Anuran Fauna of Taiwan and Adjacent Islands Based on Valid Specimen Records

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Abstract. A checklist of all species of the order Anura from Taiwan and adjacent islands is provided. In total, distribution data of 33 anuran species are given including three introduced species. The inland distribution information provided is based on specimen collections of four institutes in Taiwan: the Biodiversity Research Center, Academia Sinica, Taipei; National Museum of Natural Science, Taichung; National Taiwan Museum, Taipei; and National Taiwan University Museum, Taipei. Phylogeographic studies of these anurans are also noted if references are available.

Keywords: Anura, checklist, distribution, specimen records, Taiwan.

INTRODUCTION

Taiwan is an island located off the coast of southeastern China at latitudes of 21°53'~25°17'N with tropical to alpine climate zones and high biodiversity (Shao 2006; Kier *et al*. 2009). On this island, mountainous areas account for about 70% of the land surface. There are two main mountain ranges, the Central Mountain Range which stretches nearly the entire length of the island, with elevations exceeding 3000 m (the tallest peak is Jade Mountain at 3952 m), and the Coastal Range with a maximum elevation exceeding 1600 m. These mountain ranges and freshwater river systems that radiate from them divide Taiwan into several geographical regions and microclimatic areas, providing an excellent opportunity for biogeographical research.

Anurans, commonly known as toads and frogs, are a conspicuous component of the world's vertebrate fauna. Early faunistic studies on Taiwanese anurans date from Günther (1864), followed by several studies that reviewed the anuran fauna of Taiwan prior to 2006: Stejneger (1907, 1910), Horikawa (1931), Okada (1934), Chen (1969), Lue and Chen (1982), Zhao and Adler (1993), Chou and Lin (1997b), Yang (1998, 2006), and Lue *et al*. (1999). With the wide use of different investigative tools, such as molecular technology, and good international communication on anuran research, several taxonomic debates on Taiwanese anurans have been raised and discussed (Ye and Fei 1994; Chou and Lin 1997a; Tanaka-Ueno *et al*. 1998; Liu *et al*. 2000; Fu *et al*. 2005; Che *et al*. 2007; Jang-Liaw and Lee 2009; Liu *et al*. 2010; Jang-Liaw and Chou 2011).

Thirty-three species are currently recognized from Taiwan, including 30 native and three introduced species. Five of the Taiwanese native frogs were described in 1978~1995: *Kurixalus idiootocus* (Kuramoto and Wang, 1987), *Rhacophorus arvalis* Lue, Lai and Chen, 1995, *Rha. aurantiventris* Lue, Lai and Chen, 1994, *Rha. prasinatus* Mou, Risch and Lue, 1983, and *Rha. taipeianus* Liang and

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Wang, 1978. Furthermore, the first record of *Fejervarya cancrivora* (Gravenhorst, 1829) is thought to date to 2005 (Yang 2006). On the other hand, *Rana taiwaniana* Otsu, 1973 and *R. multidenticulata* Chou and Lin, 1997 are now respectively considered to be synonyms of *Odorrana swinhoana* (Boulenger, 1903) and *R. sauteri* Boulenger, 1909 (Matsui 2005; Jang-Liaw and Lee 2009; Hsu *et al*. 2011). In this work, valid scientific names basically refer to Frost *et al*. (2006) and Frost (2014).

Few studies previously investigated biogeographic patterns among Taiwanese anurans. Lue *et al*. (1990) and Lee *et al*. (1994) used geographic information system data to describe the biogeographic distributions of all anurans in Taiwan. Their results, however, provided an incomplete picture of the Taiwanese anuran fauna because of insufficient taxonomic references at that time. For example, at that time, Taiwan frogs of the genus *Limnonectes* were assigned to *L. kuhlii* (Tschudi, 1838) in several guidebooks of Taiwanese amphibians; however, *L. kuhlii* is known to be endemic to Java (McLeod 2010). It is necessary to clarify these taxonomic problems before discussing the natural history of these frogs on the island.

On the other hand, several studies focused on the phylogeography of Taiwanese anurans using a molecular approach. For example, Yang *et al*. (1994) identified two well-differentiated lineages among the Taipei treefrog *Rha. taipeianus* collected from seven populations in Taiwan; Tanaka-Ueno *et al*. (1998) discussed the phylogenetic relationships of brown frogs from Taiwan and Japan, which revealed highly divergent lineages among *R. sauteri*; Toda *et al*. (1998) indicated that *Fejervarya limnocharis* populations of eastern Taiwan are genetically distinct from the remaining Taiwanese populations as inferred from allozyme data; Jang-Liaw *et al*. (2008) proposed four biogeographic districts in Taiwan based on the results of phylogenetic analyses of *Hylarana latouchii*. Subsequently, the complete phylogeographic patterns of three Taiwanese frogs, *R. sauteri*, *Limnonectes fujianensis*, and *Buergeria robusta* revealed by mitochondrial (mt)DNA data were described chronologically (Jang-Liaw and Lee 2009; Jang-Liaw and Chou 2011; Lin *et al*. 2012). These studies were helpful in understanding the formation of biogeography and natural history of anurans in Taiwan and adjacent areas.

In an effort to preserve the biodiversity of the island, especially some endemic and endangered species, the Taiwanese government enacted the *Wildlife Conservation Act* in 1989. It is a national policy and differs from the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES); however, all Appendix I fauna and most Appendix II fauna listed in the CITES are protected by this law (Hsu and Agoramoorthy 1997). The *Wildlife Conservation Act* has undergone a series of amendments from 1994 to the present. Accompanying this act, a "Schedule of Protected Species" was promulgated in August 1989, which catalogued three classifications of protected species: I, endangered species; II, rare and valuable species; and III, other conservation-deserving wildlife. This list has also been modified several times, and 11 anuran species were included in December 1995: *Microhyla butleri* Boulenger, 1900, *Microhyla heymonsi* Vogt, 1911, *Micryletta inornata* [synonym of *Micryletta steinegeri* (Boulenger, 1909)], *R. taipehensis* [synonym of *Hylarana taipehensis* (van Denburgh, 1909)], *R. taiwaniana* [synonym of *Odorrana swinhoana* (Boulenger, 1903)], *R. tigerina rugulosa* [synonym of *Hoplobatrachus rugulosus* (Osbeck, 1765)], *R. guentheri* [synonym of *Hylarana guentheri* (Boulenger, 1882)], *Rha. prasinatus*, *Rha. taipeianus*, *Rha. moltrechti* Boulenger, 1908, and *Rha. robustus* [synonym of *Buergeria robusta* (Boulenger, 1909)]. The most recent revision of this list was completed in August 2008. In this version, several previously protected frog species were removed from the "protected species" list because their populations had recovered well, including *Microhyla butleri*, *Microhyla heymonsi*, *Micryletta steinegeri*, *Hop. rugulosus*, *Hylarana guentheri*, *Bue. robusta*, and *Rha. moltrechti*. On the other hand, some threatened species were added to the "protected species" list for the first time, including two rhacophorid frogs which were newly described in 1994~1995. The complete "protected species" list for frogs currently includes *Babina okinavana* (Boettger, 1895) (II), *Hylarana taipehensis* (II), *Pelophylax fukienensis* (Pope, 1929) (III), *Rha. arvalis* (II), *Rha. aurantiventris* (II), *Rha. prasinatus* (III), and *Rha. taipeianus* (III). This act prohibits human activities from disturbing these listed animals, including hunting them as food, capturing them for pets or the pet trade, and destroying their

habitats for any purposes.

Unfortunately, threats to the survival of Taiwanese anuran are still serious. Overuse of land in both mountainous areas and on the plains has caused the rapid disappearance of animal habitats on this island in recent decades (Hsu and Agoramoorthy 1997; Koh *et al*. 2006). Taiwanese anuran populations (such as *Hylarana taipehensis* and *Rha. arvalis*) have been seriously damaged by human activities, such as industrial pollution, farming and cultivation, deforestation, and urban expansion, and both the population size and distribution range appear to have been reduced in the past few decades (Chou *et al*. 1993; Lien *et al*. 2007; Chang *et al*. 2008; Lin *et al*. 2008).

In addition to anthropogenic threats to Taiwanese anurans, the main island of Taiwan is subject to frequent earthquakes and typhoons (Chang 1996; Chang and Slaymaker 2002; Chen and Hawkins 2009). Earthquakes are one of the main mechanisms that trigger landslides in mountainous areas, and landslides and debris flows are major natural hazards and threats to environmental ecology, including anuran populations. Lai *et al*. (2007), for example, described a sudden disappearance event of the riparian ranid frog, *Odorrana swinhoana*, following a serious earthquake in 1999, and proposed that anuran species that exhibit strong site-fidelity are particularly susceptible to extirpation of local populations, because they may lack the behavioral plasticity to respond to sudden water depletion. On the other hand, an average of almost four typhoons directly affects Taiwan every year from July to early October (Wu and Kuo 1999). Typhoons play important roles in the ecology of both territorial and aquatic environments (Mabry *et al*. 1998; Chang and Slaymaker 2002; Tew *et al*. 2002). When a typhoon hits Taiwan and adjacent islands, the sudden heavy rainfall frequently results in disastrous flooding in the lowlands and often causes landslides and debris flows in mountain areas (Teng *et al*. 2006; Tsou *et al*. 2011). In addition, heavy rainfall events accompanying typhoons are increasingly unprecedented because of the greenhouse effect (Whetton *et al*. 1993; Hennessy *et al*. 1997; Gong and Wang 2000). For example, the single-day (August 9, 2009) rainfall total from Typhoon Morakot was 1165.5 mm at Alishan, Chiayi County (Central Weather Bureau 2009); while the average annual average precipitation of Taiwan (1993~2004) is 2236 mm (Lin and Lin 2009). Because of violent natural hazards combined with increasing human activities on this island, the threats to Taiwanese anuran populations are become more destructive and large-scale.

Species introduced for commercial purposes also seriously threaten many native Taiwanese species. There are three introduced frogs in Taiwan now: *Lithobates catesbeianus* (Shaw, 1802), *Kaloula pulchra* Gray, 1831, and *Polypedates megacephalus* Hallowell, 1861. *Lithobates catesbeianus* was introduced from North America as a cultured and pet species (Hsu and Liang 1970; Hou *et al*. 2006; Tyler *et al*. 2007). It is widely distributed in low-elevation areas throughout Taiwan (Lue *et al*. 1990; Hou *et al*. 2006). It competes with native anuran species by preying on them (Wang *et al*. 2006). Another non-native invasive, *K. pulchra*, widely distributed throughout South and Southeast Asia (Frost, 2014), was possibly introduced into Taiwan via timber imports (Yang 2006) or through the pet trade (Hou *et al*. 2006). The other introduced species, *Pol. megacephalus*, was reported to have recently been introduced to Taiwan (Wu *et al*. 2010), and is now widely distributed in northern and west-central Taiwan (Yang and Gong 2014). Native to subtropical and tropical China, northeastern India, northern Vietnam, and Thailand, *Pol. megacephalus* was once considered a native species in Taiwan (Yang 1998, 2006; Lue *et al*. 1999; Shang *et al*. 2009). However, Kuraishi *et al*. (2011) considered that all Taiwan frogs of the genus *Polypedates* belonged to a different species, *Pol. braueri* (Vogt, 1911), based on markedly differentiated DNA sequences, advertisement calls, and morphological characteristics. Recently increasing numbers of *Pol. megacephalus* populations have been reported (Wu *et al*. 2010; Yang and Gong 2014). Furthermore, *Rhinella marina* (Linnaeus, 1758), was historically introduced from Hawaii into Taiwan in 1935 for the purpose of biological pest control (Takano and Iijima 1939), but this species failed to establish a stable population on the island.

The artificial transport of amphibian populations within the island has occurred recently. Some farm owners tend to keep as many frog species as possible on their farms to attract ecotourists, such as frog viewers. In some cases, farm owners bought frogs which had been caught in distant areas, leading to alterations

in distribution patterns of anurans at both the population and specific levels. Such artificial transport may also have been carried out by other Taiwanese who just wanted to create "higher diversity" in their favorite parks or at some famous frog-viewing hotspots. *Rhacophorus arvalis*, for example, has a naturally restricted distribution in the south-central region on the western side of Taiwan, but it can now be found in northern Taiwan.

To sum up, such disturbances of anuran distributions make future studies on biogeography, anuran phylogeography, and comprehensive comparative conservation biology in Taiwan more difficult and confusing (see Chang *et al*. 2008; Lai *et al*. 2008; Lin *et al*. 2008). Accompanied by the fact that the taxonomy of Taiwanese anurans is insufficient and needs to be revised, an updated checklist and current distribution information for Taiwanese anurans are necessary.

MATERIALS AND METHODS

In this work we collected 3795 anuran specimen records from four institutions in Taiwan: the Biodiversity Research Center, Academia Sinica, Taipei (BRCAS, 49 records); National Museum of Natural Science, Taichung (NMNS, 2795 records); National Taiwan Museum, Taipei (NTM, 406 records); and National Taiwan University Museums, Taipei (NTUM, 545 records). In most cases, we simply applied these records to summarize the herpetofauna, and we also checked those specimens when we found the possibility that they were not identified accurately, or sampled site names were mishandled. In addition, we eliminated records from these institutions which had no clear information on the collection site. Among the valid specimen records, most NMNS records had very clear information on sampling sites, including GPS and elevation. Hence, we applied NMNS specimen records only to clarify the elevation range of each anuran species. All of the anuran specimen records used from the four institutions were collected in 1969~2011, and all were clearly identified by herpetologists at these institutions.

All collecting sites of all records were too detailed and complex if they were marked on a single map, so we finally selected 236 sampling sites which refer to place names of small cities or villages identified as collection sites of each species (Table 1; Fig. 1). This made it easier to have comprehensive concepts of the distribution of Taiwanese anurans from these sampling records. Besides Taiwan main island, adjacent islands which have anuran records include Orchid Island and Green Island, Taitung County; Guishan Island, Yilan County; Makung and Wang-an/ Penghu Islands, Penghu County had been listed in the collecting sites of this study.

In total, 33 Taiwanese frogs and toads are listed in this work (Table 2). Each species account presented here includes: (1) the original source with the type locality and references; (2) the first use of the present combination of generic and specific names if different from the original ones with references; (3) notes on ecological characteristics; (4) the distribution within Taiwan and adjacent islands, highlighted by specimen-collection records; (5) notes on phylogeny/ phylogeographic patterns/taxonomy if references are available; and (6) notes on the conservation status if it is/was a protected species in Taiwan, or if it has been affected by human activities. The valid scientific names basically refer to Frost *et al*. (2006), Frost (2014), and other relevant studies (e.g., Jang-Liaw and Lee 2009; Matsui *et al*. 2010; Hsu *et al*. 2011; Jang-Liaw *et al*. 2011; Kuraishi *et al*. 2011); descriptions of tadpoles in the ecological notes follow Chou and Lin (1997b). All specimens are well preserved and catalogued by the institutions.

RESULTS AND DISCUSSION

The list below presents 33 anuran species of Taiwan and adjacent islands. Among them, 14 species belong to the family Ranidae, followed by the Rhacophoridae (11 species), Microhylidae (5), Bufonidae (2), and Hylidae (1) in sequence. *Polypedates megacephalus* is a newly invasive species to Taiwan.

SPECIES ACCOUNTS

Amphibia

FAMILY BUFONIDAE

***Bufo bankorensis* Barbour, 1908 (Fig. 2)**

Bufo bankorensis — Barbour 1908: 323

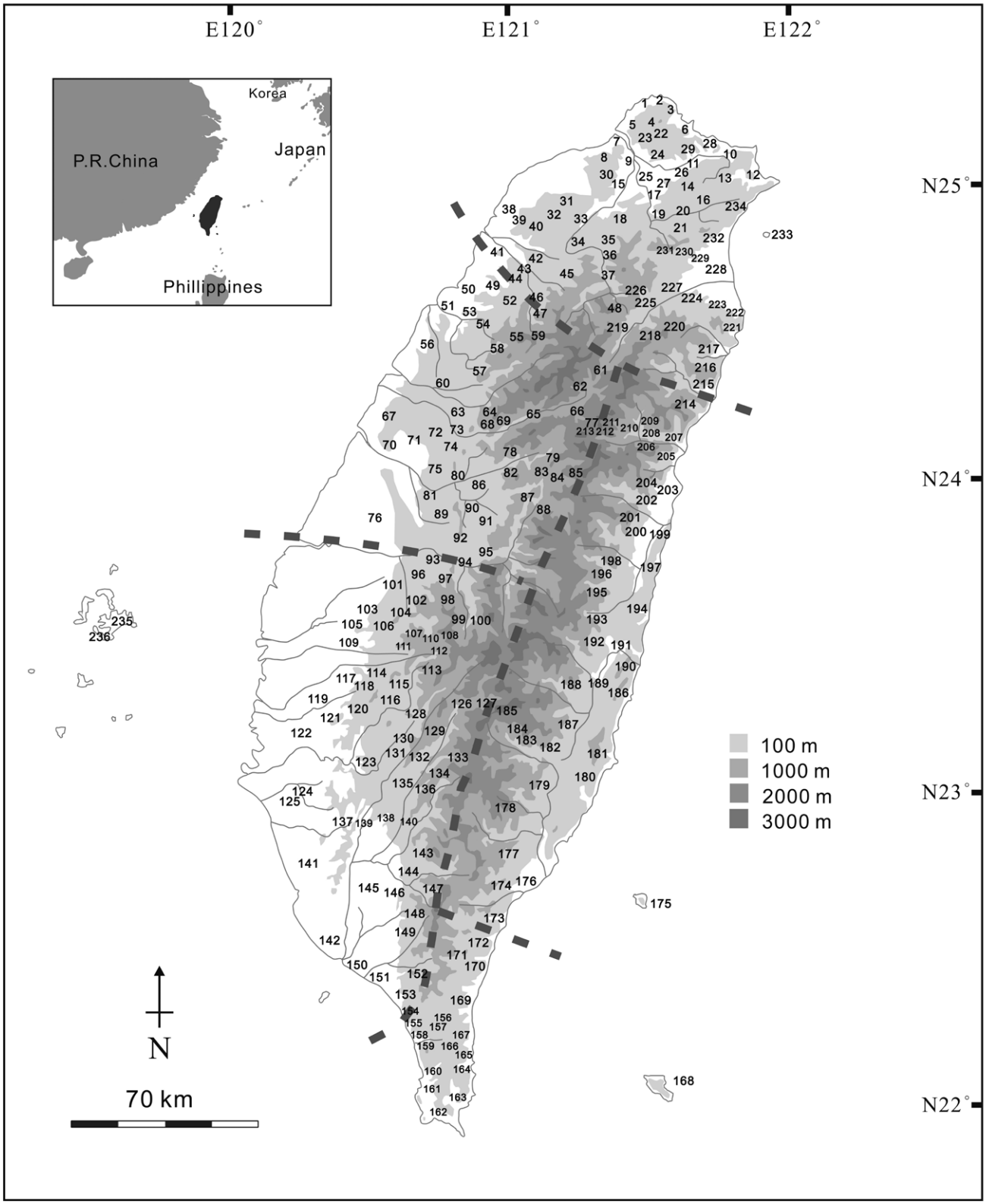

Fig. 1. Map showing Taiwan and adjacent islands. Numbers indicate collection locations of anuran specimen records used in this study. The order of locations was decided by administrative divisions first in a counter-clockwise direction. Elevations of the topology of Taiwan are also indicated. See Table 1 for detailed information on sampling sites. Dashed lines indicate phylogeographic boundaries modified from a phylogenetic study on *Hylarana latouchii* (Jang-Liaw *et al*. 2008).

Table 1. List of sampling sites.

Number	Site Name	Administrative Division	Coordinates for Reference	Estimated Altitute (m)
1	Sanchih (三芝)	New Taipei City	25° 15'15"N, 121° 29'44"E	80–210
2	Shimen (石門)	New Taipei City	25° 16'7"N, 121° 34'17"E	80–260
3	Jinshan (金山)	New Taipei City	25° 13'31"N, 121° 36'28"E	100–150
4	Yangmingshan (陽明山)	New Taipei City	25° 11'10"N, 121° 31'23"E	400–800
5	Tansuei (淡水)	New Taipei City	25° 11'30"N, 121° 27'42"E	50–200
6	Wanli (萬里)	New Taipei City	25° 11'4"N, 121° 39'7"E	300
7	Pali (八里)	New Taipei City	25° 9'10"N, 121° 24'50"E	20
8	Linkou (林口)	New Taipei City	25° 4'3"N, 121° 22'4"E	260
9	Luzhou (蘆洲)	New Taipei City	25° 5'0"N, 121° 28'0"E	10
10	Rueifang (瑞芳)	New Taipei City	25° 7'27"N, 121° 49'53"E	20
11	Xizhi (汐止)	New Taipei City	25° 3'54"N, 121° 41'19"E	80
12	Gungliau (貢寮)	New Taipei City	25° 0'52"N, 121° 54'39"E	6–100
13	Shuangxi (雙溪)	New Taipei City	25° 0'36"N, 121° 50'29"E	50–480
14	Shrding (石碇)	New Taipei City	24° 59'48"N, 121° 39'17"E	90–600
15	Shulin (樹林)	New Taipei City	24° 59'3"N, 121° 24'24"E	110
16	Pinglin (坪林)	New Taipei City	24° 55'56"N, 121° 42'56"E	400–600
17	Sindian (新店)	New Taipei City	24° 55'45"N, 121° 31'30"E	50–600
18	Sanshia (三峽)	New Taipei City	24° 52'50"N, 121° 22'49"E	110–180
19	Wulai (烏來)	New Taipei City	24° 53'15"N, 121° 33'3"E	100–500
20	Feitsui Reservoir (翡翠水庫)	New Taipei City	24° 55'34"N, 121° 37'11"E	180
21	Tunghou (桶後)	New Taipei City	24° 50'53"N, 121° 37'41"E	200–430
22	Neishuangxi (內雙溪)	Taipei City	25° 9'9"N, 121° 33'11"E	350
23	Peitou (北投)	Taipei City	25° 8'53"N, 121° 30'53"E	200
24	Shilin (士林)	Taipei City	25° 6'29"N, 121° 33'50"E	50–500
25	Daan (大安)	Taipei City	25° 1'16"N, 121° 32'11"E	20
26	Nankang (南港)	Taipei City	25° 1'51"N, 121° 37'19"E	45–100
27	Muzha (木柵)	Taipei City	24° 59'41"N, 121° 34'41"E	40
28	Keelung (基隆)	Keelung City	25° 8'22"N, 121° 47'5"E	40–120
29	Cidu (七堵)	Keelung City	25° 6'28"N, 121° 41'26"E	60
30	Gueishan (龜山)	Taoyuan County	25° 0'44"N, 121° 22'49"E	100
31	Jungli (中壢)	Taoyuan County	24° 59'14"N, 121° 12'9"E	100
32	Yangmei (楊梅)	Taoyuan County	24° 54'52"N, 121° 9'2"E	170
33	Dasi (大溪)	Taoyuan County	24° 52'47"N, 121° 17'13"E	100
34	Shihmen Reservior (石門水庫)	Taoyuan County	24° 47'52"N, 121° 15'32"E	250–400
35	Fuhsing (復興)	Taoyuan County	24° 48'2"N, 121° 21'56"E	280–500
36	Gaoyi (高義)	Taoyuan County	24° 45'22"N, 121° 21'34"E	500–530
37	Baling (巴陵)	Taoyuan County	24° 42'22"N, 121° 22'0"E	530–630
38	Sinfong (新豐)	Hsinchu County	24° 54'43"N, 121° 0'52"E	40
39	Hukou (湖口)	Hsinchu County	24° 53'46"N, 121° 3'2"E	90
40	Sinpu (新埔)	Hsinchu County	24° 50'3"N, 121° 6'18"E	120
41	Hsinchu (新竹)	Hsinchu County	24° 47'25"N, 121° 0'38"E	70
42	Cyonglin (芎林)	Hsinchu County	24° 45'37"N, 121° 6'56"E	400
43	Jhudong (竹東)	Hsinchu County	24° 43'42"N, 121° 5'36"E	140
44	Peipu (北埔)	Hsinchu County	24° 41'26"N, 121° 3'34"E	115–300

45	Chienshih (尖石)	Hsinchu County	24° 43'8"N, 121° 16'44"E	750–1000
46	Wufong (五峰)	Hsinchu County	24° 37'19"N, 121° 7'41"E	555–700
47	Chinchien (清泉)	Hsinchu County	24° 33'17"N, 121° 6'13"E	655–850
48	Yuanyang Lake (鴛鴦湖)	Hsinchu County	24° 34'37"N, 121° 23'55"E	1770
49	Sanwan (三灣)	Miaoli County	24° 38'48"N, 120° 59'24"E	200
50	Zaociao (造橋)	Miaoli County	24° 38'41"N, 120° 51'33"E	50
51	Houlung (後龍)	Miaoli County	24° 35'43"N, 120° 46'22"E	50
52	Nanjuang (南庄)	Miaoli County	24° 35'55"N, 121° 0'12"E	200–780
53	Touwu (頭屋)	Miaoli County	24° 34'22"N, 120° 54'19"E	200
54	Shihtan (獅潭)	Miaoli County	24° 31'21"N, 120° 55'6"E	260
55	Luchan (鹿場)	Miaoli County	24° 31'49"N, 121° 2'35"E	1000
56	Tongsiao (通霄)	Miaoli County	24° 27'40"N, 120° 43'3"E	35–165
57	Dahu (大湖)	Miaoli County	24° 23'33"N, 120° 52'15"E	300–630
58	Taian (泰安)	Miaoli County	24° 28'6"N, 120° 58'26"E	350–1750
59	Kungwu (觀霧)	Miaoli County	24° 29'59"N, 121° 6'51"E	2000
60	Sanyi (三義)	Miaoli County	24° 22'2"N, 120° 46'43"E	200–600
61	Sihyuan (思源)	Taichung City	24° 21'30"N, 121° 19'48"E	1850–1900
62	Wuling (武陵)	Taichung City	24° 19'11"N, 121° 17'37"E	1600–2150
63	Dongshih (東勢)	Taichung City	24° 17'2"N, 120° 52'31"E	300–600
64	Tahsuehshan (大雪山)	Taichung City	24° 14'27"N, 120° 55'42"E	605–1030
65	Techi Reservoir (德基水庫)	Taichung City	24° 14'50"N, 121° 9'16"E	1600
66	Lishan (梨山)	Taichung City	24° 15'38"N, 121° 15'12"E	1740–1800
67	Shalu (沙鹿)	Taichung City	24° 12'34"N, 120° 35'11"E	200
68	Heping (和平)	Taichung City	24° 10'49"N, 120° 55'33"E	600–1450
69	Kukuan (谷關)	Taichung City	24° 12'18"N, 121° 0'34"E	700–1000
70	Dadu (大肚)	Taichung City	24° 8'54"N, 120° 34'18"E	230
71	Taichung (台中)	Taichung City	24° 9'27"N, 120° 39'60"E	100–180
72	Daken (大坑)	Taichung City	24° 10'5"N, 120° 44'3"E	150–300
73	Hsinshe (新社)	Taichung City	24° 10'24"N, 120° 49'6"E	600
74	Taiping (太平)	Taichung City	24° 7'8"N, 120° 47'28"E	105–600
75	Wufeng (霧峰)	Taichung City	24° 2'18"N, 120° 44'31"E	100–250
76	Tianwei (田尾)	Changhua County	23° 53'46"N, 120° 31'40"E	30
77	Songcyuangang (松泉崗)	Nantou County	24° 11'45"N, 121° 18'13"E	2400–2480
78	Hui-Sun Forest Station (惠蓀林場)	Nantou County	24° 4'55"N, 121° 0'24"E	500
79	Meifeng (梅峰)	Nantou County	24° 5'4"N, 121° 10'25"E	1450–2200
80	Guoshing (國姓)	Nantou County	24° 2'26"N, 120° 51'16"E	280
81	Caoton (草屯)	Nantou County	23° 59'5"N, 120° 45'11"E	160
82	Nanshang (南山)	Nantou County	24° 0'49"N, 121° 6'1"E	840
83	Wushe (霧社)	Nantou County	24° 1'10"N, 121° 7'51"E	900–1200
84	Lushan (廬山)	Nantou County	24° 1'22"N, 121° 11'1"E	1100–1200
85	Yunhai (雲海)	Nantou County	24° 3'22"N, 121° 13'15"E	2400
86	Puli (埔里)	Nantou County	24° 0'11"N, 120° 55'32"E	500–900
87	Wujie (武界)	Nantou County	23° 57'56"N, 121° 5'14"E	820
88	Aowanda (奧萬大)	Nantou County	23° 57'7"N, 121° 10'26"E	1200
89	Nantou (南投)	Nantou County	23° 55'30"N, 120° 41'58"E	100
90	Chungliao (中寮)	Nantou County	23° 54'26"N, 120° 45'59"E	200
91	Yuchih (魚池)	Nantou County	23° 53'40"N, 120° 54'47"E	600–980

92	Chichi (集集)	Nantou County	23° 49'13"N, 120° 50'31"E	300
93	Lugu (鹿谷)	Nantou County	23° 44'7"N, 120° 46'53"E	470–1200
94	Shueili (水里)	Nantou County	23° 47'31"N, 120° 51'41"E	360
95	Tili (地利)	Nantou County	23° 47'49"N, 120° 56'55"E	500–1200
96	Jhushan (竹山)	Nantou County	23° 44'52"N, 120° 41'51"E	195–1000
97	Hsitou (溪頭)	Nantou County	23° 40'57"N, 120° 47'48"E	1100–1200
98	Shanlinhsi (杉林溪)	Nantou County	23° 38'28"N, 120° 47'2"E	1600
99	Tungfu (同富)	Nantou County	23° 32'37"N, 120° 51'50"E	1000
100	Tungpu (東埔)	Nantou County	23° 33'3"N, 120° 55'15"E	1050–2450
101	Douliou (斗六)	Yunlin County	23° 42'49"N, 120° 36'12"E	55–170
102	Chaolin (草嶺)	Yunlin County	23° 35'53"N, 120° 37'56"E	750
103	Dalin (大林)	Chiayi County	23° 35'12"N, 120° 28'41"E	35–40
104	Meishan (梅山)	Chiayi County	23° 32'59"N, 120° 38'20"E	490
105	Minsyong (民雄)	Chiayi County	23° 32'41"N, 120° 27'32"E	50–100
106	Jhuci (竹崎)	Chiayi County	23° 30'29"N, 120° 34'38"E	100–920
107	Fencihu (奮起湖)	Chiayi County	23° 30'1"N, 120° 42'3"E	1200–1405
108	Alishan (阿里山)	Chiayi County	23° 30'42"N, 120° 48'17"E	2250–2400
109	Chiayi (嘉義)	Chiayi County	23° 28'38"N, 120° 28'38"E	95
110	Shizhou (石棹)	Chiayi County	23° 27'43"N, 120° 41'15"E	1205–1495
111	Fanlu (番路)	Chiayi County	23° 25'55"N, 120° 37'53"E	300–1240
112	Dapan (達邦)	Chiayi County	23° 27'3"N, 120° 44'5"E	800
113	Lichia (里佳)	Chiayi County	23° 24'18"N, 120° 43'14"E	1010
114	Jhongpu (中埔)	Chiayi County	23° 22'11"N, 120° 32'0"E	170–630
115	Chashan (茶山)	Chiayi County	23° 20'52"N, 120° 38'8"E	700
116	Dapu (大埔)	Chiayi County	23° 17'4"N, 120° 35'19"E	200–500
117	Baihe (白河)	Tainan City	23° 21'1"N, 120° 27'45"E	80–400
118	Guanziling (關子嶺)	Tainan City	23° 20'14"N, 120° 29'54"E	175–500
119	Sinying (新營)	Tainan City	23° 16'43"N, 120° 19'55"E	15
120	Dungshan (東山)	Tainan City	23° 17'2"N, 120° 28'5."E	150–585
121	Wusanto Reservoir (烏山頭水庫)	Tainan City	23° 12'51"N, 120° 22'10"E	75
122	Madou (麻豆)	Tainan City	23° 11'14"N, 120° 16'6"E	15
123	Nanhua (南化)	Tainan City	23° 4'30"N, 120° 33'9"E	200–400
124	Yongkang (永康)	Tainan City	23° 2'25"N, 120° 14'50"E	7
125	Tainan (台南)	Tainan City	22° 58'38"N, 120° 11'55"E	10
126	Tienchi (天池)	Kaohsiung City	23° 16'40"N, 120° 54'53"E	2280–2300
127	Kuaiku (檜谷)	Kaohsiung City	23° 15'58"N, 120° 56'38"E	2400
128	Sanmin (三民)	Kaohsiung City	23° 12'59"N, 120° 40'46"E	600–800
129	Tauyuan (桃源)	Kaohsiung City	23° 13'41"N, 120° 47'58"E	600–2280
130	Xiaolin (小林)	Kaohsiung City	23° 10'19"N, 120° 38'53"E	430
131	Jiashian (甲仙)	Kaohsiung City	23° 7'1"N, 120° 37'21"E	250–480
132	Paolai (寶來)	Kaohsiung City	23° 6'33"N, 120° 42'4"E	390–405
133	Chuyunshan (出雲山)	Kaohsiung City	23° 6'56"N, 120° 50'4"E	600–1320
134	Tengjhih (藤枝)	Kaohsiung City	23° 3'57"N, 120° 44'41"E	1350–1525
135	Liouguei (六龜)	Kaohsiung City	23° 0'42"N, 120° 39'49"E	215–405
136	Shanping (扇平)	Kaohsiung City	22° 57'47"N, 120° 40'33"E	510–670
137	Tianliao (田寮)	Kaohsiung City	22° 51'48"N, 120° 24'5"E	60
138	Meinong (美濃)	Kaohsiung City	22° 55'33"N, 120° 35'14"E	110–145

139	Chishan (旗山)	Kaohsiung City	22° 53'23"N, 120° 28'37"E	100
140	Maolin (茂林)	Kaohsiung City	22° 53'16"N, 120° 40'0"E	200–520
141	Gangshan (岡山)	Kaohsiung City	22° 49'5"N, 120° 19'51"E	70
142	Linyuan (林園)	Kaohsiung City	22° 30'19"N, 120° 22'3"E	5
143	Sandimen (三地門)	Pingtung County	22° 47'41"N, 120° 41'51"E	110–700
144	Machia (瑪家)	Pingtung County	22° 41'20"N, 120° 38'40"E	100–780
145	Pingtung (屏東)	Pingtung County	22° 42'8"N, 120° 28'3"E	25
146	Neipu (內埔)	Pingtung County	22° 38'32"N, 120° 36'34"E	85
147	Wutai (霧台)	Pingtung County	22° 39'4"N, 120° 40'2"E	400–1100
148	Taiwu (泰武)	Pingtung County	22° 35'17"N, 120° 39'16"E	100–700
149	Laiyi (來義)	Pingtung County	22° 31'42"N, 120° 40'24"E	50–450
150	Linbian (林邊)	Pingtung County	22° 25'41"N, 120° 31'32"E	2
151	Jiadung (茄冬)	Pingtung County	22° 24'34"N, 120° 33'40"E	13
152	Tahanshan (大漢山)	Pingtung County	22° 25'2"N, 120° 40'9"E	270–1245
153	Fangliao (枋寮)	Pingtung County	22° 20'24"N, 120° 38'1"E	80
154	Fangshan (枋山)	Pingtung County	22° 15'46"N, 120° 40'19"E	20–60
155	Shihzih (獅子)	Pingtung County	22° 14'1"N, 120° 41'26"E	80
156	Tsaopu (草埔)	Pingtung County	22° 14'19"N, 120° 48'23"E	320
157	Suanliu (雙流)	Pingtung County	22° 12'41"N, 120° 47'2"E	145–350
158	Fongkang (楓港)	Pingtung County	22° 11'48"N, 120° 43'2"E	170–298
159	Lilung Mt. (里龍山)	Pingtung County	22° 10'36"N, 120° 42'41"E	90–400
160	Checheng (車城)	Pingtung County	22° 4'10"N, 120° 43'57"E	15–200
161	Hengchuen (恆春)	Pingtung County	22° 0'30"N, 120° 45'8"E	25–40
162	Kenting (墾丁)	Pingtung County	21° 57'30"N, 120° 47'42"E	45–250
163	Manjhou (滿州)	Pingtung County	21° 58'14"N, 120° 49'38"E	90–380
164	Nanjenshan (南仁山)	Pingtung County	22° 5'17"N, 120° 51'30"E	200–300
165	Chiupeng (九棚)	Pingtung County	22° 7'44"N, 120° 52'22"E	25–160
166	Mudan (牡丹)	Pingtung County	22° 8'28"N, 120° 48'20.91"E	100–335
167	Neiwen (內文)	Pingtung County	22° 12'8"N, 120° 50'25"E	400
168	Orchid Is. (蘭嶼)	Taitung County	22° 3'40"N, 121° 32'40"E	10–80
169	Anshuo (安朔)	Taitung County	22° 17'27"N, 120° 51'31"E	35–150
170	Dawu (大武)	Taitung County	22° 21'48"N, 120° 53'9"E	80
171	Daren (達仁)	Taitung County	22° 27'3"N, 120° 53'9"E	150–1200
172	Jinlun (金崙)	Taitung County	22° 31'39"N, 120° 57'24"E	5–40
173	Taimali (太麻里)	Taitung County	22° 36'13"N, 120° 59'4"E	20–550
174	Chiban (知本)	Taitung County	22° 42'3"N, 121° 0'19"E	20–500
175	Green Is. (綠島)	Taitung County	22° 39'52"N, 121° 29'23"E	10–100
176	Taitung (台東)	Taitung County	22° 46'50"N, 121° 7'43"E	30
177	Lichia (利嘉)	Taitung County	22° 47'43"N, 120° 59'20"E	700–1250
178	Hongye (紅葉)	Taitung County	22° 58'11"N, 121° 4'43"E	200–1200
179	Luye (鹿野)	Taitung County	22° 54'17"N, 121° 8'34"E	120
180	Tungho (東河)	Taitung County	23° 1'57"N, 121° 17'1"E	10–540
181	Chenggong (成功)	Taitung County	23° 6'22"N, 121° 21'20"E	10–295
182	Haituan (海端)	Taitung County	23° 7'31"N, 121° 9'56"E	400–800
183	Shiama (下馬)	Taitung County	23° 9'247"N, 121° 3'48"E	700
184	Litao (利稻)	Taitung County	23° 11'39"N, 121° 1'55"E	1040
185	Sianyang (向陽)	Taitung County	23° 14'42"N, 120° 59'24"E	2070–2200

186	Changbin (長濱)	Taitung County	23° 18'49"N, 121° 27'9"E	20
187	Fuli (富里)	Hualien County	23° 12'41"N, 121° 16'0"	200–300
188	Jhuoxi (卓溪)	Hualien County	23° 18'40"N, 121° 14'51"E	235–705
189	Yuli (玉里)	Hualien County	23° 22'57"N, 121° 21'28"E	125
190	Takongkau (大港口)	Hualien County	23° 27'40"N, 121° 29'40"E	20–40
191	Chimei (奇美)	Hualien County	23° 29'45"N, 121° 25'44"E	50–130
192	Rueisuei (瑞穗)	Hualien County	23° 29'51"N, 121° 22'40"E	50–250
193	Fuyuan (富源)	Hualien County	23° 33'46"N, 121° 22'29"E	200
194	Fengbin (豐濱)	Hualien County	23° 36'6"N, 121° 30'36"E	20–250
195	Guanfu (光復)	Hualien County	23° 40'49"N, 121° 22'52"E	390
196	Wanrung (萬榮)	Hualien County	23° 42'47"N, 121° 23'49"E	100–550
197	Sueilien (水璉)	Hualien County	23° 43'54"N, 121° 33'36"E	10
198	Fonglin (鳳林)	Hualien County	23° 45'20"N, 121° 25'32"E	170
199	Yanliao (鹽寮)	Hualien County	23° 51'46"N, 121° 35'43"E	40
200	Shoufeng (壽豐)	Hualien County	23° 49'20"N, 121° 30'59"E	10–300
201	Liyutan (鯉魚潭)	Hualien County	23° 54'53"N, 121° 30'45"E	45–165
202	Tungmen (銅門)	Hualien County	23° 57'10"N, 121° 30'48"E	160
203	Hualien (花蓮)	Hualien County	23° 59'41"N, 121° 37'13"E	15–80
204	Ji-an (吉安)	Hualien County	24° 0'6"N, 121° 32'48"E	50–850
205	Sioulin (秀林)	Hualien County	24° 6'9"N, 121° 35'49"E	150–160
206	Lushui (綠水)	Hualien County	24° 11'11"N, 121° 29'32"E	500
207	Taroko (太魯閣)	Hualien County	24° 9'38"N, 121° 37'3"E	50–850
208	Tianxiang (天祥)	Hualien County	24° 11'11"N, 121° 29'32"E	555
209	Sibao (西寶)	Hualien County	24° 12'26"N, 121° 28'55"E	955
210	Luoshao (洛韶)	Hualien County	24° 12'19"N, 121° 26'58"E	800–1620
211	Tsu-en (慈恩)	Hualien County	24° 11'32"N, 121° 22'52"E	1900–2200
212	Quanyuan (關原)	Hualien County	24° 11'1"N, 121° 20'33"E	2300–2370
213	Dayuling (大禹嶺)	Hualien County	24° 10'49"N, 121° 18'39"E	2500–2565
214	Hoping forest road (和平林道)	Hualien County	24° 18'18"N, 121° 39'6"E	1840–1900
215	Hanben (漢本)	Hualien County	24° 19'52"N, 121° 44'40"E	70
216	Gu-yin (鼓音)	Yilan County	24° 22'10"N, 121° 46'47"E	30–240
217	Nan-ao (南澳)	Yilan County	24° 28'1"N, 121° 46'7"E	10–800
218	Taipingshan (太平山)	Yilan County	24° 29'29"N, 121° 33'16"E	1800
219	Suchi (四季)	Yilan County	24° 29'8"N, 121° 25'22"E	680–1050
220	Cueifong Lake (翠峰湖)	Yilan County	24° 30'52"N, 121° 36'25"E	1850
221	Dong-ao (東澳)	Yilan County	24° 30'58"N, 121° 49'51"E	30
222	Su-ao (蘇澳)	Yilan County	24° 34'40"N, 121° 50'31"E	120
223	Dongshan (冬山)	Yilan County	24° 36'33"N, 121° 44'53"E	50–110
224	Datong (大同)	Yilan County	24° 34'36"N, 121° 39'6"E	100–1520
225	Chilan (棲蘭)	Yilan County	24° 36'38"N, 121° 29'19"E	300–1100
226	Mingchr (明池)	Yilan County	24° 39'6"N, 121° 28'17"E	1050–1175
227	Songluo (松蘿)	Yilan County	24° 39'54"N, 121° 35'31"E	170
228	Yilan (宜蘭)	Yilan County	24° 41'40"N, 121° 46'20"E	10
229	Yuanshan (員山)	Yilan County	24° 44'25"N, 121° 40'41"E	10–200
230	Suanlianbei (雙連埤)	Yilan County	24° 44'58"N, 121° 38'28"E	500
231	Fushan (福山)	Yilan County	24° 45'21"N, 121° 35'48"E	470–700
232	Jiaosi (礁溪)	Yilan County	24° 49'27"N, 121° 45'17"E	50–120

233	Guishan Is. (龜山島)	Yilan County	24° 50'28"N, 121° 56'41"E	70
234	Toucheng (頭城)	Yilan County	24° 56'34"N, 121° 52'10"E	15–500
235	Makung (馬公)	Penghu County	23° 33'48"N, 119° 35'42"E	20
236	Wang-an (望安)	Penghu County	23° 29'26"N, 119° 31'38"E	40

Table 2. List of anurans from Taiwan and adjacent islands. * Introduced species; † currently a protected species in Taiwan (since 2008).

FAMILY	SPECIES
Bufonidae	*Bufo bankorensis* Barbour, 1908
	Duttaphrynus melanostictus (Schneider, 1799)
Hylidae	*Hyla chinensis* Günther, 1858
Microhylidae	*Kaloula pulchra* Gray, 1831*
	Microhyla butleri Boulenger, 1900
	Microhyla heymonsi Vogt, 1911
	Microhyla fissipes Boulenger, 1884
	Micryletta steinegeri (Boulenger, 1909)
Ranidae	*Babina adenopleura* (Boulenger, 1909)
	Babina okinavana (Boettger, 1895)†
	Fejervarya cancrivora (Gravenhorst, 1829)
	Fejervarya limnocharis (Gravenhorst, 1829)
	Hoplobatrachus rugulosus (Osbeck, 1765)
	Hylarana guentheri (Boulenger, 1882)
	Hylarana latouchii (Boulenger, 1899)
	Hylarana taipehensis (van Denburgh, 1909)†
	Limnonectes fujianensis Ye and Fei, 1994
	Lithobates catesbeianus (Shaw, 1802)*
	Odorrana swinhoana (Boulenger, 1903)
	Pelophylax fukienensis (Pope, 1923)†
	Rana longicrus Stejneger, 1898
	Rana sauteri Boulenger, 1909
Rhacophoridae	*Buergeria japonica* (Hallowell, 1861)
	Buergeria robusta (Boulenger, 1909)
	Kurixalus eiffingeri (Boettger, 1895)
	Kurixalus idiootocus (Kuramoto and Wang, 1987)
	Polypedates braueri (Vogt, 1911)
	Polypedates megacephalus Hallowell, 1861*
	Rhacophorus arvalis Lue, Lai and Chen, 1995†
	Rhacophorus aurantiventris Lue, Lai and Chen, 1994†
	Rhacophorus moltrechti Boulenger, 1908
	Rhacophorus prasinatus Mou, Risch and Lue, 1983†
	Rhacophorus taipeianus Liang and Wang, 1978†

["Bankoro (might refer to Fanlu, site 111 in this study), central Formosa (=Taiwan)"].

Ecological notes: *Bufo bankorensis* is easily observed at elevations above 500 m in Taiwan, and occurs at lower elevations in winter. Tadpoles occur in both lotic and lentic habitats (Chou and Lin 1997b). Reproduction by low- and mid-elevation populations of this toad is discontinuous; that of the conspecific high-elevation population is continuous throughout the entire year (Huang and Yu 2005).

Distribution within Taiwan: Currently considered a Taiwanese endemic toad (Matsui 1986; Zhao and Adler 1993), although Liu *et al*. (2000) and Fu *et al*. (2005) revealed that *B. bankorensis* cannot be differentiated from *B. gargarizans* at the molecular level. This species is widely distributed on Guishan Is. (site 233) and mountainous areas throughout Taiwan at low, medium, and high elevations (Huang *et al*. 1996). Specimen records are from 118 sites at elevations of 5 (site 172, Jinlun) to 2400 m (site 85, Yunhai) (Fig. 3).

Phylogenetic notes: Liu *et al*. (2000) and Fu *et al*. (2005) indicated that *B. bankorensis* and *B. gargarizans* share very close relationships from mtDNA sequencing and allozyme electrophoretic data. Both studies supported the synonymization of *B. bankorensis* with *B. gargarizans*. However, Chen *et al*. (2013) indicated that *B. bankorensis* is a valid species and is restricted to Taiwan based on amplified restriction fragment length polymorphism of cytochrome *b* data with three observed phylogroups. The validity of *B. bankorensis* should be rechecked with additional evidence.

Fig. 2. Adult *Bufo bankorensis*. Dongshan, snout-vent length: 92.04 mm. Dongshan, Yilan County (site 223). NMNSC4805. Photograph by N.H. Jang-Liaw on Feb. 12, 2009.

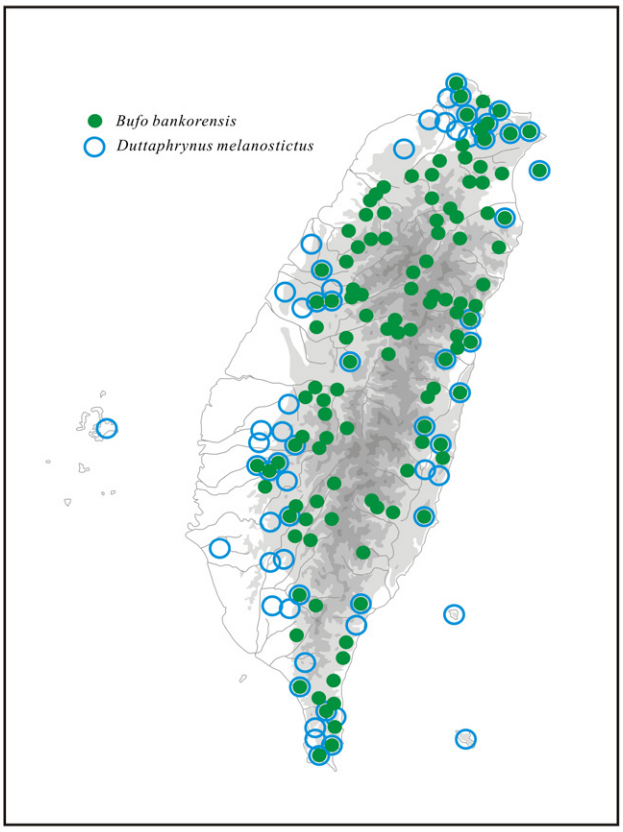

Fig. 3. Distribution localities of *Bufo bankorensis* and *Duttaphrynus melanostictus* in Taiwan based on specimen records.

Conservation notes: *Bufo bankorensis* is collected and locally consumed for food (Garner *et al*. 2009) and medicinal use in Taiwan (Lue and Chou 2004).

***Duttaphrynus melanostictus* (Schneider, 1799) (Fig. 4)**

Bufo melanostictus — Schneider 1799: 216. ["India orientali"; see Dubois and Ohler 1999: 139].
Duttaphrynus melanostictus — Frost *et al*. 2006: 365.

Ecological notes: *Duttaphrynus melanostictus* occurs in lowlands throughout Taiwan. Its tadpoles prefer pools of standing water. The breeding season is February to September in Taiwan (Yang 2006). Tadpoles appear to be restricted to standing water like ponds, paddy fields, pools of blocked ditches, and dammed pools in lowland rivers (Chou and Lin 1997b).

Distribution within Taiwan: It is widely distributed throughout Taiwan at low elevations and on adjacent islands. Specimen records are from 65 sites at elevations of 10 (sites 125,

Tainan, 165, Orchid Is., 175,Green Is., 181, Chenggong, and 197, Sueilien) to 770 m (site 152, Tahanshan) (Fig. 3).

Family Hylidae

***Hyla chinensis* Günther, 1858 (Fig. 5)**

Hyla arborea var. *chinensis* — Günther 1858: 108 [China, Formosa, and Chusan? (see Boulenger 1882: 382)].

Hyla chinensis — Günther 1864: 436.

Ecological notes: The breeding season of *H. chinensis* is March to September in Taiwan (Yang 2006). Tadpoles prefer still-water habitats such as ponds, cisterns, and paddy fields (Chou and Lin 1997b).

Distribution within Taiwan: *Hyla chinensis* is considered a widely distributed species in lowlands throughout the island (Yang 2006) and mainly occurs in northeastern, northern, and western Taiwan (Chou and Lin 1997b). Specimen records are from 20 sites at elevations of 7 (site 124, Yongkang) to 600 m (site 231, Fushan) (Fig. 6). There are very few sighting reports of the presence of *H. chinensis* in eastern Taiwan. We suggest that the eastern population of this species was accidentally introduced by recent horticulture activities. A detailed survey of inferred molecular data of all populations in Taiwan would be helpful to clarify the original distribution of this frog.

Fig. 4. Adult *Duttaphrynus melanostictus*. Male. About 70 mm in snout-vent length. Jiadung, Pingtung County (site 151). The individual was not collected. Photograph by N.H. Jang-Liaw on June 2, 2008.

Fig. 5. Adult *Hyla chinensis*. Male. Snout-vent length: 31.24 mm. Sanchih, New Taipei City (site 1). NMNSC4838. Photograph by N.H. Jang-Liaw on Feb. 23, 2009.

Family Microhylidae

***Kaloula pulchra* Gray, 1831 (Fig. 7)**

Kaloula pulchra — Gray 1831: 38 ("China"; see Parker 1934: 86).

Distribution within Taiwan: This is an introduced species. The first established population was found in 1998 in Linyuan, Kaohsiung City (site 142; see Yang 2006), and now its distribution has expanded to Tainan City and Pingtung County (Shang *et al*. 2009). The specimen record is at site 142 (Linyuan) at an elevation of 10 m (Fig. 6).

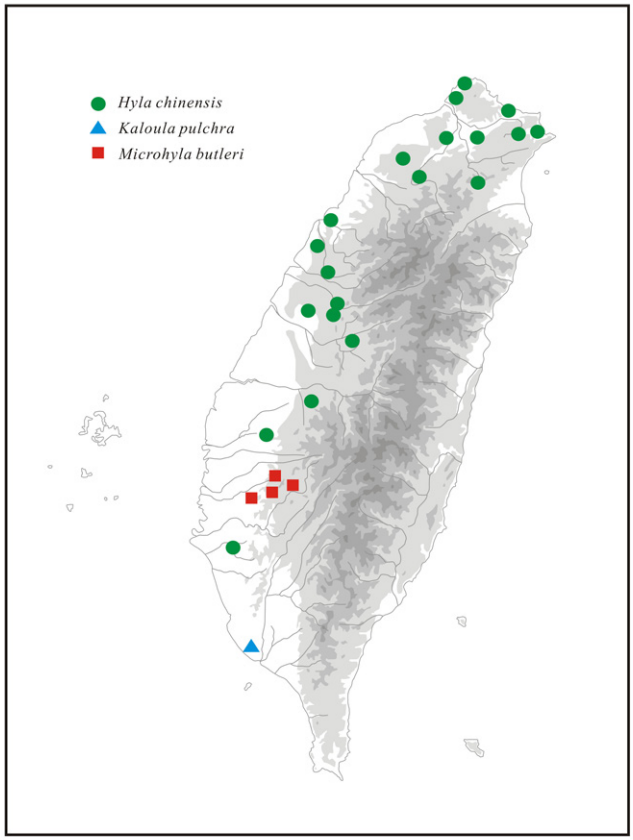

Fig. 6. Distribution localities of *Hyla chinensis*, *Kaloula pulchra*, and *Microhyla butleri* in Taiwan based on specimen records.

***Microhyla butleri* Boulenger, 1900 (Fig. 8)**

Microhyla butleri — Boulenger 1900: 188 ["Larut Hills at 4,000 feet", Perak, Malaya (Malaysia). See Parker 1934: 132].

Ecological notes: *Microhyla butleri* is relatively rare and occurs in low-elevation mountainous areas. Its tadpoles prefer still water like ponds and feed both near the surface and in the water column (Chou and Lin 1997b).

Distribution within Taiwan: It has a restricted distribution to hilly areas of southwestern Taiwan, including Chiayi County, Tainan City, and Kaohsiung City. Specimen records are from four sites at elevations of 275 (site 118, Guanziling) to 500 m (site 120, Dungshan) (Fig. 6).

Conservation notes: *Microhyla butleri* was listed as a protected species in Taiwan in 1995~2008. It is no longer protected, for its population size is considered to have recovered.

***Microhyla heymonsi* Vogt, 1911 (Fig. 9)**

Microhyla heymonsi — Vogt 1911: 181 ["Kosempo (=Jiashian, site 131), Formosa (Taiwan)"; see Parker 1934: 135].

Ecological notes: *Microhyla heymonsi* occurs in marshes, small ponds, and open grasslands at up to 800 m. Its tadpoles prefer still water like ponds, pools of blocked ditches, and even rain pools, and only feed on the surface of the water (Chou and Lin 1997b).

Distribution within Taiwan: It has a restricted distribution in western Taiwan from the center to the southern tip of the island, and in the southeast. Specimen records are from 30 sites at elevations of 10 (site 180, Tungho) to 700 m (site 111, Fanlu) (Fig. 10). A specimen (NTUM-A25a06) was noted to have been collected from Sindian (site 17); however, the original note shows no collection information for that individual. We decided to remove this questionable record from the distribution range of the species.

Fig. 7. Adult *Kaloula pulchra*. Snout-vent length: 60.58 cm. Linyuan, Kaohsiung City (site 142). NMNSC3848. Photograph by N.H. Jang-Liaw on May 21, 2003.

Fig. 8. Adult *Microhyla butleri*. About 25 mm in snout-vent length. Chiayi County. The individual was not collected. Photograph by C.S. Wu in Aug. 2000.

Fig. 9. Adult *Microhyla heymonsi*. Snout-vent length: 26.74 mm. Yanliao, Hualien County (site 199). NMNSC5322. Photograph by N.H. Jang-Liaw on June 6, 2011.

Conservation notes: *Microhyla heymonsi* was listed as a protected species in Taiwan in 1995~2008. It is no longer protected, for its population size is considered to have recovered (Shang *et al*. 2009).

***Microhyla fissipes* Boulenger, 1884 (Fig. 11)**

Microhyla fissipes — Boulenger 1884: 397 [Taiwan foo (= Tainan City), S. Formosa (Taiwan); see Parker 1934: 141].

Ecological notes: *Microhyla fissipes* occurs in marshes, small ponds, and open grasslands. Its tadpoles prefer still water like ponds, pools of

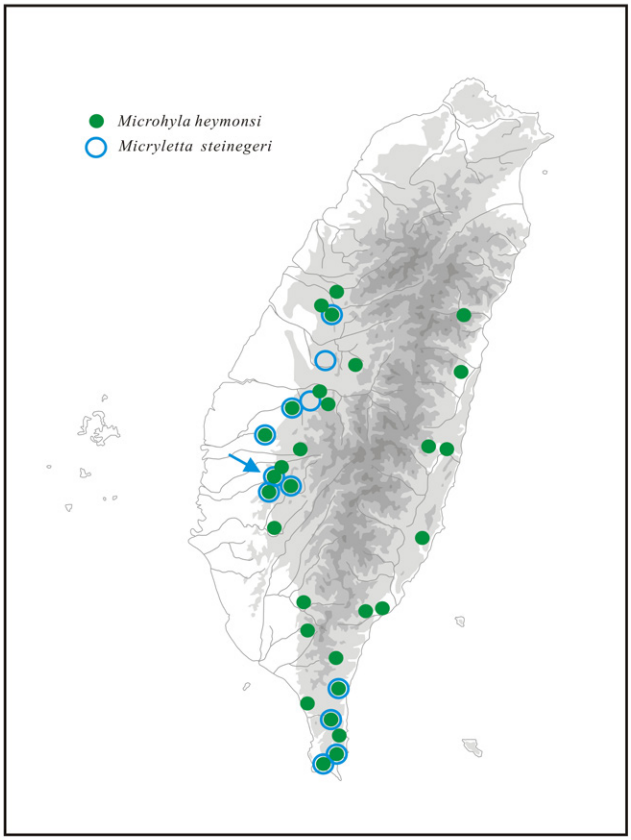

Fig. 10. Distribution localities of *Microhyla heymonsi* and *Micryletta steinegeri* in Taiwan from specimen records. The blue arrow indicates the holotype locality of *Micryletta steinegeri* (Guanziling, site 98; see Boulenger 1909).

blocked ditches, and even rain pools, and feed both near the surface and in the water column (Chou and Lin 1997b).

Distribution within Taiwan: It is widely distributed in lowlands and hilly areas throughout Taiwan. Specimen records are from 67 sites at elevations of 2 (site 151, Jiadung) to 700 m (site 86, Puli) (Fig. 12).

Taxonomic notes: The Taiwanese *Microhyla steinegeri* was previously identified as *Microhyla inornata* (Wang *et al*. 1989).

Micryletta steinegeri (Boulenger, 1909) (Fig. 13)

Microhyla steinegeri — Boulenger 1909: 494 ["Kanshirei" (=Guanziling, site 98), Taiwan; see Parker 1934: 145].
Micryletta steinegeri — Dubois 1987: 4.

Ecological notes: It prefers hilly areas and open grasslands. Its tadpoles prefer still water like rain pools and feed near the surface (Chou and Lin 1997b). Breeding groups appear at night after a heavy rain in May to September (Lin *et al*. 2011).

Distribution within Taiwan: It is rare and has a restricted distribution from west-central Taiwan (Taichung City) to the southern tip (Kenting, Pingtung County) of the island. Specimen records are from 12 sites at elevations of 85 (site 169, Anshuo) to 500 m (site 118, Guanziling) (Fig. 10).

Conservation notes: *Micryletta steinegeri* was listed as a protected species in Taiwan in 1995~2008. It was considered to be very rare, for

Fig. 11. Adult *Microhyla fissipes*. Male. Snout-vent length: 22.71 mm. Taiping, Taichung City (site 74). NMNSC4750. Photograph by N.H. Jang-Liaw on June 5, 2008.

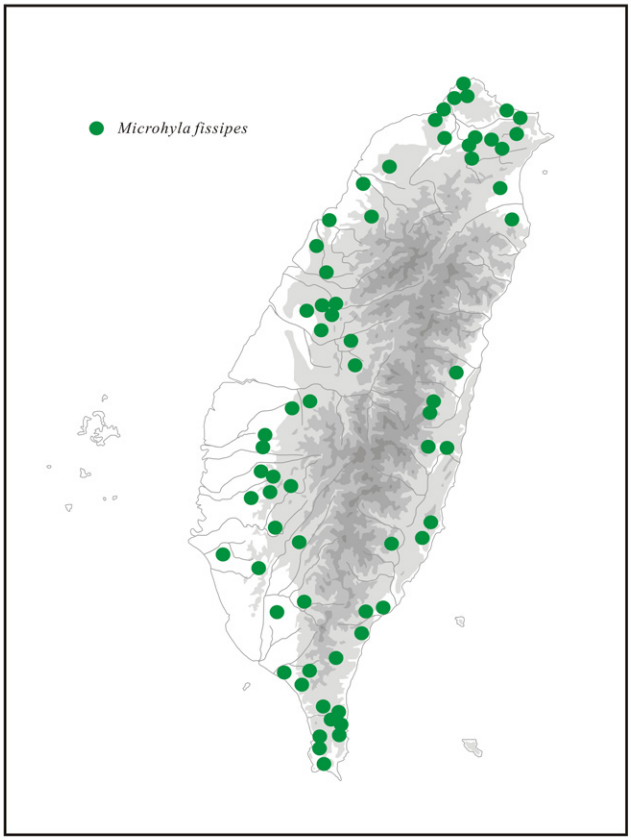

Fig. 12. Distribution localities of *Microhyla fissipes* in Taiwan based on specimen records.

Fig. 13. Adult *Micryletta steinegeri*. Snout-vent length: 22.51 mm. Nantou, Nantou County (site 89). NMNSC4752. Photograph by N.H. Jang-Liaw on June 12, 2008.

Fig. 14. Adult *Babina adenopleura*. Male. About 70 mm in snout-vent length. Fushan, Yilan County (site 231). The individual was not collected. Photograph by N.H. Jang-Liaw on March 17, 2009.

few populations were previously found (Stuart *et al*. 2008). Currently, more populations with larger numbers of individuals have been found, and it is no longer protected by law, for its population size is considered to have recovered (Shang *et al*. 2009).

Family Ranidae

***Babina adenopleura* (Boulenger, 1909) (Fig. 14)**

Rana adenopleura — Boulenger 1909: 492 ["Fuhacho Village (= Maobu or Wucheng, Nantou County; close to site 91), altitude about 4000 feet", Taiwan].
Babina adenopleura — Frost *et al*. 2006: 368.

Ecological notes: *Babina adenopleura* occurs widely in marshes and ponds of hilly areas. Its tadpoles prefer slowly flowing or still water, such as intermittent streams, pools of blocked ditches, cisterns, and pools (Chou and Lin 1997b).

Distribution within Taiwan: Specimen records are from 25 sites at elevations of 200 (sites 14, Shihding and 22, Tunghou) to 1174 m (site 226, Mingchr) (Fig. 15).

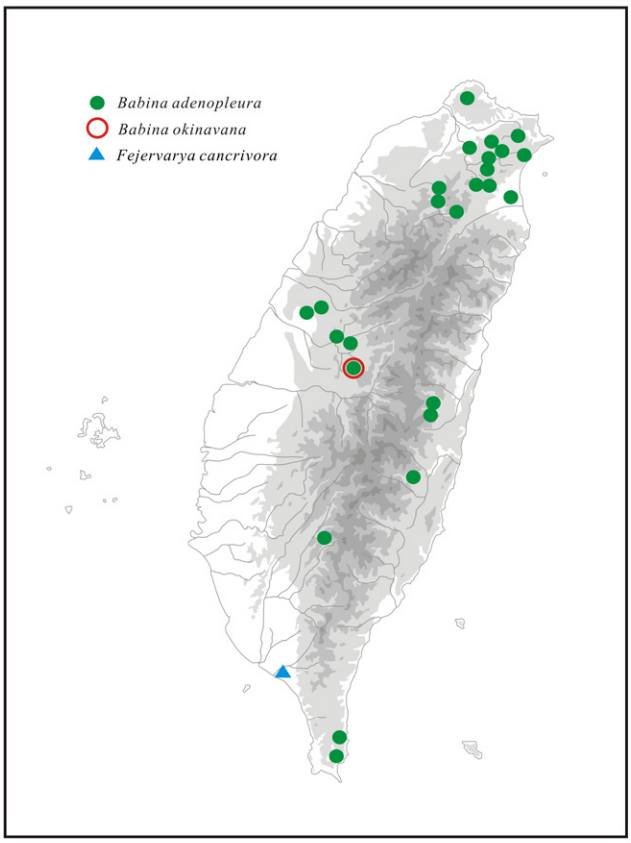

Fig. 15. Distribution localities of *Babina adenopleura*, together with the only known localities for *Babina okinavana* and *Fejervarya cancrivora* in Taiwan based on specimen records.

***Babina okinavana* (Boettger, 1895) (Fig. 16)**

Rana okinavana — Boettger 1895: 266 ["Liukiu (Ryukyu)-Inseln, angebich von Okinawa, der mittleren Gruppe", Japan. Matsui (2007) considered the type locality as incorrect, most likely actually somewhere in the Yaemama Islands].
Babina okinavana — Frost 2007.

Ecological notes: *Babina okinavana* exhibits nest construction behavior (Chuaynkern *et al*. 2010).

Distribution within Taiwan: It has a very limited distribution in one marsh in Nantou County, central Taiwan. The specimen record is from this site (91, Yuchih) at an elevation of 600 m (Fig. 15). Both Stuart *et al*. (2008) and Shang *et al*. (2009) indicated that another population occurred in Yilan County, but no valid specimen

record is available.

Taxonomic notes: This species, including populations from Taiwan and the southern Ryukyus, Japan, was described as *Rana psaltes* by Kuramoto (1985). Matsui (2007) indicated that *Babina* (*R.*) *okinavana* is identical with and a subjective senior synonym of *R. psaltes*.

Conservation notes: *Babina okinavana* was listed in the governmental conservation list of Taiwan as a "rare and valuable species" in March 2009.

Fejervarya cancrivora (Gravenhorst, 1829) (Fig. 17)

Rana cancrivora — Gravenhorst 1829: 41 (Java, Indonesia; see Dubois and Ohler 2000: 30).

Fejervarya cancrivora — Iskandar 1998: 71.

Ecological notes: *Fejervarya cancrivora* has the ability to survive in high-salinity aquatic environments (Gordon *et al*. 1961). Its morphological characters are very similar to those of *F. limnocharis*. The Taiwanese population was not differentiated from *F. limnocharis* until 2005 (Yang 2006).

Distribution within Taiwan: It has a restricted distribution on the southwestern coast of Taiwan. The specimen record is from site 151, Jiadung, at an elevation of 10 m (Fig. 15). More specimens are needed to clarify its distribution in Taiwan.

Fejervarya limnocharis (Gravenhorst, 1829) (Fig. 18)

Rana limnocharis — Gravenhorst 1829: 42 (Java, Indonesia; see Dubois and Ohler 2000: 15-50).
Fejervarya limnocharis — Iskandar 1998: 71.

Ecological notes: *Fejervarya limnocharis* is very common and occurs in lowlands, hills, and mountainous areas in Taiwan. Its tadpoles prefer still water such as intermittent streams, pools of blocked ditches, and rain pools (Chou and Lin 1997b). It can breed in rock pools above the high-tide line, and some pools are quite near the sea (<4 m). Its tadpoles tolerate salinity better than tadpoles of most species studied so far (Wu and Kam 2009).

Distribution within Taiwan: It is widely distributed from the lowlands to mid-elevation mountainous areas throughout Taiwan and adjacent islands. Specimen records are from 113 sites at elevations of 2 (site 151, Jiadung) to 1405 m (site 107, Fencihu) (Fig. 19).

Fig. 16. Adult *Babina okinavana*. About 40 mm in snout-vent length. Yuchih, Nantou County (site 91). The individual was not collected. Photograph by N.H. Jang-Liaw on Feb. 28, 2009.

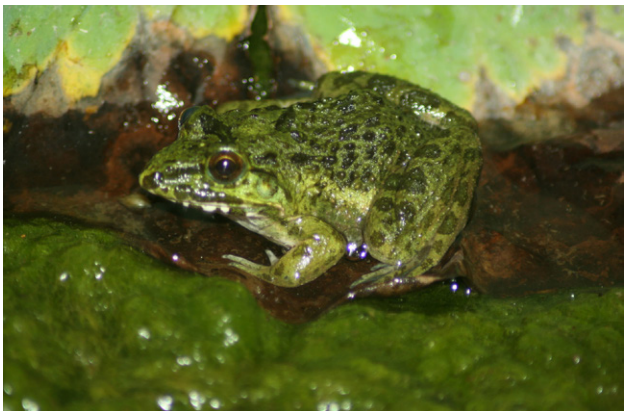

Fig. 17. Adult *Fejervarya cancrivora*. About 70 mm in snout-vent length. Jiadung, Pingtung County (site 151). The individual was not collected. Photograph by N.H. Jang-Liaw on July 9, 2009.

Fig. 18. Adult *Fejervarya limnocharis*. About 70 mm in snout-vent length. Douliou, Yunlin County (site 101). The individual was not collected. Photograph by N.H. Jang-Liaw on July 2, 2006.

Phylogenetic/phylogeographic notes: Toda *et al*. (1998) conducted an electrophoretic survey of 12 Taiwanese populations of *R. limnocharis* and identified a unique eastern lineage (including

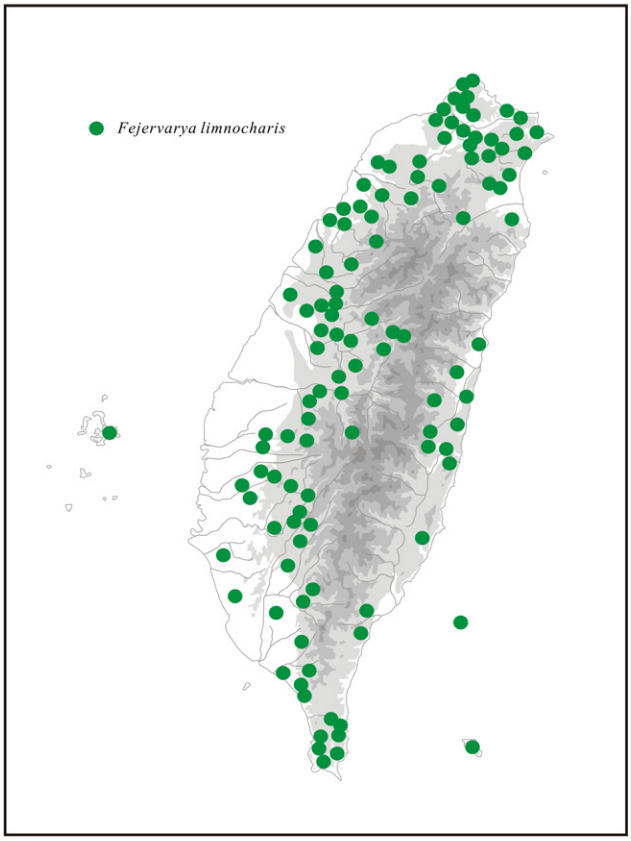

Fig. 19. Distribution localities of *Fejervarya limnocharis* in Taiwan based on specimen records.

two populations from eastern Taiwan and another two populations from Green Is. and Orchid Is.) from the remaining populations collected from northern, western, and southern Taiwan. In addition, there are many phylogenetic studies of this species. Most of them focused on the large-scale phylogeny of *F. limnocharis* populations or relative species, and only a small portion of Taiwanese *F. limnocharis* populations was included (e.g., Djong *et al*. 2007; Sumida *et al*. 2007; Islam *et al*. 2008; Zhong *et al*. 2008).

Hoplobatrachus rugulosus **(Osbeck, 1765) (Fig. 20)**

Rana chinensis — Osbeck 1765: 244 (Neotype from "near Guangzhou City, Guangdong, China" designated by Fei and Ye; see Fei *et al*. 2009).

Hoplobatrachus rugulosus — Dubois, 1982: 315.

Ecological notes: *Hoplobatrachus rugulosus* occurs on the plains, lowlands, and hills in Taiwan. Larval habitats are confined to still water such as paddy fields, ponds, and pools of blocked ditches (Chou and Lin 1997b). In addition to insects and other small terrestrial invertebrates, *Hop. rugulosus* also preys on other smaller frogs.

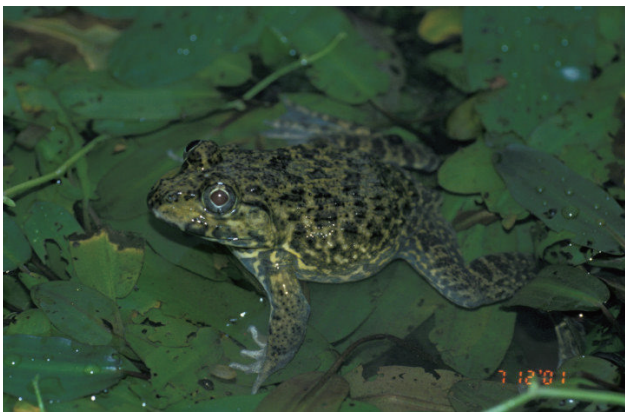

Fig. 20. Adult *Hoplobatrachus rugulosus*. About 100 mm in snout-vent length. The individual was not collected. Photograph by N.H. Jang-Liaw on July 12, 2001.

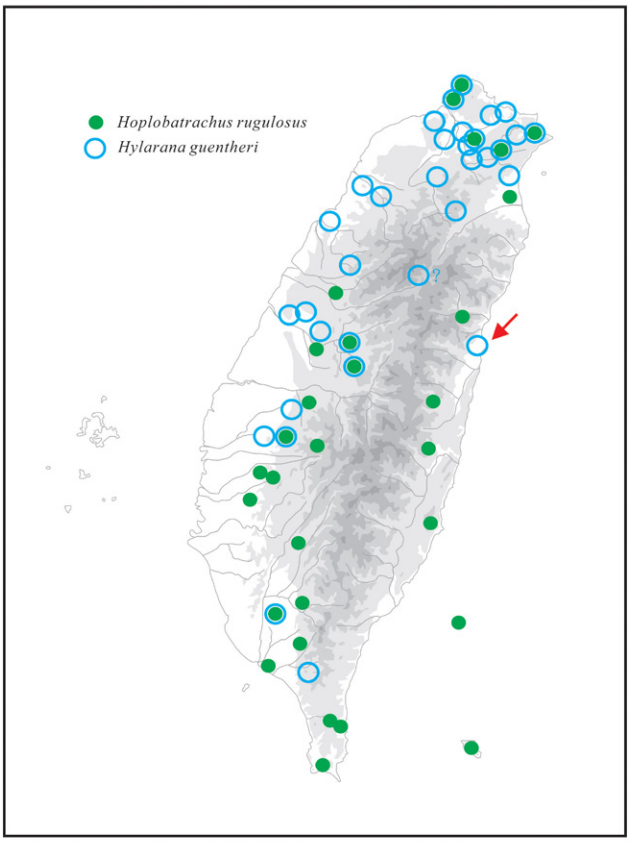

Fig. 21. Distribution localities of *Hoplobatrachus rugulosus* and *Hylarana guentheri* in Taiwan based on specimen records. The blue open circle accompanied by a question mark indicates a doubtful specimen record of *H. guentheri* from site 62, Wuling (TMAS.0127). The red arrow indicates a possible collection site in Hualien ("Hwa-lien, Swa-wa") based on a CAS HERP specimen record.

Distribution within Taiwan: It is widely distributed in low-elevation areas throughout Taiwan. Specimen records are from 30 sites at elevations of 2 (site 150, Linbian) to 650 m (site 91, Yuchih) (Fig. 21).

Conservation notes: *Hoplobatrachus rugulosus* was listed as a protected species in Taiwan in 1995~2008. Cultured individuals are available in some local markets.

Hylarana guentheri (Boulenger, 1882) (Fig. 22)

Rana guentheri — Boulenger 1882: 48 ["Amoy" (=Xiamen, Fujian) and "China"].
Hylarana guentheri — Bourret 1939: 46.

Ecological notes: *Hylarana guentheri* occurs among vegetation on the plains, lowlands, and hills in Taiwan. Tadpoles prefer slowly flowing or still water like ponds, paddy fields, and dammed pools in lowland rivers (Chou and Lin 1997b).

Distribution within Taiwan: It is widely distributed in low-elevation areas throughout Taiwan. Most specimen records are from 31 sites at elevations of 50 (sites 51, Houlung and 232, Jiaosi) to 630 m (site 57, Dahu) (Fig. 21) except one from site 62, Wuling, at an elevation of >1600 m (TMAS.0127). We doubt the validity of the specimen record of TMAS.0127. Although it is widely known that *Hylarana guentheri* is a common native species to eastern Taiwan, no specimen records from eastern Taiwan are available in our dataset. A specimen collected from "Hwa-lien, Swa-wa (possible referring to the Suhua Highway)" from the CAS Herpetology dataset (CAS HERP; accessed via http://www.gbif.org/occurrence/543703975 on 2014-06-21) indicates the occurrence of *Hylarana guentheri* in eastern Taiwan.

Conservation notes: *Hylarana guentheri* was listed as a protected species in Taiwan in 1995~2008. Currently it is no longer protected, for its population size is considered to have recovered (Shang *et al*. 2009).

Fig. 22. Adult *Hylarana guentheri*. About 90 mm in snout-vent length. [Tansuei/Tamsui?], New Taipei City (site 5). The individual was not collected. Photograph by N.H. Jang-Liaw on April 12, 2007.

Fig. 23. Adult *Hylarana latouchii*. Male. Snout-vent length: 38.44 mm. Wanrung, Hualien County (site 196). NMNSC4197. Photograph by H.Y. Su on Dec. 13, 2005.

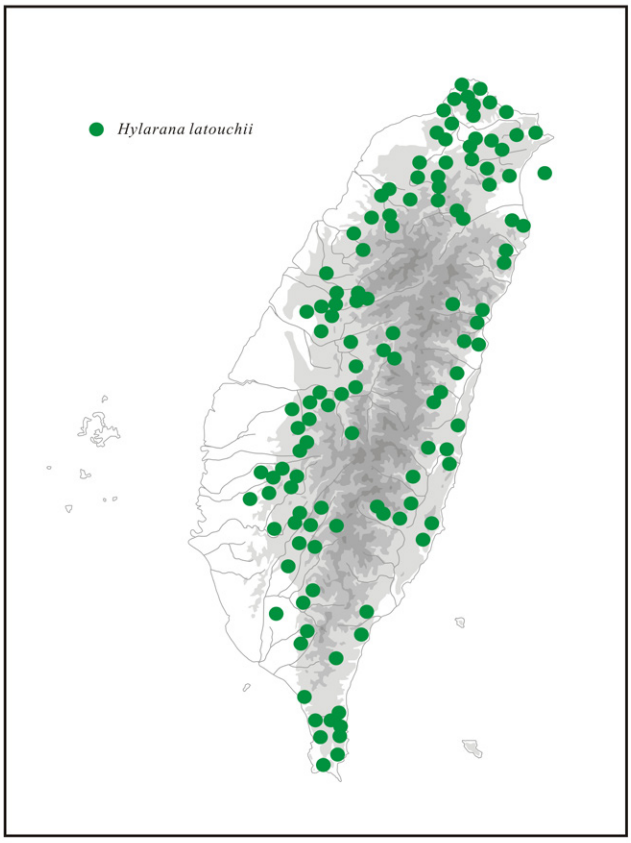

Fig. 24. Distribution localities of *Hylarana latouchii* in Taiwan based on specimen records.

Hylarana latouchii (Boulenger, 1899) (Fig. 23)

Rana latouchii — Boulenger 1899: 167 ("Kuatun, Fokien", a village located northwestern Fujian, China; see Boulenger 1920: 138).
Hylarana latouchii — Chen *et al*. 2005: 237.

Ecological notes: *Hylarana latouchii* is a very common species in Taiwan, occurring in lowlands, hills, and mountainous areas. Its tadpoles prefer still water such as intermittent streams, pools of blocked ditches, and rain pools (Chou and Lin 1997b).

Distribution within Taiwan: It is widely distributed from low- to mid-elevation areas throughout Taiwan. Specimen records are from 123 sites at elevations of 10 (sites 180, Tungho, 181, Chenggong, and 217, Nan-ao) to 1405 m (site 107 Fencihu) (Fig. 24).

Phylogeographic notes: Three major phylogeographic clades (northern, western, and eastern-and-peninsula clades) occur within Taiwan as inferred from molecular data; the northern clade was not monophyletic with the other clades from Taiwan. A multiple-invasion hypothesis for the migration history of Taiwanese *Hylarana latouchii* was proposed (Jang-Liaw *et al*. 2008).

Hylarana taipehensis (van Denburgh, 1909) (Fig. 25)

Rana taipehensis — van Denburgh 1909: 56 ["Taipeh (=Taipei), Formosa (=Taiwan)"].
Hylarana taipehensis — Bourret 1937: 33.

Ecological notes: *Hylarana taipehensis* occurs in ponds, marshes, and paddy fields in lowlands of Taiwan. Its tadpoles prefer still water among vegetation (Chou and Lin 1997b; Lien *et al*. 2007).

Distribution within Taiwan: Currently this species is restricted and has a fragmented distribution in a few discontinuous localities of western Taiwan. Chou *et al*. (1993) and Lin *et al*. (2008) indicated that this species was once distributed throughout western Taiwan but was seriously disturbed by human activities. Specimen records are from 5 sites at elevations of 60 (sites 5, Tansuei) to 100 m (site 144, Machia) (Fig. 26).

Conservation notes: The distribution of *Hylarana taipehensis* and its population are rapidly decreasing because of human disturbance (Lien *et al*. 2007) and farmland-use changes, such as paddy fields becoming fallow or no longer being irrigated and the widespread use of pesticides (Lin *et al*. 2008). Moreover, the remaining populations may have difficulty interacting because they are fragmented by long distances of mostly urban environments (Lin *et al*. 2008). This frog was listed as a protected species in Taiwan in 1995, and currently is considered a "rare and valuable species" in the governmental conservation list of Taiwan since August 2008.

Fig. 25. Adult *Hylarana taipehensis*. About 50 mm in snout-vent length. Neipu, Pingtung County (site 146). The individual was not collected. Photograph by N.H. Jang-Liaw on July 11, 2001.

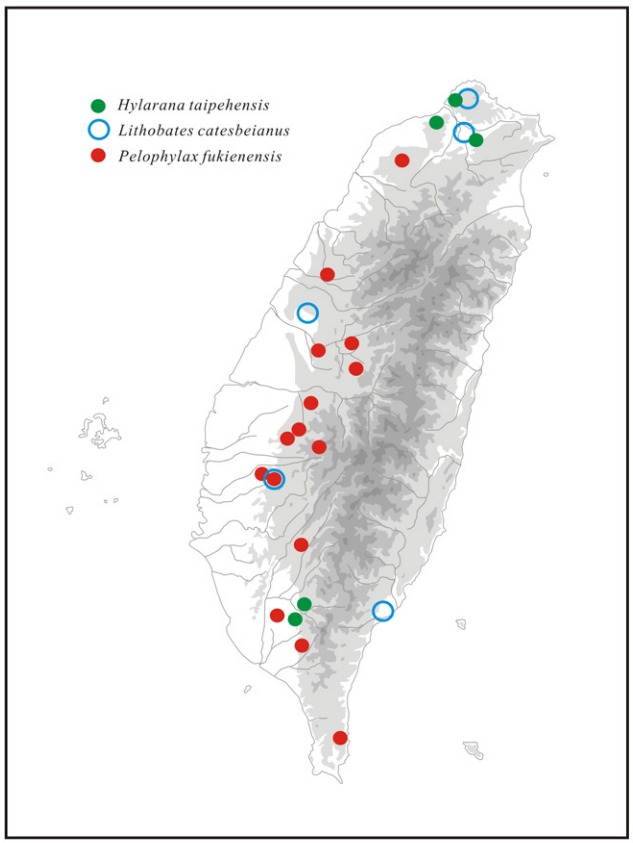

Fig. 26. Distribution localities of *Hylarana taipehensis*, *Lithobates catesbeianus*, and *Pelophylax fukienensis* in Taiwan based on specimen records.

Limnonectes fujianensis Ye and Fei, 1994 (Fig. 27)

Nyctibatrachus sinensis — Peters 1882: 146 (Loau Mountains, Guangdong Province, China; see Bauer *et al*. 1995: 49). Jang-Liaw and Chou (2011) suggested that *Nyctibatrachus sinensis* may be a senior synonym of *Lim. fujianensis*, and *Lim. sinensis* should have priority, pending additional research.
Limnonectes fujianensis — Ye and Fei 1994: 494 ["Longdu, Chong-an (Wuyishan City), Fujian

Fig. 27. Adult *Limnonectes fujianensis*. Male. About 70 mm in snout-vent length. Sindian, New Taipei City (site 17). The individual was not collected. Photograph by N.H. Jang-Liaw on March 5, 2011.

(about 27.73°N. 117.71°E); altitude 600 m", China].

Ecological notes: *Limnonectes fujianensis*, including adult frogs and tadpoles, prefers shallow, slowly flowing water of ditches and seepages with overhanging dense vegetation in mountainous areas below 900 m. It preys on other smaller animals including frogs.

Distribution within Taiwan: It has a restricted distribution in northern to west-central Taiwan. Specimen records are from 49 sites at elevations of 30 (site 29, Keelung) to 870 m (site 102, Chaolin) (Fig. 28).

Phylogenetic/phylogeographic notes: The Taiwanese *Lim. fujianensis* was synonymized with *Lim. kuhlii* (Tschudi) for a long time. Ye and Fei (1994) described a specimen from Fujian, China as a new species, and suggested that the population in Taiwan should be *Lim. fujianensis* rather than *Lim. kuhlii*. Several recent studies agreed with this view as inferred from molecular data (Zhang *et al*. 2005; Matsui *et al*. 2010; McLeod 2010; Jang-Liaw and Chou 2011). Furthermore, Jang-Liaw and Chou (2011) identified two major phylogeographic clades from populations within Taiwan. The boundary between these two clades is along the Jhuoshuei River.

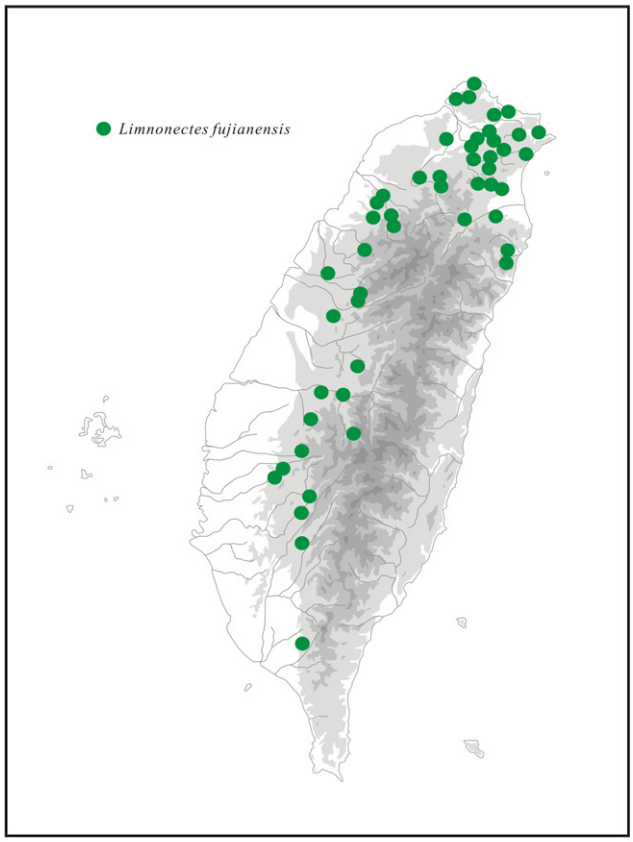

Fig. 28. Distribution localities of *Limnonectes fujianensis* in Taiwan based on specimen records (solid circles).

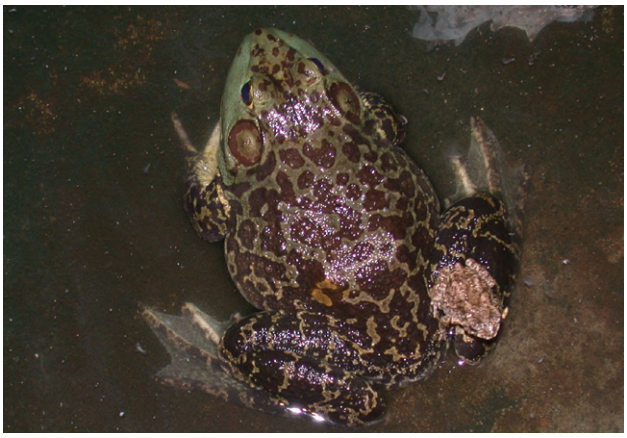

Fig. 29. Adult *Lithobates catesbeianus*. About 180 mm in snout-vent length. A farmed individual in Pingtung County. Photograph by C.S. Wu in June 2004.

***Lithobates catesbeianus* (Shaw, 1802) (Fig. 29)**

Rana catesbeiana — Shaw 1802: 106 ("many parts of North America").
Lithobates catesbeianus — Frost *et al*. 2006: 369.

Ecological notes: *Lithobates catesbeianus* was introduced to Taiwan for aquaculture purposes (Garner *et al*. 2009). This species is considered one of the major causes of global amphibian population declines (Alford and Richards 1999; Johnson *et al*. 2011) based on its ecological features such as a large body size, broad diet, frequently high population densities, and ability to invade natural environments (Stumpel 1992; Kiesecker *et al*. 2001; Pearl *et al*. 2004). In addition, *Lit. catesbeianus* is known as a carrier species of the global amphibian disease

chytridiomycosis (Mazzoni et al. 2003; Daszak *et al*. 2004; Kilpatrick *et al*. 2010).

Distribution within Taiwan: It is generally believed that *Lit. catesbeianus* is widely distributed in low-elevation areas throughout Taiwan. However, specimen records are few, with only five sites at elevations of 100 (site 71, Taichung) to 800 m (site 4, Yangmingshan) in this study (Fig. 26).

Odorrana swinhoana (Boulenger, 1903) (Fig. 30)

Rana swinhoana — Boulenger 1903: 556 ["Bangkimtsing (Wanluan, Pintung?), Formosa (= Taiwan) "].
Odorrana swinhoana — Fei *et al*. 1990: 149.

Ecological notes: *Odorrana swinhoana* is a nocturnal, riparian species found along torrential streams, rivers, and rapids with scattered boulders of various sizes (Wang and Chan 1977). Larval habitats are restricted to clear lotic water like open pools in streams, shallow riffles of ditches, pools of intermittent streams, and so on. The breeding season is long; Kam *et al*. (1998) indicated that the breeding peak of this species is in December and January.

Distribution within Taiwan: It is widely distributed in mountainous areas throughout Taiwan. Specimen records are from 101 sites at elevations of 10 (site 197, Sueilien) to 1909 m (site 211, Tsu-en) (Fig. 31).

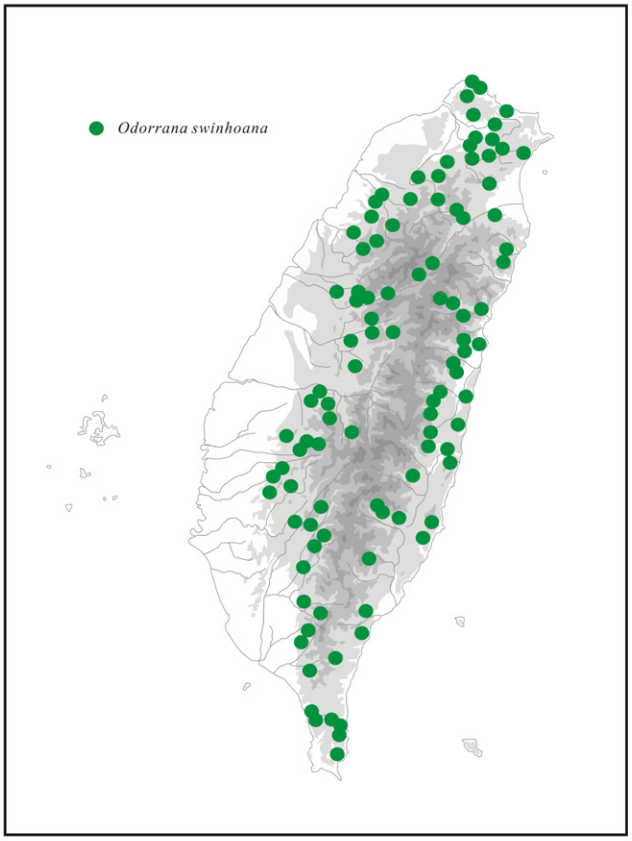

Fig. 31. Distribution localities of *Odorrana swinhoana* in Taiwan based on specimen records.

Pelophylax fukienensis (Pope, 1929) (Fig. 32)

Rana fukienensis — Pope 1929: 4 ["Futsing Hsien (= Fuqing County), northeastern Fukien (= Fujian) Province, China"].
Pelophylax fukienensis— Fei *et al*. 2005: 110.

Fig. 30. Adult *Odorrana swinhoana*. Male. About 60 mm in snout-vent length. Keelung City (site 28). The individual was not collected. Photograph by N.H. Jang-Liaw on Feb. 21, 2011.

Ecological notes: *Pelophylax fukienensis* prefers marshes, paddy fields, and ponds among vegetation. Its tadpoles appear to be limited to ponds and marshes.

Distribution within Taiwan: It is widely distributed in hilly and mountainous areas throughout Taiwan. This species was once abundant in agricultural areas, but now it has become a rare amphibian on the island (Lue *et al*. 1999; Yang 2006; Shang *et al*. 2009). Specimen records are from 15 sites at elevations of 300 (site 164, Nanjenshan) to 980 m (site 91, Yuchih) (Fig. 26).

Phylogenetic/taxonomic notes: Several researchers considered *Pel. fukienensis* to be a subspecies or a synonym of *Pel. plancyi* (Fei *et al*. 1990; Zhao and Adler 1993; Fei *et al*. 1999), and the Taiwanese *Pelophylax* was previously diagnosed as *Pel. plancyi* (Lue and Chen 1982; Lue *et al*. 1999; Yang 2006). However, Sumida *et al*. (2000) suggested that *Pel. fukienensis* is a valid species, and Liu *et al*. (2010) identified *Pel. fukienensis* (including Taiwanese sample) from

Pel. plancyi both based on molecular data.

Conservation notes: This species was listed in the governmental conservation list of Taiwan as "other conservation-deserving wildlife" in August 2008. Nevertheless, it is currently assigned to *Pel. plancyi* in the formal official document.

Rana longicrus Stejneger, 1898 (Fig. 33)

Rana longicrus — Stejneger 1898: 216 ["Taipa (=Taipei), Formosa"].

Ecological notes: *Rana longicrus* occurs in lowlands and low-elevation mountainous areas, and its tadpoles prefer still water such as paddy fields, rain pools, and blocked ditches. It breeds in winter from November to March (Kam *et al*. 1995).

Distribution within Taiwan: It has a restricted distribution from northern to west-southern areas of Taiwan. Specimen records are from 35 sites at elevations of 6 (site 12, Gungliau) to 780 m (site 52, Nanjuang) (Fig. 34).

Conservation notes: *Rana longicrus* is a rare species that appears to be in decline (Stuart *et al*. 2008). Its distribution is considered limited to north of Yuchih, site 91 (Shang *et al*. 2009). There is only one aged specimen record (NTUA22a29; four individuals collected from Guanziling, site 118 on Sept. 25, 1976) south of Yuchih, which extends the distribution of *R. longicrus* to the southwestern area of Taiwan. The southernmost population of *R. longicrus* seems to be very rare or to have even disappeared, for there are no specimen records or witness reports during the past three decades.

Rana sauteri Boulenger, 1909 (Fig. 35)

Rana sauteri — Boulenger 1909: 493 ["Kanshirei (=Guanziling, site 98) Village, altitude about 2000 feet ", Taiwan].

Ecological notes: *Rana sauteri* occurs in hills and mountainous areas from low to high elevations. Its tadpoles prefer montane stream habitats like torrents, riffles, dammed pools, and running water on roadsides in mountainous areas (Chou

Fig. 32. Adult *Pelophylax fukienensis*. Snout-vent length: 49.66 mm. Yuchih, Nantou County (site 91). NMNSC4212. Photograph by N.H. Jang-Liaw on March 29, 2006.

Fig. 33. *Adult Rana longicrus*. Snout-vent length: 43.86 mm. Yangmei, Taoyuan County (site 32). NMNSC4896. Photograph by N.H. Jang-Liaw on April 16, 2009.

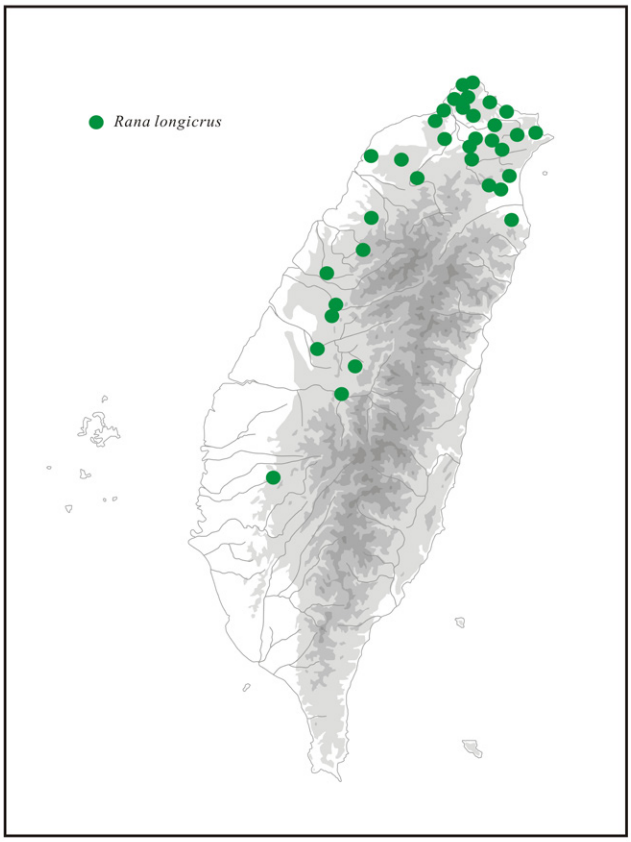

Fig. 34. Distribution localities of *Rana longicrus* in Taiwan based on specimen records.

and Lin 1997b). Breeding behavior varies among populations at different elevations. With an increase in elevation, the breeding season shifts from autumn to spring, the length of the breeding period decreases, and the length of the larval period increases (Lai *et al*. 2003).

Distribution within Taiwan: It is widely distributed in hilly and mountainous areas throughout Taiwan. Specimen records are from 87 sites at elevations of 80 (site18, Sindian) to 2565 m (site 213, Dayuling) (Fig. 36).

Phylogeographic/taxonomic notes: Tanaka-Ueno *et al*. (1998) clarified that at least two genetically distinct lineages are included in *R. sauteri* based on mitochondrial DNA cytochrome *b* sequences. Subsequently, Jang-Liaw and Lee (2009) identified five phylogeographic lineages (northern, eastern, southern-hill, northern-mountain, and southern-mountain lineages) within Taiwan as inferred from data of the same DNA segment. Some isolation mechanisms by both geographic distance and elevation differentiation were proposed by the later work. The morphologically similar species, *R. multidenticulata* Chou and Lin, 1997 is now considered a synonym of *R. sauteri* based on analyses of molecular data (Jang-Liaw and Lee 2009; Hsu *et al*. 2011).

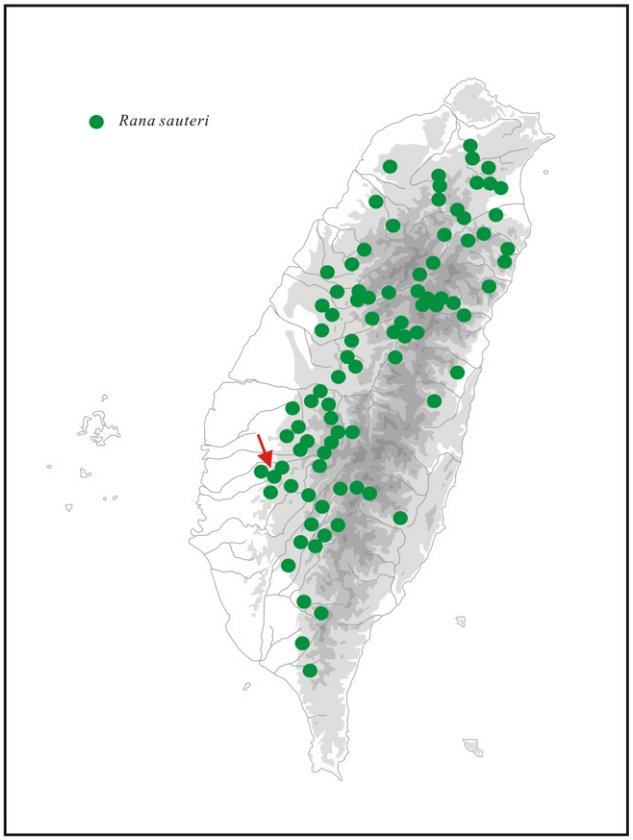

Fig. 36. Distribution localities of *Rana sauteri* in Taiwan based on specimen records. The red arrow indicates the holotype locality of *R. sauteri* (Guanziling, site 98; see Boulenger 1909).

Family Rhacophoridae

Buergeria japonica (Hallowell, 1861) (Fig. 37)

Ixalus japonicus — Hallowell 1861 (1860): 501 ["Japan"; corrected to "Amami-o-shima, Riu Kiu (=Amami, Ryukyu Islands)", Japan by Stejneger 1907].

Fig. 35. Adult *Rana sauteri*. About 45 mm in snout-vent length. Jhushan, Nantou County (site 96). The individual was not collected. Photograph by N.H. Jang-Liaw on Nov. 12, 2005.

Fig. 37. Adult *Buergeria japonica*. Snout-vent length: 25.38 mm. Sanyi, Miaoli County (site 60). NMNSC4486. Photograph by N.H. Jang-Liaw on May 1, 2007.

Buergeria japonica — Liem 1970: 90.

Ecological notes: *Buergeria japonica* is very common and occurs in lowlands, hills, and mid-elevation mountainous areas of Taiwan. Its tadpoles prefer shallow, slow-running streams, ditches, and rain pools where the canopy is usually poor and water temperatures are high during the day; it also occurs in hot spring water (Chou and Lin 1997b). The breeding season of

this species is from March to August (Huang *et al*. 2001).

Distribution within Taiwan: It is widely distributed throughout Taiwan. Specimen records are from 94 sites at elevations of 10 (site 197, Sueilien) to 1200 m (sites 88, Aowanda, 95, Tili, 100, Tungpu, and 178, Hongye) (Fig. 38).

***Buergeria robusta* (Boulenger, 1909) (Fig. 39)**

Rhacophorus robustus — Boulenger 1909: 494

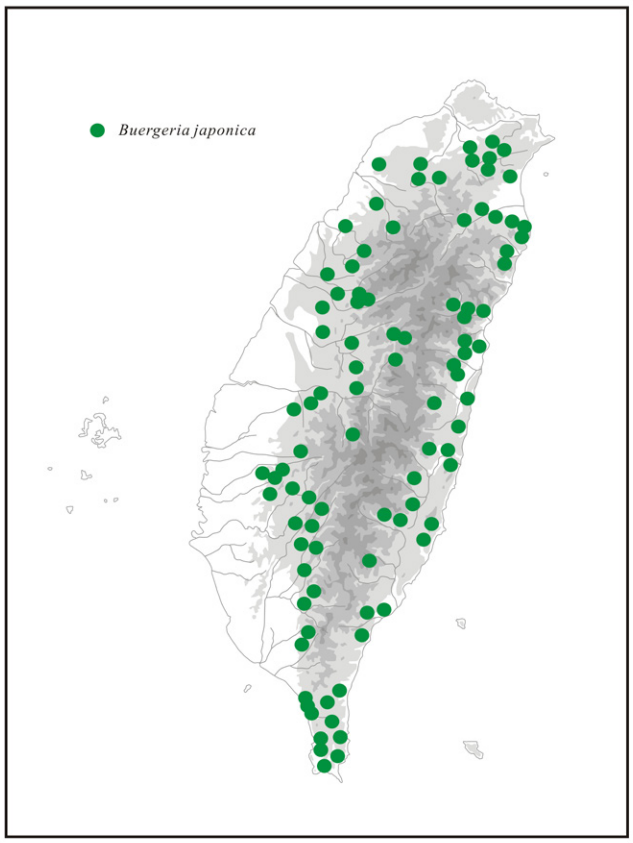

Fig. 38. Distribution localities of *Buergeria japonica* in Taiwan based on specimen records.

Fig. 39. Adult *Buergeria robusta*. Male. Snout-vent length: 51.01 mm. Dongshan, Yilan County (site 223). NMNSC4806. Photograph by N.H. Jang-Liaw on Feb. 12, 2009.

["Kankau (=Hengchuen, site 137) (a little higher than sea level), Alikang (=Ligang, Pingtung County) (about 40 m above sea level), and Kosempo (=Jiashian, site 109) (about 450 m above sea level)", Taiwan].

Buergeria robusta — Liem 1970: 90.

Ecological notes: *Buergeria robusta* is common and occurs in lowlands, hills, and mid-elevation mountainous areas in Taiwan. Its tadpoles prefer stream habitats like riffles, open pools, dammed pools, and seepage areas of mountain streams. *Buergeria robusta* can easily be observed in riverbeds during the breeding season, which is from March to August (Huang *et al*. 2001).

Distribution within Taiwan: As an endemic species to Taiwan, *Bue. robusta* is widely distributed throughout the island. Specimen records are from 78 sites at elevations of 20 (site 174, Chiban) to 1120 m (site 83, Wushe) (Fig. 40).

Phylogeographic notes: Lin *et al*. (2012) indicated that two major lineages of this species exist on the eastern and western sides of Taiwan with a non-overlapping distribution.

Conservation notes: *Buergeria robusta* was listed as a protected species in Taiwan in

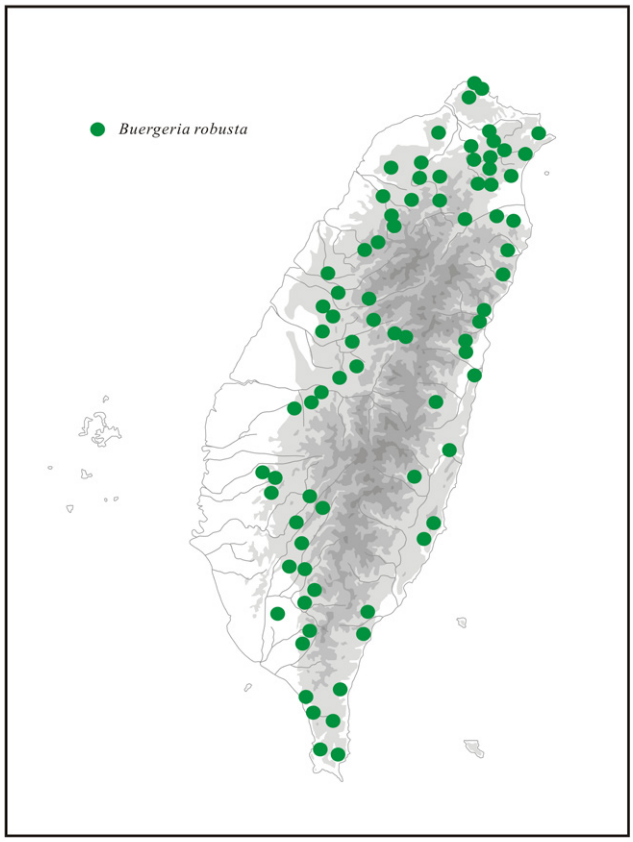

Fig. 40. Distribution localities of *Buergeria robusta* in Taiwan based on specimen records.

1995~2008.

***Kurixalus eiffingeri* (Boettger, 1895) (Fig. 41)**

Rana eiffingeri — Boettger 1895: 267 (Ryukyu Islands, Japan; see Mertens 1967).

Kurixalus eiffingeri — Ye, Fei, and Dubois in Fei 1999: 264.

Ecological notes: *Kurixalus eiffingeri* is an arboreal nester which exhibits parental care and oophagous behavior. Female frogs lay eggs in water of tree holes and bamboo stumps. It occurs in hilly and mountainous forests from low to mid-elevations. The breeding season of the western population is from about late February to early August (Kam *et al*. 1996), which differs from the eastern population which is from September to March (Yang 2006).

Distribution within Taiwan: It is widely distributed throughout Taiwan. Specimen records are from 28 sites at elevations of 10 (site 229, Yuanshan) to 1350 m (site 107, Fencihu) (Fig. 42).

***Kurixalus idiootocus* (Kuramoto and Wang, 1987) (Fig. 43)**

Chirixalus idiootocus — Kuramoto and Wang 1987: 932 ["in a rain pool near Sanshengkong (a temple, altitude ca. 650 m) in the southern slope of Mt. Mientien-Shan (Peitou, site 17), Taipei, Taiwan"].

Kurixalus idiootocus — Wilkinson *et al*. 2002: 272.

Ecological notes: *Kurixalus idiootocus* occurs in low- to mid-elevations hills and mountainous areas. The breeding season is long from February to September, even lasting over the winter in warmer years. Its tadpoles tend to inhabit shallow water of rain pools and seepages, and still water of blocked ditches.

Distribution within Taiwan: It is an endemic species to Taiwan. *Kurixalus idiootocus* has a restricted distribution from the north to the western side of the island. Specimen records

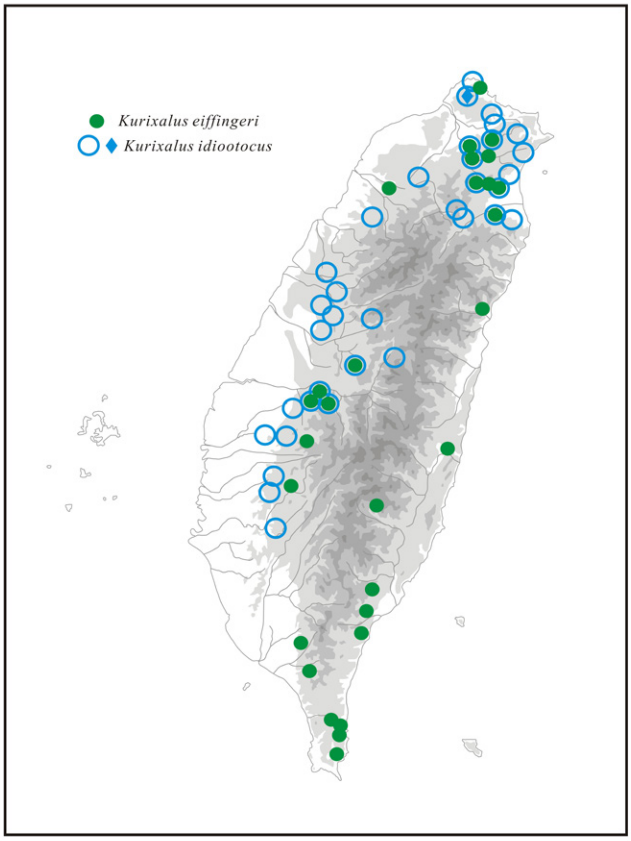

Fig. 42. Distribution localities of *Kurixalus eiffingeri* and *Kur. idiootocus* in Taiwan based on specimen records. The blue diamond indicates the holotype locality of *Kur. idiootocus* (Mientienshan, Peitou, site 17; see Kuramoto and Wang 1987).

Fig. 43. Adult *Kurixalus idiootocus*. Male. Snout-vent length: 28.85 mm. Nanhua, Tainan City (site 123). NMNSC4928. Photograph by N.H. Jang-Liaw on June 11, 2009.

Fig. 41. Adult *Kurixalus eiffingeri*. About 40 mm in snout-vent length. Tahanshan, Pingtung County (site 152). The individual was not collected. Photograph by N.H. Jang-Liaw on July 10, 2009.

are from 35 sites at elevations of 10 (site 229, Yuanshan) to 1200 m (sites 88, Aowanda and 97, Hsitou) (Fig. 42). According to the high morphological similarity with *Kur. eiffingeri*, it is not easy to identify them correctly only from field observations. More specimens are needed to clarify its distribution.

***Polypedates braueri* (Vogt, 1911) (Fig. 44)**

Rhacophorus braueri — Vogt 1911: 180 ["Nankau (?)" in Taiwan; see Kuraishi *et al*. 2011: 60].
Polypedates braueri — Matsui and Orlov 2004: 676.

Ecological notes: *Polypedates braueri* commonly occurs in low-elevation hills and mountainous areas of Taiwan. The female when clasped by a male (or males) produces a yellowish foam nest that is made by churning mucus with the hind limbs, and which is attached to leaves of shrubs or a vertical artificial pool bank 10~40 cm above the water. Its tadpoles appear to be limited to still water away from streams, such as ponds, cisterns, and paddy fields (Chou and Lin 1997b).

Distribution within Taiwan: It is widely distributed throughout Taiwan. Specimen records are from 53 sites at elevations of 10 (sites 180, Tungho and 197, Sueilien) to 720 m (site 111, Fanlu) (Fig. 45).

Taxonomic notes: The Taiwanese *Polypedates* was previously identified as *Pol. megacephalus* Hallowell, 1861, which was originally described from Hong Kong. Kuraishi *et al*. (2011) resurrected "*Pol. braueri*" as a valid name for the Taiwanese *Polypedates* population on the basis of molecular, acoustic, and morphological evidence.

Fig. 44. Adult *Polypedates braueri*. About 70 mm in snout-vent length. Yuchih, Nantou County (site 91). The individual was not collected. Photograph by N.H. Jang-Liaw on March 29, 2006.

***Polypedates megacephalus* Hallowell, 1861 (Fig. 46)**

Polypedates megacephalus — Hallowell 1861: 507 (Hong Kong, China).

Ecological notes: *Polypedates megacephalus* is a very recently introduced species in Taiwan. Its distribution seems to be rapidly expanding (Yang and Gong 2014). More-detailed field

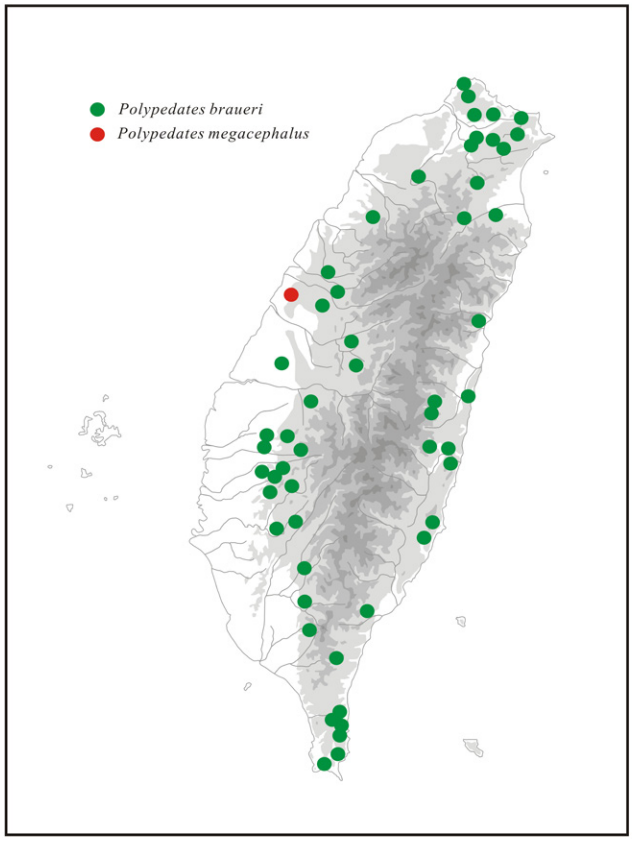

Fig. 45. Distribution localities of *Polypedates braueri* in Taiwan based on specimen records.

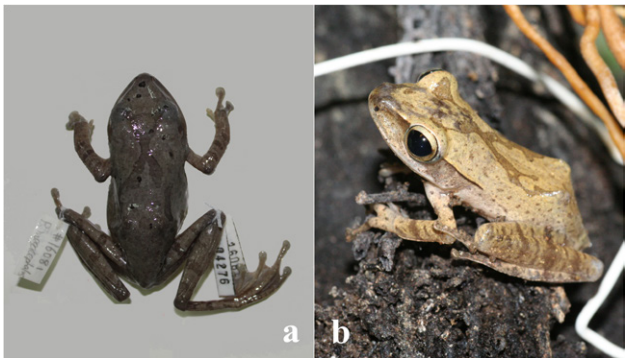

Fig. 46. a. A specimen of *Polypedates megacephalus* which was collected from Shalu, Taichung City (site 67) on June 26, 2006 (NMNSC4276). Snout-vent length (SVL): 75.03 mm. Photograph by N.H. Jang-Liaw. b. A living individual of *P. megacephalus* introduced from Guangdong, China. About 55 mm in SVL. Photograph by N.H. Jang-Liaw on Nov. 2, 2006.

investigations and specimen comparisons are needed.

Distribution within Taiwan: Only one *Pol. megacephalus* specimen record from Taiwan is currently available. Two adults (NMNSC4276) were collected from Shalu (site 67) in June 2006 (Fig. 45). Furthermore, Yang and Gong (2014) indicated that *Pol. megacephalus* has established several populations in northern and west-central Taiwan.

Rhacophorus arvalis Lue, Lai, and Chen, 1995 (Fig. 47)

Rhacophorus arvalis — Lue *et al*. 1995: 339 ["Minhsiung (=Minsyong, site 86), 12 km N Chiai (=Chiayi) City, Chiai Hsien, Taiwan"].

Ecological notes: *Rhacophorus arvalis* occurs in forests and bamboo groves of southwestern lowlands of Taiwan. Its tadpoles appear in rain pools within orchards. Foam nests are made within layers of fallen leaves by the water.

Distribution within Taiwan: It is an endemic species to Taiwan. Originally, *Rha. arvalis* had a restricted distribution in the south-central region of western Taiwan from Yunlin County south to Tainan City. Specimen records are from 5 sites at elevations of 7 (site 124, Yongkang) to 100 m (site 105, Minsyong) (Fig. 48). However, based on photo evidences of frog viewers' records, this frog was introduced into northern Taiwan including Sindian, Taipei City (site 13) and Dongshan, Yilan County (site 189) some time before 2006.

Conservation notes: Most of the natural habitats of this species are near areas of human activity, causing populations that were seriously disturbed to rapidly change in recent years (Chang *et al*. 2008, Stuart *et al*. 2008). Furthermore, *Rha. arvalis* is collected for commercial purposes as a pet frog (Hou *et al*. 2006). This species was listed in the governmental conservation list of Taiwan as a "rare and valuable species" in August 2008.

Fig. 47. Adult *Rhacophorus arvalis*. Male. Snout-vent length: 44.10 mm. Douliou, Yunlin County (site 101). NMNSC4747. Photograph by N.H. Jang-Liaw on June 4, 2008.

Rhacophorus aurantiventris Lue, Lai, and Chen, 1994 (Fig. 49)

Rhacophorus aurantiventris — Lue *et al*. 1994: 303 ["Hapen Natural Reserve. This site lies at an elevation of 800 m on the boundary between New Taipei City and Yilan County (= Fushan, site 183)"].

Ecological notes: *Rhacophorus aurantiventris*

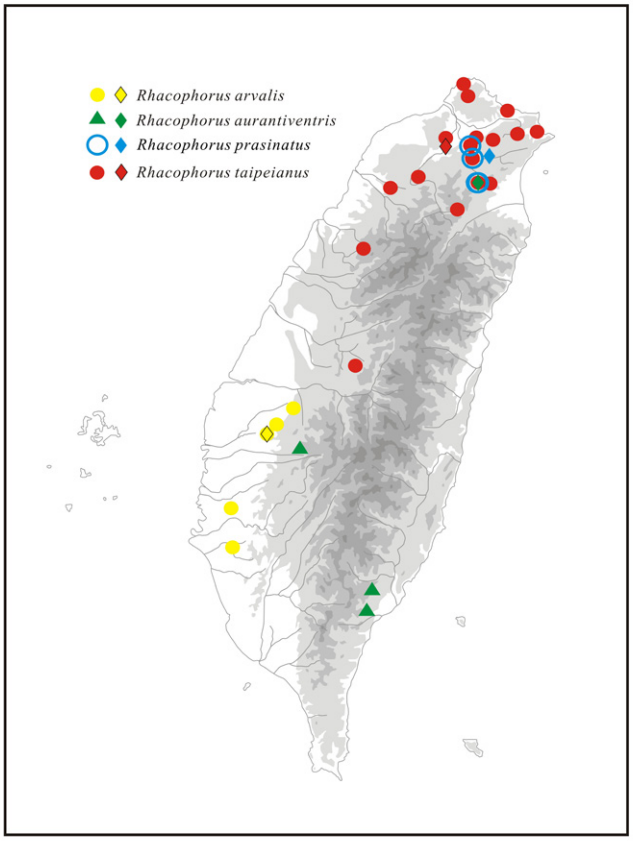

Fig. 48. Distribution localities of *Rhacophorus arvalis* (solid yellow circles), *Rha. aurantiventris* (solid green triangles), *Rha. prasinatus* (blue open circles), and *Rha. taipeianus* (solid red circles) in Taiwan based on collection records of NMNS. The open black circle is the holotype locality of *Rha. arvalis* (Minsyong, site 86; see Lue *et al*. 1995); the solid green diamond is the holotype locality of *Rha. aurantiventris* (Fushan, site 183; see Lue *et al*. 1994); the blue and green diamond is the holotype locality of *Rha. prasinatus* (Sindian, site 12; see Mou *et al*. 1983); and the red and green diamond is the holotype locality of *Rha. taipeianus* (Shulin, New Taipei City; see Liang and Wang 1978).

is an arboreal species that occurs in mid-elevation forests at 400~1200 m. The breeding season is March to September (Lee and Lue 2003). Female frogs make foam nests around rainwater that has collected inside tree holes. Tadpoles were found in tree holes with water, or artificial containers with water close to trees in the forest.

Distribution within Taiwan: It is an endemic species of Taiwan. *Rhacophorus aurantiventris* was considered a patchily distributed species according to limited records (Chou and Lin 1997b). Recently, increasing numbers of records were reported (Yang 2006; Stuart *et al*. 2008), which implies that this species might have a continuous distribution in mid-elevation forests of the Central Mountain Range. Specimen records are from three sites at elevations of 500 (site 174, Chiban) to 1248 m (site 177, Lichia) (Fig. 48). More specimens are required to clarify its distribution.

Conservation notes: This species was listed in the governmental conservation list of Taiwan as a "rare and valuable species" in August 2008.

Rhacophorus moltrechti Boulenger, 1908 (Fig. 50)

Rhacophorus moltrechti — Boulenger 1908: 221 ["Nanto (= Nantou) district, Lake Candidia (= Sun-Moon Lake), Central Formosa"].

Ecological notes: *Rhacophorus moltrechti* commonly occurs in forests, farms of hills, and mountainous areas at low, mid-, and high elevations. Female frogs make foam nests with non-pigmented eggs in the litter layer or embedded in holes excavated by males in the ground near water, or above the water surface of ponds. Its tadpoles prefer still water away from streams, like blocked roadside ditches, rain pools, ponds, and cisterns (Chou and Lin 1997b). Its breeding season differs for populations in various localities and at different elevations (Lin and Lue 2004).

Fig. 49. Adult *Rhacophorus aurantiventris*. About 55 mm in snout-vent length. Chiban, Taitung County (site 174). The individual was not collected. Photograph by W.H. Chou in May 1995.

Fig. 50. Adult *Rhacophorus moltrechti*. Male. About 50 mm in snout-vent length. Yuchih, Nantou County (site 91). The individual was not collected. Photograph by N.H. Jang-Liaw on March 1, 2009.

Distribution within Taiwan: It is an endemic species of Taiwan. *Rhacophorus moltrechti* is widely distributed throughout Taiwan, but there are few specimen records from northern Taiwan, and no population occurred north of Wulai, New Taipei City (site 19). Specimen records are from 70 sites at elevations of 20 (site 194, Fengbin) to 2300 m (site 126, Tienchi) (Fig. 51).

Conservation notes: *Rhacophorus moltrechti* was listed as a protected species in Taiwan in 1995~2008.

Rhacophorus prasinatus Mou, Risch, and Lue, 1983 (Fig. 52)

Rhacophorus prasinatus — Mou *et al*. 1983: 155 ["Hou-keng-tzu, Shih-ting area (= sites 12, Sindian), Taipei Hsien (=New Taipei City), Taiwan, 24°54′N, 121°37′E; altitude 220 m. The Hou-keng-tzu valley brook is a tributary of Pei-shih stream of Feitsui Valley"].

Ecological notes: *Rhacophorus prasinatus* occurs in low-elevation mountainous areas. Its

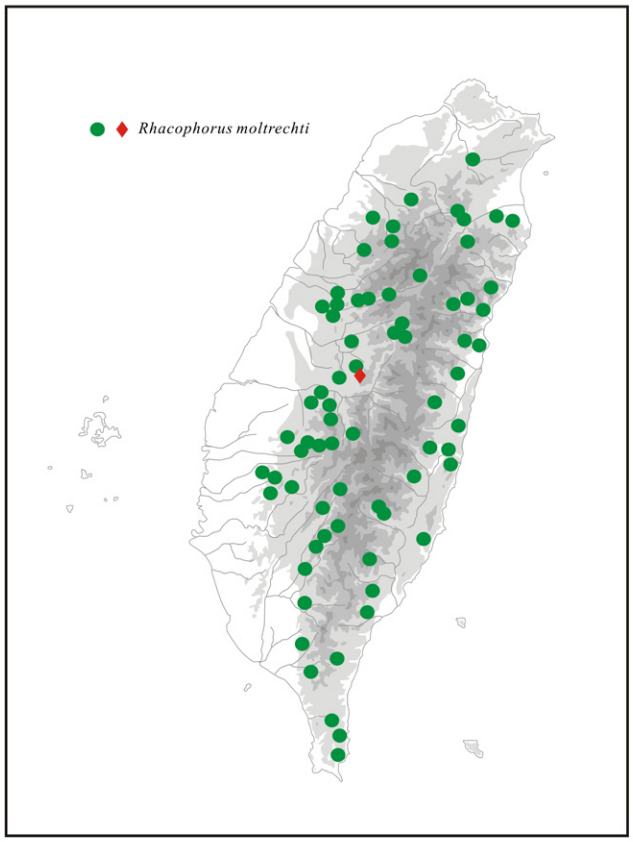

Fig. 51. Distribution localities of *Rhacophorus moltrechti* in Taiwan based on specimen records. The red diamond indicates the holotype locality of *Rha. moltrechti* (Sun-Moon Lake, Nantou County; see Boulenger 1908).

Fig. 52. Adult *Rhacophorus prasinatus*. About 50 mm in snout-vent length. Sindian, New Taipei City (site 17). The individual was not collected. Photograph by N.H. Jang-Liaw on Feb. 14, 2009.

tadpoles prefer still water like cisterns or stable pools of mountain brooks. Female frogs make light-pink foam nests stuck onto walls of cisterns or onto twigs hanging over the water. The foam turns brown when the surface dries.

Distribution within Taiwan: It is an endemic species of Taiwan. *Rhacophorus prasinatus* has a restricted distribution in northern Taiwan. Specimen records are from three sites at elevations of 200 (site 17, Sindian) to 700 m (site 231, Fushan) (Fig. 48).

Conservation notes: *Rhacophorus prasinatus* was listed as a protected species in Taiwan in 1995~2009, and now (since August 2008) is listed as "other conservation-deserving wildlife" in the governmental conservation list of Taiwan.

Rhacophorus taipeianus Liang and Wang, 1978 (Fig. 53)

Rhacophorus taipeianus — Liang and Wang 1978: 186 ["Shu-lin, Taipei Hsien (= New Taipei City; sites 15)", Taiwan].

Ecological notes: *Rhacophorus taipeianus* occurs in low-elevation hilly and mountainous areas. Its tadpoles prefer still water like rain pools, paddy fields, ponds, and blocked ditches. White foam nests are deposited in underground holes (Chou and Lin 1997b). The breeding period is from about October to March.

Distribution within Taiwan: It is an endemic species of Taiwan. *Rhacophorus taipeianus* has a restricted distribution from west-central to northern Taiwan. Specimen records are from 17 sites at elevations of 50 (site 29, Keelung) to 650 m (site 91, Yuchih) (Fig. 48).

Phylogeographic notes: Two major lineages from west-central and northern populations were identified by molecular data (Yang *et al*. 1994).

Conservation notes: *Rhacophorus taipeianus* was listed as a protected species in Taiwan in 1995~2009, and now (since August 2008) is listed as "other conservation-deserving wildlife" in the governmental conservation list of Taiwan.

Fig. 53. Adult *Rhacophorus taipeianus*. About 45 mm in snout-vent length. Sindian, New Taipei City (site 17). The individual was not collected. Photograph by N.H. Jang-Liaw on Feb. 14, 2009.

CONCLUSIONS: DISTRIBUTION PATTERNS EXIST FOR ANURAN SPECIES IN TAIWAN

Jang-Liaw *et al*. (2008) defined three biogeographic districts from phylogenetic research on a widespread species from low to mid-elevations, *Hylarana latouchii*, which are: northern district (N), western district (W), eastern and Hengchun Peninsula district (E+P). Furthermore, the western district was divided into two minor districts: western-middle (Wm) and western-southern (Ws) sub-districts which are separated by the Jhuoshuei River, and the eastern and Hengchun Peninsula district can be divided into two minor districts also: eastern sub-district and Hengchun Peninsula sub-district (see Fig. 1). These zoogeographic districts basically accord with conclusions by Chen and Fang (1999) inferred from freshwater fish distributions in Taiwan. In this study, it is obvious that the distributions of many species fit the classification and boundaries of districts proposed above. Based on specimen collection data, we concluded that five distribution patterns exist for anuran species in Taiwan: (a) pan-island distribution: such as *Bufo bankorensis, Duttaphrynus melanostictus, Microhyla fissipes, Bab. adenopleura, F. limnocharis, Hylarana latouchii, Hop. rugulosus, Hylarana guentheri, Lit. catesbeianus, Odorrana swinhoana, Pelophylax fukienensis, R. sauteri, Bue. japonica, Bue. robusta, Kur. eiffingeri, Polypedates braueri, Rha. aurantiventris,* and *Rha. moltrechti* (with limited populations in northern Taiwan); (b) wide distribution except northern Taiwan: *Microhyla heymonsi* (W+P+E); (c) limited distribution in northwestern Taiwan: *Hyla chinensis* (N+W?), *Hylarana taipehensis* (N+W), *Lim. fujianensis* (N+W), *R. longicrus* (N+Wm), *Kur. idiootocus* (N+W), *Rha. prasinatus* (N), and *Rha. taipeianus* (N+Wm); (d) limited distribution in southwestern Taiwan: *Microhyla butleri* (Ws), *Micryletta steinegeri* (W+P), and *Rha. arvalis* (Ws); and (e) very limited distribution in a small area: *Bab. okinavana* (only at site 72), *F. cancrivora* (site 124), *K. pulchra* (limited in area around sites 116, 117, and 120, but the distribution range is apparently expanding), and *Pol. megacephalus* (the distribution range is expanding rapidly; see Yang and Gong 2014). Additional specimen information on some species, such as *Hyla chinensis* and *Rha. aurantiventris*, is required to clarify their distributions.

However, the distributions of Taiwanese anurans will continue to fluctuate as a result of both biotic and physical pressures. Distribution data should be carefully rechecked and modified in the future. Long-term studies based on specimen information and accurate surveys will be helpful in making management policies on anuran conservation in Taiwan.

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Appendix. Specimen records applied in this study. ASIZAM: catalogue number for specimens from the Biodiversity Research Center, Academia Sinica, Taipei (BRCAS); NMNSC: National Museum of Natural Science, Taichung (NMNS);

NTUA: National Taiwan University Museum, Taipei (NTUM); TMAS: National Taiwan Museum, Taipei (NTM).

Bufo bankorensis – Totally 353 specimen records from BRCAS (4), NMNS (244), NTUM (42) and NTM (63).

Site 1: NMNSC1304, 1347, 1362, 1375, 1391, 4073, 4818; **Site 4**: NMNSC1307, 1314, 1315, 4614, NYUA02a43; **Site 6**: NMNSC1294; **Site 11**: ASIZAM51; **Site 12**: NMNSC191; **Site 13**: ASIZAM06; **Site 14**: NMNSC184, 186, NTUA02a07, 02a14 ; **Site 17**: NMNSC1405, 1747, 2813, 4189, 4297; **Site 18**: NMNSC848; **Site 19**: NMNSC1319, 263, 419, NTUA02a09, TMAS.0265; **Site 21**: NMNSC3862; **Site 24**: NMNSC1290; **Site 26**: NMNSC4188; **Site 28**: NMNSC4813; **Site 34**: NMNSC4479; **Site 35**: NMNSC847, 1226, TMAS.0013; **Site 37**: NMNSC152, 841; **Site 42**: NMNSC4383; **Site 43**: NTUA02a13, TMAS.0273, 274; **Site 44**: NMNSC407; **Site 46**: NMNSC1177; **Site 48**: NMNSC2898; **Site 52**: NMNSC4860; **Site 54**: NMNSC3917; **Site 55**: NMNSC1187, 1188, 4151; **Site 58**: NMNSC1181, 1199; **Site 59**: NMNSC3900; **Site 60**: NMNSC2453, 3861, 4857; **Site 61**: TMAS.0180; **Site 62**: NMNSC123, 412, 4152, 4158, TMAS.0011; **Site 64**: NMNSC3886, 3915; **Site 66**: NMNSC114, 116, 404, TMAS.0010, 0018, 0171, 0171-1, 0171-2, 0171-3, 0171-4; **Site 68**: NMNSC409, 676; **Site 69**: ASIZAM05, NMNSC405, 782, 4299; **Site 72**: NMNSC33, 1651; **Site 73**: NMNSC3883; **Site 75**: NMNSC4173; **Site 78**: NMNSC1261, 4385; **Site 79**: NMNSC95, 102, 994, 1493, 1494, 1758, 1785, 1787, 1793, 2366, 4104; **Site 83**: NMNSC103, 1759, 1760, 2367, NTUA02a01, 02a08, 02a10, 02a18, 02a19, 02a20, 02a21, 02a22, 02a23, 02a24, 02a25, 02a26, 02a27, 02a28, 02a29, 02a31, 02a48, 02a51; **Site 84**: NMNSC1764, 1765, 1766, 1791, TMAS.0015, 0194, 0194-1, 0194-2, 0194-3, 0194-4, 0194-5, 0194-6, 0194-7, 0194-8, 0195, 0195-1, 0195-10, 0195-11, 0195-12, 0195-13, 0195-14, 0195-15, 0195-2, 0195-3, 0195-4, 0195-5, 0195-6, 0195-7, 0195-8, 0195-9; **Site 85**: NMNSC415; **Site 86**: NMNSC1247, 1256, NTUA02a46; **Site 88**: NMNSC4160; **Site 91**: NMNSC408, 1025, 1546, 1970, 2570, 2576, 3871, 4088; **Site 93**: NMNSC130, 995, 1003, 1004; **Site 94**: NTUA02a35; **Site 96**: NMNSC4094; **Site 97**: NMNSC406, 418, 3890, 4164, NTUA02a12, 02a30, 02a34; **Site 98**: NMNSC1240, TMAS.0014; **Site 100**: NMNSC1, 2, 3, 7, 21, 22, 401, 1634; **Site 107**: NMNSC80, 1345; **Site 108**: NMNSC46, 47, 805, 372, 4270, NTUA02a02, 02a06, 02a11, 02a17, 02a36, 02a38, 02a44, 02a45, 02a47, 02a53, TMAS.0126, 0126-1; **Site 111**: NMNSC4272, 4436; **Site 112**: NMNSC4095; **Site 114**: NMNSC4187; **Site 117**: NMNSC4184; **Site 118**: NMNSC402, 3878, 4185, NTUA02a39; **Site 120**: NMNSC2593, 3882, 4182; **Site 126**: NMNSC403; **Site 129**: NMNSC936; **Site 130**: TMAS.0012; **Site 131**: NMNSC8, 410, 414; **Site 132**: NMNSC12, 1263; **Site 133**: NMNSC2598, 2602; **Site 135**: NMNSC939, 2605, 4187, TMAS.0201, 0201-1, 0201-2; **Site 136**: NMNSC2610; **Site 144**: NMNSC4186; **Site 147**: NMNSC4490; **Site 149**: NMNSC4179; **Site 154**: NMNSC4204; **Site 157**: NMNSC4175; **Site 162**: NMNSC1330; **Site 163**: NMNSC645, 1339, 1804; **Site 164**: NMNSC659; **Site 166**: NMNSC4176, 4177; **Site 167**: NMNSC4449; **Site 169**: NMNSC4203; **Site 170**: NMNSC4194; **Site 172**: NMNSC4190, 4191; **Site 174**: NMNSC2681, 3916, 4083, TMAS.0182, 0182-1; **Site 178**: NMNSC915, 1142; **Site 181**: NMNSC4081, 4195, 4620; **Site 182**: NMNSC916, 924, 925, 4163, 4167; **Site 183**: NMNSC4165; **Site 184**: NMNSC932, 4162, 4386, NTUA02a42; **Site 187**: NMNSC284; **Site 188**: NMNSC909, 1130, 4169; **Site 190**: NMNSC850, 851; **Site 191**: NMNSC333, 2769, 4192; **Site 192**: NMNSC292; **Site 193**: NMNSC4116; **Site 196**: NMNSC905, 1270, 2758, 4196; **Site 197**: NMNSC309; **Site 198**: NMNSC4114; **Site 201**: NMNSC4079, 4198; **Site 202**: NMNSC1108, 4078; **Site 203**: NMNSC231; **Site 204**: NMNSC2778; **Site 205**: NMNSC4077, 4154; **Site 206**: NMNSC218; **Site 207**: NMNSC223, 886, 4193, 4388; **Site 208**: NTUA02a04; **Site 210**: NMNSC122, 124, 884, 4098, 4099, 4105; **Site 211**: NMNSC4103, 4106; **Site 212**: NMNSC4121; **Site 214**: NMNSC1103; **Site 217**: NMNSC1090, 3920, 4211; **Site 218**: NMNSC143; **Site 219**: NMNSC820, 822; **Site 223**: NMNSC4805; **Site 224**: NMNSC825, 834, 835; **Site 225**: NMNSC136, 829, 1220, TMAS.0234; **Site 226**: NMNSC148; **Site 230**: NMNSC416, 4462; **Site 231**: NMNSC4463, 4467, 4873; **Site 232**: NMNSC4207, 4241; **Site 233**: ASIZAM44, TMAS.0334, 0335, 0357, 0358, 0359, 0360, 0361, 0365, 0367, 0367-1, 0367-2, 0367-3, 0367-4, 0367-5.

Duttaphrynus melanostictus – Totally 136

specimen records from BRCAS (4), NMNS (85), NTUM (17), and NTM (30).

Site 1: NMNSC1390; **Site 4**: NMNSC2634, NTUA01a09, 01a19; **Site 5**: NMNSC1380, 1420, 4455, 4817; **Site 8**: NTUA01a18, 01a24; **Site 9**: NTUA01a22, TMAS.0008; **Site 11**: ASIZAM50; **Site 12**: NMNSC189, TMAS.0219; **Site 13**: NTUA01a17; **Site 14**: NMNSC4238, NTUA01a15; **Site 24**: NMNSC131; **Site 25**: NTUA01a01, 01a12, 01a23, TMAS.0218; **Site 26**: ASIZAM48; **Site 27**: NTUA01a05, TMAS.0007; **Site 28**: NMNSC196, 4235, 4236; **Site 29**: ASIZAM07, 08; **Site 31**: NTUA01a20; **Site 56**: NMNSC4866; **Site 60**: NMNSC4858; **Site 63**: NMNSC1667, NTUA01a21; **Site 67**: NMNSC4268; **Site 71**: NMNSC36, 37, 421, 422, 530, 942, 1640; **Site 72**: NMNSC32, 38, 39, 89, 242; **Site 73**: TMAS.0002, 0004, 0006, 0109; **Site 91**: NMNSC344; **Site 101**: NMNSC4256; **Site 105**: NMNSC2472; **Site 106**: NMNSC4267; **Site 109**: NMNSC4265; **Site 111**: NMNSC4435; **Site 114**: NMNSC4072; **Site 116**: NMNSC2000; **Site 117**: NMNSC4183, 4891; **Site 118**: NTUA01a07, TMAS.0130, 0130-1, 0130-2, 0130-3; **Site 123**: NMNSC4084; **Site 125**: NMNSC270; **Site 131**: NMNSC4281; **Site 138**: NMNSC4607, TMAS.0256; **Site 139**: NMNSC4266; **Site 144**: NMNSC4155, 4262; **Site 145**: NTUA01a10; **Site 146**: NMNSC4156; **Site 152**: NMNSC4886; **Site 154**: NMNSC4261; **Site 160**: NMNSC63; **Site 161**: TMAS.0232; **Site 162**: NMNSC24, 655, 976, 978, 4199; **Site 163**: NMNSC687, 1338; **Site 165**: NMNSC4125, 4233; **Site 166**: NMNSC52, 4120, 4126, 4130, 4134; **Site 168**: NMNSC424, 864, 3310, TMAS.0202, 0202-1, 0316, 0323; **Site 173**: NMNSC423, 4285; **Site 174**: NMNSC68, 324, TMAS.0353, 0402; **Site 175**: NMNSC859, 2824, NTUA01a11, TMAS.0317; **Site 181**: NMNSC4252; **Site 186**: NMNSC4298; **Site 189**: NTUA01a04; **Site 191**: NMNSC1126; **Site 193**: NMNSC4117; **Site 197**: NMNSC310; **Site 201**: NMNSC4080, 4199; **Site 203**: NMNSC232, TMAS.0080, 0080-1; **Site 205**: NMNSC4076, 4153; **Site 223**: NMNSC4804; **Site 233**: TMAS.0336, 0337, 0338, 0362, 0366; **Site 235**: NMNSC1635, 3901, TMAS.0313, 0314.

Hyla chinensis – Totally 51 specimen records from BRCAS (2), NMNS (37), NTUM (10), and NTM (2).

Site 1: NMNSC362, 1007, 1008, 1353, 1392, 4838; **Site 5**: NMNSC1387, 1403, 1404, 1421, 1466, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 4450, 4451, NTUA03a06; **Site 12**: NTUA03a02; **Site 13**: ASIZAM14; **Site 15**: NTUA03a03, 03a04, 03a10; **Site 27**: NTUA03a05, 03a09; **Site 28**: NMNSC5314; **Site 32**: NTUA03a08; **Site 34**: NMNSC4474, 4701; **Site 51**: NMNSC268, 426, 427; **Site 56**: NMNSC132, 4869, 4870; **Site 60**: NMNSC4856; **Site 71**: NMNSC425; **Site 73**: TMAS.0020, 0155; **Site 74**: ASIZAM13, NMNSC4901; **Site 86**: NTUA03a01; **Site 96**: NMNSC4848; **Site 105**: NTUA03a12; **Site 124**: NMNSC4947; **Site 231**: NMNSC1514.

Kaloula pulchra – One specimen record from NMNS.

Site 142: NMNSC3848.

Microhyla butleri – Totally 9 specimen records from BRCAS (2), NMNS (6), and NTUM (1).

Site 116: ASIZAM15, 16; **Site 118**: NMNSC1469, 1849, 1966, 2356, 2870; **Site 120**: NMNSC1708; **Site 121**: NTUA24a01.

Microhyla heymonsi – Totally 78 specimen records from BRCAS (2), NMNS (64), NTUM (6), and NTM (6).

Site 63: NMNSC2736, 4728; **Site 72**: NMNSC325, 379; **Site 74**: NMNSC4730; **Site 91**: NMNSC338, 621, 4708, 4846, NTUA25a07; **Site 93**: NMNSC4525; **Site 97**: NTUA25a02; **Site 101**: NMNSC4275, 4943; **Site 105**: NMNSC2480; **Site 111**: NMNSC4499; **Site 114**: NMNSC622; **Site 116**: ASIZAM17, 18, NMNSC1217, 1450, 2708; **Site 118**: NMNSC623, 1426, 1865, 1967, 1999, 4745, TMAS.0104; **Site 120**: NMNSC1709, 4744, 4935; **Site 123**: NMNSC4930, 4931; **Site 144**: NMNSC1994; **Site 148**: NMNSC1215; **Site 155**: NTUA25a01; **Site 162**: NMNSC210, 369, 698, 1202, 1204, 1662, 5190, NTUA25a03, 25a05; **Site 163**: NMNSC398, 651, 946, 983, 1784, 3843, 4292; **Site 164**: NMNSC302, 389, 956, 957, 970, NTUA25a04; **Site 166**: NMNSC4921, 4926; **Site 169**: NMNSC4977; **Site 171**: NMNSC1150, 4287; **Site 174**: NMNSC321, 2744; **Site 176**: TMAS.0389; **Site 180**: NMNSC274, 275, 2687, TMAS.0374, 0375, 0376, 0377; **Site 191**: NMNSC312; **Site 192**: NMNSC296; **Site 200**: NMNSC5322; **Site 206**: NMNSC620.

Microhyla fissipes – Totally 135 specimen records from BRCAS (1), NMNS (106), NTUM (14), and NTM (14).

Site 1: NMNSC348, 361, 1351, 1378, 1383, 1393, 4839; **Site 4**: NTUA26a14; **Site 5**: NMNSC4452; **Site 7**: NMNSC200; **Site 8**: NTUA26a12; **Site 10**: NMNSC617; **Site 13**: ASIZAM19, NMNSC5315; **Site 14**: NMNSC1160; **Site 15**: NTUA26a01; **Site 16**: NMNSC616, 1063, 1163, 1164; **Site 17**: NMNSC1067, 1229, 1414, 1744; **Site 19**: NMNSC618, NTUA26a06, 26a10; **Site 27**: NTUA26a05; **Site 28**: NMNSC5316; **Site 40**: NTUA26a08; **Site 41**: NTUA26a13; **Site 51**: NMNSC615; **Site 52**: NMNSC2522; **Site 56**: NMNSC4868; **Site 60**: NMNSC4852; **Site 71**: NMNSC34, 619; **Site 72**: NMNSC243, 326, 2620, 3082; **Site 73**: TMAS.0021; **Site 74**: NMNSC4750, 4900; **Site 75**: NMNSC4609, 4720; **Site 86**: NMNSC3812; **Site 91**: NMNSC329, 358, 1942; **Site 96**: NMNSC2622, 4849; **Site 101**: NMNSC4139, 4210, 4257, 4755, 4944; **Site 105**: NMNSC2481; **Site 109**: NMNSC4264; **Site 116**: NMNSC1449, 1454; **Site 117**: NMNSC1470; **Site 118**: NMNSC1968, 2357, 3876; **Site 120**: NMNSC4763, 4936; **Site 121**: NTUA26a11; **Site 123**: NMNSC4929, 4932; **Site 125**: NMNSC272; **Site 135**: TMAS.0197, 0197-1, 0197-2; **Site 137**: NMNSC613; **Site 144**: NMNSC1956, 2015; **Site 145**: NTUA26a07; **Site 151**: NMNSC4627; **Site 152**: NMNSC4982; **Site 153**: NMNSC365; **Site 157**: NMNSC4979; **Site 160**: NMNSC57, 993, 4927; **Site 161**: TMAS.0347, 0348; **Site 162**: NMNSC25, 208, 213, 368, 384, 700, 1203, 1206, 1572, 1652, 4950, 4990, NTUA26a04, 26a15, TMAS.0212, 0212-1, 0212-2; **Site 164**: NMNSC235, NTUA26a03, 26a09; **Site 165**: NMNSC4953; **Site 166**: NMNSC4135, 4916, 4920, 4924; **Site 167**: NMNSC4291; **Site 171**: NMNSC1151; **Site 173**: NMNSC614; **Site 174**: NMNSC2743, TMAS.0380, 0391; **Site 176**: TMAS.0405, 0406; **Site 179**: NMNSC4736; **Site 180**: TMAS.0373; **Site 181**: NMNSC4995; **Site 191**: NMNSC285, 317; **Site 192**: NMNSC294, 298, 4245, 4251; **Site 195**: NMNSC5320; **Site 196**: NMNSC1111; **Site 200**: NMNSC308, 5321; **Site 223**: NMNSC5324; **Site 229**: NMNSC5317.

Micryletta steinegeri – Thirty specimen records from NMNS.

Site 74: NMNSC4897, 4898; **Site 89**: NMNSC4752; **Site 96**: NMNSC1557; **Site 101**: NMNSC4942; **Site 105**: NMNSC2478; **Site 116**: NMNSC1216; **Site 118**: NMNSC624, 625, 1423, 1424, 1425, 1436, 1471, 1473, 1539, 1655, 1664, 1665; **Site 120**: NMNSC4764; **Site 162**: NMNSC209, 688, 1201, 1209, 4951, 4989; **Site 163**: NMNSC1336; **Site 166**: NMNSC4922, 4925; **Site 169**: NMNSC4978.

Babina adenopleura – Totally 82 specimen records from BRCAS (2), NMNS (65), NTUM (8), and NTM (7).

Site 4: NMNSC2627, 2628; **Site 13**: NMNSC5004; **Site 14**: NMNSC1010, 1011, 2411, 2413; **Site 16**: NMNSC1058, 1059; **Site 17**: NMNSC335, 1068, 1072, 1231, TMAS.0181; **Site 20**: TMAS.0206, 0206-1, 0206-2, 0206-3; **Site 21**: NMNSC429; **Site 36**: NMNSC158, 159; **Site 37**: NMNSC433; **Site 71**: NTUA15a07; **Site 72**: ASIZAM22; **Site 80**: NMNSC4086; **Site 86**: NMNSC4835, NTUA15a01; **Site 91**: ASIZAM23, NMNSC328, 357, 364, 430, 431, 1862, 1938, 1939, 1972, 2378, 2383, 2417, 2484, 2565, 2578, 2580, 2581, 2584, 2585, 3867, 4215, 4712, 5184; **Site 134**: NTUA15a03; **Site 163**: NMNSC650, 966, 984, 985, 986, 987, 988, 1569, 2697; **Site 164**: NMNSC390, 660, 661, 962, NTUA15a02.1, 15a02.2; **Site 188**: NMNSC1128; **Site 195**: NMNSC4112; **Site 196**: NMNSC2759, 4734; **Site 226**: NMNSC4964; **Site 228**: NTUA15a04, 15a06; **Site 230**: NMNSC428, 4459; **Site 231**: NMNSC1512, 4872, NTUA15a08, TMAS.0277, 0278; **Site 234**: NMNSC5002.

Babina okinavana – Five specimen records from NMNS.

Site 91: NMNSC2377, 2388, 2583, 2996, 2997.

Fejervarya cancrivora – One specimen record from NMNS.

Site 151: NMNSC4985.

Fejervarya limnocharis – Totally 332 specimen records from BRCAS (2), NMNS (166), NTUM (74), and NTM (90).

Site 1: NMNSC363, 1350, 1376, 1386, 1396, 3813; **Site 2**: NMNSC4819, 5016; **Site 4**: NTUA14a74; **Site 5**: NMNSC1381, 1401, 1419, 1464, 4816, NTUA14a01, 14a24; **Site 7**: NMNSC199; **Site 8**: NTUA14a38; **Site 9**: NTUA14a35; **Site 10**: NMNSC454; **Site 12**: NMNSC193, NTUA14a18, 14a26, TMAS.0220; **Site 13**: ASIZAM31, NMNSC4691, 4940, 5006, NTUA14a64; **Site 14**: NMNSC173, 177, 1036, 2412, NTUA14a20, 14a23; **Site 15**: NTUA14a02, 14a04, 14a28, 14a46, 14a66,

14a78; **Site 16**: NMNSC466, 1055, 1062, 1162, NTUA14a09, 14a52, 14a79, TMAS.0058; **Site 17**: NTUA14a63, TMAS.0238, 0238-1; **Site 19**: NMNSC255, 266, 451, 467, NTUA14a22, NTUA14a49; **Site 20**: TMAS.0208, 0208-1, 0208-2; Site 23: NMNSC1312; **Site 24**: NMNSC2632, TMAS.0133; **Site 25**: NTUA14a51, 14a59; **Site 27**: NTUA14a11, 14a12, 14a32, 14a37, 14a60, 14a61, 14a65, 14a69, 14a70, 14a72, 14a75, 14a76, TMAS.0057, 0057-1; **Site 28**: NTUA14a03, 14a13; **Site 33**: NTUA14a25, 14a55; **Site 34**: NMNSC4704; **Site 36**: NMNSC156; **Site 39**: TMAS.0183, 0183-1, 0183-2, 0183-3, 0183-4; **Site 40**: NMNSC108; **Site 41**: NTUA14a41; **Site 43**: NTUA14a17; **Site 45**: NMNSC1172, 1173; **Site 49**: NMNSC1186; **Site 50**: TMAS.0352; **Site 51**: NMNSC105, **106; Site 52**: NMNSC2521; **Site 53**: NMNSC447; **Site 55**: NMNSC1192; **Site 56**: NMNSC4867; **Site 57**: NMNSC1663; **Site 60**: NMNSC4853; **Site 63**: NMNSC4092, TMAS.0064, 0064-1; **Site 67**: NMNSC459; **Site 71**: NMNSC35, 234, 457, 3842; **Site 72**: NMNSC239, 463, 715; **Site 73**: TMAS.0061, 0061-1, 0065; **Site 74**: NMNSC452; **Site 75**: NMNSC4725; **Site 78**: NMNSC1861; **Site 80**: TMAS.0192, 0192-1, 0192-2, 0192-3, 0192-4, 0192-5, 0192-6; **Site 81**: TMAS.0084, 0086; **Site 83**: NMNSC100, 460; **Site 84**: TMAS.0059; **Site 86**: NMNSC4877, 4890, 4892, NTUA14a15, 14a16, 14a29, TMAS.0066, 0190, 0190-1, 0190-2; **Site 87**: NMNSC1257; **Site 91**: NMNSC331, 336, 446, 1483, 2379, 2386, 2416, 2483, 2566, 3868, 4661, 4666, 4713; **Site 92**: NMNSC2554; **Site 93**: NMNSC2795; **Site 94**: NTUA14a06; **Site 96**: NMNSC2625; **Site 100**: NMNSC445, NTUA14a56, TMAS.0062; **Site 102**: NTUA14a27; **Site 105**: NMNSC2475; **Site 106**: NTUA14a10; **Site 107**: NMNSC76; **Site 109**: TMAS.0329; **Site 116**: NMNSC1452, 2704; **Site 117**: NMNSC1706; **Site 118**: NMNSC1432, 1438, 1472, 2037, 2873, 3875, NTUA14a45, TMAS.0101, 0101-1, 0101-2, 0101-3, 0132; **Site 119**: NMNSC449; **Site 121**: NTUA14a43; **Site 123**: NMNSC4933; **Site 125**: NMNSC271; **Site 128**: NMNSC455; **Site 130**: TMAS.0082, 0082-1, 0082-2, 0082-3; **Site 131**: NMNSC462, TMAS.0067; **Site 132**: NMNSC11, 2443; **Site 135**: NTUA14a21, TMAS.0199, 0199-1, 0199-2, 0199-3, 0199-4, 0199-5, 0199-6; **Site 138**: NMNSC4630, TMAS.0254, 0255-2, 0258, 0259, 0260, 0261, 0262, 0263, 0264, 0275, 0276; **Site 141**: NMNSC1580; **Site 143**: NMNSC450; **Site 144**: NMNSC1957, 1986, 1991, 1995, 2018; **Site 145**: NTUA14a33, 14a62; **Site 149**: NMNSC453; **Site 151**: NMNSC4626, 4984; **Site 152**: NMNSC4914; **Site 153**: NMNSC366; **Site 154**: NMNSC4255; **Site 160**: NMNSC62; **Site 161**: NMNSC56, TMAS.0339, 0340; **Site 162**: NMNSC23, 211, 212, 657, 947, NTUA14a44; **Site 163**: NMNSC400, 1335, 2694; **Site 164**: NMNSC664, 693, 952, 954, 971; **Site 165**: NMNSC4132; **Site 166**: NMNSC54, 4917. 4919, TMAS.0081, 0081-1; **Site 168**: NMNSC458, 461, 465, 468, 865, 1137, 3317, 3322, NTUA14a40, 14a42, 14a50, 14a53, 14a54, 14a58, 14a68, 14a77, TMAS.0088, 0203, 0203-1, 0225, 0320, 0321, 0322, 0324, 0325, 0326, 0327, 0328, 0333; **Site 173**: NMNSC456; **Site 174**: NMNSC2679, TMAS.0390. 0400, 0401, ; **Site 175**: ASIZAM30, NMNSC2827, 2877, NTUA14a19, 14a30, 14a31, 14a39, 14a47, 14a48, 14a57; **Site 180**: NMNSC281, 2686, TMAS.0384, 0385; **Site 190**: NMNSC854; **Site 191**: NMNSC319, 464; **Site 192**: NMNSC297, 4243, 4249; **Site 193**: NMNSC4115; **Site 194**: NMNSC301; **Site 196**: NMNSC1117, 2762; **Site 197**: NMNSC306; **Site 200**: NMNSC2667, 5323; **Site 203**: NMNSC230, NTUA14a14; **Site 223**: NMNSC4810; **Site 225**: NMNSC166; **Site 229**: NTUA14a07, 14a08; **Site 230**: NMNSC448; **Site 232**: NMNSC4390, NTUA14a05; **Site 234**: NMNSC5008; **Site 236**: TMAS.0315, 0318, 0319.

Hoplobatrachus rugulosus – Totally 52 specimen records from NMNS (24), NTUM (21), and NTM (7).

Site 1: NMNSC1567; **Site 5**: NMNSC1465, NTUA13a16; **Site 12**: TMAS.0054; **Site 16**: TMAS.0217; **Site 27**: NTUA13a03; **Site 63**: TMAS.0055; **Site 81**: TMAS.0077, 0120; **Site 86**: TMAS.0185; **Site 91**: NMNSC 495, 2486, 2489, 2567; **Site 96**: NTUA13a01; **Site 106**: NTUA13a07, 13a08, 13a09, 13a27, 13a28; **Site 110**: NTUA13a17; **Site 117**: NTUA13a02, 13a19; **Site 118**: NMNSC2874, NTUA13a22; **Site 121**: NTUA13a13; **Site 135**: TMAS.0200; **Site 144**: NMNSC2020; **Site 145**: NTUA13a18; **Site 149**: NTUA13a15, 13a20, 13a21; **Site 150**: NMNSC4956; **Site 162**: NMNSC728, 1207; **Site 165**: NTUA13a10; **Site 166**: NMNSC4119, 4129; **Site 168**: NMNSC494, 496, 1136, 1140, 1141; **Site 175**: NMNSC2876, NTUA13a14; **Site 181**: NMNSC4996; **Site 192**: NMNSC4248; **Site 196**: NMNSC1113, 2760; **Site 206**: NMNSC215; **Site 228**: NTUA13a04, 13a12.

Hylarana guentheri – Totally 63 specimen records from BRCAS (3), NMNS (24), NTUM (27), and NTM (9).

Site 1: NMNSC1394, 1398, 1573; **Site 5**: NMNSC1402, 1422, 1463, 1517, 1568, 1570; **Site 8**: NTUA19a32; **Site 12**: NTUA19a30; **Site 13**: NMNSC5007, NTUA19a37; **Site 15**: NTUA19a03, 19a41; **Site 16**: NTUA19a17, 19a18, 19a24, 19a25, 19a27; **Site 17**: ASIZAM47, NMNSC1600, NTUA19a16, 19a40, TMAS.0187; **Site 19**: NMNSC434, NTUA19a09, 19a14, 19a15; **Site 20**: TMAS.0224; **Site 25**: NTUA19a11; **Site 27**: NTUA19a06, 19a13, 1919 19a20, 19a38; **Site 28**: NTUA19a12; **Site 29**: ASIZAM25; **Site 35**: NTUA19a28; **Site 41**: NTUA19a21; **Site 43**: NTUA19a08; **Site 51**: NMNSC269, 432; **Site 57**: NMNSC4902; **Site 62**: TMAS.0127; **Site 70**: NMNSC4881; **Site 71**: ASIZAM24; **Site 75**: NMNSC4719; **Site 86**: NMNSC4957; **Site 91**: NMNSC5185; **Site 101**: NMNSC4141, 4941; **Site 105**: NMNSC2476; **Site 106**: NTUA18a20; **Site 145**: NTUA19a33; **Site 152**: NMNSC4981; **Site 226**: TMAS.0284, 0285, 0286, 0287, 0288, 0289; **Site 232**: NMNSC4442.

Hylarana latouchii – Totally 408 specimen records from BRCAS (2), NMNS (321), NTUM (55), and NTM (30).

Site 1: NMNSC1352, 1377, 1384, 1395; **Site 3**: NMNSC2561; **Site 4**: NMNSC206, 1313, 2636, 4615, TMAS.0107, 0107-1, 0107-2, 0107-3; **Site 5**: NMNSC4454; **Site 6**: NMNSC1292; **Site 7**: TMAS.0050; **Site 9**: TMAS.0047; **Site 12**: NMNSC192, NTUA20a49, 20a50; **Site 13**: NMNSC4939, NTUA20a18; **Site 14**: NMNSC169, 180, 183, 1035, 1053, 2410, 2414, 4237, NTUA20a10; **Site 15**: NTUA20a04, 20a19, 20a20, 20a22, 20a23, 20a25, 20a29, TMAS.0176, 0177; **Site 16**: NMNSC1057; **Site 17**: NMNSC1070, 1227, 1232, 1415, 1740, 1741, 1745, 4400, 4824, NTUA20a52; **Site 18**: NMNSC4294, 4399; **Site 19**: NMNSC245, 246, 249, 254, 257, 349, 469, 470, 483, 485, 1320, 4402, 4415, 4965, NTUA20a41, 20a42, 20a44, TMAS.0112; **Site 21**: NMNSC471, 479, 3863; **Site 22**: NMNSC1291; **Site 24**: NMNSC2631; **Site 27**: NTUA20a01, 20a07, 20a13, 20a14, 20a16, 20a31; **Site 28**: NMNSC197, 4457, 4472, 4603, 4815; **Site 30**: NMNSC487, 488, 493; **Site 33**: NTUA20a45; **Site 34**: NMNSC4481; **Site 35**: NMNSC846, NTUA20a55; **Site 36**: NMNSC157, 160, 161; **Site 37**: NMNSC151; **Site 42**: NMNSC4384; **Site 43**: NTUA20a34; **Site 45**: NMNSC1168, 1169; **Site 46**: NMNSC4484; **Site 47**: NMNSC4407, 4961; **Site 52**: NMNSC4861; **Site 54**: NMNSC4395; **Site 58**: NMNSC1197, NTUA20a38; **Site 60**: NMNSC2455, 4147, 4414, 4487; **Site 63**: NMNSC2733, 4409; Site 64: NMNSC3887, 4410, 4411, 4524; **Site 68**: NMNSC705, 4520; **Site 69**: NMNSC490, 1749, 1752; **Site 71**: NTUA20a46; **Site 72**: NMNSC26, 31, 40, 747, 748, 352, 2909, 2974, 2977, 2979, 2981, 2988, 2991, 2993, 3019, 3022, 3040, 3042, 3049, 3050, 3051, 3053, 3070, 3073, 3076, 4138; **Site 73**: NMNSC3884, TMAS.0048; **Site 74**: NMNSC4558; **Site 75**: NMNSC4148, 4610; **Site 83**: NMNSC92, 99, 1700, 1762, 1763, 1833, 2464, 2715, 3359, 4295, NTUA20a21, 20a26, 20a28; **Site 86**: NMNSC669, 1254, 4401, 4878, 4958, NTUA20a47, 20a60; **Site 87**: NMNSC1258; **Site 88**: NMNSC2373; **Site 91**: NMNSC337, 355, 484, 489, 1026, 1940, 1969, 2385, 2485, 2564, 2577, 3870, 4206, 4394, 4667; **Site 93**: NMNSC127; **Site 94**: NTUA20a27; **Site 95**: NMNSC17, 18, 20; **Site 96**: NMNSC2624; **Site 97**: ASIZAM28, 29, NMNSC1005, 2717, 3892, 3897, NTUA20a03, 20a24, 20a61; **Site 100**: NMNSC06, 15, 16, 19, 107, 472, 1647, NTUA20a32; **Site 101**: NMNSC4142, 4258, 4754; **Site 102**: NMNSC4501; **Site 104**: NTUA20a30; **Site 107**: NMNSC78; **Site 111**: NMNSC4391, 4438, 4497; **Site 114**: NMNSC477; **Site 115**: NMNSC4398; **Site 116**: NMNSC104, 475, 1451; **Site 117**: NMNSC4567; **Site 118**: NMNSC481, 723, 1435, 1437, 1964, 1998, 2592, 3045, 3325, 4403, 4569, NTUA20a17, 20a56, TMAS.0023, 0023-1, 0023-2, 0031, 0105, 0105-1; **Site 120**: NMNSC3880, 4180, 4604; **Site 121**: NTUA20a35; **Site 123**: NMNSC2701, 4284; **Site 128**: NMNSC476, 491; **Site 129**: NMNSC935; **Site 130**: NMNSC4493; **Site 131**: NMNSC482, 486, 4279, 4282, TMAS.0052; **Site 132**: NMNSC10, 473, 2442; **Site 133**: NMNSC2600, 2601; **Site 135**: NTUA20a40, 20a58; **Site 136**: NMNSC2609, NTUA20a05; **Site 138**: NMNSC4631, TMAS.0257; **Site 143**: NMNSC492, NTUA20a36; **Site 144**: NMNSC64, 111, 4260; **Site 145**: NTUA20a15; **Site 148**: NMNSC1212, 1717, 4408; **Site 149**: NMNSC1211, 1724, 4559, 4560, NTUA20a43; **Site 154**: NMNSC4174, 4564; **Site 159**: NMNSC4565; **Site 160**: NMNSC50, 61, 1962; **Site 161**: TMAS.0349, 0350, 0351; **Site 162**: NMNSC1329; **Site 163**: NMNSC396, 646, 652, 686, 690, 967, 1341, 1551, 2695, 3844, 4128,

4293, 4447, NTUA20a39, TMAS.0330; **Site 164**: NMNSC387, 658, 692, 799, 800, 948, 953, 955, 959, 960, 968, 972, 1781, NTUA20a02; **Site 165**: NMNSC4954, NTUA20a57; **Site 166**: NMNSC53, 4118, 4445; **Site 167**: NMNSC4290, 4448; **Site 171**: NMNSC1149, 4286; **Site 173**: NMNSC129, 188, 474, 1644; **Site 174**: NMNSC2678, 2742, TMAS.0368, 0369, 0404; **Site 180**: NMNSC273, 278, 279, 1134, 2685, TMAS.0386; **Site 181**: NMNSC4387, 4397, 4622; **Site 182**: NMNSC4405; **Site 183**: NTUA20a33; **Site 184**: NMNSC930; **Site 187**: NMNSC478, NTUA20a06; **Site 188**: NMNSC908, 3784, 4170, 4571; **Site 190**: NMNSC853, 4968, NTUA20a59; **Site 191**: NMNSC288, 315, 1124; **Site 192**: NMNSC293, 4244, 4246, 4250; **Site 194**: NMNSC305; **Site 196**: NMNSC898, 1112, 2761, 4197, 4733; **Site 198**: NMNSC4109, 4396; **Site 200**: NMNSC893, 895; **Site 203**: NMNSC229; **Site 204**: NMNSC887; **Site 205**: NMNSC4404; **Site 207**: NMNSC224; **Site 210**: NTUA20a54; **Site 216**: NMNSC1094; **Site 217**: NMNSC1088, 4239; **Site 222**: NTUA20a53; **Site 223**: NMNSC4809; **Site 225**: NMNSC134, 830, 2984, NTUA20a48; **Site 226**: NMNSC4406; **Site 230**: NMNSC480, 4460; **Site 232**: NMNSC4208, 4389; **Site 233**: TMAS.0363, 0364, 0364-1, 0396.

Hylarana taipehensis – Totally 15 specimen records from NMNS (11) and NTUM (4).

Site 5: NMNSC1541, 1544, 1553, 1595, 1620, 1622, NTUA17a04; **Site 8**: NTUA17a03; **Site 27**: NTUA17a01; **Site 144**: NMNSC1850, 1958, 2019, 2375, 2382; **Site 146**: NTUA17a02.

Limnonectes fujianensis – Totally 160 specimen records from BRCAS (2), NMNS (105), NTUM (36), and NTM (17).

Site 2: NMNSC5014; **Site 4**: NMNSC2635, 4687, 4688, NTUA12a34; **Site 5**: NTUA12a27; **Site 12**: NTUA12a18; **Site 13**: NMNSC4690, NTUA12a42; **Site 14**: NMNSC170, 179, 1037, 1044, 1045, 1049, 1052, NTUA12a03, 12a12; **Site 15**: NTUA12a31, TMAS.0178, 0179; **Site 16**: NMNSC1061, NTUA12a08, 12a14, 12a19; **Site 17**: NMNSC1357, 1746, 4616, 4820, NTUA12a02, 12a13, 12a28; **Site 19**: NMNSC248, 256, 436, 437, 440, 441, 1322, 2647, 4966, NTUA12a01, 12a10, 12a16, 12a21, 12a24, 12a26, 12a37, 12a38, TMAS.0026; **Site 20**: TMAS.0204, 0204-1, 0204-2, 0205, 0205-1, 0205-2; **Site 21**: NMNSC439; **Site 26**: NMNSC4618, 4685; **Site 27**: NTUA12a05, 12a09, 12a30, 12a39, 12a40, 12a41, 12a43, TMAS.0025, 0121; **Site 28**: NMNSC4233, 4600, 4689, NTUA12a35; **Site 29**: ASIZAM26, 27; **Site 34**: NMNSC4478, 4703; **Site 35**: NMNSC155, 1299, 1303, 4699; **Site 36**: NMNSC5182; **Site 43**: NTUA12a20; **Site 44**: NMNSC734; **Site 46**: NMNSC4483; **Site 47**: NMNSC4962; **Site 52**: NMNSC4862, 4864; **Site 58**: NMNSC4678, 4680, NTUA12a22; **Site 60**: NMNSC2650, 4144, 4488, 4904, 4909; **Site 64**: NMNSC4522, 4556; **Site 68**: NMNSC4517; **Site 74**: NMNSC1990, 4506; **Site 91**: NMNSC341, 342, 435, 1019, 1023, 1024, 1411, 1863, 2384, 2415, 2482, 2563, 3869, 4214, 4485, 4665, 4711, 5186; **Site 93**: NMNSC4670, 4675; **Site 94**: NTUA12a36; **Site 100**: NTUA12a25; **Site 102**: NMNSC4492, 4500; **Site 111**: NMNSC4495, 4496, 4598; **Site 114**: NMNSC162, 4503, 4504; **Site 118**: NMNSC1431, 1440, TMAS.0035, 0035-1, 0035-2, 0035-3; **Site 128**: NMNSC438; **Site 130**: NMNSC4494; **Site 135**: NMNSC2444; **Site 149**: NTUA12a29; **Site 216**: NMNSC1092, 1093, 4512, 4695; **Site 217**: NMNSC1087; **Site 224**: NMNSC137, 4469; **Site 225**: NMNSC163, 167, 4698, TMAS.0243, 0244, 5195; **Site 229**: NMNSC4617, 4697, NTUA12a04; **Site 230**: NMNSC4458; **Site 231**: NTUA12a32; **Site 234**: NMNSC4692.

Lithobates catesbeianus – Totally 7 specimen records from NMNS (2), NTUM (1), and NTM (4).

Site 4: NMNSC1145, NTUA31a02; **Site 25**: TMAS.0223; **Site 71**: NMNSC4351; **Site 118**: TMAS.0128; **Site 176**: TMAS.0395, 0395-1.

Odorrana swinhoana – Totally 259 specimen records from BRCAS (2), NMNS (230), NTUM (1), and NTM (26).

Site 2: NMNSC5015; **Site 3**: NMNSC2560, 2640; **Site 4**: NMNSC202, 1167, 1283, 1306, 1316, 1355, 1739, 2637, 4056, 4686, TMAS.0214; **Site 11**: ASIZAM39; **Site 14**: NMNSC1040, 1054, 1066; **Site 16**: NMNSC506; **Site 17**: NMNSC4060, 4825, 4829, TMAS.0188; **Site 18**: NMNSC4039, TMAS.0266; **Site 19**: NMNSC253, 264, 385, 512, 1321, 2646, 4058; **Site 20**: TMAS.0211, 0211-1, 0211-2, 0211-3; **Site 24**: NMNSC1289; **Site 27**: TMAS.0138; **Site 28**: NMNSC4234, 4602, 4814; **Site 34**: NMNSC4705; **Site 35**: NMNSC1225; **Site 37**: NMNSC843, 4059; **Site 43**: TMAS.0267,

0268; **Site 44**: NMNSC733, 4049; **Site 45**: NMNSC1170, 1171; **Site 47**: NMNSC1185, 4761; **Site 52**: NMNSC5193; **Site 54**: NMNSC4037, 4055; **Site 55**: NMNSC1189, 1190; **Site 58**: NMNSC1183; **Site 61**: NMNSC1952, TMAS.0140, 0144, 0144-1, 0144-2; **Site 62**: NMNSC118, 679, 712, TMAS.0139, 0139-1; **Site 63**: NMNSC2732, 4038; **Site 64**: NMNSC4034, 4035, 4054, 4718; **Site 65**: NMNSC1909; **Site 68**: NMNSC502, 675, 677, 740, 770; **Site 69**: NMNSC503, 504, 703, 1755, 1756; **Site 78**: NMNSC1855, 4446; **Site 82**: NMNSC4041, 4042, 4043; **Site 83**: NMNSC1703, 1761, 1834, 1934, 1935; **Site 86**: NMNSC1248, 1255, TMAS.0091; **Site 91**: NMNSC509, 2487, 4053, 4715; **Site 93**: NMNSC1006, 4526, 4671; **Site 96**: NMNSC1235, 3856; **Site 97**: ASIZAM38, NMNSC2544, 2719, 3891, 4036, NTUA10a12; **Site 98**: NMNSC1239; **Site 100**: NMNSC194, 507, 508, 1648; **Site 106**: NMNSC4040; **Site 107**: NMNSC75, 79, 1342; **Site 110**: NMNSC4047; **Site 111**: NMNSC718, 4498; **Site 114**: NMNSC4505; **Site 116**: NMNSC2705; **Site 118**: TMAS.0034, 0034-1, 0034-2; **Site 120**: NMNSC4743; **Site 129**: NMNSC501, 1265; **Site 131**: NMNSC4048; **Site 132**: TMAS.0282; **Site 134**: NMNSC2594, 4045; **Site 136**: NMNSC513, 2612; **Site 140**: NMNSC4632; **Site 144**: NMNSC110, 500, 1729; **Site 147**: NMNSC1586; **Site 148**: NMNSC1153, 1156, 1718, 1723; **Site 149**: NMNSC1157, 1719, 1726; **Site 152**: NMNSC90; **Site 158**: NMNSC505; **Site 159**: NMNSC4052, 4441; **Site 163**: NMNSC397, 647, 691, 963, 1783, 1803, 2698, 3845, 4127, TMAS.0331, 0332; **Site 164**: NMNSC386, 665, 949, 950; **Site 165**: NMNSC4131; **Site 166**: NMNSC4122, 4123; **Site 171**: NMNSC81; **Site 173**: NMNSC1146, 1282; **Site 174**: NMNSC2677, 2745, TMAS.0403; **Site 178**: NMNSC4032, 4033; **Site 180**: NMNSC219, 283, 511, 571, 2750; **Site 181**: NMNSC4031, 4507; **Site 182**: NMNSC918, 920, 921, 4168, 4216; **Site 183**: NMNSC919, 4166; **Site 184**: NMNSC4161; **Site 188**: NMNSC912, 913, 914, 1131, 1641; **Site 190**: NMNSC852; **Site 191**: NMNSC316, 1125, 2771; **Site 192**: NMNSC300; **Site 193**: NMNSC4113; **Site 194**: NMNSC1642; **Site 195**: NMNSC4110; **Site 196**: NMNSC900, 903, 1114, 1120, 1269, 1276, 2757, 4044, 4050, 4051; **Site 197**: NMNSC1637; **Site 198**: NMNSC4108; **Site 200**: NMNSC894; **Site 201**: NMNSC4030, 4508; **Site 202**: NMNSC1107; **Site 203**: NMNSC233; **Site 204**: NMNSC392, 888, 892, 1904, 2779; **Site 206**: NMNSC217; **Site 207**: NMNSC227; **Site 210**: NMNSC121; **Site 211**: NMNSC4102; **Site 216**: NMNSC1095, 4514; **Site 217**: NMNSC1084, 1091, 1901, 4046; **Site 224**: NMNSC144, 826, 4057, 4061; **Site 225**: NMNSC135, 164, 165, 1219, 1898, 2985, TMAS.0240, 0242; **Site 226**: NMNSC145, 840; **Site 230**: NMNSC510; **Site 234**: NMNSC5001.

Pelophylax fukienensis – Totally 48 specimen records from BRCAS (2), NMNS (9), NTUM (26), and NTM (11).

Site 32: NTUA18a16; **Site 60**: NMNSC4871; **Site 81**: TMAS.0169, 0169-1, 0170, 0170-1; **Site 86**: NTUA18a04, TMAS.0032, 0189, 0189-1, 0189-2, 0189-3, 0189-4, 0237; **Site 91**: ASIZAM34, 35, NMNSC334, 343, 378, 498, 2488, 4205, 4212; **Site 96**: NTUA18a22; **Site 104**: NTUA18a03; **Site 106**: NTUA18a09, 18a10, 18a17, 18a26, 18a27; **Site 110**: NTUA18a02.1, 18a02.2, 18a02.3, 18a06, 18a15, 18a24; **Site 117**: NTUA18a19; **Site 118**: NTUA18a14; **Site 135**: NTUA18a28; **Site 145**: NTUA18a05, 18a25; **Site 149**: NTUA18a07, 18a08, 18a11, 18a33; **Site 164**: NMNSC694, NTUA18a13, 18a29.

Rana longicrus – Totally 112 specimen records from BRCAS (3), NMNS (48), NTUM (41), and NTM (20).

Site 1: NMNSC347, 1009, 1305, 1348, 1349, 1374, 1379, 1382, 1385, 1397, 3814, 4841, 4842; **Site 2**: TMAS.0108; **Site 4**: NMNSC203, 204, NTUA22a05, 22a44, TMAS.0215; **Site 5**: NMNSC356, 1619, 4453, 4456, 4837, 4840, NTUA22a19; **Site 6**: NMNSC1293, TMAS.0098; **Site 7**: NMNSC201, TMAS.0039, 0042; **Site 8**: NTUA22a26; **Site 11**: ASIZAM52; **Site 12**: ASIZAM32, 33, NMNSC5336, NTUA22a38; **Site 13**: NMNSC5312; **Site 14**: NMNSC185, 187, 1654, NTUA22a03, 22a20, 22a37; **Site 15**: NTUA22a04, 22a25, 22a27, 22a28, 22a43, 22a45, 22a48, TMAS.0097, 0097-1, 0097-2, 0097-3, 0097-4, 0173, 0174, 0175; **Site 16**: NTUA22a42, 22a47; **Site 17**: NMNSC1356, NTUA22a17, 22a18, 22a24, 22a41; **Site 19**: NMNSC353, NTUA22a16; **Site 23**: NMNSC1308, 1309, 1310, 1311; **Site 24**: NMNSC2630; **Site 27**: NTUA22a01, 22a02, 22a10, 22a12, 22a13, 22a14, 22a15, 22a22, 22a31, 22a32, 22a33, 22a50, TMAS.0113; **Site 28**: NMNSC195; **Site 32**: NMNSC4896, 5017; **Site 34**: NMNSC4475; **Site 38**: NTUA22a34; **Site 52**: NMNSC4859, 5192; **Site 58**: NTUA22a36; **Site 60**: NMNSC3860;

Site 73: TMAS.0041; **Site 74**: TMAS.0249, 0251, 0252; **Site 81**: TMAS.0043, 0044; **Site 91**: NMNSC351, 442, NTUA22a40; **Site 94**: NTUA22a30; **Site 118**: NTUA22a29; **Site 223**: NMNSC5310, 5334; **Site 229**: NMNSC1623, NTUA22a21; **Site 230**: NMNSC443; **Site 232**: NTUA22a46.

Rana sauteri – Totally 384 specimen records from BRCAS (2), NMNS (367), NTUM (3), and NTM (12).

Site 17: NMNSC1233, 2812, 4832; **Site 19**: NMNSC247, 259, 543, 1318, 2814; **Site 21**: NMNSC540, 550, 555, 577, 3857; **Site 35**: NMNSC845, 1224, 1298, 4412; **Site 36**: NMNSC844; **Site 37**: NMNSC153, 842, 1297; **Site 44**: NMNSC554, 730, 731, 732, 1631; **Site 47**: NMNSC4381, 4760; **Site 57**: NMNSC798; **Site 58**: NMNSC785, 786, 787, 789, 1180, 1182, 1184, 4380, NTUA21a02; **Site 60**: NMNSC4145, 4367, 4413, 4905; **Site 61**: NMNSC814, TMAS.0142, 0142-0, 0142-1, 0142-2; **Site 62**: NMNSC205, 535, 537, 542, 551, 556, 560, 562, 581, 682, 713, 714, 742, 743, 744, 774, 775, 776, 793, 794, 795, 811, 812, 813, 880, 881, 882, 1593, 1615, 1616, 1621, 1657, 4157, TMAS.0141, 0141-1, 0141-2; **Site 63**: NMNSC767; **Site 64**: NMNSC4555; **Site 65**: NMNSC708, 709, 738, 739, 753, 773, 792, 810, 879, 1591, 1687; **Site 66**: NMNSC119; **Site 68**: NMNSC578, 674, 706, 754, 768, 769, 771, 772, 780, 781, 796, 797, 3810, 4376, 4554; **Site 69**: NMNSC548, 564, 565, 701, 702, 736, 737, 751, 752, 779, 791, 809, 877, 1688, 1750, 1757; **Site 72**: NMNSC30, 88, 238, 395, 750, 766, 783, 784, 790, 1556, 1653, 1678, 2542, 2978, 2980, 2982, 3017, 3021, 3041, 3048, 3080, 4136, 4366, 4682; **Site 74**: NMNSC546, 558, 559, 568, 569, 572, 573, 575, 583, 4557, TMAS.0250; **Site 75**: ASIZAM37, NMNSC3808, 4149, 4171, 4172, 4612, 4723; **Site 77**: NMNSC710, 777; **Site 78**: NMNSC1259, 1260; **Site 79**: NMNSC1661; **Site 83**: NMNSC1701, 1936; **Site 84**: NMNSC1769; **Site 85**: NMNSC566; **Site 86**: NMNSC1251, 1252, 1253, TMAS.0119; **Site 88**: ASIZAM36, NMNSC2374, 4159; **Site 90**: NMNSC4379, TMAS.0193; **Site 91**: NMNSC332, 444, 1015, 1658, 1971, 2569, 2579, 4150; **Site 92**: NMNSC2549; **Site 93**: NMNSC1002, 2796, 4530, 4677; **Site 96**: NMNSC876, 1236, 1237, 2586; **Site 97**: NMNSC547, 567, 1001, 1738, 2543, NTUA21a01.1, 21a01.2; **Site 98**: NMNSC729, 1241, 1243, 1246; **Site 99**: NMNSC4361; **Site 100**: NMNSC381, 553, 561, 563, 574, 680, 683, 1597, 1611, 1613, 1626, 1629, 1638, 1659; **Site 101**: NMNSC4143; **Site 104**: NMNSC4365; **Site 106**: NMNSC807; **Site 107**: NMNSC71, 72, 806, 1343, 1344, 1462; **Site 108**: NMNSC44, 48, 370, 371, 373, 375, 580, 1346; **Site 111**: NMNSC70, 716, 717, 719, 720, 808, 1679, 4370, 4371, 4437; **Site 112**: NMNSC2588, 4096; **Site 113**: NMNSC4363; **Site 114**: NMNSC536; **Site 116**: NMNSC83; **Site 117**: NMNSC4566; **Site 118**: NMNSC538, 539, 544, 54, 552, 582, 722, 2590, 4377, 4568; **Site 120**: NMNSC4181, 4934, 4937; **Site 126**: NMNSC14; **Site 127**: NMNSC934; **Site 128**: NMNSC579, 4374; **Site 129**: NMNSC1264, 4378; **Site 132**: NMNSC576, 1618; **Site 133**: NMNSC1365, 2595, 2603; **Site 134**: NMNSC4375; **Site 135**: NMNSC541, 938, 2606; **Site 136**: NMNSC2607, 2608; **Site 138**: NMNSC4364, 4572, TMAS.0255, 0255-1; **Site 144**: NMNSC545, 724, 725, 727, 755, 756, 757, 758, 759, 760, 762, 763, 764, 765, 1728; **Site 147**: NMNSC1650, 2002, 4368; **Site 149**: NMNSC1720, 1721, 1730, 1731, 1732; **Site 152**: NMNSC147; **Site 182**: NMNSC922, 923; **Site 185**: NMNSC933, 1266, 1267; **Site 196**: NMNSC906, 1268, 1279; **Site 200**: NMNSC896; **Site 206**: NMNSC171; **Site 210**: NMNSC4100, 4369; **Site 211**: NMNSC883, 1280, 1684, 1685, 2664, 4101; **Site 212**: NMNSC1499, 2663, 4097; **Site 213**: NMNSC112, 120, 711, 778, 1498, 1506, 1908, 2802, 4373, 4392; **Site 214**: NMNSC1102, 1582, 1639; **Site 216**: NMNSC4693; **Site 217**: NMNSC3807; **Site 218**: NMNSC142, 1295; **Site 219**: NMNSC817, 818, 819, 821; **Site 220**: NMNSC4372; **Site 224**: NMNSC815, 816, 823, 824, 833, 1079, 4470; **Site 225**: NMNSC832, 837; **Site 226**: NMNSC146, 570, 838, 839, 1223, 1296, 4362; **Site 229**: NMNSC836; **Site 230**: NMNSC557; **Site 231**: NMNSC4466.

Buergeria japonica – Totally 251 specimen records from BRCAS (2), NMNS (188), NTUM (31), and NTM (30).

Site 14: NTUA09a04; **Site 16**: NMNSC1060, NTUA09a14; **Site 17**: NTUA09a19; **Site 19**: NMNSC251, 260, 1645, NTUA09a27, 09a31; **Site 20**: TMAS.0210; **Site 21**: NMNSC521, 3864; **Site 33**: NTUA09a12; **Site 34**: NTUA09a32; **Site 35**: TMAS.0125; **Site 39**: TMAS.0184; **Site 44**: NMNSC3849; **Site 47**: NMNSC4960; **Site 53**: NMNSC526; **Site 57**: NMNSC4903; **Site 58**: NMNSC1198, 4679; **Site 60**: NMNSC2454, 2652, 2665, 4486, 4907; **Site 63**: NMNSC2740;

Site 64: NMNSC4523; **Site 68**: NMNSC534, 4519; **Site 69**: NMNSC1733, 1748, 1753, 1775, NTUA09a11, 09a22; **Site 72**: ASIZAM02, NMNSC27, 42, 84, 87, 2669, 2721, 2907, 2976, 2989, 3018, 3047, 3052, 3071, 3074, 3077, 3078; **Site 75**: NMNSC4608, 4721; **Site 83**: NMNSC97, 98, 3811, NTUA09a17; **Site 84**: NMNSC1770, NTUA09a03; Site 86: NMNSC671, 1250, 4879; **Site 88**: NMNSC2372; **Site 91**: NMNSC4663; **Site 93**: NMNSC4527; **Site 95**: NMNSC524; **Site 96**: NMNSC1853, 2623; **Site 100**: NMNSC04, 05, 518; **Site 101**: NMNSC4756; **Site 111**: NMNSC721, 4439, 4489; **Site 114**: NMNSC527; **Site 116**: NMNSC1453; **Site 117**: NMNSC1444, 1477; **Site 118**: NMNSC519, 520, 1430, 1710, 2036, 2038, 3323, 3877, NTUA09a18, TMAS.0172; **Site 120**: NMNSC3881; **Site 128**: NMNSC522; **Site 129**: NMNSC517, TMAS.0283; **Site 131**: NMNSC09, 515, 516, 523; **Site 132**: NMNSC514; **Site 135**: NMNSC2438; **Site 136**: NMNSC533, NTUA09a28. 09a29; **Site 140**: TMAS.0248; **Site 143**: NMNSC525; **Site 144**: NMNSC67, 726, 1851, 4888; **Site 148**: NMNSC1715; **Site 149**: NMNSC1725; **Site 154**: NMNSC4253, 4562; **Site 155**: NTUA09a13; **Site 156**: NMNSC74; **Site 158**: NMNSC65; **Site 160**: NMNSC60, 992, 1961, 4443; **Site 161**: TMAS.0343, 0344, 0345, 0346; **Site 162**: NMNSC207, 383, 656, 1328, TMAS.0111; **Site 163**: NMNSC991, 1337, NTUA09a16; **Site 164**: NMNSC391, 697, 951, 969, 1034, 1779, 1780, 5189, NTUA09a15, 09a20, 09a21; **Site 166**: NMNSC55, 4444; **Site 169**: NMNSC4738; **Site 173**: NMNSC529, 532, 1147; **Site 174**: NMNSC66, 320, 2668, 2676, 2741, TMAS.0046, 0281, 0354, 0355, 0356, 0370, 0371, 0378, 0379, 0392, 0393, 0394; **Site 176**: NTUA09a08, TMAS.0387,0388; **Site 178**: NMNSC1144; **Site 180**: NMNSC282, 1133, 2794, TMAS.0372, 0381, 0382; **Site 181**: NMNSC3786, 4621, 4997; **Site 182**: NMNSC917, 926, 1984; **Site 183**: NTUA09a06; **Site 187**: NTUA09a07; **Site 188**: NMNSC907, 910, 1129, 1132, 3783, 4570; **Site 190**: NMNSC855, 4969, NTUA09a05, 09a33; **Site 191**: NMNSC290, 311, 318, 1123, 2767; **Site 192**: ASIZAM01, NMNSC295, 1979, 1981, 4247, NTUA09a23; **Site 194**: NMNSC2765; **Site 196**: NMNSC904, 1109, 1110, 1119, 1272, 1278, 2755; **Site 197**: NMNSC307; **Site 200**: NMNSC897, 2666; **Site 201**: NMNSC4509; **Site 202**: NMNSC1106; **Site 203**: NMNSC228, NTUA09a10; **Site 204**: NMNSC889, 1905, 2776; **Site 206**: NMNSC214, 216; **Site 207**: NMNSC221, 226, NTUA09a02; **Site 208**: NTUA09a09, 09a25; **Site 210**: NMNSC117; **Site 216**: NMNSC1096, 1097, 4513, 4694; **Site 217**: NMNSC1089, 1900, 4511; **Site 221**: NMNSC4240; **Site 222**: NTUA09a26; **Site 223**: NMNSC4811; **Site 224**: NMNSC528, 1897; **Site 225**: NMNSC828, 1222, TMAS.0213, 0213-1; **Site 227**: NTUA09a24; **Site 232**: NMNSC4971.

Buergeria robusta – Totally 213 specimen records from BRCAS (1), NMNS (168), NTUM (26), and NTM (18).

Site 2: NMNSC5013; **Site 3**: NMNSC2639; **Site 4**: NMNSC1300; **Site 12**: NMNSC190; **Site 14**: NMNSC1012, 1013, 1043, NTUA05a08, 05a13, 05a28; **Site 16**: NMNSC595, NTUA05a11, 05a21, 05a23; **Site 17**: NMNSC1065, 1234; **Site 19**: NMNSC252, 592, 599, 600, 603, 605, NTUA05a10, 05a27, TMAS.0216; **Site 20**: TMAS.0209; **Site 21**: NMNSC597, 598; **Site 26**: NMNSC4619; **Site 30**: NMNSC602; **Site 33**: NTUA05a04, 05a05.1, 05a05.2, 05a07, 05a18, TMAS.0136; **Site 34**: NMNSC4476, 4707; **Site 35**: NTUA05a03, 05a15, 05a22, TMAS.0134; **Site 37**: NMNSC150, 154; **Site 43**: NTUA05a01, TMAS.0269, 0270, 0271, 0272; **Site 44**: NMNSC735, 761, 3850; **Site 45**: NMNSC1174, 1175; **Site 46**: NMNSC1176; **Site 47**: NMNSC1200, 4759, 4963; **Site 55**: NMNSC1191; **Site 58**: NMNSC788, 1195, 1196, 4681; **Site 60**: NMNSC2653, 4146, 4908, 4910; **Site 63**: NMNSC2734, 4729; **Site 69**: NMNSC593, 596, 704, 1682, 1689, 1751, NTUA05a12; **Site 72**: NMNSC28, 29, 43, 589, 746, 749, 2541, 2619, 2724, 2908, 2975, 2983, 2990, 2992, 2994, 3020, 3054, 3069, 3072, 3075, 3079, 4137; **Site 74**: NMNSC587, 588; **Site 75**: NMNSC4611, 4724; **Site 78**: NMNSC1858; **Site 83**: NMNSC93, 1630, 1702, 1937; **Site 84**: NMNSC1771; **Site 86**: NMNSC1249, 4836, TMAS.0129, 0186; **Site 91**: NMNSC586, 2574; **Site 92**: NMNSC2552; **Site 93**: NMNSC2781, 4676; **Site 96**: NMNSC1854, 2587, 2785; **Site 101**: NMNSC4140, 4753; **Site 117**: NMNSC1442; **Site 118**: NMNSC590, 591, 1711, 3046, 4746, NTUA05a14; **Site 120**: NMNSC4740; **Site 128**: NMNSC584; **Site 129**: NMNSC937; **Site 131**: ASIZAM04, NMNSC585; **Site 135**: NMNSC604, 940, 2439; **Site 138**: NMNSC4606, 4629; **Site 140**: NMNSC4633;

Site 143: NMNSC601; **Site 144**: NMNSC4988; **Site 145**: NTUA05a17; **Site 148**: NMNSC1716; **Site 149**: NMNSC1210, NTUA05a16; **Site 154**: NMNSC4563; **Site 158**: NMNSC59; **Site 161**: TMAS.0341, 0342; **Site 163**: NMNSC803, 990, 1340, 1502, 2696; **Site 166**: NMNSC51, 58, 4915, 4918, 4973; **Site 169**: NMNSC4737, 4976; **Site 173**: NMNSC1148; **Site 174**: NMNSC69, 323, 2680, TMAS.0397, 0398, 0399; **Site 180**: TMAS.0383; **Site 181**: NMNSC3785, 4623; **Site 188**: NMNSC911, 1127, 3782; **Site 191**: NMNSC1122, 2770; **Site 196**: NMNSC1116, 1118, 1627, 2756; **Site 199**: NTUA05a06; **Site 202**: NMNSC1105; **Site 204**: NMNSC1902, 1903, 2777; **Site 207**: NTUA05a09, 05sj03; **Site 215**: NMNSC4732; **Site 217**: NMNSC1085, 1086, 1899; **Site 223**: NMNSC4803, 4806; **Site 224**: NMNSC1077, 1078, 1081, 1082; **Site 225**: NMNSC138, 1076, 1221, NTUA05a26, TMAS.0245; **Site 230**: NMNSC594; **Site 231**: NMNSC4875, NTUA05a20; **Site 232**: NMNSC4209, 4696, 4970, 5011, TMAS.0253; **Site 234**: NMNSC5000.

Kurixalus eiffingeri – Totally 79 specimen records from BRCAS (2), NMNS (61), NTUM (14), and NTM (2).

Site 3: NMNSC2641; **Site 14**: NMNSC172, 175, 1038, 1047, 1792; **Site 17**: NMNSC1323, 1360, 1416, 1418, 4827; **Site 19**: NMNSC258, 606, 1656; **Site 20**: TMAS.0207; **Site 42**: NMNSC4067; **Site 91**: NMNSC1027, 1481, 4213; **Site 93**: ASIZAM09, 10, NMNSC2793; **Site 96**: NMNSC1166; **Site 97**: NMNSC996, 997, 998, 1406, 1407, 1504, 3893, 3895, NTUA10a02, 10a03, 10a04, 10a07, 10a08, 10a11, 10a13; **Site 107**: NMNSC73, 1460; **Site 116**: NMNSC1441, 1604, 2706; **Site 149**: NMNSC1159; **Site 152**: NMNSC4911, 4987; **Site 163**: NMNSC399, 648, 804, 945, 964, 965, 981, 982, 1332, 1501, 1852, NTUA10a05; **Site 164**: NMNSC394, 663, NTUA10a10, 11a02; **Site 165**: NTUA10a01; **Site 166**: NMNSC4972; **Site 173**: NMNSC1982; **Site 174**: NMNSC3858; **Site 177**: NMNSC3859, 4064; **Site 184**: TMAS.0198; **Site 191**: NMNSC299, 1978; **Site 207**: NMNSC222; **Site 224**: NMNSC4471; **Site 229**: NMNSC5319; **Site 230**: NMNSC4461; **Site 231**: NMNSC4464, NTUA10a06.1, 10a06.2, 10a09.

Kurixalus idiootocus – Totally 95 specimen records from BRCAS (3), NMNS (77), NTUM (14), and NTM (1).

Site 2: NMNSC5012; **Site 3**: NMNSC5126; **Site 4**: NTUA11a01H, 11a06, 11a08, 11a09, 11a10, 11a12, 11a13; **Site 11**: ASIZAM49; **Site 13**: NMNSC5003; **Site 14**: NMNSC178, 182, 1014, 1039, 1041, 1042, 1046, 1048, NTUA11a05, 11a14, 11a15; **Site 17**: NMNSC4826, NTUA11a07; **Site 19**: NMNSC261, 607, 609, TMAS.0280; **Site 29**: ASIZAM12; **Site 34**: NMNSC4477, 4702; **Site 46**: NMNSC5153; **Site 52**: NMNSC3885, 5156; **Site 60**: NMNSC2654, 4854, 4906, 5123; **Site 63**: NMNSC2737; **Site 64**: NMNSC5154; **Site 72**: ASIZAM11, NMNSC41, 85, 86, 237, 240, 644, 4683; **Site 73**: NMNSC5167; **Site 74**: NMNSC4749, 4899; **Site 75**: NMNSC4722; **Site 78**: NMNSC1859; **Site 80**: NMNSC5151; **Site 88**: NMNSC2371; **Site 91**: NMNSC330, 1028, 1410, 1482, 2428, 4662, 4664, 4709, 4833, 4847, 5150; **Site 93**: NMNSC2794, 4528, 4673; **Site 96**: NTUA11a03; **Site 97**: NMNSC1408, 2029, NTUA11a04; **Site 101**: NMNSC4748, 4945; **Site 105**: NMNSC2470; **Site 106**: NTUA11a11; **Site 111**: NMNSC5128; **Site 116**: NMNSC5121; **Site 117**: NMNSC5122; **Site 118**: NMNSC1428, 1965, 2355; **Site 120**: NMNSC4742, 4938; **Site 123**: NMNSC4928; **Site 131**: NMNSC5127; **Site 215**: NMNSC5149, 5155; **Site 215**: NMNSC5124, 5148, 5152; **Site 223**: NMNSC4808, 4812, 5311; **Site 224**: NMNSC1080; **Site 225**: NMNSC133; **Site 226**: NMNSC149; **Site 229**: NMNSC5318; **Site 230**: NMNSC5125; **Site 231**: NMNSC1515, 4876; **Site 232**: NMNSC5010; **Site 234**: NMNSC4999, 5009.

Polypedates braueri – Totally 105 specimen records from BRCAS (2), NMNS (91), NTUM (11), and NTM (1).

Site 1: NMNSC1399; **Site 4**: NTUA06a08, 06a10, 06a11; **Site 10**: NMNSC611; **Site 13**: NMNSC5005; **Site 14**: NMNSC1161, 1625; **Site 16**: NMNSC610, 1056; **Site 17**: NMNSC1069, 1071, 1230, 1413, 1743, 2648, NTUA06a01; **Site 24**: NMNSC2629, 2789; **Site 27**: NTUA06a04, 06a12; **Site 29**: ASIZAM21; **Site 34**: NMNSC4480, 4706; **Site 52**: NMNSC2523; **Site 60**: NMNSC4855; **Site 63**: NMNSC2735; **Site 72**: ASIZAM20, NMNSC236, 241, 244, 3081; **Site 76**: NMNSC4269; **Site 86**: NMNSC670; **Site 91**: NMNSC612, 1017, 1020, 1032, 1033, 1941, 4714, 5187; **Site 96**: NMNSC608, 2621; **Site 105**: NMNSC2473; **Site 106**: NTUA06a07;

Site 109: NMNSC4263; **Site 111**: NMNSC4273; **Site 114**: NMNSC4502; **Site 116**: NMNSC1218, 2703, 2709; **Site 117**: NMNSC1476; **Site 118**: NMNSC1429, 1439, 1712, 2872, TMAS.0131; **Site 120**: NMNSC4741; **Site 123**: NMNSC2700, 4283; **Site 131**: NMNSC4280; **Site 140**: NMNSC4635; **Site 144**: NMNSC1988, 4259; **Site 148**: NMNSC1213, 1214; **Site 162**: NMNSC699, 1205, 1208, 1327; **Site 163**: NMNSC649, 1503, 1628; **Site 164**: NMNSC345, 388, 662, NTUA06a03, 06a05, 06a06; **Site 165**: NMNSC4980; **Site 166**: NMNSC4124, 4974; **Site 167**: NMNSC4289; **Site 171**: NMNSC1152; **Site 174**: NMNSC322; **Site 180**: NMNSC277, 2688; **Site 181**: NMNSC4994; **Site 190**: NMNSC303, 856; **Site 191**: NMNSC286, 314; **Site 192**: NMNSC4242; **Site 195**: NMNSC4111; **Site 196**: NMNSC1275, 2754, 2763; **Site 197**: NMNSC327; **Site 205**: NMNSC4382; **Site 224**: NMNSC1083; **Site 225**: NMNSC1074, 1075, NTUA06a09; **Site 231**: NMNSC1513.

Polypedates megacephalus – One specimen record from NMNS.

Site 67: NMNSC4276.

Rhacophorus arvalis – Totally 13 specimen records from NMNS (11) and NTUM (2).

Site 101: NMNSC4747; **Site 103**: NMNSC4277, 4946; **Site 105**: NMNSC2469, 2474, 2477, 2479, 3805, NTUA32a01P, 32a02P; **Site 122**: NMNSC4949, 4998; **Site 124**: NMNSC4948.

Rhacophorus aurantiventris – Totally 5 specimen records from NMNS (4) and NTUM (1).

Site 111: NMNSC4831; **Site 174**: NMNSC2683, 2995; **Site 177**: NMNSC4624, NTUA30a01.

Rhacophorus moltrechti – Totally 212 specimen records from BRCAS (2), NMNS (187), NTUM (21), and NTM (2).

Site 19: NMNSC350, 642; **Site 45**: NTUA04a07; **Site 47**: NMNSC4758; **Site 52**: NMNSC4863; **Site 58**: NMNSC1193, 1194, NTUA04a09; **Site 59**: NMNSC1178, 1179, 1660; **Site 62**: NMNSC636, 681; **Site 63**: NMNSC4727; **Site 65**: NMNSC741, 754; **Site 68**: NMNSC115; **Site 69**: NMNSC640, 1683; **Site 72**: NMNSC875, 941; **Site 73**: NMNSC4071; **Site 74**: NMNSC4802; **Site 79**: NMNSC91, 1495, 1496, 1537, 1636, 1649, 1677, 1869, 1917; **Site 83**: NMNSC94, 96, 101, 637, 666, 667, 1690, 2716, 3358, NTUA04a01; **Site 84**: NMNSC1768, TMAS.0196, 0196-1; **Site 86**: NMNSC4834, 4880; **Site 91**: ASIZAM40, 41, NMNSC340, 635, 641, 1018, 1021, 1022, 1031, 1680, 1694, 1973, 2429, 2575, 4668, 4710, 4832, 4845, 5183, 5337, NTUA04a08.1, 04a08.2; **Site 92**: NMNSC2553; **Site 93**: NMNSC1000, 2810, 4529, 4674; **Site 96**: NMNSC633, 1238; **Site 97**: NMNSC128, 999, 1505, 1696, 1734, 2028, 2718, 3896, NTUA04a02, 04a04, 04a05, 04a06, 04a15, 04a16, 04a17, 04a18; **Site 98**: NMNSC1242, 1244, 1245, 1805, 1806; **Site 100**: NMNSC639, 1165, 1633; **Site 106**: NTUA04a21; **Site 107**: NMNSC77, 376, 377, 1461; **Site 108**: NMNSC45, 49, 374, 380, 634, NTUA04a20; **Site 110**: NMNSC4850; **Site 111**: NMNSC4851; **Site 116**: NMNSC1443; **Site 117**: NMNSC4605; **Site 118**: NMNSC1427, 1433, 1963, 1997, 2589, 2833, 3327; **Site 120**: NMNSC1989, 4739, 5313; **Site 126**: NMNSC13; **Site 129**: NMNSC638; **Site 133**: NMNSC2596, 2597, 2599; **Site 134**: NTUA04a19; **Site 136**: NMNSC2611, NTUA04a12; **Site 140**: NMNSC4634; **Site 144**: NMNSC126, 1727; **Site 149**: NMNSC1158; **Site 152**: NMNSC4885, 4913; **Site 163**: NMNSC653, 654, 684, 802, 943, 944, 979, 980, 989, 1500, 1542, 1695; **Site 164**: NMNSC339, 367, 801, 958, 961, 973, 5188; **Site 166**: NMNSC4923; **Site 171**: NMNSC82; **Site 174**: NMNSC2682; **Site 177**: NMNSC4625, 4884; **Site 178**: NMNSC1143; **Site 180**: NMNSC276, 2689; **Site 183**: NTUA04a11; **Site 184**: NMNSC927, 928, 929, 931, NTUA04a13; **Site 188**: NMNSC4883; **Site 190**: NMNSC4967; **Site 191**: NMNSC287, 313; **Site 192**: NMNSC289, 291, 1980; **Site 194**: NMNSC304; **Site 196**: NMNSC899, 901, 902, 1115, 1271, 1277, 1302, 1624; **Site 200**: NMNSC4895; **Site 203**: NTUA04a10; **Site 204**: NMNSC890, 891; **Site 207**: NMNSC220, 225, 2806; **Site 209**: NMNSC4731; **Site 210**: NMNSC113, 885; **Site 214**: NMNSC1098, 1099, 1100, 1101, 1104; **Site 218**: NMNSC141; **Site 223**: NMNSC4807, 5309; **Site 224**: NTUA04a03; **Site 225**: NMNSC139, 140, 827, 831; **Site 226**: NMNSC1073.

Rhacophorus prasinatus – Totally 22 specimen records from NMNS (13), NTUM (8), and NTM (1).

Site 17: NMNSC1228, 1359, 1455, 1456, 1457, 1458, 1459, 1643, 1674, 2649, 4821, 4828, NTUA08a01, 08a04, 08a05, 08a06, 08a07;

Site 20: TMAS.0160; **Site 231**: NMNSC4830, NTUA08a02.1, 08a02.2, 08a03.

Rhacophorus taipeianus – Totally 68 specimen records from BRCAS (2), NMNS (33), NTUM (30), and NTM (3).

Site 1: NMNSC267, 1533; **Site 4**: NTUA07a14, 07a15; **Site 12**: ASIZAM42, 43; **Site 13**: NTUA07a22; **Site 14**: NMNSC168, 174, 176, 181, 1666, NTUA07a20, 07a25; **Site 15**: NTUA07a01H, 07a02P, 07a03P, 07a04P, 07a05P, 07a06P, 07a07P, 07a08P, 07a09P, 07a10, 07a21; **Site 17**: NMNSC1064, 1358, 1361, 1742, 4822; **Site 19**: NMNSC250, 346, 354, 626, 631, 632, 643, 1370, 2815, NTUA07a18; **Site 27**: NTUA07a11, 07a12, 07a13, 07a23, 07a24, 07a26, 07a29, 07a31, TMAS.0146 ; **Site 28**: NMNSC198, 4601; **Site 34**: NTUA07a17; **Site 42**: NMNSC4066; **Site 58**: NTUA07a16; **Site 91**: NMNSC359, 360, 627, 628, 2571, 2582, NTUA07a19, 07a28; **Site 226**: TMAS.0290; **Site 230**: NMNSC629, 630; **Site 231**: NMNSC4874, NTUA07a30, TMAS.0279.

由標本採集資訊建立臺灣無尾兩棲類的分布現況

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本研究經由分析整理臺灣四個標本典藏機構在1969到2011年間3,795筆標本記錄，建立棲息於臺灣及周邊島嶼的33種無尾兩棲類的分布模式，其中包括3個引入種；並陳述這些無尾類的相關親緣地理學研究現況。四個標本典藏機構分別爲：中央研究院生物多樣性中心、國立自然科學博物館、國立臺灣博物館以及臺灣大學標本館。

關鍵詞：分布、名錄、無尾類、標本記錄、臺灣。