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Extended distribution patterns of the Arabian burnet moth *Reissita simonyi* (Rebel, 1899) (Lepidoptera: Zygaenidae) and the Arabian wall brown *Lasiommata felix* (Warnecke, 1929) (Lepidoptera: Nymphalidae: Satyrinae) in Southern Arabia

With 5 figures

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Clas M. Naumann passed away on 15 February 2004

Zusammenfassung

Die aktuelle Verbreitung zweier im Jemen vorkommender Schmetterlingsarten, *Lasiommata felix* (Warnecke, 1929) und *Reissita simonyi* (Rebel, 1899) werden vorgestellt. Beide Arten sind endemisch in der Arabischen Halbinsel, und ihre Verbreitung war bisher nur lückenhaft bekannt. Einerseits fasst der Artikel die Resultate zahlreicher Feldaufenthalte nach Südarabien in den Jahren 2001/2002 zusammen, andererseits werden zusätzliche bereits publizierte Arbeiten einer aufmerksamen Aufarbeitung hinsichtlich der Verbreitung unterzogen. Zahlreiche neue Fundorte für beide Schmetterlingsarten im Jemen werden veröffentlicht. Gegenwärtig ist *Reissita simonyi* von Al Hada, vic. Ta´if, Asir in Saudi-Arabien bis zur Province Dhofar, Jabal Samhan, N von Juffa im Oman bekannt. *Lasiommata felix* ist von Ta´if in Saudi-Arabien bis zur Region Jaffah, östlich von Taiz/Jemen in Südarabien verbreitet. *L. felix* scheint auf den westlichen Gebirgszug entlang des Roten Meeres beschränkt zu sein, während *R. simonyi* eine Teilung in zwei Subspezies zeigt: *R. simonyi yemenicola*, welche ebenfalls entlang des Roten Meeres zu finden ist und *R. simonyi simonyi*, welche entlang des Indischen Ozeans bis in den Oman verbreitet ist. Des Weiteren ist in diesem Zusammenhang eine kurze Beschreibung der morphologischen Merkmale und phylogenetischen Verwandtschaftsbeziehungen dieser Arten gegeben.

Summary

The extended distribution patterns of two faunal elements of Yemen, *Lasiommata felix* (Warnecke, 1929) and *Reissita simonyi* (Rebel, 1899) are presented. Both species are endemic to the Arabian Peninsula and information about distribution patterns has been rather fragmentary so far. The paper summarizes the results of several field trips to Southern Arabia in 2001/2002 and reviews additional published evidence on the distribution patterns. Numerous new localities for both studied species from Yemen are offered. Currently, *Reissita simonyi* is known from Al Hada, vic. Ta´if, Asir in Saudi Arabia to Province Dhofar, Jabal Samhan, N of Juffa in Oman. *Lasiommata felix* is distributed from Ta´if, Saudi Arabia to the Jaffah area, E of Taiz/Yemen in Southern Arabia. *L. felix* seems to be limited to the western escarpment along the Red Sea, whereas *R. simonyi* shows a division into two subspecies: *R. simonyi yemenicola*, which also occurs along the mountainous areas along the Red Sea and *R. simonyi simonyi*, which is distributed along the Indian Ocean. Furthermore, a brief description of morphological characteristics and phylogenetic relationships of these species is given in this context.

Keywords

Reissita simonyi, *Lasiommata felix*, distribution pattern, endemism, Southern Arabia, Yemen

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Introduction

The Arabian Peninsula is of particular interest for evolutionary biologists, since it represent a biogeographical link between Africa, Europe and Asia. As a consequence, the flora and fauna of the Arabian Peninsula contain many taxa, which show evolutionary connections to ancestors from all of these areas. Especially the butterfly fauna of Southern Arabia raised great interest among scientists (Rebel, 1907, Gabriel, 1954, Larsen, 1977, 1979, 1980a, 1982, 1983, 1984a, 1987, Pittaway, 1979, 1981, Wiltshire, 1980, 1982, 1983, 1986, 1990, Hacker, 1999, Hacker et al., 2001). This enormous interest was also raised by the high degree of endemism in Lepidoptera in this region. Larsen (1984) pointed out that about 10 % of the butterfly fauna in this area is endemic to Arabia. Moreover, he emphasized that about 20 species show distinct Arabian subspecies. Our work concentrated on two different species, which differ in habitat requirements, distribution patterns and evolutionary origin. The species examined in this paper are *Reissita simonyi*, Rebel, 1899 (Zygaenidae, Lepidoptera) and *Lasiommata felix*, Warnecke, 1929 (Satyrinae, Lepidoptera). *L. felix* has an assumed Palaearctic, *R. simonyi* an assumed Afrotropical origin, but both are endemic to Southern Arabia. Moreover, *R. simonyi* shows the extraordinary feature of its division in two subspecies: *R. simonyi simonyi* and *Reissita simonyi yemenicola*. The distribution ranges of the two subspecies seem to be allopatric. The main goal of this work was to provide actual distribution maps of *Reissita simonyi* and especially for *Lasiommata felix*, where no detailed distribution map has been available so far. In this context, a review of already published records and statements was also carried out to clarify distribution ranges of these two species.

Material and Methods

The observed data presented in this work were carried out in four field trips (June/July and September/October 2001; March/April and June/July 2002). Additionally, data from Naumann & Edelmann (1984) was included and further completed by literature records as well as personal communications. The different localities visited are listed under list of records. GPS data were recorded with GARMIN GPS 12. For *R. simonyi*, usually larvae were knocked off from shrubs using a stick and a box to catch them. For *L. felix*, adults were caught with a standard butterfly net. Specimens were stored in 99 % pure ethanol.

***Reissita simonyi* (Rebel, 1899)**

Zygaena simonyi Rebel, 1899: 359-361.

Specimens examined

Where possible, geographic information not included in the original sources was added, mainly from (Encarta World Atlas, 1999). Abbreviations: ZFMK = Alexander Koenig Research Institute and Museum of Zoology, CMN = private collection of Clas M. Naumann, BMNH = British Museum of Natural History, NHMW = Vienna Natural History Museum. Record numbers correspond to numbers given in maps. Some records are not given in map, because coordinates and/or geographical positions were not sufficiently known.

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***Reissita simonyi yemenicola* (Tremewan, 1959):**

= *Reissita sylviae* Tremewan, 1959: 213-217 (syn. nov., Naumann & Edelmann, 1984).

Saudi Arabia: 1 larvae, Asir, Al Hada, vic. Ta´if, 1200 m, Pittaway; **2** 1♂, Asir, An-Namaah, 20°14'N 41°16'E, 2100 m, 11.IX.1983, Büttiker; **3** 1 specimen, Asir, Wadi Jurah, vic. Jizan, 500 m, 1.XII.1981, Talhouk (not shown in map); **4** larvae, Asir, Mikhwa, 19°90'N 41°60'E, Pittaway; **5** larvae, 1♀, 1♂, Asir, Muhayil, 18°16'N 41°80'E, 75 km NW Abha, 400 m, 7.XI.1982, Pittaway, **6** larvae, Asir, Abha, 18°13'N 42°29'E, ca. 2500 m, Pittaway; 7 larvae, Asir, vic. Mifah, Pittaway (not shown in map); **8** larvae, Asir, Al Foqa, Pittaway (not shown in map).

Yemen: 9a larvae, Province Sadah, J. Razah, vic. Zerra´a, 2050-2100 m, 11.VI.2001, Klütsch & Naumann, CMN; **9b** larvae, Province Sa´ada, Jabal Razah, 16°50'E 43°18'N, 2300 m, 12.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **10a** larvae, Province Sa´ada, Zera´a (Jabal Razah), 16°52'E 43°20'N, 2300 m, 11.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **10b** larvae, Province Sadah, J. Razah, 200 m below Summut, 16°52'E 43°20'N, 2150 m, 12.VI.2001, Klütsch & Naumann, CMN; **11** larvae, Province Hajjah, N Hajjah, 15°55.975'N 43°32.689'E, 1521 m, 26.VI.2002, Klütsch, Tissue collection, ZFMK; **12a** larvae (e. l. 9.IX.1982 1♀), Province Hajjah, 7 km W Kohlan, road to Hajjah, 15°44'N 43°42'E, 9.-10.V.1982, Naumann, CMN; **12b** 1 specimen, Province Hajjah, between Kohlan and Wadi Shares (way to Hajjah), 1500 m, B. Turlin (personal communication); **13a** larvae, Province Manakhah, 15°42.734'N 43°35.638'E, 1987 m, 27.VI.2001, Klütsch, Tissue collection, ZFMK; **13b** larvae, 2820 m, 27.VI.2001, Klütsch, Tissue collection, ZFMK; **13c** larvae, Province Kohlan, Bait Zarefat, 15°42.74'N 43°35.63'E, 1987 m, Klütsch, Tissue collection, ZFMK; **13d** larvae, 1-2 km from Bait Zarefat, 14.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **14** larvae, Province Hajjah, Hajjah, 15°41'N 43°36'E, 2600 m, 14.VI.2001, Klütsch & Naumann, CMN, Tissue collection, ZFMK; **15a** larvae (1♀ e. l., 22.VII.1982), Province Al Machwit, Al Hijrah, Jabal Haiadi, 15°40'N 43°29'E, 1800 m, 31.V.1982, Naumann, CMN; **15b** larvae, 8.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **16** larvae (2♂♂, 1♀ e. l.), Province Al Mahwit, 1-5 km NNW Al Mahwit, Jabal Radman, 15°32'N 43°49'E, 2300 m, 8. + 25.VII.1982, Naumann, CMN; **17a** eggs, first instar larvae, imagines observed, Shamat (between At Tawilah and Shibam), 15°29'N 43°44'E, 1900 m, 1.VI.1982, Naumann, CMN; **17b** eggs, larvae, Province Al Machwit, 5,5 km W At Tawilah, Beni Khaiat, 15°29'N 43°44'E, 1.VI.1982, Naumann, CMN; **18** larvae (e. l. 1♀, VII. 1982), Province Al Machwit, Bait Turki, Jabal Haiadi, 1700 m, 31.V.1982, Naumann, CMN (not shown in map); **19a** Imago, 1♂, Al Rujum (between Al Mahwit and At Tawilah), 15°29'N 43°40'E,1800 m, leg. B. Turlin, coll. C. Naumann; **19b** larvae, Ar Rajun, Road Shibam-Mahwit, 15°28'N 43°50'E, 8.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **19c** larvae, Al Mahwit, 15°29'N 43°33'E, 2100 m, 8.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **19d** larvae, 14.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **20** 2♂♂, 1♀, Province Manakhah, Jabal Al Khamis, Al Haima, 15°09'N 43°56'E, 2700 m, 30.V.1982, Naumann, CMN; **21a** larvae, Province Al Qubba, J. Masnah area, 5 km S Al Qubba, 14°36'N 44°12'E,2300 m, 5.VI.2001, Naumann, CMN; **21b** ♂, ♀♀ (forma sylviae), Province Dhamar, Jabal Masnah area, 5 km SW Al Qubba, 14°36'54'N 44°12'38'E, 2200-2400 m, 5.III.1980, Edelmann & Naumann, CMN; **21c** lar-

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vae, 4.VI.2001, Naumann, Tissue collection, ZFMK (not shown in map); **22** larvae, Province Menakhah, vic. Hajjarah, 15°04'N 43°42'E, 2500 m, 26.X.2001, Naumann, CMN; **23a** larvae, Al Hudaib/Menakhah, 15°02.641'N 43°45.132'E 2818 m, 26.VI. 2001, Klütsch, Tissue collection, ZFMK; **23b** Province Sana´a, Jabal al Hotep (S Menakhah), 15°02'N 43°38'E, 2800 m (more localities than written), 26.II.2000, Hacker et al.; **24** larvae, Province Dhamar, Jabal-as Sharq, 14°42.54'N 44°09.41'E, 2300 m, 4.VI.2001, Naumann, CMN; **25a** imagines, Jabal Masnah, 30 km SW of Ma´abar, 14°35'N 44°08'E, 9.III.1938, Scott & Britton; **25b** eggs, larvae, pupae, imagines, Jabal Masnah area, 2 km N Al Qubba, 2300-2400 m, 3-7.III.1980, Edelmann & Naumann, CMN, **25c** 7♂♂, ♀♀ (forma sylviae), 30.VI.1980, Deckert, CMN; **25d** larvae, VIII.1981 (e. l. 1♂, 4.-8.X.1980), Deckert; **25e** larvae, 1♂, 6-7.VI.1982 (e.l. July 1982), Naumann, CMN; **25e** imago, 26.III.1999, Naumann, CMN; **25f** larvae, 3.VI.2001, Naumann, CMN; **25g** larvae, 3.VI.2001, Naumann, CMN; **25h** larvae, 5.VI.2001, Naumann, CMN; **25i** larvae, 18.X.2001, Naumann, CMN; **26a** larvae, Province Ibb, 4 km S Ibb, 13°58'N 44°10'E, 1600 m, 2-4.VI.1982, Naumann, CMN: **26b** larvae, 2100-2200 m, 16.X.2001, Naumann, CMN; **27** larvae, Al Manswra, 10 km W Ibb and W Jiblah, 13°58'N 44°08'E, 2200 m, 16.X.2001, Naumann, CMN; **28** Eggs, larvae, pupae, ♂♂, ♀♀ (forma sylviae), Province Ibb, Jabal Badaan, 14°00'N 44°10'E, 2400 m, 16-20.V.1982, Larsen, CMN; **29** Larvae, ♂♂, ♀♀ (forma sylviae), Province Ibb, Sumarah Pass, south-western slope, 2900-3000 m, 3-6.VI.1982, Naumann, CMN (not shown in map); **30** larvae, Sumarah, 4 km S Al Hosn, 14°16'N 44°10'E, 2700 m, 17.X.2001, Naumann, CMN (not shown in map); **31** larvae, Province Yarim, Yarim, 14°16.111'N 44°15.958'E, 2197 m, 18.VI.2001, Klütsch, Tissue collection, ZFMK; **32** larvae, 13 km W Yarim (Al Irian road), vill. Al Thahatein, 14°17'N 44°19'E, 2850 m, 17.X.2001, Naumann, CMN; **33** larvae, pupae, Al Jablah, 13°55.348'N 44°05.513'E, 2311 m, 19.VI.2001, Klütsch, Tissue collection, ZFMK; **34** larvae, Province Taiz, Dhi Al Sefal (= Dhi Sufal), 25 km N Taiz, 13°51'N 44°06'E, 1950-2050 m, 16.X.2001, Naumann, CMN; **35** larvae, Province Taiz, Al Alarifal, 13°49.852'N 44°06.089'E, 2396 m, 20.VI.2001, Klütsch, Tissue collection, ZFMK; **36a** larvae, Province Taiz, Jabal Sabir, 13°31.917'N 44°00.962'E, 2569 m, Klütsch, Tissue collection, ZFMK, **36b** larvae, vic. Hatab, 15.X.2001, Naumann, CMN; larvae, Province Taiz, Jabal Sabr, vill. Mahzaf, 2500-2600 m, 15.X.2001, Naumann, CMN; **37** larvae, Govenerate Lahaj, next village Tur-Al-Baha, Jabal Araph, 13°06'N 44°14'E, 1330 m, 22./25.VII.2002 and 1.VII.2002, Klütsch, Tissue collection, ZFMK; **38** larvae, Province Jaffah, Jabal Manwara, 13°47.280'N 45°11.040'E, 2311 m, 30.III.2002, Klütsch, Tissue collection, ZFMK; **39** larvae, E Labus, 13°54.016'N 45°17.325'E, 2256 m, Klütsch, Tissue collection, ZFMK; **40** larvae, S Al Bayda, 13°59'N 45°34'E, 2250 m, 30.VI.2002, Klütsch, Tissue collection, ZFMK.

Reissita simonyi simonyi (Tremewan, 1959)

Reissita simonyi simonyi Tremewan, 1959: 213-217.

Yemen: **41a** larvae, Korseban, 14°49.158'N 48°48.129'E, 1750 m, 15.X.2001, Klütsch, Tissue collection, ZFMK; **41b** larvae, 1950 m, 16.X.2001, Klütsch, Tissue collection, ZFMK; **42** larvae, Mola Matar, 14°47.701'N 48°46.709'E, 1750 m, 16.X.2001, Klütsch, Tissue collection, ZFMK; **43a** imago, Province Al Mahra, 5 km NW of Jadib,

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16°38'N 52°57'E, 600 m, 13.XI.2000, Naumann, CMN; **43b** imago, Province Al Mahra, 5 km NNW Jadib, 16°38'N 52°57'E, 600 m, XI.2000, Naumann, CMN; **44a** imago, Province Al Mahra, ca. 10 km NNE Al Hawf, 16°39'N 53°02'E, 650-700 m, XI.1999, Hein & Kilian, CMN; **44b** imago, 11.& 14.XI.2000, Naumann, CMN; **44c** larvae, Province Al Mahra, Al Hawf, 16°38.958'N 52°57.655'E, 800 m, 29./30.IX.2001, Klütsch, Tissue collection ZFMK; **44d** larvae, Province Al Mahra, near Al Hawf (near a spring), 16°38.290'N 52°56.643'E 792 m, 1.X.2001, Klütsch, Tissue collection, ZFMK; **45** imago, Province Al Mahra, ca. 5 km NNW Damqut, 16°34'N 52°48'E, 360-400 m, 12.XI.2000, Naumann, CMN; **46** larvae, Province Al Mahra, Damqut, 16°33.942'N 52°46.433'E 792 m, 2./3.X.2001, Klütsch, Tissue collection, ZFMK; **47** imago, ♀ (holotype), Ras Fartak, Wadi, III.1899, Simony, NHMW (not shown in map); **48** larvae, Ras Fartak, 15°50.270'N 52°00.100'E, 966 m, 6.X.2001, Klütsch, Tissue collection, ZFMK; **49** larvae, S-Ras Fartak, 15°37.583'N 52°11.53.7'E, 546 m, 10.X.2001, Klütsch, Tissue collection, ZFMK; **50** imago, 20 km N Seyhout, 15°17.348'N 51°10.902'E, 800 m (769 m), Naumann, CMN.

Oman: 51a imago, Jabal Al Qamar, 5 km N Rakhyut, Bait Sa´b, 16°46'N 53°20'E, 850-900 m, 6.XI.1997, Naumann, CMN; **51b** imago, Jabal Qamar, Naumann, CMN; **51c** imago, Jabal Qamar, vic. Arift: Bait Handawb, vic. Shaat, 950 m, 5+7.XI.1997, Naumann, CMN; **52a** imago, Province Dhofar, Jabal Qara, 1,5 km NNE Qairoon Hairitti, 17°16'N 54°06'E, 850 m, 2-3.XI.1997, Naumann, CMN; **52b** larvae, Province Dhofar, Jabal Qara, 1,5 km SW Qairoon Hairitti, 17°16'N 54°06'E, 850 m, 20.-31. XI.1999/2000, Naumann & Keil, CMN, Keil, Dresden, 4 spec. in Tissue collection ZFMK; **53** 1♂, 1♀, Province Dhofar, Jabal Qara (N of Salalah), Hatab, 2.IV.1978, Walker, Royal Scottish Museum, Edinburgh (not shown in map); **54a** imago, Jabal Samhan, 8 km E Tawi Attair, 17°07'N 54°38'E, 750 m, Naumann, CMN; **54b** imago, Jabal Samhan, 45 km N Agarhanawt Teyq waterhole, 17°09'N 54°37'E, 800 m, 3.XI.1997, V. Polak (personal communication), CMN; **55** larvae, Province Dhofar, Jabal Samhan, S-facing rocky slopes of Jabal Samhan along Wadi N of Juffa, 17°12'01'N 54°56'16'E, 455-737 m, 29.IX.2002, Meister & Oberprieler, Tissue collection, ZFMK; **56a** ♂♂, ♀♀, Province Dhofar, Qara mts., Khyount, 1750 ft. (530 m), 11.XI.1930, B. Thomas, BMNH (not shown in map); **56b** 1 specimen, Province Dhofar, Qara mts., Hamirar, 1500 ft. (460 m), 14.XI.1930, B. Thomas, BMNH (not shown in map); **56c** 1 specimen, Province Dhofar, Qara mts., Fusul, 1350 ft. (410 m), 15.XI.1930, B. Thomas, BMNH (not shown in map).

Description

In this context, only a brief summary about the differences between the two subspecies of *R. simonyi* is given. Detailed descriptions as well as drawings are available in Naumann & Edelmann (1984). The division in two subspecies is based on the following morphological characters:

1. Sexual dimorphism

A striking feature for division was the unusual sexual dimorphism of males of *R. s. yemenicola*. One morph (*f. simonyi*) is similar, although not identical to the blackish-blue female, while the second one (*f. sylviae*) is completely red and resembles the imagines of the Palaearctic genus *Zygaena* Fabricius 1775 whereas in *R. s. simonyi* males are always blackish-blue.

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2. Abdominal cingulation

R. s. yemenicola shows a reduction in the abdominal cingulation in comparison to *R. s. simonyi*.

Moreover, it seems that *R. simonyi yemenicola* shows a slightly smaller body size than *R. s. simonyi* and the mid-line interruption of the red patagia appears to be somewhat wider than in *R. s. simonyi* (Naumann & Edelmann, 1984). However, so far no detailed examination for the supposed different body size has been done.

Biology and Ecology

The larvae of *Reissita simonyi* are limited to the food plants of the genus *Maytenus* (Celastraceae): *M. senegalensis* and *M. dhofarensis*. The larvae exclusively feed on leaves of these taxa (Fig. 1).

Fig. 1: *Maytenus senegalensis*; the larval food plant of *R. simonyi*; photo taken from Tur-Al-Baha, Jabal Araph.

Therefore, the distribution of *R. simonyi* is strictly connected to the distribution of *Maytenus* (Celastraceae). Usually, the plants are relatively small caused by intensive grazing of goads and sheep (Fig. 2).

Occasionally, where strong rocks are present and the locality is protected, *Maytenus* bushes can reach 4 m in height. At the beginning of the rainy season, *Maytenus* shrubs develop fresh shoots after the first rain. Since the first instar larvae are dependent on these soft-leaved fresh shoots, the flight activity of the imagines appears to be limited to the arid periods before the rainy seasons. The first generation is limited to March; the second generation lasts from end of June till mid of July. The third and last generation continues from end of September till early October. The flight period is strictly correlated with these seasons. This corresponds to observations on other Zygaeninae feeding on Celastraceae (e. g. *Orna*, *Epiorna*, *Epizygaenella*).

A further ecological adaptation is the daily flight activity of *R. simonyi* which is limited to the hottest period of the day from 11 to 14:30. Naumann & Edelmann (1984) suggested that this behavior is important to safe energy, because imagines do not feed and drink during the entire imaginal phase. This behavioral specialization is mirrored by an extreme reduction of the proboscis. The larvae show further adaptations: the serrate setae are probably used to serve as crystallization points for

Fig. 2: *Maytenus senegalensis*; showing a small-sized specimen which is mostly found due to over-grazing. Photo was taken from Ras Fartak.

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condensation of water to supply additional water for the larvae. The precipitation is transported in form of fogs or humid air from the coast to the mountains.

Distribution

In the western part of the Arabian Peninsula an escarpment of mountains separates the lowland of Yemen and Saudi Arabia from the Central-Arabian plateau. The distribution of *Reissita simonyi yemenicola* is strongly connected to this western escarpment. *R. s. yemenicola* generally occurs in high altitudes from 1500 m to 2900 m, but can also be found down to 400 m sea level. The second subspecies, *R. s. simonyi* occurs on both sides of the Yemeni-Omani barrier along the Indian Ocean among 350-900 m above sea level.

Remarks

Reissita simonyi was described by Rebel in 1899 from a single specimen from Ras Fartak in Southeastern Yemen. In 1907, he gave detailed description of the habitus and provided morphological data. Scott & Britton (1942) collected a few specimens in 1938. In 1959, Tremewan established the new genus *Reissita* based on differences in wing venation and genital morphology. Moreover, Tremewan (1959) divided *Reissita simonyi* in two subspecies, *Reissita simonyi yemenicola* and *Reissita simonyi simonyi*. *Reissita simonyi yemenicola* is distributed in the mountainous areas along the Red Sea where as *Reissita simonyi simonyi* is distributed at both sides of the Yemeni-Omani border along the Indian Ocean. Since *Reissita simonyi yemenicola* features dimorphic males, Tremewan described another species for the northern populations, *Reissita sylviae*. In this case, *Reissita sylviae* and *Reissita simonyi yemenicola* shared one distributional area. In 1984, Naumann & Edelmann refused the species status of *Reissita sylviae* based on several facts: First of all, only males of *R. sylviae* are observed. No single red female of this species was observed ever. In other words, no reddish forms of females are known. Additionally, the two different forms of males do not vary in their behavior, period of activity or flight. Despite their different color both forms do not differ in morphological characters. Furthermore, red males mate with dark females. Moreover, there is only one type of larvae found which turn out red and black males. This leads to another aspect; both forms seem not to diverge in their ecological requirements. They are fed on the same food plant and have the same life cycles. All of these facts support *R. sylviae* to be conspecific with *R. simonyi.* Naumann & Edelmann (1984) came to the conclusion that *Reissita sylviae* is a junior synonym for *Reissita simonyi yemenicola*. Furthermore, they suggested to use the name *sylviae* for the red males (forma *sylviae*) to distinguish the two morphs of males in *Reissita simonyi yemenicola* (black morph should be named forma *simonyi*). The separation of two subspecies was still maintained because of the allopatric occurrence of *Reissita simonyi yemenicola* in the north and *Reissita simonyi simonyi* in the southeast. In addition, the dimorphic males only occur in the subspecies *R. s. yemenicola*, not in *R. s. simonyi*. These two aspects in combination with fore mentioned morphological differences (Wing pattern, abdominal cingulation) support the discrimination of two subspecies. In 1980, Wiltshire recorded seven specimens from Oman, which had been collected by Thomas in 1930. Two years later Wiltshire (1982) published one of the first records from Saudi Arabia, collected by Talhouk.

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Given the isolated distribution of *L. felix* and *R. simonyi* in Southern Arabia the evolutionary history is of particular interest. Possible origins of *R. simonyi* could be Africa with the Zygaenini genera *Orna*, *Epiorna*, *Neurosymploca*, *Zutulba*, and *Praezygaena*. Moreover, there could be a phylogenetic relationship to the genus *Epizygaenella* in the oriental region and to the genus *Zygaena* in the Palaearctic (Naumann, 1977, 1990). In this case, *Reissita* would be the sister group of *Epizygaenella* and *Zygaena* (Naumann, 1990, 1999) or to *Zygaena* alone (Naumann, 1977). Based on the male pheromone system (first described by Kames, 1980) which is shown in the genera *Reissita*, *Praezygaena*, *Epizygaenella* and *Zygaena* and the similar spindle shaped cocoons with a silk cushion of the genera mentioned above (no data available for *Praezygaena*) it is assumed that *Reissita* is closely related to these three genera (Naumann & Edelmann, 1984). Ongoing molecular approaches (Niehuis, personal communication) might clarify the phylogenetic position of the monotypic genus *Reissita*.

Results

During literature research, it became obvious that there is quite great confusion about the names of the two subspecies of *R. simonyi* and their distribution. According to statements made above, there are a few clarifications to be made:

- Naumann & Edelmann, 1984, page 487: It is written under point 6. 1. at the end of first line *R. simonyi*. This is incorrect. It should be read as *R. sylviae*.

- Naumann & Edelmann, 1984, page 491: in the description for forma sylviae is written "Forewing spots much more pronounced than in f. sylviae"; this should be read as "Forewing spots much more pronounced than in f. simonyi".

- Wiltshire, 1980, page 190: "A subspecies with a black abdomen, instead of red as in the Dhofar-Hadhramaut form, was described by Tremewan (1959) from the Yemen." So far as we know, no red form of *Reissita simonyi* is found in the area from Dhofar to Hadhramaut. Tremewan (1959) mainly distinguished between the two subspecies because of the different expressed abdominal cingulation. He mentioned also that the red form is exclusively found along the Red Sea.

- Wiltshire, 1982, page 276: Wiltshire wrote for a specimen found in Asir (Saudi Arabia) *R. simonyi simonyi*. Since Tremewan (1959) described the highland populations as *R. simonyi yemenicola* this specimen is given below in the list of records under *R. s. yemenicola*.

- Wiltshire, 1990, page 101: He did not name the subspecies *simonyi* particularly. He named *R. simonyi* on the one hand and *R. s. yemenicola* on the other. This might just be an oversight, but correctly one should read under *R. simonyi*, *R. simonyi simonyi* and *R. simonyi yemenicola*. In the first paragraph (under *R. simonyi*) he describes the distribution area of *R. s. simonyi* (Ras Fartak and South Oman) and uses the term "the typical subspecies", but did not mention the subspecies (*R. simonyi simonyi*) specifically, which might lead to confusion with the named subspecies *R. s. yemenicola*, which follows in the second paragraph.

- Hacker, 1999, page 34: It is written that *Reissita simonyi simonyi* is identical with *R. sylviae*. Naumann & Edelmann (1984, page 488) clearly pointed out that *R. sylviae* is a subjective junior synonym of *R. simonyi yemenicola*. Therefore, it should be read

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R. simonyi yemenicola is equal to *R. sylviae*. This synonym cannot be used for the subspecies *R. simonyi simonyi*. However, it would be correct to write that *R. sylviae* is conspecific with *R. simonyi*, because it does not form a species on its own.

Results further show extended distribution patterns for both chosen species, but especially for *Reissita simonyi* the results are very promising. *Reissita simonyi* has a so far known distribution extended from Al Hada, vic. Ta'if, Asir in Saudi Arabia to Province Dhofar, Jabal Samhan, N of Juffa (17°12'01'N 54°56'16'E) in Oman (Fig. 4). Moreover, it was possible to find populations within a distribution gap known in the past (Naumann & Edelmann, 1984).

Interesting new localities were found south-east Taiz (**37** Jabal Araph / **38** Jaffah / **39** E Labus / **40** S Al Bayda) as well as right in the middle (**41** Korseban / **42** Mola Matar / **50** Seyhout) of the so far known gap.

Lasiommata felix (Warnecke) – Arabian Wall Butterfly

Pararge felix Warnecke, 1929. Int. ent. Z. 22: 365 (Yemen, Sana´a).

Specimens examined

Where possible, geographic information not included in the original sources was added, mainly from (Encarta World Atlas, 1999). Abbreviations: ZFMK = Alexander Koenig Research Institute and Museum of Zoology, CMN = private collection of Clas M. Naumann, BMNH = British Museum of Natural History, NHMW = Vienna Natural History Museum. Record numbers correspond to numbers given in maps. Some records are not given in map, because coordinates and/or geographical positions were not sufficiently known.

Saudi Arabia: 1 1♂ Asir, Taif, 21°16'N 40°24'E, ca. 1750 m, 13.VII.1934; **2** Asir, As-Nimas, 19°11'N 42°19'E, ca. 2400m (mentioned in Larsen, 1983); **3** 7♂, 4♀, Asir, Suda, 18°16'N 42°22'E, ca. 3000 m, 9.X.1936; **4** 1♂, Province Gizan, Feifa, 17°16'N 43°05'E ca. 1200 m, 22.-23.XII.1936; **5** 1♂, Asir, Musaira, 28.XI.1936, Philby (not shown in map).

Yemen: 6 Province Sadah, Jabal Rhaza, vill. Zerra´a, 16°52'E 43°20'N, 2050-2100 m, 11.VI.2001, Klütsch & Naumann; Tissue collection, ZFMK; 7 2 spec., Bani Mawhab/ Bait Muzaret, 15°44.180'N 43°40.150'E, 1760 m, 14.06.2001, Klütsch & Naumann, Tissue collection, ZFMK; **8** 1-3 specimens, Province Sana´a, mountains WSW Amran, Mada´a, 15°37'N 43°44'E, 3000 m, 29.X.1996, Hacker et al.; **9** Wadi Sharas (below Hajjah), around 900 m high (locality mentioned in Larsen, 1983; not shown in map); **10** > 10 specimens, Province Sana´a, mountains WSW Amran, Masaani, 15°36'N 43°50'E, 2900 m, 30.X.1996, Hacker et al.; **11** > 10 specimens, Province Sana´a, mountains WSW Amran, Masaani-Gummama, 15°35'N 43°47'E, 3000 m, 30.X.1996, Hacker et al.; **12a** 1-3 specimens, Province Al-Mahwit, E Kawkaban, 15°29'N 43°55'E, 2750 m, 31.X.1996, Hacker et al.; **12b** 3 spec., Al Mahwit, 15°29'N 43°33'E, 2100 m, 8.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **13a** Wadi Dhar, 1982, Larsen; **13b** 2 spec., Wadi Dhar, 15°26.266'N 44°08.133'E, 4./7.VI.2001, Naumann; Tissue collection, ZFMK; 31 spec., 15.VI.2001, Klütsch & Naumann, Tissue collection, ZFMK; **14a** Province Sana´a, Sana´a, 15°21'N 44°12'E, 1934, Rathjens & Wissmann; **14b** 1♂, 3♀, Province Sana´a, app. 2400 m, II. 1938, Scott & Britton; **14c** 2♂, 2♀,

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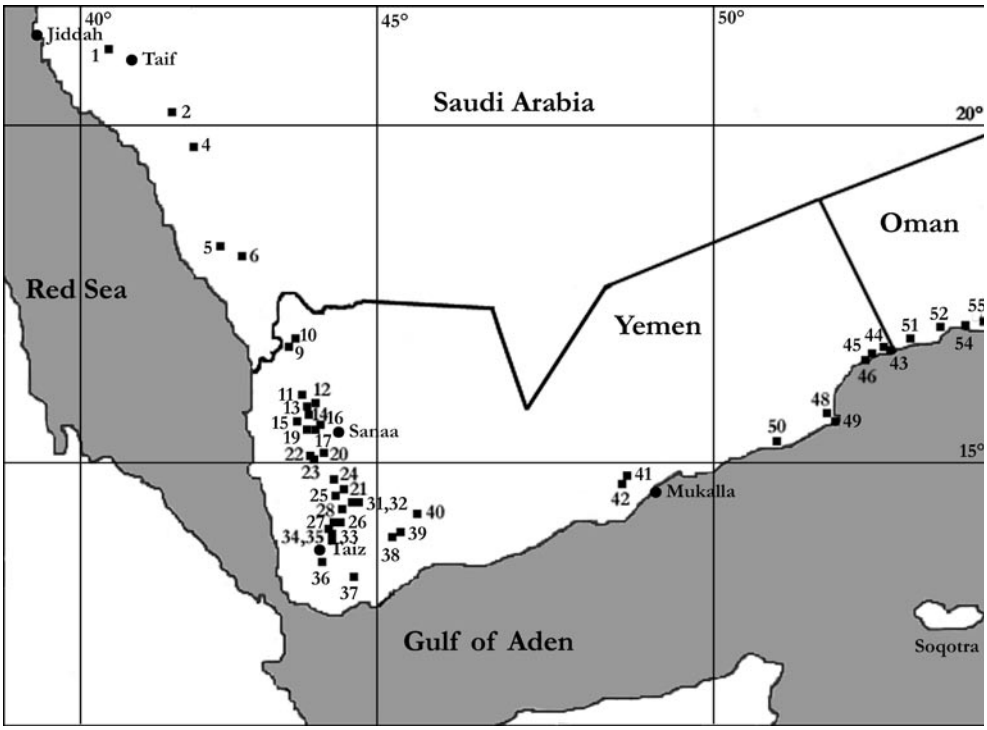

Fig. 4: Distribution of *Reissita simonyi yemenicola* (along the Red Sea) and *Reissita simonyi simonyi* (along the Indian Ocean at both sides of the Yemeni-Omani border).

Province Sana´a, Sana´a, app. 2400 m, X.1937, Rathjens; **14d** 1♂, 2♀, Province Sana´a, Sana´a, X.1938, Petrie; **15a** Province Sana´a, Road Sana´a-Hodeida, 1982, Larsen (not shown in map); **15b** 3 ♂, Al Asr (10 km W of Sana´a, around 2500 m high); **15c** 3♂, 1♀, Hada´a (6 km SW of Sana´a, around 2700 m high), 14.I.1938; **15d** 3♀, Ghaiman (15 km SE of Sana´a, around 2200 m high), 18.II.1938; **15e** 3♀, Wadi Sabir (S of Taiz, around 2000 m high), 19.XII.1937; **15f** 1♂, 1♀, Beit Baus (7 km S of Sana´a, 15°16'N 44°11'E, around 2500 m high), 21.I.1938; **16** > 10 specimens, Province Sana´a, mountains SW Sana´a, Jabal Ayban, Bait Na´ama, 15°18'12"N 44°16'48"E, 2700-2750 m, 18.IV.1998 and 24.II.2000, Hacker et al.; **17** > 10 specimens, Province Sana´a, Jabal an Nabi Shu´ayb, S-side 15°16'33"N 43°59'23"E, 3000 m, 7.V.1998, Hacker et al.; **18** 1 spec., Al Dogma/Al Haima, 15°12.015'N 43°58.009'E, 2845 m, Klütsch, tissue collection, ZFMK; **19a** 7 + 22 spec., ca. 10 km S of Al Hudaib, 15°04.129'N 43°43.550'E, 2818 m, 27./28.VI.2001, Klütsch, Tissue collection, ZFMK; **19b** 3 + 30 spec., Al Hudaib near Menakhah, 15°02.641'N 43°45.132'E, 2818 m, 26./27.VI.2001 and 21.VI.2002, Klütsch, Tissue collection, ZFMK; **20a** > 10 specimens, Province Sana´a, 60 km SW Sana´a, Makaban, Naqil Menakhah, (westside), 15°04'N 43°39'E, 1900 m, 2.XI.1996, Hacker et al.; **20b** > 10 specimens, Province Sana´a, Jabal Al Hotep, (S Menakhah), 15°02'N 43°38'E, 2800 m, 26.II.2000, Hacker et al.; **21a** Jabal Sumarah, 14°16'N 44°10'E, 1982, Larsen; **21b** Jabal Sumarah, VI.1982, Naumann; **21c** Sumarah Pass, Naqil Sumarah, around 2800 m high, mentioned in Larsen, 1983; **22** Province Ibb, 5 km N Ibb, vill. Al Bahrin, 14°02'N 44°09'E, 2200 m, 17.X.2001, Naumann;

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23 Province Ibb, Jabal Bada'an, 14°00'N 44°10'E, 1982, Larsen; **24** 16+ 8 spec., Al Udayn, 13°58.537'N 44°05.913'E, 2300 m, 19./20.VI.2001, Klütsch, Tissue collection, ZFMK; **25** 4-10 specimens, Province Ibb, 1,5 km W Jiblah, 13°57'N 43°57'E, 2100 m, 7.XI.1996, Hacker et al.; **26** 4-10 specimens, Province Ibb, 5 km NE Al Qa´idah, Mahal al Houmeira, 13°45'N 44°10'E, 1800 m, 6.XI.1996, Hacker et al.; **27** Province Ibb, 30 km S Ibb, 13°50'N 44°10'E, 1982, Larsen; **28a** Suq Al Khamis, 13°44'N 43°45'E, 2900 m, 1982, Larsen; **28b** Suq Al Khamis, near Taiz, 1982, Carden, in: Larsen, 1982; **29a** Province Taiz, Jabal Sabir, 1982, Larsen; **29b** 3 + 19 spec., Province Taiz, Jabal Sabir (vill. Mahzaf), 13°31.917'N 44°00.962'E, 2569 m, 21./24.VI.2001, Klütsch, Tissue collection, ZFMK; 10 spec., 2.VII.2002, Klütsch, Tissue collection, ZFMK; **29c** Province Taiz, Jabal Sabir, below top, 13°31'N 44°00'E, 2800 m, Naumann; **30** Jaffah area, 30.VI.2002, 13°47'N 45°11'E, ~ 2300 m, Klütsch; **31** Hizyaz, 20 km S of Sana´a, around 2000 m high, 1982, Larsen (not shown in map); **32** Jabal Dawran, 20 km W of Ma´abar, around 2000 m high, 1982, Larsen (not shown in map); **33** Jabal Jihaf, ca. 90 km N of Aden, around 2000 m high, 19.-20.IX.1938, Scott & Britton (not shown in map).

Biology and Ecology

Lasiommata felix usually occurs along walls or vertical cliffs in mountainous areas. The movement is always up and down along these vertical features. Larsen (1982) interpreted this behavior as protection behavior against unwanted dispersal since this species is often found in windy areas. Contrariwise, this vertical movement could also be part of the patrolling behavior, which is shown especially by males of *L. felix*. Nowadays the terraced agricultural regions used for cultivation replaced natural rocky hillsides in many regions (Fig. 3).

Larsen (1982) suggested that the food plant must be a common grass species. The vegetation, e. g., at Wadi Dhar, a classical place where *L. felix* is commonly found is described in Dubaie et al., 1993 (and literature within).

Distribution

Lasiommata felix is commonly found in the mountainous area of Saudi Arabia and Yemen. Usually, it can be seen in high altitudes around 2200 m (Larsen, 1982; own observations). Similar to *R. s. yemenicola*, it seems to have a strong connection to the western escarpment, but no localities are known along the coast of the Indian Ocean.

Remarks

Lasiommata felix was described by Warnecke in 1929. Scott & Britton published in 1942 one specific locality (Jabal Jihaf), where *L. felix* was found in Yemen. This place must be about 90 miles north from Aden, near Dhala. Unfortunately we were unable to identify this collection site in an actual map, but Gabriel, 1954 examined the collections of Scott & Britton and wrote that they collected 14♂♂ and 5♀♀ in September/October 1937 at this site. Furthermore, Scott & Britton mentioned another place, but did not mentioned the English or Latin name, they circumscribed the butterfly (e. g. brown Satyrines). The locality named is Jabal Al Kohl (25 km N of Sana´a, around 3000 m high). Since the locality is situated near Sana´a, a region where we frequently found *Lasiommata felix* in our field trips, it seems plausible to check this locality in further studies. However, since Scott & Britton did not mentioned *Lasiommata felix* or

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Fig. 3: A typical place to find *Lasiommata felix* near Bani Mawhab / Bait Muzaret. The artificial walls seem to be a suitable habitat for *L. felix*.

the English name wall brown in detail, we refrained to include the named locality in the list of records and distribution map.

L. felix seems to show a close phylogenetic relationship to the Ethiopian species, *L. maderakal* Guérin-Menéville, 1849, and *L. menava* Moore, 1865 of Iran and Afghanistan (Larsen, 1982). Heydemann (1954) pointed out that it should be handled as a subspecies of *L. meneva*. In 1956, Higgins & Wiltshire critically examined *L. felix* and *L. meneva*. They found that *L. felix* showed more narrowed androconia in comparison to *L. meneva*, the hind wing margin is more strongly scalloped and eye-spots on the wings are surrounded by an orange ring in comparison to *L. meneva* (see also Larsen, 1982 and Bozano, 1999). They treated both as specifically distinct. As Larsen (1982) pointed out all three mentioned species ought to have species status. *L. felix* does not appear closely related to *L. maera* in Europe and the Middle East based on genital morphology (Larsen, 1982; *L. maera* has three to four small teeth at the tip of the penis; this feature is not found in the other three species). This would suggest that some Palaearctic species found in Arabia and East Africa have ancestors from the Himalaya/Iranian region (Larsen, 1984).

In addition, Bozano (1999) examined morphological variation within *L. felix* (see there and Larsen, 1984 for pictures) and mainly found variation in wing color between populations from different localities.

Results

Lasiommata felix is distributed from Taif, Saudi Arabia (21°16'N 40°24'E) to the Jaffah area, E of Taiz/Yemen (13°47'N 45°11'E) in Southern Arabia (Fig. 5).

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It looks like it is strictly limited to the western escarpment along the Red Sea. So far, no localities could be found in Southeastern Yemen along the Indian Ocean.

Discussion

For *R. simonyi*, the predominant opinion was that both subspecies show allopatric distribution patterns. Our results suggest that there could be a connection between both subspecies (*R. simonyi yemenicola* and *R. simonyi simonyi*). Although there are still distribution gaps between Jabal Araph and Jaffah area – Mola Matar of 390 km and between Mola Matar/Korseban – Seyhout of 260 km, there could be a meeting point between these subpopulations in the area somewhere between Jabal Araph/Jaffah and Mola Matar. Moreover, at a locality named Jabal Urays (13°32'N/45°55'E), which lies exactly in between Jabal Araph/Jaffah and Mola Matar, the larval food plant of *R. simonyi* could be found, but in spring 2002, *R. simonyi* was not found; this locality should be checked again in further expeditions, since the habitat showed all features important to *Reissita simonyi*: an altitude about 1700 m, the larval food plant *Maytenus senegalensis* and the exposition to the coast, where foggy clouds transport dew to plants and larvae. If there is a connection between both subspecies, it would be of special interest how and why the subspecies barrier is abided. In addition, if there would be a hybridization zone between the two subspecies, these subspecies could eventually exchange genetic material. The division into two subspecies could still be warranted; if the exchange of genetic material would be strictly limited to the hybridization zone (e. g. hybrid individuals are

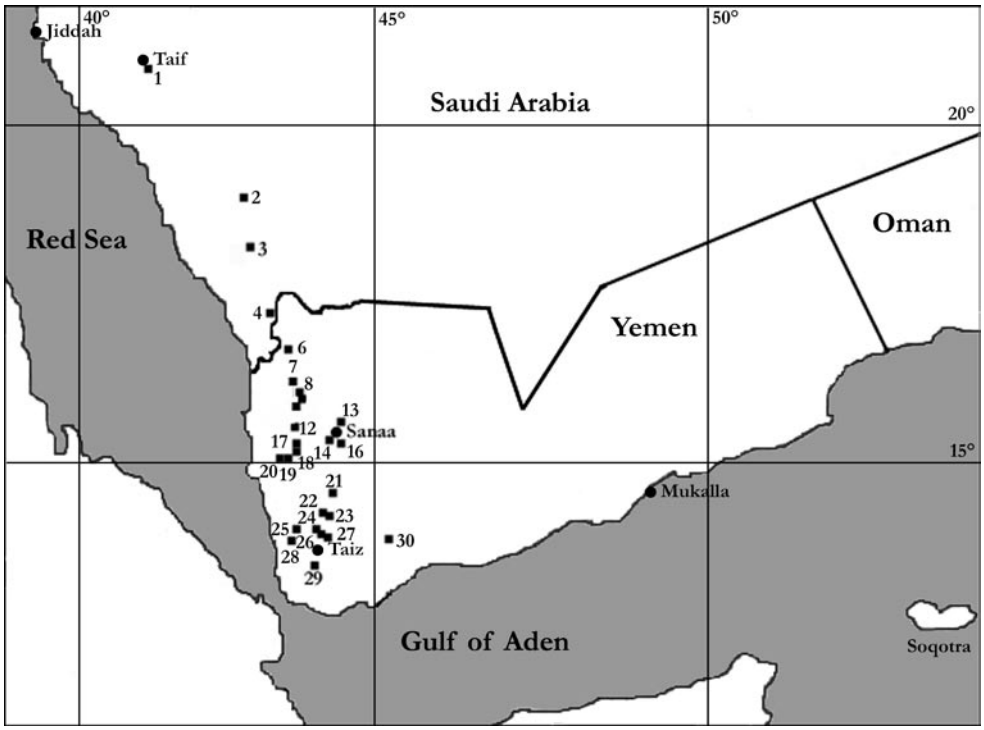

Fig. 5: Distribution of *Lasiommata felix*; the distribution is limited to the western escarpment along the Red Sea

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infertile). However, preliminary results of the genetic analysis support the divergence into two subspecies (Klütsch et al., in prep.).

The fact that *R. s. yemenicola* as well as *L. felix* are strictly limited to the mountainous area along the Red Sea suggests specific characteristics of the mountainous areas in Northwestern Yemen/Saudi Arabia to be responsible for this restricted distribution. Probable features could be the higher altitude in combination with higher precipitation in mountainous areas in Northwestern Yemen/Saudi Arabia. It is also possible that a restricted distribution range of the food plant limits the actual distribution of *L. felix*. Further studies could concentrate on examination of possible food plants in order to identify the food plants of *L. felix* in connection to the question which floristic composition is preferred by *L. felix*. Furthermore, the analysis of abiotic factors as potentially limiting reasons is suggested. Finally, it is highly likely to find more localities for both species in Saudi Arabia, since the restricted number of records might be more probably caused by the limited access as well as low research activities in this area rather by restriction of the distribution area itself.

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References

Bozano, G. C. 1999: Guide to the Butterflies of the Palearctic Region. Satyridae Part 1. 58 pp. Omnes artes.

Dubaie, A. S.; Gifri, A. N. & El-Monayeri, M. 1993: Studies on the flora of Yemen. 3. On the flora of Wadi Dhar. Candollea **48**: 101-109.

Gabriel, A. G. 1954: Expedition to SW Africa, 1937-1938. Lepidoptera, Rhopalocera. – British Museum (Natural History), London.

Guerin-Meneville, 1849: Voyage Abyssinica **6**: 381.

Hacker, H. H. 1999: Systematic list of the Lepidoptera of the Arabian Peninsula with a survey of the spread with a special reference to the fauna of Yemen. - Esperiana, Buchreihe zur Entomologie Bd. **7**: 15-237.

Hacker, H. H.; Aulombard, F.; Bischof, A.; Bittermann, J.; Fibiger, M. & Schreier, H.-P. 2001: Lepidoptera of Yemen Arab Republic, collected during three expeditions in 1996, 1998 and 2000. - Esperiana, Buchreihe zur Entomologie Bd. **8**: 597-632.

Heydemann, F. 1954: Beitrag zur Lepidopteren-Fauna Afghanistans. - Zeitschrift der Wiener Entomologischen Gesellschaft **39**: 385-396, 412-428.

Higgins, L. G. & Wiltshire, E. P. 1956: Bemerkungen zu *Melitaea* – und *Pararge*-Formen aus dem Mittleren Osten, veranlasst durch F. Heydemann´s kürzlich erschienen Artikel über Rhopaloceren aus Afghanistan. - Zeitschrift der Wiener Entomologischen Gesellschaft **41**: 10-15.

DOI: 10.21248/contrib.entomol.55.2.387-402

Kames, P. 1980: Das abdominale Duftorgan der Zygaena-Männchen (Lepidoptera, Zygaenidae). Teil 1: Freilandbeobachtungen, morphologische und histologische Untersuchungen an einigen europäischen Arten der Gattung Zygaena Fabricius 1775. - Entomologische Abhandlungen, Staatliches Museum für Tierkunde in Dresden **43**: 1-28.

Larsen, T. B. 1977: The butterflies of eastern (northern) Oman and their zoogeographical composition. - Journal of Oman Studies Special Report **1**: 179-207.

Larsen, T. B. 1979: Lep. Fam.: Papilionidae, Pieridae, Danaidae, Nymphalidae, Lycaenidae. - In: Insects of Saudi Arabia. Fauna of Saudi Arabia **1**: 342-344.

Larsen, T. B. 1980a: Butterflies of Oman. - Edinburgh, 80 pp.

Larsen, T. B. 1982: The Butterflies of the Yemen Arab Republic. - Kongelige Danske Videnskabernes Selskab Biologiske Skrifter **23**: 1-87.

Larsen, T. B. 1983: Insects of Saudi Arabia Lepidoptera; Rhopalocera (A Monograph of the Butterflies of the Arabian Peninsula). - Fauna of Saudi Arabia **5**: 333-477.

Larsen, T. B. 1984a: Butterflies of Saudi Arabia and its neighbours. Transworld Arabian Library, Riyadh & Stacey International, London, 160 pp.

Larsen, T. B. 1987: Biogeographical Aspects of Middle Eastern and Arabian Butterflies. Proceedings of the Symposium on the Fauna and Zoogeography of the Middle East. In Beihefte zum Tübinger Atlas des Vorderen Orients, Reihe A (Naturwissenschaften), 28, 178-199 (Krupp, F.; Schneider, W. & Kinzelbach, R., Eds.). Wiesbaden.

Lewis, H. L. 1974: Butterflies of the World; ISBN 0 245 52097 X.

Moore, 1865: List of diurnal Lepidoptera collected by Capt. A.M. Lang in the N.W. Himalayas Proceedings of the Zoological Society London **56 (2)**: 486-509, pls. 30-31.

Naumann, C. M. 1977: Stammesgeschichte und tiergeographische Beziehungen der Zygaenini (Insecta, Lepidoptera, Zygaenidae). - Mitteilungen der Münchner Entomologischen Gesellschaft München **67**: 1-25.

Naumann, C. M. 1990: Stammesgeschichtliche Rekonstruktion und ökologische Beziehungen der Organismen - Ansätze für interdisziplinäre Kooperation. - Verhandlungen der Deutschen Zoologischen Gesellschaft Stuttgart **83**: 291-301.

Naumann, C. M. & Edelmann, A. 1984: Insects of Southern Arabia The Life History, Ecology and Distribution of *Reissita simonyi* (Rebel, 1899) (Zygaenidae, Lepidoptera). - Fauna of Saudi Arabia **6**: 473-509.

Naumann, C. M.; Tarmann, G. M. & Tremewan, W. G. 1999: The Western Palaearctic Zygaenidae (Lepidoptera). - Apollo Books Stenstrup.

Pittaway, A. R. 1979: The butterflies and hawk-moths of eastern Saudi Arabia. - Proceedings of the British Entomology & Natural History Society **12**: 90.

Pittaway, A. R. 1981: Further notes on the butterflies and hawkmoths of eastern Saudi Arabia. - Entomologist´s Gazette **32**: 27-35.

Rathjens, C. & Wissmann von, H. 1934: Rathjens-v. Wissmannsche Südarabien-Reise, Band 3: Landeskundliche Ergebnisse. - Abhandlungen Geb. Auslandskunde, Hamburgerische Universität 40, B: 229 pp., 117 pls., 3 maps.

Rebel, H. 1899: Diagnosen neuer Lepidopteren aus Südarabien und von der Insel Sokotra. - Anzeiger der Akademie der Wissenschaften 359-361.

Rebel, H. 1907: Lepidopteren aus Südarabien und von der Insel Sokotra. - Denkschriften der Akademie der Wissenschaften, Math.-nat. Kl. **71**: 31-130, pl. 1.

Scott, H. 1942: In the High Yemen. Murray, London: 260 pp.

Tremewan, W. G. 1959: A new genus for *Zygaena simonyi* Rebel, Lepidoptera, Zygaenidae. - The Entomologist **92**: 213-217.

Warnecke, G. 1929: Eine neue *Pararge*-Art aus Süd-Arabien: *Pararge felix* sp. nov. - Internationale Entomologische Zeitschrift **22**: 365-367.

DOI: 10.21248/contrib.entomol.55.2.387-402

Warnecke, G. 1930: Die Gross-schmetterlinge de Hamburgerischen Süd-Arabien Expedition C. Rathjens-H. von Wissmann. - Mitteilungen der Münchner Entomologischen Gesellschaft **20**: 21-40.

Wiltshire, E. P. 1980: The larger Moths of Dhofar and their Zoogeographic Composition. - Journal of Oman Studies, Special Report **2**: 187-216.

Wiltshire, E. P. 1982: Insects of Saudi Arabia, Lepidoptera: Fam. Cossidae, Zygaenidae, Seslidae, Lasiocampidae, Bombycidae, Sphingidae, Thaumetopoeidae, Thyretidae, Notodontidae, Geometridae, Lymantriidae, Noctuidae. - Fauna of Saudi Arabia **4**: 271-331.

Wiltshire, E. P. 1983: Insects of Saudi Arabia, Lepidoptera: Fam. Cossidae, Sphingidae, Thyretidae, Geometridae, Lymantriidae, Arctiidae, Agaristidae, Noctuidae, Ctenuchidae (Part 3). - Fauna of Saudi Arabia **5**: 293-331.

Wiltshire, E. P. 1986: Lepidoptera of Saudi Arabia: Fam. Cossidae, Sesiidae, Metarbelidae, Lasiocampidae, Sphingidae, Geometridae, Lymantriidae, Arctiidae, Nolidae, Noctuidae, (Heterocera); Fam. Satyridae (Rhopalocera). - Fauna of Saudi Arabia **8**: 262-321.

Wiltshire, E. P. 1990: An illustrated, Annotated Catalogue of the Macro-Heterocera of Saudi Arabia. - Fauna of Saudi Arabia **11**: 91-250.

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Besprechungen

Hausser, J.: **Clé de determination des Gasteropodes de Suisse = Bestimmungsschlüssel der Gastropoden der Schweiz.** - Neuchatel: Centre suisse de cartographie de la faune (CSCF/SZKF) und Schweizerische Entomologische Gesellschaft (SEG/SES), 2005. - 191 S., Ill. (Faune helveticae; 10). - ISBN 2-88414-022-0 / ISSN 1422-6367.

Die „klassischen" Disziplinen der Biologie, jene Gebiete also, die die Organismen selbst zum Gegenstand haben, erfahren leider derzeit nur wenig Förderung. Zu gewaltig sind die monetären Aussichten, die moderne Forschungsrichtungen versprechen. Leider wird dabei oft vergessen, dass die Bestimmung von Pflanzen und Tieren sowie den Vertretern der verbleibenden Reiche eine tragende Säule der Biologie ist und diese Tätigkeit darüber hinaus ein hohes umweltbildnerisches Potenzial besitzt. Unter den Tieren hat dabei kaum eine Gruppe einen so hohen „didaktischen" Wert aufzuweisen wie die Mollusken. Ästhetik und Handhabbarkeit der Objekte spielen dabei eine große Rolle. Schnell lässt sich in geeigneten Biotopen eine anschauliche Sammlung zusammenstellen, und manche der gehäusetragenden Arten können bereits im Freiland sicher anhand von Schalenmerkmalen angesprochen werden. Es gibt jedoch auch Taxa, wie zum Beispiel die Clausiliidae oder die Oxychilidae, deren sichere Determination nur dem geübten Spezialisten schnell gelingt. Der Autor des oben genannten Buches betont dann auch dass „Bei den ... Praktika mit ... Studenten ... die Bestimmung der gesammelten Tiere das Haupthindernis darstellt, das mehr Entmutigung und Frustration als Enthusiasmus erzeugt." Ein gut angelegter Bestimmungsschlüssel ist deshalb ein überaus wichtiges Werkzeug, sowohl für den Anfänger, als auch den Spezialisten. Das vorliegende Werk, dessen äußeres Erscheinungsbild es als Band der Reihe „Fauna Helvetica" ausweist, enthält einen Bestimmungsschlüssel der 284 Arten und Unterarten von Schnecken, die bis dato in der Schweiz gefunden wurden oder deren Vorkommen wahrscheinlich hoch ist (*Paralaoma servilis*). Es werden also Land-

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