemic to the Tibetan Plateau [= Qing Zang Gaoyuan]. This subgenus, which agrees with *Helophorus* s.str. in having intercalary striae on the elytra and asymmetrical apical segments to the maxillary palpi, is unique within the genus in that the outermost (tenth) elytral interstice has no trace of a longitudinal keel. Thus there are no elytral flanks (pseudepipleura) outside the epipleura. Both species have rather small pronota, and wider elytra which are rounded laterally, and long legs with large claws. The elytra are somewhat transparent.

The type material has not been studied since the original description, so here I give an account of it, based on the material in the ZIL (coll. Zaitzev, coll. Semenov-Tian-Shansky). I have not seen the material collected by Sven Hedin.

Helophorus (*L.*) *lamicola* ZAITZEV, 1908

Type material: ZAITZEV (1908) lists his material as being from northeast Tibet (leg. Hedin) and "Jarin Nor" [= Gyaring Hu (or Tsaring Nor, Dzharin Nor, Zhaling Hu)] in the "Kuku Nor" [= Qinghai Hu] area (leg. Kozlov, about a dozen specimens taken at the end of June, 1900). The ZIL material is as follows: 4 exs., coll Zaitzev and 6 exs., coll. Semenov, labelled (in Russian) "Dol. oz. verkha Khuang Khe. Oz. Dzharin-nor. Kon. vi.1900. Eksp. Kozlova." [= Valley of lake. Upper Huang He. Gyaring Hu. End vi.1900, Expedition Kozlov], labelled as *H. lamicola* by

Zaitzev. I dissected four specimens, 3 ♂♂ and 1 ♀. One of the undissected specimens is badly damaged. There are three further specimens with the same locality data, in the Semenov collection, but in another box. These lack Zaitzev's name-label and were apparently not seen by him. Thus they cannot be considered as types. I here designate one of the labelled males lectotype, and have so labelled it. The other 9 specimens are paralectotypes.

Description of lectotype: Length 5.1 mm, width: 2.2 mm. Aedeagophore: Fig. 15.

Head dull brownish bronze with green reflections, closely and irregularly punctate, the punctures not round, giving a generally rough effect. Y-groove shallow, its stem rather indistinct, wider than the lateral arms, widened anteriorly. Maxillary palpi pale yellow, elongate, apical segment asymmetrical. Antennae yellow, 9-segmented.

Pronotum yellow, a little wider than head, moderately and evenly arched. Widest before middle, sides curved to base. Anterior angles sharper and more pronounced than is usual in *Helophorus*. Grooves scarcely traceable, midgroove straight, narrow; submedians angled outwards medially, petering out anteriorly but sinuate a quarter of the way from each end; submarginals with their basal pits distinct, traceable forward from these, petering out at middle of pronotum. Narrow raised lateral margin distinct. Interstices without granules, but with large punctures and smaller ones between them.

Elytra yellow, as pronotum, without darker marks, slightly dull. Striae weak and shallow, intercalaries present. Interstitial punctures almost as strong as the striae, with fine erect hairs. All interstices flat, including the tenth.

Legs long with long swimming hairs on the tibiae and tarsi, and long claws.

The paralectotypes and unlabelled specimens are similar to the lectotype, though some are a little more shining. The pronotal grooves are always discernible, but never distinct. The lengths of the specimens are from 5.1 - 6.0 mm.

D'ORCHYMONT (1943) gives the following localities: W Tibet, Lake "Arport tso" [= Orba Co, Wuerbachuo]; freshwater marsh 50 km N of the eastern edge of the lake district of Panggong [= Banggong Co]. S Tibet: Mang-tsa. D'ORCHYMONT (1943) further suggests that Sven Hedin's material (one specimen), despite its label, may not be from NE Tibet - from Hedin's diary, on the data given (25.vi.1901), he was further south, S of "Arka-tagh" [= Aerge Shan], at about 36°16'N, 88°21'E.

D'Orchymont's additional material numbers only three specimens.

Helophorus (*L.*) *ser* ZAITZEV, 1908

ZAITZEV (1908) lists his material as being from central Tibet (1 ex., leg. Hedin) and the "Kuku Nor" [= Qinghai Hu] district, northern and southern edges of Burchan-buddha (3 exs., vi. and vii. 1901, leg. Kozlov).

The ZIL material is as follows: coll. Zaitzev - 1 card with the specimen lost, labelled (in Russian) "sev. khr. Burkhan Budda. Kon vi - nach. vii.01. Kozlov" [northern Burhan Budai mountains. End vi - beginning vii.01. Kozlov], and labelled as *H. ser* by Zaitzev. Coll. Semenov - 1 ♂, labelled (in Russian) "Yu skz. khr. Burkhan-Budda. Dol. oz. Alyk Nor. 30.v.1900. Eksp. Kozlov." [southern edge of Burhan Budai mountains. Valley of "Alyk Nor" [= Alag Hu]. 30.v.1900. Expedition Kozlov]. 1 ♀ and 1 more or less destroyed specimen, labelled (in Russian) "Sev. orl. Khr. Burkhan Budda. Umya khaty. Kon. vi - nach. vii.01 Kozl." [northern edge of the Burhan Budai mountains. End vi - beginning vii.1901. Kozlov.]. There is also (from another box) one unlabelled female with the same data as Kozlov's *H. lamicola*.

The beetles range in length from 4.9 - 5.3 mm, and in both shape and colour closely resemble *H. lamicola*, with which they agree in the head colour, form of the Y-groove, antennae, palpi and legs. However, they differ from *H. lamicola* in the pronotal grooves which are narrow and shallow, but quite distinct, darkened in the male but pale in the females. The pronotum is also slightly wider than in *H. lamicola*, with the anterior angles more depressed and less prominent.

These specimens pose a problem. ZAITZEV (1908) lists three specimens taken in June and July, apparently the surviving female and the two cards with the specimens either lost or almost totally destroyed. However, the male, though taken in May and bringing the labelled material to four specimens, was labelled as *H. ser* sp.n. by Zaitzev in February 1908, well before the publication of his description, and is the only specimen from the southern edge of the Burhan Budai mountains. I therefore think that Zaitzev knew of this specimen when he wrote the description, but failed to list it properly. Thus it may be considered as part of the type series as defined in

Article 72a(i) of the ICZN (third edition), and I here designate it lectotype. The surviving female is a paralectotype but the unlabelled female is not a type.

The lectotype is 5.3 mm long, 2.5 mm wide, and its aedeagophore is shown in Fig. 16.

D'ORCHYMONT (1943) gives the following additional localities: W. Tibet, freshwater marshes about 50 km N of the eastern edge of the lake district of Panggong (with *H. lamicola*). S. Tibet - Mang-tsa (with *H. lamicola*). Ladakh: Mugleb.

Helophorus lamicola and *H. ser* are clearly distinguished by their pronotal grooves, largely effaced in *H. lamicola*, clear and distinct in *H. ser*. D'ORCHYMONT (1943) figures what appears to be very different aedeagophores for the two species - his Fig. 3 shows *H. lamicola* with sharply pointed parameres, while his Fig. 4 shows *H. ser* with a smaller aedeagophore with the ends of the parameres rounded and appearing somewhat crumpled. These are completely at variance with my photographs, taken from specimens mounted on slides in D.M.H.F. by the photographic laboratory of the Academy of Sciences of the USSR in 1970. D'ORCHYMONT (1943: Fig. 3) shows the parameres of *H. lamicola* more narrowly pointed than my photograph (Fig. 15), and apparently more pointed than my photograph of *H. ser* (Fig. 16). This could be the result of his drawing a dry preparation. His figure of the aedeagophore of *H. ser* (Fig. 4) is incomprehensible, but suggests a teratological specimen. D'ORCHYMONT (1943) remarks that he has seen but two males of *H. lamicola* (coll. Knisch and Indian Museum). In his list of material these are shown to be 1 ♂ from Mang-tsa (Indian Museum) and one from "Arport" [= Orba Co, Wuerbachuo] (coll. Knisch). He refers to Knisch's material from Panggong as a somewhat abnormal specimen.

For *H. ser* d'ORCHYMONT (1943) writes that all his dissected males have the type of aedeagophore shown in his Fig. 4. However, in his list of material he mentions only one male, from Ladakh. For Panggong, the only other locality from which he could have seen a male, d'ORCHYMONT (1943) gives only Knisch's reference, suggesting that he did not see the material. KNISCH (1910) mentions one specimen from this locality. It thus seems that d'Orchymont in fact studied only one male of *H. ser*, from Ladakh, and this was apparently deformed.

My own notes, written in 1969, mention that the aedeagophores of the two species are very similar, and I have rechecked the two lectotypes: both the beetle and the aedeagophore of the *H. ser* are somewhat darker than the *H. lamicola*, indicating that the aedeagophores have not been inadvertantly exchanged.

Subgenus *Rhopalhelophorus* KUWERT, 1886

Type species: *Helophorus griseus* HERBST, 1793, designated by SHARP (1915).

There is no comprehensive key to the species of this subgenus. All the species so far known from China are described, and their aedeagophores figured by ANGUS (1970b).

Helophorus (*R.*) *frater* d'ORCHYMONT, 1926

This species was originally described from the southern edge of the Tibetan Plateau [= Qing Zang Gaoyuan] - Laptel and Sanch in Kumaon (India), and (as *H. hingstoni*) from Pangle in Tibet itself. The ZIL collections contain material from the northern edge of the plateau - "Kuku Nor" [= Qinghai Hu] area (upper Huang He, "Orin Nor" [= Ngoring Hu (or Eling Hu)]) and Amdo [Anduo Xian, ca. 300 km N Lhasa]. Outside China it is known from Ladakh (d'ORCHYMONT 1943), Nepal (ANGUS 1992), in Russia from the Tuva Republic (ANGUS 1992), Chuyskaya steppe of the Altai (ZIL), and, much further west, in W Iran and E Turkey (ANGUS 1992).

Helophorus (*R.*) *nigricans* POPPIUS, 1907

In China known only from Heilongjiang (Harbin area, leg. P.M. Hammond 1952).

Outside China it is known from Yakutia in E Siberia (type locality), extending eastwards to Magadan in the north and the Primorye in the south, and also on Sakhalin (leg. A.N. Nilsson & S. Kholin) and in Japan (Hokkaido, CNK). This is a new record for Japan.

There is also one specimen from NE Mongolia (ANGUS 1970b).

Helophorus (*R.*) *similis* KUWERT, 1887

ANGUS (1970b) refers to this species as *H. motschulskyi* nom.n. Its identification as *H. similis* is given by ANGUS (1992).

In China it is known only from Heilongjiang (Harbin, leg. Hammond) and Liaoning (CWBS loc. 99). This is a steppe species with a distribution extending eastwards from the SE part of European Russia, over the steppes of W Siberia and Kazakhstan, Transbaikalia (Chitinsk obl.) and Mongolia to Manchuria.

***Helophorus* (*R.*) *montanus* d'ORCHYMONT, 1926**

D'ORCHYMONT (1926) described this species from the southern part of the Tibetan Plateau [= Qing Zang Gaoyuan] (type locality: "Tingri" [= Dingri Xian, ca. 400 km W Lhasa]]), with paratypes from "Lingka" [= Lingze, Duoji, ca. 40 km E Bomi City], "Sokkar" [= ? Sou Xian, ca. 200 km E Anduo Xian] and "Gyangtse" [= Jiangzi Xian, ca. 150 km SW Lhasa] (all in Tibet) and Laptel in India (Kumaon). The ZIL has material from the "Kuku Nor" [= Qinghai Hu] area - S bank of "Orin Nor" [= Ngoring Hu (or Eling Hu)]. The only other Chinese material I have seen is from Sichuan (Kangding, Tagu, 3500 m, vii. 1992, leg. R. Dunda), in NMW.

Outside China and the adjacent Himalaya, *H. montanus* is known from the Hindu Kush (Afghanistan, Badakshan (ANGUS 1970b)), the Tian Shan (Issyk Kul region of Kirgizia, CKB), Kirgizsky Khrebet (Ak-su Pass, ZIL; "Syr Darya, Aulie Ata" [= Dzhambul], MRHNB), the Trans Ili mts (Zailiiskiy Alatau), Semireche, (ZIL), and the Altai (Kosh Agach, ZIL).

Despite the very wide distribution, the material shows little variation - in some specimens the pronotum is a little less arched and the granulation of the external intervals varies a little. The apical segment of the maxillary palpi may be rather short, subovoid, or more elongate and clearly asymmetrical.

A greater problem is posed by the relationship between *H. montanus* and the European *H. griseus*. The aedeagophore of *H. griseus* is the same shape as that of *H. montanus*, but smaller, length about 0.5 mm as against 0.6 - 0.65 mm in *H. montanus*. *Helophorus griseus* is a smaller beetle (length 2.4 - 4 mm, males up to 3.0 mm), as against 3.1 - 5.2 mm (males up to about 3.5 mm) in *H. montanus*. *Helophorus montanus* generally has a relatively smaller pronotum and more elongate elytra than *H. griseus*, but this is not always clear. Thus the differences are a matter of size and small at that, and this, in conjunction with their widely separated distributions, invites consideration of the possibility that *H. montanus* is a subspecies of *H. griseus*. However, the differences in distribution are less striking when Pleistocene fossils are taken into account. Thus *H. griseus* occurs among the Starunia (Carpathians) fossils, radiocarbon dated at about 23000 years ago, described by ANGUS (1973) - the aedeagophore figured (ANGUS 1973: Fig. 37) as *H. glacialis* VILLA is in fact *H. griseus* (confirmed by subsequent discovery of a less distorted fossil, and shown by its longer struts than the true *H. glacialis* shown in Fig. 36). Both the fossil *H. griseus* aedeagophores are just under 0.5 mm long, and are therefore not *H. montanus*. The Starunia *Helophorus* include European species such as *H. aequalis*, *H. aquaticus* and *H. discrepans* REY, as well as east Palearctic species such as *H. aspericollis* ANGUS, *H. jacutus* POPPIUS (= *H. praenanus* LOMNICKI) and *H. browni* ANGUS. *Helophorus griseus* is thus among those European species which, under suitable climatic conditions, coexist with east Palearctic species. Because the material involved is clearly *H. griseus* and not *H. montanus*, it seems best to regard the two as separate species, albeit related.

***Helophorus* (*R.*) *carsoni* ANGUS 1970b**

The Chinese distribution is based on material in the ZIL: Qinghai: "Nan Shan" [= Qinghai Nanshan], Sichuan: Upper Chang Jiang, "Jerku NW of Gan-Tsi" [= Zako (or Zake), ca. 50 km NW Ganzi Xian] (Coll. Kozlov), and MRHNB (d'Orchymont collection): Sichuan ("Tatsienlu" [= Kangding Xian]).

Outside China *H. carsoni* is abundant in northern Mongolia (type area) and occurs at Kosh Agach, Chuyskaya Steppe, Altai (ZIL), and in the Tuva Republic (ZIL).

***Helophorus* (*R.*) *orientalis* MOTSCHULSKY, 1860.**

The only Chinese record is from Heilongjiang (Harbin area, leg. P.M. Hammond 1965).

Outside China *H. orientalis* has a very wide distribution, from the northeastern part of European Russia (Pechora), across Siberia to the Primorye (S to Vladivostok) (ANGUS 1992), and over southern and central Canada and the northern U.S.A., extending south along the Rocky Mountains (SMETANA 1985). Over most of its range only females are known, and the species has been shown to be parthenogenetic (ANGUS 1970c). Males are known from the Rocky Mountain

area (SMETANA 1985) and near Vladivostok (ANGUS 1992). *Helophorus orientalis* is known as a Pleistocene fossil, both in England and at Starunia (ANGUS 1973).

***Helophorus* (*R.*) *imaensis* d'ORCHYMONT, 1926**

D'ORCHYMONT (1926) described this species from southern Tibet ("Tingri" [= Dingri Xian, ca. 400 km W Lhasa], "Phari" [= Paili, ca. 100 km SE Gangba Xian, ca. 160 km SW Lhasa], "Kampa Dzong" [= Gamba, Gamba Xian, ca. 150 km SW Jiangzi Xian], "Lingka", [= Lingze, Duoji, ca. 40 km E Bomi City]). The ZIL collections have material from the Upper Huang He, "Jarin Nur" [= Gyaring Hu (or Tsaring Nor, Dzharin Nor, Zhaling Hu)].

The only non-Chinese material I know of is from Ladakh (coll. d'Orchymont, MRHNB).

The original spelling of the name is "*imaensis*", but in a later paper (d'ORCHYMONT 1943) the name "*immaensis*" was used.

***Helophorus* (*R.*) *timidus* MOTSCHULSKY, 1860**

Jilin: 30 km NE CWBS loc. 79, 3 ♂♂. The only Chinese record.

Outside China *H. timidus* occurs in the Transbaikal region of east Siberia (type area), and the Primorye (IBV).

***Helophorus* (*R.*) *pitcheri* ANGUS, 1970b**

Jilin: CWBS loc. 93, 1 ♂. The only Chinese record.

Outside China *H. pitcheri* is known only from the male holotype from Transbaikalia, and one female paratype from the source of the river Irkut ("Quell. d. Jrbut") in the same region.

***Helophorus* (*R.*) *browni* ANGUS, 1970b**

China: Jilin: CWBS loc. 89, 4 exs. (one male). There is also one female labelled simply "China" in the NHML.

Outside China *H. browni* is common in the Baikal area of eastern Siberia, extending to Yakutia (as far north as the middle Lena), and east to the Primorye (ZIL, IBV), the Magadan oblast (CMM), Kamtchatka (ZIL) and Sakhalin (CNU and S. Kholin). The only Mongolian specimen is from the mountains near Ulan Bator (ZIL). In North America it occurs in Alaska and the adjacent Yukon. This is a much more northerly distribution than in the Palearctic, for although, as SMETANA (1985) points out, its American range extends from the tundra down into the taiga, in Siberia it occurs in the middle taiga down to the taiga-steppe boundary.

In the European Pleistocene it is known from Starunia in the Carpathians (ANGUS 1973), but has not been found in Britain.

II. Annotated check list of the *Helophorus* species of the neighbouring territories of China

The territories bordering China may conveniently be considered in five categories: 1) the southern fringe, 2) the western mountains, 3) Mongolia, the Russian Altai and Sayan and Tuva, 4) eastern Siberia, 5) the eastern fringe.

Each of these areas shares species with China, and each has non-Chinese species, some of which may be expected to occur there. The largest of these areas is east Siberia.

Works giving keys to species of the various subgenera are given in the Chinese list, except for *Cyphelophorus* (only one extant species - *H. tuberculatus* GYLLENHAL), *Atracthelophorus* (key to species: ANGUS 1985a) and *Rhopalhelophorus*, for which there is no comprehensive key, but ANGUS (1970b) and SHATROVSKIY (1989) provide useful information.

In the following lists, species known from China are marked with an asterisk (*).

1. The southern fringe

Helophorus is an almost exclusively Holarctic genus, with two or three species in the Ethiopian region. Since the southern part of China lies within the Oriental region and China's Himalayan frontier lies close to the Palearctic border, the lands to the south of China are unlikely to yield further species. Nevertheless, there are two. The first, *H. mervensis* SEMENOV occurs in Kashmir (Yusmarg, 46 km from Srinagar, 2600 m a.s.l. (TMAB) (ANGUS 1986). The second species, from the Khasi Hills of Assam (India) is the only non-Chinese *Helophorus* to be recorded from the Oriental region and it is a new species belonging to a new subgenus described below.

Helophorus subgenus *Thaumhelophorus*, subgen.n.

Type species: *Helophorus inexpectatus* sp.n.

Pronotum: suprapleural area wide over anterior half, with no constriction before the edge of the ocular cavity, tapered posteriorly as in *Gephelophorus* (Fig. 20).

Elytra without intercalary striae, and with the suture and interstices 2, 4 and 6 raised in ridges along their whole lengths. Interstice 8 (outside the humeral callus) is less strongly ridged, the ridge running from behind the humeral callus to the base of the apical third. Flanks very broad (Fig. 21), except at base at least twice width of epipleura. Epipleura wide basally, strongly and evenly narrowed opposite basal half of metasternum, slightly tapered over rest of metasternum so that they are very narrow opposite the abdomen. The arrangement of the flanks and epipleura is most like that of *Orphelophorus*, but the inner margin of the epipleura has no trace of sinuation opposite the basal half of the metasternum.

Legs slender, tarsi with swimming hairs (Fig. 10).

The general appearance of the only known species, *H.* (*T.*) *inexpectatus* sp.n., is like a small *H.* (*G.*) *sibiricus*. However, the pronotal suprapleural areas lack any anterior tapering, the elytra lack intercalary striae, and the flanks are distinctly wider than in *Gephelophorus*. Of the subgenera without intercalary elytral striae, *Atracthelophorus* KUWERT and *Rhopalhelophorus* never have such wide flanks or distinctly ridged interstices, while the remaining subgenus, *Orphelophorus*, often has one or two punctures representing rudimentary intercalary striae, and has the tarsi much shorter, with stiff setae instead of swimming hairs. The surface sculpture of the head and pronotum, and the pronotal suprapleural areas are also quite different.

Although *Thaumhelophorus* has an unusual set of diagnostic characters, I think that it is most probably related to *Gephelophorus*.

Etymology: *Thaumhelophorus* is formed from a combination of the Greek word "Thauma", a surprise, and *Helophorus*.

Helophorus (*Thaumhelophorus*) *inexpectatus* sp.n.

Holotype ♀ (MHNG): India, Meghalaya, Khasi Kills, 1000 m. alt., Mawsynram - Balat, 27.x.1978, Besuchet - Löbl".

General appearance: Fig. 2. Head (Fig. 6) dark maroon-bronze with greenish reflections. Y-groove with stem almost parallel-sided, wider than the lateral arms, its floor with a narrow linear depression at each side, medially with irregular granules. Surface of head with small, rounded granules separated from one another by about their own diameter, the granules with conspicuous median pits bearing recurved setae. Maxillary palpi dull yellow, the apical segment rather short, narrow, almost symmetrical. Antennae dull below, 8-segmented.

Pronotum (Fig. 6) brownish with bronze reflections, anterior margin and marginal grooves dull yellow. Intervals with setigerous granules as head, these separated from one another by about 1.5 times their diameters. Surface between grooves very shiny. Moderately arched, widest at base of anterior third, the sides rounded over anterior two thirds, slightly sinuate at base of middle third, then straight to hind angles. Grooves deep and distinct, not reaching anterior margin. Midgroove tapered at ends; submedians weakly curved outwards over middle third, sinuate either end of this; submarginals almost straight, nearly parallel; marginals obsolete at ends, widened to maximum width of pronotum. Lateral margins narrowly raised from just behind anterior angles to hind angles, finely crenulate. Suprapleural area as in Fig. 20.

Elytra dirty yellowish-brown, with a darker sutural Λ-mark just behind the middle and dark spots on interstice 6 and base of apical third. There are also paler streaks on interstice 2 in front of the

Λ-mark, on the basal half of interstice 4 and on interstice 6 in front of the dark spots. Suture and interstices 2, 4, and 6 raised in ridges along their whole lengths, interstice 8 with a ridge from behind the humeral callus almost to apex. The raised ridges with erect setae, these finer than those on the head and pronotum. No trace of intercalary striae. Flanks very wide (Fig. 21), twice as wide as epipleura over most of their length. Epipleura wide at base, then strongly narrowed.

Legs yellowish brown, rather long, tarsi with swimming hairs. Posterior tarsus: Fig. 10

Distribution: So far, this species is known only from the holotype. It seems possible that its range may extend to northern Burma and into Yünnan.

Etymology: inexpectatus - unexpected, referring both to its morphology and its provenance.

2. The western mountains

At the edge of Xinjiang lies the Pamir - a node point on which many of the great mountain ranges of Central Asia converge - from the south east the Karakorum Himalaya and the Kun Lun mountains, and from the northeast the Tian Shan. To the southwest the mountains extend into Afghanistan as the Hindu Kush, while to the west the mountains extend as the Gissaro-Alai range, a western extension of the Tian Shan. North of the Gissaro-Alai lies the Kirgizsky Khrebet, another offshoot of the Tian Shan, joining the main range south of Alma Ata, well to the northeast of the Pamir. Finally, there are the smaller Eastern Kazakh mountains southeast of Lake Balkhash.

Eighteen species of *Helophorus* are known from this region, of which nine belong to the predominantly montane subgenus *Atracthelophorus* Kuwert.

It is difficult to suggest which of these species is most likely to occur in China, but any species from the Tian Shan or Pamir must be a likely candidate. The presence of *H. kozlovi*, described from eastern Tibet and found in the western Tian Shan, suggests that any of the species may occur in China, though the eastern Mediterranean *H. syriacus*, reaching its apparent eastern limit in the central Tian Shan, is the least likely candidate.

***Helophorus* (*Orphelophorus*) *obscurellus* POPPIUS ***

Distribution: Kirgizsky Khrebet, Tian Shan.

***Helophorus* (*Transithelophorus*) *beibienkoi* ANGUS**

Distribution: Kirgizsky Khrebet - Tashkent district.

***Helophorus* (*Eutrichhelophorus*) *micans* FALDERMANN**

Distribution: E Afghanistan, Bukhara.

***Helophorus* (s.str.) *syriacus* KUWERT**

Distribution: the most eastern record of this species is from the Central Tian Shan.

***Helophorus* (s.str.) *kozlovi* ZAITZEV ***

Distribution: W Tian Shan.

***Helophorus* (*Atracthelophorus*) *aspericollis* ANGUS**

Distribution: Kirgizsky Khrebet - Zailiisky Alatau (ZIL).

***Helophorus* (*A.*) *discretus* d'ORCHYMONT**

Distribution: from Kushka in S Turkmeniya in the west to the Kirgizsky Khrebet.

***Helophorus* (*A.*) *gurjevae* ANGUS**

Distribution: Kirgizsky Khrebet.

***Helophorus* (*A.*) *fosteri* ANGUS**

Distribution: Gissaro-Alai, Pamir.

***Helophorus* (*A.*) *pictus* GANGLBAUER**

Distribution: "Bukhara" - Gissaro-Alai.

***Helophorus* (*A.*) *longipennis* GANGLBAUER**

Distribution: Kirgizsky Khrebet.

***Helophorus* (*A.*) *banghaasi* KNISCH**

Distribution: Kirgizsky Khrebet, Pamir, Central Tian Shan, Hindu Kush.

***Helophorus* (*A.*) *mongoliensis* ANGUS**

Distribution: Eastern Kazakh mountains SE of L. Balkhash (Semirechie) and near L. Zaysan, Central Tian Shan.

***Helophorus* (*A.*) *kayae* ANGUS**

Distribution: Gissaro-Alai.

***Helophorus* (*Rhopalhelophorus*) *mervensis* SEMENOV**

Distribution: Eastern Afghanistan.

***Helophorus* (*R.*) *montanus* d'ORCHYMONT ***

Distribution: Kirgizsky Khrebet.

***Helophorus* (*R.*) *paramontanus* ANGUS**

Distribution: Pamir, Central Tian Shan.

***Helophorus* (*R.*) *kazakhstanicus* sp.n.**

Holotype ♂ (ZIL): "Kazakh SSR. Aksu Dzabagli Nature Reserve (Central Tian Shan), Chuuldaa, stream in meadow at 2300 metres altitude. 23.vii.1983. Ishkov."

Unfortunately the holotype is discoloured as a result of an unsuccessful attempt to remove a gold-palladium coating with ferric chloride. It is now shining black. The metallic coating was removed with a 10 % solution of potassium cyanide.

General appearance (Fig. 3): This species is known only from the holotype. Its general appearance is very like *H. lapponicus* THOMSON, but the aedeagophore (Fig. 17) is quite different, with longer struts and pointed parameres.

Length: 3.5 mm, width: 1.5 mm.

Head (Fig. 7) greenish bronze, closely granulate with flattened granules bearing small median pits. Y-groove brighter bronze, its stem fairly wide, parallel-sided, its floor rugose. Antennae dull yellow, 9-segmented. Maxillary palpi dull yellow, apical segment asymmetrical, rather elongate.

Pronotum (Fig. 7) moderately arched, widest in front of middle, the sides straightened basally. Intervals greenish bronze, granulate, the granules flattened on internal intervals, coarse on externals. Grooves brighter bronze, fairly deep, their floors rugose. Mid groove straight, tapered anteriorly; submedians angled outwards medially, sinuate a third of the way from each end; submarginals almost straight, parallel, wider medially; marginals obsolete over anterior quarter, distinct to hind angles. Narrow raised margin distinct.

Elytra dirty yellow with a darker sutural Λ-mark, strongly striate, the interstices convex, a little wider than the striae. Apex bluntly rounded. Flanks narrowly visible from below.

Legs yellow, long; tarsi with moderately developed swimming hairs.

Distribution: Central Tian Shan.

3. Mongolia, the Russian Altai, Tuva

The fauna of Mongolia was reviewed by ANGUS (1970b), and *H. shatrovskyi* ANGUS was added by ANGUS (1985b). Note that ANGUS (1970b) recorded *H. aspericollis* ANGUS as *H. brevipalpis* BEDEL (which does not occur in the eastern Palearctic), and also included *H. limbatus* MOTSCHULSKY as a synonym of *H. lapponicus*. The species status of *H. limbatus* was re-

established by Angus (1986), while ANGUS (1992) showed that *H. similis* KUWERT is the correct name for *H. motschulskyi* ANGUS.

The fauna of the eastern and highest part of the Russian Altai is included here (as well as those of the Sayan and Tuva mountains) as these faunas are very similar to the Mongolian fauna. Where a species is only found in Mongolia (out of the area here discussed), no distributional notes are given. From the few *Helophorus* I have seen from the area, the fauna of the western part of the Russian Altai (Teletskoe Ozero) is more European in character, and is not discussed here.

The southern part of Mongolia is occupied by the Gobi desert, which means that most Mongolian records refer to the northern and central parts of the country, and also provides a serious barrier between the water beetle habitats of Mongolia and the Chinese province of Nei Mongol to the south. The obvious faunal connections should be via the Altai (shared between Russia, Mongolia and China), and the eastern border of Mongolia, leading into Manchuria. Of the species listed below, six occur on the Tibetan Plateau [= Qing Zang Gaoyuan], seven in Manchuria, and two are known from both regions.

Twenty-one species are known from this area.

Helophorus* (*Orphelophorus*) *obscurellus POPPIUS *
Distribution: Altai, Tuva, Mongolia.

Helophorus* (*Transithelophorus*) *crinitus GANGLBAUER *

Helophorus* (*Gephelophorus*) *sibiricus MOTSCHULSKY *

Helophorus* (s.str.) *hammondi ANGUS *

Helophorus* (s.str.) *khnzoriani ANGUS
Distribution: Altai, Mongolian Altai.

Helophorus* (*Atracthelophorus*) *aspericollis ANGUS

Helophorus* (*A.*) *mongoliensis ANGUS

Helophorus* (*A.*) *shatrovskyi ANGUS

Helophorus* (*A.*) *altaicus GANGLBAUER
Distribution: Altai, Sayan.

Helophorus* (*Rhopalhelophorus*) *frater d'ORCHYMONT
Distribution: Tuva.

Helophorus* (*R.*) *nigricans POPPIUS

Helophorus* (*R.*) *similis KUWERT

Helophorus* (*R.*) *montanus d'ORCHYMONT *
Distribution: Altai.

Helophorus* (*R.*) *kerimi GANGLBAUER
Distribution: Tuva, Mongolia.

Helophorus* (*R.*) *limbatus MOTSCHULSKY
Distribution: Altai, Mongolia. All Mongolian records for *H. lapponicus* by ANGUS (1970b) refer to *H. limbatus*.

Helophorus* (*R.*) *carsoni ANGUS *
Distribution: Altai, Tuva, Mongolia.

Helophorus* (*R.*) *kaszabi ANGUS

Helophorus* (*R.*) *pitcheri ANGUS *
Distribution: Sayan: source of Irkut.

Helophorus* (*R.*) *jacutus POPPIUS
Distribution: Altai, Mongolia.

Helophorus* (*R.*) *parajacutus ANGUS

Helophorus* (*R.*) *browni ANGUS *
Distribution: Tuva, Mongolia: near Ulan Bator (ZIL).

4. Eastern Siberia

This is a vast area, running from the Yenisei river in the west to the Pacific coast. The eastern Primorye, with its broad-leaved forest, lying (approximately) south of the Amur, is considered separately. The east Siberian biotopes include the northern tundra (here taken to include the Ob Gulf area), the taiga which occupies the bulk of the region, and some steppe in the south, particularly in Transbaikalia. Thirty-one species are so far known from this area, and all are listed, with some indication of their distributions.

Nine of the 31 species are so far known from China, and although some of the remaining species (the northern *H. splendidus*, the European *H. granularis* and *H. strigifrons*) seem very unlikely to occur in China, the very disjunct known distributions of some species (*H. niger* near Irkutsk, *H. croaticus* near Yakutsk) make it unwise to exclude any possibility.

Helophorus* (*Orphelophorus*) *obscurellus POPPIUS
Distribution: Yakutia, middle Lena.

Helophorus* (*O.*) *arcticus BROWN
Distribution: W Magadan oblast. Also the north coast of Canada.

Helophorus* (*Transithelophorus*) *crinitus GANGLBAUER *
Distribution: Irkutsk (ZIL).

Helophorus* (*Cyphelophorus*) *tuberculatus GYLLENHAL
Distribution: widespread but sporadic in the taiga, widespread in Canada and northern U.S.A (SMETANA 1985).

Helophorus* (*Gephelophorus*) *sibiricus MOTSCHULSKY *
Distribution: widespread, especially in the taiga, from Europe to Chukotka, Alaska and N Canada.

Helophorus* (s.str.) *bergrothi J. SAHLBERG
Distribution: widespread, but apparently not common, from the lower Ob to Irkutsk, Magadan, the Amur and Kamchatka.

Helophorus* (s.str.) *hammondi ANGUS *
Distribution: Irkutsk.

Helophorus* (s.str.) *niger J. SAHLBERG
Distribution: mainly tundra from the lower Ob and Magadan, but also in the taiga near Irkutsk.

Helophorus* (*Atracthelophorus*) *aspericollis ANGUS
Distribution: very abundant in Irkutsk, Transbaikal, Yakutia.

Helophorus* (*A.*) *auricollis ESCHSCHOLTZ
Distribution: Chukotka: Cape Mertens (ZIL), mainly North American (SMETANA 1985).

Helophorus* (*Rhopalhelophorus*) *nanus STURM

Distribution: very widespread in the Palearctic, from Ireland to Vladivostok; in east Siberia a taiga species, apparently not found in the Magadan oblast.

Helophorus* (*R.*) *oblongus LECONTE

Distribution: widespread, mainly in the northern taiga, from the Obdorskaya tundra (lower Ob) to Yakutia and Magadan; widespread in North America (SMETANA 1985).

Helophorus* (*R.*) *pallidus GEBLER

Distribution: mainly taiga, from Scandinavia to Yakutia.

Helophorus* (*R.*) *nigricans POPPIUS *

Distribution: Irkutsk, Transbaikal, Yakutia, Magadan.

Helophorus* (*R.*) *popii ANGUS

Distribution: Irkutsk, Yakutsk.

Helophorus* (*R.*) *pumilio ERICHSON

Distribution: a European species reaching its eastern limit near Irkutsk.

Helophorus* (*R.*) *strigifrons THOMSON

Distribution: a European species reaching its eastern limit near Irkutsk.

Helophorus* (*R.*) *splendidus J. SAHLBERG

Distribution: a tundra species, distributed from the lower Ob to Chukotka, extending south on the Middle Lena; arctic coast of Canada.

Helophorus* (*R.*) *orientalis MOTSCHULSKY *

Distribution: widespread, mainly in the taiga, from extreme northeast Europe to Irkutsk, Transbaikal, Yakutia and Magadan; nearly always parthenogenetic and often very abundant.

Helophorus* (*R.*) *parasplendidus ANGUS

Distribution: Yakutsk, Magadan, Canadian tundra.

Helophorus* (*R.*) *kryzhanovskii ANGUS

Distribution: Irkutsk oblast, Transbaikal.

Helophorus* (*R.*) *jacutus POPPIUS

Distribution: Irkutsk, Yakutsk, Magadan.

Helophorus* (*R.*) *timidus MOTSCHULSKY *

Distribution: Irkutsk, Transbaikal, Yakutsk, Magadan.

Helophorus* (*R.*) *pitcheri ANGUS *

Distribution: Transbaikal.

Helophorus* (*R.*) *browni ANGUS *

Distribution: Irkutsk, Yakutsk, Magadan, Kamchatka.

Helophorus* (*R.*) *croaticus KUWERT

Distribution: a European species not uncommon by the river Lena near Yakutsk.

Helophorus* (*R.*) *similis KUWERT *

Distribution: a steppe species; Irkutsk, Transbaikal, Krasnoyarsky krai: Minusinsk.

Helophorus* (*R.*) *limbatus MOTSCHULSKY

Distribution: Transbaikal.

***Helophorus* (*R.*) *lapponicus* THOMSON**

Distribution: a mainly taiga species, extending from Scandinavia, over the west Siberian steppe to western Magadan.

***Helophorus* (*R.*) *griseus* HERBST**

Distribution: a European species, apparently extending east to near Irkutsk - 1 ♀ (RBA).

***Helophorus* (*R.*) *granularis* (L.)**

Distribution: a European species reaching its eastern limit near Irkutsk.

5. The eastern fringes - the Primorye, Kamchatka, Sakhalin, Japan

The eastern lands listed here are peculiar for a number of reasons: Sakhalin and Japan are islands, and Kamchatka is a peninsula connected to the mainland of Siberia by a narrow neck of tundra. Only the Primorye is part of the mainland, and it differs from the rest of Siberia in being occupied, in part, by temperate broadleaved forest, thus resembling parts of China.

Sixteen species are known from these territories. No *Helophorus* has yet been found in Korea (although a number of species were collected within a few km of its border: *H. browni*, *H. crinitus*, *H. pitcheri*, *H. timidus*) and only one, *H. orientalis*, in the Kuril Islands.

The species on this list, apart from *H. matsumurai* NAKANE and *H. laferi* sp.n. are keyed by SHATROVSKIY (1989), along with most of the east Siberian species. Note that SHATROVSKIY (1989) figures all the aedeagophores the same size, and that his figure for *H. aspericollis* is wrong. Correct figures of the *H. aspericollis* aedeagophore are given by ANGUS (1970b) (as Mongolian *H. brevipalpis*), and by ANGUS (1973).

The overriding impression of these territories is one of impoverishment. The only truly mainland area, the Primorye, has only 13 species, while the outlying territories are even poorer. Thus Kamchatka has five species, Sakhalin five and Japan four. Of the Japanese species, *H. auriculatus*, confined to Honshu, appears to be of Chinese origin, *H. sibiricus* and *H. nigricans*, known only from Hokkaido, are of Siberian origin, and *H. matsumurai*, from Hokkaido and northernmost Honshu, is endemic to Japan and Sakhalin. Seven of the species are known from China.

***Helophorus* (*Transithelophorus*) *crinitus* GANGLBAUER ***

Distribution: Primorye.

***Helophorus* (*Cyphelophorus*) *tuberculatus* GYLLENHAL**

Distribution: Primorye, Sakhalin.

***Helophorus* (*Gephelophorus*) *auriculatus* SHARP ***

Distribution: Japan (Honshu).

***Helophorus* (*G.*) *sibiricus* MOTSCHULSKY ***

Distribution: Primorye, Kamchatka, Japan (Hokkaido).

***Helophorus* (s.str.) *bergrothi* J. SAHLBERG**

Distribution: Primorye, Kamchatka.

***Helophorus* (s.str.) *hammondi* ANGUS ***

Distribution: Primorye.

***Helophorus* (*Atracthelophorus*) *aspericollis* ANGUS**

Distribution: Primorye (SHATROVSKIY 1989).

***Helophorus* (*Rhopalhelophorus*) *nanus* STURM**

Distribution: Primorye, Sakhalin.

***Helophorus* (*R.*) *oblongus* LECONTE**

Distribution: Kamchatka (SHATROVSKIY 1989).

***Helophorus* (*R.*) *nigricans* POPPIUS ***

Distribution: Primorye, Japan (Hokkaido, CNK).

***Helophorus* (*R.*) *popii* ANGUS**

Distribution: Primorye.

***Helophorus* (*R.*) *orientalis* MOTSCHULSKY ***

Distribution: Primorye, Sakhalin, Kamchatka, Kuriles.

***Helophorus* (*R.*) *parasplendidus* ANGUS**

Distribution: Primorye (SHATROVSKIY 1989).

***Helophorus* (*R.*) *browni* ANGUS ***

Distribution: Primorye, Sakhalin, Kamchatka.

***Helophorus* (*R.*) *matsumurai* NAKANE**

Distribution: Sakhalin, Japan (Hokkaido, Honshu - Aomori prefecture, N Honshu, CNK).

***Helophorus* (*R.*) *laferi* sp.n.**

Holotype ♂ (ZIL): "Vladivostok, Oksanskaya. Broad-leaved woodland. 13.v.1979. G. Lafer". **Paratypes**: 1 ♀ (RBA), Khabarovsky krai. Kr. [= mountains] Kelkhtsir. Broad leaved woodland. 12.viii.1980. G. Lafer; 1 ♀ (IBV), Kirovsky region, Krylovka. 1.vi.1978. G. Lafer".

The holotype is blackened due to the same ferric chloride treatment as was given to the holotype of *H. kazakhstanicus*.

Length: 2.6 - 2.9 mm, width: 1.2 - 1.3 mm.

General appearance (Fig. 4). Aedeagophore: Fig. 18. Head (Fig. 8) shining dark pitchy with bronze reflections. Surface with sparse small punctures, these with impressed rings round them towards the edges of the head, and surface near eyes with flattened granulation. Y-groove with stem deep, narrow but widened anteriorly. Maxillary palpi dull yellow, apical segment asymmetrical, subovoid, blunt apically. Antennae dull yellow with darker clubs, 8- or 9-segmented. When 8-segmented (holotype, Khabarovsk paratype), the basal segment of the funiculus partly divided (Figs 11, 12).

Pronotum (Fig. 8) highly arched, widest before the middle, the sides rounded. Intervals shining pitchy bronze, as head, grooves sometimes slightly brighter. Internal and middle intervals punctate to obsolètely granulate, intervals weakly granulate. Grooves narrow; midgroove straight, tapered towards ends; submedians curved or bluntly angled outwards medially, sinuate about a third of the way from the hind margin, sometimes also sinuate a quarter of the way from the front margin. Submarginals weakly curved. Marginal grooves even, obsolete in anterior quarter, clear to hind angles. Raised lateral margin distinct, weakly crenulate.

Elytra dark brown, moderately striate, the interstices raised, flat-topped. Sides rounded, widest part of elytra at middle, apex tapered, evenly rounded. Flanks at most narrowly visible from below.

Legs dull brown, moderately long, tarsal swimming hairs weak.

Distribution: Primorye.

Etymology: This species is named after Dr. G.Sh. Lafer, who collected the material.

***Helophorus* (*R.*) *matsumurai* NAKANE, 1963**

The original description of this species by NAKANE (1963) is a short paragraph in Japanese, accompanied by a coloured illustration. Later, NAKANE (1965) wrote a longer description in English, but as the species remains poorly known I am taking this opportunity to redescribe and figure it.

Length: 2.8 - 3.7 mm; width: 1.2 - 1.7 mm. Aedeagophore: Fig. 19.

Head (Fig. 9) shining pitchy bronze, weakly granulate, sometimes only punctate by the stem of the Y-groove. Stem of Y-groove expanded anteriorly, sometimes very narrow over most of its length,

but sometimes wider, its floor rugose. Maxillary palpi dull yellow, sometimes darkened apically, the apical segment rather short, asymmetrical, but sometimes only weakly so, subovoid, its tip either blunt or quite narrowly pointed. Antennae dull yellow to brown, 9-segmented.

Pronotum (Fig. 9) highly arched, sometimes flattened over the internal intervals. Widest before the middle, sides rounded. Colour as head. Internal interval punctate to weakly granulate, middle intervals generally weakly granulate, externals more strongly so. Midgroove straight, tapered to ends, often narrow, but wider in some specimens (width of widest grooves about twice that of narrowest). Submedians curved to bluntly angled outwards medially, sinuate a third of the way from the base, and sometimes also a quarter of the way from the anterior margin. Submarginals weakly curved. Marginals distinct, obsolete over anterior quarter, distinct to hind angles, sometimes widened medially. Raised lateral margins distinct.

Elytra mid- to dark brown, with a darker sutural Λ-mark and sometimes additional darker mottling. Widest medially, tapered to evenly round apex. Flanks broadly visible from below, at base of abdomen about as wide as epipleura. Legs moderately long, tarsal swimming hairs rather weak.

Helophorus matsumurai at first sight appears somewhat enigmatic, and specimens with virtually symmetrical apical segments to the maxillary palpi could be referred to the subgenus *Atracthelophorus*, which would be supported by the broad elytral flanks. However, most of the 16 specimens (from both Japan and Sakhalin) that I have seen have the segment clearly asymmetrical, and the species probably comes nearest to *H. browni*. Most *H. browni* have the pronotum less highly arched and clearly granulate over all the intervals. However some specimens, especially from the Far East (Magadan, Sakhalin) have the granulation reduced, and one male from Sakhalin (leg. Tamanuki) has the pronotum indistinguishable from some specimens of *H. matsumurai*. *Helophorus browni* may have the elytral flanks quite broadly visible from below. The aedeagophores of the two species are distinctive.

Distribution: According to WATANABE (1983) it is abundant on Hokkaido (type locality), in swamps and shallow pools.

III. General discussion

The Chinese *Helophorus* fauna at present stands at 20 species. Even allowing for the fact that southern China lies in the Oriental region, from which (with the exception of *H. jaechi* sp.n. and *H. auriculatus*) *Helophorus* is absent, this is a surprisingly small fauna. This has to be to some extent due to a lack of collecting. Further, there are a number of species from adjacent regions which are likely to occur in China - for instance, there are no records from the Chinese part of the Tian Shan, while the non-Chinese part of the Tian Shan and its associated mountains have 12 species not yet found in China.

The distribution of the Chinese species is also peculiar, with almost all records being from either Manchuria or the Tibetan Plateau [= Qing Zang Gaoyuan] and its fringes. Only *H. auriculatus* is at all widely distributed, with a range extending into the northern fringes of the Oriental region, and this species is almost endemic to China, with its Japanese distribution almost certainly a result of colonisation from China. The other Chinese endemic, *H. jaechi* sp.n., though known mainly from Sichuan, may be widely distributed in view of the Fujian specimen, again implying a range extending into the northern Oriental.

If the faunas of the areas around China are considered, then a reasonable guess might be that about 10 more species remain to be added to the Chinese list - again the areas concerned being Manchuria, the Tibetan Plateau [= Qing Zang Gaoyuan], and the Chinese Tian Shan. This would accentuate the uneven distribution of *Helophorus* in China - but inferences based on the faunas of surrounding areas are inevitably most relevant to the more peripheral parts of China.

A feature of *Helophorus* biology which is highly relevant to the likelihood of additional species being found is the timing of their adult activity. Most *Helophorus* are active in the spring and early summer, with only a small number of "die-hard" species occurring after that. In England this

seasonality is only moderate, becoming weaker in the north, but I found that in Siberia it is very pronounced. Thus near Yakutsk in the first half of June 1970 I found an abundant and rich fauna, but when I tried to collect material to bring home towards the end of June I found that all the grassy pools had dried up and in the remaining waters I took only *H. pallidus*.

Returning to the size of the Chinese fauna, examination of the lists from the neighbouring lands might suggest that about 10 species should be added. This would give a fauna of about 30 species, comparable in size with that of eastern Siberia, and the general agreement in the sizes of the faunas suggests that the estimate is not bad, which leaves the problem of the uneven distribution.

One serious complexity of the Chinese fauna is that, over most of China, the boundary between the Palearctic and the Oriental region is not clear. Perhaps a fair approximation is to take the line of the Chang Jiang [Jangtzekiang] over central and eastern China, while in the west the mountains are Palearctic and the lowlands Oriental. This would leave much of central Palearctic China with a very impoverished fauna. Assuming that this impoverishment is not entirely due to lack of collecting, it would appear to be a further illustration of the impoverishment of the *Helophorus* fauna of the southern part of the eastern Palearctic.

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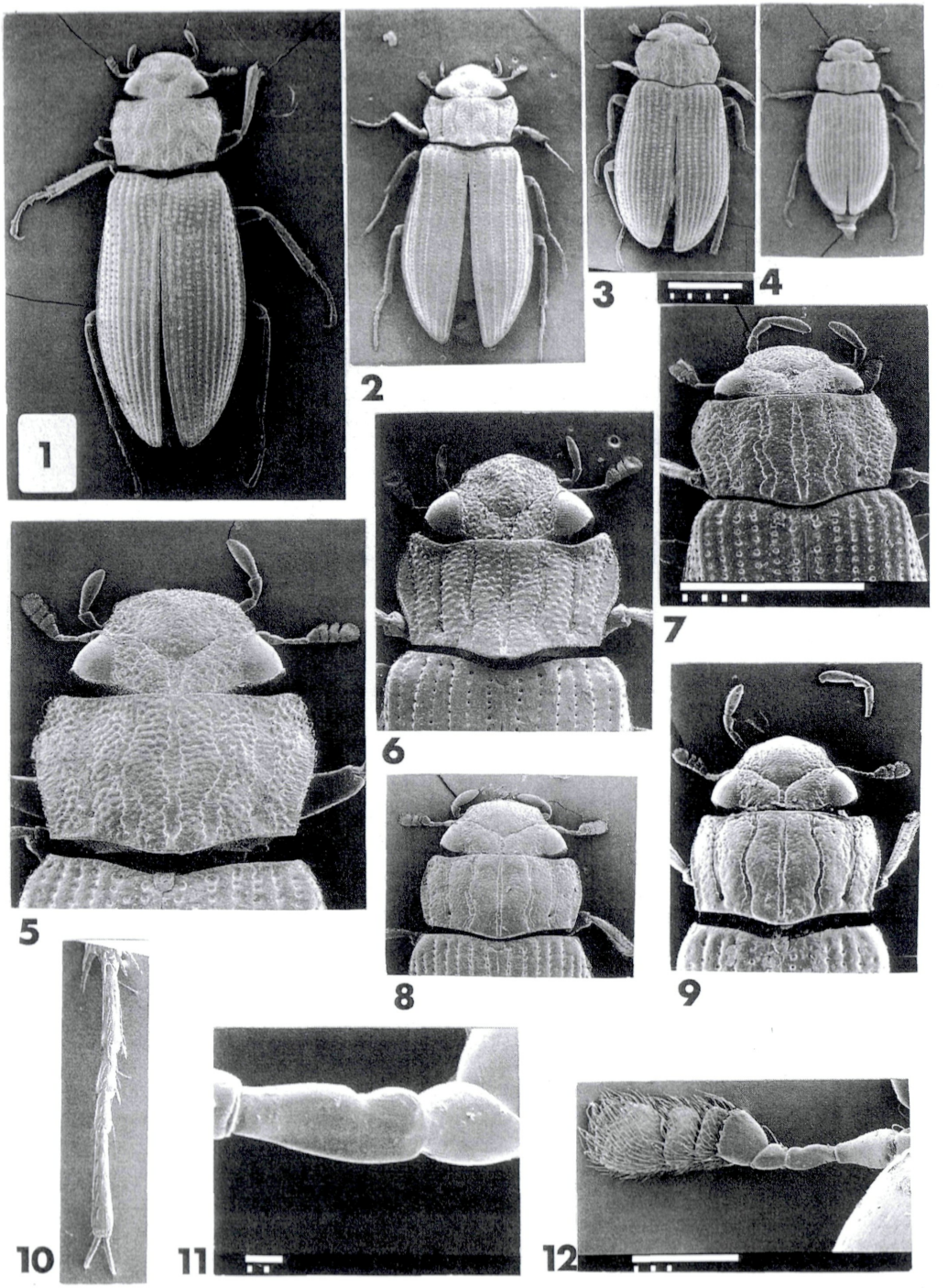

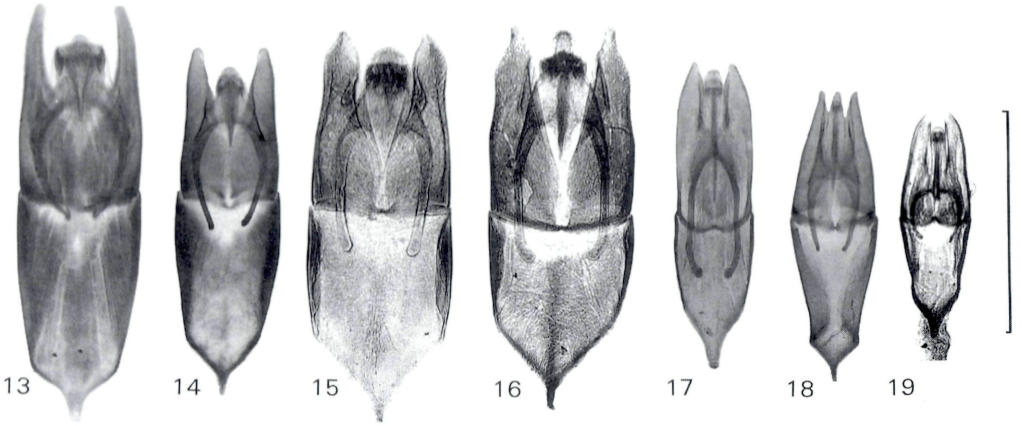

Figs. 13 - 19: Photographs of aedeagophores of 13) *Helophorus jaechi* sp.n., holotype, 14) *H. kozlovi*, Tian Shan, 15) *H. lamicola*, lectotype, 16) *H. ser*, lectotype, 17) *H. kazakhstanicus* sp.n., holotype, 18) *H. laferi* sp.n., holotype, 19) *H. matsumurai*, paratype. Scale = 0.5 mm.

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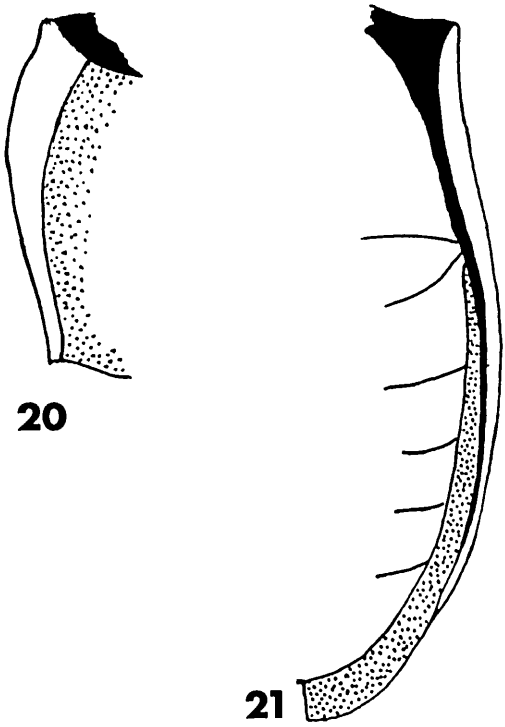
Figs. 1 - 9 (opposite page): Scanning Electron Micrographs, dorsal views of *Helophorus jaechi* sp.n., paratype (1, 5), *H. inexpectatus* sp.n., holotype (2, 6), *H. kazakhstanicus* sp.n., holotype (3, 7), *H. laferi* sp.n., holotype (4, 8) and *H. matsumurai*, paratype (9). The scales below Figs. 3 and 7 represent 1 mm.

Figs. 10 - 12 (opposite page): Scanning Electron Micrographs, 10) *Helophorus inexpectatus* sp.n., holotype, hind tarsus, 11) *H. laferi* sp.n., holotype, funiculus of right antenna, scale = 0.01 mm, 12) *H. laferi* sp.n., holotype, left antenna, scale = 0.1 mm.



Figs. 20 - 21: Diagrams of pronotal and elytral structure of *Thaumhelophorus* subg.n.; 20) underside of pronotum showing the suprapleural area (white), pleura (stippled) and ocular cavity (black), 21) underside of elytron showing the flank (white), epipleuron (black) and underside of elytron (stippled). The metasternum and abdomen are shown diagrammatically.

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