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External Morphological Study of Apantesis Carlotta Ferguson, 1985 Arctiidae-Lepidoptera-Insect in Baghdad, IRAQ

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ABSTRACT

Apantesis carlotta Packard, 1985, a species of moth belonging to the family Arctiidae within the order Lepidoptera, was identified in Baghdad, Iraq. This species is distinguished from others in its family based on its geographical distribution and morphological features, particularly those related to reproductive organs. As an arthropod of economic significance, the Arctiidae family is notable for its larvae, some of which are characterized by their hairy appearance. Fieldwork was carried out in various locations across Iraq, a country rich in biodiversity, from April 2023 to March 2024. Specimens were collected using air nets and fluorescent lights at night from mulberry trees and clover plants. The collected samples were preserved in plastic containers with 70% ethyl acetate. The species were identified, compared with existing taxonomic keys, and newly documented species were given formal taxonomic descriptions. Morphological classification was achieved by focusing on specific phenotypic traits and photographing the specimens using a mobile camera.

Keywords: Arctiidae, Lepidoptera, *Carlotta*, *Apantesis*.

1. INTRODUCTION

Moths and butterflies, belonging to the order Lepidoptera, represent a diverse group of flying insects. Lepidoptera is the second-largest insect order after Coleoptera, comprising 126 families and 46 super families, and is one of the most widespread and easily recognized insect orders globally. Approximately 180,000 species of Lepidoptera have been described, accounting for about 10% of all known living species (Albu, 2004). Lepidopteran species are characterized by several derived traits, including large triangular wings, a nectar-sucking proboscis, and bodies covered in scales (Lafontaine, 2013; Jasim, 2017). During the larval stage, most Lepidoptera are phytophagous, feeding on plant material, although some specialize in consuming detritus and fungi, and a few are predatory. Several species are considered pests due to their consumption of crops, ornamental plants, and forest trees (Lewis, 2015; Dowdy, 2019).

The family Arctiidae is a prominent group within the order Lepidoptera, with an estimated 10,945 species worldwide (Singh, 2011). This family, commonly referred to as tiger moths, includes taxa characterized by their vibrant coloration, although some, such as wasp moths, lichen moths, and footmen moths, exhibit more subdued tones (Dubatolov, 2010; Kirti & Gill, 2010). The larvae of many species are known as woolly bears or woolly worms due to their distinctive hairy appearance. The Arctiidae family is ecologically diverse, interacting with various species in habitats, including Iraq (Cock, 1982). Its economic significance arises from the hairy larvae of certain species, which are economically impactful (Saber, 2016; 2023). Additionally, many species within this family are considered harmful pests, affecting forest trees, grasses, and agricultural crops (Sabr, 2017).This study focuses on ***Apantesis carlotta***, an Iraqi species belonging to the family Arctiidae, with particular attention to its morphological traits, distribution, and ecological significance.

2. MATERIAL AND METHODS

A total of 47 specimens, including 26 females and 21 males, were collected from various locations in Baghdad between April 2023 and March 2024 (Plate 1). The specimens were distributed across the research period, with the highest number collected in April, May, October 2023, and March 2024, while November and December 2023 yielded the lowest numbers (Table 2).

The observations in this study were based on Arctiidae specimens collected from different locations across this biodiverse region (ALJAF, 2020; Sabr, 2017). Specimens were gathered exclusively at night using fluorescent lights, and ethyl acetate fumes in killing bottles were employed to preserve them (Aljoboory, 2022; Dubatolov, 2005). Identification of the collected

species was conducted with the assistance of relevant literature (Salman, 2018; Sabr, 2018; Aljaf, 2019) and verified using identification keys from multiple sources (Hameed, 2013; Singh, 2012).

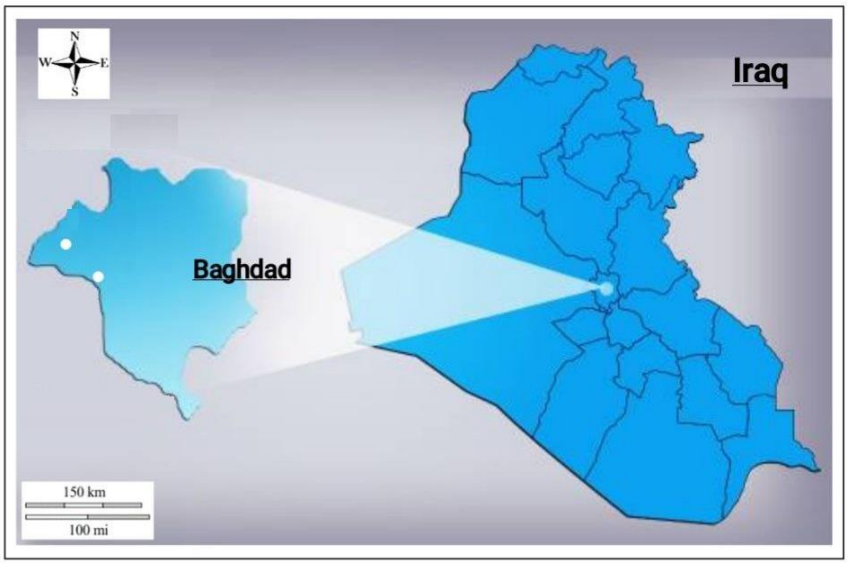
Specimens were analyzed and classified through detailed examination using both dissecting and compound microscopes. Morphological features were documented and recorded using a mobile phone camera for further analysis (Table 1). This report provides a taxonomic note on the newly documented species, contributing to the broader understanding of the Arctiidae family.

Table (1): Materials and equipment:

No.	Materials, equipment	Manufacturer	Origin
1	Dissecting microscope	Olympus	Japan
2	Compound microscope	Optica	Italy
3	Mobile Galaxy F62	Samsung	China
4	Ethyl Alcohol 70%	Iraq	Iraq
5	plastic bottles	Iraq	Iraq
6	Net	Iraq	Iraq
7	fluorescent lamp	China	China

Table (2) : Number of specimen and their species according to collection months.

Months	*A. carlotta* ♂	*A. carlotta* ♀	Total
April 2023	4	6	10
May 2023	3	5	8
June 2023	2	3	5
September 2023	3	2	5
October 2023	3	3	6
November 2023	2	1	3
December 2023	1	2	3
March 2024	3	4	7
Total	21	26	47



(Plate -1) : Map of Iraq showing specimen collection location.

3. RESULTS AND DISCUSSION

Taxonomy:

Kingdom: Animalia Linnaeus, 1758

Phylum: Arthropoda Gravenhorst, 1843

Class: Insecta Linnaeus, 1758

Order: Lepidoptera Linnaeus, 1758

Superfamily: Noctuidae Latreille, 1809

Family: Arctiidae Leach, 1815

Subfamily: Arctiinae Leach, 1815

Genus: ***Apantesis*** Walker, 1855

Species: ***A. Carlotta*** Ferguson, 1985

4. DESCRIPTION

The ***Apantesis carlotta*** Ferguson, 1985, is a moth species belonging to the Arctiidae family. It is characterized by its distinctive black and yellow striped wings. The wing scales are elongated, longitudinal, and somewhat rectangular, with lobed or serrated edges (Figure 1;2). The legs have numerous long bristles and are equipped with two claws (Figure 3). The antennae are feather-shaped (Figure 4), and the genitalia are prominent (Figures 7, 8). The wing patterns of both sexes are similar, a common feature of this species being a complete, though narrow, black edge along the rib; the hindwings are usually pale yellow, but may be orange in males and dark orange in females. A row of separate black spots borders the outer edge, sometimes forming a wavy band in females (Figure 1; 2).

This moth is characterized by its rounded shape near the apex, while the metatarsus has two claws, multiple spines, and bristles (Fig. 3). The wingspan of this moth ranges from 24 to 29 mm. It is primarily nocturnal, and can sometimes be observed at dusk or early morning. This moth inhabits a variety of habitats but is found mainly in pastures, mulberry trees, and buckthorn trees. There are paired median ridges and pointed ridges in the mid-dorsal region of the epithelium. Females can be distinguished by their smaller genitalia and vaginal plates, which are transversely widened, forming a broad V-shaped funnel rather than a column-like structure (Fig. 8). The forewings of females are 9 to 15 mm long (n = 20; mean: 11.8 mm) and are paired with dark yellow to light brown coloration on the head, thorax, wings, and abdomen.

Male palps and antennae are dark yellow, while the head is brown to dark brown (Figure 1). The fore-thorax is dark yellow to walnut-colored, with the patagia and tegula being a lighter yellow. The anterior fore-thorax is uniform light brown, gradually becoming lighter posteriorly. The mid-thorax is light cream dorsally, transitioning to pale cream ventrally near the thighs. Legs and the thoracic hump are typically brown, while cream highlights are present. The forewing length is 11–14 mm (n = 26; mean: 12.9 mm). The forewings exhibit a dark yellow to sooty black basal edge, gradually transitioning to brown or dark yellow. The upper forewings and hindwings are yellow with black spots. The underside of the wings is dark yellow near vein M1, transitioning to brown beyond. The abdomen's dorsal color changes from cream to yellow near the ventral spiral line, while the underside of the segments remains (Figure 1).

The genitalia are constricted and enlarged, curving backward and narrowing at the apex to form a pointed tip. The dorsal membrane is membranous, while the middle dorsal buttress is sclerotized. Transverse buttresses are also sclerotized. At the dorsal-medial junction, the ventral canal contains pointed projections of uniform length, extending halfway along the sac. The sac ends in a sclerotized arm shorter than the valve arm. The valve's base is broad and bordered with bristles, while its costal and posterior margins are serrated, with the apex crowned by one or two larger serrations. Females are primarily yellow, with black spots pale cream coloration on the head, thorax, wings, and abdomen. The abdomen transitions dorsally from cream to yellow near the ventral spiral line. Forewing lengths measure between 13–15 mm (n = 17; mean: 13.8 mm). The forewings and hindwings have an yellow upper surface, with dark yellow ribs featuring black spots (Figure 2). The underside of the forewings and hindwings is dark yellow near vein M1, fading to pale walnut distally.

The distinct coloration and morphological features, including serrated margins and sclerotized structures, make A. carlotta a unique and easily recognizable species within the Arctiidae family. The coloration transitions from yellow dorsally to the ventral spiral line, with the head and ventral regions appearing creamy to walnut-colored. On the anterior abdominal segments of A7, the spiral line darkens to a yellow hue. The anal papillae of the genitalia (Figure 7) are not oblong but granular, with the head partially covered in fine bristles. The central vaginal plate shows a slight bulge, and the canal pouch is less distinct compared to the vaginal body. It originates just before the orifice. The vaginal body features a bilateral bulge and is slightly longer than the posterior appendages. Its diameter is wider at the anterior portion, with two transversely positioned lateral sclerotic marks.

(Fig. 1) ***Apantesis Carlotta*** **male.**

(Fig. 2) ***Apantesis Carlotta*** **female.**

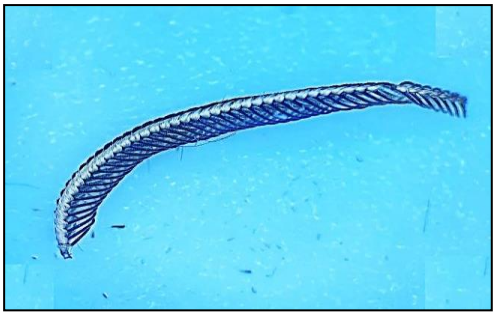


Fig. 3 : The bristles and spines in leg of ***A. Carlotta***

Fig. 4 : antenna of ***A. Carlotta***

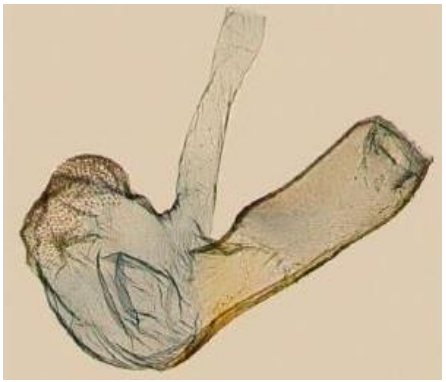


Fig. 5 : Scales of Wings ***A. Carlotta***

Fig. 6: ***A. Carlotta*** **aedeagus, inflated vesical.**

Fig. 7: Male genitalia of ***A. Carlotta***

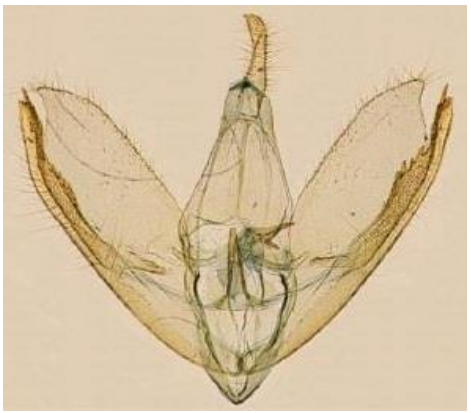


Fig. 8: Female genitalia of ***A. Carlotta***

5. SUMMARY

The current observations are derived from the taxonomic evaluation conducted as part of the Arctiidae Study Project in Iraq. This study included the examination of various Arctiidae species, such as ***Apantesis carlotta***, along with other species that remain under investigation. The findings are based on the specimens collected during the taxonomic revision of the Iraqi Arctiidae, with ongoing research continuing to explore additional species within this family.

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