

**New Species *Formosana lingchuanensis* from Taiwan
(PULMONATA : CLAUSILIIDAE)**

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關鍵詞：有肺類—煙管蝸牛科，陸貝。

Key words: Pulmonata—Clausiliidae, Landsnail.

In 1988, eleven living clausiliid snails were collected from Lingchuan, Peipu district, Hsinchu county by the author and members of the Malacological Society of China. They were allied to *Stereophaedusa horikawai ishizakii* Kuroda of same county, due to possess slender shell and absence of subcolumellar lamella on peristome. Although they were differed from the latter in having less whorled shell with more numerous parallel palatal plicae and very long principal plica. In addition, they have a long tongue shaped clausilium, long penial sheath and short diverticulum anatomically. Based on those characters they should be settled in genera *Formosana*. Among *Formosana* species from Taiwan, *Formosana formosensis* var. *chitouensis* Chang, *F. taiwanica* Pilsbry and *F. paraformosensis* (Ehrmann) Zilch have more affinity with them in slender shaped shell but differed from them due to presence of distinct subcolumellar lamella on peristome. Among the *Formosana* species from Taiwan, they are the unique species which lack the subcolumellar lamella on peristome. Therefore these snails from Lingchuan, Hsinchu county are considered as a new species of Genus *Formosana*.

Materials and Methods

Eleven specimens were collected from Lingchuan, Peipu district, Hsinchu county.

Shell morphometric items as shell length (SL), shell width (SW), width of 7th whorl (7W), apertural length (APL), and apertural width (APW) were measured. The ratio of SL/SW, 7W/SW and APL/APW were also calculated. These specimens were compared with other clausiliid snails from a several localities of the island (Map A) based on the above morphometric items. Reproductive system and radula were also inspected. The snails were immersed in boiling water for a few seconds and were separated their soft body from shells in water. They were dissected in FAA solution under a dissecting microscope.

Result

Formosana lingchuanensis, n. sp. (Plate 1)

Shell:

Medium in size (28.6 mm long, 6.1 mm wide), slender fusiform, purple brown in colour. Whorls 11 in number. Each whorl weakly convex with shallow suture. Shell surface incremental irregular oblique straight or interrupted rib-striae without acrossed wrinkles or nodules intermediately. Upper spire subcylindrical, not pale in color as that of *Formosana formosensis* var. *hotawana*. Apex relatively sharp. Succeeding whorl increased in diameter gradually reaching 4.4 mm

at the 7th whorl which is 68% of shell width. Penultimate whorl largest in diameter. Body whorl markedly contracted. Aperture sub-vertical, long pear shaped, slightly receding, 7.8 mm long, 5.4 mm wide, peristome white, moderately thickened, expanded and reflected, purple-brown in colour interiorly. Superior lamella distinctly oblique to the left side, connecting inwardly with spiral lamella. Inferior lamella raised nodular and thickened on lower half. Subcolumellar lamella invisible. Principal plica very long, about two thirds of circumference of last whorl. Numerous subequal palatal plicae parallel and oblique. Most upper one relatively long. Lunella absent. (Plate I. Fig. 1)



Plate I. *Formosana lingchuanensis* n. sp. (left two specimens) and *Formosana formosensis* var. *chitouensis* (right two specimens).

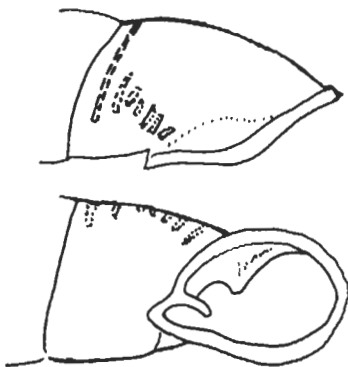


Fig. 1. Body whorl of *Formosana lingchuanensis* n. sp. Left: Ventral view. Right: Lateral view.

The clausilium long, narrow tongue shaped (4.0 x 1.7 mm), moderately arcuated to posterior. Bilateral margins parallel and slightly thickened with callus. Apex roundy but slight angulate with thickened callus nodule, no notch formation. (Fig. 2)



Fig. 2. Clausilium of *Formosana lingchuanensis* n. sp.

Reproductive system:

Penial sheath well developed, anterior half large in diameter with distinct papillar pavement pattern inwardly. Epiphallus firm, short, rather slender than posterior half of penial sheath, recognizable from out side by constriction at junction of penial sheath. Penial retractor long, strong, attached to posterior part of epiphallus. Vas deferens very long, slender, held closely to anterior end of penial sheath by a fibrous tissue, attached loosely to vagina and adhered to oviduct at anterior end of prostate.

Vagina well developed, large in diameter which is two times of that of anterior penial sheath. Oviduct moderately long, wide which is a half of width of vagina. Spermatheca long crescent form, red-yellow in colour. Spermathecal duct slender. Diverticulum thickened on anterior part but slender to posterior, almostly same length as lengths of the spermatheca and spermathecal duct combined. Stalk of spermatheca well developed, large in diameter to posterior. (Fig. 3)

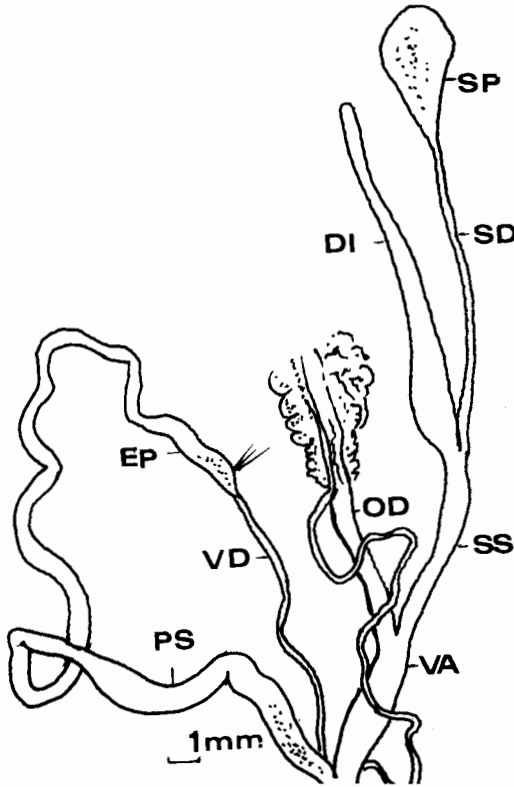


Fig. 3. Reproductive system of *Formosana lingchuanensis* n. sp.

Radula:

Radular ribbon 2.4 mm long, 1.0 mm wide, carrying about 110 rows of teeth. The radular teeth formula is 35+C+35. Lateral tooth forms into more oblique and longer cuspid starting from the 10th tooth. (Fig. 4)

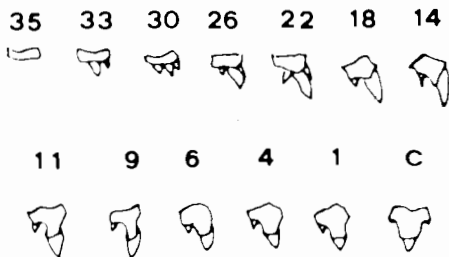


Fig. 4. Radula of *Formosana lingchuanensis* n. sp.

Remarks:






The present species from Lingchuan, Hsinchu county is allied to *Stereophaedusa horikawai ishizakii* Kuroda 1941 from same county in shell size, shape and colour, especially in apertural view which absent subcolumellar lamella. But it differs from the latter in having a rather less whorled shell with more numerous parallel palatal plicae and very long principal plica on the last whorl. In addition, the present species has a long narrow tongue shaped clausilium, long penial sheath and diverticulum which is same or shorter than lengths of spermatheca and spermathecal duct combined. (Table 1, 2)

The genera *Formosana* Böttger, 1877 of the family clausiliidae which was set up by *Formosana swinhoi* (Pfeiffer) as a type species is characterized by having the numerous parallel subequal plicae in palatal structure, very long principal plica on the last whorl, emergence of subcolumellar lamella on peristome often and long narrow tongue shaped clausilium (Zilch, 1956). In anatomical study of reproductive system, it is also characterized by presence of long penial sheath and shorter diverticulum. However the present species lacks the subcolumellar lamella on peristome, it has distinct characters which agree with those of *Formosana* mentioned above, inevitably should be settled in genera *Formosana*.

Among *Formosana* species from Taiwan, present species has more affinity with *F. formosensis* var. *chitouensis* Chang 1984, *F. taiwanica* (Pilsbry 1909) and *F. paraformosensis* (Ehrmann 1929) Zilch 1954 in its slender shape of shell. But it is differed from them in having more or less whorled shell and absence of subcolumellar lamella on peristome (Plate 1, Table 1). So far as we know, among the *Formosana* species from Taiwan it is the unique species which lack the subcolumellar lamella on peristome. Therefore present species is

Table 1. Comparison of conchometrics and conchomorphologies of *F. lingchuanensis* n. sp. and other allied clausiliids from Taiwan

(in mm)

	<i>F. lingchuanensis</i> n. sp. n ¹ = 11 Chang, 1988	<i>F. form'</i> var. <i>chitouensis</i> n = 10 Chang, 1984	<i>F. taiwanica</i> n = 2 Pilsbry, 1909	<i>F. paraformosensis</i> n = 3 Zilch, 1954	<i>Stereoph' ishizakii</i> n = 2 Kuroda, 1941
Shell length	28.0	33.3	35.1	27.5	29.1
width	6.1	7.4	6.18	6.6	5.35
SL/SW ²	4.63	4.5	5.74	4.16	5.43
7W ³	4.4	5.3	3.77	4.38	3.1
7W/SW	73%	71.6%	61%	66%	58%
Aperture length	7.1	9.2	7.35	7.26	6.0
width	5.1	5.9	5.45	5.4	4.0
APL/APW ⁴	1.39	1.56	1.34	1.34	1.5
Whorl number	10½–11	10	11–14	10–11	13–14
Shell surface colour	purplish brown	purplish brown	glossy pale brown	purplish brown	slightly dark brown
Sculpture	straight or interrupt striae. across wrinkle (–)	wavy striae. across wrinkle (+)	interrupted striae.	oblique striae. across wrinkle (+)	incremental rib-striae. across wrinkle (–)
Principa plica	very long	very long	very long	very long	not so long
Palatal armature	numerous subequal parallel plicae 	numerous subequal parallel plicae 	numerous subequal parallel plicae 	numerous subequal parallel plicae 	upper plica oblique, rather longer, low plica punct, oblique 
Subcolumellar lamella	(–) 9 (±) 2	(+)	(+)	(+)	(–)
Clausilium	long, narrow tongue shape.	long, narrow tongue shape.	long, narrow tongue shape.	long, narrow tongue shape.	long pear shape. broaden to distal.

1. n: Sample size.

2. SL/SW: Shell length to shell width ratio.

3. 7W: Width of 7th whorl.

4. APL/APW: Apertural length to apertural width ratio.

Table 2. Measurement of reproductive system and radula of *F. lingchuanensis* n. sp. and other allied clausiliids of Taiwan

(in mm)

	<i>F. lingchuanensis</i> n. sp. n*=2 Chang, 1988	<i>F. formosensis</i> <i>chitouensis</i> n=2 Chang, 1984	<i>Stereophaedusa</i> <i>horikawai</i> n=3 Chang, 1984
Penial sheath (PS)	17.0–35.0	27.5	3.0–7.0
Epiphallus (EP)	4.0–8.0	5.5	2.5–5.0
Vas deferens (VD)	20.5–28.0	35.5	10.6–12.2
Vagina (VA)	3.8–4.0	9.0	1.2–2.3
Oviduct (OD)	5.0–7.5	6.5	2.5–6.0
Spermatheca (SP)	2.5–4.5 × 1.5–2.5	4.0 × 0.8	2.2–3.0 × 1.0–1.5
Spermathecal duct (SD)	8.5–10.0	15.0	4.0–5.5
Spermathecal stalk (SS)	5.0–6.0	11.0	6.0–10.5
Diverticulum (DI)	11.0–12.0	11.5	12.0–14.0
DI/SP+SD**	0.76–1.09	0.605	1.6–2.0
Radula			
row of teeth	110	112	122
radular formula	35+C+35	33+C+33	24+C+24

* n: Sample size.

** DI/SP+SD: Length of diverticulum to combined lengths of spermatheca and spermathecal duct ratio.

considered as a new species. Pilsbry's key to genera *Formosana* (1909) may be added a new item as below:

A₂..Shell slender, purple- brown in colour, the diameter contained 5 times in the length, whorl 11 in number. Surface showed oblique straight or interrupted rib-striae without acrossed wrinkles intermediately. Apertural view absent sub-columellar lamella almostly
 *F. lingchuanensis*

Depository:

Holotype; Length 28.6 mm, width 6.1 mm. (Taiwan Museum, Taipei. TM-MT. 8825)

Paratype I; Length 31.6 mm, width 6.4 mm. (Author's collection)

Paratype II; Length 28.0 mm, width 5.8 mm. (Mr. Yang's collection)

Paratype III; Length 26.0 mm, width 5.9 mm. (Mr. Lai's collection)

Type locality:

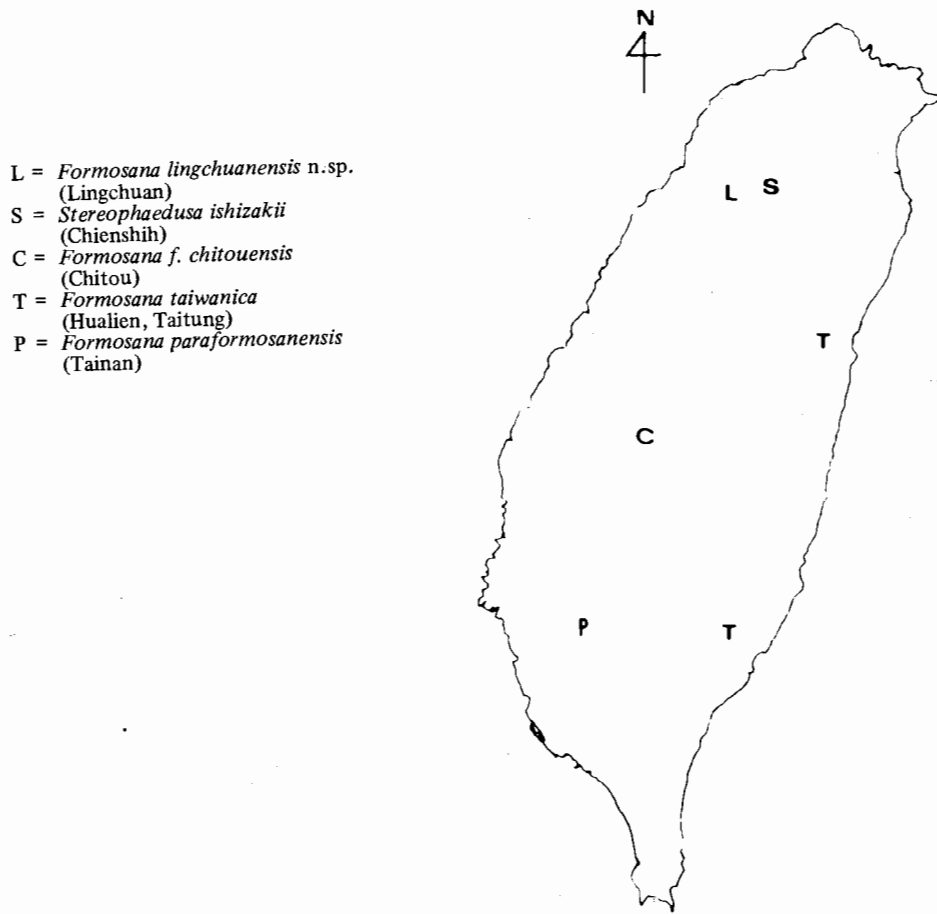
Lingchuan, Peipu district, Hsinchu county. Under a wood of broad-leaved tree where is a sloap near to river-side of Taping river.

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Map A. Distribution of localities of *F. lingchuanensis* n. sp. and compared clausiliid snails.

臺灣產冷泉煙管蝸牛(新種)

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民國七十七年著者及中華民國貝類學會會員赴新竹縣北埔鄉冷泉的學會採集活動時，採集的拾壹個煙管蝸牛標本經外殼測量及解剖觀察。因其外殼細長，殼口沒有露顯下軸板之緣故，頗似同新竹縣產的石崎氏煙管蝸牛(琉球煙管蝸屬)。但因其外殼螺層更少，主襃很長及體層具有更多平行的腔襃之特徵與後者相差。尤其是在其解剖所見，有更長的陰莖鞘，與精囊，精囊管等長或更短的盲管，舌狀細長的閉板等，很明顯應屬於台灣煙管蝸屬之特徵。本種與台灣產台灣煙管蝸屬蝸牛裏的，殼型更細長的溪頭型台灣煙管蝸，光澤台灣煙管蝸及旁台灣煙管蝸相似，但本種的殼口沒有露出下軸板，與後者等明顯相差。台灣產 *Formosana* 屬蝸牛中，僅本種在殼口沒有顯出其下軸板。故擬訂為新種，命名為冷泉煙管蝸。

冷泉煙管蝸(新種) *Formosana ling-cuanensis* n.sp.

本種的殼長28.3mm，殼寬5.9mm。其

殼型細長(殼長對殼寬比4.82)。有十一層更平坦的螺層，其殼表呈暗紫褐色，有彫刻不整的直線或中斷狀線條，在各線條間沒有任何鱗狀或顆粒狀皺紋。殼口上板斜走，在內襃連結至螺旋板。下板隆起粒狀，下半部肥厚。不顯出下軸板。體層之主襃很長，下面有平行更短的六至七條腔襃斜走，無月狀襃。閉板細長舌狀，左右兩緣平行而稍肥厚，末端略呈圓狀而肥厚，但沒有凹痕。

生殖器解剖的構造因呈更長的陰莖鞘及不長的盲管，具備台灣煙管蝸屬的特徵。齒舌各齒列的齒式35+C+35共有約110排。

模式標本	殼長度 (公厘)	殼寬度 (公厘)	保管者
第一標本	28.6	6.1	台灣省立博物館 TM-MT8825
第二標本	31.6	6.4	著者
第三標本	28.0	5.8	楊國昌
第四標本	26.0	5.9	賴景陽

標本模式產地：新竹縣北埔鄉冷泉，大坪溪西南岸，濶葉樹之山坡。