Two New Labenopimpline Ichneumonids (Hymenoptera: Ichneumonidae) from the Upper Cretaceous of Southern Africa

Authors: Kopylov, Dmitry S., Brothers, Denis J., and Rasnitsyn, Alexandr P.

Source: African Invertebrates, 51(2) : 423-430

Published By: KwaZulu-Natal Museum

URL: https://doi.org/10.5733/afin.051.0211

African Invertebrates Vol. 51 (2) Pages 423–430 Pietermaritzburg December, 2010

Two new labenopimpline ichneumonids (Hymenoptera: Ichneumonidae) from the Upper Cretaceous of southern Africa

Dmitry S. Kopylov[1], Denis J. Brothers[2] and **Alexandr P. Rasnitsyn[1,3]**

[1]A.A. Borissiak Paleontological Institute, Russian Academy of Sciences, 123 Profsoyuznaya Str., Moscow, 117997 Russia; aeschna@yandex.ru

[2]School of Biological & Conservation Sciences, University of KwaZulu-Natal, Pietermaritzburg, P. Bag X01, Scottsville, 3209 South Africa; brothers@ukzn.ac.za

[3]Natural History Museum, Cromwell Road, London SW7 5BD, UK; rasna36@yahoo.com

ABSTRACT

Two new species of Labenopimplinae, *Labenopimpla orapa* sp. n. and *Rugopimpla botswana* sp. n., are described from the Upper Cretaceous (Turonian) deposits of Orapa in Botswana. These are the first and only known Cretaceous Ichneumonidae from the southern hemisphere. The new species seem to be very similar to their relatives from the Cenomanian of the Russian Far East. This indicates a wide distribution of Ichneumonidae by the early Late Cretaceous at least.

KEY WORDS: Hymenoptera, Ichneumonidae, Labenopimplinae, new species, Cretaceous, Africa, Botswana, Orapa, fossil insects.

INTRODUCTION

The parasitoid-wasp family Ichneumonidae consists of approximately 60 000 recent species worldwide (Wahl & Sharkey 1993). In spite of the great diversity and considerable economical importance of modern ichneumon-flies, the earliest, Cretaceous, stage of ichneumonid history has remained almost unexplored until recently. Until now only a few dozen Cretaceous ichneumonids have been described, and these are entirely from Asia.

Two subfamilies are known from the Early Cretaceous. The Tanychorinae Rasnitsyn, 1975 (five genera and 11 species) were dominant during the Neocomian (Townes 1973; Rasnitsyn 1975, 1980; Zhang 1991; Zhang & Rasnitsyn 2003; Kopylov 2010*a*). The Palaeoichneumoninae Kopylov, 2009 (three genera and 12 species) were less numerous during the Neocomian, but nearly completely supplanted the Tanychorinae in the later Early Cretaceous (Kopylov 2009). Both subfamilies failed to cross the Early/Late Cretaceous boundary. Instead of the archaic Tanychorinae and Palaeoichneumoninae, the peculiar Labenopimplinae Kopylov, 2010 (five genera and 13 species), combining features of the modern Labeninae, Pimplinae and Tryphoninae, entered the fossil record in the early Late Cretaceous (Kopylov 2010*b* and present contribution). This subfamily was previously known only from the Cenomanian Obeshchayushchiy locality in the Russian Far East; the two new representatives of Labenopimplinae described below, found at the Turonian Orapa locality in Botswana, are the first and only known Cretaceous ichneumonids from Africa and the southern hemisphere. Although Brothers and Rasnitsyn (2003) listed four ichneumonids amongst the 108 specimens of Hymenoptera from Orapa, the specimens described below are the only ones complete enough for adequate treatment.

MATERIAL AND METHODS

The material studied came from the Orapa locality in north-eastern Botswana. The age of the deposits seems to be Turonian (Brothers & Rasnitsyn 2003; Gernon *et al*.

http://www.africaninvertebrates.org.za

2009; and references therein). The fossils are stored in the Bernard Price Institute of Palaeontology (BPI), University of the Witwatersrand, Johannesburg, South Africa. The photographs were taken using crossed polarizing filters to increase the contrast between the organic remnants and the matrix, or using oblique incident light from the top left to emphasise sculpture. The drawings were prepared electronically by superimposition on the photographs and checked against the specimens, specially for the addition of sculptural details. The terminology for wing venation (see Fig. 2) is from Kopylov (2009).

TAXONOMY

Family Ichneumonidae Latreille, 1802

Subfamily Labenopimplinae Kopylov, 2010

Labenopimplinae: Kopylov 2010*b*: 59–60.

Type genus: *Labenopimpla* Kopylov, 2010 (by original designation).

The prime morphological characteristic differentiating this subfamily from the Palaeoichneumoninae is the presence of parallel (rather than posteriorly converging) notauli. Unfortunately, the notauli are not visible in either of the specimens described here. Nevertheless, they are assigned to the Labenopimplinae on the basis of their

Fig. 1. *Labenopimpla orapa* sp. n. Specimen BP/2/25240-1 (part), photograph (crossed polarisers) taken in 2002. Scale bar = 1.0 mm.

characteristically shaped areolet: *Labenopimpla* has the areolet pentagonal with a relatively long 4M and subvertical r–m, and *Rugopimpla* has a quadrangular areolet, but all Palaeoichneumoninae have the areolet pentagonal with oblique r–m. Thus, these specimens can be clearly assigned to two of the five known labenopimpline genera on the basis of the generic characters listed by Kopylov (2010*b*).

Genus *Labenopimpla* Kopylov, 2010

Labenopimpla: Kopylov 2010*b*: 60–61.

Type species: *Labenopimpla rasnitsyni* Kopylov, 2010 (by original designation).

Labenopimpla orapa sp. n.

Figs 1–4

Etymology: After the type locality, Orapa; noun in apposition.

Description: Metasoma, legs and wing veins very dark, head, antenna and mesosoma less dark. Basal vein (1Rs&1M) arched, 1.5× as long as 1cu–a; r–rs straight; areolet 0.5× as long as r–rs; 2+3M 1.5× as long as 4M; r–m almost entirely unpigmented; 1m–cu 0.8× as long as 2Rs+M and 1.5× as long as 3Cu; 1m–cu&2Rs+M sharply bent at ramulus

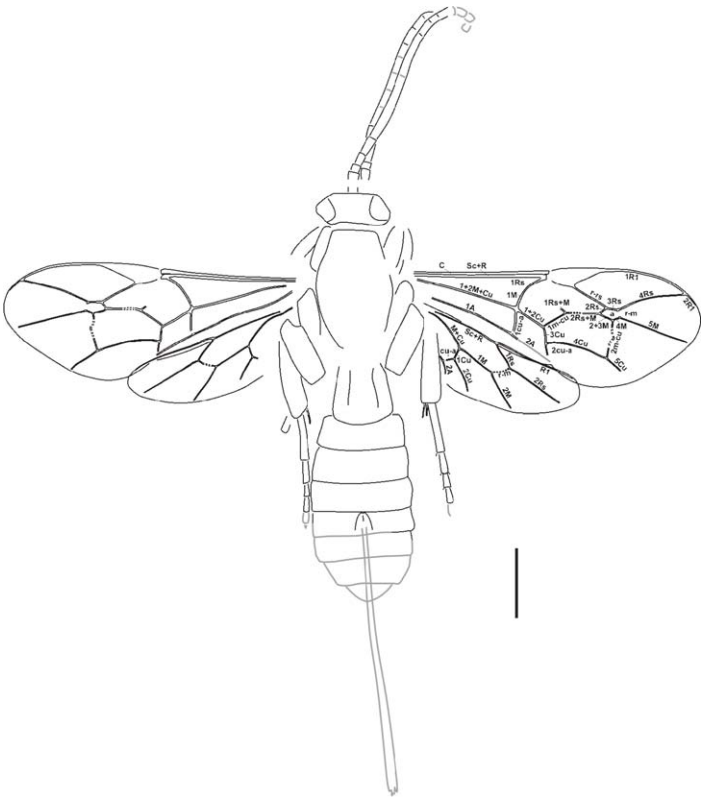
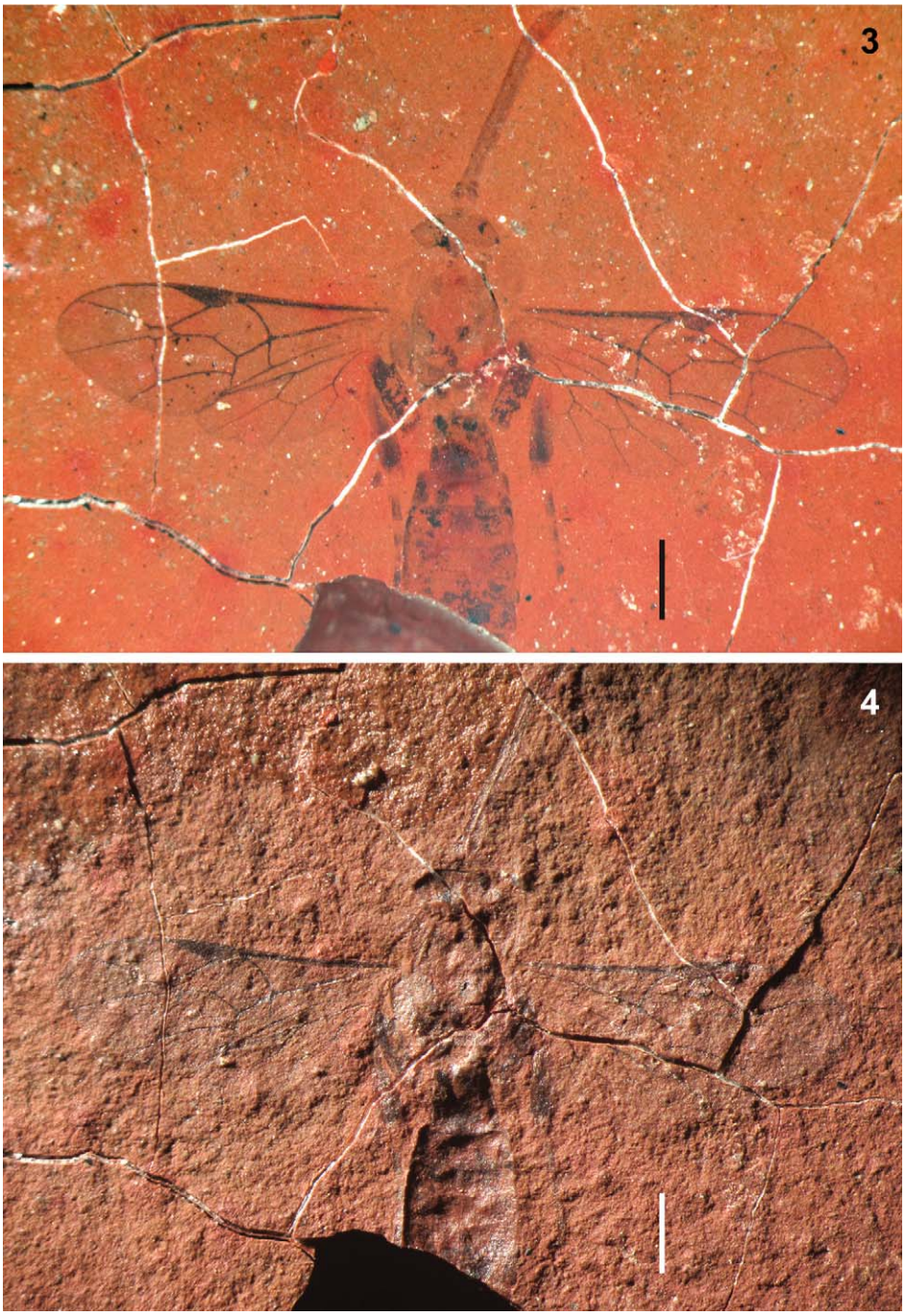


Fig. 2. *Labenopimpla orapa* sp. n. Composite line drawing, components derived from specimen P/2/25240-1 indicated as grey lines. Abbreviations: a – areola; other labels are conventional. Scale bar = 1.0 mm.



Figs 3, 4. *Labenopimpla orapa* sp. n. Specimen BP/2/25980 (counterpart), photographs: (3) using ringlight and crossed polarisers; (4) using oblique incident light. Scale bars = 1.0 mm.

(1Rs+M distal rudiment); ramulus long (a few times as long as wide); 2Rs+M with indistinct long bulla at about basal third; 2m–cu with two bullae and with the middle third strongly curved; 1cu–a very slightly postfurcal (almost interstitial). Hindwing with 1Rs 1.4× as long as r–m; r–m with indistinct long bulla; 1Cu and cu–a subequal in length, meeting at angle; cu–a with indistinct bulla. First metasomal tergum short and wide, apparently with a pair of longitudinal dorsal carinae. Ovipositor longer than metasoma.

Measurements (lengths) in mm: Head plus mesosoma 2.5, metasoma 3.6, ovipositor at least 4.2 from base, forewing 4.3, hindwing 2.8.

Comparison: Differs from congeners in having 1m–cu longer, areolet longer, ramulus long, 2Cu almost straight, and size smaller; also differs from *L. rasnitsyni* in having longer ovipositor.

Holotype: ♀ BP/2/25240-1 (part) and BP/2/25980 (counterpart). BOTSWANA: Orapa; Upper Cretaceous, Turonian. Head and mesosoma poorly preserved, metasoma well preserved, ovipositor probably incomplete (apparent apex highly irregular); legs and antenna incomplete; fore and hindwings very well preserved.

Remarks: The description is based primarily on examination of counterpart specimen 25980 (Figs 3, 4). When recently sought, specimen 25240-1 was not found. It may currently be in the National Museum of Botswana, Gaborone, but this has not been confirmed. Details of that specimen have been incorporated from a 2002 photograph (Fig. 1) and sketches by A.P. Rasnitsyn.

Genus *Rugopimpla* Kopylov, 2010

Rugopimpla: Kopylov 2010*b*: 63.

Type species: *Rugopimpla vulgaris* Kopylov, 2010 (by original designation).

Rugopimpla botswana sp. n.

Figs 5–7

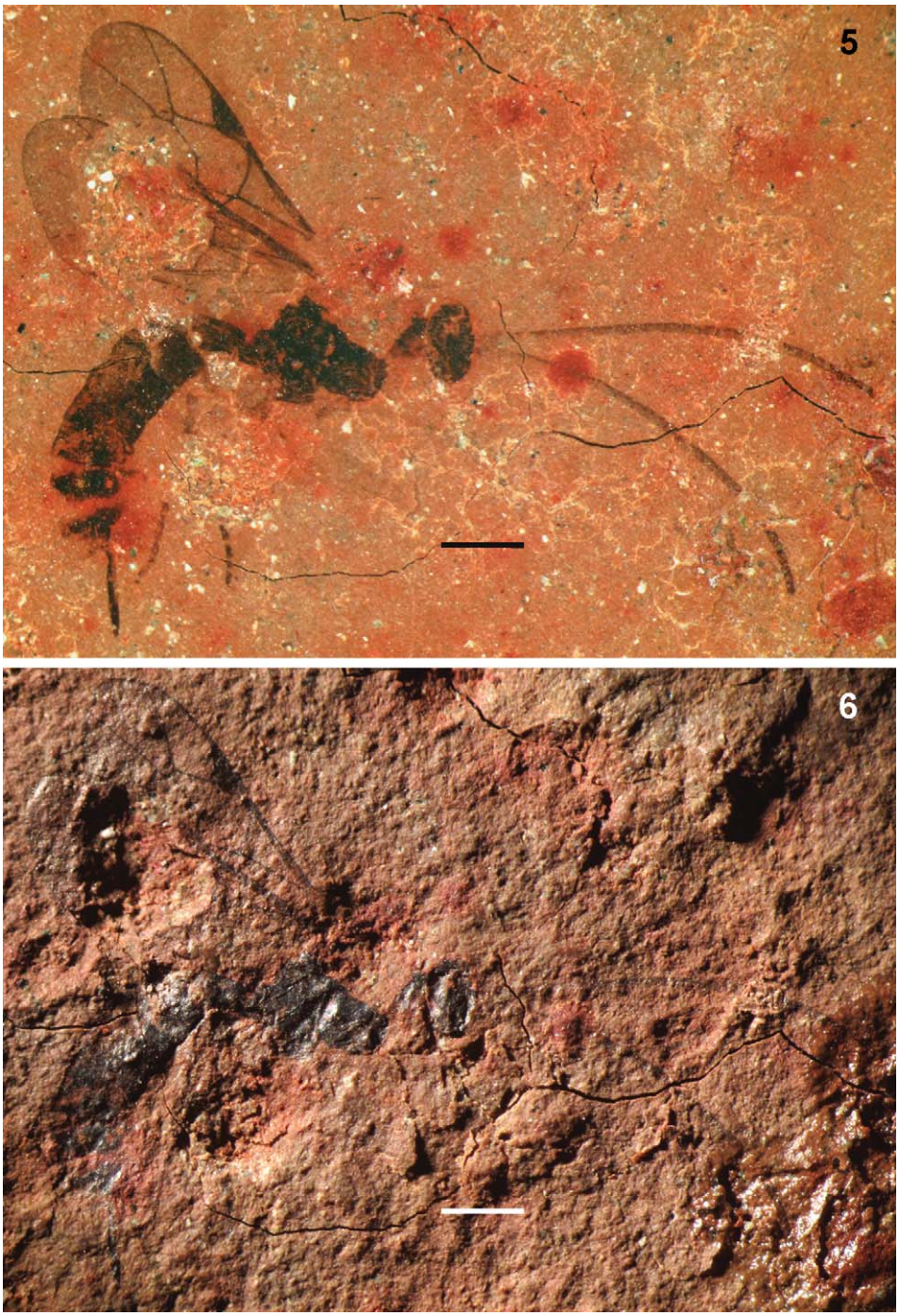
Etymology: After the country of origin, Botswana; noun in apposition.

Description: Entire body, wing veins and ovipositor very dark; antenna and legs less dark. Antenna filiform, with more than 22 flagellomeres (possibly about 25), basal flagellomeres 3× as long as wide, apical ones 1.5× so. Forewing with 1Rs&1M arched; r–rs nearly straight; 2Rs half as long as 2+3M and twice as long as 4M; r–m as long as 2+3M, with two bullae; 1m–cu 0.67× as long as 2Rs+M; 1m–cu&2Rs+M arched; ramulus twice as long as wide. Hindwing probably with 1Rs 2.5× as long as r–m; 1Cu and cu–a probably subequal in length, junction apparently weakly angled (venation unclear and confused because of superimposition of wings).

Measurements (lengths) in mm: Antenna at least 5.2, head and mesosoma 2.7, metasoma 3.5, ovipositor at least 1.2 (visible free section), forewing 3.9.

Comparison: Differs from *R. vulgaris*, *R. fallax* and *R. matrona* in 1Cu:cu–a and probably 1Rs:r–m ratios in the hindwing; also differs from *R. vulgaris* in having r–rs nearly straight, and from *R. matrona* in presence of r–m. Differs from *R. angusticella* in having areolet wider with 4M longer, and in presence of r–m and ramulus. Differs from *R. macra* in having 1Rs&1M arched, r–rs nearly straight, and longer ramulus.

Holotype: ♀ BP/2/27390. BOTSWANA: Orapa; Upper Cretaceous, Turonian. Head and mesosoma considerably damaged, propodeal carinae distinguishable; metasoma well preserved, ovipositor tip lost; antennae nearly complete, legs incomplete; one forewing fairly well preserved, other forewing and hindwings damaged.



Figs 5, 6. *Rugopimpla botswana* sp. n. Specimen BP/2/27320, photographs: (5) using ringlight and crossed polarisers; (6) using oblique incident light. Scale bars = 1.0 mm.

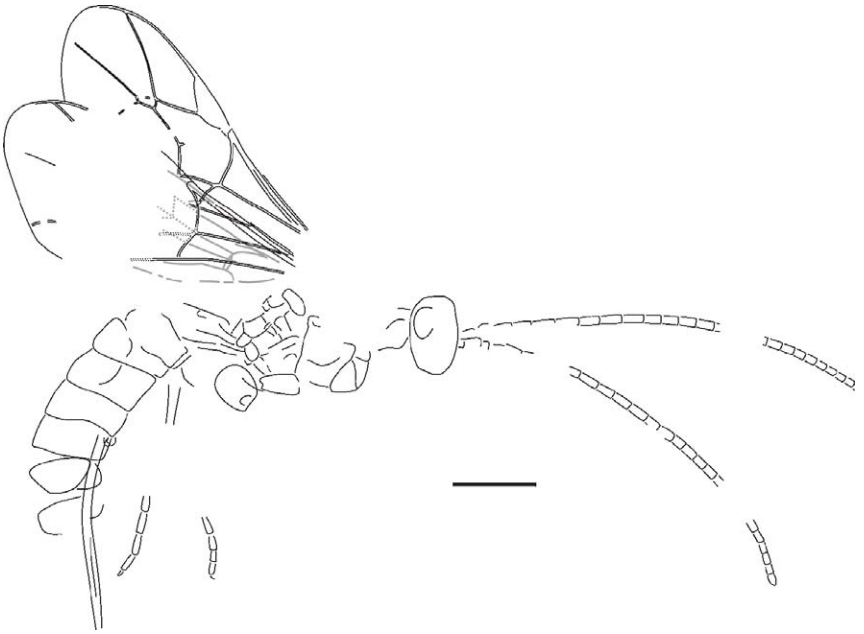


Fig. 7. *Rugopimpla botswana* sp. n. Composite line drawing, presumed venation of hind wings indicated as grey lines. Scale bar = 1.0 mm.

DISCUSSION

The first representatives of the genera *Labenopimpla* and *Rugopimpla* were recently described from the Upper Cretaceous (Cenomanian) deposits at the Obeshchayushchiy locality in the Russian Far East (Kopylov 2010*b*). The present two species from southern Africa are very similar to their congeners despite their origins almost from opposite ends of the Earth. Indeed, their localities are now separated by some 14 000 km, and were separated by the Tethys Ocean during the Cretaceous period. The source localities, Orapa and Obeshchayushchiy, are of nearly the same age (Rasnitsyn 2002; Brothers & Rasnitsyn 2003). This indicates an early expansion of distribution, the more so since even the mid-Early Cretaceous (Aptian) fauna demonstrates only the most basal ichneumonid subfamilies, Tanychorinae and Palaeoichneumoninae, which are apparently absent from Orapa and Obeshchayushchiy (Kopylov 2010*b*). All known Cretaceous ichneumonid-bearing localities, other than Orapa, are concentrated in Central, Northern and Eastern Asia (Russian Transbaikalia, Taimyr and Far East, Mongolia, eastern China) and North America (New Jersey and Canadian ambers); nothing is known from North Africa and western Eurasia, the regions which could probably clarify the scenario of early ichneumonid origins and dispersal.

ACKNOWLEDGMENTS

The authors are grateful to M.B. Mostovski for help in preparation of this paper. The helpful comments of a reviewer, A.I. Khalaim (Zoological Institute, Russian Academy of Sciences, St Petersburg), are much appreciated. For DSK and APR, the study was supported by the Program of the Presidium of the Russian Academy of Sciences "Origin

of the Biosphere and Evolution of Geobiological Systems". DJB and APR thank the University of KwaZulu-Natal and South African National Research Foundation (International Scientific Liaison) for financial support. Prof. B. Rubidge, Dr M. Raath, Dr M. Bamford and Dr I. McKay of the BPI, University of the Witwatersrand, provided much appreciated assistance and access to the specimens in their care.

REFERENCES

Brothers, D.J. & Rasnitsyn, A.P. 2003. Diversity of Hymenoptera and other insects in the Late Cretaceous (Turonian) deposits at Orapa, Botswana: a preliminary review. *African Entomology* **11**: 221–226.

Gernon, T.M., Field, M. & Sparks, R.S.J. 2009. Depositional processes in a kimberlite crater: the Upper Cretaceous Orapa South Pipe (Botswana). *Sedimentology* **56**: 623–643.

Kopylov, D.S. 2009. A new subfamily of ichneumonids from the Lower Cretaceous of Transbaikalia and Mongolia (Insecta: Hymenoptera: Ichneumonidae). *Paleontologischeskii zhurnal* (1): 76–85. (in Russian; English translation in *Paleontological Journal* **43** (1): 83–93.)

———2010*a*. Ichneumonids of the subfamily Tanychorinae (Insecta: Hymenoptera: Ichneumonidae) from the Lower Cretaceous of Transbaikalia and Mongolia. *Paleontologischeskii zhurnal* (2): 57–63. (in Russian; English translation in *Paleontological Journal* **44** (2): 180–187.)

———2010*b*. A new subfamily of ichneumon wasps (Insecta, Hymenoptera, Ichneumonidae) from the Upper Cretaceous (Cenomanian) of the Russian Far East. *Paleontologischeskii zhurnal* (4): 59–69. (in Russian; English translation in *Paleontological Journal* **44** (4): 422–433.)

Rasnitsyn, A.P. 1975. Hymenoptera Apocrita of the Mesozoic. *Transactions of the Paleontological Institute of the USSR Academy of Sciences* [*Trudy Paleontologicheskogo instituta Akademii nauk SSSR*] **147**: 1–134. (in Russian)

———1980. Origin and evolution of Hymenoptera. *Transactions of the Paleontological Institute of the USSR Academy of Sciences* [*Trudy Paleontologicheskogo instituta Akademii nauk SSSR*] **174**: 1–192. (in Russian)

———2002. Impression fossils. *In*: Rasnitsyn, A.P. & Quicke, D.L.J., eds, *History of Insects*. Dordrecht etc.: Kluwer Academic Publishers, pp. 437–446.

Townes, H. 1973. Two ichneumonids (Hymenoptera) from the Early Cretaceous. *Proceedings of the Entomological Society of Washington* **75**: 216–219.

Wahl, D.B. & Sharkey, M.J. 1993. Superfamily Ichneumonoidea. *In*: Goulet, H. & Huber, J.T., eds, *Hymenoptera of the World: an Identification Guide to Families*. Ottawa, Ontario: Research Branch, Agriculture Canada, Publication 1894/E, pp. 358–509.

Zhang, H. & Rasnitsyn, A.P. 2003. Some ichneumonids (Insecta, Hymenoptera, Ichneumonoidea) from the Upper Mesozoic of China and Mongolia. *Cretaceous Research* **24**: 193–202.

Zhang, J. 1991. A new species of *Tanychora* Townes (Hymenoptera, Ichneumonidae). *Acta Palaeontologica Sinica* **30**: 502–504.