

## Revision of Subfamily Nomiinae of Egypt (Hymenoptera: Halictidae)

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### Abstract

The Egyptian species of subfamily Nomiinae are revised. In the present study, only six species belonging to the genera, *Nomia* (Latreille) and *Pseudapis* (Kirby) are recognized from Egypt. These species are: *Nomia* (*Leuconomia*) *lutea* (Warncke), *Pseudapis* (*Pseudapis*) *armata* (Olivier), *P. (P.) dixica* (Warncke), *P. (P.) innesi* (Gribodo), *P. (P.) nubica* (Warncke) and *P. (P.) unidentata* (Olivier). The first species is transferred from subgenus *Paranomia* (Michener) to *Leuconomia* (Pauly) under the same genus *Nomia* Latreille. The next species are transferred from genus *Nomia* Latreille to genus *Pseudapis* (Kirby) and from subgenus *Lobonomia* (Warncke) to subgenus *Pseudapis* (Kirby), except the last one which is transferred from subgenus *Nomiapis* (Cockerell) to subgenus *Pseudapis* (Kirby).

Synonymies, diagnosis, descriptions and distribution records of all species are provided. The specific taxonomic characters and male genitalia of available species are figured to help in the identification of the species. Keys are constructed for genera, subgenera and species of subfamily Nomiinae of Egypt.

The flight records of the males and females of available species are illustrated in histogram plots. The host plants of the species are recorded, these plants are related to 20 plant genera, belonging to 12 plant families.

### Introduction

Family Halictidae is one of the largest families of order Hymenoptera. It includes four subfamilies: Halictinae, Nomiinae, Rophitinae and Nomioidinae (Michener, 2000). Subfamily Nomiinae is a large subfamily of morphological diverse bees that are worldwide in distribution. The species of subfamily Nomiinae are considered one of the most important and efficient pollinators of many different crops.

The classification of subfamily Nomiinae was studied by some investigators such as: Dalla Torre (1896), Friese (1897), Michener (1944, 1965 & 2000), Warncke (1976), Hirashima (1978), Pauly (1991 & 1999), Alexander and Michener (1995), Gauld and Bolton (1996) and Pesenko (1999).

Several species of genus *Nomia* Latreille are recorded from Egypt, i. e: six species by Walker (1871), 12 species by Dalla Torre (1896), 4 species by Alfken (1927), 5 species and one variety by El-zoheiry and Mohamed (1949), 3 species by Shalaby (1958) and 6 species by Warncke (1976).

The present study is carried out to clarify the

present status of subfamily Nomiinae according to recent literature and also to assist in the identification of the Egyptian species of this subfamily.

### Material and Methods

The present work was based on an examination of the preserved specimens in the Egyptian Insect Collections, in addition to the fresh specimens, collected during this work. The important source for the preserved materials is the Collection of Ministry of Agriculture, Insect Identification Section. The secondary collections are: Collection of Alfieri, Al-Azhar University, Faculty of Agriculture; Collection of Egyptian Entomological Society; Collection of Cairo University, Faculty of Science and Collection of Ain Shams University, Faculty of Science.

For preparation of the male genitalia, abdomens of male specimens were separated, boiled in 10% KOH for about 10 minutes, washed in distilled water and thereafter dissected in 50% alcohol under the dissecting Stereoscopic binocular to obtain sternites VII, VIII and male genitalia. After dehydration in alcohol series ending with absolute

alcohol, and clearing in xylol, specimens were mounted in Canada Balsam.

All drawings were made with Stereobinocular microscope and square eyepiece. All measurements had been taken using the same microscope with an ocular micrometer at 12.5 magnification.

### Results and Discussion

Subfamily Nomiinae is abundant in the southern and tropical parts of the Old World, including Australia, poorly represented in the Holarctic Region and completely absent in South America. This subfamily could be recognized as follows:

The marginal cell of forewing usually rounded [this character usually distinguishes the Nomiinae from Halictinae which has in almost pointed marginal cell]; first and third submarginal cells long, second much shorter (Fig. 6); labrum of female with a strong apical process having a median keel and fringe of bristles (Fig. 7); basal vein of forewing varies from slightly and uniformly curved to strongly curved, as in Halictinae; prepygidial fimbria not divided; male genitalia usually has both upper and lower gonostyli, latter not retrorse as in many Halictinae; lower gonostyli much smaller than upper one; 7<sup>th</sup> sternum of male transversed with two or four small apical projections usually bear long hair; 8<sup>th</sup> sternum of male compact and triangular or pentagonal, without long lateral extensions, and with a median apical peg-like structure.

Michener (2000) mentioned that genera of subfamily Nomiinae have commonly been regarded as subgenera of genus *Nomia* Latreille, for this reason various regional revision studies, treated the whole subfamily under the name *Nomia*. Such works are by Warncke (1976) for the West-Palaeartic region, Hirashima (1978) for Asian region and Pauly (1991) for Madagascar. He divided subfamily Nomiinae into 11 genera and 19 subgenera all over the world as follows: *Dieunomia* Cockerell (with two subgenera), *Halictonomia* Pauly, *Lepotriches* Gerstaecker (with 9 subgenera), *Mellitidia* Guerin-Meneville, *Nomia* Latreille (with 6 subgenera), *Pseudapis* Kirby (with 2 subgenera), *Ptilonomia* Michener, *Reepenia* Friese, *Spatunomia* Pauly, *Sphegocephala* Saussure and *Steganomus* Ritsema.

**Now, this subfamily is represented in Egypt by two genera and can be separated, as follows:**

#### Key to genera of subfamily Nomiinae of Egypt

1- Apical depressions of abdominal tergites impunctate, usually opaque white (Fig. 8), without hair bands (sometimes tergum I in males with lateral hair band); pronotum not lamellate; tegula small, not extending behind the level of scutoscutellar suture (Fig. 9) *Nomia*.....(Latreille)

- Apical depressions of abdominal tergites variable, often with hair bands or punctate, and if impunctate, then often translucent, depressions never white; tegula enormous, extending well behind the level of scutoscutellar suture (Figs. 19, 37 & 38); pronotum with strong, translucent lamella from posterior lobe mesad *Pseudapis*..... (Kirby)

**Genus: *Nomia* Latreille, 1805**

*Nomia* Latreille, Hist. Nat. Crust. & Insect. XIII, 1805, p.369, n. 411.

Type species: *Andrena curvipes* Fabricius, 1781, monobasic.

This genus could be recognized by white apical bands of abdominal tergites (in other geographical regions, these bands are yellow, green or blue). Now, this genus includes six subgenera as follows: *Acunomia* Cockerell, *Crociaspidia* Ashmead, *Hoplonomia* Ashmead, *Leuconomia* Pauly, *Nomia* Latreille s.str. and *Paulynomia* Michener.

In Egypt, this genus is represented by only one species belongs to subgenus *Leuconomia* Pauly.

**Subgenus: *Leuconomia* Pauly, 1980**

*Nomia* (*Leuconomia*) Pauly, Revue zool. Afr., 94 (1980): 124.

Type species: *Nomia candida* Smith, 1875, by original designation.

**This subgenus could be recognized as follows:**

Abdominal tergites with white apical bands; tergum I of male usually without colored band and with lateral hair band; outer spur of hind tibia of females and most males tapering to unmodified apex; middle tibial spur with minute teeth; hind femur of male with or without tooth near base on underside.

**Distribution:** This subgenus is widespread in

Africa, from Egypt to South Africa, Madagascar, Sri Lanka, India and Malaysia.

***Nomia (Leuconomia) lutea Warncke***

*Nomia (Paranomia) lutea Warncke*, Reich. Stat. Mus. Fur Tierkunde in Dresden, Nr. 7, 1976, p. 119, ? & ?

**Diagnosis:** This species is readily distinguishable from other Egyptian Nomiinae by white apical bands of abdominal tergites I - IV in females and II - V in males (Fig. 8). White hair bands of abdominal tergites are absent except tergum I of male usually with lateral hair band. Basitarsus of male foreleg with a lateral tuft of white long plumose hair (Figs. 10 a & b).

**Description : Male**

Length 8 - 9 mm. ( $\bar{X}$  = 8.5, n = 5); head short, length/width ratio 0.78 - 0.83; antenna, 13-segmented, scape reaching behind the median ocellus, second segment one-half third, 3<sup>rd</sup> slightly shorter than 4<sup>th</sup> (0.25: 0.30 mm.), remaining segments equal in length and width; last antennal segment 1.25 times length of preceding one; labrum truncated apically without distal process; mandible without subapical tooth; tegula small, not extending behind the level of scutocutellar suture (Fig. 9); scutellum without lateral projections; 5<sup>th</sup> tarsomere of mid tarsus distinctly elongate, nearly 2.5 times as long as wide (Fig. 11); hind tibia with lateral projection, nearly two thirds length of tibia and with two long apical spurs (Fig. 12); apical margin of 5<sup>th</sup> sternum with long lateral tooth on each side (Fig. 13).

**Sculpture:** Mesoscutum densely punctate, punctures (30 - 40  $\mu$ ), separated by half puncture diameter at apical half and nearly their diameter or less at basal half, distance between punctures distinctly shagreen; abdominal tergum I densely punctate, punctures (40  $\mu$ ) separated by one-half puncture diameter; apical depression of T. I impunctate; T. II sparser punctate than T. I, punctures separated by their puncture diameter or more; apical depression of T. II also impunctate; tergites III - V with shallow, irregular sparse punctures; apical depressions of tergites III - V impunctate and polished.

**Coloration:** Head, thorax and abdomen dark brown to black, except the following regions: tarsomeres of all legs yellow except the apical half of 5<sup>th</sup> tarsomeres black; the broad lateral projection of hind tibia yellowish; apical depression of tergum I

without white band, tergites II - V with white, apical bands.

**Vestiture:** Head between ocelli and apical margin of clypeus covered with dense yellowish plumose hair; vertex, genae and thorax covered with erect, long, sparse greyish hair; basitarsus of fore leg with a tuft of white long plumose hair on outer side (Figs. 10 a & b); hind legs without spatulate hairs; abdominal tergum I with white apical hair band laterally, absent medially; tergites II - V without apical or basal hair bands.

**Male genitalia:** 7<sup>th</sup> sternum strongly concaved apically, with two pointed apical projections, bear long hairs (Fig. 14); 8<sup>th</sup> sternum as in figure (15).

Male genitalia as in Figures 16 & 17: upper gonostylus broadened, bear long hairs, lower gonostylus narrower than upper one, but nearly at the same length.

**Female:** Similar to male except as follows:

Length 8 - 9 mm. ( $\bar{X}$  = 8.48, n = 5); antenna 12-segmented, scape longer, 2<sup>nd</sup> and 3<sup>rd</sup> antennal segments subequal in length, 4<sup>th</sup> - 11<sup>th</sup> gradually increased in length and width, last antennal segment slightly longer than preceding one; labrum with pointed distal process; mandible with subapical tooth; basitibial plate of hind tibia present, rounded apically; apical margins of abdominal sternites normal, slightly concave; tergum I densely punctate, distance between punctures shagreen; apical depression of T. I densely punctate at basal half, impunctate apically; tergum II densely punctate at basal half irregular in apical half, its apical depression punctate at brown basal area, impunctate at remaining area; tergites III - V with obscured punctures, distance between them shagreen; hind tibia broadened, without lateral projection; apical depressions of tergites I - V white; coxae, trochanters and femora of hind legs modified to scopa, carried long plumose hair.

**Flower records:**

Males and females of *Nomia (Leuconomia) lutea* Warncke had been collected when visiting flowers of the following plants: *Trifolium alexandrinum* L., *Medicago sativa* L., *Arachis hypogaea* L. (Family: Leguminosae), *Zea mays* L.

**Flight Records :** Figura 1 shows that members of this species had been collected from May through early October, and only one specimen from January, 1998. Most records of females (53%)

occurred during August and September, with peak in September. Males had been collected from May through August, with a peak in August (45% of males records).

#### Distribution:

Specimens of *Nomia (Leuconomia) lutea* Warncke had been collected from eleven localities related to six governorates. These governorates were: New Vally, Ismailia, Giza, Beni Suef, Cairo and Red Sea governorate. Most specimens were recorded from Kharga Oasis.

#### Genus *Pseudapis* Kirby, 1900

*Pseudapis* Kirby, Bull. Liverpool Mus., Vol. 3, 1900, p. 15.

Type species: *Pseudapis anomala* Kirby, 1900, monobasic.

This genus is the major genus, having greatly enlarged tegula extending far back behind the level of the scutoscutellar suture (Figs. 19, 37 & 38). It also differs by the presence of a preoccipital carina behind the gena area and another one across the anterior part of the scutum separating the small, vertical, anterior surface from the main part of the scutum. The lamella on the pronotal lobe and extending mesad from it is translucent, larger than that of almost any other Nomiinae, and similar in two sexes. The body length ranges from 5.5 to 11 mm.

This genus includes two subgenera, *Pachynomia* and *Pseudapis* s.str. In Egypt five species belong to *Pseudapis (Pseudapis)* s. str. are recognised.

#### Subgenus: *Pseudapis* Kirby, 1900

*Pseudapis* Kirby, Bull. Liverpool Mus., Vol. 3, 1900, p. 15.

*Stictonomia* Cameron, Rec. Albany (South Africa) Mus., Vol. 1, 1905, p.192.

*Nomiapis* Cockerell, Proc. U. S. Nat. Mus., Vol. 55, 1919, p.208.

*Labonomia* Warncke, Reich. Stat. Mus.fur Tierkunde in Dresden, Band 16, No. 7, 1976, p. 99.

*Ruginomia* Pauly, Annales Mus. Royal de l'Afrique Central, Scien. Zool. 261, 1990, p. 103.

This subgenus could be recognized as follows:

In addition to the previous taxonomical characters of the genus, the basitibial plate of

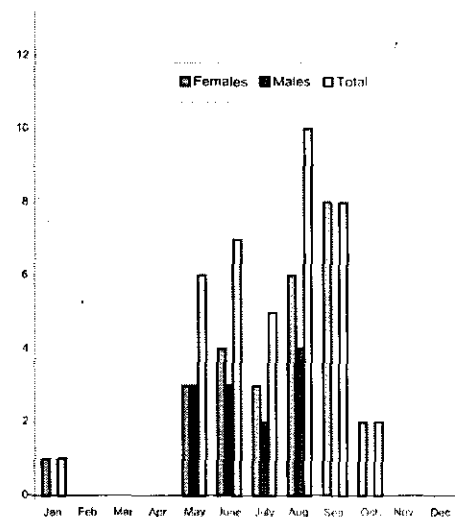


Fig 1 : Flight records of *Nomia (Leuconomia) lutea*

females fully delimited and with carina on both anterior and posterior margins; hind legs of males often greatly swollen; at least tibia with apical process, but without spurs or with only one spur; male upper gonostylus differentiated from gonocoxite, directed mesad across apex of genital capsule, and without moss-like hairs.

#### Distribution:

This subgenus occurs in the Mediterranean basin (Morocco and Spain to Egypt), Africa, Northern Europe to Austria, Poland, Southern Russia, East of Turkey, Central Asia, Northern China, Japan and Southern Asia to India and Thailand.

#### Key to the species of subgenus *Pseudapis (Pseudapis)* of Egypt (Males)

1- Scutellum without lateral projections; 3rd antennal segment shorter than 4<sup>th</sup>, nearly 2/3 its length; mesoscutum densely punctate, distance between punctures less than puncture diameter; abdominal tergites with white apical and basal hair bands, areas between these bands coarsely punctate. Length 6.5 - 7.5 mm *P. (Pseudapis) innesi*.....(Gribodo)

-Scutellum with horn-like projection on each side (Fig. 19 & 37).....(2)

2 (1) Tegula extending to mid length of scutellum (Fig. 37); 5<sup>th</sup> tarsomere of mid tarsus brown, two times as long as wide (Fig. 39); hind femur with long, subapical tooth on inner side (Fig. 40); hind tibia without apical spur, slightly dilated apically, without yellow projection; abdominal

tergites with white basal hair bands, without apical hair bands; apical margin of 5<sup>th</sup> sternum with two teeth medially (Fig. 41). Length 9.5 -10.8 mm  
P. (*Pseudapis*) unidentata.....(Olivier)

-Tegula extending to posterior margin of scutellum; 5<sup>th</sup> tarsomere of mid tarsus black and nearly rounded (Fig. 18); hind tibia with one apical spur, broadly dilated laterally, forming broad yellow projection (Figs. 20 & 27); abdominal tergites with white apical and basal hair bands; each of 4<sup>th</sup> and 5<sup>th</sup> sternites with two median teeth at apical margins (Fig. 21).....(3)

3(2) Hind femur with subapical small tooth on inner side (Fig. 27); 3<sup>rd</sup> - 5<sup>th</sup> antennal segments subequal in length; apical and basal regions of abdominal tergites (without apical depression) more depressed, median regions more convex. Length 5.5 -6.2 mm. P. (*Pseudapis*) dixica.....(Warncke)

-Hind femur without subapical tooth on inner side (Fig. 20); 3<sup>rd</sup> and 4<sup>th</sup> antennal segments subequal in length, the 5<sup>th</sup> longer, nearly 1.3 times length of each of them; abdominal tergites slightly depressed at apical and basal regions, median regions moderately convex. Length 8.4 - 9.5 mm  
P. (*Pseudapis*) armata.....(Olivier)

#### Key to the species of subgenus *Pseudapis* (*Pseudapis*) of Egypt (Females)

1- Abdominal tergites with white basal hair bands, without apical hair bands; distance between median ocellus and vertex 2.5 times the diameter of median ocellus; mesoscutum sparsely punctate, punctures separated by their diameter laterally, 2 - 4 their diameter medially (Fig. 38); abdominal tergites I - IV (without apical depressions) very densely punctate. Length 8.5 - 11mm  
P. (*Pseudapis*) unidentata.....(Olivier)

- Abdominal tergites with white apical and basal hair bands; distance between median ocellus and vertex 1 - 2 times the diameter of median ocellus.....(2)

2(1). Apical depression of tergum I densely and finely punctate; basal two thirds of tergum I finely and densely punctate, covered with dense short hair forming semicircular shape; tergum II with felt white hair except median region; tergites III - V entirely covered with felt white hair. Length 6 mm  
P. (*Pseudapis*) nubica (Warncke)\*

- Apical depression of tergum I at least,

impunctate at apical half; tergum I variable in punctation.....(3)

3(2) Mesoscutum densely punctate, punctures separated by 1/2 puncture diameter or less; tergum I coarser and denser punctate than mesoscutum (70 - 80  $\mu$ ), punctures separated by 1/4 puncture diameter; tergites II - V with apical and basal hair bands. Length 6.5 - 7.5 mm. P. (*Pseudapis*) innesi.....(Gribodo)

- Mesoscutum sparsely punctate, punctures separated by more than puncture diameter; tergum I finely and sparsely punctate.....(4)

4(3). Apical depression of tergum I impunctate except some punctures at basal area; disk of tergum I with scattered fine punctures. Length 8.5 - 9.4 mm  
P. (*Pseudapis*) armata.....(Olivier)

- Apical depression of tergum I densely and finely punctate at basal two thirds, apical third impunctate; disk of tergum I coarsely punctate, punctures (40 -50  $\mu$ ). Length 6mm  
P. (*Pseudapis*) dixica.....(Warncke)

\*Note: Male of species P. (*Pseudapis*) nubica (Warncke) unknown, diagnostic specific characters of female is based on original description of Warncke (1976), because no type material or determined comparative material was available.

#### *Pseudapis* (*Pseudapis*) armata (Olivier)

*Nomia armata* Olivier, Encycl. method. Insect VIII, 1811, p. 376.

*Nomia pallicornis* Walker, List of Hymenoptera in Egypt 1871, p. 44, n. 218, ?.

*Nomia nilotica* Smith, Trans. Entom. Soc. London 1875, p. 63, n. 24, ?.

*Nomia savignyi* Kohl., de L'Egypte Hymen. 1812; T.5; F. 17.

**Diagnosis:** The female of this species differs from the other species of the same genus in having the apical depression of tergum I nearly impunctate except basal area with some punctures. The male differs in having the hind femur without any tooth at inner side (Fig. 20) and the 5<sup>th</sup> tarsomere of mid leg more rounded and black (Fig. 18).

#### Description: Male

Length 8.4 -9.5 mm. (X = 8.8, n = 5); head short, length/ width ratio 0.72 - 0.74; 3<sup>rd</sup> and 4<sup>th</sup> antennal segments equal in length; eyes large, two times as long as wide; distance between median ocellus and vertex nearly two times ocellar

diameter; tegula enormous, extending behind the level of scutoscutellar suture; scutellum with a horn-like projection on each side (Fig. 19); 5<sup>th</sup> tarsomere of mid tarsus black, flattened and rounded as in Fig. (18); hind femur enlarged, without teeth; hind tibia enlarged, broadened apically with median cleft and with one apical spur (Fig. 20); apical margin of each of 4<sup>th</sup> and 5<sup>th</sup> sternites with two teeth medially (Fig. 21).

**Sculpture:** Mesoscutum densely punctate, punctures separated by less than half puncture diameter, distance between punctures polished; abdominal tergum I densely and coarsely punctate at apical area, while basal area covered with felt hair; apical depression of T. I with row of fine punctures basally, impunctate at remaining area; tergum II densely punctate at exposed area, remaining area covered with felt hair; apical depression of tergum II covered with hair band; tergites III - V entirely covered with dense white hair.

**Coloration:** Tegula, basitarsi, lateral areas of pronotum, tarsomeres 1- 4 of fore and mid legs and lateral projections of hind tibiae are yellow; apical depressions of tergites I - V transparent.

**Vestiture:** Mesoscutum covered with short hairs like-scales except the disk glabrous; basitarsi of fore legs without hair tuft, carried short hairs; mid and hind coxae, mid and hind trochanters, hind femora and metasternum carried spatulate hairs (Fig. 20); tergites I - III nearly covered with greyish long hair except small area at apical region; tergites II - V with broad apical and basal hair bands.

**Male genitalia:** 7<sup>th</sup> sternum with four projections at apical margin, bear row of long hair (Fig. 22); 8<sup>th</sup> sternum with median pointed apical process (Fig. 23).

The male genitalia as in figures 24 and 25, upper gonostylus enlarged, extending to the median plane; lower gonostylus distinctly shorter than upper one.

**Female:** Similar to the male except as follows:

Length 8.5 - 9.4 mm. ( $\bar{X}$  = 9.0, n = 5); head shorter, length/width ratio 0.79 - 0.82; antennae, labrum, mandibles and legs as female of *Nomia* (*Leeuconomia*) *lutea* Warncke; scutellum without projections; basitibial plate of hind tibia well developed, somewhat tapering apically; hind tibia

with two apical spurs; mesoscutum somewhat denser punctate at basal third, very sparsely punctate at remaining area, punctures separated by 2- 4 puncture diameter at the last area, distance between punctures smooth and polished; abdominal tergum I sparsely punctate; apical depression of tergum I nearly impunctate except basal region with some punctures; tergum II with sparse regular punctures; apical depression of tergum II finely punctate basally, impunctate apically; tergum III punctate, its apical depression and tergum IV covered with white plumose hair; apical and posterior margins of mesoscutum and metanotum covered with dense felt white hair; abdominal tergum I covered with felt whitish hair on each side, its apical depression with white hair band laterally, incomplete medially; tergum II with incomplete white apical and basal hair bands; tergum III with complete white apical and basal hair bands; tergum IV entirely covered with felt white hair, tergum V carried long yellowish hair.

#### Flower records:

This species is related to polytrophic bees since it was observed visiting flowers of seven different plant families; i. e.: Leguminosae, Tamaricaceae, Solanaceae, Amaranthaceae, Gramineae, Cruciferae and Labiatae. Three plant species belong to family Leguminosae; i. e. *Medicago sativa* L., *Trifolium alexandrinum* L. and *Arachis hypogaea* L. Each one of the families Cruciferae, Solanaceae and Amaranthaceae are represented by two plant species. These plant species were *Eruca sativa* M., *Zilla spinosa* (Tur.), *Solanum melangena* L., *Solanum tuberosum* L., *Amaranthus viridis* L. and *Amaranthus* sp. respectively. One plant species related to each of the families Tamaricaceae (*Tamarix articulata* Vohl.), Gramineae (*Imperata cylindrica* L.) and Labiatae (*Ocimum canum* L.).

#### Distribution:

Members of *Pseudapis* (*Pseudapis*) *armata* (Olivier) were collected from nineteen localities related to ten governorates in Egypt. These governorates were New Vally, Matrouh, Alexandria, Cairo, Red Sea, Ismailia, Beheira, Giza, Faiyum and Beni Suf governorate. This species was the most abundant and widely distributed in the New Vally than other governorates.

*Pseudapis* (*Pseudapis*) *dixica* (Warncke)

*Nomia* (*Lobonomia*) *dixica* Warncke, Reich. Stat. Mus. fur Tierkunde in Dresden, Nr.7. 1976, p. 117-118, ? & ? .

**Diagnosis:** This species could be recognized by the apical depression of tergum I densely punctate at basal two thirds, impunctate at apical third in both sexes. Hind femur of male with a small tooth at inner side (Fig. 27) and the 5th tarsomere of male mid tarsus somewhat parallel laterally (Fig. 26).

**Description:** Male: This species is similar to *Pseudapis* (*Pseudapis*) *armata* (Olivier) but differs as follows:

Length 5.5 - 6.2 mm. ( $\bar{X}$  = 5.8, n = 5); head shorter, length/width ratio 0.74 - 0.76; eyes smaller, nearly 1.6 - 1.8 times as long as wide; distance between median ocellus and vertex nearly 1.8 times the ocellar diameter; 5th tarsomere of mid tarsus not completely rounded, somewhat parallel sides (Fig. 26); inner margin of hind femur with small subapical tooth; hind tibia broadened apically, but without median cleft (Fig. 27); each of 4<sup>th</sup> and 5<sup>th</sup> sternites with two teeth at apical margins (Fig. 29).

**Sculpture:** abdominal tergum I densely and finely punctate at curvature area, and with two rows of coarse punctures at basal area above apical depression; apical depression finely and densely punctate at basal two thirds, apical third impunctate; abdominal tergum II distinctly coarsely punctate; apical depression of T. II densely and finely punctate at basal half, covered with dense hair apically; abdominal tergum III densely and finely punctate, also with row of coarse punctures at apical end, its apical depression covered with dense hair band.

**Coloration:** *Tarsomeres 2-5 of hind legs black.*

**Vestiture:** Apical and posterior margins of mesoscutum covered with broad, short plumose hairs; abdominal tergites I - V with broad apical and basal hair bands, first apical hair band incomplete medially.

**Female:** Similar to male except as follows:

Length 6.0 - 6.5 mm. ( $\bar{X}$  = 6.2, n = 5); head slightly longer, length/width ratio 0.78 - 0.81; eyes longer, nearly 2.1 - 2.2 as long as wide; distance between median ocellus and vertex shorter, nearly 1.2 - 1.4 times the diameter of the median ocellus; antenna, labrum, mandibles and legs as female of

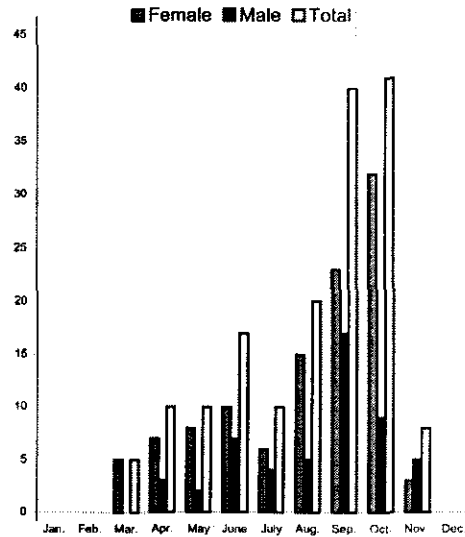


Fig. (2): Records shows that females of this species had been collected from March to November, 1998 (109 bees); 64.22% (70 bees) of this figure was collected during August-October, with a definite peak 29.35%

*Nomia* (*Leuconomia*) *lutea* Warncke; mesoscutum coarsely punctate, punctures (60 - 70  $\mu$ ), densely punctate on each side, sparsely medially, distance between punctures smooth and polished, nearly 1-2 puncture diameter medially; abdominal tergum I with impunctate transversal band apically above apical depression (Fig. 28); its apical depression densely and finely punctate at basal two thirds, impunctate at apical third; abdominal tergum II punctate, with apical impunctate band above apical depression; its apical depression impunctate at apical two thirds, finely punctate basally; abdominal tergites III and IV as tergum II in punctation; apical depression of T. I - IV brown; abdominal tergum I with two lateral white patches; apical depression of tergites I - III with white hair bands laterally.

#### Flower records:

*Pseudapis* (*Pseudapis*) *dixica* (Warncke) is considered as polytrophic bees. Members of this species were collected when visiting flowers of eight plant species related to five plant families as follows: *Medicago sativa* L., *Trifolium alexandrinum* L., *Archis hypogaea* L. (family: Leguminosea), *Amaranthus* sp. (family: Amaranthaceae), *Capsicum annuum* L., *Solanum melongena* L. (family: Solanaceae), *Eruca sativa* M. (family: Cruciferae) and *Tamarix articulata* Vohl. (family: Tamaricaceae).

#### Distribution

Members of this species were collected from nine localities related to seven governorates in Egypt. These governorates were: New Valley, Alexandria, El-Faiyum, Giza, Ismailia, Matrouh and Beheira; being more abundant in New Valley governorate.

**Pseudapis (Pseudapis) innesi (Gribodo)**

*Nomia innesi* Gribodo, Bull. Soc. Entom. Ital. XXVI, 1894, p. 126, n. 94, ?.

*Nomia edentata* Morawitz, Fedtschenko: Turkestan Mellifera II, 1876, p. 259, n. 397, ??.

**Diagnosis:**

This species differs from the other species of subgenus *Pseudapis* included here in having the mesoscutum and scutellum in both sexes densely punctate, punctures separated by 1/2 puncture diameter or less. Scutellum in male is without any lateral projections. Abdominal tergites (without apical depression) are coarsely and densely punctate. Apical hair band of tergum I is incomplete medially. Abdominal tergites II - V (in female) and II - VI (in male) have white apical and basal hair bands.

**Description: Male**

Length 6.5 - 7.2 mm. ( $X = 6.8$ ,  $n = 5$ ); head short, length / width ratio 0.72 - 0.76; eyes larger, two times as long as wide; distance between median ocellus and vertex nearly 1.4 times the diameter of median ocellus; first flagellomere shorter than the second; tegula enormous, extending well behind level of scutoscuteellar suture; scutellum without lateral projections; 5<sup>th</sup> tarsomere of mid tarsus elongated, two times as long as wide, (Fig. 30); hind femora normal, without teeth; hind tibia with large lateral projection, broadened and with concave grooved apically, with one apical spur (Fig. 31); 4<sup>th</sup> and 5<sup>th</sup> sternites without any teeth apically (Fig. 32).

**Sculpture:** Mesoscutum coarsely and densely punctate, punctures (50-60  $\mu$ ), separated by 1/2 puncture diameter, distances between punctures polished; abdominal tergum I coarsely and densely punctate, punctures (70- 80  $\mu$ ), separated by 1/5 puncture diameter or slightly more; apical depression of T.I finely and sparsely punctate at basal half, impunctate and polished at apical half; tergites II - V coarsely and densely punctate by the same of T. I ; apical depressions of tergites II - IV impunctate and covered with white hair bands.

**Coloration:** Upper side of antenna light brown; tegula, fore and mid tarsus (except 5<sup>th</sup> tarsomere) and basitarsus of hind leg yellow; apical half of apical depressions of T. II & III yellowish transparent.

**Vestiture:** Apical and posterior margins of

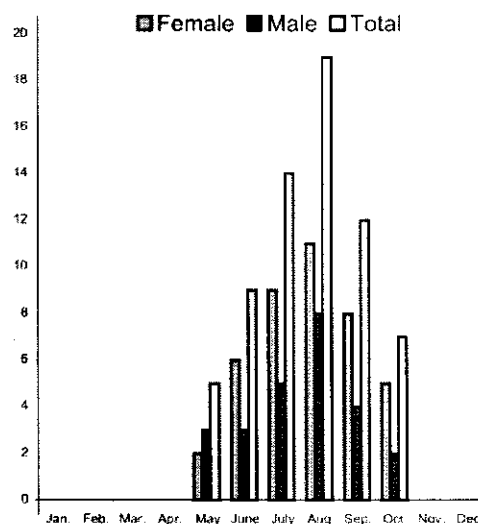


Fig. (3): Flight records indicates that the members of this species existed during May - October, 1998; being more abundant during July - September; 65 and 58% of the total catch of females and males, respectively.

mesoscutum carried flat yellowish hairs like scales, rest area of mesoscutum nearly bare or with some scattered hair; basitarsus of fore leg without hair tuft; coxa, trochanter and femur of hind leg carried numerous spatulate hairs; T. I covered with plumose hair basally, its apical depression with white hair band laterally, incomplete medially; tergites II - V with white apical and basal hair bands.

**Male genitalia:** 7<sup>th</sup> sternum with two apical broad lateral projections, each one bears row of long setae (Fig. 33); 8<sup>th</sup> sternum pentagonal, with a median apical peg-like structure (Fig. 34). Male genitalia as in figures 35 & 36: upper gonostylus larger with internal process projects inwards and covered with rows of short setae; lower gonostylus smaller, finger - shaped and projects apically.

**Female:** Similar to male except as follows:

Length 6.5 - 7.5 mm ( $X = 7.0$ ,  $n = 5$ ); head longer, length/width ratio 0.78 - 0.82; antennae, labrum, mandibles and legs as female of *Nomia (Leuconomia) lutea* Warncke.

**Flower records:**



This species is also related to polytrophic bees; visiting flowers of four different plant families. These families were Malvaceae (*Gossypium barbadense* L.), Labiatae (*Ocimum* sp.), Leguminosae (*Trifolium alexandrinum* L.) and Graminae (*Imperata cylindrica* L.). Most specimens had been collected on the flowers of Egyptian cotton during August, 1998.

**Flight records:** Figure 4 shows that males and females of *Pseudapis* (*pseudapis*) *innesi* (Gribodo) had been collected during April - October. About 50 % of total specimens were collected during August while about 16 % were collected during each of September and October. Few specimens were collected during April - July.

#### Distribution:

The specimens of this species were collected from nine localities related to six governorates in Egypt. These governorates were New Vally, Cairo, Beni Suef, Assiut, Giza and Qalyubiya governorate; most of specimens were collected from Qalyubiya governorate.

*Pseudapis* (*Pseudapis*) *nubica* (Warncke)

*Nomia nubica* Warncke, Reich. Stat. Mus. Fur. Tierkunde in Dresden, Nr. 7, 1976, p. 117, ?.

#### Diagnosis:

This species could be recognized from other species of genus *Pseudapis* studied here in having the apical depression of tergum I entirely densely and finely punctate. T. I covered with dense short hairs forming semicircular shape. Tergites II -V entirely covered with felt white hairs. The distance between median ocellus and vertex is equal the diameter of median ocellus.

#### Description: Female

Length 6 mm.; head short; length of eyes nearly 1.5 times its width; distance between median ocellus and vertex equal the diameter of median ocellus; tegula enormous, extending behind the scutoscuteellar suture; scutellum without any projections.

**Sculpture:** Vertex densely and finely punctate, usually more or less wrinkled; mesoscutum nearly moderately punctate, distance between punctures smooth and polished, nearly two times as puncture diameter; scutellum denser punctate than mesoscutum, distance between punctures 1-2 puncture diameter and smooth;

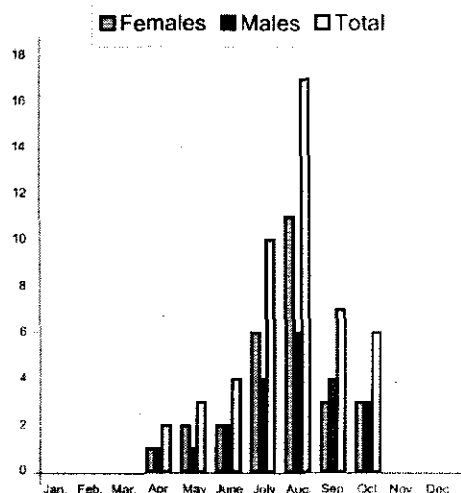


Fig. (4): Flight records: shows that males and females of *Pseudapis* (*pseudapis*) *innesi* (Gribodo) had been collected during April - October. About 50% of total specimens were collected during August while about 16% were collected during each of September and October. Few specimens were collected during April - July.

propodeal dorsal surface with longitudinal median line, steriolate laterally; lateral surfaces of propodeum finely and somewhat scattered punctate, distance between punctures 1-2 puncture diameter, smooth and polished; basal two-third of abdominal tergum I finely and densely punctate, entirely covered with dense short hair forming semicircular shape; apical third of T.I above the apical depression with feebly and finely transversal wrinkled; apical depression of T. I until apical margin densely and finely punctate; tergum II at middle area glabrous, densely punctate, remaining area entirely covered with felt hairs; tergites III - V entirely covered with felt white hairs.

**Coloration:** Head and thorax black, abdomen reddish yellow; antennae, tibiae, basitarsi brownish; pronotal lateral angles and tegula yellow.

#### *Pseudapis* (*Pseudapis*) *unidentata* (Olivier)

*Nomia unidentata* Olivier, Encycl. method. Insect. VIII. 1811, p. 376, n.2.

*Nomia bispinosa* Brulle, Exped. Sc. Moree. Zool. II, 1832, p. 318, n. 767, ?

*Nomia polita* Costa, Fauna Napoli Andren. 1861, p. 11, ?.

*Nomia ruficornis* Spinola, Ann. Soc. Ent. France VII, 1838, p. 514, N. LX.

*Nomia ruficornis* Spinola, Ann. Soc. Ent.,

France VII, 1838, p. 514, N. LXI, ?.

### Diagnosis:

This species could be recognized from other species of *Pseudapis* studied here in having the abdominal tergites (II - IV in females & II - V in males) with white basal hair bands and without apical hair bands.

### Description: Male

Length 9.5 -10.8 mm ( $\bar{X}$  = 10, n = 5); head short, length/width ratio 0.81- 0.85; eyes 2.0 - 2.5 times as long as wide; distance between median ocellus and margin of vertex 2.5 times diameter of median ocellus; first flagellomere slightly shorter than second, flagellomeres 2 -10 equal in length and width; tegula enormous, extending behind scutoscuteellar suture; scutellum with a pair of horn-like lateral projections (Fig. 37); 5<sup>th</sup> tarsomere of mid tarsus normal, nearly two times as long as wide, not rounded (Fig. 39); hind femur with long subapical tooth; hind tibia with narrow projection apically, without apical spur (Fig. 40); apical margin of 4<sup>th</sup> sternum without any teeth; apical margin of 5<sup>th</sup> sternum with two median teeth (Fig. 41);

**Sculpture:** Head densely punctate beside eyes and vertex, distance between punctures polished; mesoscutum and scutellum very densely punctate, distance between punctures polished and one-fourth their diameter or less (Fig. 37); abdominal tergum I with deep, coarse dense punctures until basal margin of apical depression; apical depression of T. I with three rows of fine punctures basally, remaining area impunctate; tergum II with the same punctures of T. I; apical depression of T. II with row of fine punctures basally, remaining area impunctate; tergites III - IV with the same punctures of T. I; its apical depressions impunctate.

**Coloration:** Head, thorax and abdomen usually dark brown to black, sometimes reddish brown, except the following regions: antennae, legs (except basitarsi) reddish brown to light brown; tegula, basitarsi and apical portion of lateral projection of hind tibia yellowish; apical depressions of tergites I - V yellowish transparent.

**Vestiture:** Mesoscutum carried long, scattered greyish hairs, also, apical and basal margin covered with dense, very short plumose hair; basitarsi of fore legs without hair tuft; legs without spatulate hairs; basal half of tergum I covered with suberect,

yellowish hair, apical depression of T. I without apical hair band; tergites II - V with white basal hair bands, without apical hair bands.

**Male genitalia:** 7<sup>th</sup> sternum with two large projections and bear long hair (Fig. 42); 8<sup>th</sup> sternum smaller than seventh and nearly trapezoidal as in Figure 43.

Male genitalia as in figures (44 & 45), upper gonostylus large, nearly two times lower gonostylus and bears plumose hairs at basal end; lower gonostylus with row of long setae, pins - shaped.

**Female:** Similar to male except as follows:

Length 8.5 - 11.4 mm. ( $\bar{X}$  = 9.5, n = 5); head short, length width ratio 0.81- 0.84; antenna, labrum, mandible and legs as female of *Nomia (Leuconomia) lutea* Warncke; mesoscutum sparsely punctate, punctures separated by their diameter laterally, 2-4 their diameter medially (Fig. 38); apical depression of T. I & II densely punctate at basal half, impunctate apically; tergum II sparser punctate than tergum I; tergites III - IV inconspicuously punctate, shagreen; its apical depressions impunctate apically.

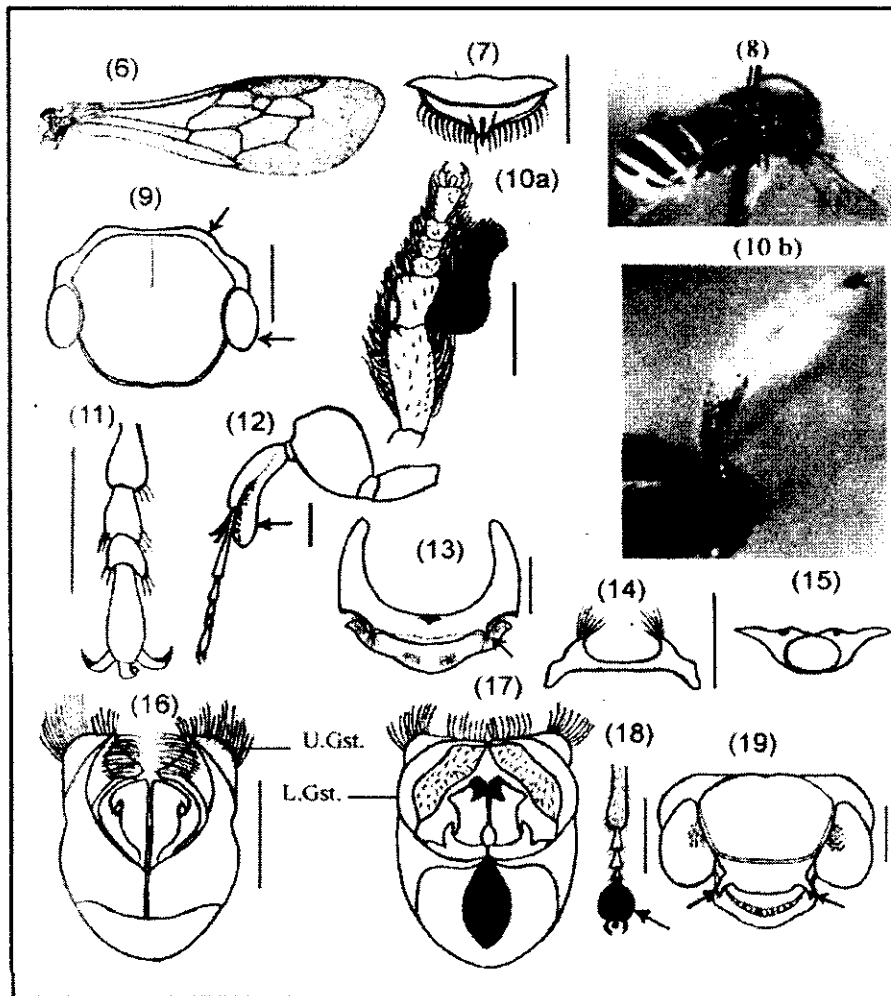
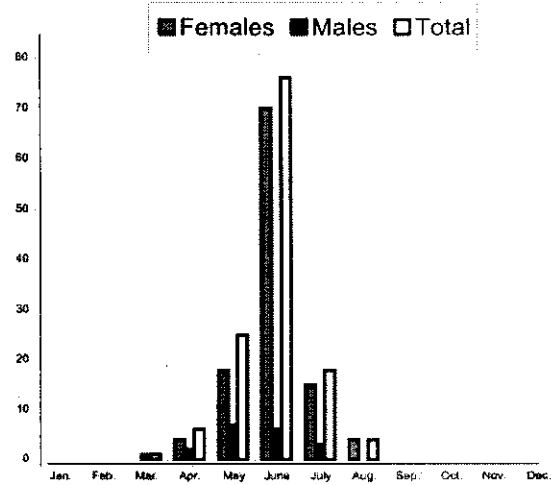
### Flower records:

This species is polytrophic wild bee. Males and females were collected when visiting more than 15 flowering plant species related to nine plant families. Many specimens had been collected during the blooming period of the Egyptian clover *Trifolium alexandrinum* L. (Family Leguminosae). The females had been collected during the blooming period of the following plant species: *Trifolium alexandrinum* L., *Medicago sativa* L., *Brassica oleracea* var. *capitata* L., *Tamarix articulata* Voh., *Citrullus vulgaris* Sch., *Cladium mariscus* (L.), *Solanum melongena* L., *Gossypium barbadense* L., and *Imperata cylindrica* (L.). The males had been collected during the blooming period of the following plants: *Trifolium alexandrinum* L., *Amaranthus viridis* L., *Zilla spinosa* (Turro), *Lycopersicum esculentum* Mill and *Saccharum officinarum* L.

### Distribution:

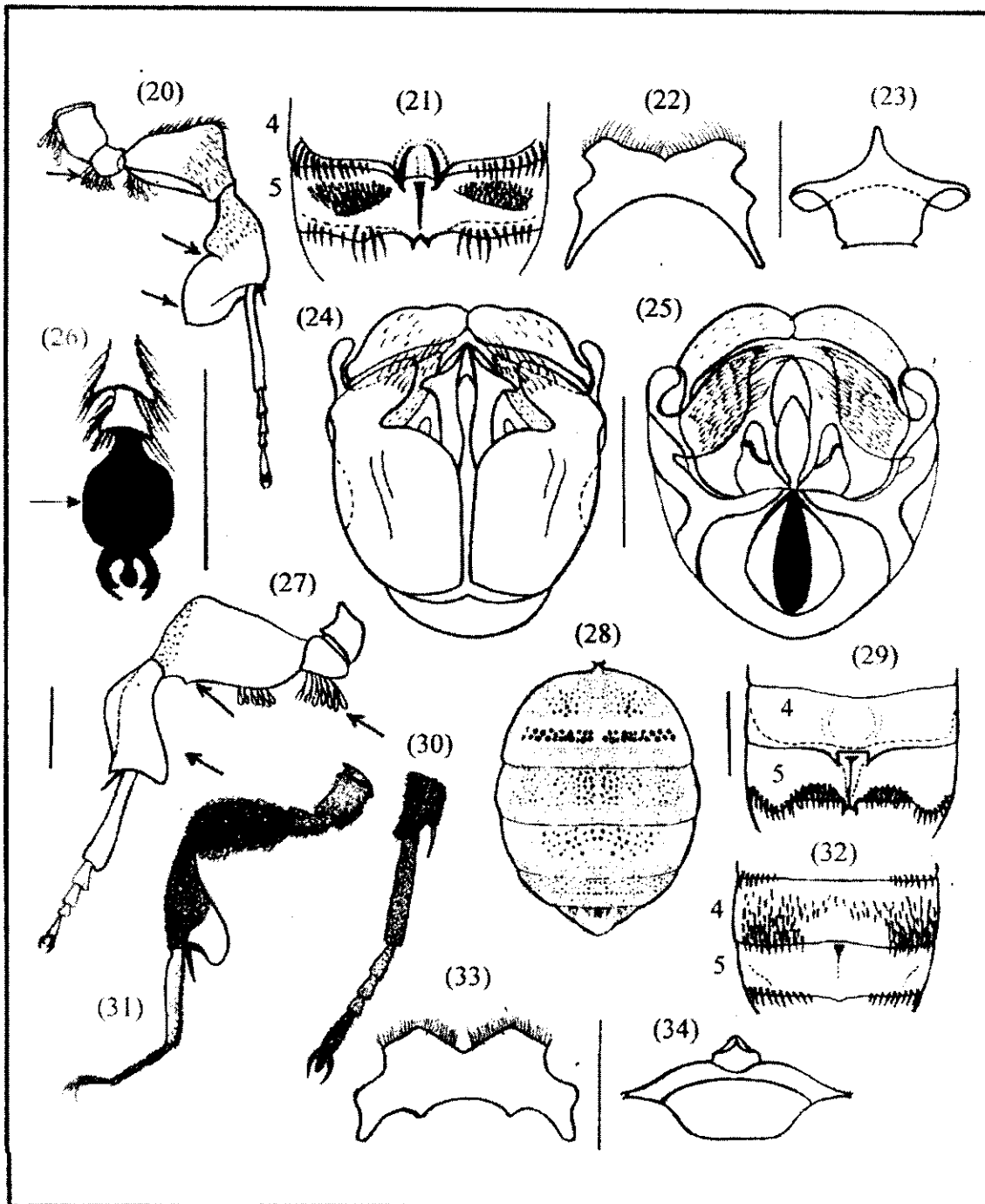
*Pseudapis (Pseudapis) unidentata* (Olivier) is widely distributed in Egypt. Members of it had been collected from 40 localities related to 15 governorates, extended from Matruh governorate in the north to Beni Suef governorate in the south, in addition to Sinai governorates.

Fig. (5): Flight records: indicates that females of this species had been collected from April through August, with most records (92.7%) from May through July, with a definite peak in June, 1998. Males had been collected from late of March through July, with most records (72.2%) from May and June, with a peak in May.



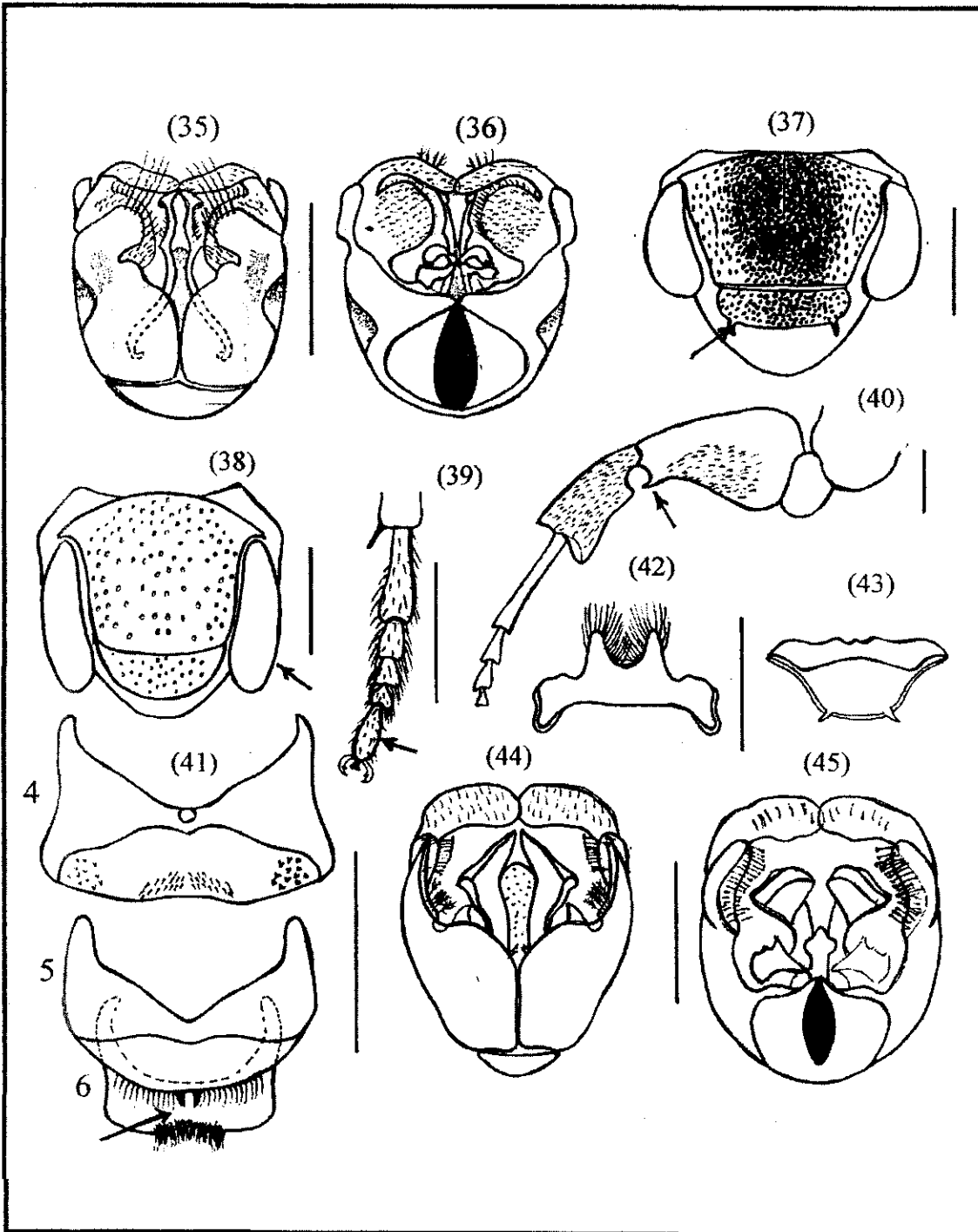
Scale line = 1mm.

Figs. (6,7): *Pseudapis (Pseudapis) innesi* (Gibodo): 6- Forcing wing; 7- Female labrum; Figs. (8-17) *Nomia (Leuconomia) lutea* Warncke: 8-Male (lateral view); 9-Pro, mesonotum and tegula; 10 (a&b) - Fore leg; 11-Mesotarsus; 12- Male hind leg; 13-5<sup>th</sup> & 6<sup>th</sup> sternites of male; 14-7<sup>th</sup> sternum of male; 15-8<sup>th</sup> sternum of male; 16-17: Male genitalia: 16-dorsal view; 17-ventral view, Figs. (18-19): *Pseudapis (Pseudapis) armala* (Olivier): 18-Mid tarsus of male; 19-Thorax of male (dorsal view). U. Gst: Upper gonostylus; L. Gst: Lower gonostylus.



Scale line = 1 mm.

Figs. (20-25): *Pseudapis (Pseudapis) armala* (Olivier): 20-Male hind leg; 21-4<sup>th</sup> & 5<sup>th</sup> sternites of male; 22-7<sup>th</sup> sternum of male; 23-8<sup>th</sup> sternum of male; 24-25: Male genitalia: 24-dorsal view; 25-ventral view. Figs. (26-29): *P. (Pseudapis) dixica* (Warncke): 26-4<sup>th</sup> tarsomere of mid tarsus of male; 27-Male hind leg; 28-Female abdominal tergites; 29-4<sup>th</sup> & 5<sup>th</sup> male sternites; Figs. (30-4): *Pseudapis (Pseudapis) innesi* (Gribodo): 30- Male mid -tarsus; 31-Male hind leg; 32-4<sup>th</sup> & 5<sup>th</sup> male sternites; 33-7<sup>th</sup> male sternum; 34-8<sup>th</sup> male sternum.



Scale line = 1mm. .

Figs. (35-36): Male genitalia of *Pseudapis (Pseudapis) innesi* (Gribodo): 35-dorsal view; 36-ventral view. Figs. (37-45): *Pseudapis (Pseudapis) unidentata* (Olivier): 37-Thorax of male; 38-Thorax of female; 39-Male mid tarsus; 40-Male hind leg; 41-4th-6th sternites of male; 42-7th sternum of male; 43-8th sternum of male; 44-45: Male genitalia: 44-dorsal view; 45-ventral view.

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## مراجعة تصنيفية لفصيلة نومييني في مصر (رتبة غشائية الأجنحة : فصيلة هليكتيدي)

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استهدف البحث مراجعة تصنيفية شاملة للأنواع المتاحة الموجودة في مصر من فصيلة نومييني - فصيلة هليكتيدي (رتبة غشائية الأجنحة) لما لهذه الأنواع من أهمية اقتصادية كبيرة في تلقيح المحاصيل النباتية المختلفة، وقد اتضح من البحث وجود ستة أنواع من هذه الفصيلة في مصر، تنتمي إلى جنسين هما *Nomia* and *Pseudapis* وهذه الأنواع هي: *Nomia* (*Leuconomia*) *lutea* Warncke, *Pseudapis* (*Pseudapis*) *armata* (Olivier), *P. (P.) dixica* (Warncke), *P. (P.) innesi* (Gribodo), *P. (P.) nubica* (Warncke) and *P. (P.) unidentata* (Olivier). وقد تم في هذا البحث نقل النوع الأول من تحت جنس *Paranomia* إلى تحت جنس *Leuconomia* وظل هذا النوع تحت جنس *Nomia*، كما تم نقل الأربعة الأنواع التالية له من جنس *Nomia* إلى جنس *Pseudapis* ومن تحت جنس *Lobonomia* إلى تحت جنس *Pseudapis*، والنوع الأخير فقط نقل من جنس *Nomia* إلى جنس *Pseudapis* ومن تحت جنس *Nomiapis* إلى تحت جنس *Pseudapis*. هذا وقد زود البحث بما يلي:

الأسماء المرادفة والصفات التشخيصية والوصف الكامل والتوزيع الجغرافي سواء في مصر أو في العالم لكل الأنواع المتاحة في مصر.

الرسومات التوضيحية للصفات التصنيفية للأنواع وكذلك أعضاء التناسل الخارجية في الذكور وذلك لتسهيل التعرف على الأنواع المصرية المتاحة وكذلك الأنواع التي يمكن أن تكتشف مستقبلاً في البيئة المصرية.

المفاتيح التصنيفية للأجناس وتحت الأجناس والأنواع التي تم دراستها في هذا البحث والموجودة في البيئة المصرية.

رسم بياني لفترات الطيران لكل من الذكور والإناث للأنواع تحت الدراسة خلال عام.

تسجيل لكل العوائل النباتية التي قامت هذه الأنواع من النحل البري بزيارتها أثناء فترة التزهير بغرض جمع حبوب اللقاح أو امتصاص الرحيق مما يؤدي إلى حدوث التلقيح لخلطي للمحاصيل التي تقوم بزيارتها، وقد وجد أنها تنتمي إلى عشرين جنس نباتي واثنى عشرة فصيلة نباتية.