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# Contribution to the knowledge of the Papilionoidea fauna of Dhofar (Sultanate of Oman) (Insecta: Lepidoptera)

R. Verovnik, M. Seizmair, V. Hula, Z. Mráček & Z. F. Fric

## Abstract

The Lepidoptera fauna of Dhofar province and Sultanate of Oman in general have been poorly studied with a total of 63 species recorded so far for the province. Our aim was to study the distribution of Lepidoptera more in detail, in particularly for some rare species with limited records. We sum up the results of 13 expeditions to Dhofar in the period between 2008 and 2019. Lepidoptera were recorded from 67 localities covering mostly the three mountain ranges in the region. Among 65 species recorded *Colias crocea* (Geoffroy, 1785) is new for the country and three are new for the region (*Papilio machaon muetingi* Seyer, 1976, *Papilio demoleus* Linnaeus, 1758 and *Pelopidas thrax* (Hübner, [1821])) bringing the total to 72 species recorded for Dhofar. Additionally, interesting records for the following species are discussed in detail: *Colotis liagore* (Klug, 1829), *C. protomedea* (Klug, 1829), *Acraea neobule* Doubleday, 1847, *Melitaea deserticola scotti* Higgins, 1941, *Melanitis leda* (Linnaeus, 1758), *Cigaritis dhofarina* Seizmair, 2017, *Chloroselas esmeralda bilqis* Larsen, 1983, *Tarucus balkanicus* (Freyer, 1844), *Azanus moriqua* (Wallengren, 1857), *Euchrysops lois* (Butler, 1886), *Spialia colotes semiconfluens* de Jong, 1978, and *Spialia zebra bifida* (Higgins, 1924). Further surveys during monsoon season would be valuable to complement our study.

KEY WORDS: Lepidoptera: Papilionoidea, distribution, Dhofar, Oman.

## Contribución al conocimiento de los Papilionoidea de Dhofar (Sultanato de Omán) (Insecta: Lepidoptera)

## Resumen

La fauna de Lepidoptera de la provincia de Dhofar y del Sultanato de Omán, en general ha sido poco estudiada con un total de 63 especies registradas, hasta ahora, de la provincia. Nuestro objetivo fue estudiar la distribución de los Lepidoptera más en detalle, en particular para algunas especies raras con registros limitados. Sumamos los resultados de 13 expediciones a Dhofar en el período comprendido entre 2008 y 2019. Se registraron los Lepidoptera de 67 localidades que cubrían principalmente las tres cordilleras en la región. Entre las 65 especies registradas *Colias crocea* (Geoffroy, 1785) es nueva para el país y tres son nuevas para la región (*Papilio machaon muetingi* Seyer, 1976, *Papilio demoleus* Linnaeus, 1758 y *Pelopidas thrax* (Hübner, [1821])) del total de las 72 especies registradas para Dhofar. Adicionalmente, se discuten en detalle los registros para las siguientes especies: *Colotis liagore* (Klug, 1829), *C. protomedea* (Klug, 1829), *Acraea neobule* Doubleday, 1847, *Melitaea deserticola scotti* Higgins, 1941, *Melanitis leda* (Linnaeus, 1758), *Cigaritis dhofarina* Seizmair, 2017, *Chloroselas esmeralda bilqis* Larsen, 1983, *Tarucus balkanicus* (Freyer, 1844), *Azanus moriqua* (Wallengren, 1857), *Euchrysops lois* (Butler, 1886), *Spialia colotes semiconfluens* de Jong, 1978 y *Spialia zebra bifida* (Higgins, 1924). Futuras visitas durante la temporada del monzón serían valiosas para complementar nuestro estudio.

PALABRAS CLAVE: Lepidoptera: Papilionoidea, distribución, Dhofar, Omán.

## Introduction

Dhofar is the southernmost province of the Sultanate of Oman bordering Yemen to the west and Rub al Khali desert of the Saudi Arabia in the north. Its southern part is characterised by rugged mountain chains that retain clouds during mid-June to mid-September monsoon period forming so called desert fog oasis known for their high plant biodiversity (MILLER, 1994; PATZELT, 2015). The seaward facing slopes in particular are covered by thick deciduous forests that turn into *Themeda* tall-grass savannah further inland from the edge of the escarpment (PATZELT, 2011). Wider coastal plains and the northern sides of the mountain chains are gradually becoming drier changing into stone deserts interspersed by wadis with generally well-developed fringe vegetation (MOSTI *et al.*, 2012).

The Lepidoptera fauna of Dhofar and Oman in general has been relatively poorly studied with first accounts published only in the seventies (LARSEN, 1977). In the first overview of Lepidoptera of Dhofar, LARSEN (1980) lists 56 species. In his final account, published as an appendix to his study of the zoogeography of Arabian Lepidoptera, that number has been raised to 62 species (LARSEN, 1984b). His pioneering work has been supplemented by two monographs with extensive information on species ecology, behaviour, and distribution (LARSEN, 1984a; LARSEN & LARSEN, 1984). Further faunistic papers for Dhofar were published by POLAK & VEROVNIK (1998, 2009) and SCHMIDT *et al.* (2020) however with no new additions. A series of reports by Seizmar added *Gegenes nostrodamus* (Fabricius, 1793), *Colotis protomedia* (Klug, 1929) and most prominently a new endemic species *Cigaritis dhofarina* Seizmar, 2017 to the list (SEIZMAIR, 2016, 2017a, 2017b). In 2019 a checklist of Lepidoptera of Dhofar based mainly on LARSEN's list (1983) was published covering 63 species (COWAN & COWAN, 2019).

The main aim of our surveys was to complement the so far limited knowledge about the distribution of Lepidoptera in Dhofar province, in particularly for some rare species with only single records for the region. Despite focused surveys for such species a wider coverage of the region was also important, thus surveys were conducted also in areas and localities without prior records. The more important findings, including new records for the region, are discussed in detail.

## Material and Methods

The results presented in this paper are based on surveys by the five authors in a total of 13 expeditions undertaken to Dhofar in the period between 2008 and 2019. The research activities have been concentrated in the autumn period October / November and the winter period January / February. The only expedition outside this period was in the spring at the beginning of April in 2014.

The sampling activities of the authors were focussed on the coastal mountain system in the south western part of Dhofar (Tab. 1, Fig. 1) which includes the following ranges: Al Qamar in the district Sarfait-Dalkuth in the extreme southwest of the country, reaching into the eastern Hadramaut in Yemen, Qara in the northern surroundings of Salalah, and Samhan to the east of Salalah, in the northern surroundings of Mirbat. The Dhofar mountain chains are part of a comprehensive mountain system extending in southwest-northeast direction along the whole of the southern coastal line of Yemen and along the Hadramaut valley, reaching as far as Dhofar in the northeast. The highest elevation in the Dhofar mountain chain is at around 1850 m in the Samhan Mts. while Al Qamar and Qara Mts. reach approximately 1300 m and 1100 m, respectively. The sampling activities of the authors took place in the mountains at altitudes of up to 1300 m as well as at the foot of the mountains, in particular in the coastal stretches to the west and east of Dalkuth, at Al Mughsayl beach, on coastal plains near Salalah, and in wider surroundings of Hasik.

The coastal mountain system is clearly distinguished from the central and eastern desert areas of Dhofar in the abundance of vegetation particularly in the monsoon affected southern slopes of the Jabal Al Qamar and Jabal Qara mountains. The herb layer there is predominantly composed of Asteraceae, Euphorbiaceae, Brassicaceae and Fabaceae comprising around 130 species. The shrub layer is dominated by Caparaceae, Malvaceae, and Rubiaceae comprising approximately 45 species. The tree

layer is mainly composed of Moraceae represented by four species of *Ficus*, Rhamnaceae, the predominant species being *Ziziphus spina-christi* (L.), Moringaceae, and Fabaceae (MOSTI *et al.*, 2012). The overall composition of the herb and shrub layers is characterised by Nubio-Sindian and Iran-Turanian elements. The tree layer on the contrary contains the least species and is considered as an Eritreo-Arabian relict (LARSEN, 1984b).

The material collected was determined on the basis of external features using monographs published by LARSEN (1984a) and LARSEN & LARSEN (1984). For the determination of species complexes difficult to distinguish by habitus (*Deudorix* spp., *Leptotes* spp., *Spialia* spp.) genital morphological features were used. Standard procedures for genital extraction and fixation were implemented. The nomenclature mainly follows the “African Butterfly Database” (ABDB, 2020) complemented by WIEMERS *et al.* (2018) for the species also present in Europe.

### List of localities

The list of localities contains the relevant toponyms, coordinates, altitude, a short description of the habitat, and dates of the visits. The names of the authors/observers are abbreviated. The numbered localities are shown on the map (Fig. 1) and referred to in the results section for each species recorded (Tab. 1).

1. Sarfayt, slopes above the road to Yemen W of the village; 16°40'50.07"N, 53°06'31.99"E; 800 m; sparse woodland, small rocky gullies; 29-30-I-17 (MS), 28-I-18 (RV), 19-I-19 (RV)
2. Sarfayt, at the top of the plateau just before the military base; 16°42'4.37"N, 53°07'11.53"E; 1210 m; barren rocky slopes with flowers and dwarf bushes; 19-I-19 (RV)
3. Sarfayt, small wadi on the slopes N of the road to the plateau with military base; 16°42'11.02"N, 53°07'11.53"E; 1120 m; grassy and rocky slopes, small gully with bushes; 19-I-19 (RV)
4. Sarfayt, at the main road NE of town before the turn to Dhalkut; 16°42'31.44"N, 53°08'37.31"E; 910 m; bushy and rocky slopes, moderately grazed grassland; 9-X-18 (ZF), 19-I-18 (VH)
5. Sarfayt, at a road curve about 5 km NE of the town; 16°42'34.01"N, 53°08'53.52"E; 1010 m; bushy and rocky slopes, overgrazed in some places; 19-I-18 (VH), 27-I-18 (MS), 29-I-18 (RV)
6. Dhalkut, on the plateau below the main road W of the town; 16°42'0.82"N, 53°11'39.98"E; 450 m; open grassland with solitary shrubs; 22-I-18 (VH)
7. Dhalkut, along the road and above the beach W of the town; 16°41'55.26"N, 53°13'17.40"E; 20 m; ruderal rocky slopes, grasslands, woods; 29-30-I-17, 19-23-I-18, 26-27-I-18, 5-7-XI-18, 2-4-II-19, 23-24-XI-19 (MS), 28-I-18, 19-I-19 (RV), 8-XII-18, 25-X-19 (ZM)
8. Dhalkut, Dara Hafoof, along the road towards wadi Sayq 3 km NE of the village; 16°43'54.70"N, 53°13'18.68"E; 640 m; heavily grazed open woodland; 19-I-18 (MS), 28-I-18 (RV)
9. Dhalkut, wadi Sayq, along the road and below the bridge along the stream; 16°44'57.73"N, 53°13'34.03"E; 450 m; overgrown wadi with bushy areas, rocky slopes, road verges; 29-31-I-17, 20-27-I-18, 4-8-XI-18, 3-4-II-19, 25-XI-19 (MS), 9-X-17 (ZF), 29-I-18, 19-XI-19 (RV)
10. Dhalkut, above wadi Sayq, along the road towards Dhalkut 1,3 km from the bridge; 16°44'30.79"N, 53°13'44.40"E; 480 m; flowery slopes along the road; 29-I-18 (RV)
11. Dhalkut, wadi Sayq, on the plateau N of the valley near the road; 16°45'23.18"N, 53°14'11.31"E; 1035 m; dry meadows at the edge of the limestone plateau; 19-I-18 (VH)
12. Dhalkut, 3 km E of the town, eastern end of the road; 16°42'42.0"N, 53°15'48.1"E; 130 m; ruderal and rocky slopes, grasslands; 26-XI-19 (MS)
13. Rakhyut, along the road to the town N of Ambruf village; 16°45'54.31"N, 53°20'7.95"E; 675 m; grazed forest meadows; 9-X-17 (ZF)
14. Rakhyut, in the gorge above the entrance of a large cave; 16°45'18.14"N, 53°23'42.95"E; 70 m; dry wadi with wooded rocky slopes; 20-XI-19 (RV)
15. Rakhyut, at the beach at the end of the road E of the town; 16°44'55.57"N, 53°26'17.04"E; 10 m; ruderal vegetation along the road; 20-XI-19 (RV)

16. Ajdarawt, pastures at NE edge of the village 16°47'37.61"N 53°33'47.87"E 1030 m pasture with low bushes, small gully 29-I-18 (RV)
17. Ajdarawt, along the main road to Salalah on the ridge E of the town; 16°49'30.32"N, 53°38'56.19"E; 1075 m; hilltop with scattered shrubs, pasture; 8-X-17 (ZF)
18. Qamar Mts, at the road on the plateau SW of the police checkpoint; 16°49'43.49"N, 53°39'39.12"E; 1000 m; plateau and rocky slopes with bushes and acacia trees; 19-I-18, 21-I-18 (VH)
19. Qamar Mts, along the escarpment above the road NE of the police checkpoint; 16°50'8.10"N, 53°40'37.63"E; 790 m; rocky slopes with bushes and acacia trees; 20-XI-19 (RV)
20. Qamar Mts, large wadi along the main road 10 km W Al Mughsail; 16°51'50.1"N, 53°43'11.7"E; 630 m; large wadi with steep rocky slopes, bushes, *Boswellia* trees; 9-XI-18, 29-XI-19 (MS)
21. Al Mughsayl, in the side valley of wadi Mughsayl; 16°53'52.47"N, 53°45'49.07"E; 20 m; dry wadi with rich vegetation, bushes, solitary trees; 18-I-18 (VH), 30-I-18, 20-XI-19 (RV)
22. Al Mughsayl, side valley W of the beach; 16°52'58.09"N, 53°46'00.07"E; 30 m; dry wadi with scarce bush vegetation; 8-XI-08, 3-XII-18 (ZM), 10-X-17 (ZF), 18-I-18 (VH)
23. Al Mughsayl, slopes above the Marneef cave parking; 16°52'42.01"N, 53°46'1.73"E; 40 m; dry shrubby pasture on a slope; 21-I-18 (VH)
24. Al Mughsayl, near abandoned houses in the main Mughsayl wadi; 16°53'33.58"N, 53°46'25.87"E; 10 m; acacia trees, bushy and rocky slopes; 30-I-18 (RV)
25. Al Mughsayl, in the wadi along the main road to Salalah NE of the beach; 16°53'48.52"N, 53°48'50.40"E; 30 m; overgrazed pasture, rocky and bushy slopes; 18-I-18 (VH), 30-I-18 (RV)
26. Urzuq, small dry wadis E of a big quarry at the edge of the plateau; 17°03'43.20"N, 53°49'0.94"E; 1070 m; dry gully with small shrubs, rocky slopes; 17-XI-19 (RV)
27. Al Mughsayl, wadi on both sides of the road 5 km NE of the beach; 16°54'26.3"N, 53°49'30.1"E; 70 m; dry wadi with rocky slopes and bushy areas; 28-I-17, 5-6-XI-18 (MS)
28. Al Mughsayl, near the main road to Salalah NE of the beach; 16°54'51.82"N, 53°50'18.79"E; 45 m; dry wadi with grassland and scarce bushes; 8-X-17 (ZF), 18-I-18 (VH)
29. Eal Aleali, on the crest to the W of the village; 17°03'39.48"N, 53°51'39.12"E; 950 m; open woods with flowery undergrowth; 17-XI-19 (RV)
30. Ayun wadi, below the Ayun village; 17°15'17.66"N, 53°52'59.67"E; 665 m; dry wadi with scarce bush vegetation; 10-XI-08 (ZM)
31. Ayun wadi, in the gorge SW of the village; 17°14'46.91"N, 53°53'20.28"E; 685 m; open grasslands with small shrubs, rocky slopes; 11-X-17 (ZF)
32. Ayun wadi, small wadi at the main road SE of the main gorge; 17°13'14.95"N, 53°54'21.77"E; 730 m; small side gullies with bushes, trees and rocky slopes; 11-X-17 (ZF), 17-XI-19 (RV)
33. Ayun wadi, small side wadi along the road E of the main gorge; 17°14'27.74"N, 53°54'31.91"E; 730 m; dry wadi with acacia trees and bushes; 17-XI-19 (RV)
34. Teetam, at the viewpoint W of the village; 17°06'13.81"N, 53°54'40.49"E; 940 m; ruderal area, rocky slopes with bushes; 17-XI-19 (RV)
35. Ayun wadi, small wadi N of the main road and 7 km E of the main gorge; 17°15'15.99"N, 53°57'47.59"E; 730 m; flowery dry river bed with rocky slopes and bushy areas; 17-XI-19 (RV)
36. Salalah, Ain Garziz, along side-tracks at the turn to the wadi; 17°05'34.99"N, 54°04'22.70"E; 100 m; dry wadi with bushes and small trees, pastures; 11-X-17 (ZF)
37. Salalah, Ain Garziz, at the lower waterfall; 17°06'19.29"N, 54°04'29.52"E; 320 m; gravels with bushes, open woods; 17-XI-19 (RV)
38. Quairoon Haritti, surroundings of the village; 17°15'11.32"N, 54°05'11.87"E; 875 m; dry pastures with scarce trees and bushes; 9-XI-08 (ZM)
39. Quairoon Haritti, last wadi before desert plain, E of the road to Thumrait; 17°18'06.11"N, 54°05'19.32"E; 700 m; dry wadi with scarce bush and herb vegetation; 3-XII-18, 21-X-19 (ZM)
40. Quairoon Haritti, in the wadi below the abandoned main road; 17°17'2.40"N, 54°05'39.54"E; 770 m; dry wadi with sparse bushes and large diversity of flowers; 18-XI-19, 23-XI-19 (RV)

41. Quairoon Haritti, about 2 km NE of the village; 17°15'49.63"N, 54°05'42.95"E; 830 m; dry pastures with scarce trees and bushes; 8-XI-08, 21-X-19 (ZM)
42. Salalah, N of the city and E of the road to Jahaneen; 17°07'59.88"N, 54°06'14.20"E; 445 m; grassy slopes, pastures; 11-X-17 (ZF)
43. Salalah, al Hafa, plantations at the beach; 17°00'13.29"N, 54°06'56.26"E; 5 m; fruit market with gardens; 11-X-17 (ZF)
44. Salalah, parking lot at the road to Thumrait, left side; 17°07'42.56"N, 54°08'19.59"E; 165 m; partly ruderal, scarce bushes and trees; 5-XII-18, 22-X-19 (ZM)
45. Ain Sahiounout, along the road to the plateau NW of the wadi; 17°10'24.48"N, 54°09'58.89"E; 320 m; woods, flowering road verges; 18-XI-19 (RV)
46. Arkut, in the wadi N of the village; 17°11'54.50"N, 54°10'36.47"E; 380 m; dry wadi with overgrazed grasslands and woods; 18-XI-19 (RV)
47. Ain Sahiounout, in the main wadi upstream from the waterfall; 17°09'4.51"N, 54°10'52.64"E; 145 m; grassy wadi with gravels, rocks, woodland edges; 18-XI-19 (RV)
48. Arkut, small peak along the road N of the village towards Irita 17°13'15.35"N 54°12'11.32"E 630 m grassy slopes, woodland edge at hilltop 18-XI-19 (RV)
49. Nirin wadi, along the valley E of the main road; 17°16'9.49"N; 54°12'52.02"E; 750 m; dry wadi with sparse bushes, overgrazed grasslands; 18-XI-19 (RV)
50. Ayn Razat, along the stream in parallel to the gardens; 17°07'41.35"N, 54°13'59.67"E; 100 m; rich vegetation along a permanent stream; 31-I-18, 21-XI-19, 23-XI-19 (RV)
51. Ayn Razat, valley above the gardens; 17°07'22.30"N, 54°14'21.25"E; 120 m; dry wadi with bushes and solitary trees; 31-I-18, 21-XI-19, 23-XI-19 (RV)
52. Ayn Razat, upper part of the valley above the side road; 17°08'4.54"N, 54°14'44.31"E; 230 m; dry wadi with woods and overgrazed grassy areas; 21-XI-19 (RV)
53. Ayn Hamran, area around the spring; 17°06'1.23"N, 54°17'3.11"E; 100 m; woods, parkland and greens; 31-I-18 (RV)
54. Ayn Tubrook, around the parking area below the waterfall; 17°06'3.39"N, 54°19'35.82"E; 120 m; woods, open areas near the road; 21-XI-19 (RV)
55. Ayn Anthum, woods and open areas at the waterfall; 17°07'4.69"N, 54°22'0.05"E 270 m; sparse woods, grassy areas along small dry gullies; 21-XI-19 (RV)
56. Khawr Rawir, at the old Darbat bridge N of the lagoon; 17°03'07.32"N, 54°25'34.32"E; 10 m; partly ruderal, bushy slopes, lush vegetation along the stream; 7-IV-14, 6-II-18, 23-X-19 (ZM)
57. Darbat wadi, along the main road just above the turn to Darbat; 17°04'21.28"N, 54°26'54.81"E; 290 m; open forest, ruderal vegetation on its edge; 12-X-17 (ZF)
58. Khawr Rawir, at the SW edge of the lagoon; 17°01'51.95"N, 54°26'6.91"E; 5 m; grassland, ruderal vegetation; 13-X-17 (ZF)
59. Darbat wadi, in the valley further up from the end of the road; 17°06'58.22"N, 54°27'19.83"E; 200 m; wadi with water, overgrazed grasslands, woods; 12-X-17 (ZF), 1-II-18 (RV)
60. Quashroub, at the NE edge of the village; 17°02'43.35"N, 54°32'32.48"E; 80 m; semi-ruderal land, scarce tree vegetation, overgrazed area; 7-XII-18 (ZM)
61. Salafan wadi, small side valley E of Jibjat village; 17°14'17.86"N, 54°32'43.73"E; 890 m; bushy and rocky wadi with flower rich vegetation; 22-XI-19 (RV)
62. Mirbat, Hinnah wadi, near the pools in baobab woods; 17°03'16.05"N, 54°36'27.83"E; 330 m; dense woods, small clearings, rocky slopes; 14-X-17 (ZF), 1-II-18 (RV)
63. Samhan Mts., Dharirat, in a small wadi W of the village; 17°07'9.33"N, 54°38'41.93"E; 980 m; dry rocky wadi with sparse trees and bushes; 22-XI-19 (RV)
64. Samhan Mts., along the track on the escarpment E of the viewpoint; 17°06'43.03"N, 54°42'43.76"E; 1270 m; rocky slopes with rich flowering vegetation, sparse bushes; 22-XI-19 (RV)
65. Hasik, at a large lagoon N of the town; 17°36'2.59"N, 55°15'14.64"E; 5 m; semi desert with solitary bushes; 14-X-17 (ZF)



66. Hasik, large wadi about 5 km S of the town; 17°23'35.46"N, 55°17'21.13"E; 15 m; gravels with small bushy patches, rocky slopes 2-II-18 (RV)
67. Hasik, small wadi with an oasis about 10 km S of the town; 17°22'18.27"N, 55°17'3.74"E; 60 m; dry rocky and bushy wadi, palm grove; 2-II-18 (RV)

## Results

During our surveys, a total of 67 localities in Dhofar province were visited and over all 65 Lepidoptera species were recorded (Table 1).

**Tab. 1.**– The distribution of Papilionidae and Hesperidae in the southern part of Dhofar, Sultanate of Oman. Numbering of the localities corresponds to the list of localities in Materials and Methods section.

Species	distribution
<b>PAPILIONIDAE</b>	
<b>PAPILIONINAE</b>	
<i>Papilio machaon muetingi</i> Seyer, 1976	56
<i>Papilio demodocus</i> Esper, 1798	7, 36, 39, 44, 48, 50, 51, 56
<i>Papilio demoleus</i> Linnaeus, 1758	see discussion
<b>PIERIDAE</b>	
<b>PIERINAE</b>	
<i>Pontia glauconome</i> Klug, 1829	7, 9, 10, 14, 21, 24, 25, 32, 38, 39, 40, 44, 51, 56, 60, 64
<i>Belenois aurota</i> (Fabricius, 1793)	1, 3, 4, 7, 9, 10, 11, 13, 14, 15, 18, 19, 21, 22, 23, 24, 25, 26, 27, 29, 31, 32, 33, 34, 35, 38, 39, 40, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 58, 59, 60, 61, 62, 63, 64
<i>Pinacopteryx eriphia tritogenia</i> (Klug, 1829)	5, 7, 9, 10, 14, 19, 21, 22, 23, 24, 25, 36, 44, 47, 50, 51, 53, 54, 56, 60, 62, 63
<i>Colotis amata calais</i> (Cramer, 1775)	4, 7, 9, 10, 14, 15, 18, 21, 22, 23, 24, 25, 27, 28, 35, 37, 39, 40, 44, 47, 50, 51, 52, 56, 58, 62, 66, 67
<i>Colotis phisadia</i> (Godart, 1819)	7, 9, 15, 32, 39, 58, 66
<i>Colotis chrysonome</i> (Klug, 1829)	1, 7, 19, 20, 21, 24, 25, 29, 31, 51, 52, 64
<i>Colotis halimede</i> (Klug, 1829)	7, 9, 10, 20, 21, 22, 23, 25, 27, 28, 50, 51, 56, 64
<i>Colotis danae eupompe</i> (Klug, 1829)	4, 7, 14, 19, 21, 22, 24, 25, 27, 30, 31, 32, 33, 34, 36, 38, 39, 44, 47, 51, 52, 53, 56, 60, 66, 67
<i>Colotis evarne</i> (Klug, 1829)	7, 9, 14, 18, 19, 21, 22, 24, 25, 27, 28, 29, 30, 32, 36, 38, 39, 40, 44, 45, 47, 51, 52, 53, 56, 57, 60, 61, 62, 63, 66, 67
<i>Colotis antevippe zera</i> (Lucas, 1852)	1, 7, 9, 10, 14, 19, 24, 25, 27, 36, 39, 44, 50, 51, 52, 55, 59, 61, 62, 63, 64
<i>Colotis liagore</i> (Klug, 1829)	7, 22
<i>Colotis दौरа</i> (Klug, 1829)	1, 7, 9, 12, 14, 24, 50
<i>Colotis eris contractus</i> Gabriel, 1954	4, 7, 9, 10, 18, 19, 21, 22, 24, 44, 51, 52, 53, 56, 60, 61, 62
<i>Colotis protomedia</i> (Klug, 1829)	7, 12
<i>Colotis fausta</i> (Olivier, 1807)	7, 9, 19, 34, 40, 61, 64, 67
<i>Nepheronia buqueti buchanini</i> (Rothschild, 1921)	4, 7, 23, 29, 37, 40, 44, 45, 62
<b>COLIADINAE</b>	
<i>Colias crocea</i> (Geoffroy, 1785)	see discussion
<i>Catopsilia florella</i> (Fabricius, 1775)	1, 7, 9, 13, 19, 21, 22, 24, 28, 36, 38, 39, 40, 41, 44, 47, 48, 50, 51, 52, 53, 56, 57, 60, 61, 64
<i>Eurema hecabe solifera</i> (Butler, 1875)	1, 3, 4, 6, 7, 9, 10, 13, 14, 15, 20, 45, 46, 47, 50, 51, 52, 55, 56, 60, 63, 64

<b>NYMPHALIDAE</b>	
<b>DANAINAE</b>	
<i>Danaus chrysippus</i> (Linnaeus, 1758)	1, 7, 9, 14, 15, 21, 22, 28, 36, 37, 40, 44, 46, 47, 49, 50, 51, 52, 53, 55, 56, 59, 60, 61, 63
<b>ACRAEINAE</b>	
<i>Acraea neobule</i> Doubleday, 1847	7, 9
<b>CHARAXINAE</b>	
<i>Charaxes hansali arabica</i> Riley, 1931	1, 5, 7, 10, 19, 29, 45, 47, 48, 50, 51, 52, 63
<i>Charaxes varanes bertrami</i> Riley, 1931	1, 6, 7, 13, 14, 44, 45, 51, 52, 53, 59, 62, 63
<b>NYMPHALINAE</b>	
<i>Melitaea deserticola scotti</i> Higgins, 1941	9
<i>Vanessa cardui</i> (Linnaeus, 1758)	1, 6, 17, 34, 45, 50, 51, 59, 61, 64
<i>Junonia hierta cebrene</i> Trimen, 1870	1, 3, 4, 5, 7, 9, 10, 13, 14, 15, 16, 19, 22, 32, 33, 36, 39, 40, 44, 51, 56, 59, 60, 61, 63
<i>Junonia orithya here</i> Lang, 1884	3, 6, 7, 9, 14, 19, 21, 22, 26, 34, 36, 37, 38, 39, 40, 41, 42, 44, 46, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 59, 60, 61, 63, 64
<i>Hypolimnas misippus</i> (Linnaeus, 1764)	51
<i>Byblia ilithyia</i> (Drury, 1773)	7, 9, 14, 20, 22, 23, 50, 51, 60, 61, 63
<b>SATYRINAE</b>	
<i>Melanitis leda</i> (Linnaeus, 1758)	43
<i>Ypthima asterope</i> (Klug, 1832)	1, 3, 4, 5, 7, 9, 10, 11, 14, 19, 21, 24, 26, 35, 40, 61, 62, 63, 64, 67
<b>LYCAENIDAE</b>	
<b>THECLINAE</b>	
<i>Myrina silenus</i> (Fabricius, 1775)	1, 3, 4, 7, 9, 29, 38, 40, 41, 45, 46, 47, 48, 50, 51, 62, 64
<i>Deudorix livia</i> (Klug, 1834)	5, 7, 8, 9, 17, 21, 22, 32, 34, 51, 53, 61, 64
<b>APHNAEINAE</b>	
<i>Cigaritis dhofarina</i> Seizmair, 2017	1
<i>Chloroselas esmeralda bilqis</i> Larsen, 1983	21, 28, 56
<i>Axiocerces harpax kadugli</i> Talbot, 1935	1, 5, 7, 9, 10, 19, 20, 35, 63
<b>POLYOMMATINAE</b>	
<i>Anthene amarah</i> (Guérin-Méneville, 1849)	1, 4, 5, 7, 9, 10, 13, 18, 19, 20, 21, 22, 23, 31, 32, 44, 51, 55, 56, 61, 63
<i>Lampides boeticus</i> (Linnaeus, 1767)	1, 4, 5, 6, 7, 9, 29, 51, 61
<i>Leptotes pirithous</i> (Linnaeus, 1767)	1, 5, 6, 7, 8, 15, 19, 21, 22, 23, 24, 42, 45, 47, 50, 51, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63
<i>Cacyreus virilis</i> Stempffer, 1936	1, 3, 4, 7, 9, 13, 19, 40, 51, 61, 64
<i>Tarucus theophrastus</i> (Fabricius, 1793)	21, 22, 23, 36, 37, 40, 44, 47, 51, 59
<i>Tarucus rosaceus</i> (Austaut, 1885)	9, 14, 21, 22, 25, 37, 40, 44, 46, 47, 50, 51, 52, 53, 54, 56, 60, 64
<i>Tarucus balkanicus</i> (Freyer, 1844)	32
<i>Zizeeria knysna</i> (Trimen, 1862)	7, 9, 21, 22, 29, 34, 35, 39, 41, 42, 47, 50, 51, 55, 57, 59, 61, 62, 63, 64
<i>Zizula hylax</i> (Fabricius, 1775)	1, 3, 4, 7, 9, 13, 14, 21, 22, 23, 24, 29, 39, 40, 41, 42, 49, 54, 55, 57, 61, 62, 63, 64
<i>Azanus ubaldus</i> (Stoll, 1782)	1, 7, 18, 21, 24, 31, 32, 33, 51, 53, 56, 58, 60, 61, 63
<i>Azanus jesous</i> (Guérin-Méneville, 1849)	1, 4, 7, 9, 13, 17, 19, 21, 22, 24, 32, 33, 35, 40, 51, 53, 55, 56, 59, 60, 61, 64, 65
<i>Azanus moriqua</i> (Wallengren, 1857)	9, 18, 19, 51, 53, 55, 60, 62
<i>Chilades parrhasius</i> (Fabricius, 1775)	1, 5, 7, 21, 24, 51, 65
<i>Freyeria trochylus</i> (Freyer, 1844)	1, 2, 7, 9, 12, 14, 19, 21, 22, 23, 24, 25, 26, 31, 32, 35, 37, 39, 40, 46, 47, 50, 51, 52, 56, 59, 61, 63, 64



<i>Euchrysops lois</i> (Butler, 1886)	11, 20, 21, 27
<i>Euchrysops osiris</i> (Hopffer, 1855)	1, 3, 4, 13, 14, 21, 22, 40, 49, 51, 52, 57, 59, 62, 63
<b>HESPERIIDAE</b>	
<b>COELIADINAE</b>	
<i>Coeliades anchises jucunda</i> (Butler, 1881)	4, 5, 7, 9, 10, 14, 23
<b>PYRGINAE</b>	
<i>Sarangesa phidyle</i> (Walker, 1870)	9, 18, 22, 26, 29, 39, 40, 56, 61, 63, 64
<i>Gomalia elma</i> (Trimen, 1862)	7, 9, 14, 21, 23, 50, 51, 61, 64
<i>Spialia doris</i> (Walker, 1870)	5, 9, 35, 40, 53, 56
<i>Spialia colotes semiconfluens</i> de Jong, 1978	40
<i>Spialia zebra bifida</i> (Higgins, 1924)	2, 9, 16, 20, 21, 22, 25, 63
<i>Spialia mafa higginsii</i> Evans, 1937	5, 8, 9, 16, 21, 22, 40, 51, 57, 64
<b>HESPERIINAE</b>	
<i>Pelopidas mathias</i> (Fabricius, 1798)	22, 50, 52, 59
<i>Pelopidas thrax</i> (Hübner, [1821])	44
<i>Gegenes pumilio</i> (Hoffmannsegg, 1804)	9

## Discussion

With a total of 71 Lepidoptera species the fauna of Dhofar is comparatively rich reflecting its specific position, orogeny, and summer monsoon providing higher levels of precipitation facilitating also high plant diversity (MILLER, 1994; MOSTI *et al.*, 2012). We were able to observe most of the known species in the region with notable exclusions of *Hypolimnas bolina* (Linnaeus, 1758), *Iolaus glaucus* Butler, 1886, *Cigaritis acamas bellatrix* (Butler, 1886), *Cigaritis scotti* (Gabriel, 1954), *Spialia mangana* (Rebel, 1899), and *Gegenes nostradamus* (Fabricius, 1793). All these species were observed only once in Dhofar and are undoubtedly rare or occurring only during monsoon period which was not covered by our surveys.

Among most widespread species *Belenois aurota* (Fabricius, 1793) was by far the commonest recorded at 48 localities which is not surprising given its migratory potential. Other common species occurring at 25 or more sites were: *Colotis amata calais* (Cramer, 1775), *Colotis danae eupompe* (Klug, 1829), *Colotis evarne* (Klug, 1829), *Catopsilia florella* (Fabricius, 1775), *Danaus chrysippus* (Linnaeus, 1758), *Junonia hierta cebrene* Trimen, 1870, *Junonia orithya here* Lang, 1884, *Leptotes pirithous* (Linnaeus, 1767), and *Freyeria trochylus* (Freyer, 1844). On the other hand several rare species were recorded including *Colias crocea* (Geoffroy, 1785) which is new for the Sultanate of Oman, while *Papilio machaon muetingi* Seyer, 1976, *Papilio demoleus* Linnaeus, 1758, and *Pelopidas thrax* (Hübner, 1821) are new for the Dhofar province. These, and additional interesting species are discussed in more detail below:

### *Papilio machaon muetingi* Seyer, 1976

The species inhabits Holarctic with links to Oriental and Afrotropical regions. This is the first record from Dhofar. It was captured twice, first in November 2008 and secondly during early spring season in April 2014, both specimens on the bank of Darbat River just before the coastal lagoon (locality 56). Number of antennal segments was counted to more than 33, therefore we identified both specimens as *P. machaon muetingi*. Related and superficially similar species *P. saharae* possess less than 33 segments (PITTAWAY *et al.*, 1994). It seems that Salalah surroundings mark the southernmost distribution of this species in Arabia. Its incidence during dry period is possibly very restricted, however that might be different during the rainy season for which we have no information. It is also an open question if the *P. machaon* presence in Dhofar represents an indigenous small, isolated colony or is it a subject of an accidental human introduction.

*Papilio demoleus* Linnaeus, 1758

This Oriental species is replaced in Afrotropical region by *Papilio demodocus* Esper, 1798 and this has been used as a good example of vicariance by LARSEN (1984b), as the latter species inhabits only Dhofar region while *P. demoleus* is limited to the oasis in the northern Oman. So far, no range overlap has been reported for both species (MORGUN & WIEMERS, 2012), although *P. demoleus* has been unintentionally dispersed to other continents (GUERRERO *et al.*, 2004; MORGUN & WIEMERS, 2012). The first record of the species for Dhofar is in oasis conditions in the northern desert of the region, where a single specimen was photographed on 22-11-2018 at Al Beed Farm east of Ubar (18°21'14.32"N, 54°0'45.52"E) by Sander Bot (OBSERVADO, 2018). As it is a known pest on citrus it remains to be seen if it will invade the coastal region of Dhofar, where plantations are abundant around Salalah town and how it will interact with autochthonous *P. demodocus*.

*Colotis liagore* (Klug, 1829)

Although the commonest *Colotis* in northern Oman, it appears to be very sporadic and rare in Dhofar. It was first mentioned for Dhofar by LARSEN (1983), but without indicating exact locality. Its presence was confirmed by POLAK & VEROVNIK (1992) with a single specimen collected in foothills of Quara Mountains in wadi Nahiz. We found the species at Al Mughsayl (locality 22) and the coastal stretch west of Dhalkut (locality 7). Again, only single specimens were observed, however the new records indicate a wider range of the species in Dhofar.

*Colotis protomedia* (Klug, 1829)

The species was reported as new to the fauna of Oman by SEIZMAIR (2017a) on the basis of specimens collected on the coastal stretch west of Dhalkut at the base of the Qamar Mountains. For a discussion on the hitherto known distribution of this Afrotropical species on the Arabian Peninsula and its ecology the reader is referred to aforementioned paper. The species is a regular resident at this locality and has been particularly common in the late autumn of 2019 (Fig. 6). Further records could be taken by the second author at another location along the coast east of Dhalkut. Thus, all the records for Dhofar are up to now confined to the littoral stretch near Dhalkut. The presence of the species is bound to the occurrence of the larval host plant *Maerua* sp., the population in Dhofar exclusively on *Maerua crassifolia*. Comparison of the material collected in Dhofar to material from Africa and Saudi Arabia in the Zoological State Collection Munich did not reveal any constant differences in external features between the African populations and populations on the Arabian Peninsula. Therefore, no sub-specific status is attributed to the Arabian populations.

*Colias crocea* (Geoffroy, 1785)

This widespread west Palaearctic species, known also for its strong migrations, has so far not been observed in Oman despite its occasional sightings in the neighboring UAE (GILLET, 1997). Its surprising presence in Dhofar was first noted by Dirk Stadie on 9-10.10.2011 when he collected a single specimen south of Quairoon Haritti (17°12'52"N, 54°04'26"E). Valérie Goethals added an additional record on platform Observation (OBSERVADO, 2014) with multiple specimens seen on irrigated fields at Al Beed Farm east of Ubar deep in the desert region (18°21'14.32"N, 54°0'45.52"E) on 29-XI-2014. Given the abundance of the species at the time it is possible that the larval stages of the Lepidoptera were accidentally introduced with alfa-alfa hay or seeds to the site. No observations of the species were made during our surveys.

*Acraea neobule* Doubleday, 1847

The species is widely distributed and common in sub-Saharan Africa. On the Arabian Peninsula, on the contrary, the species is highly localised and rare. In Dhofar it was first recorded by Pittaway at Ayn Razat in 1980 (LARSEN, 1984a). Since then, no further records for Dhofar were published until a single fresh male specimen was collected at the coast west of Dhalkut (SEIZMAIR, 2018). During our surveys, the second author managed to reconfirm its presence at the Dhalkut site and found the species

at a new locality in wadi Sayq, well into the Qamar Mountains. Four fresh male specimens were observed at the road verge feeding on unidentified *Euphorbia*. The recent observations remove any doubt on permanent residency of the species in Dhofar.

*Melitaea deserticola scotti* Higgins, 1941

The distribution of this subspecies on the southern Arabian Peninsula ranges from the Asir Mountains in the extreme northwest of Yemen over Aden, the wadi Hadhramaut to Dhofar in highly localized populations of low densities (LARSEN, 1982, 1984a, 1984b). The records for Dhofar have been up to now confined to the dry plateau beyond Qara Mountains in Ayun area (LARSEN, 1984a) where the species was recorded for the first time in the Oman Flora and Fauna Survey project. In November 2019, the second author (MS) found a single fresh male specimen (Fig. 4) in the western part of Qamar Mountains in wadi Sayq along the road verge (Fig. 3). This corroborates the recent published record from eastern Qamar Mountains (SCHMIDT *et al.*, 2020). The species was previously recorded from Qamar mountains in Sarfait area near the border with Yemen in 1985 (Howard Elston; unpublished records).

*Melanitis leda* (Linnaeus, 1758)

This is usually a common Lepidoptera with wide distribution covering Africa, Oriental and Australian regions. Unlike other Lepidoptera, this species is crepuscular, flying during dusk and dawn. It is frequently found at lights. The species was recorded from Oman only few times. LARSEN & LARSEN (1980) mention this species from Sarfayt while LARSEN (1983) adds records from Ain Arzat and its vicinity. More recently the species was photographed in wadi Darbat (COWAN & COWAN, 2019). We found one individual sitting on a streetlamp in fruit market in Salalah; the place is surrounded by gardens and banana plantations.

*Cigaritis dhofarina* Seizmair, 2017

It was described as a separate species on the basis of external differences to *Cigaritis somalina* (Butler, 1888) and *Cigaritis scotti* Gabriel, 1954, both previously reported from Arabian Peninsula. Interestingly, this species is genetically closer to the South African congeners such as *Cigaritis natalensis* (Westwood, 1851) than to *C. somalina*, the latter being distributed in Somalia, Ethiopia, northern Kenya and Yemen (LARSEN, 1984a). No further observations were made beyond the type material. In November 2019, the first author (RV) found the habitat of the type locality on the slopes immediately at the border to Yemen near Sarfayt destroyed by human impact (border wall construction works at the frontier).

*Chloroselas esmeralda bilqis* Larsen, 1983

This is an East African species, living in open sparse scrubland or savannah. In Dhofar it was first recorded by H. Horsfall, but no locality is given (LARSEN, 1984b). We found the species at two sites near Al Mughsayl (localities 21, 28) and at Darbat River just before the coastal lagoon (locality 56), all in the coastal plains. The Lepidoptera were observed in low numbers perching on tops of *Acacia* shrubs or low trees. It was more common in January, but it is easily overlooked due its small size and very rapid and direct flight. Males were patrolling among small bushes in dry wadi feeding on *Euphorbia larica* Boiss. (Fig. 5). Another similar species, *C. arabicus* (Riley, 1932), is reported from wadi Hadhramaut, Yemen (LARSEN, 1991), but has so far not been found in Oman.

*Tarucus balkanicus* (Freyer, 1844)

It is a species widespread in Mediterranean area, northern part of Africa and in the Middle East. The species is common in northern parts of Oman, but from Dhofar it is known only from few records, LARSEN (1983) reports this species from Sarfait and Darbat-Mirbat road. We found it only in Wadi Ayun area (locality 32), where they were numerous around *Acacia* shrubs in semidesert-like landscape.

*Azanus moriqua* (Wallengren, 1857)

The species is widely distributed and common in sub-sahrian Africa. On the Arabian Peninsula, on the contrary, the species is highly localised and rare. It was recorded from north-western Yemen, and the Asir Mountains of Saudi-Arabia (LARSEN, 1982; LARSEN, 1984a). LARSEN & LARSEN (1984) mentions a single record by F. J. Walker in Dhofar near Thumrait. Since then no further published records had been known for Dhofar until SEIZMAIR (2017b) reported two records, a male and a female collected in the western part of Qamar Mountains (wadi Sayq). During our surveys we extended its known range considerably with new records from foothills of Qara Mountains (Ayn Razat, Ayn Hamran, Ayn Anthum, Quashroub, wadi Hinnah) and two records from eastern part of Qamar Mountains (localities 18, 19), confirming the recent observation of the species in this region (SCHMIDT *et al.*, 2020). The species could be even more widespread but is easily overlooked due to low density of occurrence and similarity to other congeners.

*Euchrysops lois* (Butler, 1886)

The distribution of this rare species is confined to the Horn of Africa and the south-western parts of the Arabian Peninsula (BALLETO & LARSEN, 1984; LARSEN, 1984b). The species was first recorded by Guichard at the Salalah Thumrait road (LARSEN, 1980) and then in Ayun area (LARSEN & LARSEN, 1984). Additional record was provided by SEIZMAIR (2017b) at Al Mughsayl which seems to be the stronghold for the species with one additional locality (locality 21) discovered during our surveys in this area. The species was observed also in a nearby large wadi in the eastern part of Qamar Mountains (locality 20) and above wadi Sayq (locality 11) in the same mountain system. All the records in Dhofar are confined to the arid areas with high disturbance regime and prevalence of *Lavandula* sp. and *Campylanthus* sp.

*Spialia colotes semiconfluens* de Jong, 1978

This is one of the rarest *Spialia* in Dhofar recorded only by LARSEN (1980) from the road Salalah to Thumrait and Aqabat al Hatab from the same area. We found a single specimen in a small wadi along the abandoned old road north of Quairoon Haritti, possibly in close proximity of the old records. The otherwise rocky wadi with sparse bushes was covered by large diversity of flowering plants attracting many Lepidoptera. Both, *Spialia doris* and *S. mafa higginsii* shared the habitat with *S. colotes*. The species is otherwise distributed also in western Yemen and Asir Mountains in Saudi Arabia (LARSEN, 1980; PITTAWAY, 1985).

*Spialia zebra bifida* (Higgins, 1924)

Reported widespread in Dhofar by LARSEN & LARSEN (1984), however known only from a single additional locality in Arabia from Aden, Yemen (LARSEN, 1980). Our records corroborate Larsen as we found the species at nine localities from Sarfayt escarpment in the south (locality 2) through wadi Sayq (locality 9), Qamar Mountains, where it was already reported by SEIZMAIR (2017), Al Mughsayl (localities 21, 22, 25), to the northern slopes of Samhan mts. (locality 63). It prefers small rocky gullies with sparse vegetation and is easily overlooked due to small size and fast flight.

*Pelopidas thrax* (Hübner, [1821])

The species is found in most Africa, eastern Mediterranean, Arabia and north western India. LARSEN (1984b) ranked *P. thrax* among migratory Palearctic species with a limited Oriental distribution. In northern Oman *P. thrax* lives in oasis whereas in Dhofar it has by then not been recorded (LARSEN & LARSEN, 1984). We captured the species on the semi-ruderal parking place with a scarce bush density and relatively rich grass and herbal vegetation in the foothills of Qara Mountains (locality 44). Its presence in Dhofar seems to be local and scarce but could be masked by the presence of similar and more widespread *P. mathias*.

Despite our exhaustive surveys covering most of the Dhofar coastline and mountain parts of the region there are still areas which were not studied at all, most notably the highest parts of Samhan Mts. and the wadi systems to the north of the range (part of Samhan Nature Reserve). Additionally, surveys

during monsoon season from June to September should provide further insights into the fauna of Lepidoptera of Dhofar, as some of the species are likely to be seasonal or even occur only during that period. We hope our surveys will initiate additional studies of the Lepidoptera of the Sultanate of Oman and Arabian Peninsula in general.

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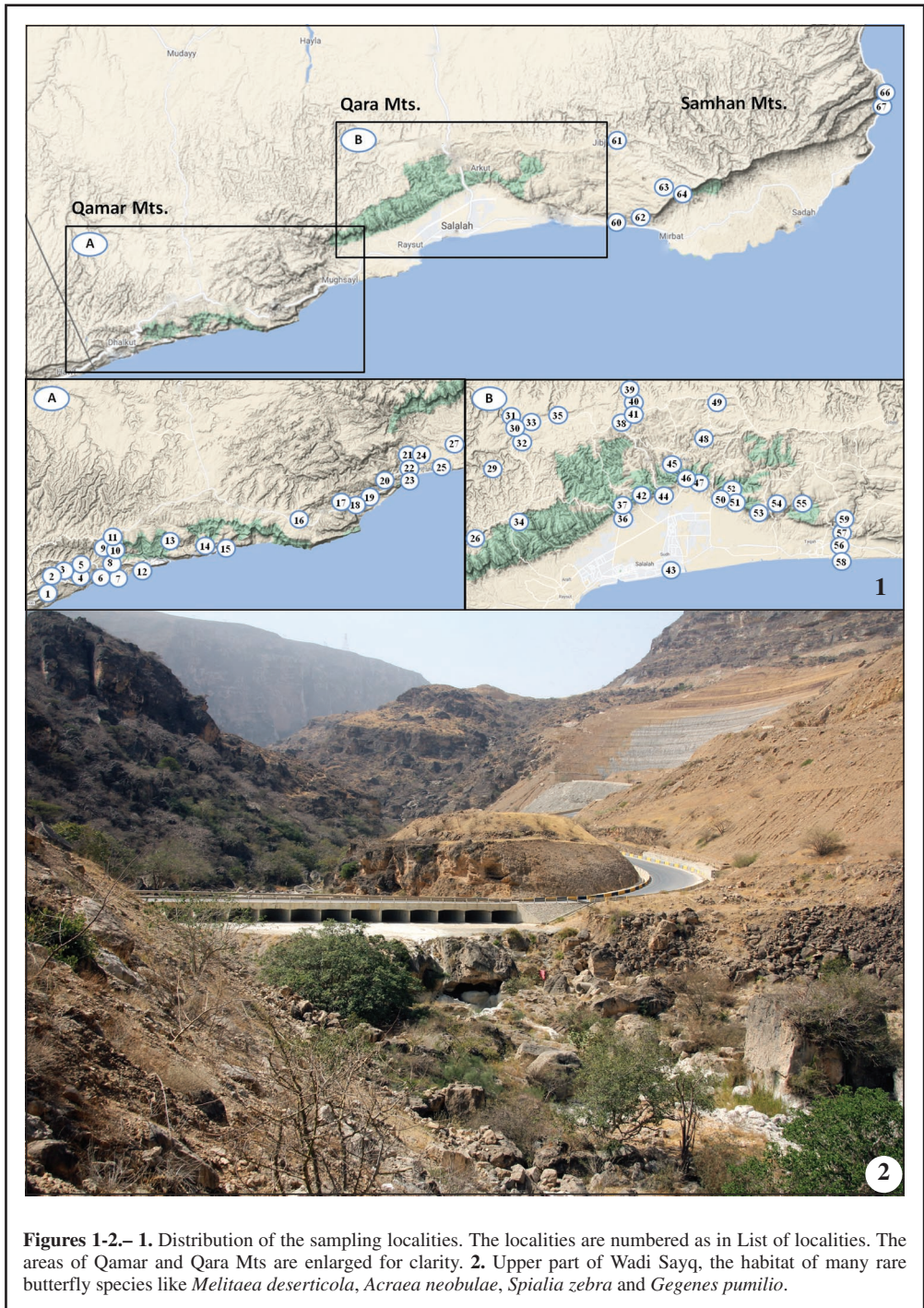
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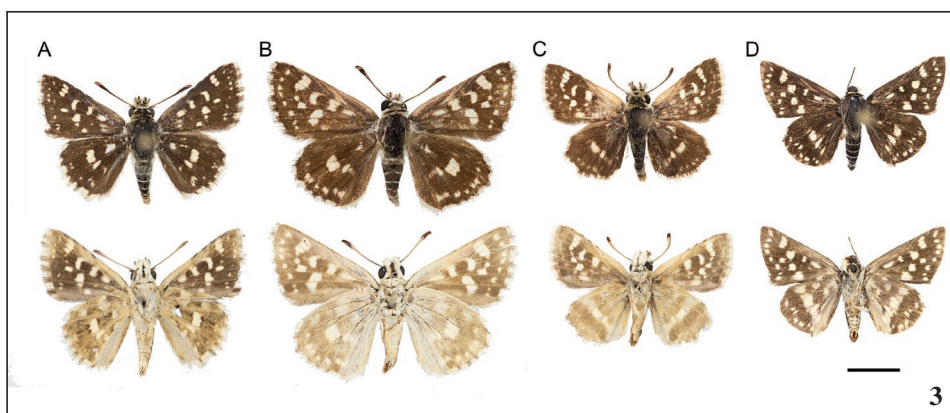
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**Figures 3-6.**— **3.** Representatives of the genus *Spialia* collected in Dhofar: A. *Spialia mafa*, B. *Spialia doris*, C. *Spialia zebra*, D. *Spialia colotes*. **4.** *Melitaea deserticola scotti* collected by MS in Wadi Sayq in November 2019. **5.** *Chloroselas esmeralda bilqis* feeding on *Euphorbia larica* Boiss. near Al Mughsayl. **6.** *Colotis protomedia* has so far been recorded only from environs of Dhalkut.