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## A Review of Reptiles and Amphibians of the Amami Group, Ryukyu Archipelago

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**Abstract.** Distributional records of reptiles and amphibians from each island of the Amami Group, Ryukyu Archipelago, are reviewed and some new records are added on the basis of the results obtained during the herpetological surveys in April and July, 1984, and May, 1985. Geographic variation, taxonomy, and a few aspects of natural history of some species and subspecies are presented and discussed.

### Introduction

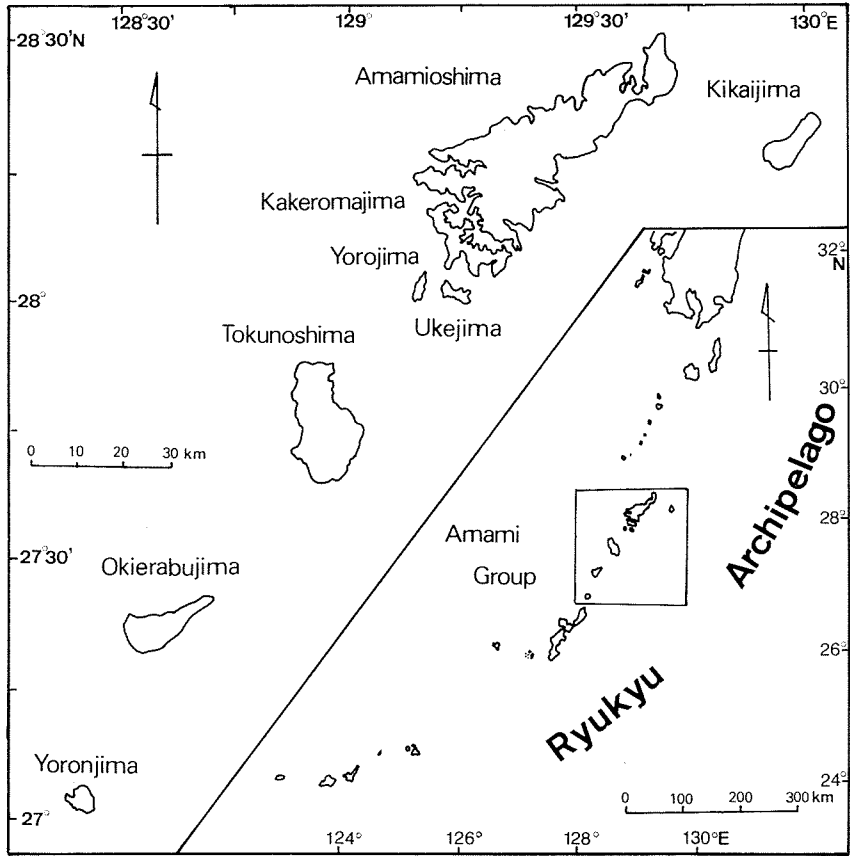
The Amami Group is located in the north-eastern half of the Ryukyu Archipelago, between the Okinawa and the Tokara Groups. The archipelago includes eight inhabited islands (Kikaijima, Amamioshima, Kakeromajima, Ukejima, Yorojima, Tokunoshima, Okierabujima and Yoronjima), and a few uninhabited islets (Fig. 1, Table 1).

During the last three decades, several reports on reptiles and amphibians of the Amami Group have been published (e.g., Koba, 1956, 1958, 1959, 1960; Hiraiwa et al., 1958; Takara, 1962; Morita, 1964; Shibata, 1964; Mishima, 1965). Recently, Toyama (1984, 1985) reviewed the literature on distributions of reptiles and amphibians in the Ryukyu Archipelago, and listed totally 19 species of reptiles and 12 species of amphibians from the Amami Group. Detailed information on the herpetofauna of each island belonging to this group is, however, quite sparse especially on Yorojima, Ukejima, and Kakeromajima.

On the basis of collectinos, new observations made during the surveys in April and

**Table 1.** Geographic data for each island of the Amami Group.

Island	Location	Area (in km <sup>2</sup> )	Elevation of the highest part (in m)
Kikaijima	28°20'N, 129°58'E	59	204
Amamioshima	28°23'N, 129°30'E	718	694
Kakeromajima	28°07'N, 129°15'E	83	321
Ukejima	28°01'N, 129°14'E	22	398
Yorojima	28°02'N, 129°10'E	15	297
Tokunoshima	27°44'N, 128°57'E	263	645
Okierabujima	27°24'N, 128°36'E	97	245
Yoronjima	27°09'N, 128°26'E	22	94



**Fig. 1.** A map showing the geographic locations of the Amami Group, and islands surveyed in the present study.

July, 1984 and May, 1985, and from a literature review, I herein provide revised distributional records of each species in the Amami Group. The purpose is to provide more detailed data for further herpetogeographical studies on the Ryukyu Archipelago. Morphological variations of some species from the group were compared with those from other localities with comments on their taxonomical implications. Brief notes on the habits of some species also will be given.

### Methods

On each island, I surveyed in the grass and bush along the coast, and, if present, also in the mountain forest in the day time. In the night, I looked in both illuminated and unilluminated portions around the inhabited area with the aid of the flashlight. Specimens were sexed by observing gonads.

The differences among means were tested for statistical significance with Kruskal-Wallis's test, Student's *t*-test, or Aspin-Welch's *t*-test, following Sokal and Rolf (1981).

## Results of the Survey

## CLASS REPTILIA

## ORDER SQUAMATA

## SUBORDER LACERTILIA

## Family Gekkonidae

*Gekko hokouensis* (Pope, 1928)

Specimens examined (N=73): Kikaijima (N=9), Ota's Private Number (OPN) 4186-4189, 4201, 4204, 4210-4211, 4254, VIII 3, '84; Amamioshima (N=5), OPN 2146-2147, IV 6, OPN 2270, VII 31-VIII 1, '84, OPN 3017, 4246, V 9, '85; Kakeromajima (N=1), OPN 4684, VIII 1, '84; Ukejima (N=2), OPN 4685-4686, V 7, '85; Yorojima (N=1), OPN 4687, V 8, '85; Tokunoshima (N=1), OPN 4688, IV 3, '84; Okierabujima (N=50), OPN 2113-2140, 4146-4153, 4157-4162, 4183-4185, 4249-4253, IV 1, '84; Yoronjima (N=4), OPN 2093, 4240-4241, 4243, III 31, '84.

This is the first record of this species from Kakeromajima. In the daytime, specimens were collected from under the bark of trees, and at night on the walls and windows of houses, both from the illuminated and dark portions.

Shibata (1981) divided *Gekko japonicus* from various localities of Japan into two types, A and B. He noted that all the 47 specimens from the Ryukyu Archipelago (28 from the Amami, 13 from the Okinawa, one from the Miyako, and five from the Yaeyama Groups) belonged to type B, in which the cloacal spur consisted of one enlarged tubercle. One Ishigakijima specimen was mistakenly reported to have two cloacal tubercles on both sides. (The second tubercle proved to be a slight wrinkle in a single tubercle (Shibata, pers. comm.)). Later, Zhou et al. (1982) examined a large number of specimens of *Gekko japonicus* from China and Japan, and regarded the gecko with a single pair of tubercle (=type B *sensu* Shibata (1981)) as a good species *Gekko hokouensis*. Several previous authors recorded *Gekko japonicus* from the Ryukyu Archipelago and the distributinoal map of *G. japonicus* and *G. hokouensis* by Zhou et al. (1982: Fig. 3) indicates that both species occur sympatrically in this region. However, all the 213 examined specimens of *Gekko* from the Archipelago, including 73 specimens listed above, belonged to *G. hokouensis*. No specimen of *G. japonicus* was found. It is, therefore, highly probable that *G. japonicus* does not occur in the Ryukyu Archipelago. Previous reports of *G. japonicus* seem more likely to be misidentifications of *G. hokouensis*.

The problem of nomenclatuarl priority of the species name of this form (*hokouensis*), pointed out by Shibata (1983), is deferred to future study.

*Hemidactylus bowringii* (Gray, 1845)

Specimens examined (N=4): Kikaijima (N=1), Okinawa Prefectural Museum (OPM) H936, VIII 5, '84; Kakeromajima (N=1), OPN 4688, VIII 1, '84; Ukejima (N=1), OPN 4689, V 7, '85; Yorojima (N=1), OPN 2982, V 8, '85.

This gecko was recorded from Kakeromajima, Ukejima, and Yorojima for the first time in the present survey. One specimen (OPN 4688) was found from under the bark of a dead tree in the daytime and the others were found on the illuminated windows and walls of buildings at night. Detailed data for another specimen (OPM H936) were given in Ota and Hikida (1985). This species is known also from Amamioshima and Tokunoshima (Shibata, 1965; Toyama, 1984).

*Hemidactylus frenatus* Duméril and Bibron, 1836

Tokunoshima, OPN 4691, IV 3, '84; Okierabujima, OPN 4693-4699, IV 1, '84; Yoronjima, OPN 4692, III 31, '84.

This gecko was abundant on Yoronjima and Okierabujima, but was uncommon on Tokunoshima, and was not found on the other islands of the Amami Group. The specimens were collected both around houses and in the forests.

*Gehyra mutilata* (Wiegmann, 1835)

Specimens examined (N=10): Kikaijima (N=1), OPM H937, VIII 5, '84; Amami-oshima (N=6), OPN 4700, IV 6, OPN 4701-4702, VIII 1, '84, OPN 4703-4705, V 6, '85; Ukejima (N=2), CPN 3037, 4054, V 7, '85; Yorojima (N=1), OPN 4706, V 8, '85.

This species was recorded from Yorojima for the first time in the present survey. It is also known from Tokunoshima and Okierabujima (Toyama, 1984).

Detailed data for OPM H937 were given in Ota and Hikida (1985). Specimens from Kikaijima, Ukejima, and Yorojima were found only in the shaded surfaces of walls of buildings, whereas, in Koniya of Amami-oshima, many individuals were foraging at night exclusively on the illuminated portion, where no other gecko species was observed, in May and August.

*Eublepharis kuroi wae splendens* (Nakamura et Uéno, 1959)

This species is known from Tokunoshima (Koba, 1956), but was not found in the present survey.

**Family Agamidae***Japalura polygonata* (Hallowell, 1860)

Specimens examined (N=145): Kikaijima (N=35), OPN 2266, 2321, 2335, 2337-2338, 2393-2395, 2409-2420, 3962, 4059-4062, 4067-4076, VIII 3, '84; Amami-oshima (N=16), OPN 2163, IV 6, OPN 2379-2389, VIII 1, '84, OPN 2968-2971, V 6, '85; Kakeromajima (N=33), OPN 2396-2408, 3984-3999, 4063-4066, VIII 1, '85; Ukejima (N=3), OPN 3104, 3277, 3973, V 7, '85; Yorojima (N=3), OPN 3426, 3471, 4438, V 8, '85; Tokunoshima (N=55), OPN 2159-2162, 2425-2429, 3426, 3471, IV 3-4, OPN 2940, 2943-2945, 3000, 3014, 3057, 3102, 3224-3225, 3286, 3457, 3465, VII 29, '84, OPN 3965, 4003-4031, 4033, V 4, '85.

Koba (1956) reported a specimen of *Japalura polygonata* from Yoronjima, but no additional record has ever been known. In Yoronjima, I interviewed sixteen inhabitants about this species by showing them its picture, but none of these persons remembers ever seeing such a lizard. Thus, this tree lizard does not likely occur on this island.

**Family Scincidae***Eumeces barbouri* Van Denburgh, 1912

Specimens examined (N=13): Amami-oshima (N=3), OPN 4707-4708, IV 6, OPN 4709, VIII 1, '84; Kakeromajima (N=2), OPM H934-935, VIII 2, '84; Tokunoshima (N=8), OPN 4710-4711, IV 3, OPN 4712-4714, VII 29-30, '84, OPN 4715-4717, V 5, '85.

I observed a few blue-tailed skinks on Ukejima and Yorojima. They possibly belong to the present species since they had brightly colored tails. Detailed data for OPM H934-935 were given in Ota and Hikida (1985). This species was found not only in the mountain forests but also in the grassland near the coast, occurring syntopically with *Eumeces marginatus oshimensis* on Tokunoshima. By contrast, on Amami-oshima, they were observed

only in the forests. All of the collected specimens possess a pair of postnasals and 22 rows of midbody scales.

*Eumeces marginatus oshimensis* Thompson, 1912

Specimens examined (N=16): Kikaijima (N=1), OPN 4718, VIII 3, '84; Amami-oshima (N=1), OPN 4719, VIII 1, '84; Tokunoshima (N=5), OPN 4720–4722, IV 4, '84, OPN 4723–4724, V 5, '85; Okierabujima (N=4), OPN 4725–4728, IV 2, '84; Yorojima (N=5), OPN 4729–4733, III 31, '84.

This species is recorded also from Kakeromajima, Ukejima, and Yorojima (Koba, 1958; Toyama, 1984).

*Ateuchosaurus pellopleurus* (Hallowell, 1860)

Specimens examined (N=6): Kikaijima (N=1), OPN 4734, VIII 3, '84; Amami-oshima (N=1), OPN 2974, VIII 1, '84; Ukejima (N=2), OPN 3031, 3034, V 7, '85; Yorojima (N=1), OPN 2941, V 8, '85; Tokunoshima (N=1), OPN 2942, V 5, '85.

This species is known also from Okierabujima (Koba, 1958). One adult was observed but not captured on Kakeromajima on August 1, '84. This lizard was recorded from Kakeromajima and Ukejima for the first time in the present survey.

Stejneger (1907) noted that there was variation in presence or absence of a frontal suture of *Ateuchosaurus pellopleurus*. Koba (1958) reported that only one out of eight specimens from the Amami Group lacked the frontal suture. Later, Shibata (1960) noted that all four specimens from Takarajima of the Tokara Group he examined had the frontal suture. Some scale characters (presence or absence of the frontal suture and the numbers of mid dorsal scales, fourth toe subdigits and mid-body scale rows) of this skink from the Tokara, Amami, and Okinawa Groups are presented (Table 2 and Table 3). There is no significant sexual differences in these characters within each local population. But the frequency of the presence or absence of the suture differs significantly between specimens from the Tokara-Amami and Okinawa Groups (Table 3); most of the specimens from the Tokara and Amami Groups have the frontal suture, whereas those from the Okinawa

**Table 2.** Scutellation ( $X \pm SE$ , with the number of specimens and range in parentheses) of *Ateuchosaurus pellopleurus* from Tokara, Amami and Okinawa Groups.

Localities	Frontal suture condition (present/absent)	Mid-dorsal scales	Scale rows at mid-body	Fourth-toe subdigits
Tokara Group <sup>(1)</sup>	17/1	—	—	—
Amami Group <sup>(2)</sup>	16/1	58.3±0.31 ( 8; 57–60)	25.0±0.30 (11; 24–26)	12.0±0.27 ( 8; 11–13)
Okinawa Group <sup>(3)</sup>	6/30	57.0±0.37 (33; 53–61)	26.8±0.16 (36; 25–28)	13.1±0.15 (33; 12–15)

<sup>1)</sup> Data from Koba (1959) and Shibata (1960).

<sup>2)</sup> Data from Hallowell (1860), Boulenger (1887) and Koba (1959) included.

<sup>3)</sup> Data from Stejneger (1970) and Koba (1959) included.

**Table 3.** Results of statistical comparisons in the scutellation of *Ateuchosaurus pellopleurus* between populations from the Amami and the Okinawa Groups tested by Kruskal Walli's test.

Frontal suture	Mid-dorsal scales	Scale rows at midbody	Fourth toe subdigits
p<0.001	0<0.05	p<0.001	p<0.01

Group lack it. Moreover, other characters also show geographic variation between the Amami and Okinawa populations. Thus, it is likely that further taxonomic study may reveal subspecific differentiation of *Ateuchosaurus pellopleurus* between the Tokara-Amami and Okinawa Groups.

#### Family Lacertidae

*Takydromus smaragdinus* Boulenger, 1887

Specimens examined (N=23): Kikaijima (N=5), OPN 4339, 4341, 4345-4347, VIII 3, '84; Amamioshima (N=3), OPN 4335-4337, VIII 1, '84; Kakeromajima (N=3), OPN 4000-4001, 4340, VIII 1, '84; Ukejima (N=3), OPN 4735-4737, V 7, '85; Yorojima (N=5), OPN 3032-3033, 4035-4037, V 8, '85; Tokunoshima (N=4), OPN 3027-3029, VII 30, '84, OPN 3103, V 4, '85.

This species is known also from Okierabujima (Toyama, 1984). Most of the lizards collected were found basking on the blades of grass.

#### SUBORDER OPHIDIA

#### Family Typhlopidae

*Ramphotyphlops braminus* (Daudin, 1803)

Specimens examined (N=2): Yoronjima (N=2), OPN 2783-2784, III 31, '84.

This species is recorded from all the inhabited islands of the Amami Group (Takara, 1962).

Present specimens are all adult females. They were found near coast under a rock on sand.

#### Family Colubridae

*Achalinus weneri* Van Denburgh, 1912

This snake is known from Amamioshima and Tokunoshima (VanDenburgh, 1912; Moriguchi and Naito, 1979), but was not collected in the present survey.

*Entechinus semicarinatus* (Hallowell, 1860)

Specimens examined (N=7): Amamioshima (N=1), OPN 4109, VIII 1-2, '84; Tokunoshima (N=5), OPN 4105-4106, IV 4, OPN 4107, VII 30, '84, OPN 3024-3025, V 5, '85; Okierabujima (N=1), OPN 4108, IV 1, '84.

This species is recorded from Kikaijima, Kakeromajima, Yorojima, and Yoronjima (Takara, 1962).

Specimens from Tokunoshima showed a variation in the dorsal color pattern. In most specimens, the dorsum is uniformly greenish tan, whereas two adults possessed four dark lines on the grayish brown ground color.

The numbers of ventrals (VT) and subcaudals (SC) of this species are presented in Table 4 for each locality of the Amami Group, as well as of the Tokara and Okinawa Groups. These data are compared geographically in Table 5.

Neither VT nor SC showed significant sexual difference within each local population when tested by Kruskal Walli's test. The SC does not differ among the local populations. The VT of the populations of the Amami Group, while showing no geographic variation within the group, is significantly smaller than in the Okinawa populations but larger than in the Tokara populations.

Maki (1931) noted that the VT of the specimens of *Entechinus semicarinatus* (formerly *Liopeltis semicarinata*) from Amamioshima was constantly smaller than that of the speci-

**Table 4.** Ventrals and subcaudals of *Entechinus semicarinatus* from the Tokara, Amami and the Okinawa Groups.

Localities	Ventrals				Subcaudals			
	N	X	SE	range	N	X	SE	range
Takarajima <sup>(1)</sup>	28	170.6	0.35	166–173	19	73.7	0.60	69–78
Amamioshima <sup>(2)</sup>	12	177.0	1.01	171–182	10	73.8	0.81	70–78
Tokunoshima <sup>(1)</sup>	7	178.3	0.89	175–182	5	72.8	1.02	70–76
Okierabujima <sup>(1)</sup>	8	179.9	2.22	173–190	4	73.3	1.18	70–75
Okinawa Group <sup>(2)</sup>	39	185.6	1.06	173–195	29	74.5	0.53	69–80

<sup>1)</sup> Data from Takara (1962) included.

<sup>2)</sup> Data from Maki (1931) and Takara (1962) included.

**Table 5.** Results of statistical comparisons in the number of ventrals and subcaudals among specimens of *Entechinus semicarinatus* from the Tokara, Amami and the Okinawa Groups. (Tested by Student's t-test for the pairs with the equal variances and by Aspin-Welch's t-test for the pairs with the unequal variances (\*))

Localities	Ventrals		Subcaudals	
	t	p	t	p
Takarajima vs. Amamioshima	6.02	<0.001*	0.06	NS
Takarajima vs. Tokunoshima	9.35	<0.001	0.73	NS
Takarajima vs. Okierabujima	4.14	<0.01*	0.34	NS
Takarajima vs. Okinawa Group	13.46	<0.001*	0.90	NS
Amamioshima vs. Tokunoshima	0.86	NS	0.73	NS
Amamioshima vs. Okierabujima	1.32	NS	0.37	NS
Amamioshima vs. Okinawa Group	5.87	<0.001*	0.66	NS
Tokunoshima vs. Okierabujima	0.66	NS*	0.29	NS
Tokunoshima vs. Okinawa Group	5.27	<0.001*	1.24	NS
Okierabujima vs. Okinawa Group	2.24	<0.05	0.81	NS

mens from the Okinawajima (type locality of the species) and described a new subspecies *Liopeltis semicarinata fritzei*. On the basis of the specimens mainly from other localities, Takara (1957a, b, 1962) postulated that the VT of this species varied continuously throughout its range and regarded Maki's (1931) taxonomic treatment as invalid. The present result, however, shows that variation of the VT is discontinuous among the three groups, although the ranges of variation slightly overlap with each other. Problems on the subspecific division of *E. semicarinatus* are to be reconsidered in later studies by examining additional characters.

#### *Dinodon semicarinatus* (Cope, 1860)

Specimens examined (N=3): Tokunoshima (N=3), OPN 4115–4116, IV 2, OPN 2128, VII 30, '84.

This species was recorded also from Kikajima, Amamioshima, Kakeromajima, Ukejima, Yorojima, Okierabujima and Yoronjima (Takara, 1962).

#### *Amphisma pryeri pryeri* (Boulenger, 1887)

Specimens examined (N=13): Amamioshima (N=7), OPN 3010, IV 6, OPN 4105–



4110, VIII 2, '84; Ukejima (N=4), OPN 2977, 2980-2981, 3015, V 8, '85; Yoorjima (N=1), OPN 3008, V 8, '85; Tokunoshima (N=1), OPN 4053, V 3, '85.

This species was recorded also from Kikajima, Kakeromajima, Okierabujima, and Yoronjima (Koba, 1956; Takara, 1962). In Ukejima, I observed 25 individuals in one rice paddy, approximately  $15 \times 15$  m<sup>2</sup> in area. They were hunting tadpoles and adults of *Rana l. limnocharis* and *Buergeria japonica*.

*Calliophis japonicus japonicus* Guenther, 1868

Specimen examined: Ukejima, OPN 4738, V 7, '85.

One adult male was collected while moving on arid, open ground in the evening. Morita (1964) reported *Calliophis j. japonicus* from Tokunoshima, but Mishima (1965) suggested that this record was likely the misidentification of *C. j. boettgeri*.

*Calliophis japonicus boettgeri* (Fritze, 1894)

No specimen was seen during the present survey.

Fritze (1894) described *Calliophis boettgeri* as a good species. Later, Nakamura and Uéno (1963) regarded it as a mere color variation of *C. japonicus*. After detailed examination of external characters in a large series of specimens, Koba et al. (1977) assigned the populations from Amamioshima, Yorojima, and Ukejima to nominate subspecies and the populations from Tokunoshima and Okinawajima to the other subspecies *boettgeri*.

**Family Viperidae**

*Trimeresurus flavoviridis* (Hallowell, 1860)

Specimens examined (N=2): Amamioshima (N=1), OPN 4739, VIII 1, '84; Tokunoshima (N=1), OPN 4740, IV 2, '84.

This dangerous snake was recorded also from Kakeromajim, Ukejima, and Yorojima (Koba, 1956, 1959).

*Trimeresurus okinavensis* Boulenger, 1892

This species is known from Amamioshima, Kakeromajima, Ukejima, Yorojima, and Tokunoshima (Koba, 1956; Takara, 1962), but was not collected in the present survey.

**CLASS AMPHIBIA**

**ORDER CAUDATA**

**Family Salamandridae**

*Echinotriton andersoni* (Boulenger, 1892)

I observed one larva of this species in a still water pool at the foot of a hill near Kame-toku, Tokunoshima, on May 5, '85. This newt was recorded from Amamioshima and Tokunoshima (Tago, 1931; Sato, 1943; Koba, 1956).

*Cynops ensicauda* (Hallowell, 1860)

Specimens Examined (N=82): Amamioshima (N=11), OPN 3132-3142, V 9, '85; Ukejima (N=18), OPN 3143-3160, V 7, '85; Yorojima (N=53), OPN 3161-3214, V 8, '85.

This species was recorded also from Kakeromajima (Morita, 1964). On Ukejima, I collected this newt in the coastal area near Ukeamuro where it was quite abundant in rice paddies and other bodies of water, both running and still. On Yorojima, however, it

was never found in rice paddies near the coast, but instead, was observed only in the waters on mountains above 170 m.

## ORDER SALIENTIA

### Family Microhylidae

#### *Microhyla ornata* (Duméril et Bibron, 1841)

Specimens examined (N=38): Kikaijima, six uncatalogued specimens, VIII 4, '84; Amamioshima (N=7), OPN 2833–2834, 2837–2839, 2842–2843 V 9, '85; Ukejima, two uncatalogued specimens, V 7, '85; Yorojima (N=23), OPN 4586–4608, V 8, '85; Tokunoshima, one uncatalogued specimen, VII 30, '84.

Tadpoles of this species were observed on Kakeromajima. This species was recorded from Kakeromajima, Ukejima, and Yorojima for the first time in the present survey. Kuramoto (1979) recorded this frog also from Okierabujima.

Tadpoles with distinct hind limb buds were observed in a pond near Kametsu, Tokunoshima on IV 3, '84.

### Family Hylidae

#### *Hyla hallowellii* Thompson, 1912

Specimen examined (N=1): Yoronjima, OPN 4739, III 31, '84.

Calls were heard on Yoronjima on March 31, '84, on Ukejima on May 7, and on Yorojima on May 8, '85. This is the first record for Ukejmia and Yorojima. This frog is known also from Kikaijima, Amamioshima, Kakeromajima, Tokunoshima, and Okierabujima of the Amami Group, Okinawajima of the Okinawa Group and Iriomotejima of the Yaeyama Group. (Van Denburgh, 1912; Nakamura and Uéno, 1963; Koba, 1956; Shibata, 1965; Matsui and Mastui, 1982).

### Family Ranidae

#### *Rana catesbeiana* Shaw, 1802

This introduced species is known from Yorojima and Tokunoshima (Toyama, 1984).

Calls were heard and tadpoles were observed in Yorojima on May 8, '85.

#### *Rana okinavana* Boettger, 1895

This brown frog is known from Amamioshima and Tokunoshima (Nakamura and Uéno, 1963).

Koba (1956) identified, based on Okada (1934), the brown frog from the Amami Group as *Rana sauteri*, a species known from Taiwan and Indochina (Bourett, 1942). More recently, Okada (1966) listed *Rana macropus* as a distinct species of the brown frog occurring in the Amami and Okinawa Groups. There seems, however, to be only one brown frog, *Rana okinavana*, in these groups, and the former two names (*R. sauteri* and *macropus*) are regarded as misidentifications of *R. okinavana* by the previous collectors (see Shibata and Matsui (1985) for more detailed discussions).

#### *Rana limnocharis limnocharis* Wiegmann, 1835

Specimens examined (N=78): Kikaijima, two uncatalogued specimens, VIII 3, '84; Amamioshima (N=2), OPN 4615, VIII 1, '84, OPN 4616, V 6, '85; Kakeromajima, four uncatalogued specimens, VIII 1, '84; Ukejima, one uncatalogued specimen, V 7, '85. Yorojima (N=24), OPN 2947–2948, 4629–4650, V 8, '85; Tokunoshima (N=15), OPN 4038–4052, V 5, '85; Okierabujima, thirty uncatalogued specimens, IV 2, '84.

This is the first record for Ukejima. This frog was very abundant around rice paddies and in ditches on all the islands listed above, both in the daytime and at night. Calls were heard throughout the survey period.

In the table of Koba (1956), *Rana l. limnocharis* was listed among other amphibians occurring on Yoronjima. He did not, however, note its occurrence on this island in the text, and no other record from the island has been known. In the present survey, I never heard a call or found a tadpole of this species there. Therefore, the record of this frog from Yoronjima probably originated from misprinting in the table and in fact it does not occur on Yoronjima.

All the observed individuals, 283 in number, lacked mid-dorsal stripes, as pointed out by Kuramoto (1968).

*Rana narina* Stejneger, 1901

This species is known from Amamioshima and Tokunoshima (Koba, 1958), but was not collected in the present survey.

*Rana ishikawae* (Stejneger, 1901)

This species is known from Amamioshima (Toyama, 1984), but was not found in the present survey.

*Babina subaspera* (Barbour, 1908)

Record of this large frog had long been confined to Amamioshima (Koba, 1956), but recently this species was found also on Kakeromajima (Toyama, 1984). I found no individuals during the present survey.

#### Family Rhacophoridae

*Buergeria japonica* (Hallowell, 1860)

Specimens examined (N=17): Kikajima, six uncatalogued specimens, VIII 3, '84; Amamioshima (N=5), OPN 2992, IV 6, OPN 2995-2997, VII 31, '84, OPN 4614, V 9, '85; Kakeromajima, three uncatalogued specimens, VIII 1, '84; Ukejima, one uncatalogued specimen, V 7, '85; Yorojima (N=1), OPN 2946, V 8, '85; Tokunoshima (N=1), OPN 4034, IV 3, '84.

This species was very abundant in ditches and around the rice paddies on all the islands listed above. Calls were heard at night and even in the daytime on cloudy or rainy days during the whole term of the survey. This frog has been known also from Okierabujima and Yoronjima (Morita, 1964).

*Rhacophorus viridis amamiensis* Inger, 1947

Specimens examined (N=2): Amamioshima, OPN 4739-4740, IV 7, '84, V 9, '85.

Calls were heard on Kakeromajima, Ukejima, and Yorojima. All of these are the first records of this species for the three Islands. Around the beginning of April, several foamy egg nests of this species were observed along ponds in Amamioshima. The nests, five to 30 cm above the ground, adhered to grasses. This species is reported also from Tokunoshima (Koba, 1956).

#### Natural History

In the Yaeyama Group, *Gekko hokouensis* was observed more frequently in shaded places of houses and in forests than in open illuminated places such as windows of houses

at night. Sengoku (1976) has noted that *G. japonicus* (probably *G. hokouensis*) mainly occurs in the mountain forests on Iriomotejima, Okinawajima, and Amamioshima. However, many foraging individuals of *G. hokouensis* were observed on illuminated windows together with *Hemidactylus frenatus* in Yoronjima and Okierabujima. This gecko was abundant at such places also in Kikaijima, and cities of Kagoshima and Ibusuki in the Kyushu Mainland.

Although *Hemidactylus bowringii* has been recorded from whole range of the Ryukyu Archipelago (except for the Tokara Group), several authors noted that this species was very rare in each locality of this archipelago (e.g. Stejneger, 1907; Namie, 1912; Van Denburgh, 1912; Okada, 1936; Shibata, 1965; Toyama, 1976, 1981a). Toyama (1981a) suggested that they are rare because the Ryukyu Archipelago lies in the northernmost extreme of the distributional range. The present survey, however, reveals that this gecko occurs with a relatively high density on Kikaijima, Amamioshima, Yorojima, and Ukejima all locations where *H. frenatus* is absent. On the contrary, I have never observed that species in Tokunoshima, Okierabujima and Yoronjima, where *H. frenatus* occurs. Moreover, I found this species abundant in Guangzhou City, China, where few *H. frenatus* were observed, but in Hainan Island where the latter was dominant, *H. bowringii* was rare, (Ota, unpubl.). Thus, it is probable that the relatively frequent occurrence of this species in Yorojima, Ukejima, Amamioshima and Kikaijima, and rarity in the other islands of the Ryukyu Archipelago have resulted from interspecific relation with *H. frenatus*.

Several authors have pointed out that *Gehyra mutilata* is found mostly in the shaded places at night (Tanaka, 1979; Toyama, 1981b, 1983, 1984; Ota and Yamashita, 1985). In fact, this species was obtained from such places on Kikaijima (Ota and Hikida, 1985), Ukejima and Yorojima of the Amami Group; but at Koniya Village, Amamioshima, I observed many individuals foraging on a wall under the light. During the survey, no other gecko species were found in illuminated places at Koniya Village. By contrast, in other localities observed, other gecko species, *Hemidactylus bowringii* and/or *Gekko hokouensis*, were dominant. It seems therefore likely that the foraging habit of *G. mutilata* is easily influenced by the interferences with other geckos.

It has been supposed that the habitat of *Eumeces barbouri* is confined to montane regions, whereas *E. marginatus* inhabits in the lowlands such as areas along the seashore (Koba, 1958, 1960, 1962; Hino and Morita, 1964; Toyama, 1984). In the present survey, however, I observed several individuals of *E. barbouri* around the forests near the beach, as well as in the mountains on Kakeromajima (Ota and Hikida, 1985) and Tokunoshima. Thus, this species appears to inhabit forest regions irrespective of elevation or distance from the coast, as pointed out by Toyama and Sato (1985).

Utsunomiya and Utsunomiya (1983), in their descriptions of reproductive habits of anurans in the Ryukyu Archipelago, noted that the breeding season of *Hyla hallowellii* ranged from the end of March to the middle of May. However, they overlooked the report of Koba (1956) in which he described that many calls were heard in Amamioshima on 12 August and that one female collected that night laid eggs by the next morning. Therefore, this tree frog seems to have a mating season, at least, also in the middle of August.

Okada (1931) reported that the female *Buergeria japonica* was larger than the male. Later, Inger (1947) tested Okada's (1931) data statistically (t-test) and noted that there was no significant sexual dimorphism in body size of this frog. The body size of the specimens examined here, however, showed a considerable difference (Aspin-Welch's t-test;  $t=6.49$ ,

$p < 0.001$ ) between males ( $N=25$ ,  $X=26.61$ ,  $SE=0.223$ ) and females ( $N=7$ ,  $X=31.73$ ,  $SE=0.756$ ).

### Herpetofauna of the Amami Group in Relation to Other Regions

Distributions of reptiles and amphibians within the Amami Group are presented in Table 6.

Several authors have stated that characteristics in the herpetofauna of the Amami

**Table 6.** Distribution of reptiles and amphibians within the Amami Group.

Species	Kikai-jima	Amamio-shima	Kakeroma-jima	Ukejima	Yorojima	Tokuno-shima	Okierabu-jima	Yoronto
<b>REPTILIA</b>								
<i>Gekko hokouensis</i>	*	*	+	*	*	*	*	*
<i>Hemidactylus bowringii</i>	*	*	+	+	+	*	—	—
<i>Hemidactylus frenatus</i>	—	—	—	—	—	*	*	*
<i>Gehyra mutilata</i>	*	*	—	*	+	*	*	—
<i>Eublepharis kroiwae splendens</i>	—	—	—	—	—	*	—	—
<i>Japalura polygonata</i>	*	*	*	*	*	*	—	—
<i>Eumeces barbouri</i>	—	*	*	+	+	*	—	—
<i>Eumeces marginatus oshimensis</i>	*	*	*	*	*	*	*	*
<i>Ateuchosaurus pellopleurus</i>	*	*	+	+	*	*	*	—
<i>Takydromus smaragdinus</i>	*	*	*	*	*	*	*	—
<i>Ramphotyphlops braminus</i>	*	*	*	*	*	*	*	*
<i>Achalinus weneri</i>	—	*	—	—	—	*	—	—
<i>Entechinus semicarinatus</i>	*	*	*	*	*	*	*	*
<i>Dinodon semicarinatus</i>	*	*	*	*	*	*	*	*
<i>Amphiesma pryeri pryeri</i>	*	*	*	*	*	*	*	*
<i>Calliophis japonicus japonicus</i>	—	*	*	*	*	—	—	—
<i>Calliophis japonicus boettgeri</i>	—	—	—	—	—	*	—	—
<i>Trimeresurus flavoviridis</i>	—	*	*	*	*	*	—	—
<i>Trimeresurus okinavensis</i>	—	*	*	*	*	*	—	—
<b>AMPHIBIA</b>								
<i>Echinotriton andersoni</i>	—	*	—	—	—	*	—	—
<i>Cynops ensicauda</i>	—	*	*	*	*	—	—	—
<i>Microhyla ornata</i>	*	*	+	+	+	*	—	*
<i>Hyla hallowellii</i>	*	*	*	+	+	*	*	*
<i>Rana catesbeiana</i>	—	—	—	—	*	*	—	—
<i>Rana okinavana</i>	—	*	—	—	—	*	—	—
<i>Rana limnocharis limnocharis</i>	*	*	*	+	*	*	*	—
<i>Rana narina</i>	—	*	—	—	—	*	—	—
<i>Rana ishikawae</i>	—	*	—	—	—	—	—	—
<i>Babina subaspera</i>	—	*	*	—	—	—	—	—
<i>Buergeria japonica</i>	*	*	*	*	*	*	*	*
<i>Rhacophorus viridis amamiensis</i>	—	*	+	+	+	*	—	—

\*: Recorded previously; +: recorded for the first time in the present survey; —: not recorded.

Group lie in its close similarity to that of the Okinawa Group; most reptile and amphibian species found in this region occur both in these two groups (e.g., Thompson, 1912; Koba, 1955, 1962; Takara, 1962, etc.). Recently, however, intraspecific differences between populations from the two groups have been reported for several species (e.g., Utsunomiya, 1978; Seto et al., 1984, etc.). Results of the present survey favour the previous accounts on the herpetofauna of the Amami Group, namely, close character resemblance of the Amami Group to the Okinawa Group. Even so, I have indicated two cases of differentiation (differentiations of *Ateuchosaurus pellopleurus* and *Entechinus semicarinatus*) between the Amami and Okinawa populations, which may lead to subspecific divisions. Therefore, more detailed taxonomic reviews of each reptile and amphibian species should be made to elucidate the distinctiveness of the herpetofauna and biogeographical status of the Amami Group.

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#### Literature Cited

- Bourret, R. (1942) Les Batraciens de l'Indochine. *Mem. Inst. Oceanogr. Indochine* 6: X+1-547.
- Fritze, A. (1894) Die Fauna von der Liu-Kiu-Insel Okinawa. *Zool. Jahrb. (Syst.)* 7: 852-926.
- HINO, K. and T. Morita. (1964) The animals of Kagoshima. In *Nature of Kagoshima*. Edited and published by Kagoshima Prefectural Association of Education of Science, pp. 173-193. (in Japanese)
- Hiraiwa, Y.-K., K. Ota, T. Udagawa, A. Sato, T. Matsui and T. Uchida. (1958) Biological surveys in the Amami Group of the Loo Choo Islands, with special reference to the relationship between murine-animals and snakes. *J. Fac. Agr., Kyushu Univ.* 16(4): 525-546. (in Japanese)
- Inger, R.F. (1947) Preliminary survey of the amphibians of the Riukiu Islands. *Fieldiana: Zool.* 32(5): 295-352.
- Koba, K. (1956) Herpetofauna of the Amami Group of the Loo Choo Islands, I. *Bull. Fac. Edc., Kumamoto Univ.* 4: 148-164+2 pls. (in Japanese with English summary)
- Koba, K. (1958) Herpetofauna of the Amami Group of the Loo Choo Islands (II). *Bull. Fac. Edc., Kumamoto Univ.* 6: 173-184+2pls. (in Japanese with English summary)
- Koba, K. (1959) Herpetofauna of the Amami Group of the Loo Choo Islands (III). *Bull. Fac. Edc., Kumamoto Univ.* 7: 187-201. (in Japanese with English summary)
- Koba, K. (1960) Herpetofauna of the Amami Group of the Loo Choo Islands (IV). *Bull. Fac. Edc., Kumamoto Univ.* 8: 181-191+1pl. (in Japanese with English summary)
- Koba, K. (1962) *Studies on the snakes of the genus Trimeresurus of the Amami and Tokara Islands, Japan*. Japan Society for the Promotion of Science, Tokyo. 120pp.+pls. 1-39. (in Japanese)

- Koba, K., D. Kikukawa, T. Fukada and K. Tanaka (1977) A taxonomic study of *Calliophis japonicus* (Serpentes: Elapidae) of the Nansei Islands, Japan. *Bull. Ginkyo Coll. Med. Technol.* 2: 7-30. (in Japanese with English summary)
- Kuramoto, M. (1968) Studies on *Rana limnocharis* Boie II. Geographic variation in external characters. *Bull. Fukuoka Univ. Edc.* 18(3): 109-119.
- Kuramoto, M. (1979) Distribution and isolation in the Anurans of the Ryukyu Islands. *Jpn. J. Herpetol.* 8(1): 8-21. (in Japanese with English abstract)
- Maki, M. (1931) *A Monograph of the Snakes of Japan*. Dai-ichi Shobo, Tokyo. 247pp.
- Matsui, M. and T. Matsui (1982) *Hyla hallowelli* recorded from Iriomotejima, Yaeyama group, Ryukyu Archipelago. *Jpn. J. Herpetol.* 9(3): 79-86.
- Mishima, S. (1965) The snakes of Amami. *Nature Study* 11(2): 14-19. (in Japanese)
- Moriguchi, H. and S. Naito (1979) A new locality record of *Achalinus spinalis wernerii* from Tokuno-shima. *Jpn. J. Herpetol.* 8(1): 36. (in Japanese)
- Morita, T. (1964) Animals of Amamioshima Island. In *Nature of Kagoshima*. Edited and published by Kagoshima Prefectural Association of Education of Science. pp. 303-327. (in Japanese)
- Nakamura, K. and S.-I. Uéno (1963) *Japanese Reptiles and Amphibians in Colour*. Hoikusha, Osaka. 214pp. (in Japanese)
- Namie, M. (1912) On the geckos of Okinawa. *Zool. Mag.* 24(286): 442-445+pl. 6. (in Japanese)
- Okada, Y. (1931) *The tailless batrachians of the Japanese Empire*. Imp. Agr. Exp. Station, Nishigahara, Tokyo, 2+2+215pp.+29pls. (in Japanese)
- Okada, Y. (1934) The anuran fauna of Formosa. *Copeia* 1934(1): 19-20.
- Okada, Y. (1936) Studies on the lizards of Japan. Contributino I. Gekkonidae. *Sci. Rep. Tokyo Bunrika Daigaku, B* 2(42): 233-289+pls. 15-19.
- Okada, Y. (1966) *Fauna Japonica: Anura*. Tokyo Electrical Engineering College Press, Tokyo. 234pp.
- Ota, H. and T. Hikida (1985) New locality records of the three lizard species in the Amami Group, Ryukyu Archipelago. *Akamata* 3: 1-2. (in Japanese)
- Ota, H. and A. Yamashita (1985) New record of the gekkonid lizard *Gehyra mutilata* (Wiegmann) from Hateruma-jima Island, Okinawa, Southern Japan. *Biol. Mag., Okinawa* 23: 33-34. (in Japanese)
- Sato, I. (1943) *A Monograph of the Tailed Batrachians of Japan*. Nippon Shuppan-sha, Osaka, 520pp. (in Japanese)
- Sengoku, S. (1976) A brief observation on the natural history of the house gecko (*Hemidactylus frenatus*) on Iriomotejima Island. *Nippon Herpetol. J.* 4: 5. (in Japanese)
- Seto, T., T. Utsunomiya and Y. Utsunomiya (1984) Interpopulation variation of the C-banded karyotypes in *Rana ishikawae* (Stejneger) from Okinawa-jima and Amami-oshima in the Ryukyu Islands. *Jpn. J. Herpetol.* 10(3): 67-72. (in Japanese with English abstract)
- Shibata, Y. (1960) Amphibia and reptilia collected from Tokara Islands. *Bull. Osaka Mus. nat. Hist.* 12: 57-62.
- Shibata, Y. (1964) Amphibians and reptiles from Okierabu-jima, Amami Group. *Kansai Shizen Bunka Kenkyukai Kenkyu-houkoku* 1: 13-16. (in Japanese)
- Shibata, Y. (1965) A northward extension of the known range of *Hemidactylus bowringii* (Gray) in the Ryukyu Archipelago (Reptilia: Gekkonidae). *Bull. Osaka Mus. nat. Hist.* 18: 1-2. (in Japanese)
- Shibata, Y. (1981) A new record of the gekkonid lizard *Gekko yakuensis* from the Tanegashima Island, Kyushu, Japan (Reptilia: Sauria). *Occasional Pap. Osaka Mus. Nat. Hist.* 1(15): 149-154. (in Japanese with English summary)
- Shibata, Y. (1983) Two species in "Japanese gecko". *Nature Study* 29(3): 27-29. (in Japanese)
- Shibata, Y. and M. Matsui (1985) Taxonomic notes on some Japanese amphibians I. Problems concerning *Rana macropus* Boulenger, 1886. *Bull. Osaka Mus. Nat. Hist.* 30: 1-4.
- Sokal, R.R. and F.J. Rohlf (1981) *Biometry*. 2nd ed. W.H. Freeman and Company, San Francisco. 859pp.

- Stejneger, L. (1907) Herpetology of Japan and adjacent territory. *Bull. U.S. natl. Mus.* 58: 1-577.
- Tago, K. (1931) *Imori to Sansho-uo (Newts and Salamanders)*. Geisoudo, Kyoto. 210pp. (in Japanese)
- Takara, T. (1957a) Studies on the difference between *Liopeltis semicarinata fritzei* Maki and *Liopeltis semicarinata semicarinata* Hallowell. *Zool. Mag., Tokyo* 66(9): 345-346. (in Japanese with English summary)
- Takara, T. (1957b) Some observations on snakes found in the Ryukyu Islands. *Sci. Bull. Agr. and Home Econ. Div. Univ. Ryukyus* 4: 144-156+pls. 1-2. (in Japanese with English summary)
- Takara, T. (1962) Studies on the terrestrial snakes in the Ryukyu Archipelago. *Sci. Bull. Agr. and Home Econ. Div. Univ. Ryukyus* 9: 1-102+pls. 1-22. (in Japanese with English summary)
- Tanaka, S. (1979) *Gehyra mutilata*. In *Reptiles and Amphibians in Color*. Edited by Showich Sengoku. Ienohikari-kyoukai, Tokyo. p. 24. (in Japanese)
- Thompson, J.C. (1912) Prodrôme of descriptions of new species of Reptilia and Batrachia from the Far East. *Herp. Notices, San Francisco* 2: 1-4.
- Toyama, M. (1976) On the herpetological fauna of the Miyako Islands, Ryukyu Archipelago (I). *Jpn. J. Herpetol.* 6(3): 64-74. (in Japanese with English abstract)
- Toyama, M. (1981a) The amphibians and reptiles of the Miyako Islands. *Okiseikyouden-kaishi* 14: 30-39. (in Japanese)
- Toyama, M. (1981b) Preliminary reports on the herpetological fauna of the Okinawa Islands, Ryukyu Archipelago (I). *Bull. Okinawa pref. Mus.* 7: 1-8. (in Japanese with English abstract)
- Toyama, M. (1983) Preliminary reports on the herpetofauna of the Okinawa Islands, Ryukyu Archipelago (II). *Report of the Okinawa pref. Mus. III—Zamami-Son Villadge*. p. 16-22. (in Japanese)
- Toyama, M. (1984) Amphibians and Reptiles. In *Handbook of the Animals of the Ryukyu Archipelago (1): terrestrial vertebrates*. Edited by Ikehara, S., Y. Yonashiro, K. Miyagi and M. Toyama. Shinsei-tosho-shuppan, Naha. pp. 208-352. (in Japanese)
- Toyama, M. (1985) The herpetology of the Ryukyu Archipelago. In *Conservation of the Nansei Shoto, part II*. Edited and published by World Wildlife Fund Japan, Tokyo. pp. 54-152. (in Japanese)
- Toyama, M. and F. Sato (1985) A new record of the scincid lizard, *Eumeces barbouri* from Iheyajima Island, the Okinawa Islands. *Biol. Mag. Okinawa* 23: 25-27. (in Japanese)
- Utsunomiya, T. (1978) On inter-island morphological variations of amphibians on the Ryukyu Islands. *Jpn. J. Herpetol.* 7(4): 104. (in Japanese)
- Utsunomiya, Y. and T. Utsunomiya (1983) On the eggs and larvae of frog species occurring in the Ryukyu Archipelago. *J. Fac. Appl. Biol. Sci., Hiroshima Univ.* 22: 255-270. (in Japanese with English summary)
- Van Denburgh, J. (1912) Concerning certain species of reptiles and amphibians from China, Japan, the Loo-Choo Islands, and Formosa. *Proc. Calif. Acad. Sci., Ser. 4* 3: 187-258.
- Zhou, K., Y. Liu and D. Li (1982) Three new species of *Gekko* and remarks on *Gekko hokouensis* (Lacertiformis, Gekkonidae). *Acta Zootax. Sinica* 7(4): 438-446+2pls. (in Chinese with English summary)