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Developmental Stages of *Neobisium erythrodactylum* (Koch, 1873): New to the Turkish Fauna

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Abstract: The morphological features of the developmental stages of *Neobisium erythrodactylum* (Koch, 1873), a new record for the Turkish fauna, are given.

Key Words: Pseudoscorpionida, *Neobisium*, development stages, new record, Turkey

Türkiye Faunası İçin Yeni Olan *Neobisium erythrodactylum* (Koch, 1873)'un Gelişim Evreleri

Özet: Türkiye faunası için yeni kayıt olarak belirlenen, *Neobisium erythrodactylum* (Koch, 1873)'un gelişim evrelerinin morfolojik özellikleri verilmiştir.

Anahtar Sözcükler: Pseudoscorpionida, *Neobisium*, Gelişim evreleri, yeni kayıt, Türkiye

Introduction

Worldwide, 110 species of the subgenus *Neobisium (Neobisium)* are known (Harvey 1990). The first studies of pseudoscorpions in Turkey were performed by Beier (1949, 1963, 1965, 1967, 1969) and Mahnert (1979). In total, these researchers recorded 16 species from Turkey, though Turkey may have more species of the subgenus, which is widespread in Asia and Europe. The aims of the present study were to contribute to the pseudoscorpion fauna of Turkey and to examine morphological features of developmental stages of the species.

Material and Methods

Pseudoscorpions were collected from litter with a Tullgren funnel. They were preserved in 70%-80% alcohol and were then dissected, cleared in 50% lactic acid for 1 h, and mounted on microscope slides for detailed examination. Figures were drawn using a Nikon type 104 microscope. All measurements were obtained according to Chamberlin (1931) and are given in millimeters. Examined materials are deposited at the Zoological Museum of Atatürk University, Erzurum, Turkey.

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Results

Neobisium (Neobisium) erythrodactylum (Koch), 1873

Body (Figure 1 A-D, Figure 2 A-F)

Female*:* Body length 2.417. Carapace 1(0.700/0.695), with 4 eyes. Chaetotaxy of carapace 4-2-4-2-4-6. Chaetotaxy of tergit 6-10-10-11-10-12-10-11-10-9-6-2. Maxilla 12 or 13 setae, coxa I 8-12 setae, coxa II 6-10 setae, coxa III 8 setae, and coxa IV 12 setae. Chaetotaxy of abdomen 10-12-14-12-14-14-14-14-8-2 setae.

Male*:* Body length 2.633. Cephalothorax 0.97 (0.695/0.711). Chaetotaxy of tergite 6-8-10-11-11-10-11-12-9-9. Maxilla 13 or 14 setae, coxa I 9-11 setae, coxa II 8 or 9 setae, coxa III 8 setae, and coxa IV 10 or 11 setae. Chaetotaxy of abdomen 12-16-16-14-14-14-12-10 setae.

Tritonymph*:* Body length 1.800. Carapace 1 (0.495/0.475). Chaetotaxy of carapace 4-2-4-2-2-2-7. Chaetotaxy of tergites 7-7-9-9-9-10-10-9-9-9-6-2. Maxilla 9 setae, coxa I 6 setae, coxa II 6 setae, coxa III 6

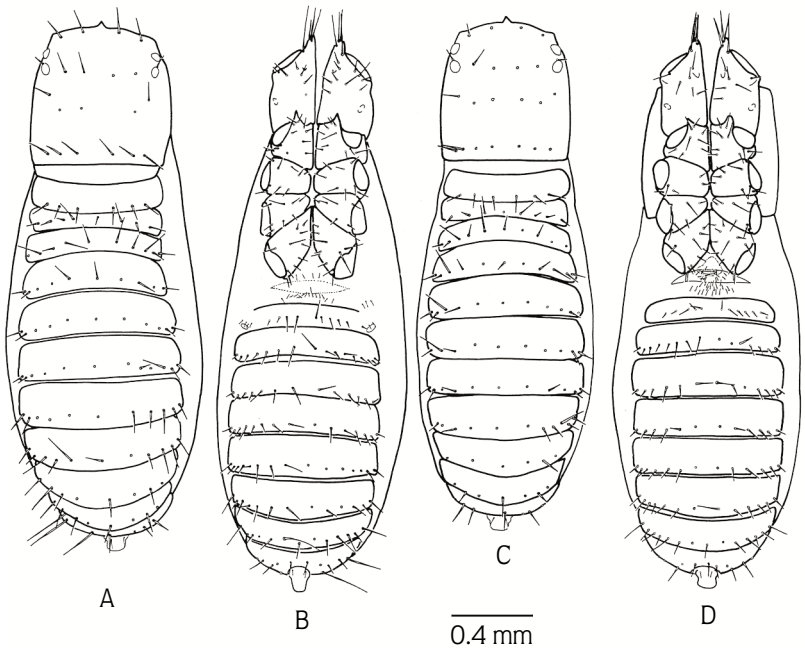

Figure 1. *Neobisium* (*Neobisium*) *erythrodactylum* (Koch, 1873). Female: A) dorsal view, B) ventral view. Male: C) dorsal view, D) ventral view.

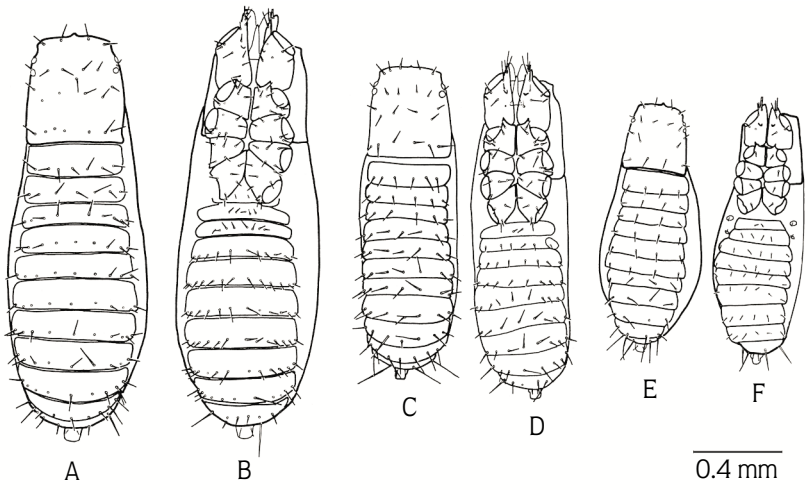

Figure 2. *Neobisium* (*Neobisium*) *erythrodactylum* (Koch, 1873). Tritonymph: A) dorsal view, B) ventral view. Deutonymph: C) dorsal view, D) ventral view. Protonymph: E) dorsal view, F) ventral view.

setae, and coxa IV 7 setae. Chaetotaxy of abdomen 5-8-10-13-12-13-12-11-8-2 setae.

Deutonymph: Body 1.422 long. Carapace 1.02 (0.411/0.403). Chaetotaxy of carapace 4-2-4-2-4-6. Chaetotaxy of tergite 6-6-6-6-6-6-7-7-7-7-8-2. Maxilla 7 or 8 setae, coxa I 4 setae, coxa II 4 or 5 setae, coxa III 4 setae, and coxa IV 4 setae. Chaetotaxy of abdomen 6-8-8-9-8-8-8-8-2 setae.

Protonymph: Body 1.069 long. Carapace 0.97 (0.291/0.301). Chaetotaxy of carapace 4-2-4-2-2-4. Chaetotaxy of tergites 4-4-4-4-4-4-4-4-4-4-2. Maxilla 5 setae, coxa I 1 seta, coxa II 1 seta, coxa III 1 seta, and coxa IV 1 seta. Chaetotaxy of abdomen 4-6-6-6-6-6-6-4-2 setae.

Palp (Figure 3A-D, Figure 4A-D)

Female: Trochanter 2.06 (0.434/0.211); femur 3.8 (0.753/0.200); tibia 2.7 (0,622/0.232); chela (excluding pedicel) 3.06 (1.253/0.409); depth 0.87; hand 1.51 (0.596/0.395); movable finger 0.779.

Male: Trochanter 2.04 (0.438/0.215); femur 3.8 (0.790/0.206); tibia 2.7 (0.648/0.242); chela (excluding pedicel) 3.4 (1.321/0.390); depth 0.353; hand 1.54 (0.569/0.369); movable finger 0.816.

Tritonymph: Trochanter 1.7 (0.255/0.150); femur 3.9 (0.485/0.125); tibia 2.5 (0.375/0.150); chela (excluding pedicel) 3.6 (0.832/0.232); depth 0.242; movable finger 0.527; hand 1.7 (0.390/0.232).

Deutonymph: Trochanter 1.8 (0.213/0.118); femur 3.2 (0.360/0.113); tibia 2.1 (0.283/0.135); chela (excluding pedicel) 3.3 (0.637/0.195); hand 1.54 (0.308/0.200); movable finger 0.401.

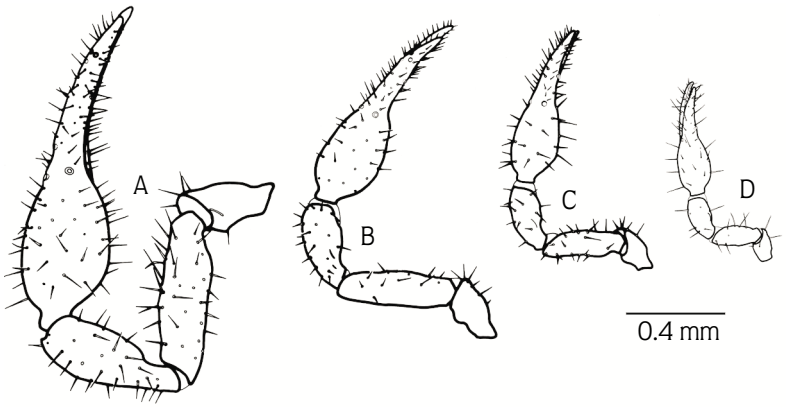

Figure 3. *Neobisium* (*Neobisium*) *erythrodactylum* (Koch, 1873). Palp, dorsal: A) male, B) tritonymph, C) deutonymph, D) protonymph.

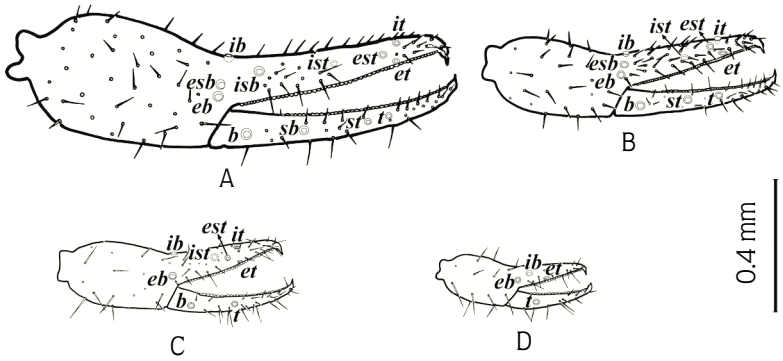

Figure 4. *Neobisium* (*Neobisium*) *erythrodactylum* (Koch, 1873). Palpal chela, lateral: A) male, B) tritonymph, C) deutonymph, D) protonymph. Tactile setae on movable finger; (*b*) basal, (*sb*) subbasal, (*st*) subterminal, (*t*) terminal, Tactile setae on fixed finger: (*eb*) exterior basal, (*esb*) exterior subbasal, (*est*) exterior subterminal, (*et*) exterior terminal, (*ib*) interior basal, (*isb*) interior subbasal, (*ist*) interior subterminal, (*it*) interior terminal.

Protonymph: Trochanter 1.8 (0.143/0.078); femur 2.6 (0.213/0.083); tibia 2 (0.185/0.093); chela (excluding pedicel) 3 (0.420/0.138); depth 0.143; hand 1.5 (0.205/0.138); movable finger 0.263.

Chelicera (Figure 5 A-H)

Chelicera of female 1.5 (0.378/0.245), movable finger 0.278.

Chelicera of male 1.55 (0.345/0.223), movable finger 0.263.

Chelicera of tritonymph 1.4 (0.225/0.165), movable finger 140. Both adult and tritonymph have flagellum with 8 setae.

Chelicera of deutonymph 1.37 (0.198/0.145), movable finger 0.165. Flagellum with 6 setae.

Chelicera of protonymph 1.4 (0.150/0.108), movable finger 0.120. Flagellum 4 or 5 setae.

Legs

Female: Leg I trochanter 1.3 (0.190/0.145); basifemur 4.35 (0.405/0.093); telofemur 3 (0.278/0.093); tibia 4.2 (0.313/0.075); basitarsus 3.4 (0.195/0.058); telotarsus 5.56 (0.278/0.050). Leg IV trochanter 2.3 (0.335/0.145); basifemur 1.6 (0.343/0.210); telofemur 1.9 (0.403/0.213); tibia 5.46 (0.606/0.111); basitarsus 2.9 (0.238/0.083); telotarsus 6 (0.408/0.068).

Male: Leg I trochanter 1.4 (0.198/0.140); basifemur 4 (0.415/0.103); telofemur 3.01 (0.293/0.095); tibia 4.14 (0.323/0.078); basitarsus 3.1 (0.198/0.063); telotarsus 6.1 (0.293/0.048). Leg IV trochanter 2.25 (0.345/0.153); basifemur 1.6 (0.355/0.225); telofemur (0.425/0.218); tibia 5.2 (0.632/0.121); basitarsus 2.9 (0.240/0.083); telotarsus 6.6 (0.430/0.065).

Tritonymph: Leg I trochanter 1.4 (0.130/0.095); basifemur 3.5 (0.260/0.075); telofemur 2.7 (0.190/0.070); tibia 3.6 (0.200/0.055); basitarsus 2.5 (0.125/0.050); telotarsus 4 (0.180/0.045). Leg IV trochanter 2.3 (0.230/0.100); basifemur 1.7 (0.235/0.135); telofemur 2 (0.265/0.130); tibia 4.53 (0.385/0.085); basitarsus 2.5 (0.160/0.065); telotarsus 5 (0.275/0.055).

Deutonymph: Leg I trochanter 1.24 (0.103/0.083); basifemur 3 (0.188/0.063); telofemur 2.2 (0.140/0.063); tibia 2.8 (0.148/0.053); basitarsus 2 (0.085/0.043); telotarsus 3.4 (0.145/0.043). Leg IV trochanter 1.77 (0.168/0.095); basifemur 1.62

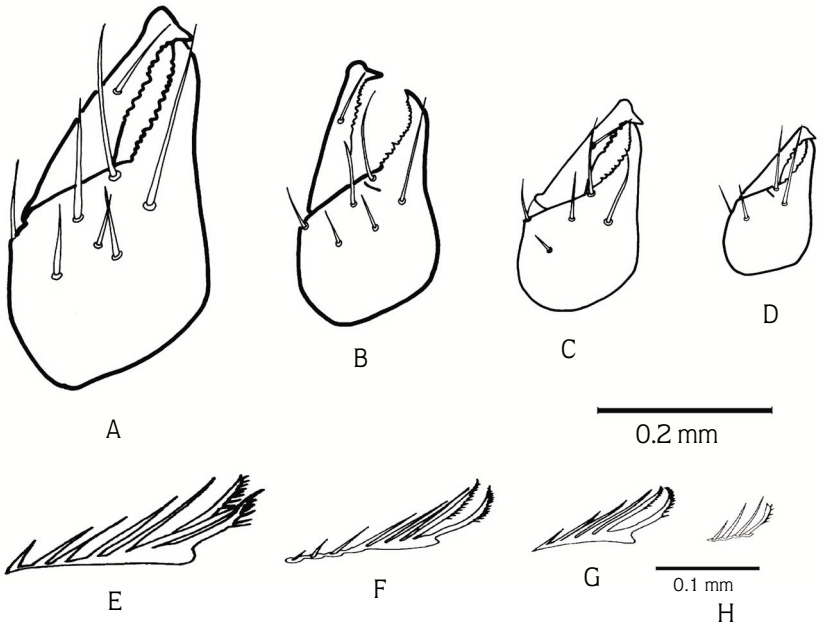

Figure 5. *Neobisium* (*Neobisium*) *erythrodactylum* (Koch, 1873). Chelicera, dorsal: A) male, B) tritonymph, C) deutonymph, D) protonymph. Flagellum: E) male, F) tritonymph, G) deutonymph, H) protonymph.

(0.183/0.113); telofemur 1.8 (0.190/0.108); tibia 3.9 (0.283/0.073); basitarsus 2,3 (0.123/0.053); telotarsus 4.1 (0.205/0.050).

Protonymph: Leg I trochanter 1.2 (0.070/0.058); basifemur 2.7 (0.128/0.048); telofemur 1.8 (0.090/0.050); tibia 2.08 (0.100/0.048); basitarsus 1.45 (0.058/0.040); telotarsus 2.7 (0.103/0.038). Leg IV trochanter 1.6 (0.110/0.070); basifemur 1.54 (0.120/0.078); telofemur 1.7 (0.118/0.070); tibia 3.26 (0.173/0.053); basitarsus 1.7 (0.078/0.045); telotarsus 3.09 (0.133/0.043).

Examined Materials: 3♀♀, 4♂♂, 1 tritonymph, 4 deutonymphs, and 3 protonymphs from bark, lichens, and Bryophyta, Derebağı area, Oltu, Erzurum, 21.08.2000.

Distribution: Austria, Czechoslovakia, Germany, Greece, Hungary, Iran, Italy, Poland, Romania, Armenia, Azerbaijan, Georgia, R.S.F.S.R., Ukraine, Yugoslavia (Harvey, 1990), and Turkey (current paper).

Discussion

New to the Turkish fauna, *Neobisium* (*N.*) *erythrodactylum* (L. Koch 1873) is known from Eastern Europe, the Caucasus, and Iran (Schawaller, 1983; Harvey, 1990). Schawaller (1983) reported that it seems to be among the most common species of *Neobisium* in the Caucasus and that it lives in high areas. We therefore think that the species is very widespread in Turkey, especially in eastern Anatolia. In the developmental stages from nymph to adult, the size of all digits (palp, legs etc.), a number of cheliceral flagellum, and chaetotaxy increase (Table). Features of the Turkish specimens do not significantly differ from those from Europe and the Caucasus (Beier, 1932; Schawaller, 1983); however, additional investigations of the biology and distribution of *N. erythrodactylum* are required.

Acknowledgment

This study, which is a part of the PhD thesis by Fatih Sezek, was supervised by Professor M. Özkan.

Table. Some measurements from the various development stages of *Neobisium (Neobisium) erythrodactylum* (Koch, 1873).

		Female	Male	Tritonymph	Deutonymph	Protonymph
Body length (mm)		2.417	2.633	1.800	1.422	1.069
Total length of leg I (mm)		1.659	1.720	1.085	0.809	0.549
Total length of leg IV (mm)		2.333	2.427	1.550	1.152	0.732
Length of palpal digits (mm)	Trochanter	0.434	0.438	0.255	0.213	0.143
	Femur	0.753	0.790	0.485	0.360	0.213
	Tibia	0.622	0.648	0.375	0.283	0.185
	Chela (without pedicel)	1.253	1.321	0.832	0.637	0.420
	Hand of chela	0.596	0.569	0.390	0.308	0.205
	Movable finger	0.779	0.816	0.527	0.401	0.263
Number of flagelluma		8	8	8	6	4-5
Cheliceral setae		7		6	5	4

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