

**New taxa of the “brown” species-complex
of the genus *Agrodiaetus* HÜBNER, [1822] from Transcaucasia**

(Lepidoptera, Lycaenidae)

by

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Summary: One new species and two new subspecies of the “brown” species-complex of the genus *Agrodiaetus* from Transcaucasia are described on the basis of external morphology and karyology data: *Agrodiaetus belovi* spec. nov. (Armenia, Gegamsky mts.), *Agrodiaetus admetus yeranyani* subspec. nov. (Armenia, Zangezur mts.) and *Agrodiaetus admetus malievi* subspec. nov. (Azerbaijan, Talysh mts., Zuvand plateau). New data on larval food plants are provided. Holotypes are kept in the collection of the Museum of Comparative Zoology (Harvard University, Cambridge, MA, USA).

The following abbreviations are used:

EMEM – Entomologisches Museum of Dr. ULF EITSCHBERGER, Marktleuthen, Germany

ZSSM – Zoologische Staatssammlung, München

SPBU – St. Petersburg State University, Department of Entomology, St. Petersburg, Russia

CB – entomological collection of Mr. DMITRY BELOV, (Moscow, Russia)

CE – entomological collection of Mr. KAREN ERANYAN (Erevan, Armenia)

CN – chromosome number

Introduction

The brown species-complex is one of the most complicated groups within the genus *Agrodiaetus* HÜBNER, [1822]. In the middle of the last century it was an object of extensive investigation in the frames of two competitive programs: so-called polytypic species concept (FORSTER, 1956, 1960, 1961) and biological concept (DE LESSE, 1960, 1960a, 1961).

In contrast to the “classical” museum work of FORSTER, the approach by DE LESSE was based on the assumption of reproductive isolation of sibling species with different chromosome numbers. The methodology of this novel approach was based on cytology samples prepared under field conditions from alive butterfly specimens.

That relatively complicated procedure of obtaining cytological samples was not accepted by the contemporary scientific community.

However, in fact, the series of outstanding works of DE LESSE (see e.g. DE LESSE, 1952–1972), who proposed cytological parameters as the only important criterion for splitting the “brown-complex” (DE LESSE, 1961), created a new style for research in this field. This new approach determined the conception of this complex as a very complicated group from the taxonomic point of view.

It seems, it was the main reason that for a long time the great value of the material from Asia Minor and Transcaucasia was unclaimed. The “brown” species-complex became an object of

specific investigation only in latest time (CARBONEL, 2001; SCHURIAN & TEN HAGEN, 2003). However these studies disregard any distinct biological parameters and turned investigation back to FORSTER's concept. The only exclusion concerns the recent work based on cytological data (LUKHTANOV et al., 2003).

Meanwhile, our latest field investigations showed clearly that species of the genus are strong stenotopic and monophag.

Most part of the populations studied have a specific food plant, which probably restricts the range of the species.

Breeding larvae collected from a specific food plant allowed us to select essential characters in external morphology and to study the population variability. The cytology investigation of fresh imago specimens, also obtained from breeding larvae, links karyology and morphology data.

This methodology generates a productive concept, especially in the case of sibling species sympatry.

In the present paper we announce new taxa of the genus *Agrodiaetus* of the "brown" species-complex, which were studied during the last years from both biology and cytology points of view.

The detailed discussion of the cytological data will be object of the next paper (LUKHTANOV & DANTCHENKO, in prep.).

***Agrodiaetus belovi* spec. nov.**
(colour plate XIVb, figs. 1-4)

Material

Holotype ♂: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, "Khosrov reserve" 1800 m alt., 16.VII.2002, DANTCHENKO A. leg. (sample 2002_Q479, kept in the DNA and Tissues Collection of the Museum of Comparative Zoology (Harvard University, Cambridge, MA, USA).

Paratypes: 12 ♂♂, same data, same locality; 8 ♂♂, 4 ♀♀, same locality but VII.2004; 4 ♂♂, same locality, but 24.VI.2001 (will be preserved in EMEM, ZSSM, SPBU, CB).

Description

Holotype ♂: forewing length 17.0 mm.

UPS: ground colour warm light brown with light yellow shimmer and slightly darkened veins, discal strokes invisible, submarginal and antemarginal marking absent on both fore- and hindwings. Forewings with a good developed sex brand and scale-tuft; Fringe brown in the forewings with clear lightened apex and very light brown, especially in outer part, in hindwings, that strongly contrasts with the ground colour.

UNS: ground colour very light brown, resembles coffee with milk, with specific yellowish tint, discal spot light brown in forewings clear, depicted diffusely by ground colour; row of post-discal spots relatively large, encircled with light, marginal design of forewings near invisible, in hindwings clear depicted by light diffusive submarginal spots bordered by brown spots contrasting with ground colour; white stroke sharp, equal in width from basal to distal part; basal dust absent.

Paratype ♀: forewing length 16.5 mm.

UPS: ground colour as in male, with darkened veins, discal spots in forewings and submarginal spots in hindwings clearly visible.

UNS: general design as in male but ground colour more dark; white stroke sharp, enlarged distally; basal dust absent.

Variation

Forewing length in males varies from 15.5 to 17.5 mm, marginal design on underside of hindwings relatively stable.

Forewings length in females varies from 15.0 to 16.5 mm.

Definition

Agrodiaetus belovi spec. nov. differs from the closest brown species occurring sympatrically—*Agrodiaetus admetus*, *Agrodiaetus eriwanensis*, *Agrodiaetus demavendi*, and *Agrodiaetus ripartii*—by specific yellowish tint of wing ground color and strongly reduced marginal design on upperside of hindwings. This is the largest species of the “brown” complex in Transcaucasia. Haploid chromosome number in specimens from the type series and additional specimens from surrounding mountains (Pambaksky and Vaiozdvorsky mts.) is stable and was found as CN = 74. This chromosome number is different from those found in *A. admetus* (CN = 78–80), *A. eriwanensis* (CN = 34), *A. demavendi* (CN = 66–67) and *A. ripartii* (CN = 90) (DE LESSE, 1961; LUKHTANOV & DANTCHENKO, 2002; LUKHTANOV et al., 2003).

Bionomy

The type series was collected in dry steppe-like biotope with xerophytous vegetation on specific gypseous soil. The species flies in one generation from the first decade of July (at low altitude, 1200 m, in southern slopes of Vaiozdvorsky mts.) to the end of July or even first decade of August (egg laying females). The food plant, which probably restricts the range of the new species, is *Onobrychis atropatana* Boiss. (GROSSGEIM, 1952). Oviposition was observed on dry stems. Hibernation most probably as young 2nd instar larvae. Mature larvae (white, densely pubescent) were active mostly during night time. Pupation in the soil, often near the food plant.

Distribution

Armenia: Gegamsky, Pambaksky, Vayatzdorsky mts., Dzhervezh gorge near Erevan city.

Etymology

Mr. DMITRY BELOV, a butterfly collector (Moscow, Russia), was an active participant of our trip to Armenia in 2004.

Agrodiaetus admetus yeranyani subspec. nov.
(colour plate XV, figs. 1–4)

Material

Holotype ♂: Transcaucasia, Armenia, Zangezour mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 10.VIII.2002, DANTCHENKO A. leg. (sample 2002_B282, kept in the

DNA and Tissues Collection of the Museum of Comparative Zoology (Harvard University, Cambridge, MA, USA).

Paratypes: 1 ♂, same data, same locality; 8 ♂♂, 4 ♀♀, same locality, but 7.VIII.2002; 14 ♂♂, 4 ♀♀, same locality but 7.VIII.2004. (will be preserved in EMEM, ZSSM, SPBU, CE).

Description

Holotype ♂: forewing length 15.5 mm.

UPS: ground colour dark brown, discal strokes invisible, submarginal and antemarginal marking absent on both fore- and hindwings. Forewings with a good developed sex brand and scale-tuft, veins slightly darkened in hindwings; fringe brown on the forewings, light brown in outer part of hindwings.

UNS: ground colour brown, discal spot in forewings clear depicted, in hindwings reduced; row of postdiscal spots relatively large, encircled with light, marginal design of forewings reduced, in hindwings composed with complete rows of brackets with slight red spot in cell 2A-Cu2; white stroke sharp, equal in width from basal to distal part, basal dusting almost invisible.

Paratype ♀: forewings length 15.0 mm.

UPS: ground colour as in male, with darkened veins in hindwings, discal spots clearly visible, in forewings a slightly visible marginal row of reddish spots.

UNS: general design as in male but with more pronounced marginal design both in hind- and in forewings; white stroke sharp, enlarged distally, basal dust absent.

Variation

Forewing length in males varies from 15.3 to 16.5 mm, marginal design on underside of hindwings relatively stable.

Forewings length in females varies from 15.0 to 16.0 mm.

Definition

Agrodiaetus admetus yeranyani subsp. nov. differs from the closest brown species occurring sympatrically—*Agrodiaetus belovi* spec. nov., *Agrodiaetus eriwanensis*, *Agrodiaetus demavendi*, *Agrodiaetus ripartii*—by marginal design on the underside of the hindwings. The haploid chromosome number based from specimens of the type series and additional specimens from surrounding mountains of Armenia (Pambaksky, Vaiotzdvorsky, Gegamsky mts.) is stable and was found as CN = 78–80.

The new subspecies differs from the nominotypical subspecies by the presence of a sharp white stroke on the hindwings' underside. It differs from *Agrodiaetus admetus anatoliensis* FORSTER, 1960 by reduction of marginal design on the wing underside, grey-brown tint of ground color and a sharp stroke, which is equal in width. The structure and number of bivalent chromosomes in MI cells shows clearly its affiliation to the *admetus* species-complex. It shows constant difference to other species of the "brown" complex occurring sympatrically: *Agrodiaetus demavendi* (PFEIFFER, 1938) (CN = 66–67), *Agrodiaetus ripartii paralcestis* FORSTER, 1960 (CN = 90), *Agrodiaetus eriwanensis* FORSTER, 1960 (CN = 34), *Agrodiaetus demavendi* (CN = 67), *Agrodiaetus belovi* spec. nov. (CN = 74).

Bionomy

The type series was collected in a dry meadow biotope with xerophytous vegetation near the

upper forest border. The species flies in one generation from middle July to the first decade of August. The food plant, which probably restricts the area of the new species, is *Astragalus* spp., from *Onobrychium* BGE section (GROSSGEIM, 1952), close in first appearance to *A. cancellatus* BGE. The problem with systematics in this group and details of the biology will be discussed in a following paper (DANTCHENKO, in preparation). Oviposition was observed on dry stems. Hibernation as young 1st or 2nd instar larvae.

Distribution

Armenia: Zangezursky, Gegamsky, Pambaksky, Vayatzdzorsky mts., Dzhervezh gorge near Erevan city.

Etymology

Mr. KAREN ERANYAN, a butterfly collector (Erevan, Armenia), was an active participant in all our trips in Armenia in 1999–2004.

Agrodiaetus admetus malievi **subspec. nov.**
(colour plate XV, figs. 5–8)

Material

Holotype ♂: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. (sample 2003_F903, kept in the DNA and Tissues Collection of the Museum of Comparative Zoology (Harvard University, Cambridge, MA, USA).

Paratypes: 4 ♂♂, same data, same locality; 3 ♂♂, 3 ♀♀, same locality but 2.VIII.2003, DANTCHENKO A. leg.; 2 ♂♂, same locality, but 5.VIII.2003; 3 ♂♂, 3 ♀♀, Azerbaijan, Talysh mts., Zuvand plateau, Lyalyakeran village, 1800 m alt., 20.–25.VI.1995, DANTCHENKO A. leg. (will be preserved in EMEM, ZSSM, SPBU).

Description

Holotype ♂: forewing length 16.0 mm.

UPS: ground colour dark brown, discal strokes invisible, submarginal and antemarginal marking absent on both fore- and hindwings. Forewings with a good developed sex brand and scale-tuft, veins slightly darkened in hindwings; fringe brown on forewings, light brown in outer part of hindwings.

UNS: ground colour brown, discal spot in forewings clearly depicted, in hindwings reduced; row of postdiscal spots relatively large, encircled with light, marginal design of forewings reduced, in hindwings composed with complete rows of brackets pronounced posteriori; white stroke sharp, equal in width from basal to distal part, basal dusting almost invisible.

Paratype ♀: forewings length 15.0 mm.

UPS: ground colour as in male, with darkened veins in hindwings, discal spots clearly visible, in forewings a slightly visible marginal row of reddish spots.

UNS: general design as in male but with more pronounced marginal design both in hind- and in forewings; white stroke sharp, enlarged distally, basal dust absent.

Variation

Forewing length in males varies from 15.5 to 16.2 mm, marginal design on underside of hindwings relatively stable.

Forewings length in females varies from 15.0 to 15.5 mm.

Definition

Agrodiaetus admetus malievi subsp. nov. differs from the closest brown species occurring sympatrically—*Agrodiaetus rjabovi* FORSTER, 1960 and *Agrodiaetus demavendi* (PFEIFFER, 1938)—by marginal design on the underside of the hindwings. The chromosome number based on specimens from the type series is stable and was found as CN = 78–80. The new subspecies differs from other subspecies of *Agrodiaetus admetus* by smaller size and strong reduction of the marginal design on the wings' underside. From the nominotypical subspecies it differs by the presence of a sharp white stroke on the hindwing underside. The structure and number of bivalent chromosomes in MI cells shows clearly its affiliation to the *admetus* species-complex. It shows constant difference from *A. demavendi*.

Bionomy

The specimens of the type series were collected in dry steppe-like biotope inhabited with xerophytous vegetation: *Astragalus marschallianus* FISCH, *Onobrychis cornuta* L. The food plant, which probably restricts the area of the new species, is *Astragalus* spp., from *Onobrychium* BGE section (GROSSGEIM, 1952), close in first appearance to *A. zuvanticus* GROSSH. The problem with systematics in this group and details of the biology will be discussed in a following paper (DANTCHENKO, in preparation). Oviposition was observed on dry stems. Hibernation as young 1st or 2nd instar larvae.

Distribution

Zuvand plateau of the Talysh Mountains (Transcaucasia, Azerbaijan).

Etymology

Dr. AKRAM MALIEV is head physician of the regional hospital. His kind attention we felt during our trips to Zuvand in 1980–2003.

Acknowledgments

We wish to express sincere thanks to Dr. ULF EITSCHBERGER for the publication of this paper and Dr. NAOMI PIERCE (Harvard University, USA) for very useful discussion on the cytology and systematic position of genus *Agrodiaetus*. We gratefully acknowledge support of our "*Agrodiaetus*" research from Putnam Expedition Committee (Harvard University). The second author has been supported by the Russian Research Foundation (Grant RFFI 02–04–49138), the Russian Federal Programs "Universities of Russia" (Grant UR 07.01.056) and "Support of the leading scientific schools" (Grant NSH–2232.2003.4).

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Explanation of colour plate XIVb (p. 473):

Fig. 1: *Agrodiaetus belovi* spec. nov., paratype ♂: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Upperside.

Fig. 2: *Agrodiaetus belovi* spec. nov., paratype ♂: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Underside.

Fig. 3: *Agrodiaetus belovi* spec. nov., paratype ♀: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Upperside.

Fig. 4: *Agrodiaetus belovi* spec. nov., paratype ♀: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Underside.

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Explanation of colour plate XV (p. 475):

Fig. 1: *Agrodiaetus admetus yeranyani* subsp. nov., paratype ♂: Transcaucasia, Armenia, Zangezur mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 7.VIII.2002, DANTCHENKO A. leg. Upperside.

Fig. 2: *Agrodiaetus admetus yeranyani* subsp. nov., paratype ♂: Transcaucasia, Armenia, Zangezur mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 7.VIII.2002, DANTCHENKO A. leg. Underside.

Fig. 3: *Agrodiaetus admetus yeranyani* subsp. nov., paratype ♀: Transcaucasia, Armenia, Zangezur mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 7.VIII.2002, DANTCHENKO A. leg. Upperside.

Fig. 4: *Agrodiaetus admetus yeranyani* subsp. nov., paratype ♀: Transcaucasia, Armenia, Zangezur mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 7.VIII.2002, DANTCHENKO A. leg. Underside.

Fig. 5: *Agrodiaetus admetus malievi* subsp. nov., paratype ♂: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Upperside.

Fig. 6: *Agrodiaetus admetus malievi* subsp. nov., paratype ♂: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Underside.

Fig. 7: *Agrodiaetus admetus malievi* subsp. nov., paratype ♀: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Upperside.

Fig. 8: *Agrodiaetus admetus malievi* subsp. nov., paratype ♀: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Underside.

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Colour plate XIVa

DANTCHENKO, A.: A new species of the genus *Agrodiaetus* HÜBNER, [1822] from Transcaucasia (Lepidoptera, Lycaenidae). – *Atalanta* 35 (3/4): 323–326.

Fig. 1: *Agrodiaetus lukhtanovi* spec. nov., paratype ♂: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 07.VIII.2003, DANTCHENKO A. leg. Upperside.

Fig. 2: *Agrodiaetus lukhtanovi* spec. nov., paratype ♂: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 07.VIII.2003, DANTCHENKO A. leg. Underside.

Fig. 3: *Agrodiaetus lukhtanovi* spec. nov., paratype ♀: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 05.VIII.2003, DANTCHENKO A. leg. Upperside.

Fig. 4: *Agrodiaetus lukhtanovi* spec. nov., paratype ♀: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 05.VIII.2003, DANTCHENKO A. leg. Underside.

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3	4

Colour plate XIVb

DANTCHENKO, A. & V. LUKHTANOV: New taxa of the “brown” species-complex of the genus *Agrodiaetus* HÜBNER, [1822] from Transcaucasia (Lepidoptera, Lycaenidae). *Atalanta* 35 (3/4): 327–334.

Fig. 1: *Agrodiaetus belovi* spec. nov., paratype ♂: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Upperside.

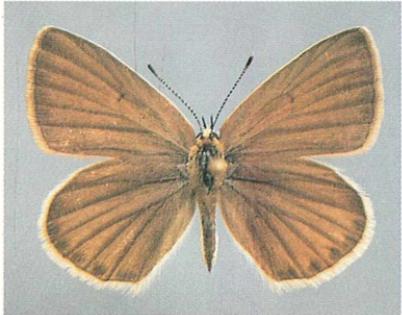
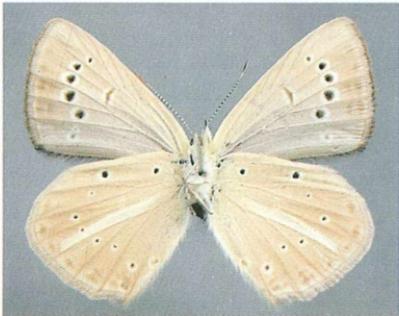
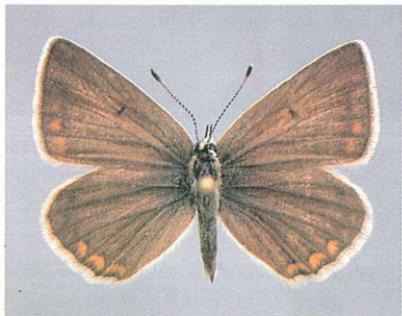
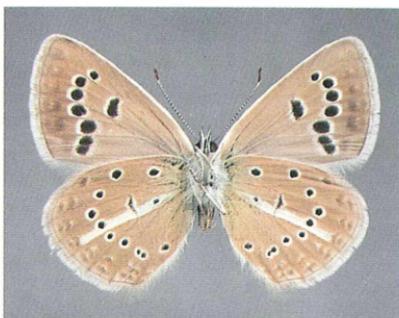
Fig. 2: *Agrodiaetus belovi* spec. nov., paratype ♂: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Underside.

Fig. 3: *Agrodiaetus belovi* spec. nov., paratype ♀: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Upperside.

Fig. 4: *Agrodiaetus belovi* spec. nov., paratype ♀: Transcaucasia, Armenia, Gegamsky mts., right bank of Vedy river, “Khosrov reserve” 1800 m alt., 19.VII.2004, DANTCHENKO A. leg. Underside.

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3	4

Colour plate XIVa/b



DANTCHENKO, A. & V. LUKHTANOV: New taxa of the "brown" species-complex of the genus *Agrodiaetus* HÜBNER, [1822] from Transcaucasia (Lepidoptera, Lycaenidae). – *Atalanta* **35** (3/4): 327–334.

Fig. 1: *Agrodiaetus admetus yeranyani* subspec. nov., paratype ♂: Transcaucasia, Armenia, Zangezur mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 7.VIII.2002, DANTCHENKO A. leg. Upperside.

Fig. 2: *Agrodiaetus admetus yeranyani* subspec. nov., paratype ♂: Transcaucasia, Armenia, Zangezur mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 7.VIII.2002, DANTCHENKO A. leg. Underside.

Fig. 3: *Agrodiaetus admetus yeranyani* subspec. nov., paratype ♀: Transcaucasia, Armenia, Zangezur mts., Kajaran dstr., right bank Vokhtchi river, Pkhrut vic., 1900 m alt., 7.VIII.2002, DANTCHENKO A. leg. Upperside.

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Fig. 5: *Agrodiaetus admetus malievi* subspec. nov., paratype ♂: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Upperside.

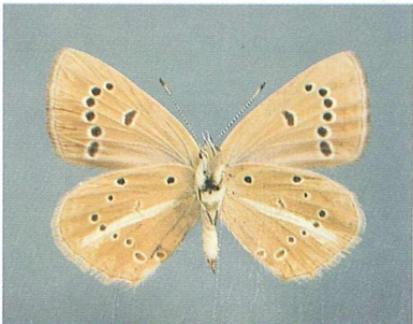
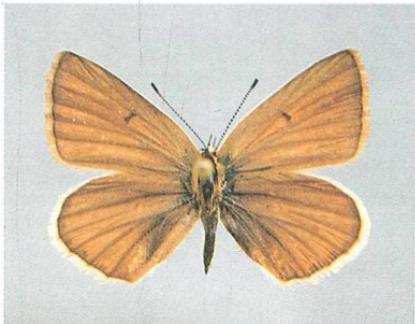
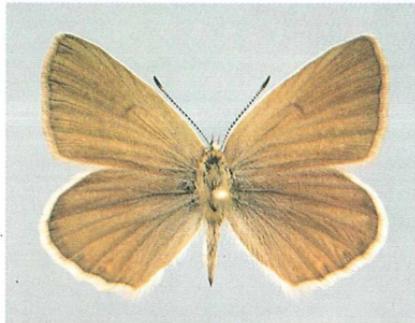
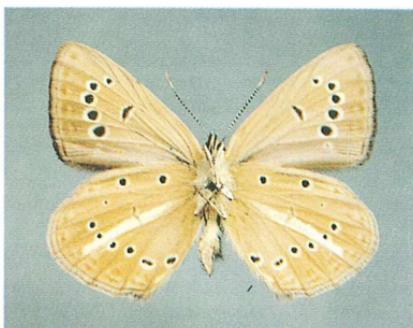
Fig. 6: *Agrodiaetus admetus malievi* subspec. nov., paratype ♂: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Underside.

Fig. 7: *Agrodiaetus admetus malievi* subspec. nov., paratype ♀: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Upperside.

Fig. 8: *Agrodiaetus admetus malievi* subspec. nov., paratype ♀: Transcaucasia, Azerbaijan, Talysh mts., Zuvand plateau, Mistan village, 2000 m alt., 30.VII.2003, DANTCHENKO A. et LUKHTANOV V. leg. Underside.

1	2
3	4
5	6
7	8

Colour plate XV



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