

# First record of the parasitoid *Cryptochetum jorgepastori* (Cadahia, 1984) (Cryptochetidae: Diptera) from Jordan

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## Abstract

*Cryptochetum jorgepastori* (Cryptochetidae: Diptera) is recorded from Jordan for the first time. Adult flies emerged from the giant date palm mealybug, *Pseudaspidopectus hyphaeniacus* (Hemiptera: Monophlebidae), attacking date palm, *Phoenix dactylifera*, Canary Island date palm, *Phoenix canariensis*, and fan palms, *Washingtonia* sp., in Ghawr Kabid in the central Jordan Valley. The collected specimens were identified according to the original descriptions for the adult (including male and female genitalia) and the operculum of the pupa. Specimens were deposited at the University of Jordan Insects Museum. A survey to confirm the current distribution of *C. jorgepastori* and its hosts in Jordan is needed as well as the study of its biology and ecology and to evaluate its potential role in integrated pest management programmes.

## KEY WORDS

*Cryptochetum jorgepastori*, giant date palm mealybug, mealybug parasitoid

## Premier signalement du parasitoïde *Cryptochetum jorgepastori* (Cadahia, 1984) (Cryptochetidae: Diptera) en Jordanie

*Cryptochetum jorgepastori* (Cryptochetidae: Diptera) est signalé pour la première fois en Jordanie. Des mouches adultes ont été trouvés émergeant de la cochenille *Pseudaspidopectus hyphaeniacus* (Hemiptera: Monophlebidae) attaquant des palmier-dattiers, *Phoenix dactylifera*, des palmiers des Canaries, *Phoenix canariensis* et des palmiers *Washingtonia* sp. à Ghawr Kabid dans la région centrale de la vallée du Jourdain. Les spécimens collectés ont été identifiés grâce aux descriptions originales pour les adultes (notamment les organes génitaux mâles et femelles) et l'opercule de la pupa. Les spécimens sont conservés à la Galerie d'Entomologie de l'Université de Jordanie. Une prospection visant à confirmer la répartition géographique actuelle de *C. jorgepastori* et de ses hôtes en Jordanie est nécessaire, ainsi que l'étude de sa biologie, de son écologie et l'évaluation de son intérêt potentiel dans des programmes de lutte intégrée.

## Первая находка паразитоида *Cryptochetum jorgepastori* (Cadahia, 1984) (Cryptochetidae: Diptera) в Иордании

Муха *Cryptochetum jorgepastori* (Cryptochetidae: Diptera) впервые зарегистрирована в Иордании. Взрослые мухи появились из мучнистого червеца

гигантской финиковой пальмы *Pseudaspidopectus hyphaenicus* (Hemiptera: Monophlebidae), атакующего финиковую пальму *Phoenix dactylifera*, финиковую пальму Канарских островов *Phoenix canariensis* и веерные пальмы *Washingtonia* sp. в Гавр Кабид в центральной долине Иордании. Собранные образцы были идентифицированы в соответствии с оригинальными описаниями взрослой особи (включая мужские и женские гениталии) и оперкулула куколки. Образцы были переданы на хранение в Музей насекомых Иорданского университета. Необходимо проведение дополнительных исследований для подтверждения нынешнего распространения *C. jorgepastori* и его хозяев в Иордании, изучение его биологии и экологии. Также целесообразна оценка потенциальной роли этого паразитоида в программах интегральной защиты растений.

## 1 | INTRODUCTION

Members of the family Cryptochetidae are small stout-bodied flies (2–4 mm long), metallic blue-black, with a broad high head and clear wide wings; the last antennal segment is very elongate and without an arista (McAlpine, 1987). The family currently contains 30 described species in the genus *Cryptochetum*; most of them occur in the Palearctic and Australasian regions with a few species in the Palearctic region (Papp et al., 2018). The immature stages are endoparasitoids in the bodies of scale insects in the subfamily Monophlebinae.

Cadahia (1984) reviewed the original descriptions of *Cryptochetum* spp., their biology and their role in biological control. *Cryptochetum jorgepastori* was described as a new species parasitizing the mealybug *Paleococcus fuscipennis* Burm. (Margarodidae: Monophlebinae). Cadahia (1984) also provided descriptions for the immature stages of *C. jorgepastori* to contribute to the identification of this species because he considered the genus *Cryptochetum* as a clear example of poecilogony (polymorphism in larval development). In addition to *C. jorgepastori*, *C. buccatum* Hendel 1933 was recorded for the first time in Spain. Both species were recorded in the coastal pine forests of Huelva. Later it was found in Barcelona (Carles-Tolrá, 1992) and Andorra (Carles-Tolrá and Pujade-Villar, 2003). *Cryptochetum jorgepastori* was introduced from Marismas del Dial Nature Reserve, south-east of Huelva in southern Spain and released at a single site in the forest at Nahal 'Iron, Israel' to control *P. fuscipennis* (Mendel et al. 1998).

Papp et al. (2018) recorded *C. jorgepastori* and *C. grandicorne* in Turkey for the first time and provided four original figures for *C. jorgepastori* male genitalia in addition to a key for both species. *Cryptochetum buccatum* Hendel 1933 was recorded for the first time on *Palaeococcus fuscipennis* (Burmeister) (Monophlebidae) in Turkey and *Cryptochetum grandicorne* Rondani was reported from *Gueriniella serratulae* Fabricius (Monophlebidae) (Ülgentürk and Balci, 2019).

Thorpe (1934) studied the development of *Cryptochetum grandicorne* Rondani 1875 on *Gueriniella*

*serratulae* (at that time named *Guerinia serratulae* [Coccidae]). He found that the eggs are laid in the haemocoel of the mealybug and hatch to an unsegmented first instar larva that has no trachea. At this stage nutrients are absorbed by diffusion from the blood of the host. The second-stage larva is segmented and has a trachea but with no open spiracles. It also feeds on the blood and fat-body of the host. The third-stage larva feeds on the organs of the host. The tracheal system has anterior and posterior spiracles that pierce the skin of the host and get oxygen from atmospheric air. The puparium is formed within the dead body of the host. The development of *C. jorgepastori* is expected to be similar to the development of *Cryptochetum grandicorne*.

Our objective is to officially record the endoparasitoid, *Cryptochetum jorgepastori*, from Jordan for the first time and to provide original digital images of the adult stage, male and female genitalia, the puparium and the parasitized host *Pseudaspidopectus hyphaenicus* (Hall, 1925) (Hemiptera: Monophlebidae).

## 2 | MATERIALS AND METHODS

About 150 specimens of the recently recorded giant date palm mealybugs, *Pseudaspidopectus hyphaenicus*, were placed in Petri dishes at room temperature to check for the presence of endoparasitoids. The mealybugs were collected from date palm, *Phoenix dactylifera* L., Canary Island date palm, *Phoenix canariensis* Hort. ex Chabaud, and fan palms, *Washingtonia* sp., in Ghawr Kabid in the central Jordan Valley on 6 January 2021.

Adult flies of the parasitoid that emerged from *P. hyphaenicus* were soaked in 10% KOH for 1–2 days, washed in distilled water, then the male and female genitalia were removed and mounted in glycerin. Images for slide preparations were taken using a digital camera (CMEX 5.0 M pixel digital USB2 camera Euromex, Arnhem, The Netherlands) attached to the eye tube of a light microscope.

Digital images of adult flies were taken using a 65 mm macro lens mounted on a Canon (Tokyo, Japan) 5D Marl

IV camera with an LED ring light. Images were stacked using Helicon Focus software and then processed using Adobe Photoshop 2020. The specimens were identified according to the original descriptions of Cadahia (1984) for the adult (including male and female genitalia) and the operculum of the pupa. All specimens were preserved in the University of Jordan Insect Museum.

### 3 | RESULTS AND DISCUSSION

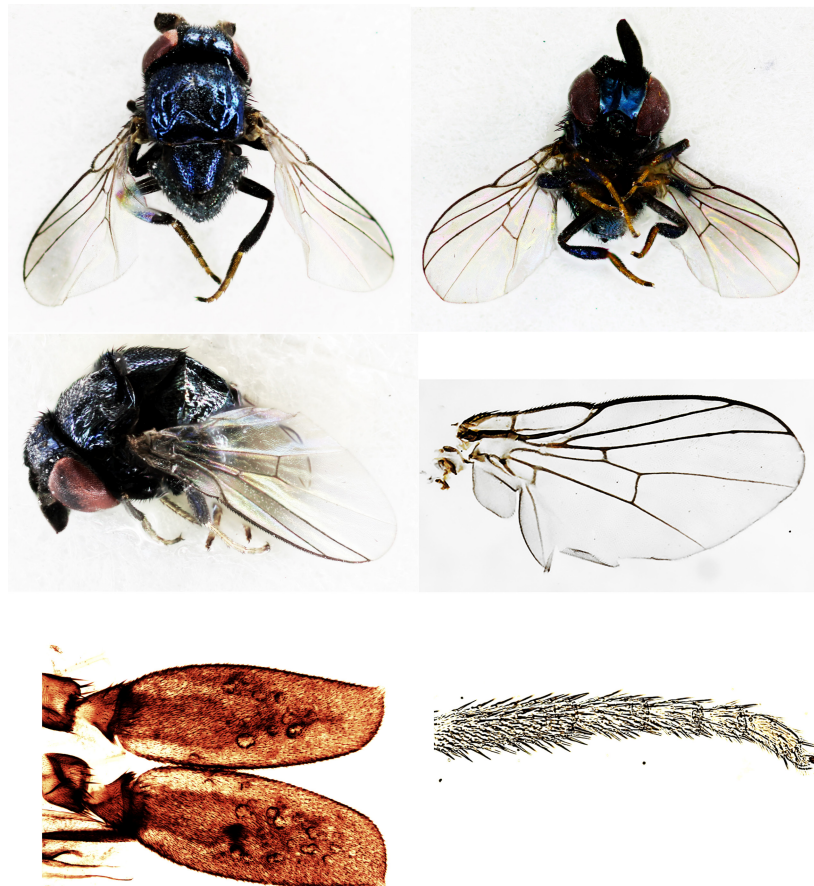
A total of 35 females and nine males were recovered from parasitized mealybugs. The morphology of the collected specimens matched the adult descriptions given by Cadahia (1984) and Papp et al. (2018). Such descriptions could be summarized as the following: the eyes are large and pubescent; the last antennal segment is large without arista; the scutellum is large and convex; the lower calypter of the wings is very small; the tarsal claws are simple; and the legs are without characteristic setae (Figure 1). Male and female genitalia are shown in the top left and right images of Figure 2 respectively. The puparium is dark brown or black, 10-segmented. The operculum is three-segmented with a dorsal emergence

line on the third segment (Figure 2). The anterior spiracular processes are attached to operculum while the posterior spiracular ones arise from adjoining surfaces (McAlpine, 1987).

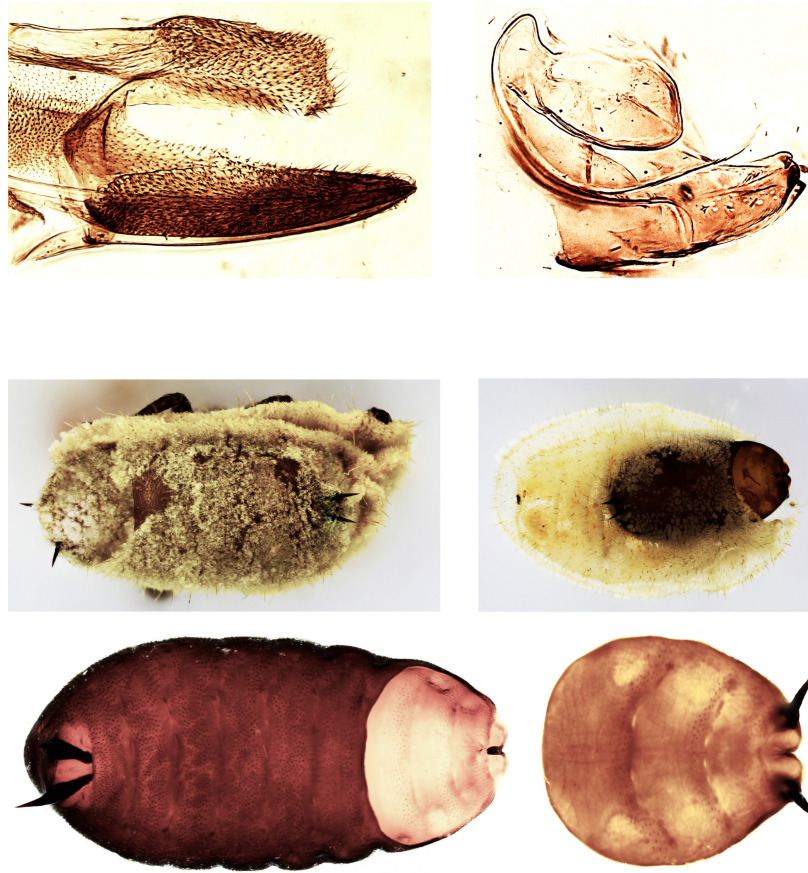
Papp et al. (2018) mentioned that the Cryptochetidae are rarely collected. For example, there were only 97 specimens from this family in the Hungarian Natural History Museum specimens and only four specimens out of the 15000 fly specimens collected in Thailand were found to be cryptochetids. Many undescribed species may be discovered from the Asia and Afrotropical regions.

The introduction of the Australian species, *Cryptochetum iceryae*, into California as a biological control agent against the cottony cushion scale, *Icerya purchasi* Maskell, was highly efficient in controlling the pest (McAlpine, 1987). Currently, two hosts of *C. jorgepastori* are known from Jordan, the recently recorded (Katbeh Bader and Al-Jboory 2021) giant date palm mealybug, *Pseudaspidopectus hyphaeniacus*, and the cottony cushion scale, *Icerya purchasi*, previously listed by Morales et al. (2016).

Future research could focus on additional sampling for both hosts to determine their distribution in Jordan.



**FIGURE 1** *Cryptochetum jorgepastori*: adult dorsal (top left), ventral (top right), lateral (middle left), wing (middle right), antennae (bottom left) and leg (bottom right)



**FIGURE 2** *Cryptochetum jorgepastori*: lateral view of female genitalia (top left) and lateral view of male genitalia (top right), puparium inside the giant date palm mealy bug *Pseudaspidopectus hyphaeniacus* with the anterior and posterior spiracles protruding from the skin of the host (middle left), puparium inside the cleared host (middle right), cleared and extracted puparium from the host (bottom left) and operculum (bottom right)

Furthermore, the population densities of the parasitoid can be studied and the possibility of the existence of other species of the genus *Cryptochetum*. The obtained results may contribute to any integrated pest control program for these two pests.

## 4 | CONCLUSION

*Cryptochetum jorgepastori* is recorded from Jordan for the first time on the giant date palm mealybug, *Pseudaspidopectus hyphaeniacus*. Digital images for adult flies, their genitalia and puparium are provided. The distribution and biology of this endoparasitoid in Jordan is currently unknown.

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