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A rare teratology in the harvestman *Lophopilio palpinalis* (Opiliones: Phalangiidae)

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Introduction

In many animal species, harvestmen alike, abnormalities in individuals occur. Synonyms of these deviations of the body are, among others, deformities, anomalies and malformations (e.g. Juberthie 1963a, Stoll 1998). Abnormalities that are the result of embryonal or post-embryonal development are specifically called teratologies or monstrosities (e.g. Juberthie 1968). Some abnormalities might arise from damage to the body, as has been shown in regenerating legs of *Trogulus* harvestmen that have probably been eaten by shrews (Novak *et al*. 2006). An eye-catching abnormality is gynandromorphy, an organism having both male and female characteristics. These are conspicuous anomalies, that are relatively often described in harvestmen (e.g. Blaszak 1968; Chemini 1984; Cokendolpher & Sissom 1988; Gnaspini 2007). Other reported abnormalities in harvestmen are aberrations on or fusions between legs, chelicera and pedipalps and its segments (e.g. Hadži 1928; Juberthie 1968; Schultz & Pinto-da-Rocha 2007; Kozel & Novak 2013). In the review papers of Juberthie (1963a) and Mitov (1995), many abnormalities are given, like the fusion between tergites, sternites and deformaties of the prosoma, trident and abdominal sculpture.

There are also published records on eye abnormalities in harvestmen. Cirdei (1955 in Juberthie 1963a) and Stoll (1998) each described an individual, respectively of *Lacinius ephippiatus* C. L. Koch, 1835 and *Oligolophus tridens* C. L. Koch, 1836, without an ocularium but with a single eye positioned flat on the prosoma. Holmberg & Kokko (1983) described an individual of *Togwoteeus biceps* (Thorell, 1877) (as *Homolophus biceps*) without eyes and ocularium, similar to the abnormality we describe here.

Material and methods

In order to gain insight in the distribution of the harvestman fauna of the Netherlands, pitfall trapping is employed at many locations across the country. Two deciduous forests where we collected samples are Wijlre Bossen (Wijlre, community Gulpen-Wittem) in 2011–2015, and Meerdink Estate (Woold, community of Winterswijk) in 2013.

From the samples of these forests, deformed specimens of *Lophopilio palpinalis* (Herbst, 1977) (Fig. 1) were retrieved. As the pitfall traps were filled with a formol solution, the harvestmen were shrunk and stiffened. The specimens were not examined on maturity and sex, but left intact and stored in the collection of JN.

Lophopilio palpinalis is restricted to Europe, where it is wide ranging (Martens 1978). In the Netherlands, it lives in the litter layer of forests, thickets, roughs and grasslands (personal observations JN).

Fig. 1: A living, normal subadult of *Lophopilio palpinalis*. Estate De Hamert (municipality Bergen, province of Limburg), 14 August 2008. Photo by Jinze Noordijk.

Results

One specimen of *Lophopilio palpinalis* without an ocularium and eyes was collected in the Wijlre Bossen (sampling period 12 October–15 November 2011, leg. Th. Heijerman, det. & col. J. Noordijk) (Fig. 2), and one in Meerdink Estate (sampling period 10 August–27 September 2013, leg. R. Morssinkhof, J. Noordijk & Th. Heijerman, det. & col. J. Noordijk) (Fig. 3). These locations are 135 km apart (Fig. 4). The specimen from Meerdink Estate has, apart from the missing ocularium, a normal body. The specimen from Wijlre Bossen has, in addition to the missing eyes and ocularium, a malformed trident. Normally, this trident consists of three stout long teeth, of which the middle one is the longest (Fig. 1). In the deformed specimen, the trident is composed of one short thick middle tooth, a short conical right tooth and a missing left tooth (Fig. 2).

Discussion

Deformed harvestman individuals are only occasionally reported. Mitov (1995) gave frequencies of separate anomalies in 12 species; these numbers range from 0.029–14.3%. High frequencies occurred in an aberration of the adenostyle (tubercle with a gland) on a leg of *Siro beschkovi* Mitov, 1994 (7.14%), and abberations on the tarsi of *Trogulus graecus* Dahl, 1903 (14.3%). However, only 14 of the former and seven of the latter were studied and, for the last species, it is not known if the anomaly had been caused by predation (*cf*. Novak *et al*. 2006). The average frequency of anomalies studied by Mitov (1995) is 1.465% (frequency of *T. graecus* omitted).

Lophopilio palpinalis is most easily identified by the largest second tubercle on the ocularium, the trident that points characteristically forwards, and the tubercles on the ventral side of the palpal trochanter, femur and tibia (Martens 1978). Even the first nymphal instars can be identified this way. For these three characteristics, the specimens need to be viewed laterally; individuals without an ocularium would therefore readily be noticed. The first author has, in recent years, identified 2420 specimens of *L. palpinalis*. The frequency of the teratology described here

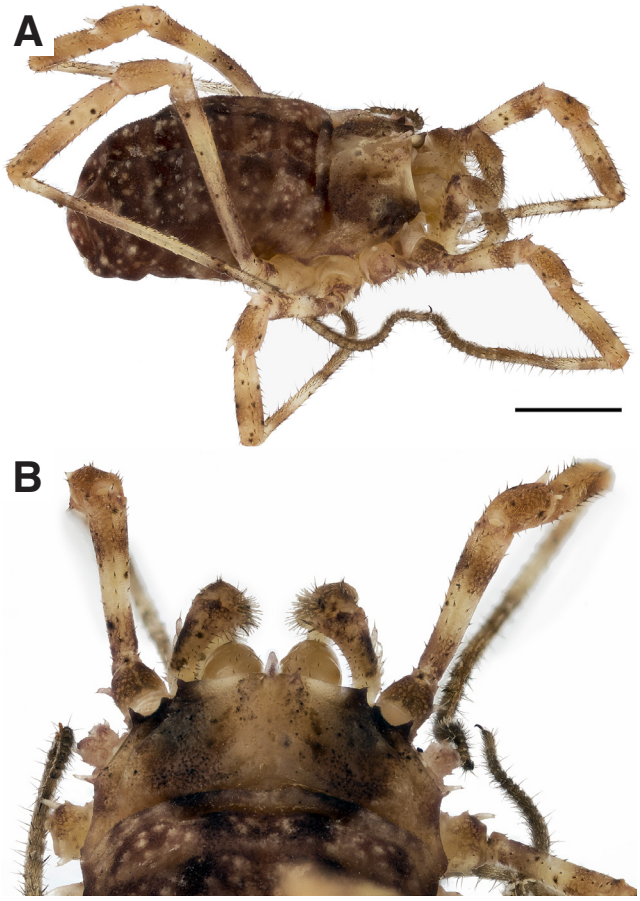

Fig. 2: Specimen of *Lophopilio palpinalis* without ocularium and eyes, Wijlre Bossen (community of Gulpen-Wittem), 12 October–15 November 2011. **A** lateral view, scale line 1 mm; **B** dorsal view. Photos by Theodoor Heijerman.

comes at 0.083%. The absence of an ocularium and eyes in *L. palpinalis* is a thus a rare teratology.

The lack of eyes is a rare teratology in harvestmen anyway, with the specimens described here being only the second and third individuals reported in literature (Holmberg & Kokko 1983). Mortality surely plays an important role in the low frequencies of reported anomalous individuals (Juberthie 1968). It is not known how the absence of sight affects survival, and thus how long individuals may live after hatching. *Lophopilio palpinalis* hatches in April–May in the Netherlands (personal observations JN). Given the sampling dates and the size of the two specimens, it is certain that they moulted several times and probably proximate maturity. The missing eyes, therefore, did not hinder development of these particular individuals of *L. palpinalis*, they were able to find food and develop throughout several nymphal stages.

Abnormalities might arise from several causes. It seems unlikely that the abnormality described here is the cause of a genetic change. If it would be caused by a simple, single genetic change, the abnormality would probably occur more frequently (and also in related species); the disappearance of the eyes and the ocularium likely involves the involvement of many genes (Holmberg & Kokko 1983; Stoll 1998). Physical damage also seems not to be the cause, since the prosoma shows no signs of a wound or other irregularities (Holmberg & Kokko 1983; Novak *et al*. 2006). The most likely cause for the deformed individuals of *L. palpinalis*

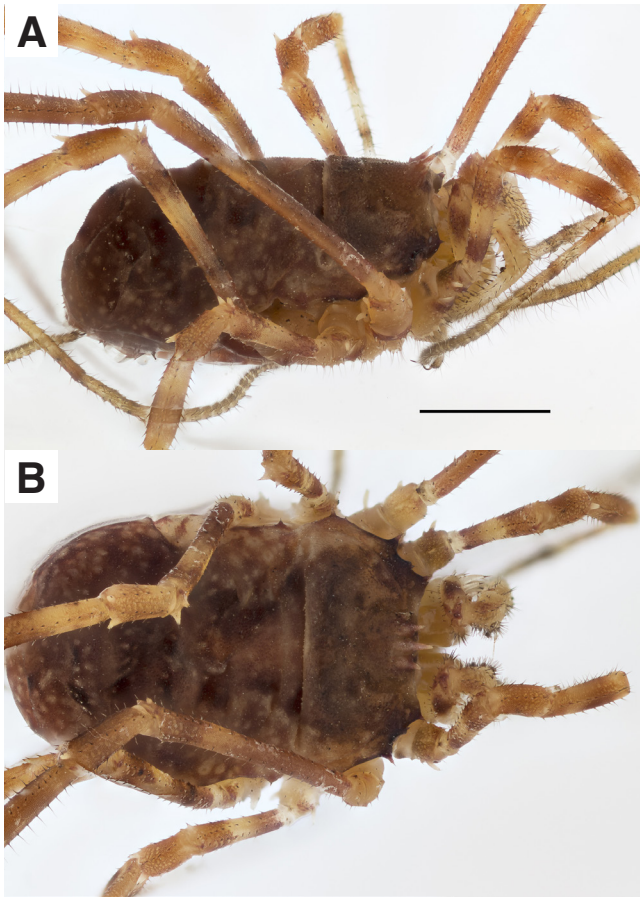

Fig. 3: Specimen of *Lophopilio palpinalis* without ocularium and eyes, Landgoed Meerdink (community of Winterwijk), 10 August–27 September 2013. **A** lateral view, scale line 1 mm; **B** dorsal view. Photos by Theodoor Heijerman.

seems to be environmental. Juberthie (1960, 1961, 1962, 1963b, 1968) has shown in laboratory studies that high temperatures may cause a variety of teratologies. Other aberrant abiotic conditions or exposure to pesticides (Holmberg & Kokko 1983) might also be the cause of the deformation during embryonal or post-embryonal development of the individuals described in this paper.

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References

BLASZAK, C. 1968: Investigations on intersexes in harvestmen (Opiliones). *Bulletin Entomologique de Pologne* **38**: 9–27.

CHEMINI, C. 1984: Andromorphy in a female of *Nemastoma dentigerum* Canestrini (Opiliones) from northern Italy. *Newsletter of the British Arachnological Society* **40**: 56.

COKENDOLPHER, J. C. & SISSOM, W. D. 1988: New gynandromorphic Opiliones and Scorpiones. *Bulletin of the British Arachnological Society* **7**: 278–280.

GNASPINI, P. 2007: Development. *In* R. Pinto-da-Rocha, G. Machado & G. Giribet (eds.), *Harvestmen, the biology of Opiliones*. Cambridge, MA: Harvard University Press: 455–472.

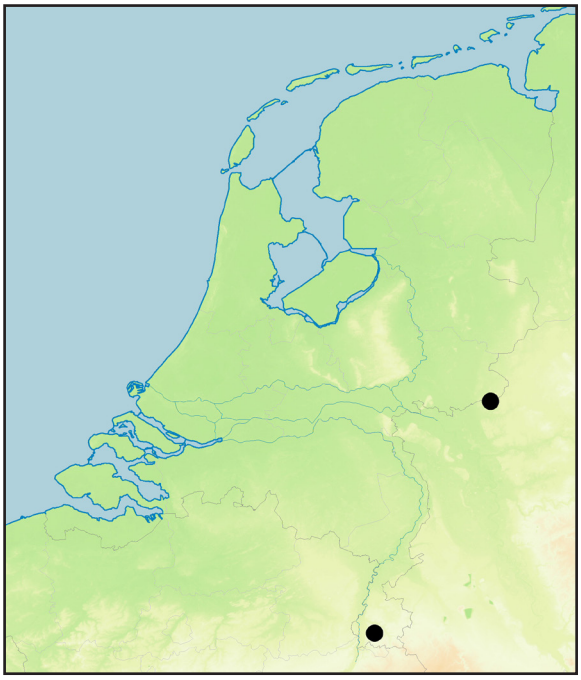

Fig. 4: Localities of the specimens of *Lophopilio palpinalis* without ocularium and eyes in the Netherlands (135 km apart).

HADŽI, J. 1928: Naturfund einer Mehrfachbildung an der Chelicere von *Opilio parietinus* (de Geer). *Bulletin des Travaux de la Classe des Sciences Mathématiques et Naturelles* **22**: 1–4.

HOLMBERG, R. G. & KOKKO, E. G. 1983: A blind *Homolophus biceps* (Arachnida: Opiliones). *Entomological News* **94**: 49–52.

JUBERTHIE, C. 1960: Action de differentes temperatures constantes sur le developpement des oeufs de l'Opilion *Odiellus gallicus* (E.S.). *Comptes Rendus des Séances de l'Académie des Sciences* **250**: 2079–2081.

JUBERTHIE, C. 1961: Les phases du developpement embryonnaire et leurs relations avec la temperature et l'humidite chez un Opilion Palpatores. *Comptes Rendus des Séances de l'Académie des Sciences* **252**: 2142–2144.

JUBERTHIE, C. 1962: Étude des symelies provoquees par la temperature chez un Opilion (Arachnides). *Comptes Rendus des Séances de l'Académie des Sciences* **254**: 2674–2676.

JUBERTHIE, C. 1963a: Monstruosités observées chez les Opiliones. *Bulletin de Muséum National d'Histoire Naturelle* **35**: 167–171.

JUBERTHIE, C. 1963b: Production experimentale de l'heterosymelie chez un Opilion. *Comptes Rendus des Séances de l'Académie des Sciences* **256**: 3363–3365.

JUBERTHIE, C. 1968: Teratologie experimentale chez un opilion (Arachnide). *Journal of Embryology and Experimental Morphology* **19**: 49–82.

KOZEL, P. & NOVAK, T. 2013: Absence of a ventral spur on the chelicera in *Lacinius ephippiatus* (Oligolophinae: Phalangiidae; Opiliones). *Entomological News* **123**: 201–205.

MARTENS, J. 1978: Spinnentiere, Arachnida: Weberknechte, Opiliones. *Die Tierwelt Deutschlands* **64**. Jena: G. Fischer.

MITOV, P. 1995: Teratological data about Opiliones (Arachnida) from Bulgaria. *In* Růžička V. (ed.), *Proceedings of the 15th European Colloquium of Arachnology.* České Budějovice: Institute of Entomology: 147–158.

NOVAK, T., ALATIČ, A., POTERČ, J., BERTONCELJ, B. & JANŽEKOVIČ, F. 2006: Regenerational leg asymmetry in damaged *Trogulus nepaeformis* (Scopoli 1763) (Opiliones, Trogulidae). *Journal of Arachnology* **34**: 524–531.

SCHULTZ, J. W. & PINTO-DA-ROCHA, R. 2007: Morphology and functional anatomy. *In* R. Pinto-da-Rocha, G. Machado & G. Giribet (eds.), *Harvestmen, the biology of Opiliones*. Cambridge, MA: Harvard University Press: 14–61.

STOLL, I. 1998: Misdannelser hos vevkerring (Opiliones). *Insekt-Nytt* **23**: 25–26.