The biology and early stages of *Adscita (Adscita) capitalis* (Staudinger, 1879) (Lepidoptera: Zygaenidae, Procridinae)

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Abstract: The biology and early stages of *Adscita (Adscita) capitalis* (Staudinger, 1879) are described for the first time, based on field observations and rearing experiments. *Helianthemum canum* (L.) Hornem. (Cistaceae) is confirmed as the larval host-plant. Notes on the biotope and ecology are given and information on the distribution is provided.

Angaben zur Biologie und Beschreibung der ersten Stände von *Adscita (Adscita) capitalis* (Staudinger, 1879) (Lepidoptera: Zygaenidae, Procridinae)

Zusammenfassung: Basierend auf Freilandbeobachtungen und Zuchten wird die Biologie von *Adscita (Adscita) capitalis* (Staudinger, 1879) erstmals beschrieben. *Helianthemum canum* (L.) Hornem. (Cistaceae) wird als Futterpflanze der Raupe bestätigt. Einige Angaben zur Ökologie der Art und ihrer Lebensräume werden ergänzend angeführt.

La biologie et les premiers états d'*Adscita (Adscita) capitalis* (Staudinger, 1879) (Lepidoptera: Zygaenidae, Procridinae)

Résumé: La biologie et les premiers états d'*Adscita (Adscita) capitalis* (Staudinger, 1879) sont décrits pour la première fois, à partir d'élevages et d'observations sur le terrain. La plante hôte *Helianthemum canum* (L.) Hornem. (Cistaceae) a été confirmée. Des notes sur le biotope et l'écologie sont données ainsi que des informations sur la répartition.

Introduction

Ino capitalis Staudinger, 1879, was described from a series of syntypes originating from "Amasia" [Turkey: Amasya]. The ♂ lectotype was designated by Efetov & Tarmann (1994: 85) and is deposited in Zoologisches Museum der Humboldt-Universität zu Berlin (Germany). The first data on the larval hostplant (cf. *Helianthemum canum* (L.) Hornem.) were published by Mollet (1995: 135). This information confirmed the opinion that there is a close relationship between *A. capitalis* and *Adscita (Adscita) geryon* (Hübner, 1813) (Efetov & Tarmann 1994: 85, 1995: 82, 1999: 59, Efetov et al. 2000: 88, Efetov 2001: 88, 2004: 22).

The present paper is based on observations made by K. A. Efetov, G. M. Tarmann and W. G. Tremewan on 23./24. vii. 1999, on rearing experiments by the first and third author and on the published data (Mollet 1995: 135) and unpublished observations by B. Mollet.

Abbreviations used

BM[F] [Observations by] B. Mollet [in France].
fwl. forewing length.
GMT[A] [Observations by] G. M. Tarmann [in Austria].
KAE[C] [Observations by] K. A. Efetov [in Crimea].

Depositories of material

BNMS Bulgarian Natural History Museum, Sofia, Bulgaria.
CBM Coll. B. Mollet, Gif-sur-Yvette, France.
CKAE Coll. K. A. Efetov, Simferopol, Crimea, Ukraine.
CMWM Museum Witt, Munich, Germany.
NHMW Naturhistorisches Museum Wien, Austria.
MNMS Macedonian Natural History Museum, Skopje, Macedonia.
TLMF Tiroler Landesmuseen, Ferdinandeum, Innsbruck, Austria.
ZFMK Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany.
ZIAN Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia.
ZMA Zoölogisch Museum Amsterdam, Amsterdam, The Netherlands.
ZMHB Zoologisches Museum der Humboldt-Universität zu Berlin, Germany.
ZSBS Zoologische Sammlung des Bayerischen Staates, Munich, Germany.

Observations

(by K. A. Efetov & G. M. Tarmann)

Locality (Fig. 1): Turkey, prov. Niğde, Bolkar Dağları, S. of Ulukışla, W. of Madenköy, vic. Karagölü, 2500–2600 m.

Biotope (Fig. 2): The biotope is a northerly exposed slope with spiny, high-mountain cushion vegetation ("Igelpolsterheide") on silicate soil (gneis) with flowering plants of *Helianthemum canum* (L.) Hornem. (Cistaceae) (Fig. 3), *Campanula ptarmicifolia* Lam. (Campanulaceae), *Ononis adenotricha* Boiss. (Fabaceae) and others.

This biotope was first discovered by F. Carbonell in 1988. B. Mollet visited the place in 1991–1993 and 1995–1998 between May and August. On 23./24. vii. 1999 the locality was visited by KAE, GMT and W. G. Tremewan.

On 23. vii. 1999 we reached the site at 10:30 h. It was a bright, cloudless day. There was a slight thermal wind coming up from the valley, the temperature was 22°C. There were still patches of snow on the mountains above the habitat (Figs. 1, 2). No *Adscita capitalis* were on the wing and no specimens could be found at rest. At 11:00 h KAE observed one ♂ and one ♀ flying low over the ground. Altogether 2 ♂♂ and 4 ♀♀ were observed by us between 11:00 and 14:30 h flying very low over the ground. At that time the thermal wind became quite strong and it was difficult to observe and catch the specimens. *Adscita capitalis* was the only representa-

tive of the Zygaenidae at that locality except for a very peculiar, small, dark *Zygaena loti* ([Denis & Schiffermüller], 1775) that was flying around the small bushes (especially around a *Lotus* sp.) with a slow buzzing flight like that of *Z. exulans* (Hohenwarth, 1792) in the Alps. This population has later been identified as *Zygaena loti senilis* Burgeff, 1914 (Tarmann & Tremewan 1999). No oviposition by *A. capitalis* was observed on that day. The specimens from this locality are very small, much smaller than those from northern Turkey (a situation that is reminiscent of *A. geryon geryon* (Hübner, 1813) and *A. geryon chrysocephala* (Nickerl, 1845)), there is even a small and constant genitalic difference in the sclerotization of the ductus bursae in the ♀ (Efetov 2001: pl. 34, figs. 14.1, 14.2). Although we remained at the site until 18:30 h no further *A. capitalis* could be found.

On 24. vii. we revisited the locality between 10:00 and 18:30 h. Once again it was a sunny day with some clouds in the afternoon above the mountain peaks, which were coming especially from the humid coastal areas further south. The temperature was similar to that of the previous day but the thermal wind was even stronger and mixed with local turbulences. At a distance of about 300 m above (about 100 m higher) the site where we observed *A. capitalis* the day before, we found 9 ♂♂ and 13 ♀♀. Once more they were active between 11:00 and 14:30 h, and ♂♂ and ♀♀ were flying very low over the ground. However, this time 2 ♀♀ were observed nectaring and ovipositing single eggs on *Helianthemum canum*. The ♀♀ hide deep in the plants or close to the soil on rocks near the plants and, as they are very shy, ovipisition is very difficult to observe. First only one single egg could be found after careful examination of the stems and leaves of the *Helianthemum* plants where one ♀ was observed several times bending the abdomen towards the stems and leaves. The egg was attached to the thickly haired small terminal leaf of the host-plant (Fig. 4). Later, further eggs were found in similar positions. Most of them were laid singly but sometimes two or even three had been deposited close together. The ♀♀ interrupt oviposition several times to nectar on the flowers of their larval host-plant. Earlier in 1993, B. Mollet already took a photo of an ovipositing ♀. Between 17:00 and 17:30 h, in the last sunshine of the day, ♂♂ were observed flying rapidly low over the ground and searching for ♀♀. GMT observed one ♀ in calling position: the abdomen is curved dorsad with the posterior end pointing ventrad and with the wings lowered exposing the dorsal parts of the intersegmental cuticle of the abdomen. Such sexual behaviour was first discovered by Subchev (1996) and Hallberg & Subchev (1997) for *Theresimima* Strand, 1917, and was also found in the genera *Rhagades* Wallengren, 1863, *Zygaenoprocris* Hampson, 1900, *Adscita* Retzius, 1783, *Jordanita* Verity, 1946 (Efetov 2001: 24, pl. 53, figs. 1–7), and *Illiberis* Walker, 1854 (Nishihara & Wipking 2003: 116, fig. 3). The ♀♀ are extremely difficult to spot, but more easily so against the sun. As the Turkish time does not correspond with the astronomic time of the sun, approximately two hours have to be added to the time of the observation in order to obtain the actual astronomic time at the locality (corrected time of last observation: about 19:00–19:30 h).

Description

Ovum (Fig. 4). Ovoid, pale yellow, surface with fine longitudinal ribs; length 0.8 mm, breadth 0.5 mm, height 0.4 mm; deposited singly or in groups of 2–3. Duration of egg stage variable, in captivity between 5 and 15 days (KAEC: 5–6 d, BMF: 6–10 d, GMTA: 7–15 d).

Larva

First instar. Length 1.1 mm, breadth 0.3 mm. Body light yellow, head brown, first thoracic segment with sclerotized, light brown T-shaped dorsal plate. Thoracic legs light brown, prolegs light yellow, anal comb light brown. Setae (first abdominal segment): 2 dark dorsal setae, 1 light subdorsal seta, 2 light lateral setae [D: 2*d,* 0*l*; SD: 0*d*, 1*l*; L: 0*d*, 2*l*] (Efetov 2001: 20, fig. 24, 2004: 154, fig. 55). This setal combination is typical for the subgenus *Adscita* Retzius, 1783 (Efetov & Tarmann 1999: 9). However, some specimens have 1 light and 1 dark dorsal seta [D: 1*d*, 1*l*; SD: 0*d*, 1*l*; L: 0*d*, 2*l*]. The same variation has been observed in *A. geryon* (Efetov et al. 2000: 88, Efetov 2001: 17, 2004: 143). Duration of L_1: 6 d (KAEC), 12–14 d (GMTA).

Second instar. Length 2.0 mm. Body light yellow, mediodorsal line light brown. Head, prothoracic plate and anal comb brown. Thoracic legs light brown, prolegs light yellow. Setae (first abdominal segment): [D: 7–8*d,* 3*l*; SD: 4–6*d*, 3*l*; L: 0*d*, 2*l*]. Duration of L_2: 5–6 d (KAEC), 8–16 d (GMTA).

Third instar. Length 2.5 mm [measurement taken immediately after moulting]. Light yellow, mediodorsal and dorsolateral lines light brown (dorsolateral lighter than mediodorsal). Anal comb with 11 setae. Two light brown spots above anal comb. Setae (first abdominal segment): [D: 11–14*d,* 4*l*; SD: 9*d*, 6*l*; L: 3*d*, 4*l*]. Duration of L_3: 6–7 d (KAEC), 8–21 d (GMTA).

The larvae were reared on *Helianthemum georgicum* Juz. & Pozd. by KAEC and on *Helianthemum nummularium* (L.) Mill. by GMTA. In captivity, larvae of L_1–L_3 produced short gallery mines in the leaves of *H. georgicum,* the length of the mines being up to two-thirds that of the body of the larva. On *H. nummularium* no leaf mining habit was observed. The larvae fed exclusively by scratching the parenchyma of the leaves, producing small grooves. In Crimea the larvae also accepted *Helianthemum grandiflorum* (Scop.) DC. as a host-plant.

Fourth instar. Length of body 3.5 mm. Greyish yellow with light brown mediodorsal, dorsolateral and lateral lines; prolegs and ventral part of abdomen yellow. Spined macrotubercles present on mediodorsal line, more densely posteriorly, tubercles mainly with one spine only. Peritreme of spiracles dark brown. Dorsal setae

of first abdominal segment [D: 21*d*, 4*l*], the dark setae significantly shorter than the light setae. Duration of L_4: 12 days (KAEC), 258–277 days (with diapause) (GMTA). In Austria the L_4 larvae showed remarkable variation in coloration, some being almost uniform greyish black. During the winter the larvae came out of diapause several times and searched for food.

Fifth instar. Length of body 3.5–4.0 mm. A visible colour change was noted, the larva having become darker. Mediodorsal and dorsolateral lines dark reddish brown, mediodorsal line double, divided by a whitish central line, lateral line and basal line light brown; dorsal and subdorsal verrucae orange and edged with white laterally, lateral and ventral verrucae yellow. Prolegs and ventral part of abdomen yellow. Peritreme of spiracles light brown, poorly visible on lateral line. Spots above anal comb now confluent, forming an arc-shaped brown spot. Number of spined macrotubercles increased, these now situated on mediodorsal line and also on dorsolateral line, most with one spine but some already multispined. Dorsal setae of first abdominal segment [D: 23*d*, 9*l*]. Duration of L_5: 14–28 d (KAEC), 12–16 d (GMTA). As in the L_4, in Austria some L_5 larvae were also very dark, almost uniform greyish black whereas others showed the above-mentioned typical pattern.

Sixth instar. Length of body 3.8–4.5 mm (in Crimea), 8.0–12.5 mm, fully grown (in Austria). Similar but darker than L_5. Mediodorsal and dorsolateral lines as in L_5. Lateral line brown, basal line greyish brown. Dorsal verrucae as in L_5, subdorsal verrucae light brown with slightly pronounced white edging laterally, lateral verrucae light brown, ventral verrucae yellowish grey. Ventral part of abdomen yellowish grey, prolegs yellow. Number of spined macrotubercles increased, mainly on mediodorsal and dorsolateral lines but also on lateral line and a few on basal line. Dorsal setae of first abdominal segment [D: 25*d*, 11*l*]. Duration of L_6: 22–41 d (KAEC), 12–14 d (GMTA). In Austria there were still some uniform greyish black larvae amongst the others.

In Austria the larva overwintered in L_4, in Crimea in L_7. In Austria pupation took place after L_6, in Crimea after L_8.

Seventh instar (observed in Crimea only). Length of body 5.0–5.5 mm. Larva distinctly larger and darker. Mediodorsal line blackish brown, divided by greyish central line, dorsolateral line blackish brown, lateral line and basal line brown. Dorsal verrucae dark orange and edged with white ventrally (below), subdorsal verrucae light brown edged with diffuse grey dorsally and ventrally (above and below), lateral and ventral verrucae brown. Ventral part of abdomen greyish brown, prolegs orange. Anal comb well pronounced with 10 setae. Head, prothoracic plate, thoracic legs, spot above anal comb and anal comb dark brown. Peritreme of spiracles grey. Spined macrotubercles densely covering especially the mediodorsal and dorsolateral lines but also on lateral and basal lines and in the intersegmental area between the verrucae, mainly multispined. Dorsal setae of first abdominal segment [D: 35*d*, 12*l*], the dark setae short, the light setae long with dark apices. Duration of L_7: 159–182 d (diapause).

Adult larva, eighth instar (Fig. 5) (observed in Crimea only). Length of body 8.0 mm. Coloration as in L_7. Spined macrotubercles multispined, spines with crown-shaped apices (Efetov 2004: 177, fig. 111), spined microtubercles unispined, apices pointed (Efetov 2004: 180, fig. 131). Anal comb 10–13 setae (Efetov 2004: 189, fig. 156). Dorsal setae of first abdominal segment [D: 40*d*, 20*l*]. When constructing the cocoon prior to pupation, the colour of the larva changes, the dorsal verrucae become lighter and of the same colour as the lateral edging, to form a broad light yellow band, the coloration of the lines and other verrucae not changing significantly. Duration of L_8: 22–23 d, period from the beginning of the construction of the cocoon to pupation: 6–8 d.

Cocoon. Length 10.0–12.5 mm. Fusiform, white, silk not very dense.

Pupa. Length 7.2–8.5 mm. Head, thorax, wings and abdomen smooth, shiny light brown; abdomen with dark brown mediodorsal and dorsolateral lines. Duration of pupal stage: 15–19 d (KAEC and GMTA).

The imagines emerge during the morning (Figs. 6, 7). 12 individuals emerged in Crimea (KAEC) and 9 in Austria (GMTA).

Observations

(by B. Mollet)

Locality 1: Turkey, Prov. Niğde, Bolkar Dağları, S. of Ulukışla, road to Madenköy, 1100 m.

Locality 2: Turkey, Prov. Niğde, Bolkar Dağları, S. of Ulukışla, road to Madenköy, 1600 m.

Locality 3: Turkey, Prov. Niğde, Bolkar Dağları, S. of Ulukışla, W. of Madenköy, vic. Karagölü, 2500–2600 m.

The larval host-plant has been observed without any discontinuity from 1100 m to 2600 m. At 1100 m (30. v. and 5. vi. 1993) the biotope is an old pine plantation protected from grasing by a fence and the *Helianthemum* is there very abundant and large (20–30 cm in diameter). The specimens of *A. capitalis* are large (fwl. of ♂♂ 10.0–10.5 mm). *Adscita (Adscita) obscura* (Zeller, 1847) is also occurring at that locality. At 1600 m (13. vi. 1992) the biotope is a small hill with oak bushes (1–3 m high), pine trees and meadows. The size of the *Helianthemum* plants is smaller (10–20 cm) and the moths are smaller (fwl. of ♂♂ 10.0 mm). *A. obscura* and *Jordanita (Roccia) budensis* (Speyer & Speyer, 1858) are also occurring at that locality. Higher up the size of the host-plant is decreasing to a low prostrate plant. Also the specimens of *A. capitalis* become smaller and the fwl. of the ♂♂ does not exceed 7.5–8.5 mm. At a hight of 2600–3000 m *Zygaena (Agrumenia) formosa* Herrich-Schäffer, 1852, is on the wing at the same time as *A. capitalis*. In 1993

Figs. 1–2: Localities of *Adscita (Adscita) capitalis* (Staudinger, 1879) in Turkey, Prov. Niğde, Bolkar Dağları, S. of Ulukışla, W. of Madenköy, vic. Lake Karagölü. **Fig. 1:** Moths of *A. (A.) capitalis* were collected at the altitude 2500–2600 m (photo: K. A. Efetov 1999). **Fig. 2:** Vic. Lake Karagölü, 2500 m. Biotope of *A. (A.) capitalis* and *Zygaena loti senilis* Burgeff, 1914 (photo: G. M. Tarmann 1999). **Fig. 3:** *Helianthemum canum* (L.) Hornem. (Cistaceae). Larval host-plant of *A. (A.) capitalis* (biotope see Fig. 2) (photo: K. A. Efetov 1999). **Fig. 4:** Egg of *A. capitalis* on the felty leaf of *Helianthemum canum* (L.) Hornem. (Cistaceae) (biotope see Fig. 2) (photo: K. A. Efetov 1999). **Fig. 5:** Adult larva, 8th instar, of *A. capitalis,* ex ovo, reared in Crimea (photo: K. A. Efetov 2000). **Fig. 6:** *A. capitalis,* ♂, ex ovo, reared in Crimea (photo: K. A. Efetov 2000).

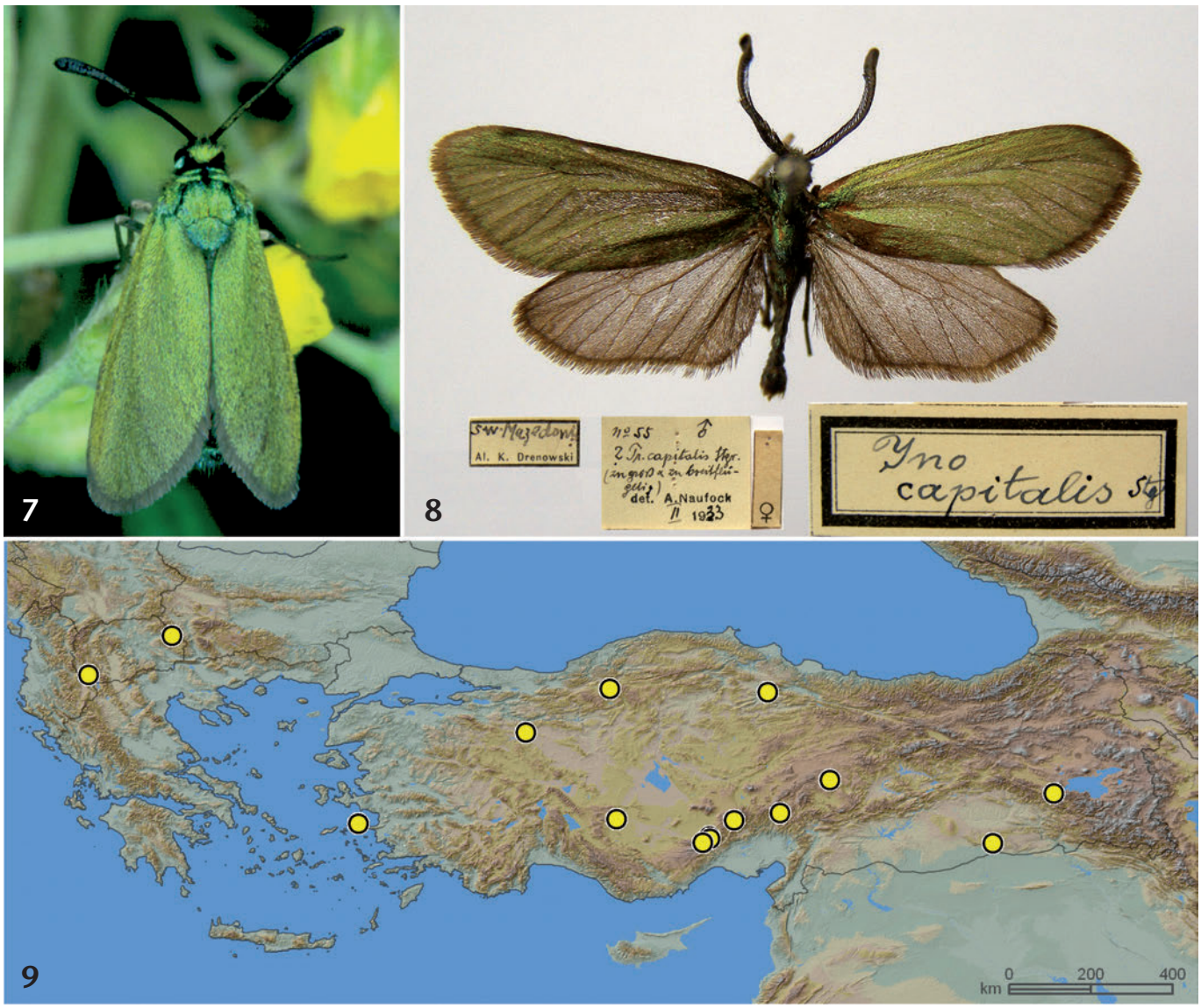

Fig. 7: *A. (A.) capitalis*, ♀, ex ovo, reared in Crimea (photo: K. A. Efetov 2000). **Fig. 8:** *A. capitalis*, ♂, original specimen mentioned by Drenowsky (1921), Drenowski (1930) and Rebel & Zerny (1934) and rediscovered by S. Beshkov and V. Krpach in BNMS (photo: V. Krpach 2007), with pin labels. — **Fig. 9:** Map of the distribution of *A. (A.) capitalis*.

flying of *A. capitalis* was observed at 1100 m on 30. v. and 5. vi. (B. Mollet), at 2500 m on 8. vii. (F. Carbonell) and 2.–8. viii. (B. Mollet). It is interesting to state that in spite of the difficult climatic conditions at 2500 m the flying period is very long (1 month) and from the lowest habitats to the highest (2 months).

Distribution

So far *A. capitalis* is known from Macedonia, the eastern Greek islands and Turkey (Drenowsky 1921, Drenowski 1930, Rebel & Zerny 1934, Efetov & Tarmann 1994, 1999, Mollet 1995, Naumann et al. 1999, Efetov 2001, 2004), see map in Fig. 9.

List of localities figured in the map and depositories of material:

Macedonia

Galičica Planina, Ochrid, 1000–1700 m (A. K. Drenowski) (BNMS); Bigla Planina, Delčevo, 1000–1700 m (A. K. Drenowski) (Drenowsky 1921, Drenowski 1930, Rebel & Zerny 1934: 123, Alberti 1966: 473) (specimen not traced).

Remark: For a long time these two specimens have not been found by us in collections. All material from the above mentioned localities collected by Rebel and Zerny deposited in the NHMW and examined by G. M. Tarmann belongs to *Adscita (Adscita) geryon* (Hübner, 1813). Parts of the collection of A. K. Drenowski (= Drenowsky) are deposited in the Macedonian Natural History Museum in Skopje but were partly destroyed in the earthquake in 1963. This collection was visited and examined by G. M. Tarmann in April 2007. No specimens of *A. capitalis* could be found. Finally, S. Beskhov (Sofia) and V. Krpach (Skopje) discovered one of the two specimens in the collection of the BNMS in Sofia. This specimen (Fig. 8) is larger (length of forewing 12.0 mm) than *A. capitalis* from Turkey and has an original determination label by A. Naufock with a question mark (in Fig. 8). From this label it is visible that even Naufock, who did not dissect the specimen, was in doubt whether it is really *A. capitalis*. In 2008, during the XI International Symposium on Zygaenidae in Sofia, this specimen could be examined and finally dissected by K. A. Efetov. Accor-

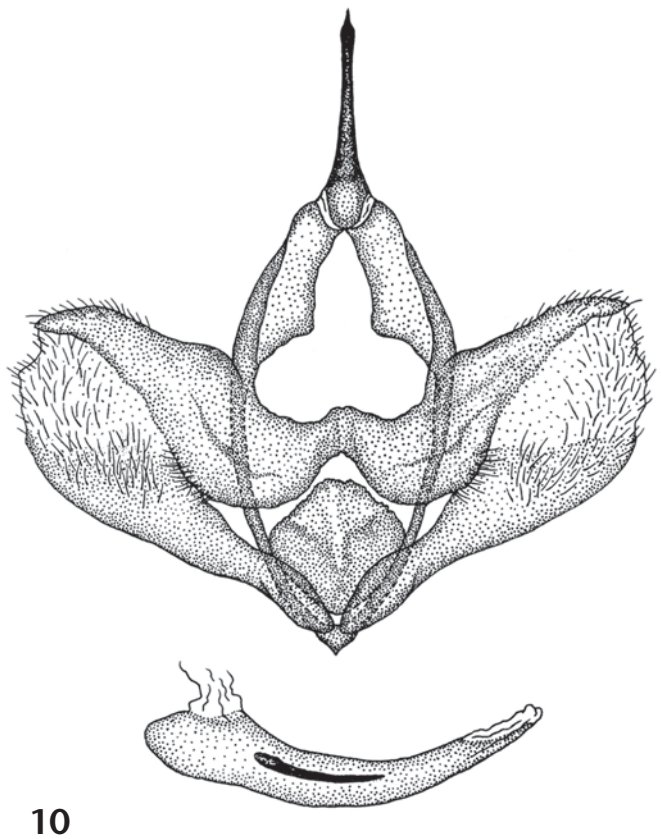

Fig. 10: *A. (A.) capitalis,* ♂ genitalia of the specimen mentioned by Drenowsky (1921), Drenowski (1930) and Rebel & Zerny (1934) (specimen see Fig. 8).

ding to the genitalia characters (Fig. 10), it is in fact a very large specimen of *A. capitalis*. The second specimen (from Bigla Planina) has not been found.

Greece

Île de Samos, 1150 m, 2. vi. 1992 (M. Delnoye) (CBM) (Mollet 1995: 134); Samos, Karvouni, 1360 m, 6.–11. vi. 1993 (M. Delnoye) (CBM); Samos, Mt. Vigla (Kerketevs Oros), 1100–1430 m, 20. vi. 1989 (A. Olivier) (CBM).

Turkey

Eski Chehir [Eskişehir], viii. 1900 (Werner) (CMWM); Eskipazar S., Cankırı, 950 m, 7. vi. 1986 (E. Hüttinger) (TLMF); Kızılören, 34 km W. Konya, 1500 m, 14. vi. 1997 (W. ten Hagen) (CBM); Konia [Konya], 1899 (M. Korb) (ZMHB); Amasia [Amasya] (lectotype, paralectotypes) (ZMHB) (Efetov & Tarmann 1994: 85, 90, figs. 25–27); Amasia (S. Alphéraky) (ZIAN) (Efetov 2001: 213, plate 34, fig. 14.1); Ulukışla S., Niğde, 1100 m, 30. v. 1993 (B. Mollet) (CBM) (Mollet 1995: 135); Bolkar Dağları N., Niğde, 2000–3000 m, 19.–20. vii. 1995 (F. Carbonell) (CBM); Karagöl N., 10 km W. Madenköy, Bolkar Dağları N., Niğde, 2500–2600 m, 8. viii. 1993 (B. Mollet) (CBM) (Mollet 1995: 135); Karagöl N., 10 km W. Madenköy, Bolkar Dağları N., Niğde, 2500–2600 m, 8. vii. 1993 (F. Carbonell) (CBM), 27. vii. 1998 (F. Carbonell) (CBM) (Mollet 1995: 135); Karagöl N., 10 km W. Madenköy, Bolkar Dağları N., Niğde, 2500–2600 m, 23–24. vii. 1999 (K. A. Efetov, G. M. Tarmann & W. G. Tremewan) (TLMF, CKAE); Hadjin, 1885 (ZMHB); Hadjin (= Saimbeyli), Adana, 1200 m (TLMF, ZSBS); Cukurbağ, E. Camardı, Niğde, 1600–2000 m, 1.–6. vii. 1983 (W. Eckweiler) (TLMF); Gürün, 19.–30. vi. 1976 (Friedel) (CMWM); Gürün, Sivas, 1500–1700 m, 15.–29. vi. 1983 (H. van Oorschot) (ZMA) (Mollet 1995: 135); Mardin (CMWM, TLMF); Bitlis (ZFMK).

There are additional specimens in CMWM, NHMW, TLMF, ZFMK, ZIAN, ZMHB, ZSBS. Their labels give no exact localities.

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Wasseraufnahme und Wasserabgabe („Mud-puddling") bei *Iphiclides podalirius* (Linnaeus, 1758) in Deutschland (Lepidoptera: Papilionidae)

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Die Wasser- und Mineralienaufnahme von Tagfaltern ist ein oft beobachtetes Phänomen (Hesselbarth et al. 1995: 666, SBN 1987: 402, Ebert & Rennwald 1991: 407 etc.) und wurde von Beck et al. (1999) für tropische Arten genauer untersucht. Danach suchten männliche Falter der Familien Papilionidae und Pieridae NaCl-haltige Feuchtstellen auf, während Vertreter der Familien Nymphalidae, Hesperiidae und im Besonderen Lycaeniden Wasserstellen mit zusätzlich Proteinen beziehungsweise Peptiden bevorzugten. Man interpretiert dieses Verhalten als Möglichkeit der Lebensverlängerung, Steigerung der Fekundität und einer Attrakivitätssteigerung der ♂♂ bei der Kopula.

Massenansammlungen von Tagfaltern an Feuchtstellen sind in Mitteleuropa eher die Ausnahme. Der stetige Rückgang der Arten- und Individuenzahlen in unseren Breiten führen dazu, daß man das „Mud-puddling" nur ausnahmsweise in großer Individuendichte beobachten kann und es ein Phänomen vor allem der Subtropen und Tropen ist.

In Ländern mit heißen und trockenen Sommern wie beispielsweise der Türkei und dem Iran wurden auch in den letzten Jahren vom Autor noch große Ansammlungen von Faltern an Feuchtstellen festgestellt. So konnten in der Osttürkei (Dez-Tal) auf einem Stein, der einen Durchmesser von etwa 35–40 cm hatte, am 7. vii. 1992 zirka 70 ♂♂ von *Pseudophilotes bavius* (Eversmann, 1832) beobachtet werden. Der Stein ragte aus einer feuchten Stelle heraus und war so dicht von den Faltern besetzt, daß man ihn nur an den Rändern sehen konnte. Eine bei Entomologen bekannte Stelle mit gelegentlichen Massenansammlungen von Schmetterlingen sind Quellen im nördlichen Munzur-Gebirge in der Nähe des Dorfes Caglayan (Türkei, Provinz Erzincan). Hier werden von den Hirten Schafe und Ziegen zur Tränke geführt. Der Urin und die Exkremente der Tiere ergeben zusammen mit dem Quellwasser offenbar eine perfekte Stelle zur Aufnahme der benötigten Ressourcen. Zahlreiche weitere Örtlichkeiten in Zentral- und Ostanatolien sind in Hesselbarth et al. (1995) aufgeführt. Auch in der Umgebung der ostanatolischen Metropole Hakkari konnten weitere Beobachtungen gemacht werden. So gelang am 13. vii. 2009 ein seltenes Foto zweier Papilioniden, *Iphiclides podalirius* (Hübner, [1819]) und *Papilio machaon* (Linnaeus, 1758), die direkt nebeneinander Wasser und Mineralien aufnahmen (Abb. 1).

Oftmals beobachtet man deutlich getrennte Falteransammlungen: sämtliche Bläulinge sitzen an einer Stelle, Pieriden an einer weiteren und Melitaeen und Hesperiden an einer anderen, während man Satyriden nur selten am Wasser sieht. Es scheint dabei so zu sein, daß sich die ersten Tiere danach orientieren, wo die begehrten Stoffe leicht aufzunehmen sind, während die nachfolgenden Falter sich optisch ausrichten und dort niederlassen, wo bereits Vertreter ihrer Gruppe versammelt sind.

In keinem Fall wurde vom Autor bisher neben der Aufnahme von Wasser und anderen Stoffen auch eine Abgabe von Flüssigkeit beobachtet. Auch eine Anfrage bei Kollegen (unter anderen bei Jürgen Rodeland, Administrator des „Lepiforums") ergab bisher keine Hinweise, daß in unseren Breiten Schmetterlinge auch Flüssigkeit abgeben, wie dies bei tropischen Arten oftmals der Fall ist (Beck et al. 1999, Beck 2007). Nun kann von einer erstmals gelungenen Beobachtung von Wasserauf- und -abgabe in Deutschland berichtet werden.

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