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Monojapyx Paclt, 1957 (Diplura: Japygidae) Cinsinin Türkiye'den İlk Kaydı

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Öne Çıkanlar:
- Tür
- Cins
- Yeni kayıt

Anahtar Kelimeler:
- Monojapyx
- Japygidae
- Diplura
- Diyarbakır
- Türkiye

ÖZET:

Monojapyx Paclt, 1957 (Diplura: Japygidae) cinsi, Türkiye'nin Güneydoğu Anadolu Bölgesi'nde yer alan Diyarbakır ilinde toplanan materyale dayanarak ilk kez Türkiye'de kaydedilmiştir. Bu çalışmada, daha önce bilinen Akdeniz dağılımından doğuya doğru önemli bir yayılım gösteren Monojapyx simplex (Verhoeff, 1923) için tanısal notlar, ekolojik gözlemler ve dağılım verileri sunulmaktadır. Yeni kayıt, Türkiye'deki Japygidae çeşitliliğini beş cins ve on üç türe çıkarmaktadır. Dipluranların gizli yaşam tarzı ve Anadolu'daki sınırlı örnekleme göz önüne alındığında, bulgularımız gözden kaçmış çeşitlilik olasılığını vurgulamakta ve yeraltı ve toprak habitatlarında bütünleyici faunistik araştırmalara duyulan ihtiyacın altını çizmektedir.

First Record of the Genus *Monojapyx* Paclt, 1957 (Diplura: Japygidae) from Türkiye

Highlights:
- Species
- Genus
- New record

Keywords:
- Monojapyx
- Japygidae
- Diplura
- Diyarbakır
- Türkiye

ABSTRACT:

The genus *Monojapyx* Paclt, 1957 (Diplura: Japygidae) is recorded from Türkiye for the first time, based on material collected in Diyarbakır Province located in Southeastern Anatolian Region of Türkiye. We provide diagnostic notes, ecological observations, and distributional data for *Monojapyx simplex* (Verhoeff, 1923), representing a substantial eastward range extension from its previously known Mediterranean distribution. The new record increases the known diversity of Japygidae in Türkiye to five genera and thirteen species. Given the cryptic lifestyle of diplurans and the limited sampling in Anatolia, our findings highlight the likelihood of overlooked diversity and underscore the need for integrative faunistic surveys in subterranean and soil habitats.

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INTRODUCTION

Diplura is one of the basal lineages of Hexapoda (Table 1.), characterized by entognathous mouthparts and an elongated, soft-bodied morphology (Koch, 2009; Zhang, 2013). Members of this group possess a head with multi-segmented antennae, a three-segmented thorax bearing legs, and a segmented abdomen typically ending with paired cerci. In Japygidae, these cerci are forceps-like and play an important role in both predation and defense (Sendra et al., 2021a). Diplurans are wingless (apterygote) hexapods and are mostly adapted to cryptic lifestyles in soil and subterranean environments.

Globally, Diplura comprises approximately ten families with a wide range of morphological and ecological diversity. Among these, Campodeidae and Japygidae are the most species-rich groups. Japygidae, in particular, are distinguished by their robust body structure and predatory habits, occupying an important ecological niche within soil ecosystems as regulators of microarthropod populations (Sendra et al., 2025).

Despite their ecological importance, diplurans remain one of the least studied groups of hexapods, mainly due to their cryptic habits, small size, and the difficulty of sampling. In Türkiye, studies on Diplura are relatively scarce and geographically limited. Available data indicate that the family Japygidae is currently represented by four genera and twelve species (Tusun & Satar 2020), but this number is likely underestimated.

Anatolia represents a key biogeographical region at the intersection of Europe, Asia, and the Middle East. Its complex geological history and diverse habitats provide suitable conditions for both endemic and widely distributed taxa. However, the dipluran fauna of this region remains insufficiently explored, and new records are expected with increased sampling effort (Tusun & Satar 2020; Nehme et al., 2023).

The genus *Monojapyx* Paclt, 1957 is known from the Mediterranean region but has not previously been recorded from Türkiye. The aim of the present study is to report the first occurrence of the genus *Monojapyx* and the species *Monojapyx simplex* (Verhoeff, 1923) in Türkiye, and to contribute to the knowledge of the diversity and distribution of Japygidae in Anatolia.

Table 1. The phylogeny of Diplura and its taxonomic structure in comparison with protura, collembola and insecta from Koch (2009)

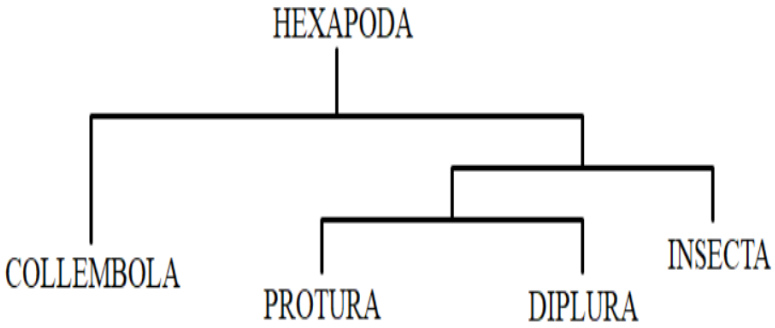

Table 2. The Classification of Diplura from Sendra (2015)

Classis: Diplura
Ordo: Rhabdura
Super family**: Campodeioidea**
Family: Campodeidae
Family: Procampodeidae
Super family**: Projapygoidea**
Family: Projapygidae
Family: Anajapygidae
Family: Octostigmatidae
Ordo: Dicellurata
Super family**: Japygoidea**
Family: Dinjapygidae
Family: Heterojapygidae
Family: Evalljapygidae
Family: Japygidae
Family: Parajapygidae

MATERIALS AND METHODS

Specimens were collected manually from various localities in Diyarbakir Province, Southeastern Anatolia (located between 38°16'36°35'N and 50°34'to 54°10'E), during 2024–2025. The habitats included soil, leaf litter, and beneath stones in shaded environments (Figs 1, 2). The material was examined with a Leica S8APO stereoscopic microscope. Photographs of the specimens were taken with a Zeiss Axiocam 305 Color digital camera attached to the microscope. Stacks of photos taken at different focal planes were combined using the Helicon Focus 6.4.1 software.

Some specimens were cleared in distilled water and mounted on slides using Marc André II solution or glycerine for microscopic examination. After examination, specimens were preserved in 70% ethanol. Additional material was sent to Prof. Alberto Sendra (Valencia, Spain) for identification. All examined specimens are deposited in the private collection of S. Tusun (Diyarbakir, Türkiye).

Figure 1: Habitat of *Monojapyx simplex* (Verhoeff, 1923). Türkiye, Prov. Diyarbakir, Photo: Tusun

Figure 2. Distribution of *M. simplex*

RESULTS AND DISCUSSION

Systematics:

Subphylum: Hexapoda
Classis: Diplura Börner, 1904
Ordo: Dicellurata
Super family: Japygoidea
Family: Japygidae Lubbock, 1873
Genus: ***Monojapyx* Paclt, 1957**
Species: ***Monojapyx simplex* (Verhoeff, 1923)**

Distribution, Biology and Description:

Monojapyx simplex was firstly described by Verhoeff (1923) from Sicily as a subspecies of *Japyx solifugus* Haliday, 1864, based on material collected from Ognina (Catania), Taormina (Messina), and Monte Pellegrino (Palermo), the species was subsequently recorded from numerous additional localities by Silvestri (1948). Within Italy, its distribution is restricted to Puglia (Foggia & Taranto), as reported by Pages (1978). Beyond Italy, the species has been documented in Valencia, Spain (Sendra & Zaragoza 1982), Malta (Pagés 1978), the Balearic Islands (Ginés 1982) and Barranco del Spartal near Granada (Doblas-Miranda 2007).

Like all Diplura, it inhabits soil and subsurface terrestrial habitats, extending from non-consolidated debris in soils to network of voids in the bedrock, including caves (Condé 1956; Sendra *et al*. 2021a). It is a predatory species of other small soil arthropods (Sendra et al., 2021b).

Monojapyx simplex was found in Diyarbakır in shaded areas with favorable soil conditions, among leaf litter, and on stones partially buried in the soil. (Fig. 1). The examined specimens exhibit a straight posterior margin on the 7th urotergite, lacking the angular process that is present in *Japyx solifugus*, which is considered the primary diagnostic feature according to Silvestri (1948).

Figure 3. *Monojapyx simplex* from Diyarbakir: Last VII-IX urotergites (UT), VII urosternite (US), angular stylus (Sty) of the VII US. The white lines indicate, the posterior margin of the VIII UT and the posterior "subrectis" margin of the VII UT

Discussion

The dipluran fauna of Türkiye remains poorly studied, especially with regard to the family Japygidae. Previous faunistic surveys have reported four genera and twelve species from the country (Tusun & Satar 2020), indicating that the current knowledge is still fragmentary and likely underestimates the true diversity.

The discovery of *Monojapyx simplex* in Southeastern Anatolia represents a significant range extension for the species, which has previously been reported mainly from Mediterranean regions such

as Italy, Malta and Spain. The new record from Diyarbakır lies approximately 2000–2300 km east of the nearest known localities, suggesting a much wider distribution than previously assumed. This disjunct distribution pattern may be explained by historical biogeographical processes, such as past land connections, climatic oscillations, or passive dispersal mechanisms.

From a biogeographical perspective, Anatolia is known as a transition zone between Europe, Asia, and the Middle East, acting both as a corridor and a refugium for many taxa. The presence of *M. simplex* in this region may support the hypothesis of an "Anatolian bridge" facilitating faunal exchanges between western and eastern Mediterranean regions (Sendra et al., 2022). Alternatively, the species may have a continuous but overlooked distribution across suitable subterranean habitats in the Eastern Mediterranean basin.

Ecologically, the species was found in microhabitats characterized by shaded conditions, moist soil, and abundant organic matter, such as leaf litter and beneath stones. These findings are consistent with previous observations indicating that diplurans prefer stable, humid environments with limited light exposure. The predatory behavior of *M. simplex* suggests its potential role in regulating populations of other soil microarthropods, contributing to soil ecosystem functioning.

Taxonomically, the examined specimens correspond well with previous descriptions of *M. simplex*, particularly in the morphology of the VII urotergite, which shows a straight posterior margin. This character clearly distinguishes it from closely related taxa such as *Japyx solifugus*, supporting the reliability of this diagnostic feature. The six insect specimens collected during field surveys exhibited a mean body length ranging between 6–7 mm, whereas specimens reported from Sicily reached a length of 7.6 mm. The coloration of the specimens examined in the present study was a darker shade of yellow compared to those from Sicily; moreover, the cerci and pretarsi were distinctly darker brown. The abdominal segments appeared slenderer, and the styli were more prominently developed.

CONCLUSION

The addition of *Monojapyx* to the Turkish fauna increases the number of Japygidae genera to five and the number of species to thirteen. However, considering the limited sampling efforts and the cryptic lifestyle of Diplura, it is highly probable that additional taxa remain undiscovered in Türkiye.

Future studies should focus on more extensive sampling across different habitats and regions, combined with both morphological and molecular approaches, to better resolve the taxonomy, distribution, and evolutionary history of Diplura in Anatolia

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Conflict of Interest

The article authors declare that there is no conflict of interest between them.

Author's Contributions

The authors declare that they have contributed equally to the article.

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