

SYSTEMATIC POSITION AND DESCRIPTION OF
CHILADES PERIPATRIA SP. NOV.
(LEPIDOPTERA: LYCAENIDAE)

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Yu-Feng Hsu (1989) Systematic position and description of *Chilades peripatria* sp. nov. (Lepidoptera: Lycaenidae). Bull. Inst. Zool., Academia Sinica 28(1): 55-62. Based on the examination of length-width ratio of valva at genitalia and of androconia, a Taiwanese new species *Chilades peripatria* is described.

Key words: *Cycas*-feeding, *Chilades*, Androconia.

The earliest report on Taiwanese *Cycas*-feeding lycaenid was in 1970's (Anonymous, 1976), and the insect is regarded as *Lampides boeticus* Linnaeus. Later in 1982, Chang reported the same insect based on materials from Taipei, and followed the above name (Chang, 1982). In 1987 the author made a revision after examining Chang's materials, and treated them as *Chilades pandava pandava* (Horsfield) (Hsu, 1987). Konishi (1987) also reported the same insect with the same name based on materials from Taitung. Chen and Chen (1983) reported "*Chilades kiamurae*" based on materials from Pingtung; however, these materials are actually identical with the insect mentioned above.

In 1988 the author had an opportunity to examine a number of this insect, and compared these with *C. pandava* from the other regions. It is very intriguing that there are obvious differences between these Taiwanese materials and *pandava* materials. The fact reveals that Taiwan-

ese individuals should belong to an independent population, and has specialized a good species level.

MATERIALS AND METHODS

These are a number of Taiwanese specimens available, which were collected from the wild of Taitung, eastern Taiwan. The *pandava* materials are from Burma, N. Thailand, W. China and Java, but available samples are in a small number only.

Male genitalia and androconia were used for this study. Length-width ratio (L/W) values of valva, and L/W values of androconia, of materials from each region were compared. In the procedure only the left valva was measured, so only one value was obtained per sample. Notice that the L value of androconia is the stalk-excluded length, and 10 androconia were sampled per individual by random.

RESULTS

L/W values for valva of Taiwanese

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material are comparatively low and that for androconia are comparatively high (Table 1). According to the former values, the *pandava* materials from Burma, N. Thailand and Java are quite different from Taiwanese material. As for Chinese material, τ value is 1.96, just at the edge of confidence limits (Table 1). According to the result due to Duncan's grouping method applying to the information based on the data of androconia, the materials from various regions can be divided into 3 groups, namely group a, b and c (Table 1). Group a is far different from the other two groups since its mean of L/W value is far greater than that of the other materials. Group b and c can be regarded as one single group because L/W value ranges of the two groups are widely overlapped each other, whereas the value range of group a is not overlapped with those of group b and c. The fact reveals that Taiwanese individuals are different taxon from *C. pandava*.

Valva of male genitalia of Taiwanese material is shown in Fig. 11, that of *pandava* materials from Figs. 12-15. Androconia of Taiwanese material is shown in Fig. 16, that of the *pandava* materials from Figs. 17-20.

Since the materials from Taiwan possess characters which are different from all of the *pandava* materials from the other regions, it can be recognized as an independent species. The species is described as follow.

***Chilades peripatria* sp. nov.**

(Figs. 1-8)

Lampides boeticus Linné; Anonymous, 1976: 49; Chang, 1982: 43.

Chilades kiamurae Matsumura; Chen & Chen, 1983: 4.

Chilades pandava pandava (Horsfield); Hsu, 1987: 9-12.

Chilades pandava (Horsfield); Konishi, 1987: 25.

Male: Forewing length 15.17 ± 0.72 mm. Antennal shaft dark brown, ringed with

Table 1
The comparison of L/M values based on materials used in this study

Locality	Valva				Androconia			
	R	M±S.D.	τ	N	R	M±S.D.	D	N
Taiwan	2.50-3.03	2.82±0.13		30	1.44-2.30	1.68±0.15	a	100
Burma	3.08-3.24	3.13±0.06	5.00	4	1.08-1.40	1.22±0.07	c	40
N. Thailand	—	3.19	2.95	1	1.11-1.33	1.21±0.08	c	10
W. China	—	3.06	1.96	1	1.23-1.41	1.33±0.06	b	10
Java	—	3.37	4.37	1	1.17-1.39	1.31±0.07	b	10

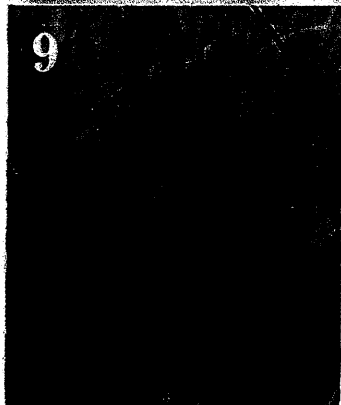
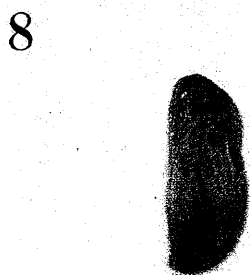
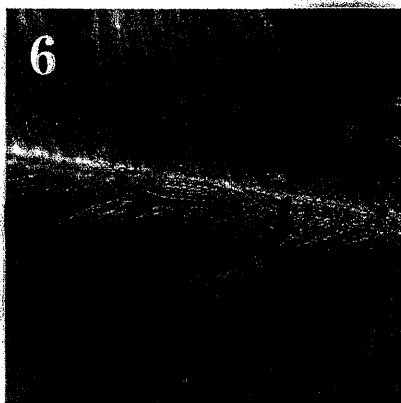
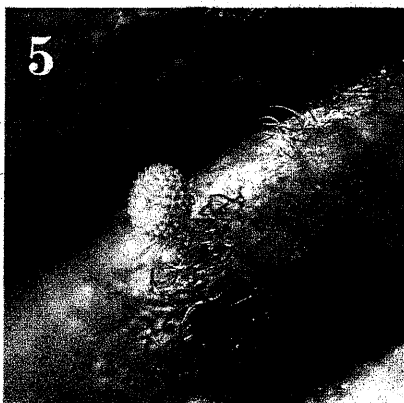
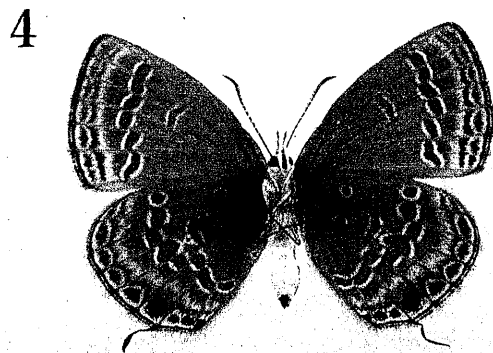
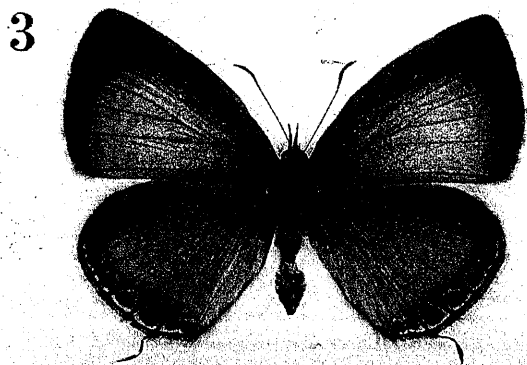
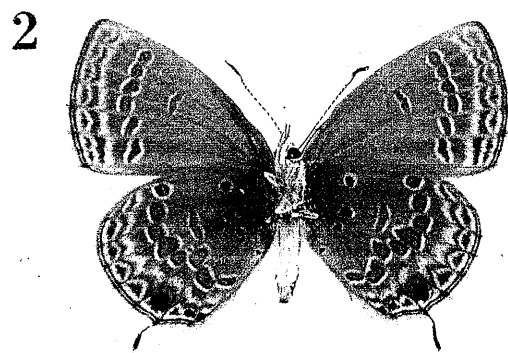
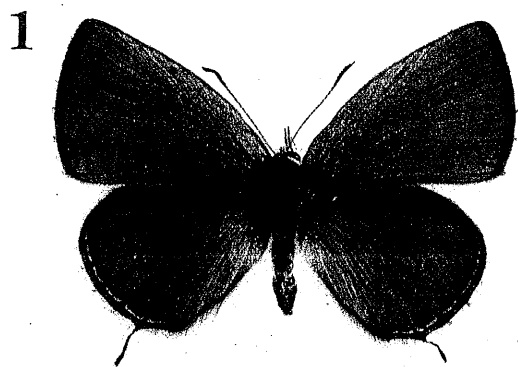
R, range of measurements; M, mean or unique measurement; S. D., standard deviation; N, sample size; τ , test statistics for materials from various habitats compared with ones from Taiwan; D, grouping result by Duncan's grouping method.

Figs. 1-4. *Chilades peripatria* sp. nov. 1. Holotype ♂ (NTUIM 2005), upperside; 2. Ditto, underside; 3. Paratype ♀ (NTUIM 2070), upperside; 4. Ditto, underside.

Figs. 5-8. Early stages of *Chilades peripatria* sp. nov. 5. Ovum; 6-7. larva; 8. pupa.

Fig. 9. A number of larvae of *Chilades peripatria* sp. nov. at a bud of *Cycas taiwaniana* Carrière.

Fig. 10. Ovum laid on a inedible dying leaf when over-reproduction occurs.



white at the base of each segment, club dark brown; head and frons gray, white adjacent to eye margins, palpi dark brown laterally white; thorax dark brown, dorsally overlaid with bluish gray hairs and ventrally overlaid with white hairs; abdomen grayish brown, ventrally white, legs grayish black overlaid with white.

Forewing termen convex, upperside bluish purple, termen dark brown; underside pale grayish brown to brown, wing patterned with brown spots edged with dark brown and an outer white margin, these spots comprising a discocellular spot and a postdiscal band, a white marginal and two submarginal white

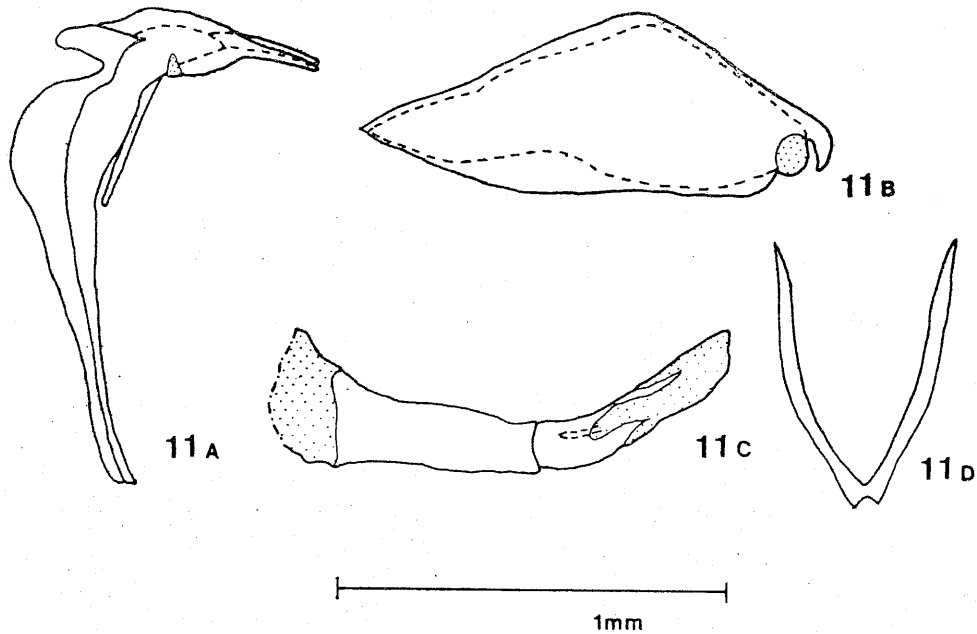
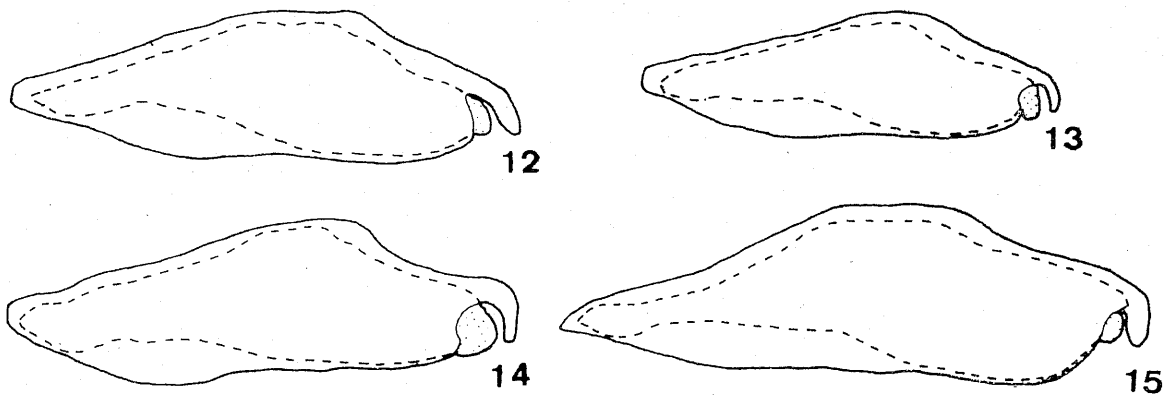


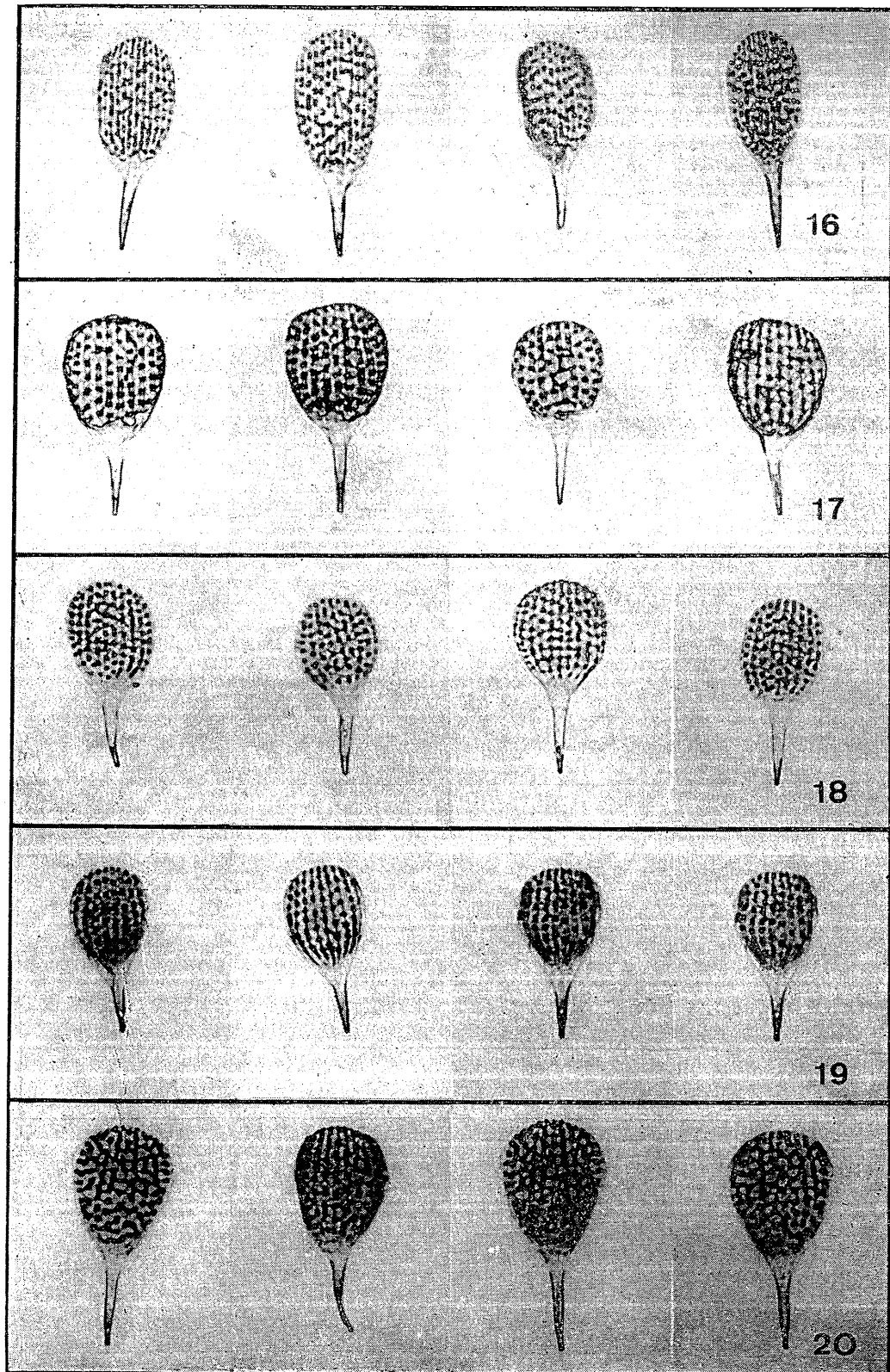
Fig. 11A-11D. Genitalia of *Chilades peripatria* sp. nov. A. Ring; B. Valva; C. Phallus; D. Juxta.



Figs. 12-15. Genitalia of *Chilades pandava* Horsfield. 12. Sample from Burma; 13. Sample from N. Thailand; 14. Sample from W. China; 15. Sample from Java.

Fig. 16. Androconia of *Chilades peripatria* sp. nov.

Figs. 17-20. Androconia of *Chilades pandava* Horsfield. 17. Samples for Burma; 18. Samples from N. Thailand; 19. Samples from W. China; 20. Samples from Java.



lines from apex to tornus, between the lines are pairs of dark grayish brown spots between each vein. Hindwing termen convex; upperside overlaid with its white basal hairs, ground colour same as the forewing but costa brown, termen narrowly dark brown with an inner white line, a series of submarginal spots along the white line, in which spots on cell Cu_1 and Cu_2 are black and the others brown, vein Cu_2 produced as a black tail tipped with white; underside similar in pattern and colours to forewing but four prediscal black spots usually in cell $Sc+R_1$, Cu_1 , 3A and discoidal cell, and one postdiscal black spot often in cell $Sc+R_1$, in cell Cu_1 is a orange-crowned black spot and in cell Cu_2 and 2A perhaps is a similar spot but smaller and more irregular in shape. Cilia of both wings alike each other, termen with inner brown and outer white, and dorsum with only white.

Female: Forewing length 14.59 ± 0.94 mm. In all details, except pattern of the wings upperside, similar to the male in appearance. Forewing upperside costa, apex and termen brown broadly, proximal area iridescent blue. Hindwing upperside brown with a series of white-ridged marginal spots, that in cell Cu_1 is black crowned with orange, in cell Cu_2 is black and in the other cells are brown, proximal area same colour as that of forewing upperside, between the spots and the proximal iridescent blue area with a diffuse white postdiscal line.

Variation: Seasonal variation is obvious in this taxon. In high-temperature brood, both sexes have a darker ground colour of wing underside with a narrower submarginal line; the female has a reduced proximal blue area of wing upperside, in some cases the area becomes nearly disappeared. In low-temperature brood, both sexes have a paler ground colour of wing underside with a broader white submarginal line; the proximal

blue area of the wing upperside in the female is better developed.

Early stages: Ovum measures 0.49 ± 0.02 mm in diameter and 0.25 ± 0.01 in height, disc-like appearance but concave at micropyle, surface overlaid with minute process. Ovum is usually laid on the bud or young leaf, but when over-reproduction occurs it can be found from any position of the hostplant (Fig. 10). Larva is nearly cylinder, its colour is pale yellowish brown just after hatching, and becomes yellow, red, ochreous or green with growth. Body length reaches about 15 mm. It feeds on young leaf and soft tissue of hostplant, sometimes bores into midrib. Brown pupa measures 9.95 ± 0.33 mm in length, surface marked with a number of dark brown spots. Pupa usually hide in sponge-like substance around the base of leaves.

Hostplant: The main host is *Cycas taiwaniana* Carrière (Chang, 1982). *Cycas revoluta* Thunberg is also recorded (Anonymous, 1976), but the plant is perhaps a secondary host.

Distribution: Taiwan.

Etymology: The species name given to the new species is composed of *peri* around + *patria* habitat, which implies that the new species is derived from the peripheral population of *C. pandava*.

Holotype: ♂, TAITUNG, Yenping, Taoyuan (Abb. T). Emerged on 26. II. 1988 from larva. Yu-Feng Hsu leg. (Type no NTUIM 2005).

Paratypes: 8♂♂1♀, TAITUNG, Yenping, Hungyeh (Abb. H). 3. I. 1988, (NTUIM 2006-2013 & 2065); 1♂, (H), 30. I. 1988, (NTUIM 2014); 7♂♂2♀♀, (T), 9. II. 1988, (NTUIM 2015-2021 & 2066-2067); 2♂♂, (T), Emerged on 14. II. 1988 from pupae, (NTUIM 2022-2023); 1♀, Emerged on 18. II. 1988 from larva, (NTUIM 2068); 2♂♂, (T), Emerged on 22, II. 1988 from pupae, (NTUIM 2024-2025); 1♂2♀♀, (T), Emerged on 23. II. 1988 from pupae, (NTUIM 2026 & 2069-2070); 5♀♀, (T), Emerged on 25. II.

1988 from larvae, (NTUIM 2071-2075); 3♂♂ 14♀♀, (T), Emerged on 26. II. 1988 from larvae, (NTUIM 2027-2029 & 2076-2089); 3♂♂1♀, (T), Emerged on 27-28. II. 1988 from larvae, (NTUIM 2030-2032 & 2090-2099); 5♂♂5♀♀, (T), Emerged on 29. II. 1988 from larvae, (NTUIM 2033-2037 & 2100-2104); 6♂♂8♀♀, (T), Emerged on 1. III. 1988 from larvae, (NTUIM 2038-2043 & 2105-2112); 2♂♂13♀♀, (T), Emerged on 2. III. 1988 from larvae, (NTUIM 2044-2045 & 2113-2125); 3♂♂8♀♀, (T), Emerged on 3. III. 1988 from larvae, (NTUIM 2046-2048 & 2126-2133); 1♂3♀♀, (T), Emerged on 4. III. 1988 from larvae, (NTUIM 2049 & 2134-2136); 1♂5♀♀, (T), Emerged on 5. III. 1988 from larvae, (NTUIM 2050 & 2137-2141); 3♂♂8♀♀, (T), Emerged on 6. III. 1988 from larvae, (NTUIM 2051-2053 and 2142-2149); 3♂♂2♀♀, (T), 15. V 1988, (NTUIM 2054-2056 & 2150-2151); 2♂♂, (T), 16. V. 1988, (NTUIM 2057-2058); 1♂, (T), 17. V. 1988, (NTUIM 2059); 1♂, (T), Emerged on 27. V. 1988 from larva, (NTUIM 2060); 1♂, (T), Emerged on 28. V. 1988 from larva, (NTUIM 2061); 1♀, (T), Emerged on 30. V. 1988 from larva, (NTUIM 2154); 3♂♂2♀♀, (T), Emerged on 3. VI. 1988 from larvae, (NTUIM 2062-2064 & 2152-2153). Yu-Feng Hsu leg.

The types are deposited in the Insect Museum, Dept. of Plant Pathology and Entomology, National Taiwan University.

To distinguish this taxon from the allied species *Chilades pandava*, the following characters can be available.

(a) Valva of male genitalia of *peripatria* is convex dorsally, whereas in *pandava* is plane.

(b) Valva of male genitalia in *peripatria* is shorter and broader than that in *pandava*.

(c) Androconia of *peripatria* is slenderer than that of *pandava*.

DISCUSSION

Chen and Chen (1983) reported that to complete a life cycle of this taxon needs

only 31.5 days. They also reported the intraspecific competition of the larvae is very fierce. Since the larva only utilizes soft tissue, it is very difficult to find on area to supply enough food for keeping its population. In Taiwan only the region along the Ruyeh stream in Taitung possesses abundant native *Cycas taiwaniana*, so the region is the unique place that *C. peripatria* can ceaselessly undergo reproduction though in some cases the insect is able to migrate to another place where *Cycas* is grown, and reproduces there for several generations. Even in Ruyeh region, the population of the insect can not be kept stable, it usually fluctuates according to the supply of the bud of *Cycas taiwaniana*. This host plant is an old gymnosperm, and budding of the plant is concentrated in spring and early summer except rarely irregular budding. Therefore the insect usually undergoes "bottleneck" effect. In the bottleneck term the population size of the insect is small due to the reduction of larva's food. This phenomenon may cause the genetic evolution (Mayr, 1963).

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REFERENCES

- Anonymous. (1976) *The major pests of flowers and trees in Taiwan*. Dept. of Plant Pathology and Entomology, National Taiwan University, Taipei, 84pp. (In Chinese).
- Chang, Y. C. (1982) *The common pests of the economical trees in Taiwan*. Taipei, 48pp. (In Chinese).

- Chen, J. C., and W. H. Chen. (1983) On ecology and food-competition of *Chilades kiamurae* Matsu-mura. *Abstracts of papers presented at 1982 annual meeting of the Entomological Society of the Republic of China* p. 4. (In Chinese).
- Hsu, Y. F. (1987) Notes on *Chilades pandava* *pandava* Horsfield from Taiwan. *Tyô to Ga* 38: 9-12.
- Konishi, T. (1987) The collection of one unrecorded *Chilades* species from Taiwan. *Gekkan-Mushi* 196: 25. (In Japanese).
- Mayr, E. (1963). *Animal species and evolution*. Belknap, Harvard Univ. Press, Cambridge, 797pp.

記新種 *Chilades peripatria* 之系統分類地位

徐 堉 峰

經研究發現臺灣之食蘇鐵性小灰蝶與分布于大陸東南亞地區之近緣種 *Chilades pandava* Horsfield 在發香鱗及交尾器 Valva 長寬比上有顯著而穩定之差異，故名東陞蘇鐵小灰蝶 *C. peripatria* sp. nov.。由于此蟲幼蟲賴寄主之柔軟組織為食，且世代甚短，臺灣僅臺東鹿野溪流域之蘇鐵保護區一地可供其世代綿延不絕。因臺灣蘇鐵每年僅在春夏之際有一回開芽期，在此時期此蟲可迅速增殖成一大族羣，而在其他季節則僅有少許不定芽可供其維持一小族羣。此現象致使此蟲易在小族期「流失」基因，符合 Mayr (1963) 所提出之種分化易在族羣邊緣發生之說法。此新種之種名即用以表示上述之特性。