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Note on *Hemiphaedusa ooi* Kuroda Albino Population from Pailu (Pulmonata: Clausiliidae)

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Among the collection of clausiliid snails from central Taiwan in 1976, I have noted that 18 specimens from Pailu, Taichung County were resemble *Hemiphaedusa ooi* Kuroda from Kukuan, northern shore of Ta-chia river, Taichung County. Although they have rather large and more whitish colour on their shells and soft bodies. In personal opinion of the writer, these snails still should be considered as an albino population of *H. ooi.*

Material and Method

Shell morphometric items as shell length (SL), shell width (SW), width of the 7th whorl (7W), apertural length (APL) and apertural width (APW) were measured. Reproductive system and radula were also inspected. The ratio of SL/SW, APL/APW and 7W/SW were calculated. I also compare these items among *H. ooi* specimens which were collected from Kukuan, northern shore of the Ta-chia river. (Table 1, 2) The snails were immersed in boiling water a few second and were separated their soft parts from shells in water. They were dissected in FAA solution under a dissecting microscope.

Result

Shell:

Medium in size, moderately thick, fusiform, semitransparent, whitish in color. Whorls 10–10½ in number. Each whorl mederately convex with distinct suture. Upper part of spire subcylindrical with obtuse apex. Succeeding whorls increase in diameter reaching 4.8 mm at the 7th whorl which is about 87.5% of the shell width. Irregular fine oblique striae on the surface. Penultimate whorl largest in diameter. The last contracted inferiorly and dorsally. Aperture extends weakly to forward beyond the penultimate whorl with continuous peristome, oblique pear shaped, lip expanded with lustrous white thick callus inside with well developed sinulus. Superior lamella thick, marginal, oblique, strongly arcuates to left side, continued inwardly with spiral lamella. Inferior lamella well developed, situated inwardly, strongly angulated on upper half and thickened on lower half. Subcolumellar lamella barely emerged or absent on apertural margin. There is a small elevated tooth like callous process existing on the inner margin of outer lip which limited the sinulus inferiorly. Principal plica very long. Upper palatal plica united on its outer end with the upper end of the lunella, thus forms a strong arc as reverse "C" on the lateral side. Lower palatal plica vestigial. (Fig. 2)

The clausilium long oval shape measured as 3.4–2.7 mm long, 1.6–1.4 mm wide, strongly arcuates to posterior. Margin slightly thickened. Apex of the plate is almost round, thickened with long pear or oval shape callus. Notch presents. (Fig. 3)

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Reproductive system:

Penial sheath short, well developed, yellowish slightly tortuous. Junction with epiphallus is inconspicuous. Epiphallus also well developed, semitransparent whitish on anterior half, white-yellowish on posterior half. Vas deferens slender but slightly thickened to posterior, attached loosely to vagina and closely to anterior end of penial sheath by a fibrous tissue. Vagina short, thick. Oviduct rather long and slender. Spermatheca long oval shape, slightly yellowish and located under-neath the intestine. Spermathecal duct short, rather slender. Stalk of spermatheca rather thick and equal length as spermathecal duct. Diverticulum tortuous, rather thicker than spermathecal duct, slightly longer than this combined elngth of spermatheca and spermathecal duct.

Radula:

Radula ribbon 2.05 mm long, 0.75 mm wide, carrying about 95 rows of teeth. The radula teeth formula is 25+C+25. Lateral teeth transform into more oblique and longer cuspid starting from the 9th tooth. (Fig. 4)

Type locality:

Pailu, Taichung County. The southern shore of Ta-chia river. Collected from spaces between the conglomerate of lacolized patches.

Remark:

The present species from Pailu differed from *H. ooi.* from Kukuan, northern shore of the Ta-chia river by having rather large whitish shells and soft parts, fine striated, lustrous shell surface with more expanded upper spire and more shortened penial sheath. Although both of them are almost similar on shapes of shell (including apertural view and plicae), clausilium, radula and reproductive system. Hence the species from Pailu should be considered as an albino type mutation of *H. ooi.*

Albino mutation may be divided as genetic and non-genetic. About species of genetic albino mutation of pulmonate, already many authors reported their cross experiment such as for *Lymnaea peregra* (Boycott and Diver, 1927. Cain, 1956), *Biomphalaria* sp. (Newton, 1954. Richards 1962, 1973) *Cepaea* sp. (Cain & Sheppard, 1954), *Phylomycus* (*Incilaria*) *bilineatus* (Ikeda, 1928, 1937), *Euhadra quaesita* (Emura 1971), *Euhadra grata* (Emura, 1978), and *Bradybaena similaris* (Emura, 1956, 1971). Although about the population of albino mutation, there are only a few reports such as for *Zaptyx* (*Mesozaptyx*) *ishikawai* (Minato, 1979), 14 species of snails (Cooke, 1959) and *Stereophaedusa japonica* (Tada, 1973). In last report Tada reported that 10% of 50 specimens of *S. japonica* were albino. But in Pailu all specimens (18) of *H. ooi* are albino. Hence nongenetic factors also may be considerable in regard to this albino population. Some unexplained factors on this locality which to be particularly favourable to the production of albino variety are suspectable. These factors such as a climate (includes temperature, moisture and duration of daylight etc), environment and feed, resulted to break an enzyme which produce the pigment of superficial structure of soft body and allow to emerge the recessive gene of albinism. This enzyme block is hereditable secondary.

Creese (1976) recognized that food availability, rather than a genetic factor, determines the amount of pigmentation. In the shell of *Austrococchlea constricta*, this author reported that different algaes on six shores of Sydney resulted to the various chlorophyll pigmentation on the shell surface. Regards to an environment, it was already known that the animals (includes fishes, reptiles, insects and snails) breed in deep cave may alter to blind or albino. And in plant, some barley species under the low-temperature, may mutates to and may be inherited as albino. Generally speaking, in environmental factors as high temperature and

high moisture are favourable to promote pigmentation, others while low temperature and low moisture to produce fainting or lack of pigmentation on an animate thing. (Gloger's law). Further ecological observation of more numerous specimens of *H. ooi* of other locality is highly requested.

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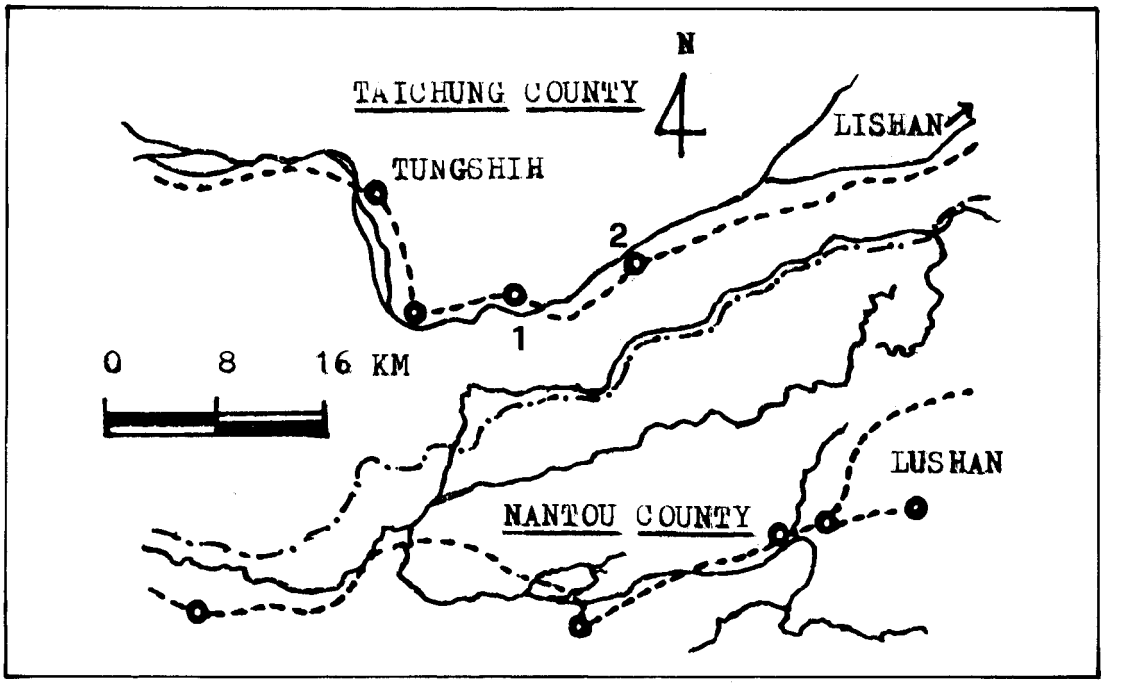

Fig. 1. Map of Taichung County shows the locality of *H. ooi*. 1: Habitat of albino type, Pailu. 2: Kukuan.

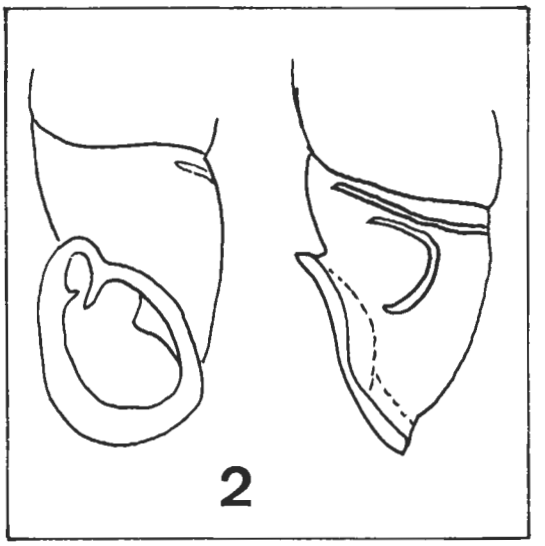

Fig. 2. Body whorl of *H. ooi*; albino type. Left: ventral view. right: lateral view.

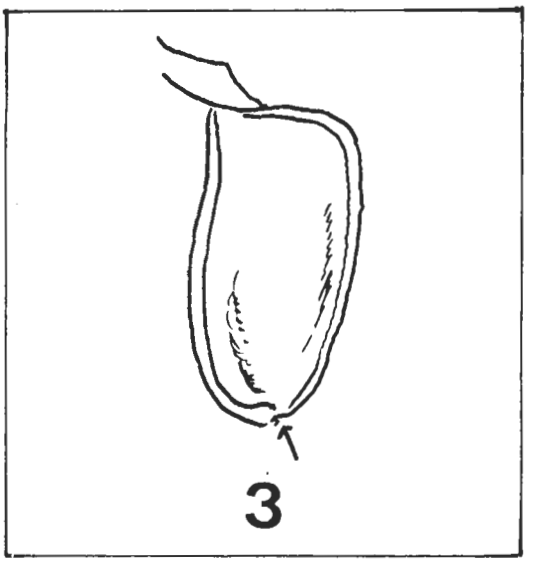

Fig. 3. Clausilium of *H. ooi*; albino type.

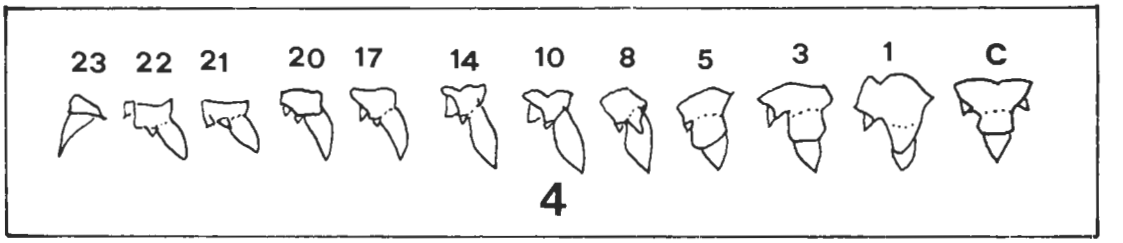

Fig. 4. Radula of *H. ooi*; albino type.

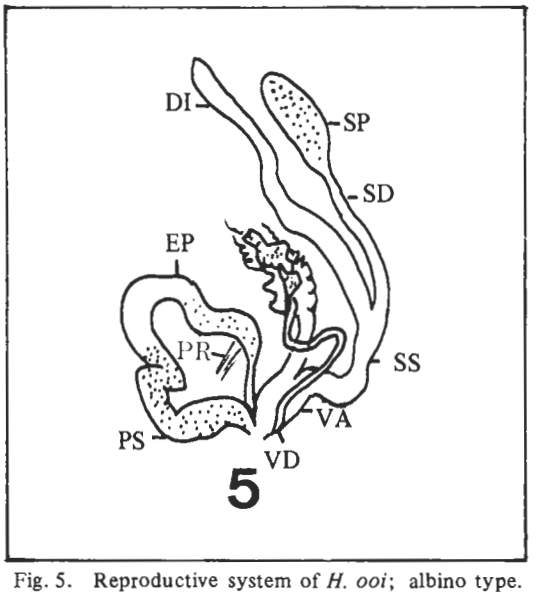

Fig. 5. Reproductive system of *H. ooi*; albino type.

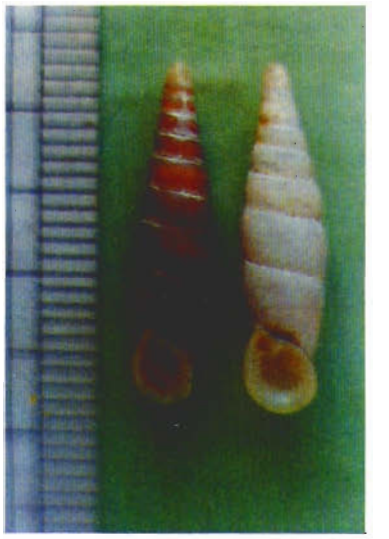

Fig. 6. *H. ooi* Kuroda. Left: *H. ooi* from Kukuan. Right: *H. ooi*, albino type from Pailu.

Table 1. Comparison of conchometrics and conchomorphology of *H. ooi* from Pailu (Albino type) and from Kukuan. (in mm)

	Albino sp. from Pailu n[1] = 18 (The author)	*H. ooi* from Kukuan n = 28 (The author)
Shell		
Length	21.7	19.4
Width	5.5	4.9
Length/Width	3.96	3.98
Whorls	10 – 10½	9½ – 11
Aperture		
Length	5.5	4.8
Width	4.5	3.7
APL/APW[2]	1.24	1.29
7W[3]	4.8	3.5
7W/SW[4]	87.5%	71.46%
Shell		
Colour	white or pale straw-yellow	grey-brown or faint brown
Striae	irregular fine striae	irregular distinct striae
Apertural shape	rather round pear shape	rather longer pear shape
Subcolumellar lamella	$7/18^{(+)}, 11/18^{(-)}$	$18/28^{(+)}, 4/28^{(\pm)}, 6/28^{(-)}$
Labium tooth	total (+)	total (+)
Clausilium	3.1 x 1.4 mm, long oval shape, notch (+)	2.5 x 1.3 mm, oval shape or crescent shape, notch (+)

[1] n = Sample size
[2] APL/APW: Apertural length to apertural width ratio.
[3] 7W: Width of 7th whorl.
[4] 7W/SW: Width of 7th whorl to shell width ratio.

Table 2. Measurement of reproductive system and radula of *H. ooi* from Pailu (Albino type) and from Kukuan. (in mm)

	Albino sp. from Pailu n[1] = 3	*H. ooi* from Kukuan n = 2
Penial sheath (PS)	4.5	8.0
Epiphallus (EP)	5.2 – 5.8	2.8 – 4.8
Vas deferens (VD)	9.5 – 11.0	9.5 – 9.8
Vagina (VA)	1.3 – 3.5	1.8 – 2.0
Oviduct (OD)	1.8 – 6.5	1.8 – 5.0
Spermatheca (SP)	3.0 – 3.7 x 0.6 – 1.2 long oval shape	2.7 – 3.0 x 0.7 – 1.4 pear or crescent shape
Spermathecal duct (SD)	4.2 – 4.5	3.5 – 4.8
Spermathecal stalk (SS)	4.2 – 10.0	4.8 – 6.5
Diverticulum (DI)	8.0 – 8.3	6.4 – 7.5
DI/SP + SD[2]	1.1	1.15
Redula		
Ribbon size	2.05 x 0.75	2.0 x 0.8
Row of teeth	Ca 90	Ca 103
Formula of radula	25 + C + 25	26 + C + 26

[1] n = Sample size.
[2] DI/SP + SD: Length of diverticulum to combined length of spermatheca and spermathecal duct ratio.

白鹿產王氏煙管蝸牛白型變異個體羣

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民國六十五年自台中縣白鹿採取的十八個煙管蝸牛是頗似同縣谷關（大甲溪北岸）產的**王氏煙管蝸牛**。雖然其外殼稍大，殼表及軟體呈白色，殼表彫不整微小線條帶光澤及有更粗短之陰莖鞘，但兩者間之殼形(包括殼口及腔襞之形狀)，閉板，齒舌及生殖器大略相同之緣故，白鹿產煙管蝸牛擬訂爲**王氏煙管蝸牛**之白型變異個體群。

白型變異分爲基因性及非基因性。關有肺類軟體動物之基因性白型變異已有衆多之報告。(例如Boycott & Diver 1927, Cain 1956, Newton 1954, Richards 1962, 1973, Cain & Sheppard 1954, Ikeda 1928, 1937, Emura 1956, 1971, 1978, etc)。但關白型變異之個體群之報告是稀見。僅有Cooke 1959, Tada 1973, Minato 1979。日人多田報告**日本煙管蝸牛**50個中僅10%有白型變異。在白鹿採到的十八個**王氏煙管蝸**全部都呈白型，因此著者認爲這白型變異個體群可能是非基因性要素引起的。是否白鹿之環境有容易使這蝸牛發生白型變異之某要素存在。例如氣候（包括氣温、濕度、日光時間之長短），環境及食料有無破壞表在組織之色素形成而發生白型之劣性基因顯露。對這色素形成酵素之破壞會二次的變成遺傳性變異，食料；Crease 1976 認定食料比基因更容易影響色素形成作用。他舉例一種軟體動物在澳洲 Sydney 之六個海岸因當地食料之海藻不相同，使各域個體群之殼表呈葉綠素色素沈著之差異。環境要素；例如在洞窟深處之動物爲黑暗之環境下發生盲目或白型變異。氣候；關于植物例如大麥在冷温下變異白型而會遺傳下去。一般説生物在高温高濕之氣候下會加強其色素形成，反此在低温低濕下會減弱或缺乏色素之形成。(Gloger 氏定律)。白鹿之白型個體群發生之原因要探討其他地區更多之**王氏煙管蝸牛**或調查該地域之更多其他動物生態才能確定。