

A Taxonomical and Ecological Study of the Species *Drypta lineola* Macleay 1825 of Ground Beetles: Order: Coleoptera: Family: Carabidae in Maysan Governorate, Iraq

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Abstract

This study was conducted on a family Carabidae during the period from 1/12/2018 to 30/11/2019 at the province of Maysan, the research included a diagnostic and environmental study of the species *Drypta lineola* Macleay 1825, the classification of species, genera and families of ground beetles on the study of adult insects. The results showed that the aforementioned species was registered in Maysan Governorate / Iraq (Qal'at Salih area). It recorded the highest numerical density of adult insects in April and October , at a rate of 8 adult insects / trap per month. The most important diagnostic character of adult insects: Medium sized insects, elongated and Symmetrical sides; labrum trilobed; antennae long and slender, scape longer than all joints and it had two colors, pronotum almost cylindrical, brown; tarsal joint 4 bilobed; elytra parallel-sided, wide near the top, consisting of two colors.

Key words: Coleoptera, Carabidae, *Drypta lineola*, Maysan, Qal'at Salih, Iraq.

Introduction:

Considered the order of Coleoptera one of the largest orders known of its many types. It contains approximately 360,000 described species (Bouchard *et al.*, 2017). The morphological diversity of beetles led to the spread of their species, outperforming the various orders, most families of this order are universal (Arnett and Thomas, 2000). It accounts for 40% of all known insects in the world (Hangay and Zborowski, 2010). Ground beetles of the Carabidae family of the predatory insect groups that have studied in most countries of the world, it consists of more than 40,000 species spread over 1927 genera around the world, it lives in lands various and on almost all continents, most are nocturnal, but some are diurnal, most of them cannot fly (Larochelle and Lariviere, 2007).

Genera returns *Drypta* Latereille (1796) to subfamily Harpalinae which has the following characteristics: The length of the insects ranged from 2.0 to 35.5 mm; with long 6 setigerous punctures on labrum; clypeus it is narrow in the distance between the two antennae socket, antennae filiform or moniliform, scapes can be seen completely from the top, instilled side-to-side towards the outline of mandibles, the final or terminal rings of the labial palp are spindle or semi-cylindrical, scutellum is

visible and implanted between elytra bases, the abdomen is usually not visible dorsally (Ball *et al.*, 2000; Arndt *et al.*, 2005).

This species are spread in Taiwan, China, Japan, Indonesia, Myanmar, India, Pakistan and Afghanistan and lives in wetlands and rice fields (Habu and Sandanaga, 1965), and the banks of the rivers (Aono, 1987; Aono, 1988), and in the cultivated plains (Yamaguchi, 1988), and grassland (Kasahara and Nishiyama, 1990). Chien *et al.*, (1984) explained it as a predator for Lepidoptera larvae *Hydylepta indicate*.

The study included a diagnostic and environmental study of the species *Drypta lineola* Macleay 1825.

Materials and Methods:

1- Sample collection:

Ground traps were used type of plastic pitfall which is one of the most common methods for collecting ground beetles samples (Skvarla *et al.*, 2014; Lovei and sunderland, 1996), they are glass-like transparent plastic containers with a diameter of 15 cm and height 15 cm perforated from the sides in the upper area of the container for the purpose of insects entering, covered from the top with a plastic cover to protect it from rain and other animals, such as mice, traps are placed in pits in the ground so that the side holes are at ground level, and fill up to 40% of them with a solution of ethyl alcohol 70% with a few drops of odorless cleaning fluid to break the surface tension and some drops of glycerin, three alternate lines work each line containing three traps, the distance between the trap and the other 10 meters and the distance between one line and another is 10 meters, it is distributed in three locations in the region, the distance between one location and another is 100 meters, the numbers of full insects are collected in the traps every two weeks, and the monthly rate was taken (Karem and Fadl, 2010).

2- Internal dissection and making microscopic slides:

After transferring samples to the laboratory and preserved with 70% alcohol wash with distilled water, then transferred to a 100 ml beaker contains 10% sodium hydroxide she left for 15 days or placed in sodium hydroxide 15%, it is left for 10 days at room temperature or according to the type of sample then the samples were washed with distilled water several times (Gabara, 1986); (Khudair, 2014). Then, passed up the ethyl alcohol ascending (60%, 70%, 80% and 90%) for 15 minutes per dilution. Then it was placed in a Petri dish containing 90% alcohol until it was dissected, the insect can be dissected before placing it with sodium hydroxide by placing it in a Petri dish after placing a filter paper in the dish that helps to insure the insect in the dish and not to slip, after slicing the parts with a fine needle, they are put in sodium hydroxide.

The glass slides were made for transparent and delicate parts after dissection of the insect kept in 70% ethyl alcohol under the dissection microscope using a very fine needle (insulin syringe) by cutting the head, separating the parts of the mouth, antennae, pronotum and the rest of the body transferred from dish to filter paper for the purpose of alleviating ethyl alcohol and passed over the xylol then it is put on a glass slide containing the Canada Balsam then put the slide cover on it, after making sure that the form is placed in the form it is intended for the purpose of the study next, the glass slides were put in a heat oven under 60 ° C for 24 hours.

The large parts that cannot be covered with the slide cover are installed on the glass slides as required for the purpose of inspection and drawing by a quick-dry, transparent nail polish (Shaaban, 2018). The Lucida camera is used, which is installed on the optical microscope to draw transparent and small, Lucida's camera was mounted on a dissecting microscope to draw large portions. Full insect lengths

were measured and lengths of the parts of image program, the unit Mm of measurement of the body and its parts is adopted. The insect and its parts were photographed by Canon 40-pixel camera.

3- statistical analysis:

The experiment was conducted according to the design of complete randomized blocks (CRBD) and analyzed by GenStat program (three replicates were made of the ground traps, the distance between the replicates is 100 meters).

Results:

Description of genera *Drypta* Latreille, 1796:

Medium in size and symmetrical on both sides; head rectangular, punctat and pubescent; labrum trilobed, transverse and setose; clypeus transversal, without setose; antennae long, cylindrical, huge and prominent; pronotum cylindrical, side edges carry straight hair, scutellum not wide, punctuate; elytra parallel-sided, humeral angle rounded, striate punctuate, intervals with small punctures with straight hairs; apices truncate; Legs hairy, tarsal joint 4 bilobed; prosternum, mesosternum, metasternum and abdomen punctate.

Description of species *Drypta lineola* Latreille 1796:

Body:

Medium sized insects; elongated; symmetrical sides; head and pronotum brown; elytras are of black and brown color; average length insect 8.860 mm. Picture (1- A-B).

Head:

Figure (1): head rectangular is smaller than pronotum, length 1.684 mm, width 0.777 mm, vertex punctuate pubescent, frons pubescent; clypeus transversal not hairs; compound eyes, black circular, bristles surrounding eye, one hair attached to each side of the top of head behind eyes; antennae long cylindrical length: 4.603 mm, scape longer than the following three pieces combined, length 1.190 mm, two-color brown and black, all pieces pubescent and ring bristles on top (Picture 2-A and Figure 2- D).

Mouth parts:

Labrum brown, length 0.190 mm, width 0.561 mm, trilobed, median lobe well developed, with long 6 setigerous punctures (Figure 2-B); mandibles brown, slightly uneven, triangle, right mandible length 0.835 mm, left mandible length 0.927 mm figure (2-A); Maxillae palpi consists four pieces, length 1.313 mm, brown, base piece short, second piece large, last piece spindle, last three pieces hairy figure (2-C); Labial palp consists three pieces, brown, length 0.696 mm, base piece small, second long and hairy, front piece expanding spindle hairy.

Thorax:

Dorsal surface pronotum (Picture 2-B) (Figure (3-B): Slightly rectangular, cylindrical shape, length 1.750 mm, width 1.432 mm, creased base, middle line clear, disc punctuate and not dense hair; scutellum triangle, protracted, brown, dotted, length 0.521 mm, width at the base 0.306 mm (Figure 4-A) .

Ventral side pronotum (Figure 3-A): Brown, punctuate, hair dense at sides; mesothorax black, dotted, hair in the center and sides; metathorax black, dotted, hair at the sides.

Legs:

Front leg (Figure 4-B), length 5.759 mm; coxa large rounded, brown, with a hairy suit; trochanter oval, with a hairy set; femur thick, brown, with a number of dense hair, brown and the last quarter near the

tibia black; tibia black, with a hair, at the end, top and under spurs; tarsus black-brown, hairy, tarsal joint 4 bilobed, ends two claws.

Middle legs (Figure 4-C) length 5.843 mm; coxa large rounded, brown, with one hair; trochanter oval, with two hairs; femur thick, with thick hair, brown, except for the last quarter, near the tibia black; tibia black, hairy; tarsus black-brown, tarsal joint 4 bilobed, ends two claws.

Hind legs (Figure 4-D) length 7.673 mm, coxa huge, wide, flat, brown, with a hairy set; trochanter shaped trailing parallel to the femur, with a hairy set; femur thick, with thick hair, brown, except for the last quarter, near the tibia black; tibia black, hairy, black-brown in its last quarter; tarsus hairy, tarsal joint 4 bilobed, ends two claws.

Elytra:

Elytra rectangular, length, 5.071 mm, width 1.595 mm, elongated, convex, hairy, humeral angle rounded, apices truncate, striate-punctate, striate and interval clear, brown interferes with black, interval 1-2 striate 1-2 black turns brown in the last part near the top, interval 3 striate 3 black in the first quarter near the base and turn brown towards the top, interval 4-5-6 striate 4-5-6 black at the base only and turns brown to the top, interval 7 black at the top, base and brown in the center, striate 7 interval 8 striate 8 interval 9 radial field black, apices truncate (Picture 2-C) (Figure 5-A).

Abdomen:

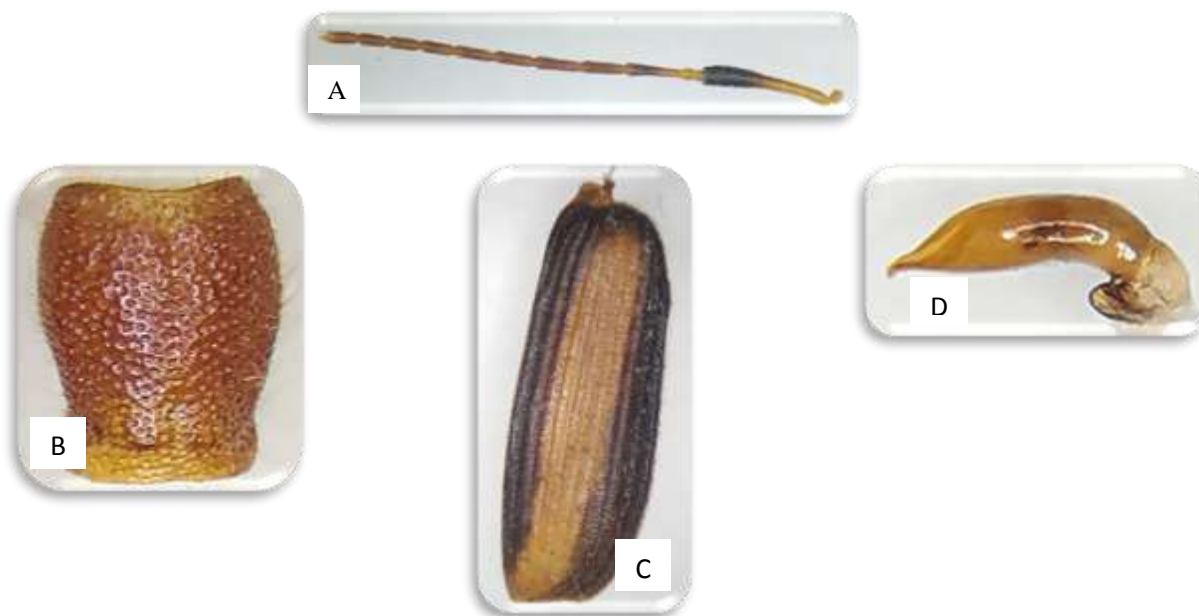
Abdomen dark black, punctuate, hair in the middle and sides, last sternum hair thick, ambulatory, pairs of setiferous punctures on sterna 4-6; last sternum often with a single pair of ambulatory setae in the male and two pairs in the female.

Male genitalia:

Male copulatory organ consisting of the aedeagus, thick, tapered top, convex base; parameres (lateral lobes) fixed laterally and basally to the aedeagus, small and wide at the base; average length aedeagus 2.166 mm (Picture 2-D) (Figure 5-B).



Picture 1. A- The dorsal surface of adult insect B- the ventral surface of adult insect.



Picture 2. A- antennae B- pronotum C- elytra D- aedeagus.

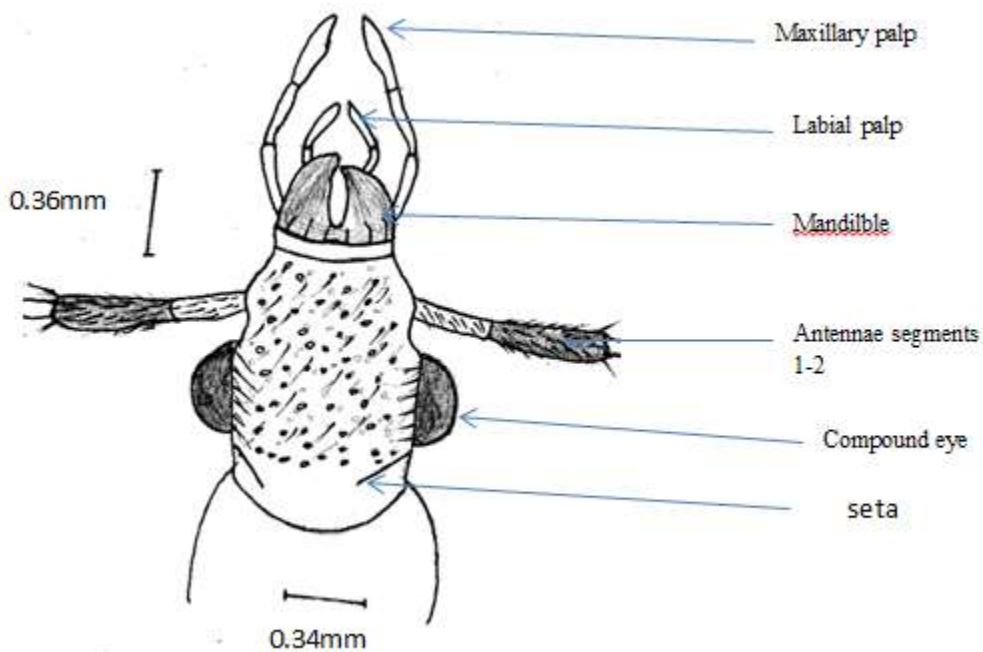


Figure 1. The dorsal surface of the head.

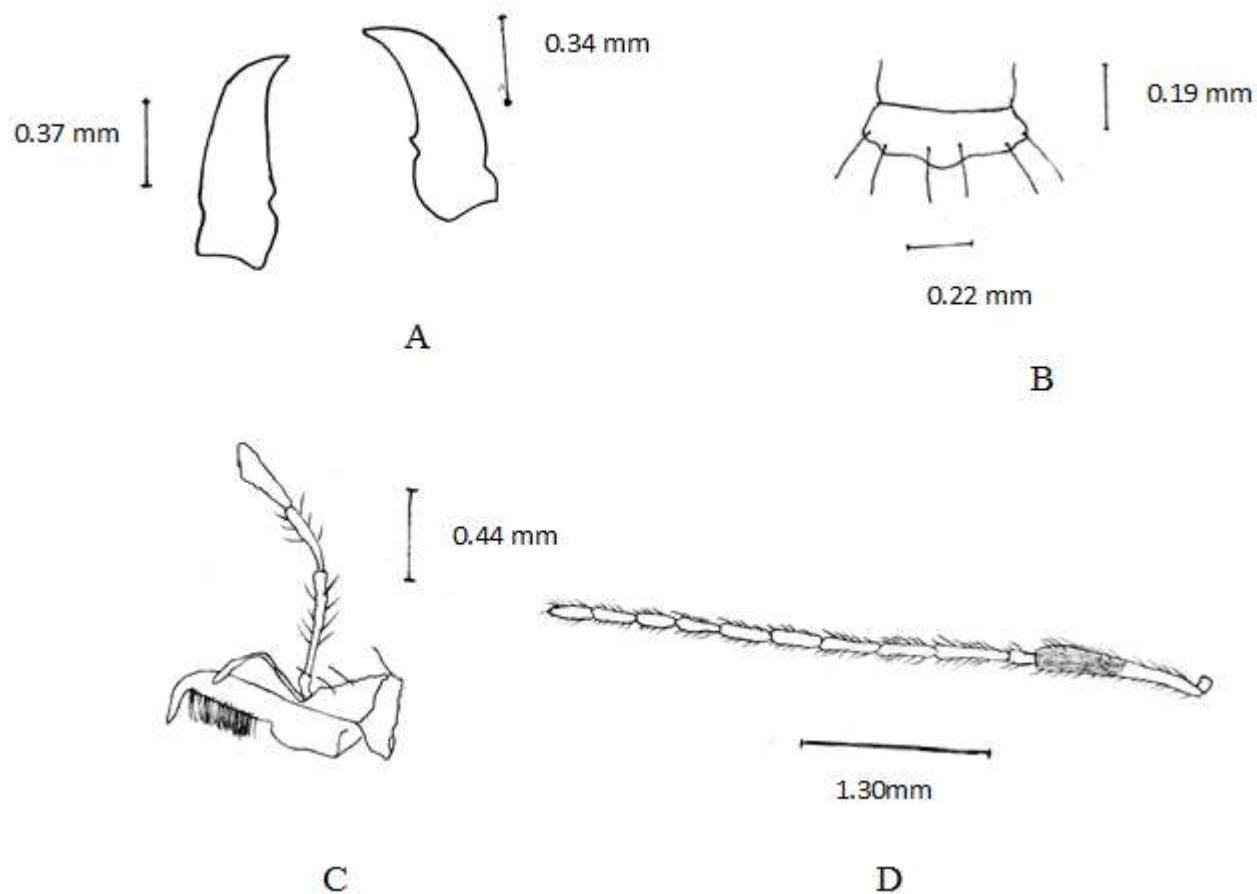


Figure 2. A-Mandibles B-labrum C- Maxillae palpi D- antennae .

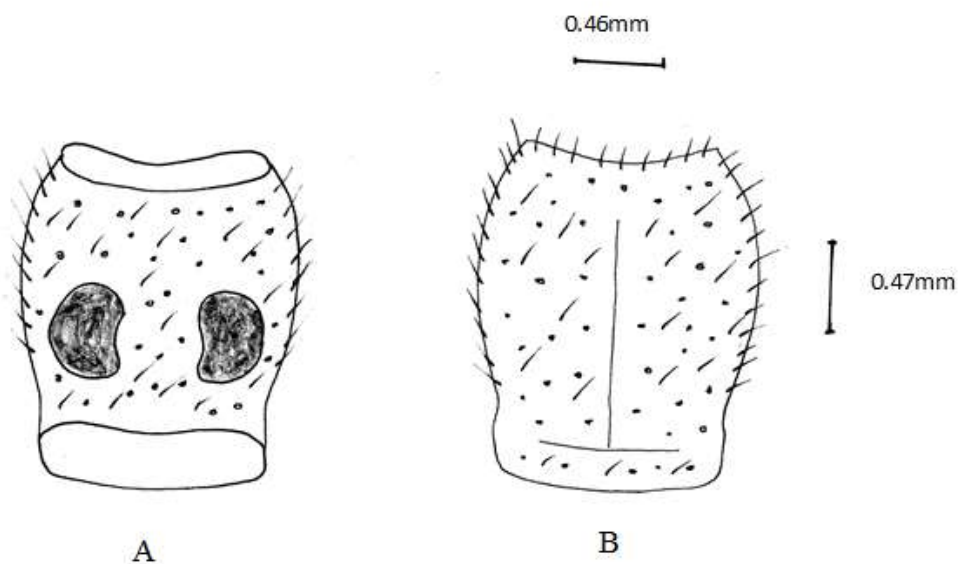


Figure 3. A- The ventral surface of pronotum B- The dorsal surface of pronotum.

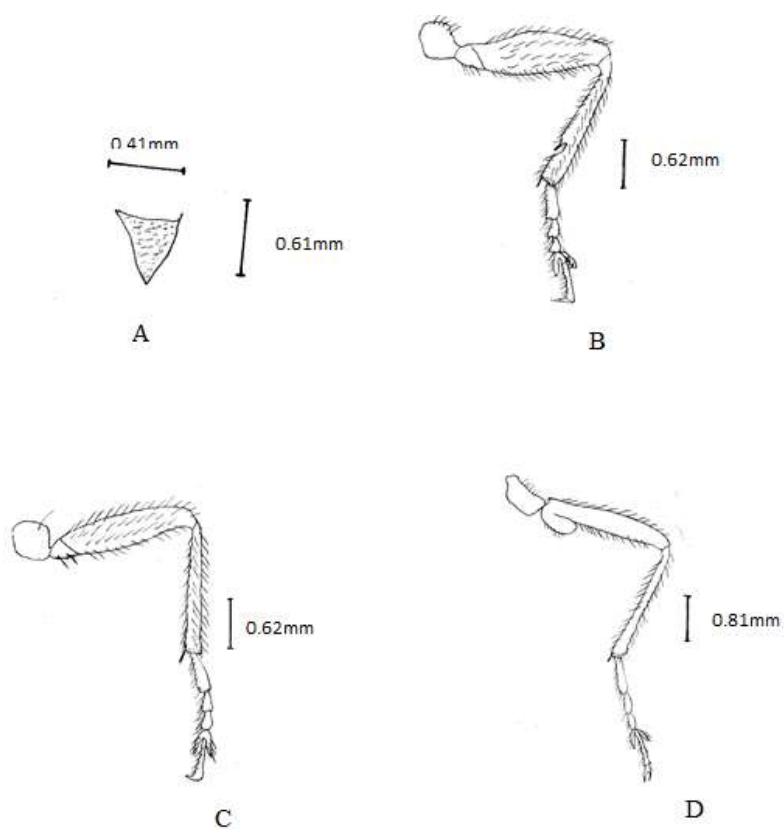


Figure 4. A- scutellum B- front leg C- middle leg D- Back leg.

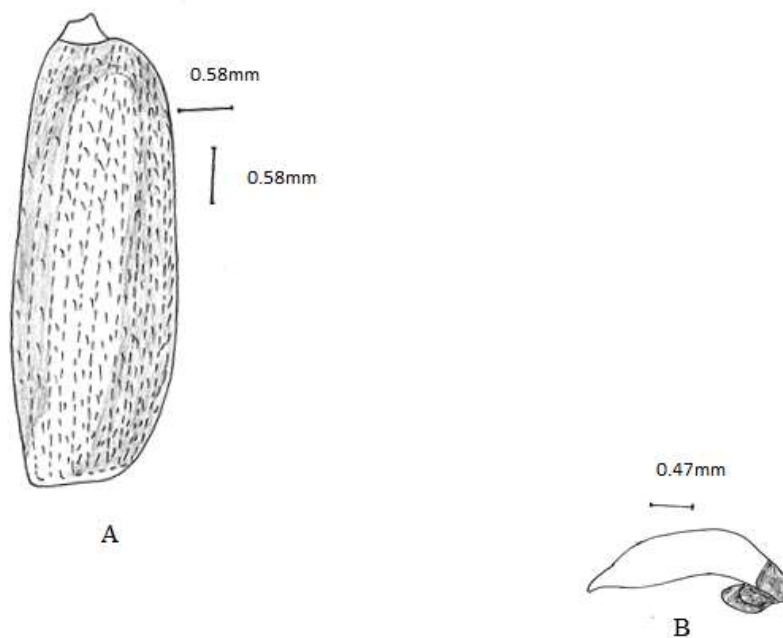
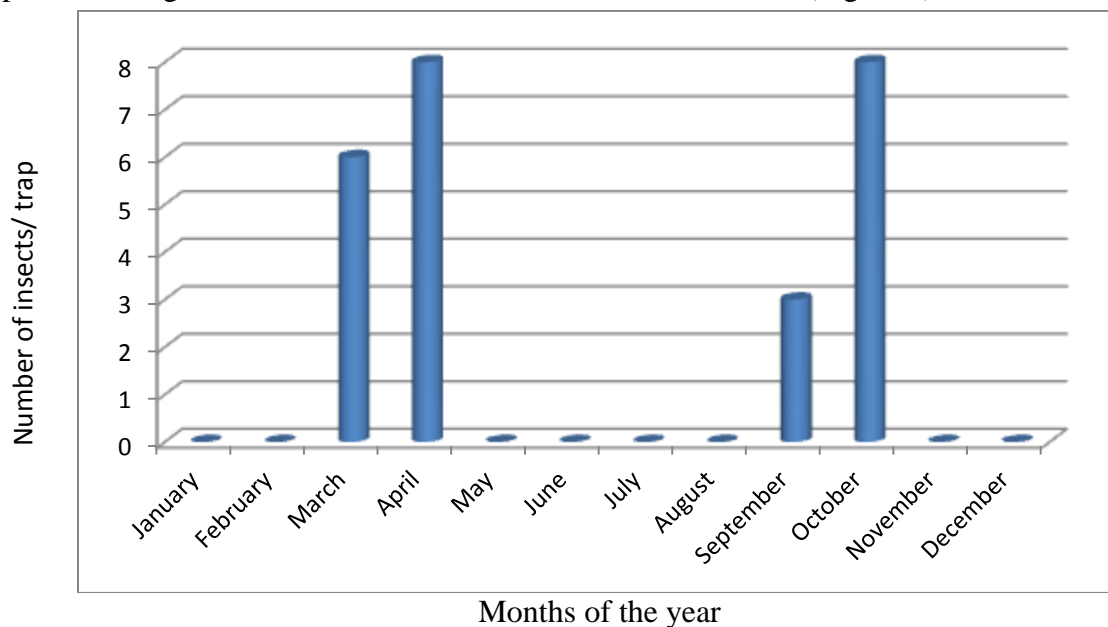


Figure 5. A- elytra B- aedeagus

Environmental study:

Numerical density of the species *Drypta lineola*:

The results of the study show the presence of the *Drypta lineola* species, during four months of the year are the months of March, April, September and October at Qal'at Salih area/Maysan Governorate, which characterized the area studied for the density of palm and earth groves is abundant with grass and weeds, for being since it has not been cultivated for nearly two years, it is located near lands planted with various vegetables on the banks of the Tigris River, which provides suitable conditions for the insect from high humidity and availability prey from arthropods and other insects especially the Lepidoptera larvae. The results indicate that the highest average number of adult insects was during the months of April and October where reached 8 adults insect/trap, where insect activity decreased or disappeared during the hot summer months and cold winter months (Figure 6).



L.S.D. 0.26 (P>0.05)

Figure 6. The numerical density of *Drypta lineola* adults during a year in the Qal'at Salih area.

Discussion:

Taxonomic study:

Saha *et al.*, (1992) explained the most important diagnostic traits of this species: Head and pronotum brown; labrum trilobed; scape in the antennae is the longest pieces; elytra clear, wide near top, hairy; average insect length 9.5 mm. Habu, (1967) explained that the length of an adult insect is 8.2 - 9.0 mm, elytra is arched and the wider part is in the middle, the longitudinal lines of the elytra are curved and are small engraved points.

Environmental study:

Figure (6) shows that the insects are active during the spring and autumn months, and that the highest density rates are in April and October, where Bousquet, (2010) mentioned that the first pattern is the spring and early summer period, which is the period of insect activity for mating, which is mainly dedicated to mating beetles of the Carabidae family are two main patterns of seasonal activity during the year, the second pattern is the autumn period, which is mainly devoted to nutrition, there are a few

numbers that can be found between these two periods, hibernation of most species occurs in the larval stage as well as in the adult stage. Kromp, (1999) explained that ground beetles are a natural enemy group in the agricultural environment, more specifically in wet locations such as wet grassy areas and lowland with vegetation and wetlands higher than adjacent lands, the fact that the studied land is not cultivated for a long time, and this provides suitable conditions of stability and consequently the presence of different types of insects, as semi-natural fields such as forests, field borders and meadows contain many types of arthropods that are useful because they provide a more stable environment than cultivated fields (Médiène *et al.*, 2011). This stability is due to the fact that these habitats include greater biological diversity than annual crops (Altieri and Nicholls, 2004). These resources available in non-cultivated areas allow the development of beneficial arthropods, which then move to the plots of cultivated land (Duelli *et al.*, 1990; Tschardtke, 2007).

Conclusions:

The Iraqi environment is abundant with Carabidae species, and this species is one of the few species in the world, which have a great role in the natural balance, as they are non-specialized predators of many insect pests, especially the larvae of the Lepidoptera.

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دراسة تصنيفية وبيئية للنوع *Drypta lineola* Macleay 1825 من الخنافس الأرضية
ORDER: COLEOPTERA: FAMILY: CARABIDAE
 في محافظة ميسان، العراق

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الملخص

أجريت هذه الدراسة على عائلة Carabidae للفترة من 2018/12/1 لغاية 2019/11/30 في محافظة ميسان. تضمن البحث دراسة تشخيصية وبيئية للنوع *Drypta lineola* Macleay 1825 حيث يعتمد في تصنيف أنواع وأجناس وعوائل الخنافس الأرضية على دراسة الحشرات البالغة، وأوضحت النتائج تسجيل النوع المذكور أعلاه في العراق في محافظة ميسان (قضاء قلعة صالح)، حيث سجلت أعلى كثافة عددية للحشرات البالغة في شهري نيسان وتشرين الأول وبمعدل 8 حشرة بالغة/مصيدة في الشهر. ومن أن أهم الصفات التشخيصية للحشرات البالغة أنها متوسطة الحجم، ومنطولة ومتناظرة الجانبين، والشفة العليا ثلاثية الفصوص، والأصل من قرن الاستشعار طويل ويتكون من لونيين بني وأسود، والصدر الأمامي أسطواني الشكل، بني اللون، وقطعة الرسغ الرابعة ثنائية الفصوص، والأعماد واضحة، وعريضة قرب القمة، وتتكون من لونيين بني وأسود.

الكلمات المفتاحية: غمدية الأجنحة، كاريبيدي، *Drypta lineola*، ميسان، قلعة صالح، العراق.