An unusual threat-action in a Japanese moth, *Smerinthus planus* Walker (Lepidoptera, Sphingidae)

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Abstract An unusual threat-action in a Japanese moth *Smerinthus planus* belonging to the family Sphingidae is reported. This species has an eyespot pattern on the hindwing. When the moth was surprised, it opened its four wings to show its eyespot pattern, and displayed a “shrink and stretch” threat-action. The action apparently increased the effect of the threat against an enemy. Another Japanese species of the same genus, *Smerinthus tokyonis*, also with an eyespot pattern on its hindwing, when stimulated opened its four wings to threaten the enemy. However, in this species the “shrink and stretch” motion was not observed. As far as I know, no one has reported this curious threat-action in *S. planus*, although this is a very common species in Japan.

Key words Eyespot pattern, threat-action, *Smerinthus planus*, *Smerinthus ocellatus*, *Smerinthus tokyonis*.

The moths of *Adris tyrannus* and *Lagoptera juno*, both belonging to the family Noctuidae, have an eyespot pattern on their hindwings. When frightened in the early morning of late autumn, at which time they cannot fly without warming up, they open their wings and almost stand on end instead of taking flight (Miyata, 2005). These postures, accompanied with slow movements of their wings, appeared effective to deter an enemy. Another Japanese moth, *Smerinthus planus*, also has the eyespot pattern on its hindwing. I stimulated it and observed an unusual threat-action.

The genus *Smerinthus* (family Sphingidae) is distributed in the Palaeartic and Nearctic regions. All the species of the genus have a conspicuous eyespot pattern of basically red with blue and black on the hindwing, reminiscent of a Kabuki actor’s face. Two representative species are *S. ocellatus* occurring in Europe and North Africa, and *S. planus* in Japan, Korea, Siberia, and China. Their host plants are various species of the family Salicaceae. Two other species of the genus are found in Japan: *S. tokyonis* and *S. caecus*—the former species was used for the experiment with *S. planus*.

*Smerinthus planus* is a well-known common species in Japan, but as far as I know, no one has reported this unusual threat-action. When its thorax was disturbed by finger snapping, its eyespot pattern appeared immediately from under its forewing and the threat effect was amplified by the “shrink and stretch” action. I believe that the action has not been reported by European entomologists in *S. ocellatus*, but it may be possible to observe it in that species.

The observation was carried out at a light trap set-up with a white cloth screen behind a black light and three fluorescent lights in the garden of Kokonoe Institute of Natural History, which is situated in Jizobaru Highland, Kokonoe, Oita-prefecture (about 830 meters above sea level; 33°09’05”N, 131°11’00”E).

In the early morning, about five o’clock of June 7, 2006, I found two individuals of *S. planus* on the screen. Then, I snapped strongly at their thorax one after another using the nail point of my forefinger.
The first individual opened its wings and showed the eyespot pattern; at the same time it stretched its legs against the screen, with its thorax pushed up, and its forewings and abdomen bent strongly ventrally, causing it to fall to the ground. Despite that, it kept its wings open on the ground.

I applied the same treatment to the second moth and obtained an identical result. In addition, this individual repeated the unusual action, which might be described as a motion of “shrink and stretch” on the ground. I recorded the motion with my digital video camera, and counted the frequency. It occurred 6 times in 35 seconds. The thorax moved up in the “shrink” position and down in the “stretch” position, with the wings also working together. This individual was a male but in the photograph (Fig. 6) its abdomen cannot be seen because it was bent too strongly ventrally.

At five o’clock in the morning of June 20, 2006, again I found a male of S. planus on the white screen and attempted the experiment by the same method. However, the male did not fall down but clung tightly to the screen; nonetheless it repeated rhythmically the “shrink and stretch” action 20 times in 35 seconds.

I believe that the different frequency of the action may depend upon the body condition of...
the individual, duration after shock, and strength of received stimulus, etc.

I find it somewhat difficult to explain the motion in English or even in Japanese. Therefore, I show four typical photographs taken of different individuals to illustrate the phenomenon. Fig. 1 shows the usual resting posture of S. planus on the screen, Fig. 3 the “shrink” position, and Fig 2 and 6 the “stretch” position.

In the morning of June 7, 2006, two Smerinthus tokyonis came to the light and were resting on the white screen with their wings closed (Fig. 4). I performed the same experiment with each separately. The result was different compared with S. planus. S. tokyonis also opened their wings (Fig. 5) but held the posture for at least ten minutes, and did not show the threat action as observed in S. planus.

Two other species belonging to the family Sphingidae, Callambulyx tatarinovii and Marumba gaschkewitschii, also rested on the white screen. They have camouflage color on their forewings but in contrast their hindwings are reddish, thought to be useful to threaten an enemy. I tested them by the same method. They opened their wings in a flash but soon closed them and did not exhibit the posture as seen in S. tokyonis. I repeated the same experiment with other species belonging to the family Sphingidae when I could. The results were identical to those with C. tatarinovii and M. gaschkewitschii.

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Cited literature


摘 要

日本産ウチズスメの奇妙な威嚇行動（宮田 彦）

晩秋の寒い朝、夜の間に灯火に来たアサシノホハやムクゲコノハの胸部に触っても彼らは飛ぶことが出来ない。その代わり翅を開いて、逆立ちをするような威嚇姿勢を取り、後翅の目玉模様を露出し、翅を小刻みに振動させる（Miyata, 2005）。目玉模様を持つガは敵に出会うと、自らその模様を見せびらかすらしい。しかし、気温が高い夏の朝、ムクゲコノハに触ると直ちに飛び去る。晩秋の頃と反応が違う。ウチズスメも後翅に目玉模様を持つので、威嚇姿勢を取るかどうか試した。6月の早朝、白布に止まってい るウチズスメの胸部をバチンと指ではじか、触れ、反応を観察した。驚いたガは翅を突っ張り尾端や翅の先端を腹方に強く曲げる。そのまま地面に落下する個体や白布に止まったままの個体もある が、いずれも脚を突っ張って胸部を突き出し、翅を腹方に曲げる運動と、力を持った翅が水平に近くなる運動、つまり一種の屈伸運動を反覆する。その運動を初めて観察した個体は地面に落ちてそこで屈伸運動をしたもので、35秒間に6回その運動を繰り返した。また触った時、白布に止まったままの1頭は35秒間に20回屈伸運動を繰り返した。屈伸運動のリズムは刺激の大きさ、屈伸運動を始めからの経過時間によって違う。この運動は後翅にある目玉模様を一層際だたせる効果があると考え られる。同属のコウチズスメの場合は、驚くと翅を広げ後翅の目玉模様を露出する。触った後、相当長い間、少なくとも10分以上、翅を開いたままであるが、ウチズスメのような屈伸運動は見られない。また後翅の赤いモチモチズメやウンモンズメも調べたが、触れると一瞬翅を開くだけで、ウチズスメのようなに長い時間後翅を露出することはなかった。他のズスメ類も同様であった。ウチズスメは古くから知られている普通種なに今回発見した威嚇行動を、今まで誰も報告していなかったのは誠に不思 議である。ヨーロッパと北アメリカに分布するウチズスメの近縁種S. ocellatusでも同様の行動が見ら
れると予想される。誰か調べて欲しい。またヒメウチスズメは九州には産せず、威嚇行動が見られるかどうか調べることが出来なかった。

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