

The Inventory of Lepidoptera in the United Arab Emirates

Die Inventarisierung der Lepidopteren in den Vereinigten Arabischen Emiraten

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Summary: The present note gives a short survey of the present inventory of Lepidoptera of the United Arab Emirates. Essentially, the inventory started in 2005, when the dutch A. VAN HARTEN published a checklist of the hitherto collected insects. Later VAN HARTEN and the author visited several ecologically different biotopes, where they collected insects, but particularly Lepidoptera, using a wide spectrum of collecting techniques. Specimens were sorted to family level and given to specialists for identification. Currently 239 species of Microlepidoptera with 30 new species and 294 Macrolepidoptera with 7 new species are known from this region.

Keywords: Palaearctic, United Arab Emirates, Lepidoptera.

Zusammenfassung: Die vorliegende Arbeit gibt einen kurzen Abriss der bisherigen Bestandsaufnahme der Lepidopterenfauna der Vereinigten Arabischen Emiraten. Diese begann im Wesentlichen erst ab 2005 nach einer Synopsis der bisher aufgesammelten Insekten durch den Niederländer A. VAN HARTEN. Später wurden von VAN HARTEN und dem Verfasser ökologisch unterschiedliche Biotope aufgesucht und mit Hilfe eines weiten Spektrums von Sammelmethode Insekten gesammelt, vor allem Schmetterlinge, und nach Identifikation auf Familienebene auf verschiedene Spezialisten zur Bearbeitung verteilt. Zurzeit sind aus den Vereinigten Arabischen Emiraten 239 Mikrolepidopteren bekannt – davon sind 30 neue Arten – und 294 Makrolepidopteren mit sieben neuen Arten.

Schlüsselwörter: Paläarktis, Vereinigte Arabische Emirate, Lepidoptera.

1. Introduction

In the western world the Arabian Peninsula is primarily known for its oil production. For a long period interest of biologists in the region has not been very high. Professional interest, with the organisation of expeditions, occurred in 1760 (ROYAL DANISH EXPEDITION), at the end of the 19th century an Austrian expedition was performed by the ROYAL ACADEMY OF SCIENCE OF VIENNA and a British expedition by the MUSEUM OF LIVERPOOL. In 1937-38 an expedition was organized by the BRITISH MUSEUM OF NATURAL HISTORY. The first three were made to collect the fauna and flora of the region, the latter mainly collected

insects. Examples of publications based on the results of these expeditions were published by J.C. FABRICIUS (1775), M.A. WALSINGHAM (1903), and H. REBEL (1907). Parts of the material collected are still under examination.

Two major steps forward were made in the 1960s and 1970s. The first were the entomological activities of the British diplomat, E.P. WILTSHIRE (1977, 1985, 1986, 1994) and T.B. LARSEN (1983), who collected numerous Rhopalocera and Macro-Heterocera and published the results. The second greater step was the decision by the Royal Family of Saudi Arabia, in the end of the 1970s, to start the "Zoological Survey of Saudi Arabia" and

to initiate the series "Fauna of Saudi Arabia". The opening of the Natural History Museum of Muscat and the activities in the 1980-90s in Yemen by A. VAN HARTEN (Netherlands), an agricultural engineer, who collected material from numerous orders and acting as a co-worker in investigations on the fauna, were big steps forward, resulting in numerous publications (for example in Fauna of Saudi Arabia). Only few individual collectors visited the United Arab Emirates after the 1990s regularly, e.g. A. LEGRAIN (Belgium) was very active in collecting Noctuidae and C.A. COLLINGWOOD (Great Britain) worked on ants.

As a result knowledge on insects mainly increased in the faunas of Saudi Arabia, Yemen and Oman, but the United Arab Emirates received only minimal attention in entomological research.

2. The project

In 2004 Sheikh TAHNOON BIN ZAYED AL NAHYAN decided to start an insect survey of the United Arab Emirates. For this task A. VAN HARTEN, who worked in agriculture development in Yemen from 1990 till 2004, was asked to take the lead.

VAN HARTEN (2005) started with an inventory on the known and published species from the country. The next step was to consider how to collect large numbers of species in different biotopes. For this reason, an analysis was made of the habitats to select places where to collect. A variety of methods such as light, malaise, dish, bait and pitfall traps as well as beating of insects from the vegetation, breeding, netting, etc. were used. All insects were killed and stored in ethanol. This type of collecting is very efficient and satisfying for most insect groups, which can be studied after storing in ethanol. However, Lepidoptera stored in ethanol very quickly loose the scales from their wings. Lepidopterous specimens are practically not dryable with the wings prepared in a satisfactory

manner, therefore exact identification is difficult or even impossible. Although specimens stored in ethanol may be identified by preparing their genital structures, in practice this way of working is not possible for two reasons. First, the process to make the genital preparations is time-consuming and in relation to the extremely high number of specimens collected not an option, and second, the fauna comprises numerous species, which are poorly known or even unknown to science. References of genital illustrations from the region in a wider sense do not exist yet. The United Arab Emirates are part of the Palaearctic fauna which contacts the African as well as the South Asian faunas in the southern Arabian region. For this reason these faunas have to be taken in consideration in the identification of species as well. This illustrates why Macro- and Micro-Heterocera were collected at light or bred from their hostplants and processed dry.

In 2005 contact between A. VAN HARTEN and the author was established. We agreed, in order to cover most of the flight period of the Macro- and Micro-Heterocera, upon a long collecting period from the winter rest into the summer heat. This was the best option to create maximum results in finding large numbers of species and specimens. Later the switch from summer heat to the winter temperatures would give information on the second period of flight of these insects. To cover these periods the author collected from mid-February to the end of April in 2006 and from mid-October to mid-November in 2007. Collecting in the summer period, with day temperatures over 40 degrees Celsius, has not been made.

At the start of the collecting period in 2006 an inventory of the biotopes was made and test collecting was performed on a number of possible sites. The purpose was to make a choice of seven locality groups, each to be visited once a week.

2.2. The biotopes

Surveying the country revealed a series of biotopes. In order to cover the different biotopes for maximum result, a choice was made of localities considered best for maximum results. Principally each habitat type was visited once a week, although not always on the same spot. On Fig.1 a country map with the main cities is given. In this way an impression can be obtained, where the various habitats are located. For detailed information check in VAN HARTEN (2005, 2008), or in a detailed atlas of the region. The main types of habitat can be defined as described:

A. Coastal salt marshes. These are located on the west coast between Al Ajman and Ras al-Khaimah. Their size is variable, the larger directly north of Al Ajman. On the east coast one small stretch of marsh land is located north of Fujairah.

B. Coastal mangrove vegetation. Both on the west and east coast. On the west coast most area is private property and not accessible, except for some acres north of the Al Ajman harbour. In the east a rather small area directly north of the Oman border is present. In general this type of vegetation is poorly accessible.

C. Coastal beaches and sand dunes. Mainly found on the west coast, between Al Ajman

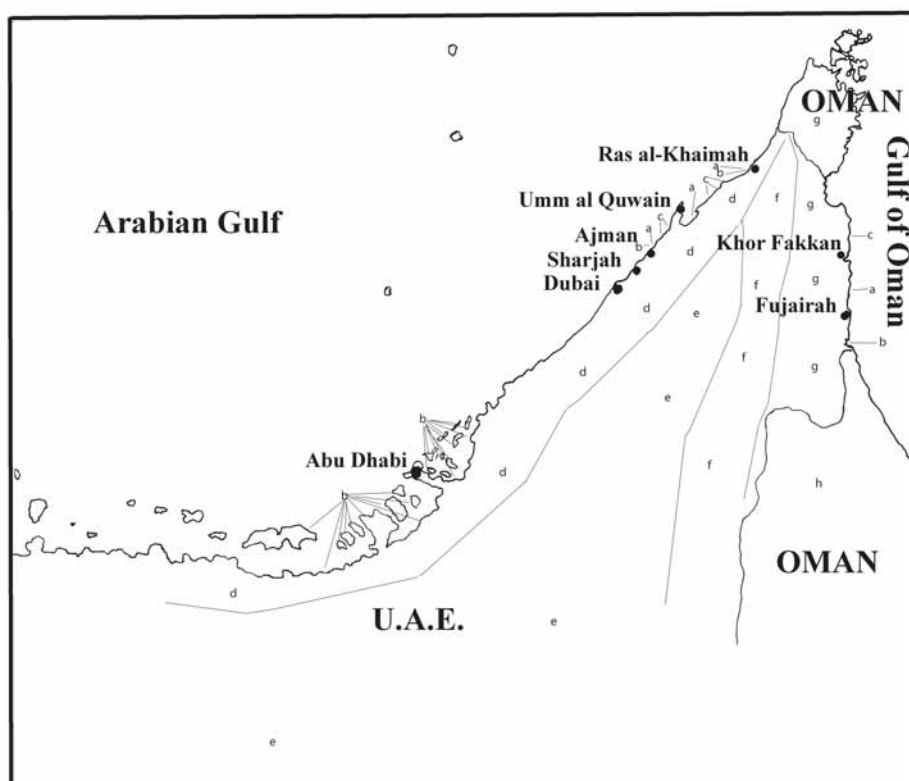


Fig. 1: Map of the United Arab Emirates with main biotopes, in which Lepidoptera were collected. **a** Coastal salt marshes; **b** coastal mangrove vegetation; **c** coastal beaches and sand dunes; **d** desert dunes; **e** sand desert; **f** rock and gravel sedimentation zone; **g** mountains.

Abb. 1: Karte der Vereinigten Arabischen Emirate mit den besammelten Biotopen. **a** Küstennahe Salzmarschen; **b** Mangrove; **c** Strände und küstennahe Sanddünen; **d** Dünen der Wüste; **e** Sandwüste; **f** Fels- und Kiessedimente; **g** Berge.

and Ras al-Khaimah. A minimal stretch of this coast type is found on the east coast near Khor Fakkan.

D. From the west coast inland a landscape of desert dunes is developing. The vegetation gradually decreases. The width of the zone is difficult to establish, but can be estimated by around 30-50 km. The vegetation is mainly halophytic.

E. Deep inland the sand desert fully stretches. Vegetation here is very limited, except in the wadis, which are relatively moist. Also in this area the halophytic component of the vegetation is high, due to evaporation of ground water and the residue salt content.

F. Going further to the east, between the sand desert and the mountains, a zone of rock and gravel sedimentation stretches, with decrease of the sand component towards the mountains.

G. The mountain zone stretches parallel to the east coast. The mountains reach a height of 1,700 meters in the United Arab Emirates, in neighbouring Oman over 2,000 meters. The rocks are steep and very brittle. Erosion has broken off numerous fragments, which are extremely sharp. For this reason roads and tracks are only constructed in the lower parts, up to 500 meters altitude. In higher elevations narrow donkey tracks are sparsely present. Higher elevations are in practice not accessible for collecting.

H. Farms are situated in virtually every landscape. Nearly all of them are connected to electricity and pump up fossil water. Contacts with farmers proved very successful in finding spots to run lights and traps.

G. Private gardens and parks. Dispersed over the country, the royal families of the Emirates have their palaces surrounded by gardens and/or parks. Also botanical gardens, such as the "Sharjah Desert Park", are places of interest. Admission to collect on private ground is in practice not obtainable, except in one case where the property was not in use. The "Sharjah Desert Park" has been very generous

to allow collecting in their botanical garden and on their grounds.

3. The Lepidoptera fauna

At the start of the project in 2005 the known Lepidoptera fauna listed 53 species of Rhopalocera, 210 species of Macro-Heterocera and 42 species of Micro-Heterocera (VAN HARTEN 2005). The extremely poor knowledge of the Micro-Heterocera urged me primarily to concentrate on the families in this group. The Macro-Heterocera which were encountered were collected as well, killed and papered. Rhopalocera were not taken in consideration at all.

During both collecting periods a total of over 4,000 Micro-Heterocera was collected or bred, prepared and mounted. Individual specimens were collected, at light, in glass vials. The specimens were placed in a cool-box during the collecting at night and after return to the laboratory placed in a refrigerator. The next morning the moths were killed either with ammonia 25% or ethyl-acetate (killing with ammonia makes the spreading of the wings of Micro-Heterocera very easy, in contrast to ethyl-acetate which creates stiffening of the specimens after killing Ammonia, however, effects some pigments in Lepidoptera and has to be avoided in red marked specimens and Pieridae). After killing the specimens were pinned and their wings spread. After drying, the specimens were preliminary labelled and stored in small plastozote boxes. Back in the Netherlands all specimens were double-mounted and labelled. Only at this point the specimens could be sorted to family level and sent to specialists for identification. So far not all specialists have completely processed the specimens sent to them.

The Macrolepidoptera were killed and papered. Approximately 2000 specimens were collected. The papered specimens have been placed in the hand of some wellknown specialists on these families.

Tab. 1: Listing of lepidopteran families with the known number of species known in the United Arab Emirates in 2004 and 2010 and the number of the species per family described as new to date.

* This number comprises the number of species already identified in the “other Micro-Heterocera families” but were not yet published.

Tab. 1: Auflistung der Schmetterlingsfamilien mit den aus den Vereinigten Arabischen Emiraten bekannten Artenzahlen bis 2004 und bis 2010 sowie die Anzahl der bisher neu beschriebenen Arten pro Familie. * Die Zahl bezeichnet die Anzahl der Arten, die bei den „restlichen Familien“ bereits identifiziert wurden, aber noch nicht publiziert sind.

Family	Known up to 2004 (VAN HARTEN 2005)	Present situation (VAN HARTEN 2009, 2009, 2010)	Hitherto described new species
Rhopalocera	53	53	
Noctuidae	154	170	3
Geometridae	45	56	4
Other Macro-Heterocera families	15	15	
Total number of Macrolepidoptera	267	294	7
Pyalidae (incl. Crambidae)	20	95	16
Pterophoridae	-	15	1
Alucitidae	-	1	1
Tortricidae	1	10	
Brachodidae, Choreutidae	1	2	
Autostichidae	-	3	
Depressariidae	-	2	
Stathmopodidae		4	1
Cosmopterigidae	1	16	4
Batrachedidae	1	1	
Coleophoridae, Blastobasinae	-	13	2
Scythrididae	2	12	
Elachistidae	-	2	1
Ethmidae	-	4	
Psychidae	3	4	
Tineidae	-	9	3
Tischeriidae	-	1	
Nepticulidae	-	7	1
Other Micro-Heterocera families	13	38*	
Total number of Microlepidoptera	42	239	30

4. Discussion

The processing of the collected specimens is a time-consuming process. A number of authors have produced a review of the family/

families they examined (VAN HARTEN 2008, 2009, 2010). Others only could produce temporary results, splitting the material to species level, without naming the taxa. The results are summarized in table 1.

In the reviews of the Lepidoptera families of the Emirates (VAN HARTEN 2008, 2009, 2010) a list of collected specimens is given per species, recording the distribution of species in the country. Many species of Lepidoptera, but also the highest number of plant species, are found in the mountains (VAN HARTEN 2008, 2009, 2010; JONGBLOED 2003).

The number of Macrolepidoptera (Rhopalocera and Macro-Heterocera) has risen from 267 to 294 species (HAUSMANN & SKOU 2007; HAUSMANN & HERBERT 2009; FIBIGER & LEGRAIN 2009), of which seven are new to science. In the Microlepidoptera the number of species rose from 42 to 239, of which 30 are new to science. These last numbers do not include the families Cossidae, Gracilariidae, Plutellidae, Symmocidae, Momphidae, Gelechiidae and (partly) Pyralidae. The number of families of Microlepidoptera recognized in the country rose from 12 to 21. With the families still under investigation, the estimated number of Microlepidoptera from the country will rise above 275 species.

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