HYPOLIXUS PICA (CURCULIONIDAE: LIXINAE) - A LIFE BETWEEN *AMARANTHUS* AND *TAMARIX* ON CYPRUS

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Abstract.

Description of the circumstances of the discovery of *Hypolixus pica* (Fabricius, 1798) and attempts to explain a life between the hostplant *Amaranthus* spp. and the foodplant *Tamarix* spp. on Cyprus.

Keywords. Coleoptera, Curculionidae, Lixinae, host plant change, ecology, Cyprus, Gran Canaria.

Introduction

The very pretty *Hypolixus pica* (Fabricius, 1798) is one of 9 *Hypolixus* species found in the Palaearctic. It has been described under 6 other names (synonyms). The by no means uniform distribution area extends from southern France to Greece as well as from Egypt and Cyprus to Turkey, the Middle East, Saudi Arabia and Iraq and Iran to Pakistan. The species also seems to have been introduced with its host plant *Amaranthus* (perhaps with *A. retroflexus* or *A. caudatus*) to the Canary Island of Gran Canaria, where it was beaten as a single specimen from the low branches of *Tamarix canariensis* Willd at Puerto S. Nicolas, on 12 November 1999 (Morris 2007, here provisionally determined as *Hypolixus brachyrhinus* Boh.).

Hypolixus pica (Fabricius, 1798) was initially recorded by the author exclusively on *Tamarix* spp. during various excursions to Cyprus (Fig. 1) (Stüben & Jacob 2024). This confirms another record Gran Canaria, where the species was collected by Schönfeld from *Tamarix canariensis* near Playa de Taurito, on 24 December 2006 (Stüben 2022). The main breeding season is evidently from October to December, because Rüdiger Jacob (Germany, Engen) and the author had to deal with a mass occurrence of these Lixinae in many places on Cyprus during this period. With just a few knocks from each of the 2-3 m high *Tamarix bushes* on a salt lake south of Larnaca near the Hala Sultan Teke mosque, around 100 specimens could be knocked off in less than a minute. An initial estimate on site showed that there must have been at least 2000 specimens on the 10 - 15 relatively low tamarisk trees, without it being clear at that time where the actual host plant, an Amaranthaceae, might have been (Fig. 2). - A side note: It is reasonable to assume that this species, which is capable of flight, is also much more widespread in the Canary Islands than previously assumed; wherever Tamaricaceae and Amaranthaceae occur more or less together.

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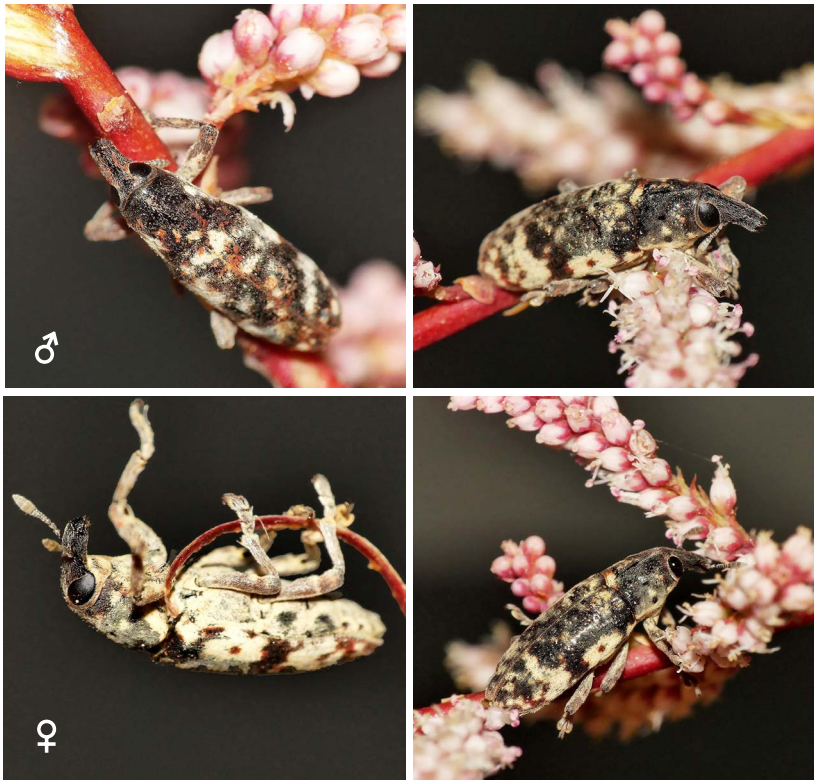

Hypolixus pica

Cyprus, 1 Km W Sarama: near Evretou Dam, 34º57′32.33″N 32º30′39.27″E, 223m, 23.06.2023, *Tamarix*, leg Stüben (38)

Fig. 1. *Hypolixus pica* in its coloured vestiture on *Tamarix* spp. in Cyprus.

In mid-November 2023, we knocked about 100 specimens of *Hypolixus pica* from only 2-3 m high *Tamarix* bushes at a salt lake south of Larnaca near the Hala Sultan Teke Mosque, specimens that we later needed for feeding experiments on various plants.

It proved difficult to remove them from the tapping umbrella by hand, as the animals clung (perhaps an adaptation to the fine branches of the Tamaricaceae in wind and weather) and with their long tarsi could hardly be separated from the fingers. With the Exhauster it worked much better later.

Fig. 2: An astonishing population density of *Hypolixus pica* on *Tamarix* in Cyprus in late fall.

Amaranthus spp. - the actual host plant

It has been known for some time that the *Amaranthus* species introduced to Cyprus, mainly from North America, are not only a noxious weed in various cultivated plantations, but also, like *A. spinosus*, *A. retroflexus* and *A. palmeri* in the eastern Mediterranean and south-eastern Turkey, are the hostplants of *H. pica* (e.g. Tawfik et al., 1976; Pourtaherzarei et al., 2010, Özbek 2014, see Fig. 3). *H. pica* has even been considered as a potential biological control agent of *Amaranthus* weeds in summer crops and orchards in south-eastern Turkey (Adana province, Pehlivan et al. 2022).

Fig. 3. A few kilometres northwest of the small village of Lageia in the south of Cyprus, we found largely wilted *Amaranthus retroflexus* populations on the roadside by the field edge, in whose root necks, but above all stems - barely visible from the outside - hundreds of larvae, pupae and immature specimens of *Hypolixus pica* were uncovered by us on 16 November 2023.

Pourtaherzarei et al. (2010) carried out their studies in Iran and found that the larvae of *H. pica* feed and develop in the stems of *A. retroflexus* L, while for the first time Özbek (2014) reported the leaves of almond trees being reduced to the midrib in an extensively damaged almond plantation in Antalya, Turkey. Strangely enough, however, the same article does not mention any of the Tamaricaceae, which are widespread in the Mediterranean region and northern Africa and often occur along rivers and prefer salty lakes and coasts, as a feeding shrub. However, it was precisely at similar localities that we found numerous specimens of *H. pica* on various *Tamarix* plants in many places on Cyprus, from the sea coasts to the low mountain ranges, during our November 2023 excursion. In the absence of any visible Amaranthaceae that could have provided the larvae and pupae with an ideal developmental substrate, we could not determine where the animals could have come from.

Up until this point, only Tamaricaceae had been reported in association with *H. pica* on Cyprus, with the author not being aware of any evidence of *Amaranthus* plants as hosts in Cyprus, nor of the existence of any specimens of larvae and pupae.

Description of the circumstances under which *H. pica* was found on *Amaranthus retroflexus*

However, that quickly changed when we discovered a large, coherent stand of *Amaranthus retroflexus* on the side of the road near the small town of Lageia in the Greek part of the island of Cyprus (Fig. 3). The population density of the larvae was enormous, especially in the stems down to the smallest

lateral branches, and 50 to 70 specimens in a single *Amaranthus* plant were not uncommon (Fig. 4). Only very occasionally were the root necks also utilised. This partly contradicts observations by Gültekin & Korotyaev (2012), who suggest that larvae develop mainly in the roots of *A. spinosus* in the first weeks of September in Hatay province (south-east Turkey). We found larvae, pupae and immature adults even in the most remote branches of *Amaranthus retroflexus* plants over 1 metre high. The emergence holes were often found high up in the strongest stems (Fig. 5).

Fig. 4. The population density of *H. pica* larvae in only a few centimetres of stem was enormous.

The main emergence should only occur in late autumn, as we were able to see for ourselves on the November 2023 excursion (Fig. 6). In the early summer of the same year and in March 2024, the author only rarely found specimens on the various Tamaricaceae. Özet (2014) also reports that the population density of weevils increased considerably in October and November in the infested almond plantations of Antalya in south-east Turkey, where in some cases the foliage loss was 30%.

The adults do not show their colourful vestiture immediately after hatching **inside** their *Amaranthus* host plants in late autumn and early winter. They quickly lose this colour over the course of their lives, as soon as they come into contact with moisture. Incidentally, this makes targeted colour-preserving dissection difficult, but - as with many Lixinae - it is not absolutely necessary for identification, and in view of the existing identification keys it is often even a disadvantage if essential identification features of the integument are obscured by the colourful, waxy vestiture! For reliable identification, the mtCO1 barcode (658 bp / Follmer region) from two sites in Cyprus was presented here for the first time (see Appendix 1).

The softer pith in the stems of *Amaranthus* plants are almost completely eaten by the larvae. The imagines actually seem to temporarily feed on the leaves before they leave their host plant and visit Tamaricaceae. However, this initial feeding on *Amaranthus* leaves is limited to the leaf margins (own feeding experiments, see Fig. 7), not creating holes in the leaves, which are probably caused by snails. Overall, however, the plants inhabited by *H. pica* leave a stressed and ailing impression (Fig. 8). However, it remains questionable whether three generations per year actually hatch in Cyprus, as Pourtaherzarei et al. (2010) assume for Iran.

Fig. 5. Only a few larvae were found in the root collar. The circular emergence holes were often located high up on the plant.

Fig. 6. Larva, pupa and teneral specimen of *H. pica* - all at the same time in a stem of *Amaranthus retroflexus*.

Tamaricaceae as a food and feel-good plant?

Ultimately, the question remains: why do the newly emerged Lixinae visit the *Tamarix* bushes that are so valued in Cyprus and are often many kilometres away? There were no *Tamarix* bushes in the immediate vicinity of the *Amaranthus* stand at Lageia, 435 m above sea level, that *H. pica*, an excellent flyer, could have sought out (Fig 9). To a certain extent, the *Tamarix* flower can be excluded here. The flowering period is usually from March to September. An ideal time to deal with Nanophyinae of the tribe Corimaliini, which stay in the pink and purple-colored, terminal inflorescences and lay their eggs there (Stüben & Schön 2023). However, this period does not coincide with the mass colonizations of *H. pica* on Tamaricaceae, as we discovered. Feeding experiments with *Tamarix* twigs for 3 days in linen bags showed on site that this weevil obviously feeds on the leaves. (Fig. 7).

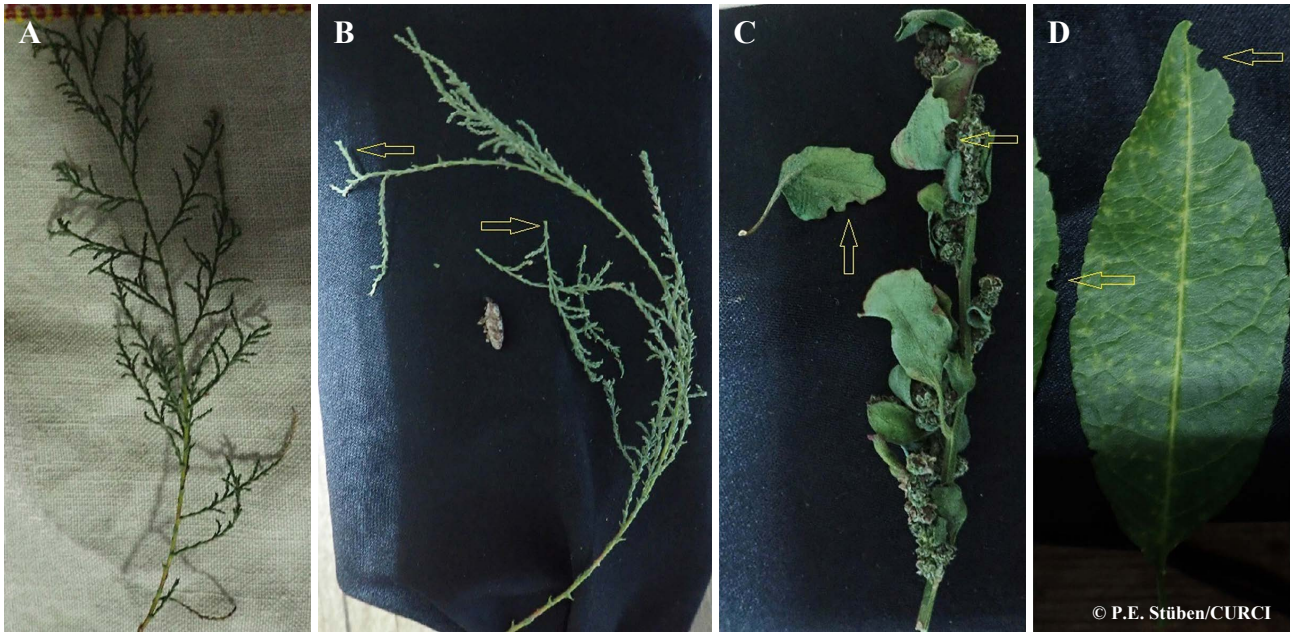

Fig. 7 Feeding experiments on *Tamarix* (A. before / B. after), C. *Amaranthus* and D. almond tree leaves.

Fig. 8. Hardly visible from the outside except for the few emergence holes and eaten leaves: The stems of the *Amaranthus* plants are almost completely eaten by the larvae on the inside.

However, *H. pica* not only has the foodplant in common with the tiny Brentidae, but also the long, adhesion-intensive tarsi with which both representatives of these completely different families of the Curculionoidea use to cling to their host plants in windy weather. A clutching reaction that you can appreciate yourself after picking up the animals, when *H. pica* can only be pulled off your own fingers with great difficulty - not always without damage to the weevil itself.

Is this an evolutionary adaptation to the fine branches of *Tamarix*, an anti-drift protection against 'wind and weather' in treeless open land and coastal areas? Are Tamarix shrubs sought out as food resource when annual *Amaranthus* plants are no longer available? Is this related to migration, and can the tall Tamarix "trees" - we know this from many Apioninae (especially in Cyprus; Stüben et al. 2012) - serve as a "high perch" (German: "Aufbaumen") from where they can better perceive the chemical signals and released plant ingredients of their host plants in spring? Still a wide field of research.

Fig. 9. There were no *Tamarix* bushes in the immediate vicinity of the *Amaranthus* stand near the village of Lageia in the south-eastern foothills of the Troodos Mountains that *H. pica* could have visited. But where and how does the freshly hatched, still beautifully marked specimen, which is just getting ready to take off from its hostplant, find the tamarisk bushes along the rivers and streams (see below right) or beaches of Cyprus?

A life between *Amaranthus* and *Tamarix* in Cyprus - We have not yet found a conclusive answer to the question of how *H. pica* finds its hostplant and foodplant. But perhaps here, too, secondary plant constituents could show the way for an excellent flier even over many kilometres.

But that's another topic.

Acknowledgments

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Literature

Gültekin, L. & Korotyaev, B. A. 2012. New Data on *Cosmobarisdis color* (Boheman) and *Hypolixus pica* (F.) (Coleoptera: Curculionidae) associated with *Amaranthus* (L.) (Amaranthaceae). - Coleopterists Bulletin 66 (3): 226-232.

Morris, M. G. 2007. Three species of Curculionoidea (Col) new to the Canary Islands. - Entomologist's Monthly Magazine 143: 10.

Özbek H. 2014. *Hypolixus pica* (F.) (Coleoptera: Curculionidae) feeding on almonds in Antalya. - Turkish Bulletin of Entomology, 4 (1): 55-59.

Pehlivan, S., Erbey, M. & Atakan, E. 2022. The weevil, *Hypolixus pica* (F.) (Coleoptera: Curculionidae) as a potential biological control agent of *Amaranthus* species (Amaranthaceae) in Adana Province, Turkey. - Türk. Biyo. Mücadele Derg., 13 (2): 118-127.

Pourtaherzarei, R.A., Shishebor, P. & Eslamizadeh, R. 2010. A study of the biology of *Amaranthus* stem boring weevil, *Hypolixus pica* (F.) on red root pig weed, *Amaranthus retroflexus* L. in Dezful. - Iran Journal of Plant Protection Science 41: 225-232 (in Persian with English abstract).

Stüben P.E., Sprick P., Behne L., Alziar G., Colonnelli E., Giusto C., Messutat J. & Teodor L.A. 2012. The Curculionoidea (Coleoptera) of Cyprus. Results of a collecting journey on Cyprus by members of the CURCULIO Institute in April 2010. - SNUDEBILLER: Studies on taxonomy, biology and ecology of Curculionoidea 13, No. 195: 80-137, CURCULIO-Institute: Mönchengladbach. [https://www.curci.de/?beitrag=195]

Stüben P.E. 2022. Weevils of Macaronesia. Canary Islands, Madeira, Azores (Coleoptera: Curculionoidea), Curculio Institute, Mönchengladbach, 784 pp.

Stüben, P.E. & Jacob, R. 2024. Weevils of Cyprus - an image catalogue. - Le Charançon. Catalogues & Keys No. 6, Curculio-Institute, Mönchengladbach, Germany. ISSN 1864-0699. [accessed: 1. May 2024] / https://cyprus.curci.de/

Stüben, P.E. & Schön, K. 2024. Nanophyinae of the Western Palearctic - Part A: Presentation and Image key of the Corimaliini. - *Le Charançon. Catalogues & Keys* No. 7, Curculio-Institute, Mönchengladbach, Germany., ISSN 1864-0699. [accessed: 1. May 2024] / https://nanophyinae.curci.de/

Tawfik, M.F.S, Awadallah, K. & Shalaby, F.F. 1976. The biology of *Hypolixus nubilosus* Boh., an insect infesting the weed *Amaranthus caudatus* L. in Egypt (Coleoptera: Curculionidae). - Bulletin of Entomological Society of Egypt 60: 65-74.

Appendix I

CO1 molecular barcodes (658bp, Follmer region) of *Hypolixus pica* from Cyprus. The PDF online version allows in practice the direct retrieval of the **mtCO1** sequence listed below for species identifications and further scientific investigations:

Hypolixus pica: Cyprus, 3 km NW Lageia, 34º51′3.73″N 33º13′31.92″E, 435 m, *Amaranthus retroflexus*, 17.11.2023, leg. & det. Stüben / 4033-PST

TACTCTATATTTTATTTTTGGTGCTTGATCTGGTATAGTGGGAACTTCTCTAAGAATACTAATTCGAACTGAATTAGGGAACCCAGGAA
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TTTCTACTGTTTTAAATATACGACCAACAGGAATAAAACCTGATCAAACTACCTTATTTACATGAGCTGTAGAAATTACAGCTATTCTC
TTACTTCTTTCCTTGCCAGTTCTTGCAGGAGCAATTACTATACTATTAACAGATCGAAATATTAATACATCATTTTTTGACC
CTGCTGGAGGAGGGGACCCTATTTTATATCAACATTTATTT

Hypolixus pica: Cyprus, 1 km W Sarama: near Evretou Dam, 34º57′32.33″N 32º30′39.27″E, 223 m, *Tamarix*, 23.06.2023, beating, leg. & det. Stüben / 3973-PST

TACTCTATATTTTATGTTTGGTGCGTGATATGGTATAGTGGGAACTTCTCTRAGAATACTAATTCGAACTGAATTAGGGAACCCAGGAA
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