

Dwarfism of lymantriid moths of *Ivela auripes* (Lepidoptera) breaking out in the garden of the Institute for Nature Study, Tokyo, in 2009

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自然教育園で大発生したキアシドクガ（鱗翅目，ドクガ科）
成虫の小型化について，2009 年

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Abstract: Dwarfism of lymantriid moths of *Ivela auripes* in the Institute for Nature Study, Tokyo, in 2009 is investigated and compared with the results in 2005, 2006, 2007 and 2008. The length of male forewing in 2009 (N=50) is significantly larger than those in 2005-2008, and significantly smaller than that of the Imperial Palace, Tokyo, in 2005. The length of female forewing (N=2) is not significantly different from those in 2005-2008 and that of the Imperial Palace, Tokyo, 2005. The population density of *I. auripes* in 2009 was evidently smaller than before, and the defoliation of *Swida controversa* was not found.

Introduction

In 2001, the lymantriid moth of *Ivela auripes* was observed first at the garden of Institute of Nature Study (ISN), Tokyo (Owada *et al.*, 2001). The population size of the moth was not so large in 2002 and 2003. Remarkable defoliation was observed in the spring on some host plants, *Swida controversa*, Cornaceae, and the outbreak of the moths started (Yano & Kuwahara, 2006). Defoliation of *Swida controversa* by *I. auripes* was so serious that investigations of this outbreak were carried out on the damage of host-plant from 2005 (Yano & Kuwahara, 2006, 2007, 2008, 2009) and on the population size and dwarfism of *I. auripes* (Owada *et al.*, 2007, 2008, 2009).

In 2009, the lymantriid moth of *Ivela auripes* was observed very scarcely at ISN, and the outbreak of this moth seemed to have ended. In this paper, we are going to record sampling result, and to discuss on the population dynamics of *I. auripes* at INS, Tokyo.

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Sampling and metrical methods

The collecting days were May 19-22, and June 17, 2009, and moths were collected by nets, or were secured on the ground by Kuwahara. On May 26, Owada used a pole (6 m in length) with a net (60 cm in diameter), and started to collect moths as many as possible from 10:00, and he was able to collect three male moths only in one hour. And an additional female was discovered by Kuwahara on June 17 (Table 1).

The forewing length is a distance from the basal hinge to the apex. Moths collected in this research were set in paper pouches, dried, and measured in millimeters with rounding to the nearest whole number. All the specimens investigated in this study are preserved in the National Museum of Nature and Science, Tokyo.

Table 1. Number of moths collected at INS, Tokyo, in 2009.

Date	May 19	May 20	May 21	May 22	May 26	June 17
Male	29	11	6	1	3	0
Female	0	1	0	0	0	1

Results

A total of 50 males and 2 females were collected from May 19 to June 17 in 2009 survey (INS 2009). In the surveys of IPT 2005 and INS2005-2008, the sampling day was one day, and in INS2009 the sampling days were six days, and the average number of each sampling day is 8.7 individuals. In comparison with the total of moths in INS2008 (May 27, 402 males and females), the population size of *I. auripes* in INS2009 (May 19, 29 males), decreased to ca. 7.2 % (Table 1, 2).

Table 2. Forewing length (mm) of *I. auripes* at the Imperial Palace, Tokyo (IPT 2005), and the Institute for Nature Study (INS 2005, INS 2006, INS 2007, INS 2008, INS2009).

	IPT 2005		INS 2005		INS 2006		INS 2007		INS 2008		INS2009	
	June 1		May 29		May 26		May 26		May 27		May 19-26, June 17	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Mean	25.7	29.8	22.5	22.8	21.4	23.5	22.5	23.4	20.6	21.6	24.0	25.5
SD	0.8	1.1	2.3	2.7	1.8	2.5	2.2	2.6	2.0	2.1	1.9	3.5
N	76	9	183	28	522	132	189	86	301	101	50	2

In the male forewing length in INS 2009 (N=50), the minimum size is 18 mm, which is 1 mm longer than those of INS 2005 and INS 2006, and 2 mm longer than those of INS 2007 and INS 2008. The maximum size of

INS 2009 is 26 mm, which is equivalent to the smallest population of INS 2008. The difference between the five years is statistically significant (one-way ANOVA, $F_{4,1240}=55.88$, $P<0.0001$). On the other hand, the difference between each year is not statistically significant in INS 2005 and INS 2007 ($P>0.05$), and is statistically significant in the others ($P<0.01$, Turkey).

In the female forewing length in INS 2009 ($N=2$), the minimum size is 23 mm and the maximum size is 28 mm. The difference in the five years is statistically significant (one-way ANOVA, $F_{4,1240}=11.24$, $P<0.0001$). In comparison of the two groups, we found statistically significant difference between INS 2006 and INS 2008, and INS 2007 and INS 2008 (both Turkey, $P<0.01$), and not statistically significant difference between the others ($P>0.05$).

Discussion

The defoliation of *Swida controversa* was quite a few in 2009 (Yano & Kuwahara, 2010), and it was expected that moths of *I. auripes* would appear much fewer and grow-up larger. The occurrence of *I. auripes* was earlier than those in 2005-2008, and an exceptional female was collected on June 17. The dwarfism of moths is obviously eased from those in INS 2005-2009 in the male, and the sampling number of two females is too small when compared their size with that of others. The variance of their forewing length and the mean length with SD of IPT 2005 and INS 2005-2009 are shown in Fig. 1 and Table 2.

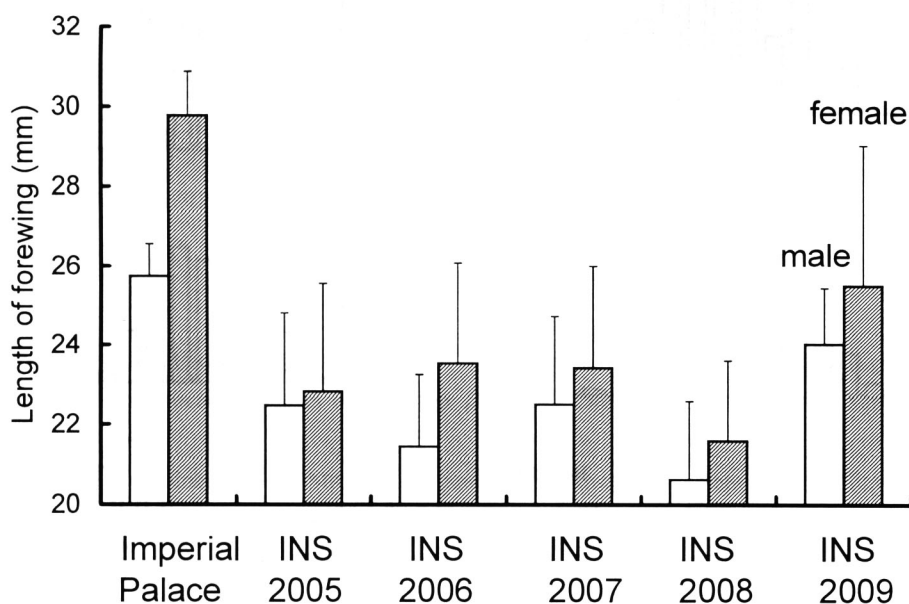


Fig. 1. Mean lengths and SD of the forewing of *I. auripes* at the Imperial Palace, Tokyo, 2005, INS 2005, INS 2006, INS 2007, INS 2008 and INS 2009.

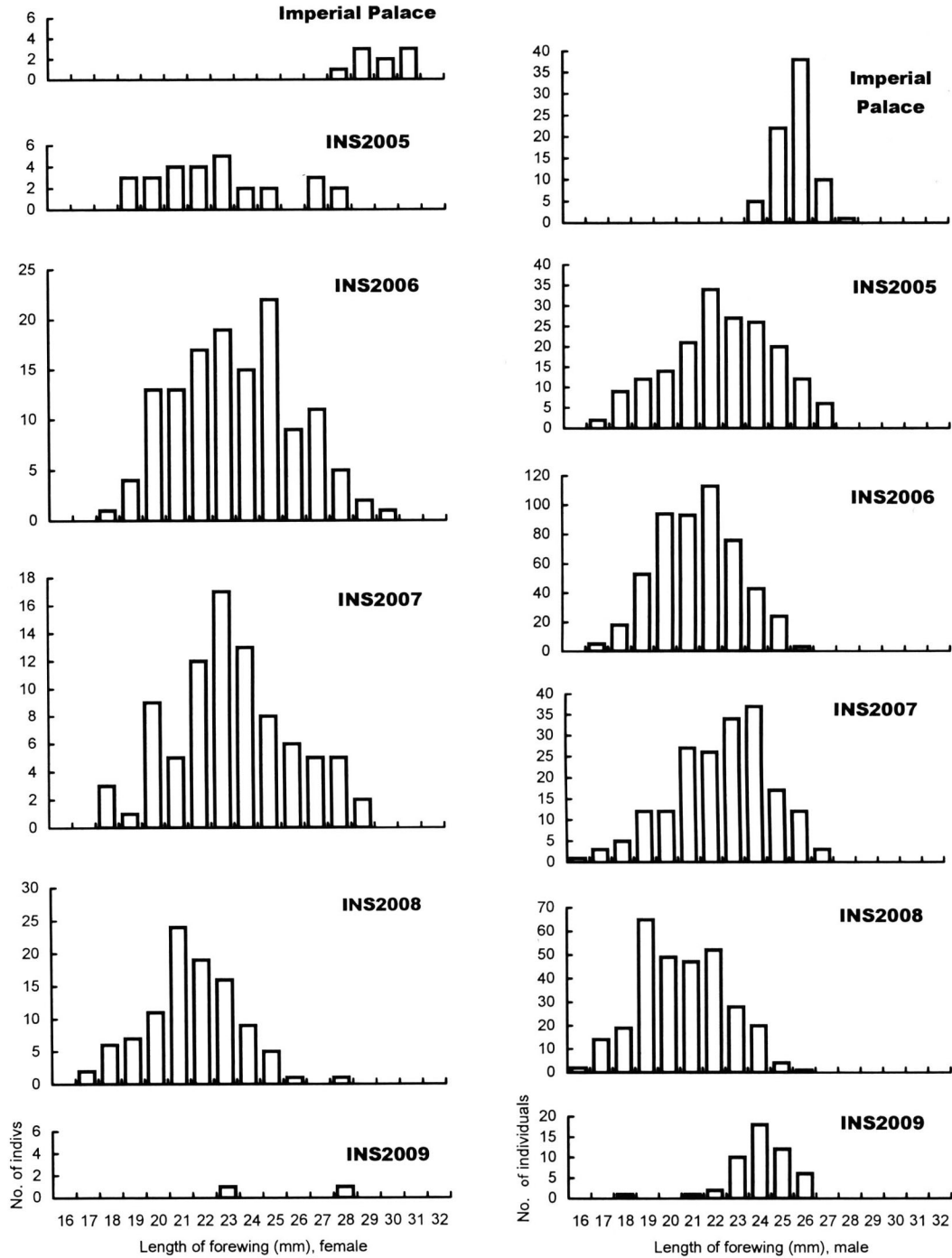


Fig. 2. Length of the forewings of male (left) and female (right) *I. auripes*. Imperial Palace, Tokyo, 2005, control, larvae grown under sufficient leaves, and INS 2005, INS 2006, INS 2007, INS 2008 and INS 2009.

In 2009, males of *I. auripes* were larger than those in 2005-2008, but did not reach the size of the control moths of IPT 2005. It is doubtless that larvae of *I. auripes* fed enough leaves of *Swida controversa* in 2009. It can be surmised that the damage of moths in 2008 was so serious that moths in 2009 could not recover their size to ordinary one of IPT 2005. Besides, it is also worth noting that in INS 2009 only two females, 3.8 %, were secured in the sampling as compared with 50 males, 96.2 %. Recently, Nakano (2009) recorded several dipteran and hymenopteran parasitoids on *I. auripes* from a cemetery in Minato, Tokyo.

摘 要

2004 年から開始された継続的なキアシドクガの大発生によって、発生した成虫が小型化していることが明らかになった。2009 年は従来より発生が早かったようで、しかも個体数が激減したので 2006-2008 年に行ったサンプリング調査と同様の調査を行うことができなかった。2009 年 5 月 19 日に雄を 29 個体、20 日に雄を 11 個体、メスを 1 個体確保できたが、それ以降はほとんど飛翔はみられず、5 月 26 日には大和田が従来のサンプリングを行おうとしたが 1 時間で 3 個体の雄しか採集できず、調査を中止した。以後、6 月 17 日に雌を 1 個体確保できたに過ぎない (Table 1)。

採集できた雄 50 個体のサイズは、小型化した 2005-2008 年のものより有意に大型になったが、対照区として計測した普通サイズの皇居の 2005 年の個体よりは有意に小型であった。一方、雌の前翅長の平均も 2005-2008 年のものより長く、皇居の 2005 年より短かったが、資料が 2 個体だけで、統計的には有意な差と認められなかった (Table 2, Fig. 1)。

2009 年のキアシドクガ幼虫によるミズキの食害は軽微で、ほとんどの木でわずかな食害が認められたに過ぎなかった (矢野・桑原, 2010)。このことから、成虫の発生が減少することは予想できたが、調査結果の通り激減していた。2009 年は大発生による食料の枯渇はなく、幼虫は十分に葉を食べて成長したはずであるが、雄の個体サイズは対照区の皇居のものに比べ有意に小さく、2008 年の極端な大発生による食糧不足によるダメージから回復できていないようである。また、採集できた 52 個体のうち、雌が 4% を下回る 2 個体だけだったというもの注目される。近隣地区から捕食寄生の報告もあり (中野, 2009)、2010 年の発生が注目される。

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