A gynandromorph of the funnel-web spider *Allagelena opulenta* (Araneae: Agelenidae)

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Abstract — We report the occurrence of a gynandromorph of the funnel-web spider *Allagelena opulenta* collected by a Malaise trap set in a Japanese cedar plantation on Mt. Aikodake, Yakushima Island, Japan. This specimen presents a transverse gynandry, with the anterior half of the body male and the posterior one female. The epigyne is abnormally developed, and the shape of the epigynal opening is deformed compared to that in normal females. This is the first case of gynandromorphy observed in this genus.

Key words — intersexuality, Malaise trap, sex mosaic, transverse gynandry

Introduction

Gynandromorphism is the phenomenon where both male and female characteristics occur on the same individual due to a sex chromosomal aberration in the early developmental stages (Narita et al. 2010). This can be seen in various orders of arthropods, and has been reported in many spider species (Exline 1938; Kaston 1961; Roberts & Parker 1973). However, it is an exceedingly rare event with an estimated incidence in spiders of one case per 5,000 to 17,000 individuals (e.g. Kaston 1961; Stratton 1995), and only a few cases from Japan have been reported (e.g. *Xysticus insulicola*, Yaginuma & Arita 1967; *Plebs sachalinensis*, Tanaka 1971; *Oxytate striatipes*, Nishikawa 1971; *Carrhotus xanthogramma*, Maekawa & Ikeda 1992; *Episinus nubilus*, Kumada 1989). Here, we report an occurrence of a gynandromorphic specimen of the funnel-web spider *Allagelena opulenta* (Araneae: Agelenidae) from Yakushima Island, Kagoshima Prefecture, Japan, and describe its morphological characteristics by comparing them with those of normal specimens. This is the first time that gynandromorphy has been reported for this genus, although occurrence of gynandromorphy has been reported in other agelenid spiders (e.g., *Coelotes atropos*, Kaston 1961).

Description

The gynandromorphic specimen was found among the extremely large number of arthropods collected by Malaise traps set by T. Yamauchi et al. at five locations on Yakushima Island, Kagoshima Prefecture, as part of a

number of comprehensive faunal surveys conducted during 2006 and 2008 (Yamauchi & Hisamatsu 2013; Yamauchi 2014; Baba et al. 2015). This particular specimen was obtained between 22 and 25 September 2006 in a Japanese cedar plantation on Mt. Aikodake (30.384076 N, 130.627420 E; alt. 150 m). By using the classification suggested by Roberts & Parker (1973), this specimen can be classified as having a regular Type 3 gynandromorphic form, in which the anterior half (including legs) is male and the posterior half is female (Figs. 1, 2). Segments of this specimen's right legs were bent due to an incomplete molt, preventing proper measurement; therefore, only the left leg lengths were measured.

We examined eight normal male specimens and twelve normal female specimens collected from four localities (Tochigi Prefecture, 5♂1♀; Ibaraki Prefecture, 1♂5♀; Fukuoka Prefecture, 1♀; Yakushima Island, 2♂5♀), and compared them with the gynandromorphic specimen.

Abbreviations: g: gynandromorphic specimen; ♀: normal females; ♂: normal males. Measurements (in mm, average and range values in brackets): Body length: g: 11.5 (♀: 11.02, 8.00–14.00; ♂: 8.94, 6.25–11.00). Carapace length: g: 4.75 (♀: 4.21, 3.50–5.00; ♂: 4.13, 3.00–4.75). Carapace width: g: 3.25 (♀: 3.08, 2.50–3.75; ♂: 3.16, 2.50–3.50). 1st leg length: g: 18.75 (♀: 14.08, 11.75–16.5; ♂: 18.16, 14.5–20.00). 2nd leg length: g: 17.50 (♀: 13.06, 11.25–15.50; ♂: 16.63, 13.00–18.75). 3rd leg length: g: 16.00 (♀: 12.48, 10.00–14.50; ♂: 15.61, 12.75–17.00). 4th leg length: g: 19.75 (♀: 16.44, 13.00–18.75; ♂: 19.54, 16.00–21.50).

The carapace width and length of the gynandromorph

Figs. 1–2. A gynandromorph of *Allagelena opulenta*. 1, dorsal view; 2, ventral view. Left palp was removed for examination. Arrows indicate the genital organs of male and female parts. Scales=2.5 mm.

were within the ranges of both sexes of normal specimens, reflecting a lack of marked sexual size dimorphism in this species. Leg lengths of the gynandromorph were long, which is consistent with the male characteristic. Both palps of the gynandromorph were developed normally as male sexual organs (Figs. 3–4), although the coloration appears lighter than that of normal males. On the other hand, the epigyne was abnormally developed, and the shape of the epigynal opening was deformed compared to that in normal females (Figs. 5–6), indicating that this specimen also exhibited an intersex condition in which sexual characteristics were different from both normal males and females. This condition, where gynandry and intersex coexist in a single specimen, has been often reported in spiders (Roberts & Parker 1973).

Although *A. opulenta* is a very common species in Japan, the present paper is the first report of gynandromorphy in this genus. This seems to be not only because of the very low incidence rate of gynandromorphy, but also because of the difficulty in recognizing gynandromorphic individuals in the field: this species exhibits a low degree of sexual dimorphism in body size and coloration, which makes it difficult to visually discriminate between normal and abnormal

individuals. This is supported by the claim made by Narita et al. (2010) that gynandromorphic individuals are more likely to be reported in sexually dimorphic species than in sexually non-dimorphic species. Hence, the non-visually oriented sampling approach used in this study seems an effective way to collect gynandromorphic specimens from the broad spectrum of spider groups.

Acknowledgement

We deeply thank Dr. Shin-ichiro Aiba (Kagoshima University), Dr. Ryo Tsujino (Nara University of Education), and Dr. Takakazu Yumoto (Kyoto University) for the setting traps, and we thank Mr. Kenji Tezuka, Mrs. Tatsuko Tezuka, and Mr. Toshihiro Saito for collecting samples from the traps. We also thank Mr. Hiroyoshi Ikeda for providing useful information about gynandromorphy in spiders. This study was partly supported by the research project “Sustainability and biodiversity assessment on forest utilization options” launched by the Research Institute for Humanity and Nature.

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Figs. 3–6. Genital organs of *Allagelena opulenta*. 3–5, gynandromorphy; 6, normal female. 3, ventral view of left palp; 4, lateral view of left palp; 5–6, epigyne. Scales=1.0 mm.

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Received January 28, 2016 / Accepted February 15, 2016