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Studies on the genus M o c y d i a EDWARDS, 1922, with the description of a new species: M.aegea n.sp. (Homoptera, Auchenorrhyncha, Cicadellidae)

with
19 figures

by

H. ABDUL-NOUR

Key-words:
Homoptera, Auchenorrhyncha, Cicadellidae, Mocydia, taxonomy, biology, zoogeography, Greece, Anatolia, Lebanon.

Abstract:
A new species, Mocydia aegea n.sp. is described from Greece and Anatolia. The study of 138 specimens of Mocydia from Europe and the east-mediterranean zone has shown that this genus is composed at least of three species (M.crocea (H.-S.), M.spiculum ABD. and M.aegea n.sp.) which are hence compared. An identification key is given, as well as comparative notes on biology and zoogeography.

Introduction:

The genus Mocydia EDW. had long been considered as monotypic, with M.crocea (H.-S.) covering a large geographical area according to literature records (Western Palearctic, including North Africa, Caucasus, Middle East and Iran). Previous investigations, with the discovery of M.spiculum ABD. in Lebanon (ABDUL-NOUR, 1986), have shown that speciation could occur on the fringe of this zoogeographical range and split up this genus in maybe more than two species. In this study, 138 specimens of the genus Mocydia were examined and a new species erected, which is compared to the two others.

Abbreviations:

ZMA: Zoölögisch Museum, Universiteit van Amsterdam.

I.R.Sc.N.B.: Institut Royal des Sciences Naturelles de Belgique.

BMNH: British Museum (Natural History).

Coll. Abdul-Nour: In collection H.Abdul-Nour, Lebanon.

Origin of examined specimens:

France: M.crocea: 1♀ (SE of Lyon); 2♀ (Moselle). (I.R.Sc.N.B.).

Belgium: M.crocea: 4♂, 7♀. (I.R.Sc.N.B.).

W.Germany: M.crocea: 3♂, 3♀ (Marburg, Hessen). (Coll. Abdul-Nour).

Spain: M.crocea: 1♀ (Sierra de Gredos); 2♀ (N.Granada). (ZMA).

Italy: M.crocea: 2♂, 4♀ (N.Italy). (ZMA).

Yugoslavia: M.crocea: 1♀. (ZMA).

Turkey: M.crocea: 6♂, 2♀ (Anatolia, Pontus mts., Gerze). (Coll. Abdul-Nour).

M.aegea: 4♂, 4♀ (Ankara); 2♂, 3♀ (Pontus mts., Gerze). (Coll. Abdul-Nour).

Greece: M.aegea: 12♂, 6♀ (N.Greece, Nomos Florina). (Coll. Abdul-Nour).

12♂, 30♀ (Peloponnisos, Lesbos, Attika). (ZMA).

Lebanon: M.spiculum: 16♂, 11♀. (Coll. Abdul-Nour).

Mocydia aegea n.sp. (figs. 5-15 & 5a-15a):

Habitus as for M.crocea and M.spiculum; no noticeable differences could be found in the coloration, female genitalia, pygofer, sub-genital plates and anal tube. The main specific characteristics of this taxa are in the aedeagus.

Aedeagus: general shape and proportions as in M.spiculum, with the two lateral appendages longer and thinner than in M.crocea. The apical part of the stem has a spear-like shape that is generally more slender than that of M.spiculum. Phallotreme usually much longer than in the other two species, sometimes reaching far down on the stem (fig. 11a & 13a). Most of the spines are much more bigger than those of M.crocea and are nearly always concentrated towards the apex of the stem (one exception was found in a specimen of north Greece: fig. 5 & 5a); there is always a number of them above the phallotreme. The number of spines is very variable, ranging from 5 to 22 in the examined specimens.

Four populations of M.aegea n.sp. were analysed separately (N.Greece, (Nomos Florina), Lesbos island, S.Greece (Peloponnisos) and Anatolia) and will be discussed hereafter (Table 1 & figs.), but we may readily make the following observations: lowest number of spines are in the Lesbos population; highest one in the Peloponnisos; medium number in Anatolia and north Greece; but medium numbers occur also in Lesbos and Peloponnisos. In Nomos Florina, near the northern limit of M.aegea's range, one specimen has small spines distributed on the whole stem as in M.crocea, along with the bigger spines near the apex. Measurements were made on 26 ♂♂ and 27♀♀ (in mm.). Total length is from apex of vertex to wings tip.

Male:

Total length: 4,100-5,000 ($\bar{x}$=4,461);

lenth of vertex: 0,350-0,425 ($\bar{x}$=0,373);

length of pronotum: 0,475-0,575 ($\bar{x}$=0,511);

width of head: 1,025-1,225 ($\bar{x}$=1,088);

width of pronotum: 0,950-1,125 ($\bar{x}$=0,998).

Female:

Total length: 4,650-5,250 ($\bar{x}$=4,918);

length of vertex: 0,400-0.500 ($\bar{x}$=0,434);

length of pronotum: o,550-0,650 ($\bar{x}$=0,567);

width of head: 1,150-1,250 ($\bar{x}$=1,210);

width of pronotum: 1,050-1,175 ($\bar{x}$=1,114).

Distribution (Map 1): According to museum specimens and to our own investigations in Greece, the range of this new species is as follows: Greece (north, Nomos Florina), Attika, Peloponnisos, aegean islands), Anatolia (including Pontus mts.).

Food plant: In north Greece (Mikrolimni) it was found only on Brachypodium pinnatum (Graminae).

One Holotype and 72 paratypes.

Holotype:

(BMNH): 1♂ (Turquie, Anatolie, Ankara, Cubuk I. Gölü, 30.8.78, leg. M.Asche).

Paratypes:

(BMNH): 1♂ (Turquie, Anatolie, Ankara, Cubuk I. Gölü, 30.8.78, leg. M.Asche).

3♀♀ (same labels as above).

(ZMA): 3♂♂, 7♀♀ (Ellas, Peloponnisos, Lakonia, Mistras, 400m, 19.10.76, leg. A.C. & W.N.Ellis).

1♂, 2♀♀ (Ellas, Peloponnisos, Lakonia, Anavriti, 850-930m, 7.11.76, leg. A.C. & W.N.Ellis).

3♀♀ (Ellas, Peloponnisos, Langada-ravijn, 5km ESE Artemisia, 1040-1140m, 8.11.76, leg. A.C. & W.N.Ellis).

1♀ (Ellas, Peloponnisos, Paleopanayia, 450-650m, 26.10.76, leg. A.C. & W.N.Ellis).

1♀ (Ellas, Peloponnisos, Lakonia, Parori, 2km SE Mistras, 350-500m, 30.10.76, leg. A.C. & W.N.Ellis).

1♀ (Ellas, Peloponnisos, Lakonia, Yeoryitsi, 1050-1100m, 11.11.76, leg.

A.C. & W.N.Ellis).

1♀ (Hellas, Peloponnisos, 8km W of Langadia, 16.7.77, leg. M.H. & J.P. Duffels).

1♀ (b.Athen, coll. v.Oertzen, leg. C. & O.Vogt, 1960).

5♂♂, 11♀♀ (Ellas, Lesbos, 2km NO Loutropolis, Thermis, 21.10.73, leg. A.C. & W.N.Ellis).

1♀ (Ellas, Lesbos, Kratigos, 10km SSO Mitilini, 25.11.73, leg. A.C. & W.N.Ellis).

2♀♀ (Ellas, Lesbos, 10km SO v.Kalloni, 10.11.73, leg. A.C. & W.N.Ellis).

1♀ (Ellas, Maguisia, 10km No Volos, 800-1100m, 21.9.62, Ent. Exc. Zool. Mus.

1♀ (Attika, C. & O.Vogt leg., 1960)

(Coll. Abdul-Nour):

2♂♂, 1♀ (Turquie, Anatolie, Ankara, Cubuk I. Gölü, 30.8.78, leg. M.Asche).

2♂♂, 3♀♀ (Turquie, Anatolie, Pontus mts. E.Gerze, 1.9.78, leg. M.Asche).

1♂, 1♀ (Grece, Nomos Florina, Ladopotamos valley, Gavros, 25.9.78, leg. M.Asche).

11♂♂, 5♀♀ (Grece, Mikrolimni, Nomos Florina, 18.8.86, coll. H.Abdul-Nour).

Discussion:

In order to define more precisely the taxonomic status of M.aegea n.sp. many specimens of M.crocea and M.spiculum were studied for comparison.

M.crocea (figs. 1-4 & 1a-4a): As figured by RIBAUT (1952) and LE QUESNE (1969), the aedeagus of most of the european and north anatolian specimens have an evenly rounded apex when seen in caudal view (figs. 2 & 3); in dorso-caudal view, the stem apex is gently tapering (figs. 2a & 3a). However, one specimen from Italy (Genova) and one from Anatolia (Pontus mts.) have a spear-like apex (figs. 1, 1a, 4, 4a) like M.aegea and M.spiculum. The most distinctive features of M.crocea are: 1, a small number of spines (4 to 13 in our specimens) distributed on the stem with always at least one above the phallotreme; 2, relatively short

lateral appendages with a broad base.

M.spiculum (figs. 16-19 & 16a-19a): aedeagus very much like M.aegea's, with the following distinctive characteristics: 1, small number of spines (2 to 6) which are gathered near the apex, but there is never any spine above the phallotreme; 2, Phallotreme relatively small when compard to M.aegea's, and always situated on the spear-like apex without extending down on the main stem (as it occurs for M.aegea).

The three species can be easily separated with the following key:

1. Lateral appendages of aedeagus short and broad-based; length of distal part of the stem (from the base of appendages to apex of the stem) nearly equal to half the total length of the stem when seen in caudal view.....M.crocea (H.-S.)
- Lateral appendages long and slender; length of distal part of the stem at least equal to three-quarters of the total length; stem with a spear-like apex.....2

2(1) No spines above the phallotreme.....M.spiculum ABDUL-NOUR
- Spines above the phallotreme.....M.aegea n.sp.

The presence of a spear-like apex in some of the M.crocea specimens (figs. 1, 1a, 4, 4a) and small spines on the whole stem of a specimen of M.aegea (figs. 5 & 5a) may be discussed. We think that it cannot be interpreted as hybrid characteristics, especially because it doesn't fit with the fact that the italian specimen is to far from the geographical area of M.aegea. These peculiarities should be interpreted as occasionnal phenotypic expressions of a genetic potentiality. Thus, it can be considered that the spear-point apex of the M.spiculum-aegea group is apomorphic, while the small spines distributed on the stem of the greek specimen (fig. 5 & 5a) are the occasionnal resurgence of a plesiomorphic

characteristic.

Different measurements for all the examined populations are figured in Table 1, and the following comments can be made:

The range of variation and mean values concerning the population of Lesbos, Peloponnisos and Anatolia (M.aegea) are very similar, contrasting with higher values in the northern greek population (especially in males). On the other hand, there are significant differences between the european and anatolian M.crocea (Student's t-test, $P \leq 0,05$), the latter being larger. Except for this last case, there is a general north-south trend for values to become smaller, thus giving the impression of a clinal variation; the reduction of size could then be interpreted as an effect of higher temperatures and levels of aridity, with M.aegea and M.spiculum being considered at most as subspecies of M.crocea.

However, taking into consideration that there are clear-cut and important differences in the structure of the aedeagus, with no obvious hybrid or intermediate specimen observed so far, we think that the best decision was to separate those taxa at species level.

But other problems are to be solved: As it can be seen in figs. 5-15 & 5a-15a, the Lesbos population of M.aegea tends to have the smallest number of spines on the aedeagus, and the Peloponnisos' the highest. Do we have here the beginning of a subspeciation process? Isn't the gene flow between all the aegean populations impaired by a low spreading ability (which has already been noted by MÜLLER (1981) for M.crocea), and why are the Pontus specimens of M.crocea much bigger than the european ones? The ultimate answer of these questions will be given only by acoustic and/or hybridisation studies.

Biological notes:

According to MÜLLER (1981), M.crocea is a grass-feeding oligophagous species, and he could breed it on barley, Poa and Festuca. LE QUESNE (1969) mentions a possible association of the same species with Bromus erectus, Brachypodium or Dactylis.

As to M.spiculum this species is strictly associated to Brachypodium

pinnatum in the field, with occasional survival migration in summer on Quercus calliprinos (ABDUL-NOUR, 1984, 1986). Our own field observations in north Greece have shown that M.aegea was found only in association with B.pinnatum.

Larval forms: While there are six different larval morphs for M.crocea (MÜLLER, 1981), only one was found for M.aegea and M.spiculum. Field collecting and laboratory breeding have yielded only the yellow two-banded form for M.spiculum, and all the larvae of M.aegea collected in N.Greece were also of this type.

According to MÜLLER (1976) the first larvae of M.crocea (in E.Germany) appear by the end of May, and the last ones become adult by the end of August. It is approximatively the same for M.spiculum in Lebanon, and we have found in north Greece 4-5th larval instars of M.aegea in mid-August.

Zoogeography:

On map 1 are shown the various distribution ranges or collecting spots of the three species, and the following comments can be made: Most of the records of M.crocea from the east-mediterrannean area are certainly wrong, since this species had never been found in the Greek peninsula, central Anatolia and Lebanon. All the ZMA specimens from Greece that were labelled as M.crocea belong in fact to M.aegea; KALKANDELEN (1974) reports M.crocea from central Anatolia, but her drawings of the aedeagus are those of a typical M.aegea. M.ASCHE collected many specimens in the Pontus mts. (Anatolia), not far from Gerze (Black Sea coast) and, surprisingly enough, both species M.crocea and M.aegea were found in the lot. Unfortunately, we don't know if they were collected in the same biotope, but there was no specimen showing any morphological indication of hybridisation. Thus, the southern limit of M.crocea's range would be north Greece and the Pontus mts. in Anatolia. Records of this species from Iran (DLABOLA, 1981), Armenia & Jordan (DLABOLA, 1965) and Cyprus (LINDBERG, 1948) are to be considered doubtful.

M.aegea is distributed all over Greece and Anatolia, being geographically sympatric with M.crocea in the Black Sea coastal area.

M.spiculum is recorded only from Lebanon, but investigations in the neighbouring countries may well extend its range, and it would be of the utmost zoogeographical interest to identify and delimitate the contact zone between this species and M.aegea.

Acknowledgements:

I 'm very grateful to Dr.J.P.Duffels and Dr. J.Van Stalle for the loan of museum specimens, respectively from the ZMA and the I.R.Sc.N.B.; to Dr.M.Asche for the gift of specimens collected by him in Anatolia, and to Dr.S.Drosopoulos for providing me facilities for collecting in north Greece.

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Table 1

	L total		L vertex		L pronotum		W head		W pronotum	
♂	min.-max.	$\bar{x}$	min.-max.	$\bar{x}$	min.-max.	$\bar{x}$	min.-max.	$\bar{x}$	min.-max.	$\bar{x}$
crocea(8) (Europe)	4,450-5,100	4,706	0,350-0,450	0,400	0,525-0,575	0,540	1,100 1,250	1,159	1,025 1,150	1,071
crocea(5) (Pontus)	4,900-5,050	4,990	0,350-0,400	0,370	0,550-0,600	0,575	1,125-1,250	1,170	1,050-1,175	1,105
aegea(6) (N.Greece)	4,550-5,000	4,717	0,350-0,425	0,396	0,475-0,575	0,529	1,075-1,225	1,138	1,000 1,125	1,050
aegea(5) (Pelop.)	4,200-4,700	4,480	0,350-0,400	0,375	0,500-0,550	0,520	1,025-1,100	1,080	0,950-1,000	0,985
aegea(9) (Lesbos)	4,100-4,550	4,338	0,350-0,400	0,361	0,475-0,550	0,502	1,050-1,100	1,077	0,950-1,025	0,983
aegea(6) (Anatolia)	4,250-4,500	4,375	0,350-0,400	0,367	0,475-0,525	0,500	1,050-1,100	1,063	0,950-1,025	0,983
spiculum (13)	4,000-4,300	4,162	0,350-0,400	0,367	0,475-0,500	0,492	1,025-1,100	1,062	0,950-1,025	0,973
♀										
crocea(10) (Europe)	4,900-5,250	5,110	0,425-0,475	0,453	0,550-0,600	0,585	1,250-1,300	1,278	1,150-1,225	1,185
crocea(2) (Pontus)	5,400-5,650	5,525	0,450-0,475	0,463	0,650-0,650	0,650	1,300-1,325	1,313	1,225-1,250	1,238
aegea(4) (N.Greece)	4,900-5,100	4,988	0,450-0,450	0,450	0,575-0,600	0,594	1,225-1,250	1,238	1,125-1,150	1,138
aegea(4) (Pelop.)	4,750-5,250	4,925	0,400-0,500	0,438	0,550-0,650	0,577	1,150-1,250	1,198	1,050-1,175	1,107
aegea(5) (Lesbos)	4,800-4,950	4,880	0,400-0,450	0,425	0,550-0,600	0,575	1,200-1,250	1,215	1,100-1,150	1,115
aegea(4) (Anatolia)	4,750-4,950	4,875	0,400-0,425	0,413	0,500-0,575	0,556	1,200-1,250	1,219	1,075-1,150	1,113
spiculum (13)	4,200-4,700	4,487	0,400-0,450	0,413	0,500-0,575	0,540	1,075-1,225	1,156	0,975-1,100	1,055

Morphometric characteristics of different Mocydia populations.

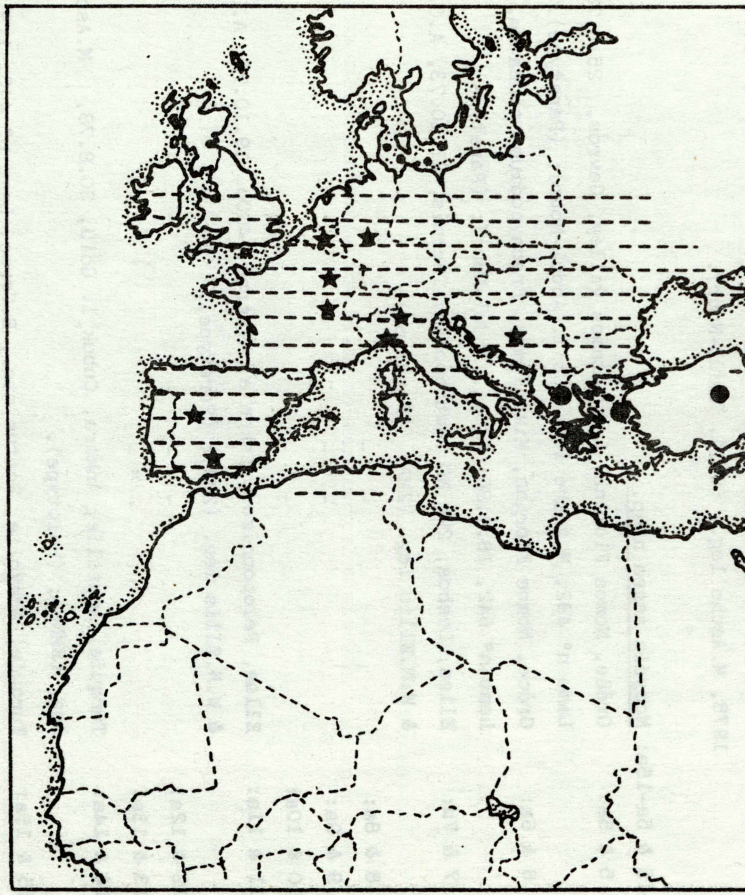
L = Length; W = Width. (in mm).

$\bar{x}$ = mean value.

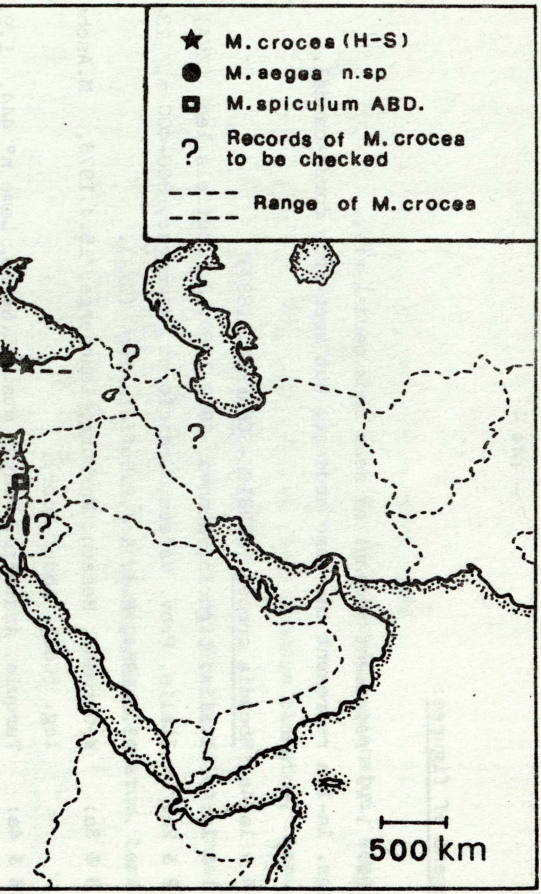
Numbers in between brackets (ex.: crocea(8)) represent the number of measured specimens.

Map 1:

Distribution of the three species of Mocydia. Stars, rounded dots and squares indicate the origin of the specimens examined in this study. Question-marks are for doubtful records of M.crocea in literature.



Map 1


M. crocea (H-S)
M. aegea n.sp
M. spiculum ABD.
Records of M. crocea to be checked
Range of M. crocea
500 km

Legend of figures:

Figs. 1-19 represent aedeagi as seen from caudal view.
Figs. 1a-19a represent the same aedeagi, but seen from dorso-caudal.

1-4 & 1a-4a: Mocydia crocea (HERRICH-SCHAFFER, 1837)

1 & 1a: Italia, Liguria, Genova, 29.9.1969, J.P.Duffels leg. (ZMA).

2 & 2a: Italia, Prov. Varesa, Orascio bij Maccagno, 300-400 m, 13-15.8.1964, M.J. & J.P.Duffels leg. (ZMA).

3 & 3a: W-Germany, Hessen, Marburg, Lahnberge, 15.4.1976, M.Asche leg. (Coll. Abdul-Nour).

4 & 4a: Turquie, Anatolie, Pontus mts., E.Gerze, Lame n° 444, 1.9. 1978, M.Asche leg., (Coll. Abdul-Nour).

5-15 & 5a-15a: Mocydia aegea n.sp.

5 & 5a: Grèce, Nomos Florina, Ladopotamos valley, Gavros, 25.9.78 Lame n° 432, M.Asche leg. (Coll. Abdul-Nour); (Paratype).

6 & 6a: Grèce, Nomos Florina, Mikrolimni, Brachypodium pinnatum, Lame n° 642, 18.8.86; (Coll. Abdul-Nour); (Paratype).

7 & 7a: Ellas, Lesbos, 2km NO Loutropolis, Thermis, 21.10.73, A.C. & W.N.Ellis leg. (ZMA). (Paratype).

8 & 8a: - " -

9 & 9a: - " -

10 & 10a: - " -

11 & 11a: Ellas, Peloponnisos, Lakonia, Mistras, 400m, 19.10.76, A.C. & W.N.Ellis leg. (ZMA); (Paratype).

12 & 12a: - " -

13 & 13a: - " -

14 & 14a: Turquie, Anatolie, Ankara, Cubuk I. Gölü, 30.8.78, M.Asche leg. (BMNH); (Holotype).

15 & 15a: Turquie, Anatolie, Pontus mts., E.Gerze, Lame n° 440, 1.9.78 M.Asche leg. (Coll. Abdul-Nour); (Paratype).

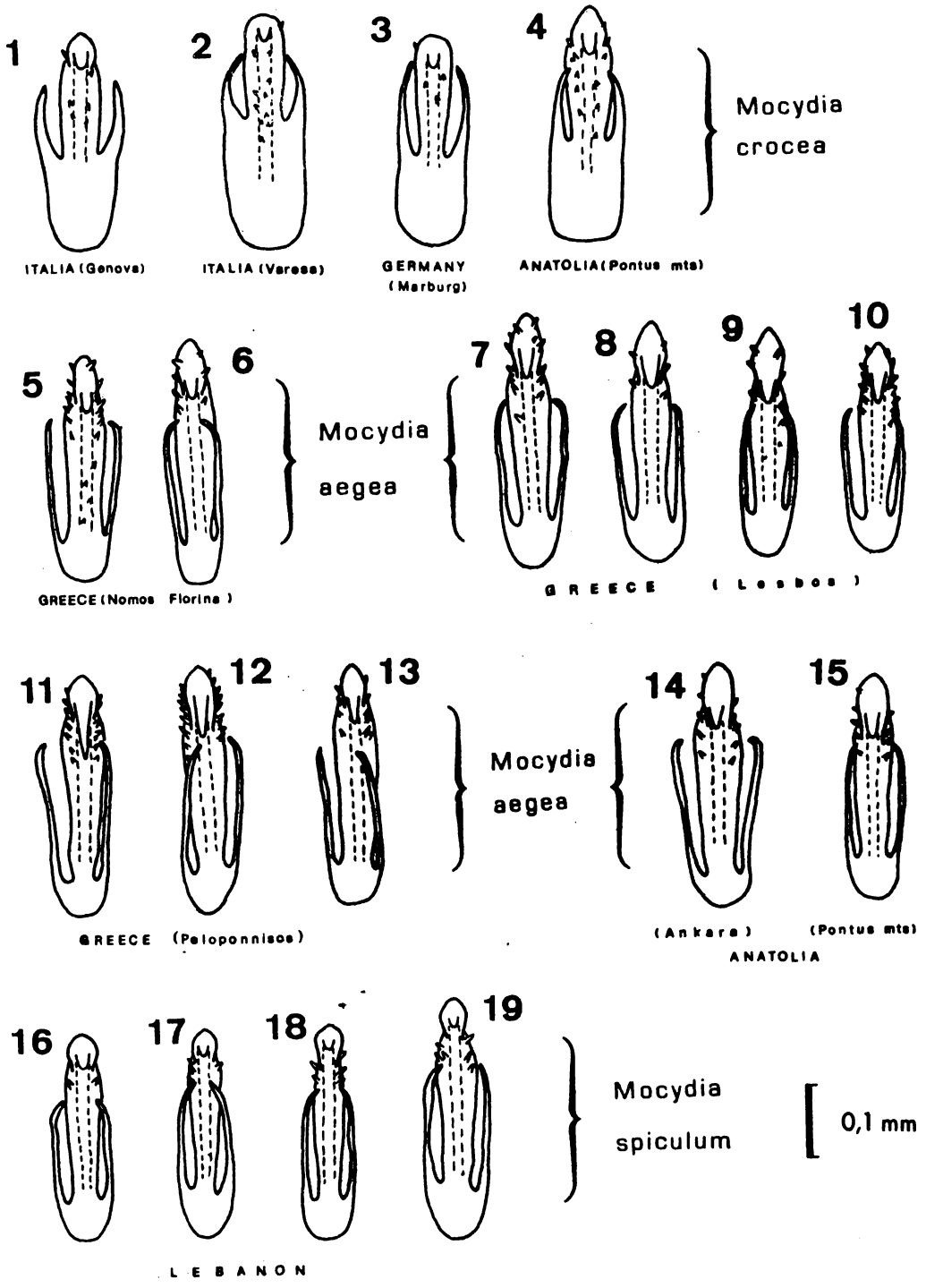
16-19 & 16a-19a: Mocydia spiculum ABDUL-NOUR, 1986

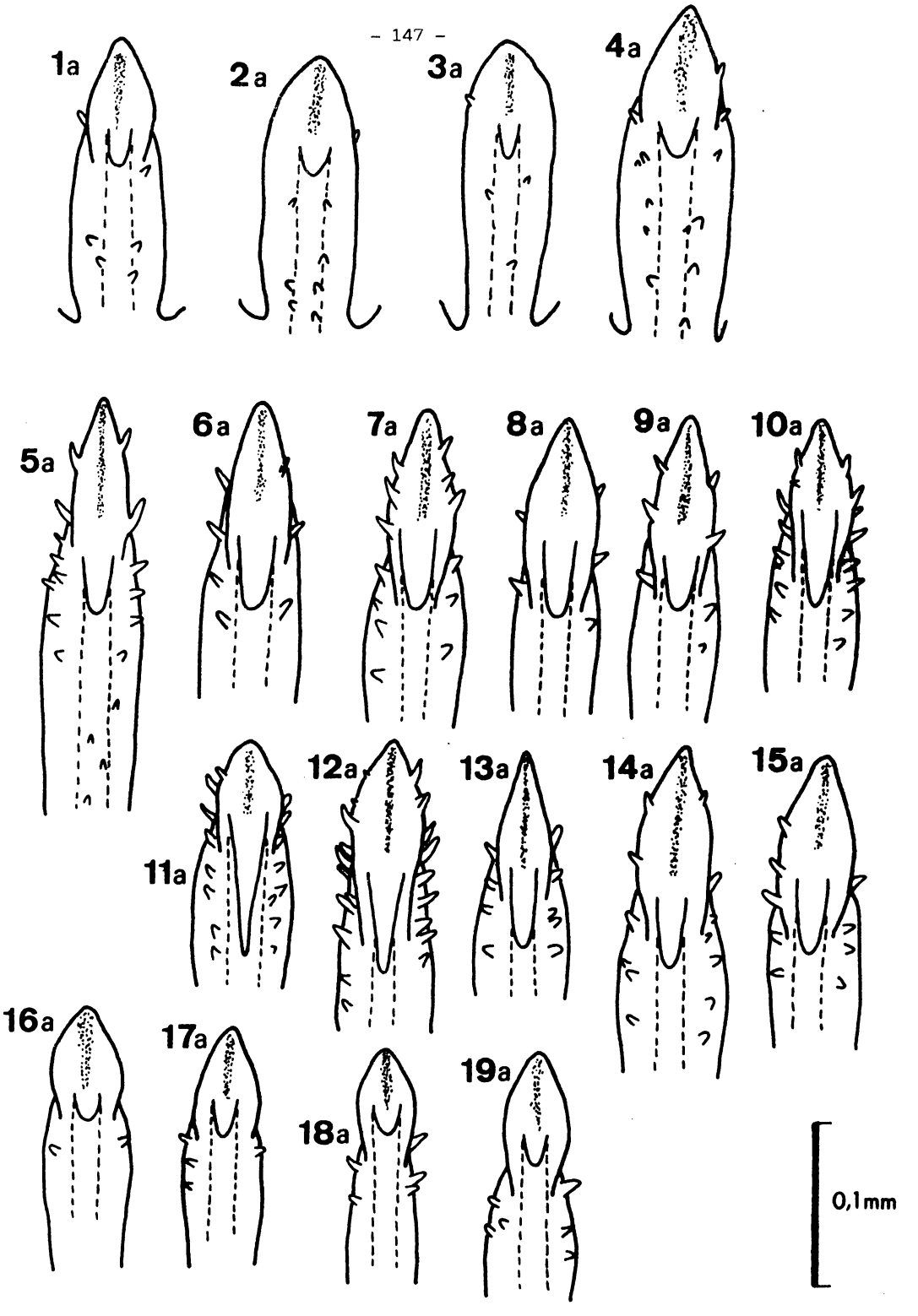
16 & 16a: Lebanon, Qartaba, 29.6.83, Brachypodium pinnatum, Lame n° 76, (Coll. Abdul-Nour).

17 & 17a: Lebanon, Qartaba, 2.8.86, Brachypodium pinnatum, Lame n° 645, (Coll. Abdul-Nour).

18 & 18a: Lebanon, Dahr-es-Souane, 19.11.83, Brachypodium pinnatum, (Coll. Abdul-Nour).

19 & 19a: Lebanon, Qartaba, 29.6.83, Brachypodium pinnatum, Lame n° 75 (Coll. Abdul-Nour).


1
2
3
4
Mocydia crocea
ITALIA (Genova)
ITALIA (Varese)
GERMANY (Marburg)
ANATOLIA (Pontus mts)
5
6
Mocydia aegea
7
8
9
10
GREECE (Nomos Florina)
GREECE (Lesbos)
11
12
13
Mocydia aegea
14
15
GREECE (Peloponnisos)
(Ankara)
(Pontus mts)
ANATOLIA
16
17
18
19
Mocydia spiculum
0,1 mm
LEBANON


1a
2a
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12a
13a
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17a
18a
19a
0,1mm

Adress of the author:

Dr. Hani Abdul-Nour
Université Libanaise
Faculté des Sciences
Dept. des Sciences Naturelles
MANSOURIEH-EL-METN, B.P. 72
Lebanon

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