蛇蛙研究

CHINESE HERPETOLOGICAL RESEARCH

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内 容 简 介

《蛇蛙研究》主要报道以两栖爬行动物为研究对象的生物化学、生物学、细胞学、生态学、生理学、分类区系、毒理学等方面的科学论文，实验方法，国内外研究综述等。

Brief Introduction

Each book of the Chinese Herpetological Research mainly publishes theses on the biochemistry, biology, cytology, ecology, physiology, fauna, toxicology, etc. of reptiles and amphibians used as research materials, and on the experimental methods involved, as well as reviews on current developments, at home and abroad, in this field.

蛇 蛙 研 究 **CHINESE HERPETOLOGICAL RESEARCH**

赵尔宓 编
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剑蛇属中国产种类的分类学研究

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剑蛇属(*Sibynophis*)是分布于亚洲的一属中小型蛇类，其特征是：齿骨后端与隅骨（或称上隅骨）游离，二者间有一定程度的活动性；牙齿细小均匀而数多，每侧上颌骨上可有25～56枚，各牙齿侧扁而端部略平，在上颌骨上形成剑形的锐利切缘，适于咬吃具硬鳞的蜥蜴如石龙子之类；全部背椎均具发达的椎体下突(hypapophysis)。本属与分布于中南美的铲齿蛇属(*Scaphiodontophis*)很相近，过去曾将此二属共置于剑蛇属。

本属已知共7种，我国有3种。黑领剑蛇 *Sibynophis collaris* (Gray, 1853)分布于喜马拉雅山南坡，西起Simla，东到中南半岛，我国记载于西藏东南部及云南，它以上唇鳞10枚，前颞鳞一枚，仅与最大的第八枚上唇鳞相切，区别于另二种(图1)。黑头剑蛇 *Sibynophis chinensis*(Günther, 1889)分布于我国南部广大地区及越南北部，上唇鳞9枚，前颞鳞2枚，下前颞鳞较大，与第七、八两枚上唇鳞相切。棕头剑蛇*Sibynophis grahami*(Boulenger, 1904) 系依据云南昆明与曲靖间一号标本所订名，以后曾在昆明与武定采到过标本。棕头剑蛇与黑头剑蛇很相近，所以Pope(1935, 81页)及Smith(1943, 3:276)仅以其具较少(83或以下）尾下鳞与黑头剑蛇（98或以上）相区别。

Maki(1931)依据我国台湾省剑蛇属标本10号，以其腹鳞数偏低(164-179)订为台湾亚种(*Sibynophis collaris formosensis*——按其上唇鳞及颞鳞特征应隶*Sibyno* *...nensis*)。经采用划分亚种的差异系数法将台湾标本与我国大陆各地黑头剑蛇标本进行比较，无论在腹鳞数、尾下鳞数或腹鳞与尾下鳞数之和等方面，二者均未达到划分亚种的标准。因此认为台湾标本作为黑头剑蛇的亚种是不能成立的。

近年，分别在位于四川与云南交界处的泸沽湖的云南一侧及四川西南部米易县采到一批剑蛇属标本，其尾下鳞数较多与黑头剑蛇似，但腹鳞数也较多又与棕头剑蛇似，由此引起作者的注意。于是，将我国各地被鉴定为此两种的标本加以比较，并参考文献记载，结果发现：黑头剑蛇与棕头剑蛇标本具以下共同特征：上唇鳞9，3-3-3式；眶前鳞1，眶后鳞2；颞鳞2+2，仅个别标本一侧的前颞鳞为1，二者的腹鳞与尾下鳞在两性间无明显区别，虽然黑头剑蛇的尾下鳞多于棕头剑蛇，棕头剑蛇的腹鳞多于黑头剑蛇，但腹鳞与尾下鳞数之和则较一致；此外，二者的色斑亦相似。因此认为：*Sibynophis grahami*(Boulenger, 1904)应为*Sibynophis chinensis*(Günther, 1889)的同物异名，其中文名仍称黑头剑蛇。

在详细比较黑头剑蛇各地居群的腹鳞与尾下鳞数(表1及表2)，结合地理分布特点（图2及图3）则可划分为三种类型。由图2可见：居群A以腹鳞数较少区别于居群B与C，其两两间的差异系数(Coefficient of Difference)均已达到划分亚种的标准；居群B以尾下鳞数少于居群C，彼此间的差异系数亦已达到划分亚种的标准。居群C以其腹鳞与尾下鳞数之和多于居群A，彼此间的差异系数也达到划分亚种的标准。因此认为：黑头剑蛇可划分为3个亚

Table 1. Ventral and Subcaudal Counts of *Sibynophis chinensis*.

Locality	n	Ventrals	Subcaudals	Ventrals+Subcaudals	Material or Reference
Yichang, Hubei	1	182	53+		Type of *S. chinensis*
Sichuan	16	172-184	83-119	258-295	Chengdu Inst. of Biol.
Gansu	2	179, 184	25+, 49+		Feng, 1981
Guizhou	3	171-186	104-114	285-294	Chengdu Inst. of Biol.
"	10	176-185	90-130	270-309	Wu et al., 1985
Guangxi	2	176, 176	50+, 112	288	Fan, 1931
Jiangxi	2	170, 175	74+, 81+		Chang, 1936
"	2	179, 180	108,101	287,281	Maslin, 1950
Fujian	6	174-180	107-125	287-299	Chengdu Inst. of Biol.
Hainan I.	1	173	81	254	Chengdu Inst. of Biol.
"	1	167	115	282	Schmidt, 1925
Taiwan	10	164-179	110-129	281-301	Maki, 1931
"	1	182	79+		Kuntz, 1963
Vietnam	1	165	107	272	Bourret, 1937
between Kunming and Kutsing	1	185	83	268	Type of *S. grahami*
Yunnan	2	188, 194			Pope, 1935
"	1	195	93	288	Chengdu Inst. of Biol.
Western Guizhou	11	183-206	80-104	267-309	Wu et al., 1985
Miyi, Sichuan	7	189-199	108-119	297-314	Chengdu Inst. of Biol.
Lugu, Lake Yunnan	3	196-199	112-115	310-312	Yunnan University

Table 2. Subspecific Differenciation of *Sibynophis chinensis*.

Population	n	Ventrals			Subcaudals			Ventrals+Subcaudals		
		range	mean	S. D.	range	mean	S. D.	range	mean	S. D.
A	58	164-187	177.4	5.09	81-130	108.8	10.93	254-309	285.9	10.78
B	15	185-208	193.3	6.32	80-110	95.8	8.32	267-309	289.5	12.67
C	10	189-199	194.8	3.73	108-119	113.5	3.51	297-314	309.1	5.82

Table 3. Description of *Sibynophis chinensis miyiensis*, ssp nov.

Number	Sex	Dorsal scales	Ventrals	Subcaudals	Upper labials	Lower labials	Loreals	Preoculars	Postoculars	Temporals	
CIB 105026	male	17-17-17	189	108	3-3-3	9/8(4)	1	1	2	2+3	
CIB 105027	"	17-17-17	194	110	3-3-3	9(4)	1	1	2	2+2	holotype
CIB 105028	"	17-17-17	192	119	3-3-3	9(4)	1	1	2	2+2	
CIB 105030	"	17-17-17	198	116	3-3-3	9(4)	1	1	2	2+2	
CIB 105031	"	17-17-17	199	115	3-3-3	8(4)	1	1	2	2+2	
YU 857012	"	17-17-17	198	112	3-3-3	9(4)	1	1	2	2+2	
YU 857013	"	17-17-17	199	113	3-3-3	10(5)	1	1	2	2+1	
YU 857021	"	17-17-17	196	115	3-3-3	10(5)	1	1	2	2+2	
CIB 105025	female	17-17-17	190	56+	3-3-3	9(4)	1	1	2	2+2	allotype
CIB 105029	"	17-17-17	193	99+	3-3-3	8(4)	1	1	2	2+2	

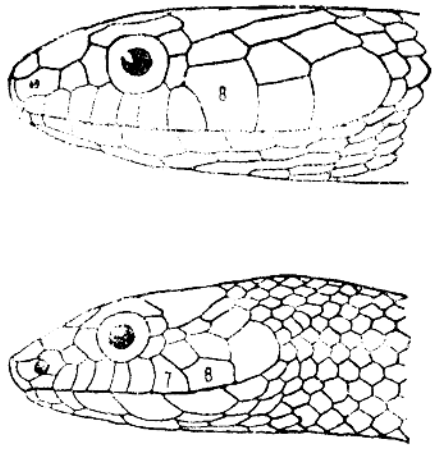

Figure 1. Head scalation of Chinese species of the genus *Sibynophis*.
upper: *Sibynophis collaris*
lower: *Sibynophis chinensis*

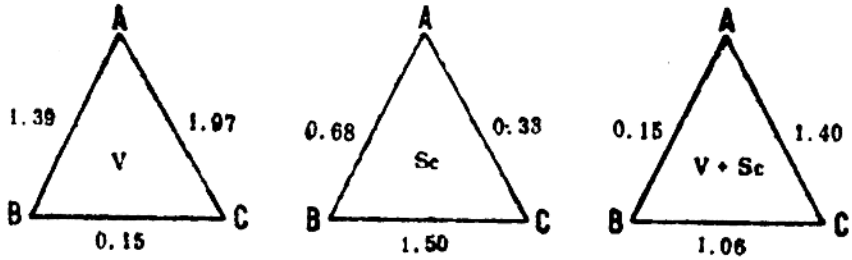

Fig. 2. Coefficient of Difference among Three Populations of *Sibynophis chinensis*.

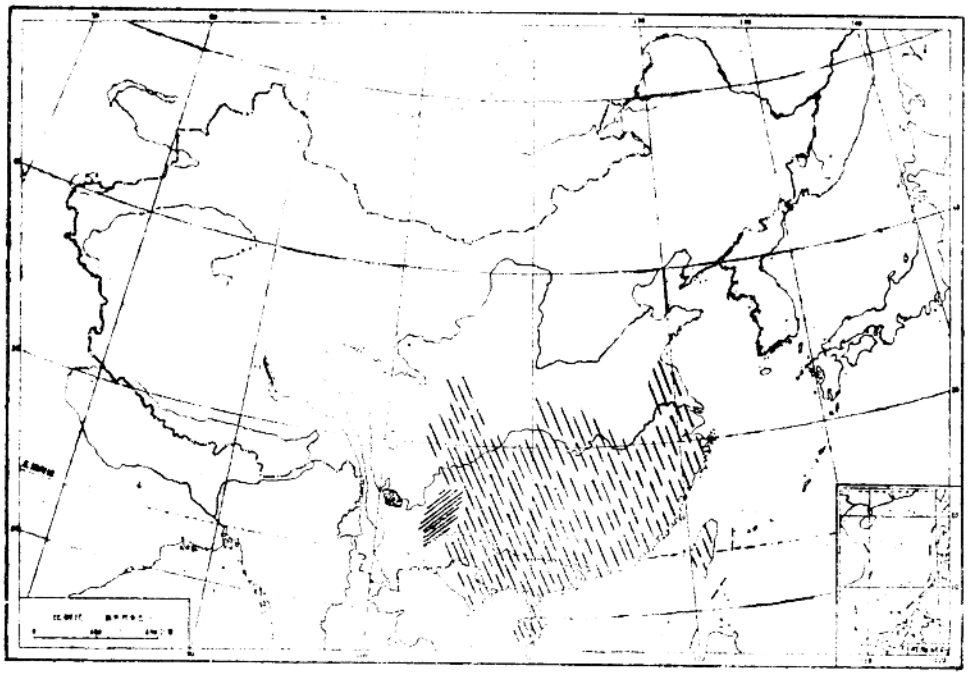

Figure 3. Distribution of subspecies of *Sibynophis chinensis*.
S. c. chinensis(dotted line)
S. c. grahami(black line)
S. c. miyiensis, ssp. nov.(black spot)

种如下：

1. **黑头剑蛇指名亚种***Sibynophis chinensis chinensis* (Günther, 1889)

Ablabes chinensis Günther, 1889. Ann. Mag. Nat. Hist., (6)4:220.

Sibynophis hainanensis Schmidt, 1925. Amer. Mus. Novitates, no. 157 (type locality: Nodoa, Hainan).

模式标本产地：湖北宜昌。

形态特征：腹鳞数较低(164-187，平均177.4)，尾下鳞数较高(81-130，平均108.8)，腹鳞与尾下鳞数之和254-309，平均285.9。

分布：国内已知产地有：江苏(栖霞山)，浙江(桐庐)、莫干山)，湖北(宜昌)，湖南(长沙)，福建(崇安、南平、福州、福清、德化)，台湾，江西(庐山)，广东(罗浮山、连平)，海南岛(那大、五指山)，广西(罗香)，贵州(印江、雷山、兴义、赤水、清镇、务川、贵定)，四川(九峰山、峨眉山、安县、宝兴、宜宾)，甘肃(徽县)，山西(石泉)。国外见于越南北部。

2. **黑头剑蛇云贵高原亚种***Sibynophis chinensis grahami* (Boulenger, 1904)

Polydontophis grahami Boulenger, 1904. Ann. Mag. Nat. Hist., (7)13:132.

模式标本产地：云南昆明曲靖间。

形态特征：腹鳞数较高(185-208，平均193.3)，尾下鳞数较低(80-110，平均95.8)，腹鳞与尾下鳞数之和267-309，平均289.5。

分布：云南(昆明、武定)，贵州(威宁)。

3. **黑头剑蛇米易亚种　新亚种***Sibynophis chinensis miyiensis* Zhao and Kou, ssp. nov.

模式标本：

正模：CIB105027，雄性；四川米易，海拔880m；1986年6月；康绍和采。

配模：CIB105025，雌性；与正模同。

副模：7号雄性(CIB Nos. 105026, 105028, 105030-1；YU Nos. 857012-3, 857021)，1号雌性(CIB105029)。其中CIB系列与正模同，YU系列采自四川云南交界处的泸沽湖，海拔2600m；1985年；寇治通采。

模式标本产地：四川米易与四川云南交界处的泸沽湖。

形态特征：腹鳞数(189-199，平均194.8)与尾下鳞数(108-119，平均113.5)均较高，腹鳞与尾下鳞数之和(297-314，平均309.1)亦较已知另二亚种为高。

分布：目前仅见于模式标本产地。

综上所述，剑蛇属在我国有二种，其中黑头剑蛇有3个亚种，检索如下：

1A　上唇鳞10，3-3-4式；前颞鳞1枚，其下缘仅与最大的第八枚上唇鳞相切……黑领剑蛇 *S. collaris*

1B　上唇鳞9，3-3-3式；前颞鳞2枚，其下缘楔入第七、八两枚上唇鳞间……2

2A　腹鳞187以下；分布于我国东部低山丘陵地区……黑头剑蛇指名亚种 *S. c. chinensis*

2B　腹鳞185以上；分布于我国西部云贵高原及川西南山地……3

3A　尾下鳞110以下；分布于贵州西部及云南东部高原地区……黑头剑蛇云贵高原亚种 *S. c. grahami*

3B　尾下鳞108以上，分布于四川西南山地及云南北部山地……黑头剑蛇米易亚种 *S. c. miyiensis*

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A TOXONOMIC STUDY ON CHINESE SPECIES OF THE GENUS *SIBYNOPHIS*

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Abstract

Three species of *Sibynophis* were recognized from China. *S. collaris* is readily distinguished from the other two in having ten supralabials with the eighth, which is largest, in contact with the single anterior temporal. *S. grahami* should be a synonym of *S. chinensis*. *S. chinensis* can be divided into three subspecies. The nominate subspecies has less ventrals and more subcaudals; *S. c. grahami*, in contrast with the former, has more ventrals but less subcaudals. The total number of ventrals plus subcaudals is the same in these two subspecies. The third one is a new subspecies named as *S. c. miyiensis*. It has a higher ventral count like the *grahami* and a higher ventrals plus subcaudals count than the former two subspecies. *Sibynophis chinensis miyiensis* Zhao and Kou, ssp. nov.

TYPES: Holotype: CIB 105027, male; Miyi County, Sichuan Province, China, 880m; 1986; by Kang Shaohe. Allotype: CIB 105025, female; the same as the holotype. Paratypes: 7 males (CIB Nos. 105026, 105028, 105030-1; YU Nos. 857012-3, 857021) and 1 female (CIB 105029). The CIB number series the same as the holotype. The YU number series collected from Lugu Lake, Sichuan-Yunnan border, 2600m; 1985; by Kou Zhitong.

DIAGNOSIS: This new subspecies differs from the other two subspecies in

having higher ventrals plus subcaudals count. It differs from *S. c. chinensis* in having more ventrals and from *S. c. grahami* in having more subcaudals.

DISTRIBUTION: Known from the type locality: Miyi County, southwestern Sichuan and on the shore of Lugu Lake, which constitutes part of the border between Sichuan and Yunnan.

This article was read by the author at the annual meetings of ASIH held at Albany 21-25 June, 1987.

Chinese Herpetol. Res. 1987:7-11

KARYTYPES OF CHINESE SPECIES OF OCCIDOZYGA (FAMILY RANIDAE), WITH DISCUSSION ON THE TAXONOMIC STATUS OF O. laevis martensi

(Plate I)

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(Chengdu Institute of Biology, Academia Sinica)

The number of the species in the ranid genus *Occidozyga* is comparatively small; but the animals are widely distributed over Southeast Asia. In China, two species, *O. lima* (Gravenhorst) and *O. laevis martensi* (Peters) have so far been found. They range mainly over tropical and subtropical areas of Fujian, Hainan Island and the mainland of Guangdong, Guangxi, and Xishuang Banna and Hekou of southern Yunnan. The taxon *martensi* has for a long time been considered as a subspecies of *O. laevis* (Guenther), type locality in the Philippines. However, Liu and Hu (1961, p. 226) pointed out that there were considerable differences in morphology between the taxon *martensi* collected from China and *O. laevis* captured in the Philippines.

This paper reports the karyotypes of the two species of *Occidozyga* found in China, compares them with the reported karyotype of *O. laevis* distributed over the Philippines, and discusses the taxonomic status of the taxon *martensi* known to Chinese herpetologists. The results produce convincing evidence for the establishment of *martensi* as a valid species.

Materials and Methods

Table 1 lists the frogs examined in the experiments. Both ends of the femur, tibio-fibula, and humerus bones were scissored off, and the marrow cells were washed out with 0.46 M KCl for chromosome preparation by a centrifugal air-drying method (Zhao et al., 1983) and a direct mounting method (Wu, 1982). The samples were stained for 20 min with 2% Giemsa (diluted by PBS, pH 6.8-7.0). Readers

are asked to refer to the previous report by the same authors (Tan et al., 1986) for the methods for analysing interspecific chromosome variation and the variation between different populations of *martensi*.

Results

Plate I depicts the karyotypes of *O. lima* found in Xishuang Banna and of the two populations, Hainan and Xishuang Banna, of *martensi*. For the measurement of the karyotypes, see table 2.

The diploid number of the above-mentioned frogs is the same, 2n=26, comprising two groups.

The large chromosome group includes chromosome Nos. 1-5, with a relative length (R. L.) larger than 9%. It is worth mentioning that the R. L. of No. 1 in *O. lima* is very similar to that in the Hainan population of *martensi*, but quite different from that in the Xishuang Banna population. The difference in R. L. of the remaining chromosomes among the three populations is not prominant. With regard to the arm ratio (A. R.), chromosome Nos. 1, 4, and 5 of all three populations are metacentric (m); No. 3 is submetacentric (sm); No. 2 is submetacentric in *O. lima*, but metacentric in the two populations of *martensi*.

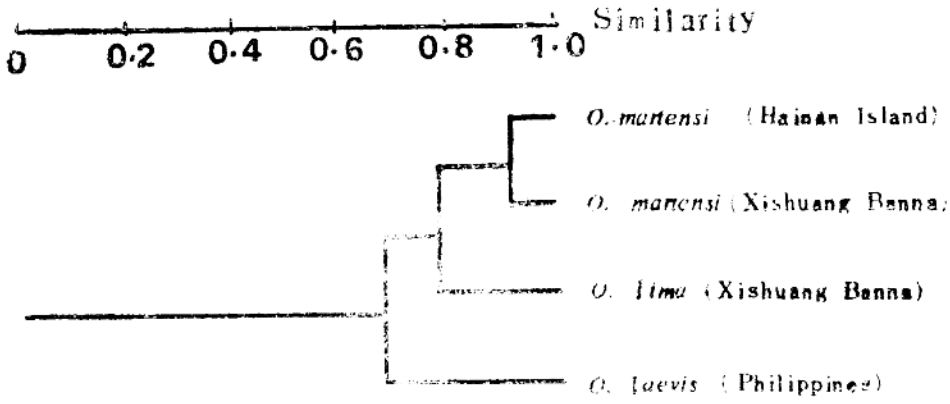
The small chromosome group comprises chromosome Nos. 6-13, with a R. L. less than 7%. The difference in R. L. is not obvious between *O. lima* and the Hainan population of *martensi*, but is prominant between these two and the Xishuang Banna population of *martensi*. Nos. 6, 7, 11, and 12 are metacentric; Nos. 8 and 9 submetacentric in all three populations. Nos. 10 and 13 are metacentric in *O. lima*, but submetacentric in the two populations of *martensi*.

The secondary constrictions of the Hainan population of *martensi* can be readily observed on the short arms of Nos. 6 and 7, and on the long arms of Nos. 8-10. A satellite can also be seen on the long arm of No. 3 in a few cells (plate I, B). No secondary constrictions were observed on the chromosomes of *O. lima* and of the Xishuang Banna population.

On the whole, the karyotypes of the two populations of *martensi* are the same, except for some differences in R. L. and in the centromeric type of chromosome No. 13 (sm in the Hainan population but sm or st in the Xishuang Banna population). Whether these differences are due to population variation caused by geographical isolation or they are the result of errors in observation and measurement is still unknown and will be settled by future studies.

Discussion

The taxon *martensi* was first described by Peters (1867) as *Phrynoglossus martensi* based on the specimens collected from Bangkok. Smith (1923) reported it from Hainan Island; Chang (1942) from Wuxuan and Tengxian Counties, Guangxi, and



* Similarity = $\frac{\text{Numbers of the same kind of centromeric type}}{\text{Total numbers of centromeric types compared}}$

Figure 1. Presumed phylogenetic relationships of the four populations of *Occidozyga*.

Table 1. The specimens examined in this study.

Taxon	Number	Sex	Locality	Date
lima	2	female	Xishuangbanna, Yunnan	June, 1986
martensi	3	female	Xishuangbanna, Yunnan	June, 1986
martensi	1	female	Hainan Island	Sept., 1985

Table 2. Chromosome measurements of *Occidozyga* from China.

Chromosome Number	*lima* (Xishuangbanna)		*martensi* (Xishuangbanna)		*martensi* (Hainan)	
	Relative Length	Arm Ratio	Relative Length	Arm Ratio	Relative Length	Arm Ratio
1	14.31±0.45	1.28±0.04	15.68±0.73	1.15±0.06	14.39±0.57	1.10±0.08
2	12.06±0.48	1.74±0.17	12.78±0.69	1.56±0.14	12.35+0.62	1.53±0.11
3	11.20±0.36	1.91±0.14	11.33±0.69	2.19±0.13	10.92±0.29	2.20±0.15
4	10.28±0.45	1.64±0.11	10.76±0.48	1.57±0.15	10.30±0.42	1.59±0.15
5	9.58±0.52	1.23±0.12	9.42±0.39	1.31±0.12	9.31±0.46	1.28±0.09
6	6.52±0.39	1.18±0.12	6.21±0.39	1.29±0.13	6.52±0.26	1.14±0.07
7	6.09±0.28	1.15±0.11	5.79±0.30	1.37±0.17	6.06±0.15	1.17±0.07
8	5.75±0.40	1.97±0.20	5.58±0.34	2.55±0.39	5.87±0.29	2.41±0.23
9	5.44±0.35	1.90±0.19	5.20±0.37	2.58±0.43	5.45±0.22	2.32±0.38
10	5.19±0.35	1.19±0.09	4.82±0.30	2.30±0.35	5.08±0.27	1.98±0.20
11	4.92±0.35	1.22±0.12	4.51±0.34	1.30±0.16	4.93±0.21	1.29±0.10
12	4.54±0.38	1.30±0.13	4.23±0.31	1.36±0.20	4.71±0.22	1.40±0.17
13	4.11±0.26	1.39±0.12	3.70±0.38	3.07±0.70	4.11±0.30	2.42±0.36

Table 3. The centromeric type of chromosomes of four populations of the genus *Occidozyga*.

Taxon (Locality)	Centromeric Type												
	1	2	3	4	5	6	7	8	9	10	11	12	13
lima (Xishuangbanna)	m	sm	sm	m	m	m	m	sm	sm	m	m	m	m
martensi (Xishuangbanna)	m	m	sm	m	m	m	m	sm	sm	sm	m	m	st/sm
martensi (Hainan)	m	m	sm	m	m	m	m	sm	sm	sm	m	m	sm
laevis (the Philippines)	m	m	sm	m	m	m	m	m	m	m	m	m	m

Liu and Hu (1959) from Xishuang Banna, southern Yunnan. These authors, as well as other workers, who deal with the amphibian fauna of China in recent years, identified *martensi* specimens with *O. laevis* or its subspecies *O. l. martensi*. However, the characteristics of *martensi* are much different from those of *O. laevis*. For example, *laevis* has a disc beneath each toe-tip and a distinct longitudinal groove on the upper surface; the toe-tip in *martensi* only appears as a small swollen ball-like structure or a very indistinct disc, and it has no dorsal longitudinal groove. Moreover, the snout-vent length of *laevis* (48-49mm) is much greater than that of *martensi* (20-30mm). Therefore, they are in fact different species as listed in "Amphibian Species of the World" (Ed. Frost, 1985:464-465).

Kuramoto(1980)reported the karyotype of *O. laevis* from Binangonan, the Philippines, with a diploid number, 2n=26, comprising five large and eight small pairs. This is quite similar to our results using Chinese *O. lima* and the taxon *martensi*. In *laevis*, all the chromosomes except No. 3, which is submetacentric, are metacentric. This, however, is much different from the cases in *O. lima* and the taxon *martensi*.

Based on karyotypic materials of the four populations of three species in the genus *Occidozyga*, the phylogenetic relationship may be illustrated as figure 1.

It is therefore very clear, as shown in table 3 and figure 1, that the differences in the centromeric type of their chromosomes are prominent between *O. laevis* and the taxon *martensi*.

Conclusion

On basis of karyotypic and morphological characteristics, the taxon *martensi* should be regarded as a valid species. The name *Occidozyga laevis martensi* (Peters), formerly used for the specimens of the taxon *martensi* collected from Hainan Island, Guangxi and Yunnan, should be revised to *Occidozyga martensi* (Peters).

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中国产浮蛙属的染色体组型，兼论中国产圆舌浮蛙的分类地位

（图版Ⅰ）

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摘　要

中国产尖舌浮蛙和圆舌浮蛙的二倍染色体数2n＝26，由5对大型与8对小型染色体组成。尖舌浮蛙的第2-3，8-9对染色体为亚中着丝粒型，其余各对为中部着丝粒型。圆舌浮蛙第3，8-10，13对为亚中着丝粒型，其余各对为中部着丝粒型。基于中国产圆舌浮蛙与菲律宾产*O. laevis*在外部形态上的差异，在核型上也有多对染色体的着丝粒类型不同。因此，本文认为，中国产圆舌浮蛙不是菲律宾产*O. laevis* (Günther)的亚种，而是一个种级阶元，即*Occidozyga martensi* (Peters)。同时，本文也初步探讨了上述3种浮蛙共4个居群的系统发生关系。

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本所储义诊、曾晓茂二同志参加了云南西双版纳野外标本采集工作，特以致谢！

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A RARE CASE OF KARYOTYPE IN ANURA—A PRELIMINARY STUDY ON THE KARYOTYPE OF Philautus doriae (Boulenger) WITH DIFFERENT DIPLOID NUMBERS OF 26 AND 16

(Plate Ⅱ)

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In recent years the studies of the chromosomes of amphibians have been used as a useful method for the solution of some taxonomic and genetic problems. The discovery of more and more exceptional karyotypes has in turn raised new problems in cytogenetics awaiting scientists' answers. Schmid (1980, 1983) reported two species in Anura with highly developed XX/XY and ZZ/ZW sex chromosomes. Liu Wanguo et al. (1984) and Wu Guanfu et al. (1984) reported several species of Anura that have exceptional karyotypes, e.g. the karyotype of *Rana phrynoides* consisting of 64 telocentric microchromosomes, the presence of heteromorphic pairs of chromosomes (XX/XY) in *Amolops mantzorum*, and the occurence of different diploid numbers, 2n=26 (male) and 2n=27 (female) in *Amolops jingjiangensis*. In the studies of the karyotypes of pelobatids found in the Hengduan Mountains, another type of karyotypic polymorphism with 2n=26, 27 and 28 in *Brachytarsophrys carinensis* has been discovered (Tan et al., 1987, Acta Herpetologica Sinica 6(2)). The karyotype of *Philautus doriae* now under discussion is unique to this field.

Material and Method

Chromosome preparations and karyotype analysis were made after Wu (1980) and Tan et al. (1986), using 7 females and 1 male of *Philautus doriae* captured from Youle Mountain, Xishuangbanna, Yunnan on June 6, 1986 at the altitude of 1,100 m above sea level. Student's t-tests were then followed to testify the significance of difference.

Results

The frequency of different diploid numbers of the 8 specimens examined is presented in Table 1. The frequency of 2n=16 (86.93%) is much higher than that of 26 (13.07%).

Table 1. The diploid numbers and frequencies of the 8 specimens examined of *Philautus doriae*

No	Sex	2n=26*	2n=16
1	♂	6	11
2	♂	0	26
3	♂	1	7
4	♂	2	10
5	♂	0	35
6	♂	0	23
7	♂	1	7
8	♀	10	14
Total	cells	observed	
		20	133
Frequencies			
		13.07%	86.93%

* 2n=26 includes 2n=23(3), 2n=24(1) and 2n=25(1).

The statistical data for the two different karyotypes are tabulated in Table 2. The karyotype with 2n=26 is composed of 5 pairs of macro- (R.L.>9%) and 8 pairs of microchromosomes (R. L.<7%). Among these chromosomes, Nos. 1 and 4 are metacentric or submetacentric, Nos. 2-3 are submetacentric, and the rest are metacentric. This is quite similar to the case in other species of Rhacophoridae having the same diploid number. The karyotype with 2n=16 has never been described in rhacophorid frogs, even in Anura. In the case examined, all the 8 pairs of chromosomes are larger ones (R.L.>9%), among which Nos 5-6 are submetacentric and the rest are metacentric (Plate Ⅱ, Table 2). No heteromorphic chromosomes are observed.

Analysis and Discussion

Preliminary analysis shows that there seems to be a possibility of relationship between the two karyotypes. Despite the apparent differences in chromosome number and morphology, the first five pairs of macrochromosomes in the karyotype with a diploid number of 26 correspond with Nos. 2,4-6, and 8 in the other karyotype, except that the arm ratio of No. 2 in the karyotype of 2n=26 differs significantly from that of No. 4 in the other karyotype. In addition, the total relative length of Nos. 6-13 (41.96±2.49) is similar to that of Nos. 1, 3, and 7 (40.01±1.32) of the latter, implying that the two karyotypes may be homogeneous in origin. Further evidence for the homogeny of the karyotypes may be given by determining the DNA

Table 2, The two kinds of karyotypes of *Philautus doriae* (Boulenger)♂♂, (10 Cells)

2n=26				2n=16			
No.	Relative length	Arm ratio	Type	No.	Relative length	Arm ratio	Type
				1	15.92±0.65	1.45±0.12	m
1	14.34±0.68	1.68±0.11	m,sm	2	14.60±0.55	1.51±0.11	m
				3	13.54±0.44	1.24±0.13	m
2	12.11±0.54	1.78±0.21	sm	4	12.62±0.61	1.20±0.06	m
3	11.54±0.58	1.90±0.13	sm	5	11.90±0.57	2.00±0.11	sm
4	10.67±0.39	1.61±0.11	m,sm	6	10.89±0.38	1.82±0.10	sm
				7	10.55±0.23	1.13±0.11	m
5	9.59±0.54	1.35±0.13	m	8	9.83±0.44	1.11±0.06	m
6	6.77±0.38	1.57±0.10	m				
7	6.02±0.33	1.46±0.15	m				
8	5.58±0.28	1.30±0.13	m				
9	5.48±0.28	1.32±0.14	m				
10	5.03±0.30	1.31±0.17	m				
11	4.68±0.34	1.19±0.11	m				
12*	4.41±0.23	1.20±0.17	m				
13	3.99±0.35	1.15±0.07	m				

* Chromosome with satellite at the terminal of the long arm.

Table 3, Statistical analysis of the relationship between the two karyotypes

2n=26 no.	2n=16 no.	t-value between relative lengths	t-value between arm ratios
1	2	0.30	1.09
2	4	0.63	2.66*
3	5	0.44	0.59
4	6	0.40	1.41
5	8	0.17	1.68
6-13	1,3,7	0.47	

* differs significantly ($0.01<P<0.05$); the others differ insignificantly ($P>0.05$).

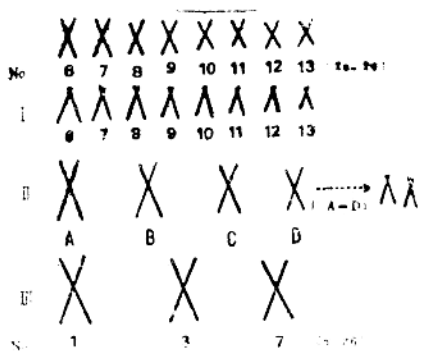

Fig 1, Presumed karyotype changes from 2n=26 to 2n=16
Stage I Pericentric inversion
Stage II Robertsonian fussion and fission
Stage III Random translocation and rearrangement