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FAUNISTIC DIVERSITY OF DOLICHOPODIDAE (DIPTERA) IN NORTHWEST IRAN WITH A NEW RECORD OF *TACHYTRECHUS TRANSITORIUS*

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Darnahal E., Sanatgar E., Shoushtari R.V., Goldasteh S. - Faunistic diversity of Dolichopodidae (Diptera) in northwest Iran with a new record of *Tachytrechus transitorius*.

A faunistic study of long-legged flies' family Dolichopodidae (Diptera) was conducted in the West Azerbaijan province of northwest of Iran, in 2019. In this study, 23 species belonging to 13 genera of this family were collected and identified. Among them, *Tachytrechus transitorius* Becker, 1917, is newly reported for the first time in Iran. An identification key to the species of the genus *Tachytrechus* from Iran, as well as their geographical distribution and diagnostic characters, along with photos of the newly recorded species in the Iranian fauna, is give. Long-term monitoring showed temporal and altitudinal changes in Dolichopodidae, indicating the appearance of new species and shifts in community composition. These results contribute to the knowledge of Iranian Dolichopodidae diversity and provide baseline data for future ecological and conservation studies.

KEY WORDS: Dolichopodidae, *Tachytrechus*, New Record, Iran, West Azerbaijan

INTRODUCTION

Dolichopodidae, commonly known as long-legged flies, comprises over 7500 described species, making it one of the largest families within Diptera (BICKEL, 2009). Approximately 1,680 of these species are Palearctic, while about 800 are Afrotropical (YANG *et al.*, 2006; GRICHANOV and BROOKS, 2017; GRICHANOV, 2020). The members of this family typically have a small to medium body size, with body lengths ranging from 1 to 9 mm. Both adults and larvae are predominantly predators (GRICHANOV, 2007). To date, 190 species belonging to 31 genera of Dolichopodidae have been reported from Iran (GRICHANOV and GILASIAN, 2023).

The genus *Tachytrechus* Haliday, 1851, is a worldwide genus that belongs to the subfamily Dolichopodinae, with 16 western Palearctic species. In Iran, knowledge of *Tachytrechus* is limited; with only five species recorded so far. Previous records include: *Tachytrechus beckeri* Lichtwardt, 1917, collected from the Markazi and Lorestan provinces (AHMADI *et al.*, 2016). *Tachytrechus kowarzi* Mik, 1864, has been recorded from Esfahan and Markazi Provinces (GRICHANOV *et al.*, 2017). *Tachytrechus notatus* Stannius, 1831, collected from Hyrcanian forests, also from Tehran, Lorestan and Markazi Provinces (GRICHANOV *et al.*, 2010; KAZERANI *et al.*, 2014; AHMADI *et al.*, 2017; GRICHANOV *et al.*, 2017). *Tachytrechus planitarsis* Becker, 1907 was reported from the East of Iran, Sistan & Balouchestan, and Kerman Provinces (BECKER and STEIN, 1913; GRICHANOV *et al.*, 2017; RE-

ZAEI *et al.*, 2019a; REZAEI *et al.*, 2019b). Lastly, *Tachytrechus sogdianus* Loew, 1871 has been identified in Lorestan province (GRICHANOV *et al.*, 2017).

This study aims to expand our understanding of the Dolichopodidae family in Iran by documenting newly recorded species and providing an identification key for the genus *Tachytrechus*. The findings contribute valuable data to the entomological records of the region and offer insights into the geographical distribution of these predatory flies.

MATERIALS AND METHODS

This survey was conducted in 2019 in Azerbaijan province, located in the northwest of Iran (Table 1), (Fig. I). Urmia, the capital and main city of West Azerbaijan province, is situated in northwest Iran, bordered by the Nakhchivan Autonomous Republic of Azerbaijan, Turkey, and Iraq. The province spans 39,487 km², expanding to 43,660 km² with Lake Urmia included. Urmia experiences significant temperature variations, with summer highs of 34°C and winter lows of -16°C, and is 20 kilometers from Lake Urmia, sitting at an elevation of 1,332 meters above sea level. The city is surrounded by several mountains, creating a diverse climate with numerous springs and streams throughout its mountainous terrain.

Specimens were collected using two primary methods: malaise traps and sweep netting. Several sites were mostly intensively and repeatedly sampled. Each specimen was stored in a small vial containing 75% ethyl

Table 1 - Characteristics of sampling areas

Geographical region	Altitude (m)	Longitude and latitude	Habitat type
Dalampar Peak (Mam Sheikh Lake)	3449	37° 12'38"N, 44° 47'39"E	Mountainous/ Grassland
Serow	1634	37° 72' 75"N, 44°64'27"E	Riparian
Agbolagh (Kanisepe)	1520	37°2'23"N, 45°5'54"E	Grassland
Godal	1862	37°83'59"N, 44°51'58"	Valley
Tarsabolagh	1720	37°19'08"N, 45°14'50"	Wetland
Shamlakan	600	37°47'48"N, 44° 99' 99"E	Grassland
Nazlouchay	1390	37° 71'67"N, 45° 03'33"E	Mountainous
Sotan Yaghoub	2150	36°32'28"N, 44° 59' 46"E	Grassland

alcohol, with labels indicating the location, date, and collection method.

For identification, various external characteristics of the specimens were examined, including the male external genitalia, head, chest, wings, antenna features, legs, and limbs. Accurate identification keys, such as those provided by PARENT (1938) and GRICHANOV (2007), were utilized for this purpose. The identified specimens are preserved in the Museum of Entomology at the Faculty of Agriculture, Arak University.

Statistical comparison of species abundance this document provides a detailed explanation of the statistical analysis conducted to compare species abundance among sampling years (2019–2023) for Dolichopodidae assemblages. It outlines the dataset preparation, statistical tests applied, formulas used, and interpretation of results suitable for inclusion in the Materials & Methods and Results sections of the article.

Data on the abundance of 23 Dolichopodidae species were extracted from the text of the manuscript (Material examined and Results sections). Missing records were treated as zero abundance. This produced a matrix of 23 species $\times$ 4 years (92 data points in total).

RESULTS

1100 dolichopodid specimens were collected and identified during this study, representing 23 species in 13 genera (Table 2).

The genus *Tachytrechus* Haliday, 1851, can be identified by several distinctive external features: face narrowed under antennae and somewhat widened towards the clypeus; wing vein M1+2, usually with gentle curvature before the middle of the distal part, then running towards R4+5 and reaching the costa far before the tip of the wing; stylus short and bare; postpedicel usually short and suboval (GRICHANOV, 2003-2010)

Tribe *TACHYTRECHINI* Negrobov,

Genus *TACHYTRECHUS* Haliday, 1851

Tachytrechus transitorius Becker, 1917

MATERIAL EXAMINED: 3♂, 1♀, Iran, West Azerbaijan province, Urmia city, Agbolagh (Kanisepe) (Oshnavieh), 37°2'23"N, 45°5'54"E, August/22/2021, Darnahal.

DISTRIBUTION: Turkey (Kars), S. Russia: Alania, Kabardino-Balkaria, Krasnodar; Austria, France, Italy, Switzerland. New record for Iran. (GRICHANOV, 2007)



Fig. 1: Aghblagh. Habitats of northwest of Iran where the new records were collected.

DIAGNOSTIC CHARACTERS: scape reddish (Fig. II,b); legs black, knees narrowly red-yellow (Fig. II,a), fore basitarsus normal, not especially slender. Cercus black-brown (Fig. II,c), weakly projecting basoventrally, semilunular, 1.5 times wider than long; 4.0.

KEY TO SPECIES OF THE GENUS *TACHYTRECHUS* FROM IRAN (MALES) [adapted from PARENT (1938)]

1. Fore basitarsus normal, not especially slender; wing without spot at apex.....2
- Fore basitarsus conspicuously slender; wing with strongly pronounced grey spot at apex *kowarzi* Mik
2. Antennae yellow, apart from the dorsal edge of flagellum. Small size: 3 mm..... *beckeri* Lichtwardt
- Antennae: at least the 3rd part entirely black. Larger size3
3. Antennae entirely black; legs black, knees narrowly yellow.....*notatus* (Stannius), var
- At least scape reddish beneath4
4. Cercus yellow, subtriangular, with narrow pointed basoventral process; 1st to 5th segments of fore tarsus enlarged; 4.0.....*planitarsis* Becker
- Cercus black-brown, weakly projecting basoventrally5
5. Face gray brown; external hypopygial lamellae remarkably small, approximately circular, the longest hairs at the outer edge shorter than the greatest width: *sogdianus* L
- Face white silver; external hypopygial lamellae well developed, shaped like a transverse half-moon, hairs at the outer edge at least as long as the diameter of the half-moon.....6
6. Cercus 1.5 times wider than long; legs black, knees narrowly red-yellow; 4.0.....*transitorius* Becker
- Cercus nearly as wide as long; tibiae usually reddish-yellow; 4.0-5.5 *notatus* (Stannius)

Genus *DOLICHOPUS* Latreille, 1796

1. *D. campestris* Meigen, 1824

REFERENCES: KAZERANI *et al.*, 2014c: 139; KAZERANI *et al.*, 2014d: 23; KHAGHANINIA *et al.*, 2014a: 589.

MATERIAL EXAMINED: 1♂, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, June/20/2022.

TYPE LOCALITY: not given. Trans-Palaeartic species.

PALAEARCTIC DISTRIBUTION: Algeria, Armenia, Austria, Belarus, Belgium, Czech, Denmark, Egypt; Estonia, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russia (Karelia, Leningrad, Novgorod, Alania, Kabardino-Balkaria, Krasnodar, Altai, Kamchatka, Khabarovsk and Primorskii Terr.), Slovakia, Sweden, Switzerland, UK, Ukraine (Carpathian Mountains, Odessa) (Grichanov, 2007); Iran.



Fig. II: *Tachytrechus transitorius*: a: male habitus; b: head, c: hypopygium.

2. *D. griseipennis* Stannius, 1831

REFERENCES: GRICHANOV *et al.*, 2010: 198; KAZERANI *et al.*, 2013; KAZERANI *et al.*, 2014c: 140; KAZERANI *et al.*, 2014f: 267; KHAGHANINIA *et al.*, 2014a: 589; AHMADI *et al.*, 2016: 192; AHMADI *et al.*, 2017: 66.

MATERIAL EXAMINED: 2♂, West Azerbaijan Prov., Urmia city, Serow, 37° 72' 75"N, 44°64'27"E, July/28/2021. 2♀, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/2/2021.

TYPE LOCALITY: France: Lyon. West Palaeartic species.

PALAEARCTIC DISTRIBUTION: Algeria, Azerbaijan, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Georgia, Germany, Greece: Crete, Hungary, Iran, Ireland, Israel, Italy, Kazakhstan, Lithuania, Luxembourg, Morocco, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK, Yugoslavia.

3. *D. kiritshenkoi* Stackelberg, 1927

REFERENCES: KAZERANI *et al.* 2014c: 140.

MATERIAL EXAMINED: 2♂, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, June/20/2022.

TYPE LOCALITY: Georgia: "prope stationem Kobi, prov. Tiflisiensis, Caucasus centralis". Georgia, Iran.

PALAEARCTIC DISTRIBUTION: Georgia, Iran.

4. *D. longitarsis* Stannius, 1831

REFERENCES: KHAGHANINIA *et al.*, 2013a: 42; KAZERANI *et al.*, 2014c: 140; KAZERANI *et al.*, 2014d: 24.

MATERIAL EXAMINED: 2♂, West Azerbaijan Prov., Urmia city, Godal, 37°83'59"N, 44°51'58", June/26/2023.

TYPE LOCALITY: GERMANY: Hamburg. West and Central Palaeartic species.

PALAEARCTIC DISTRIBUTION: Kazakhstan, Romania, Ukraine (Grichnov, 2007), Iran (Gharajedaghi *et al.*, 2014)

Table 2: list of dolichopodid taxa recorded from Iran

Subfamily	Tribe	Species
DOLICHOPODINAE Latreille, 1809	DOLICHOPODINI	<i>Dolichopus campestris</i> Meigen, 1824
		<i>D. griseipennis</i> Stannius, 1831
		<i>D. kiritshenkoi</i> Stackelberg, 1927
		<i>D. longitarsis</i> Stannius, 1831
		<i>D. malekii</i> , Grichanov, Khaghaninia et Gharajedaghi, 2014
		<i>D. perversus</i> Loew, 1871
		<i>D. siculus</i> Loew, 1859
		<i>D. simplex</i> Meigen, 1824
		<i>Gymnopternus angustifrons</i> Staeger, 1842
		<i>Hercostomus apollo</i> Loew, 1869
		<i>H. gracilis</i> Stannius, 1831
		<i>Poecilobothrus armeniorum</i> (Stackelberg, 1933)
		<i>Sybistroma crinipes</i> Staeger, 1842
	TACHYTRECHINI	<i>Tachytrechus transitorius</i> Becker, 1917 [new record]
		<i>T. notatus</i> Stannius, 1831
HYDROPHORINAE Lioy, 1864	HYDROPHORINI	<i>Hydrophorus balticus</i> Meigen, 1824
MEDETERINAE Lioy, 1864	MEDETERINI	<i>Medetera meriodonalis</i> Negrobov, 1967
	THRYPTICINI	<i>Thrypticus bellus</i> Loew, 1869
SYMPYCNINAE Aldrich, 1905	SYMPYCNINI	<i>Sympycnus pulicarius</i> Fallen, 1823
		<i>Campsicnemus umbripennis</i> Loew, 1856
		<i>Syntormon pallipes</i> Fabricius, 1794
		<i>S. denticulatus</i> Zetterstedt, 1843
RHAPHINAE Bigot, 1852	RHAPHINI	<i>Rhaphium appendiculatum</i> Zetterstedt, 1849
Total 5	7	23

5. *D. malekii* Grichanov, Khaghaninia et Gharajedaghi, 2014

REFERENCES: KHAGHANINIA *et al.*, 2014b: 4; KAZERANI *et al.*, 2014c: 142.

MATERIAL EXAMINED: 12♂, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, June/20/2022.

TYPE LOCALITY: Iran: East Azerbaijan province, Chichakli region.

PALAEARCTIC DISTRIBUTION: Iran.

6. *D. perversus* Loew, 1871

REFERENCES: GRICHANOV *et al.*, 2010: 198; KAZERANI *et al.*, 2014b: 142; AHMADI *et al.*, 2017: 66; GRICHANOV *et al.*, 2017: 101.

MATERIAL EXAMINED: 10♂, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/2/2021. 1♀, West Azerbaijan Prov., Oshnavieh city, Tarsabolagh, 37°19'08"N, 45°14'50", August/13/2021.

TYPE LOCALITY: Tajikistan: "Zaravschan Thal [=Zeravshan valley], Turkestan".

PALAEARTIC DISTRIBUTION: Abkhazia, Armenia, Iran, Israel, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, and Uzbekistan.

7. *D. siculus* Loew, 1859

REFERENCE: KAZERANI *et al.*, 2014b: 144; KAZERANI *et al.*, 2014f: 268; AHMADI *et al.*, 2017: 66; GRICHANOV *et al.*, 2017: 102.

MATERIAL EXAMINED: 3♂, 1♀, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/2/2021.

TYPE LOCALITY: ITALY: Sicily.

PALAEARTIC DISTRIBUTION: Bulgaria, France, Iran, Israel, and Italy.

8. *D. simplex* Meigen, 1824

REFERENCE: KHAGHANINIA *et al.*, 2013a: 44; KAZERANI *et al.*, 2014b: 146; KAZERANI *et al.*, 2014d: 24; HAMED *et al.*, 2018: 3.

MATERIAL EXAMINED: 6♂, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/21/2023.

TYPE LOCALITY: Germany: Hamburg, Kiel.

PALAEARTIC DISTRIBUTION: Georgia; Romania; S. Russia: Karachai-Cherkessia, Krasnodar, Rostov, Ukraine: Cherkasy, Odessa; all Europe; Kazakhstan; E Russia: Orenburg Region, Yakutia.

Genus *GYMNOPTERNUS* Loew, 1857

9. *G. angustifrons* Staeger, 1842

REFERENCE: KAZERANI *et al.* 2014d: 26.

MATERIAL EXAMINED: 1♂, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/21/2023.

TYPE LOCALITY: Denmark.

PALAEARTIC DISTRIBUTION: West Palearctic.

Genus *HERCOSTOMUS* Loew, 1857

10. *H. apollo* Loew, 1869

REFERENCE: KAZERANI *et al.* 2014d: 26.

MATERIAL EXAMINED: 3♂ West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/2/2021.

TYPE LOCALITY: "Parnass, Griechenland" [Greece].

PALAEARTIC DISTRIBUTION: Armenia, Greece, Iran, Iraq, Tunisia, Turkey and Ukraine.

11. *H. gracilis* Stannius, 1831

REFERENCE: GRICHANOV, 2007.

MATERIAL EXAMINED: 1♂, West Azerbaijan Prov., Oshnavieh city, Tarsabolagh, 37°19'08"N, 45°14'50", August/2/2021.

TYPE LOCALITY: not given

PALAEARTIC DISTRIBUTION: Armenia, Austria, Belgium, Bulgaria, Czech, Denmark, France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Spain, Sweden, Tajikistan, Turkey, Turkmenistan, UK and Ukraine, Iran.

Genus *POECILOBOTHRUS* Mik, 1878

12. *P. armeniorum* Stackelberg, 1933

REFERENCE: KHAGHANINIA *et al.*, 2013b: 74; HAMED *et al.*, 2017: 3.

MATERIAL EXAMINED: 5♂, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/27/2023.

TYPE LOCALITY: Armenia: Erivan.

PALAEARTIC DISTRIBUTION: Armenia, Azerbaijan, Iran, and Russia (Adygea, Kabardino-Balkaria, Karachai-Cherkessia, Krasnodar, and Kursk).

Genus *SYBISTROMA* Meigen, 1824

13. *S. crinipes* Staeger, 1842

REFERENCE: KAZERANI *et al.* 2014d: 26.

MATERIAL EXAMINED: 1♂, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/21/2023.

TYPE LOCALITY: Denmark: "Ellemosen, Charlottenlund".

PALAEARTIC DISTRIBUTION: Europe, Iran and Turkey.

Genus *TACHYTRECHUS* Haliday, 1851

14. *T. transitorius* Becker, 1917 [new record]

MATERIAL EXAMINED: 3♂, 1♀, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/22/2021.

TYPE LOCALITY: (Kars) Turkey, S. Russia: Alania, Kabardino-Balkaria, Krasnodar; Austria, France, Italy, Switzerland.

PALAEARTIC DISTRIBUTION: West and Central Palearctic.

15. *T. notatus* Stannius, 1831

REFERENCE: GRICHANOV *et al.*, 2010: 199; KAZERANI *et al.*, 2014f: 272; AHMADI *et al.*, 2017:

68; GRICHANOV *et al.*, 2017: 105.

MATERIAL EXAMINED: 2♂, 1♀, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/22/2021- June/21/2023.

TYPE LOCALITY: Germany: Hamburg.

PALAEARTIC DISTRIBUTION: West and Central Palaearctic.

Genus *HYDROPHORUS* Fallen, 1823

16. *H. balticus* Meigen, 1824

REFERENCE: : KAZERANI *et al.*, 2014e: 27; AHMADI *et al.*, 2017: 68; GRICHANOV *et al.*, 2017: 102; HAMED *et al.*, 2017: 3.

MATERIAL EXAMINED: 5♂, 7♀, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/22/2021- June/5/2023.

TYPE LOCALITY: Germany: Hamburg.

PALAEARTIC DISTRIBUTION: Trans-Palaearctic species; Afrotropical Region.

Genus *MEDETERA* Fischer von Waldheim, 1819

17. *M. meriodonalis* Negrobov, 1967

REFERENCE: : KAZERANI *et al.*, 2014e: 27; KAZERANI *et al.*, 2014f: 270; AHMADI *et al.*, 2017: 68; GRICHANOV *et al.*, 2017: 103; HAMED *et al.*, 2017: 3.

MATERIAL EXAMINED: 2♀, West Azerbaijan Prov., Urmia city, Serow, 37° 72' 75"N, 44°64'27"E, July/28/2021. 4♂, 1♀, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/2/2021. 2♀, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/21/2023.

TYPE LOCALITY: Russia: Voronezh, near the Novokhopersk River.

PALAEARTIC DISTRIBUTION: Russia (Crimea, Lugansk, Voronezh, Rostov, Volgograd, Penza, Orenburg, Altay and Krasnodar Regions), Ukraine (Odessa and Poltava), Armenia, Azerbaijan, Georgia, Iran, Kazakhstan, and Turkey.

Genus *THRYPTICUS* Gerstaecker, 1864

18. *T. bellus* Loew, 1869

REFERENCE: AHMADI *et al.*, 2016:194; AHMADI *et al.*, 2017: 68.

MATERIAL EXAMINED: 6♂, 1♀, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/21/2023.

TYPE LOCALITY: England: Kew.

PALAEARTIC DISTRIBUTION: Trans-Palaearctic species; Afrotropics.

Genus *SYMPYCNUM* Loew, 1857

19. *S. pulicarius* Fallén, 1823

REFERENCE: KAZERANI *et al.*, 2014a: 64; AHMADI *et al.*, 2016: 194; AHMADI *et al.*, 2017: 69; GRICHANOV *et al.*, 2017: 104

MATERIAL EXAMINED: 2♂, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/22/2021.

TYPE LOCALITY: not given (Sweden).

PALAEARTIC DISTRIBUTION: Mainly West Palaearctic species; California.

Genus *CAMPSCINEMUS* Haliday in Walker, 1851

20. *C. umbripennis* Loew, 1856

REFERENCE: GRICHANOV *et al.*, 2010; KAZERANI *et al.*, 2014b; AHMADI *et al.*, 2016: 192; AHMADI *et al.*, 2017: 69; GRICHANOV *et al.*, 2017: 101.

MATERIAL EXAMINED: 3♂, 1♀, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/21/2023.

TYPE LOCALITY: Austria.

PALAEARTIC DISTRIBUTION: West and Central Palaearctic species.

Genus *SYNTORMON* Loew, 1857

21. *S. pallipes* Fabricius, 1794

REFERENCES: BECKER, STEIN, 1913: 597; NEGROBOV, MATILE, 1974: 844; GRICHANOV *et al.*, 2010: 201; KAZERANI *et al.*, 2014g: 146; KHAGHANINIA *et al.*, 2014a: 590; AHMADI *et al.*, 2016: 194; AHMADI *et al.*, 2017: 69; GRICHANOV *et al.*, 2017: 105; HAMED *et al.*, 2018: 3; REZAEI *et al.*, 2019b: 91.

MATERIAL EXAMINED: 1♂, West Azerbaijan Prov., Urmia, Band, Shamlakan, 37°47'48"N, 44° 99' 99"E, July/23/2021.

TYPE LOCALITY: Germany.

PALAEARTIC DISTRIBUTION: West and Central Palaearctic; Orient and Afrotropics.

22. *S. denticulatus* Zetterstedt, 1843

REFERENCE: KAZERANI *et al.*, 2014g: 146; AHMADI *et al.*, 2016: 194; AHMADI *et al.*, 2017: 69; GRICHANOV *et al.*, 2017:105.

MATERIAL EXAMINED: 2♂, 1♀, West Azerbaijan Prov., Oshnavieh city, Agbolagh (Kanisepe), 37°2'23"N, 45°5'54"E, August/22/2021.

TYPE LOCALITY: Sweden: Scania.

PALAEARTIC DISTRIBUTION: West and Central Palaearctic species.

Table 3 - Statistical comparison of species abundance among years (2019–2023)

Statistical Test	Statistic Value	p-Value	Interpretation
ANOVA (F-test)	3.72	0.0144	Significant difference between years ($p < 0.05$)
Kruskal–Wallis	20.26	0.00015	Highly significant difference ($p < 0.001$)

Genus *RHAPHIUM* Meigen, 1803

23. *R. appendiculatum* Zetterstedt, 1849

REFERENCE: NEGROBOV, MATILE, 1974: 844 (as *Rhaphium macrocerum* Meigen); KAZERANI *et al.*, 2013: 115; KAZERANI *et al.*, 2014f: 271; AHMADI *et al.*, 2016: 193; AHMADI *et al.*, 2017: 68; GRICHANOV *et al.*, 2017: 104

MATERIAL EXAMINED: 1♂, West Azerbaijan Prov., Urmia, Nazlouchay, 37° 71'67"N, 45° 03'33"E, July/3/2019. 3♂, West Azerbaijan Prov., Urmia city, Serow, 37° 72' 75"N, 44°64'27"E, July/28/2021. 2♂, West Azerbaijan Prov., Naghadeh city, Sotan Yaghoub, 36°32'28"N, 44° 59' 46"E, August/3/2021. 6♂, 1♀, West Azerbaijan Prov., Urmia city, Dalampar Peak (Mam Sheikh Lake), 37° 12'38"N, 44° 47'39"E, July/21/2023.

TYPE LOCALITY: Sweden: Scania ad Esperod.

PALAEARTIC DISTRIBUTION: West Palaearctic.

TEMPORAL VARIATION IN SPECIES COMPOSITION

Long-term data suggest that certain species, such as *H. balticus* and *D. griseipennis*, remain relatively stable in occurrence, whereas others—namely *D. longitarsis* and *T. transitorius*—represent newly recorded taxa in the region (Fig. III). The emergence of these species may result from several factors:

- 1. Broader spatial or temporal sampling coverage
- 2. Environmental and climatic fluctuations, or
- 3. Natural expansion of species' geographical ranges

EMERGING SPECIES

The recent emergence of rarely documented species and new occurrence records emphasizes the critical importance of long-term, systematic, and comprehensive habitat monitoring. Such findings may reflect ecological shifts or improved detection efforts and provide a robust foundation for future ecological and conservation-based studies.

SPECIES TREND ANALYSIS

Analysis of species trends indicates that some taxa, such as *D. malekii*, *D. perversus*, and *H. balticus*, exhibited consistently high abundance during particular sampling periods.

In contrast, newly recorded or previously uncommon species, including *T. transitorius*, *G. angustifrons*, and *D. longitarsis*, have appeared in more recent surveys, suggesting possible alterations in community composition or range expansion. Furthermore, the greatest species diversity was observed during the summer months at elevations between 1500 and 3500 meters, highlighting the potential influence of elevation and seasonal temperature variations on species distribution patterns.

SEASONAL AND ALTITUDINAL PATTERNS

Species activity recorded during the summer and at higher elevations reflects the strong dependence of Dolichopodidae populations on ambient temperature and humidity observations may serve as sensitive indicators for forecasting population dynamics and predicting the potential impacts of future climatic variations on species distribution and ecological assemblages.

Table above presents the statistical comparison of species abundance (Table 3) among the sampling years (2019–2023) based on one-way ANOVA and Kruskal–Wallis tests. Significant temporal differences were detected, indicating notable variation in Dolichopodidae assemblages through time.

Conclusion: Statistical analyses (ANOVA and Kruskal–Wallis) revealed significant temporal differences in species abundance among the years 2019–2023, indicating notable temporal variation in Dolichopodidae assemblages potentially influenced by environmental and climatic factors.

TEMPORAL AND SPATIAL DYNAMICS OF DOLICHOPODIDAE ASSEMBLAGES IN NORTHWEST IRAN: A COMPARATIVE PERSPECTIVE

Long-term monitoring of Dolichopodidae populations in northwest Iran (2019–2023) revealed that certain species, such as *Hydrophorus balticus* and *Dolichopus griseipennis*, remained relatively stable, whereas *Tachytrechus transitorius* was newly recorded for the region, while *Dolichopus longitarsis* had been previously documented by Khaghani-Nia & Kazerani. The appearance of newly recorded species may result from broader spatial and temporal sampling coverage, natural range expansions, or environmental and climatic fluctuations. Trend analyses indicated that taxa such as *D. malekii*, *D. perversus*, and *H. balticus* maintained consistently

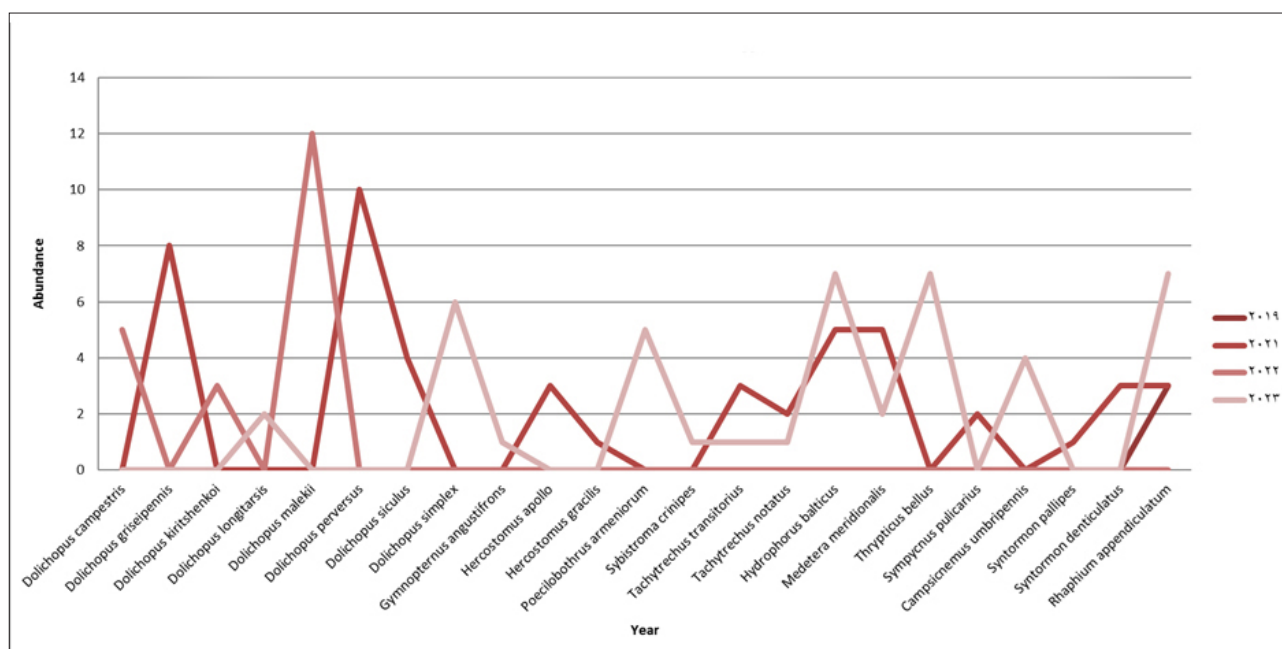


Fig III - Temporal variations in Dolichopodidae species in West Azerbaijan (2019 -2023)

high abundance, whereas newly recorded or previously uncommon species, including *T. transitorius* and *G. angustifrons*, suggest potential shifts in community composition or ongoing range expansions.

Highest species diversity was observed during the summer months at elevations of 1500–3500 meters, highlighting the strong dependence of Dolichopodidae populations on temperature and humidity. Statistical analyses (ANOVA and Kruskal–Wallis) confirmed significant temporal differences in species abundance between 2019 and 2023, underscoring the importance of long-term, systematic monitoring.

These patterns are consistent with global findings, which show that Dolichopodidae community composition and population dynamics are strongly influenced by habitat, elevation, seasonality, and climatic factors, and that newly emerging or rare species appear under similar ecological and environmental contexts worldwide (Pollet, 1996; Brooks, 2005; Goodman et al., 2016; Harterreiten-Souza et al., 2020; Marchiori, 2022; Ulinnuha et al., 2025). Overall, the results demonstrate that local dynamics in northwest Iran reflect broader global trends in Dolichopodidae ecology, emphasizing the value of long-term monitoring for understanding population responses, predicting ecological shifts, and guiding conservation planning.

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