



# **AN ECOLOGICAL STUDY OF THE WANDERING BEETLE, *LARINUS MACULOSUS* (SCHR.) (CURCULIONIDAE: COLEOPTERA), IN THE GOVERNORATES OF IRAQ**

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<b>Article history:</b>	<b>Abstract:</b>
<b>Received:</b> 11 <sup>th</sup> April 2025	The wandering weevil, <i>Larinus maculosus</i> (Schr), is the most recently discovered species of the genus <i>Larinus</i> , belonging to the Coleoptera family. It is widely distributed in central and northern Iraq, particularly. A total of 110 <i>Larinus</i> species have been identified across Iraq, and it has been shown that the majority of species are recorded in the northern regions, compared to the southern regions, at a rate that may reach 70%. It is also clear that there are morphological and anatomical differences between <i>L. maculosus</i> and its closest relatives. The most obvious differences are found in the head region, specifically the snout, as well as in the male and female reproductive organs. It has also been found that this insect has a great ability to survive in harsh environmental conditions and may be a serious agricultural pest for economic crops. At the same time, this insect can be used for biological control of plants that harm agricultural crops.
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**Keywords:** The wandering weevil, *Larinus maculosus*, central and northern Iraq, 110 species

## **INTRODUCTION:**

The weevil (*Larinus maculosus* (schr)) is a species of coleopteran beetle. It is also called a weevil because it has a snout at the front of its head. It has another name, the weevil or the weevil. This is due to the nature of the cocoon, as it has been proven that it is related to the formation of some medicinal herbs used to treat shortness of breath. In some sources, it is called the carpenter beetle (Sadoon and Thuraya, 2020). The weevil family includes approximately 200,000 species, of which approximately 70,000 have been described. It is found in Iraq on the plant host *Canthamus tinctorius*, the tannin plant. After feeding, the cocoons are formed, surrounding themselves in a hard cocoon. The male is 10 mm long, and the female is 12 mm long. It is black in color and has fuzz that is not clearly visible to the naked eye (Shafik, 1968). These insects feed largely on plants, some of which feed on organic compounds or plant waste; some of which feed on. Feeding on decaying matter, some of these species are important as medicinal insects, causing skin allergies, rhinitis, and asthma, such as the *Sitophilus* species (Oberprieler, 2004). As is well known, the larvae of this insect feed on plant roots, stems, leaves, and seeds. Generally, females lay their eggs in various parts of plants. Many studies have considered weevils to be important pests of agricultural crops, ornamental plants, stored products, as well as trees and forest products. On the other hand, a few weevil species have been successfully used in biological control as an effective means of controlling weeds and agricultural pests (weeds) (Anderson, 2002; Abdel and Alhadalg, 2015). There are species of beetles from the weevil family that may be similar in many phenotypic characteristics and lifestyle to the *Larinus maculosus* (schr) insect, such as the *Larinus planus* weevil, also known as the flat weevil. It is found in Europe and North America and is of economic importance, particularly in biological control, as it has the ability to eliminate plant pests that threaten economic agricultural crops. It feeds on flower buds, especially thorns, and the larval stage is the most effective against pests targeted in biological control (Ministry, 2019).

The thorn weevil (*Larinus maculosus* (schr)) is a newly discovered species of beetle in Iraq and globally. This study will examine its lifestyle, habitat, and life cycle, as well as identify some morphological and anatomical characteristics of this insect (researcher).

## **RESEARCH OBJECTIVES:**

- 1- An environmental bio-study of the thorn weevil (*Larinus maculosus* (schr)) in Iraq.
- 2- A study A partial analysis of the scorpion weevil and a comparison with other species of the same family from other regions of the world.
- 3- To determine the economic impact of this insect on agricultural crops and its potential use in biological pest control.

Previous studies:

#### **BACKGROUND :**

In the study (Sadoon and Thuraya, 2020). In determining the external characteristics of the Tihan weevil (*Larinus maculosus* (Scha.)), which belongs to the family Curculionidae, this species was recorded for the first time in Iraq. This insect was established as a general model for the family, which is supposed to be a reference in the classification of other species of this family. According to the study, body regions such as the head, thorax, abdomen, and their appendages, including the male and female reproductive organs, were studied and described. External or morphological characters are used in the classification of the genus *Larinus*, such as the length of the insect, the length and shape of the raised compound eye, the length of the inner margin of the snout, the length of the snout relative to the prothorax, the length and shape of the annular suture, the density of the hairs over the prothorax, the size and shape of the plate in the Mesothorax, Metaepisternum, Mesosternum, and Mesepimerum, and the density of the hairs over each of them, the order of the density of the hairs on the elytra, the size and shape of the siphon in the male reproductive organs, and finally the shape and number of segments of the ovipositor in the female reproductive organs (Sadoon and Thuraya, 2020). In a study (Yang et al., 1991), the oak weevil, also known as the oak flea, *R. maculosus*, was first discovered as a new species in China and identified based on the general morphological characteristics of adults collected from specific areas in 1987. A gradual increase in the insect's population led to its transformation into a pest that affected oak tree growth. How this insect affects oak production was not fully understood until 2015 due to insufficient biological information on its habitat, reproduction, life cycle, and which of its adult, pupal, or larval stages is most impactful on oak trees. Researchers eventually adopted the only available approach for identifying the oak weevil, *R. maculosus*, based on the limited morphological characteristics of the adult weevil. Identifying this species in the larval and pupal stages is very difficult due to the similarity between other species. Hence, the importance of studying beetle species in this family to avoid the threat they pose to economic plants. On the other hand, molecular markers have greatly enhanced the efficiency and accuracy of insect species identification (Jung et al., 2016) and are widely used by taxonomists to overcome the limitations of traditional methods based on morphology or the restriction of phenotypic classification of insects. A short standard fragment of the cytochrome c subunit 1 (CO1) gene, or mitochondrial oxidase, has become a key tool for quickly and accurately distinguishing insect species (Foster et al., 2013), especially when identifying morphologically. This fragment is complex and problematic. The CO1 gene fragment has been widely used as a DNA barcode and species marker for all animal taxa. The objectives of this study were to provide a description. Detailed morphological and phenotypic analysis of the four life stages of the traditional species identification of *R. maculosus* oak weevil, verification of the effectiveness of barcode or DNA testing in species identification, and then establishment of molecular alternatives for rapid identification of this insect pest to avoid its dangers and treat it quickly (Jinbo et al., 2011).

#### **Classification: Tihan weevil (*Larinus maculosus*)Scha**

Kingdom : Animalia (Animals)

Phylum : Arthropoda (Arthropods)

Subphylum : Hexapoda (Hexapods)

Class : Insecta (Insects)

Order : Coleoptera (Beetles)

Suborder : Polyphaga

No Taxon : (Series Cucujiformia)

Superfamily : Curculionoidea

Family : Curculionidae (Snout and Bark Beetles)

Subfamily : Lixinae

Tribe : Lixini

Genus : *Larinus*

Species : *maculosus*



: (2016 . Larinus)

#### **Tools and Working Methods:**

**1- Collection Tools:** Insects were collected using various methods, such as nets, striking boards, pottery siphons, light traps, and hand-picking from fruit trees, forests, vegetables, and wild plants.

**2- Collection Season:** Insects were collected during their breeding season from several areas across the province, and across Iraq's governorates if possible. After collection, a group of them (more than one sample) was mummified for accurate diagnosis and sent to the Natural History Museum. Another group was reared in the laboratory and field to create colonies of the insect for the purpose of ensuring their continued survival and conducting studies.

**3- Number of Samples:** More than 100 samples were collected, followed by preliminary field diagnosis, and the samples were stored in special plastic containers until they were delivered to the laboratory and rearing cages.

**4- Diagnosis:** The diagnosis was made according to the Natural History Museum report in an official letter sent from the college with the samples to the museum to determine and confirm the type of insect, whether it is a new species or a previously discovered species. If this is not possible, we make a preliminary diagnosis according to foreign websites and platforms approved for diagnosing and classifying insects. The taxonomic location and scientific names of the species were generally determined by researchers using original descriptions, available keys, and catalogs (Alonso-Zarazaga et al., 2017). Tribes, genera, and species were listed in the records alphabetically, following the highest and most recent classification in the order of Coleoptera (Curculionoidea) and the general distribution of each species in the first place.

**5- Field study:** During sample collection, the collection locations were recorded, along with the number of insects (adults), the collection season, the collection locations, and the frequency of this insect in the area from which it was collected, for example, 1 square kilometer. The types of plants or plant hosts on which it is found or from which it feeds were recorded, as well as other species of the same genus. Also, the natural enemies of this insect at the collection location were identified, as well as the extent of the impact of natural enemies on the reproduction and spread of this insect, as well as the environmental conditions surrounding the insect. 5- Semi-field study: We build special cages with dimensions of 2 x 3 m and a height of 2.5 m, surrounded by a metal mesh (SIM) to prevent the entry or exit of the insect or its natural enemies. The cages are placed in a nursery or greenhouse, which is well covered with a plastic cover (nylon) to maintain the standard living conditions of the weevil in terms of temperature and humidity. Then, the preferred plant host for the insect is planted inside the cages for the purpose of propagation and obtaining the different stages of the insect. The rate of spread and reproduction is periodically recorded on the cages.

#### **6- Laboratory Study:**

After collecting insect samples using various methods, such as nets, punch boards, and pottery suction cups, as previously mentioned, they were well preserved after anesthetization and then transferred to the Entomology Laboratory at the College of Education for Pure Sciences. The taxonomic location and scientific names of the species were then determined in general. Species of the thorny weevil were identified in the northern, central, and southern regions of Iraq through a relatively small number of studies on this particular insect. Morphological and anatomical differences were also identified using microscopes. Each part of the insect was photographed individually using a digital camera connected to a light microscope, and multiple lenses were used to photograph all body parts, such as the head, antennae, mouthparts, and eyes. The other body parts were then photographed in detail, including the thorax, abdomen, and reproductive organs of the male and female insect, in all their details. The results were then recorded using a computer (laptop) for photography.

#### **RESULTS:**

The morphology of this insect was found to be recognizable by its relatively long and slender snout, with mouthparts located at its tip, and most of its antennae being stapes-shaped. Twenty-five and 40 species were identified, respectively, in the Baghdad and central governorates. In 1966, one new species was also recorded in and around Baghdad. In 1967, 11 more species of the genus *Aedes aegypti* were recorded, and by 1974, 23 new species of the same genus were recorded. In 1976, 25 new species were recorded, and by 1977, 23 to 28 species were recorded in Nineveh and Karbala governorates. Subsequently, in a 2007 study, 20 species from two subfamilies were studied (Halgurd and Talal, 2019). Another study in 2015 identified two additional species from Basra Governorate. Finally, Ismail (2015) studied the microscopic sculpture of 8 species and 3 genera (Sadoon and Thuraya, 2020). In total, 85 species were identified only in northern Iraq, from Nineveh Governorate to Basra Governorate. The last study was conducted in the Kurdistan Region of Iraq, based on an intensive survey in different areas of Kurdistan from March 2016 to November 2017. In total, 41 species belonging to 28 genera, 21 tribes, and 3 families were collected. These have been identified, including 25 newly recorded species of Iraqi insects and 16 previously recorded species (Halgurd and Talal, 2019). By comparison with species discovered in Iraq, the final number of *Larinus* species discovered in Iraq by 2017 may be 110 species of weevils of the family Larinidae. This is certainly far fewer than those actually present in this large and diverse country.

Table (1) Types of beetles recorded in the Iraqi governorates of the genus *Larinus* from 1966 to 2017:

Governorate	السنة	العدد	New species
Baghdad	1966	40 – 25	1
Central governorates	1967	11	NON
Governorates north of Baghdad	1974	23	23
Governorates south of Baghdad	1976	25	4
Nineveh Governorate	1977	23	8
Karbala Governorate	1977	5	3
Southern Iraqi governorates	2007	20	NON
Basra Governorate	2015	2	2
Eastern Iraqi governorates	2015	8	3
Governorates of the Kurdistan Region of Iraq	2017	41	25
Total	The total number of recorded and new species in Iraq until the year 2017 amounted to 110 species of the genus <i>Larinus</i> , including ( <i>Larinus maculosus</i> (schr		

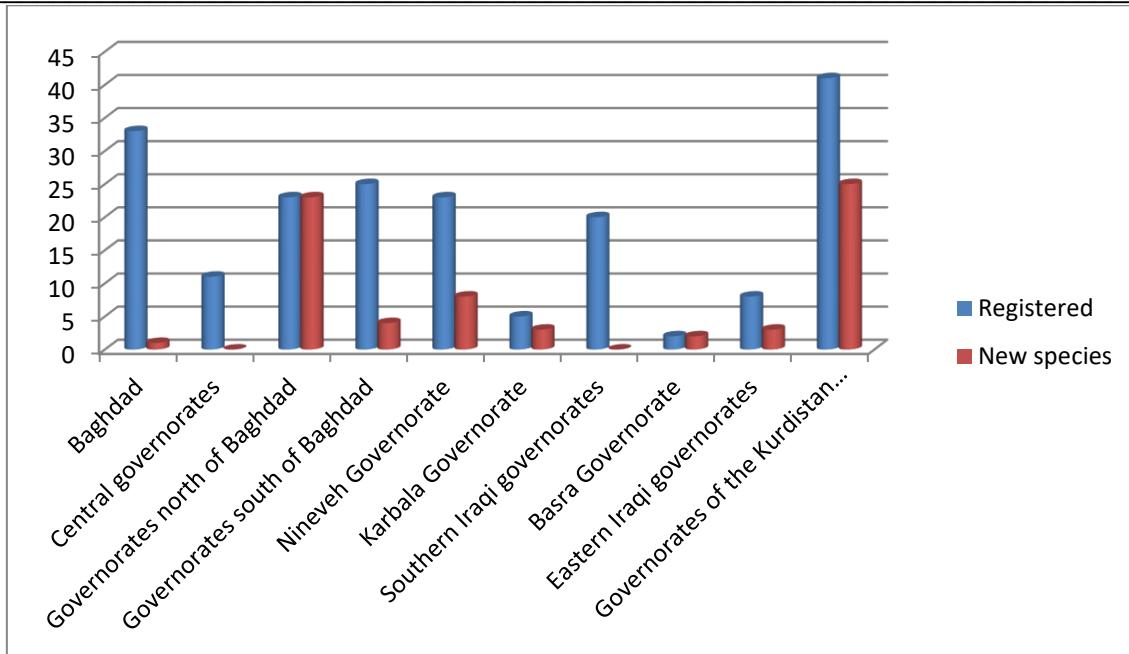


Figure (1) shows the number of recorded and new species of *Larinus* beetles in Iraq during the past 6 decades.

Some external and anatomical characteristics of the wandering weevil (*Larinus maculosus* (schr)): Comparison of some morphological and anatomical characteristics between *Larinus maculosus* and the closest species of the same genus *Larinus obtusus*.

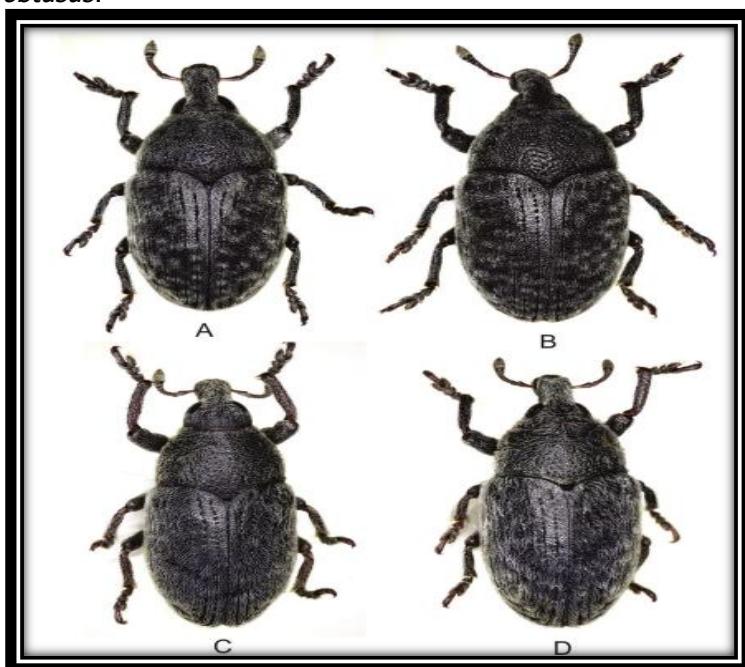


Figure (2) with adults of *Larinus obtusus* with *Larinus maculosus* in dorsal view. Where: A: *L. obtusus* male and B: *L. obtusus* female; C: *L. maculosus* male and D: *L. maculosus* female.

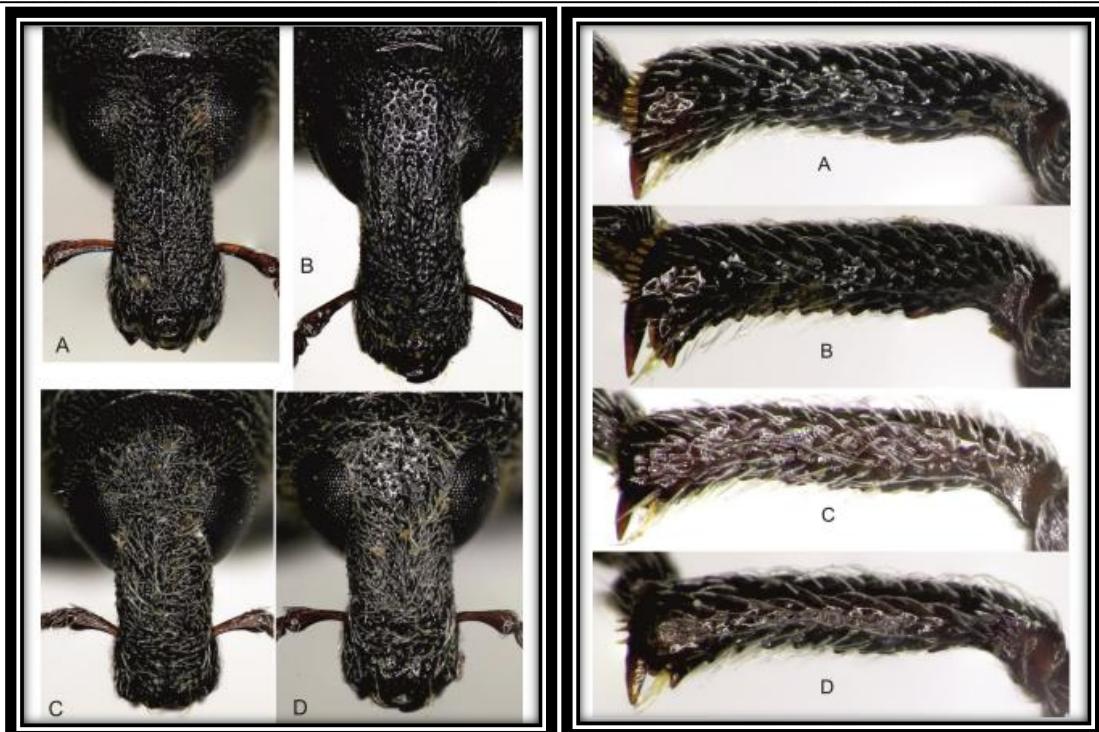


Figure (3) Mouth parts and legs in adults of *Larinus obtusus* with *Larinus maculosus* in dorsal view. Where: A: *L. obtusus* male and B: *L. obtusus* female; C: *L. maculosus* male and D: *L. maculosus* female. ( Levent and Robert, 2017).



Figure (4): The reproductive organs of adults of the species *Larinus obtusus* in comparison with the species *Larinus maculosus* in the dorsal view. Where: A B: *L. obtusus* male and C D: *obtusus*. L, female; E F: *L. maculosus* and male G I: *L. maculosus* female. .( Levent and Robert, 2017).

#### DISCUSSION:

It is clear that the beetle family, also known as the Larinidae family, is one of the largest families in the Coleoptera order, which is considered the largest order in the insect class. From this study, we conclude that 110 species of the genus *Larinus* have been recorded in Iraq in general and in almost all governorates from 1965 to 2020. The last species recorded in 2020 was *Larinus maculosus*. According to Table (1), we note that most of these beetle species were recorded for the first time in the northern regions or northern governorates of Iraq, compared to the southern regions of Iraq. We note, according to Figure (1), that only two species were recorded in Basra Governorate, and the total number of species recorded in the southern governorates as a whole was 20 species. Meanwhile, 23 species were recorded in Nineveh alone, and 41 species in the Kurdistan Region, including 16 new species. This is naturally due to the fact that the mountainous and semi-mountainous plants in northern Iraq are very rich in plant biodiversity, as the abundance of vegetation cover with its diversity in the northern regions of Iraq, specifically north of Baghdad, has led to the general prosperity and proliferation of this insect species, particularly in the regions of Nineveh and Iraqi

Kurdistan. In this systematic study, the morphological form of the wandering weevil and some anatomical and molecular characteristics were determined, and when compared with the closest species to the *Larinus maculosus* species belonging to the genus *Larinus*, which is *Larinus obtusus*, there were some phenotypic differences in general between the male and female of both species, Figure (2), where it is noted after careful examination that the male and female *Larinus maculosus* are somewhat thinner than the male and female *Larinus obtusus*, and also the length of the posterior wings is greater, in addition to the relatively small chest area, but the most prominent anatomical differences are clear in the mouth area, specifically in the snout, as we notice that the distance between the end of the snout and the antennae differs, in addition to the presence of what resembles chitinous teeth in *Larinus obtusus* and their almost absence in *Larinus maculosus* for males, Figure (3). The difference is also clear in the distribution and presence of down in the legs of both species, and a clear difference in the anatomical reproductive organs of both species, such as the copulatory organ in males and the egg-laying apparatus in Females also form (4). It has been shown that this particular type of beetle has a high ability to attack plant stems in the environment in which it lives, especially the stems of herbaceous plants such as some economic crops. It was also found that the most capable stage of destroying plants is the larval stage, in addition to the high ability of the pupa stage to withstand harsh environmental conditions that enable it to survive for the longest possible period in harsh environments. Here, it is necessary to study the classification of these genera and families and to know the extent of their ability to develop and differentiate between the species of each genus, in order to control them and identify the species of dangerous pests on economic agricultural crops such as wheat, barley, and others and combat them in a way that does not lead to damage to the ecosystem and at the same time the possibility of using these types of beetles in the biological control of many types of harmful plants in the field of agriculture and controlling the management of biological control in the correct ways. This study may be similar to some previous studies such as the study (Yang et al., 1991) on the oak weevil, where it was difficult to determine which species had a significant impact on oak tree crops, as well as the study (Halgurd and Talal, 2019), which studied the taxonomy of weevil species of the genus *Larinus*.

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## دراسة حياتية بيئية لحشرة التيهان *Larinus maculosus* (schr.)(curculionidae: coleoptera) في محافظات العراق

م. د: غزوan ثامر خصير الرشيدi / وزارة التربية / المديريه العامة ل التربية نينوى

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### الخلاصة :

تُعد سوسنة الرحالـة، *Larinus maculosus* (Schr), أحدـت الأنواع المـكتشفـة من جـنس *Larinus* ، الذي يـنتمـي إلى فـصـيلـة غـمـديـات الأـحـنـحة (Coleoptera). تـنـتـشـر هـذـه السـوـسـة عـلـى نـطـاق وـاسـع فـي وـسـط وـشـمـال العـرـاق، خـاصـةً. وـقـد تم تـحـدـيد ما مـجـمـوعـه 110 أـنوـاع مـن *Larinus* فـي جـمـيع أـنـحـاء العـرـاق، وـقـد تـبـيـن أـنـ غالـبيـة الأـنـوـاع تـسـجـل فـي الـمـنـاطـق الـشـمـالـيـة، مـقـارـنـةً بـالـمـنـاطـق الـجـنـوـبـيـة، بـنـسـبـة قد تـصـل إـلـى 70%. كـمـا يـتـضـح وـجـود اختـلـافـات مـوـرـفـولـوـجـيـة وـتـشـرـيـحـيـة بـيـن *L. maculosus* L. وـأـقـرـب أـفـارـيـهـا. وـتـظـهـر أـبـرـز هـذـه الاـخـلـافـات فـي مـنـطـقـة الرـأـس، وـتـحـدـيدـاً الـخـطـم، وـكـذـلـك فـي الـأـعـصـاء الـتـنـاسـلـيـة الـذـكـرـيـة وـالـأـنـثـيـة. كـمـا وـجـد أـنـ هـذـه الحـشـرـة تـتـمـتـع بـقـدرـة كـبـيرـة عـلـى الـبـقـاء فـي الـطـرـوـف الـبـيـئـيـة الـقـاسـيـة، وـقـد تـشـكـل آـفـة زـرـاعـيـة خـطـيرـة عـلـى الـمـحـاـصـيل الـاـقـتـصـادـيـة. فـي الـوقـت نـفـسـهـ، يـمـكـن استـخـدـام هـذـه الحـشـرـة فـي الـمـكـافـحة الـبـيـولـوـجـيـة لـلـنـبـاتـات الـتـي تـضـرـرـ بـالـمـحـاـصـيل الـزـرـاعـيـة.

الكلمات المفتاحية: السوسنة المتجولة *Larinus maculosus* وسط وشمال العراق 110 نوع.

هـ 1445

مـ 2025