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Source: Current Herpetology, 38(1) : 99-109

Published By: The Herpetological Society of Japan

URL: https://doi.org/10.5358/hsj.38.99

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*Current Herpetology* 38(1): 99–109, February 2019 doi 10.5358/hsj.38.99
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# Trade in Endangered and Critically Endangered Japanese Herpetofauna Endemic to The Nansei Islands Warrants Increased Protection

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**Abstract: Rare or newly discovered species are attractive targets for poaching as they often command a high value in the international market. Endemic species often have a very restricted range, making them extremely vulnerable to stochastic events and human activities, including poaching. Previous studies have shown that several species endemic to the Nansei Islands in Japan are available in the international pet trade. This paper further investigates the presence of live reptiles and amphibians endemic to the Nansei Islands in international pet trade. Seven Facebook groups and five classified websites were searched for these species, in addition to the CITES database and a spot-check at Chatuchak market in Thailand. Nansei Island endemic reptiles and amphibians are more common in the international pet trade than initially thought. During the study period, advertisements for 23 species endemic to the Nansei Islands were found, comprising a total of 360 specimens. In addition, during a spot-check, 8 individuals of 2 subspecies of Japanese sword-tail newt were found at Chatuchak market in Thailand. Only three of these species are protected by the CITES and nine are regionally or nationally protected. Yet, ten species observed in international markets are classified as Endangered by IUCN and two even as Critically Endangered. The large numbers observed for the Endangered and Critically Endangered *Goniurosaurus* and *Takydromus* species warrants increased protection and a CITES Appendix III listing is recommended for these species.**

Key words: CITES; *Goniurosaurus*; Japan; Nansei Islands; *Takydromus*; Wildlife trade

## Introduction

The global trade in reptiles and amphibians is booming. Reptiles are possibly the most intensively harvested terrestrial fauna, sourced in great volumes, both legally and illegally, for many different purposes, including for the pet trade (Nijman et al., 2012). Amphibians too are increasingly threatened by international pet trade (Nijman and Shepherd, 2010; Rowley et al., 2010; Rowley et al., 2016). Species that are difficult to breed

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in captivity or for which no export is allowed appear to command a high commercial value, making them an attractive target for poachers and smugglers. In particular, rare, newly identified, and/or endemic species appear to be in high demand (Shepherd and Ibarrondo, 2005; Stuart et al., 2006), with endemic species being especially vulnerable to overexploitation due to their very restricted range (Kiester et al., 2013; Kuchling, 2007) often limited to only their type location (Meiri et al., 2018). Endemic species are more vulnerable to stochastic events and human activities compared to wide-ranging species (Meiri et al., 2018). Overexploitation in itself can exterminate species locally (e.g. Stuart et al., 2006) but can also be an additional pressure driving species towards extinction (Meiri et al., 2018).

Japan is home to many different reptile and amphibian species with a high percentage of them being endemic. At the time of writing, 99 species of reptiles are known to occur in Japan (Uetz et al., 2017), of which 59 are endemic (Yoshikawa and Hikida, 2015). For amphibians, 45 species of frogs and toads and 33 species of salamanders and newts are known to occur in Japan (Amphibiaweb, 2017), with at least 62 being endemic (Yoshikawa and Matsui, 2015). This high rate of endemism makes Japanese reptiles and amphibians popular targets for wildlife traffickers (e.g. Kanari and Xu, 2012; Kyodo, 2016). Japan's Nansei Islands are especially known for their high percentage of endemic species (WWF Japan, 2010), with more than 67 endemic reptile and amphibian species (Wakao, 2018), drawing poachers and traffickers (e.g. Kyodo, 2016) also because of its proximity and good connections to China and Hong Kong (Kanari and Xu, 2012). Previous research (Kanari and Xu, 2012) has highlighted the illegal harvest and trafficking of some endemic reptile species from the Nansei Islands and their availability in the pet trade in mainland China and Hong Kong. The Nansei Islands consist of a string of islands from the Ōsumi Islands to the north and the Yaeyama Islands to the south, and include the Tokara Islands, Amami Islands, Okinawa Islands, Miyako Islands, Daito Islands and Senkaku Islands. Previous studies showed that a higher percentage of taxa on the Nansei Islands is considered threatened compared to the rest of Japan, where habitat loss is considered the main threat (Ota, 2000).

In 2018, a briefing paper on the trade in live reptiles and amphibians was published, in Japanese, to bring attention to this issue, and to highlight the need to better utilize the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to control the international trade in key Nansei Islands species, and to highlight other regulatory gaps at a national level (Wakao, 2018). This paper further investigates the presence of live reptiles and amphibians endemic to the Nansei Islands in international pet trade and to build upon current knowledge on the availability of the Nansei Islands endemic reptiles and amphibians by examining two major consumer regions for reptiles and amphibians as pets in order to guide conservation efforts and ultimately reduce the illegal trade in Japan's endemic species.

## Materials and Methods

This paper examines the availability of reptiles and amphibians endemic to the Nansei Islands in the international live animal trade in Europe and the United States of America (USA), two of the largest consumer regions of live reptiles and amphibians (Robinson et al., 2015). The use of social media (e.g. Facebook) as a platform for trading wildlife is increasing fast (Krishnasamy and Stoner, 2016; Sy, 2018). Facebook groups and conventional classified websites selling rare reptiles and amphibians for Europe and the United States were monitored and selected based on previous experience of the authors. During this study, seven Facebook groups for rare and uncommon reptiles and amphibians, and five classified websites were monitored between 1 October and 18 Novem-

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ber 2017, although advertisements dated earlier than this time period were also reviewed. Every Facebook group or reptile classified website was monitored twice a week for new advertisements. All Facebook groups monitored used closed settings, meaning that the advertisements are only visible to members of this group. In contrast to the conventional classified websites, for which advertisements are visible to everyone. The location as mentioned in the advertisement, or the country of origin of the seller was used to determine if the specimens were available in Europe or the United States.

In addition to the online surveys, an opportunistic spot-check was carried out on November 25, 2017, in the Chatuchak Market in Bangkok, Thailand. Chatuchak Market was surveyed as part of a TRAFFIC study (unpublished). Nansei endemic amphibians were observed during this survey, therefore, the authors included this data to emphasize that trade in these species is not limited to the two main markets (EU and USA) as discussed here. Chatuchak market is notorious as a hub of illegal trade in reptiles and amphibians from around the world, including very rare and/or high monetary value species (Nijman and Shepherd, 2014; Shepherd and Nijman, 2008). All species native to the Nansei Islands observed in the Chatuchak market are recorded here.

Prices from the online and market surveys were obtained where possible and converted to USD for comparison using 1 EUR=1.19 USD (December, 2017). Further information, such as the conservation and legal protection status are also analysed here. Finally, recommendations to aid in reducing the illegal international trade in the reptiles and amphibians of the Nansei Islands are made.

*Japanese law and policy regulating reptile trade*

In Japan, the trade in endemic reptiles is regulated by several laws and consist both of national legislation and local legislation on a prefecture level. The primary legislation is the Law for the Conservation of Endangered Species of Wild Fauna and Flora (LCES) (Act. No. 75 of 5 June 1992). LCES regulates the collection and trade of species designated a "nationally endangered" as well as species classified as "internationally endangered" (listed on CITES Appendix I). The LCES prohibits the hunting, killing, collecting, wounding or damaging of nationally endangered species and the sale, giving, lending, buying or selling of these species. Currently, seven reptile and 11 amphibian species are categorized as nationally endangered, which is defined as threatened in the wild because their habitat is affected by human activity. The Sengoku's Gecko *Goniurosaurus kuroiwae sengokui* is temporarily designated as endangered species, due to its recent description (Honda and Ota, 2017). The LCES is also applicable to species designated as "internationally endangered species", which under LCES are species listed in CITES Appendix I or are covered by bilateral conventions and agreements for the protection of migratory birds. LCES does not apply to species listed on CITES Appendix II and III (Kanari and Xu, 2012).

The Law for the Protection of Cultural Properties (Act No. 214 of 30 May 1950), which was established for the preservation and promotion of "cultural properties" or cultural heritage in Japan provides another way of protecting wildlife in Japan. As a category of cultural property, this law designates certain species of wildlife that have high value to the nation, historically and/or scientifically, as "Natural Monuments" and mandates their protection. This law prohibits anyone to "change the existing state" of "Natural Monuments", including capture, transfer or trade without the permission of the Commissioner for Cultural Affairs (Article 125) (Kanari and Xu, 2012). Local authorities can protect native wildlife in several ways, via 1) local nature protection ordinances and/or 2) designate species as local "Natural Monuments" at a prefecture level, known as Protected as Prefectural Natural Monuments. The Prefec-

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ture of Kagoshima, covering the northern portion of the Nansei Islands uses both ways to protect native wildlife, but only has one reptile and four amphibian species listed as Prefectural Natural Monument. The Okinawa Prefecture, covering the southern portion of the Nansei Islands, has six reptile species and four amphibian species listed as Prefectural Natural Monuments, but no protection ordinance in place (Kay Wakao, in litt. 4-12-2017).

*CITES*

Japan has been a signatory to the CITES since 1980, which regulates and controls international trade in species listed in its appendices. CITES is implemented in Japan through the Foreign Exchange and Foreign Trade Control Law (Kanari and Xu, 2012) and LCES. The Foreign Exchange and Foreign Trade Control Law (Act No. 228 of 1 December 1949) and the Customs Law (Act No. 61 of April 1954) contain provisions for regulating and executing the import and export procedures at Japan's official ports of entry and exit (Kanari and Xu, 2012).

## Results

*Classified websites*

During the study period, advertisements for 23 species endemic to the Nansei Islands were found, comprising a total of 360 specimens (Table 1) in 143 advertisements, on four classified websites and six Facebook groups. Advertisements dating back to 2001 were detected, but except for one advertisement in 2001, the remaining advertisements (142) were posted online between 2013 and 2017. Within the monitoring period itself, fresh online posts for 56 specimens of nine species, including one species for which no quantity was given, were detected. The oldest advertisement found was for three specimens of Spotted Cave Gecko *Goniurosaurus orientalis*, dating back to 2001.

The most frequently encountered Nansei Island endemic found was the Yamashina's Cave Gecko *Goniurosaurus yamashinae* with 67 specimens (18.6% of all specimens), of which the majority was advertised in 2017 (n=54, 80.6%). The *Goniurosaurus* genus in itself was the most popular genus with 181 out of 360 specimens (50.3%) offered for sale belonging to this genus, even though all *Goniurosaurus* species are protected in Japan. This was followed by the *Takydromus* genus with 87 out of 360 specimens (24%). All advertisements of *Goniurosaurus* and *Takydromus* were advertised as bred in captivity. None of the advertisements of any of the Nansei Island endemic reptiles stated that the animals were caught in the wild. Several advertisements (n=2) were found of people asking for Japanese *Plestiodon* spp. but no actual advertisements of Nansei Islands endemic *Plestiodon* spp. were observed.

Price differences were observed between both markets for the species for which prices were mentioned (Table 2). The most expensive animal in the European market was the Ryukyu Black-breasted Leaf Turtle *Geoemyda japonica* for 900 EUR (1071 USD), followed by the Toyamai's Cave Gecko *Goniurosaurus toyamai* at 600 EUR (714 USD). Within the United States, the most expensive was the Yonaguni Keeled Rat Snake *Elaphe carinata yonaguniensis* for 2500 USD, followed by Ryukyu Yellow Pond Turtle *Mauremys mauremys kami* with 1000 USD. Price differences between markets were very visible with the Spotted Cave Gecko priced at 60 EUR (71 USD) in the European market, but at 450 USD in the United States. Similar observations for the Ryukyu Yellow Pond Turtle at 35 EUR in Europe and 1000 USD in the United States. For all species for which both markets displayed prices, American prices were between 6% and 650% higher compared with the European prices.

*Origin of advertisements*

Europe appears to be the more important market for endemic species of the Nansei Islands in numbers with 298 out of the 360

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TABLE 1. List of Nansei Island endemic reptiles as observed on classified websites, including number of animals offered for sale, their corresponding English name where available, protection status (LCES: Law for the Conservation of Endangered Species of Wild Fauna and Flora; NNM: Protected as National Natural Monument; and PNM: Protected as Prefectural Natural Monument) and the year of the advertisement.

| Scientific name | English Name | IUCN | CITES | Protected | 2001 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bufonidae** | | | | | | | | | | |
| *Bufo gargarizans miyakonis* | Miyako Toad | LC | — | — | — | — | — | — | 6 | 7 |
| **Rhacophoridae** | | | | | | | | | | |
| *Rhacophorus viridis* | — | LC | — | — | — | — | — | — | — | — |
| **Salamandridae** | | | | | | | | | | |
| *Cynops ensicauda* | Sword-tailed Newt | EN | — | — | — | — | — | — | — | 1 |
| *Cynops ensicauda popei* | Sword-tailed Newt | EN | | | | | | | | 4 |
| *Echinotriton andersoni* | Anderson's Crocodile Newt | EN | — | LCES | — | — | 2 | — | — | 4 |
| **Geoemydidae** | | | | | | | | | | |
| *Cuora flavomarginata evelynae* | Ryukyu Yellow-margined Box Turtle | EN | II | LCES/NNM | — | — | — | — | — | 1 |
| *Geoemyda japonica* | Ryukyu Black-breasted Leaf Turtle | EN | II | NNM | — | — | — | 1 | 2 | 7 |
| *Mauremys mutica kami* | Ryukyu Yellow Pond Turtle | EN | II | | | | | | | 13 |
| **Colubridae** | | | | | | | | | | |
| *Dinodon semicarinatum* | Loo-choo Odd-tooth Snake | LC | — | — | — | — | — | — | — | — |
| *Elaphe carinata yonaguniensis* | Yonaguni Keeled Rat Snake | — | — | — | — | — | — | — | — | 5 |
| **Eublepharidae** | | | | | | | | | | |
| *Goniurosaurus kuroiwae* | Kuroiwa's Cave Gecko | VU | — | LCES/PNM | — | — | 2 | — | 8 | 18 |
| *Goniurosaurus orientalis* | Japanese Cave Gecko | EN | — | LCES/PNM | 3 | — | 2 | 2 | 2 | 24 |
| *Goniurosaurus splendens* | Spotted Cave Gecko | EN | — | LCES/PNM | — | — | 16 | 4 | 2 | 11 |
| *Goniurosaurus toyamai* | Toyama's Cave Gecko | CR | — | LCES/PNM | — | — | — | 10 | — | 10 |
| *Goniurosaurus yamashinae* | Yamashina's Cave Gecko | CR | — | LCES/PNM | — | — | 4 | 7 | 2 | 54 |
| **Gekkonidae** | | | | | | | | | | |
| *Gekko shibatai* | — | — | — | — | — | 4 | — | — | — | — |
| **Lacertidae** | | | | | | | | | | |
| *Takydromus dorsalis* | Sakishima Grass Lizard | EN | — | — | — | — | 5 | — | — | 12 |
| *Takydromus smaragdinus* | Green Grass Lizard | NT | — | — | — | — | 4 | — | 5 | 47 |
| *Takydromus toyamai* | Miyako Grass Lizard | EN | — | LCES | — | — | — | 4 | 3 | 7 |
| **Viperidae** | | | | | | | | | | |
| *Ovophis okinavensis* | Ryukyu Island Pit Viper | — | — | — | — | 7 | 2 | 5 | 5 | 5 |
| *Protobothrops elegans* | Elegant Pit Viper | — | — | — | — | — | — | — | 2 | 2 |
| *Protobothrops flavoviridis* | Habu | — | — | — | — | — | — | 1 | — | — |
| *Protobothrops tokarensis* | Tokara Habu | — | — | — | — | — | — | 2 | — | 4 |

recorded specimens observed for sale in these countries. Only 62 out of 360 specimens were sold in the United States. However, those 62 specimens comprised 13 species, whereas in Europe only 19 species were offered for sale. Yet, quantities per species in Europe seemed to be higher. Germany was the most commonly named location of the seller with 137 specimens of 10 species, followed by the Czech Republic with 46 specimens of seven species and 40 specimens from unknown countries (Table 3). In this study, species of

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Table 2. Observed Nansei Islands endemic reptiles and amphibians with corresponding prices as advertised for Europe (EUR) and United States (USD), using a 1 EUR=1.19 USD exchange rate (December 2017). Min stands for minimum price, max for maximum price, and max USD for the maximum price in Euro converted to USD.

| Scientific name | EUR | | | USD | |
|---|---|---|---|---|---|
| | min | max | (max USD) | min | max |
| **Bufonidae** | | | | | |
| *Bufo gargarizans miyakonis* | 25 | 150 | 179 | 250 | 250 |
| **Salamandridae** | | | | | |
| *Echinotriton andersoni* | | | | 200 | 200 |
| **Geoemydidae** | | | | | |
| *Geoemyda japonica* | 900 | 900 | 1071 | | |
| *Mauremys mutica kami* | 35 | 35 | 42 | 149 | 1000 |
| **Colubridae** | | | | | |
| *Elaphe carinata yonaguniensis* | | | | 2500 | 2500 |
| **Eublepharidae** | | | | | |
| *Goniurosaurus kuroiwae* | | | | 150 | 400 |
| *Goniurosaurus orientalis* | 70 | 350 | 417 | 200 | 550 |
| *Goniurosaurus splendens* | 60 | 60 | 71 | 200 | 450 |
| *Goniurosaurus toyamai* | 600 | 600 | 714 | | |
| *Goniurosaurus yamashinae* | 100 | 220 | 262 | 150 | 700 |
| **Gekkonidae** | | | | | |
| *Gekko shibatai* | | | | 125 | 350 |
| **Lacertidae** | | | | | |
| *Takydromus dorsalis* | 45 | 350 | 417 | 400 | 875 |
| *Takydromus smaragdinus* | 30 | 250 | 298 | 265 | 265 |
| *Takydromus toyamai* | | | | 225 | 225 |
| **Viperidae** | | | | | |
| *Ovophis okinavensis* | 50 | 300 | 357 | | |
| *Protobothrops elegans* | 350 | 350 | 417 | | |

the *Takydromus* and *Goniurosaurus* genera were most common with 72 and 155 specimens respectively for Europe and 15 and 26 specimens respectively for the United States. In Europe, the Yamashina's Cave Gecko was the most commonly traded species with 58 specimens, closely followed by the Green Grass Lizard *Takydromus smaragdinus* with 54 specimens. In the United States, the Yamashina's Cave Gecko was also the most commonly traded with nine specimens, but equal with a different *Takydromus* sp, namely *T. dorsalis* (nine specimens).

*Chatuchak Market, Thailand*

On 26 November 2017, four specimens of both subspecies of Sword-tailed Newt, *Cynops ensicauda ensicauda* and *C. e. popei*, were observed for sale in a pet store in the Chatuchak market in Bangkok, Thailand. The salesperson confirmed that they were from Japan, and stated they were very rare. *C. e. ensicauda* were priced at ฿ 15 000 per pair (approximately 458 USD), while *C. e. popei* were priced at ฿ 2500 each (approximately 76 USD).

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TABLE 3. Total number of animals from Nansei Islands endemic reptile and amphibian species and the country in which the advertisement was observed. Countrycodes are the following; AT: Austria; BE: Belgium; CZ: Czech Republic; DK: Denmark; FR: France; DE: Germany; IT: Italy; NL: Netherlands; PL: Poland; SK: Slovakia; ES: Spain; CH: Switzerland; UK: United Kingdom; US: United States of America.

| Scientific name | European Union | | | | | | | | | | | | | | United States of America |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AT | BE | CZ | DK | FR | DE | IT | NL | PL | SK | ES | CH | UK | Unknown[a] | US |
| **Bufonidae** | | | | | | | | | | | | | | | |
| *Bufo gargarizans miyakonis* | | | | | 7 | | | | | | | | 4 | | 2 |
| **Rhacophoridae** | | | | | | | | | | | | | | | |
| *Rhacophorus viridis* | | | | | | | | | | | | | | | |
| **Salamandridae** | | | | | | | | | | | | | | | |
| *Cynops ensicauda* | | | | | | | | | | | | | | | 1 |
| *Cynops ensicauda popei* | | | 4 | | | | | | | | | | | | |
| *Echinotriton andersoni* | | | | | | 4 | | | | | | | | | 2 |
| **Geoemydidae** | | | | | | | | | | | | | | | |
| *Cuora flavomarginata evelynae* | | | | | | 1 | | | | | | | | | |
| *Geoemyda japonica* | | | | | | | 7 | | | | 2 | | | 1 | |
| *Mauremys mutica kami* | | | | | | | 5 | | | | | | | | 8 |
| **Colubridae** | | | | | | | | | | | | | | | |
| *Dinodon semicarinatum* | | | | | | | | | | | | | | | |
| *Elaphe carinata yonaguniensis* | | | | | | | | 1 | | | | | | | 4 |
| **Eublepharidae** | | | | | | | | | | | | | | | |
| *Goniurosaurus kuroiwae* | | | 2 | 1 | | 17 | | | | | | | | 4 | 4 |
| *Goniurosaurus orientalis* | | | 3 | | | 19 | | | | 2 | | | | 2 | 7 |
| *Goniurosaurus splendens* | | | 5 | | | 2 | | | | | | | 4 | 16 | 6 |
| *Goniurosaurus toyamai* | | | | | | 16 | | | | | | | | 4 | |
| *Goniurosaurus yamashinae* | | | 28 | | | 14 | | | | | | | 3 | 13 | 9 |
| **Gekkonidae** | | | | | | | | | | | | | | | |
| *Gekko shibatai* | | | | | | | | | | | | | | | 4 |
| **Lacertidae** | | | | | | | | | | | | | | | |
| *Takydromus dorsalis* | | | | | | 3 | | | | | | 5 | | | 9 |
| *Takydromus smaragdinus* | 1 | | | | | 49 | | | | | | 4 | | | 2 |
| *Takydromus toyamai* | | | | | 10 | | | | | | | | | | 4 |
| **Viperidae** | | | | | | | | | | | | | | | |
| *Ovophis okinavensis* | | | 2 | | | 12 | | 7 | 3 | | | | | | |
| *Protobothrops elegans* | | | 2 | | | | | | 2 | | | | | | |
| *Protobothrops flavoviridis* | | | | | | | | | 1 | | | | | | |
| *Protobothrops tokarensis* | | 4 | | | | | | | 2 | | | | | | |

Some advertisements from Spain (*Cynops ensicauda, Takydromus dorsalis*, and *Dinodon semicarinatum*), Italy (*Mauremys m. kami*), Russia (*Rhacophorus viridis*), Czech Republic (*Cynops ensicauda popei*), Unknown (*Rhacophorus viridis*) and United States (*Mauremys m. kam*i) were excluded from the above table as no quantities were mentioned in these advertisements.

[a] Advertisements with no known European origin.

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## Discussion

The Nansei Island endemic reptiles and amphibians are more common in the international pet trade than initially thought and a higher number of known Nansei Island endemic species in pet trade compared to previous studies was found. The actual number of animals in trade is likely a lot higher than observed in this study, and additional species might also be found in the global trade, but likely in low numbers.

Of the species observed during this study, only three are listed in the Appendices of CITES, including Ryukyu Yellow-margined Box Turtle, *Cuora flavomarginata evelynae* (one observed), Ryukyu Black-breasted Leaf Turtle (seven observed) and Ryukyu Yellow Pond Turtle (13 observed). While the most commonly observed species, all *Goniurosaurus* spp. and subspp., and one *Takydromus* sp. are protected in Japan, they are not covered by international trade agreements like CITES. Seven species observed during this study are listed as protected at a national level under the LCES.

Of the species observed, ten are categorised as Endangered (EN) and two Critically Endangered (CR) by the IUCN Red List of Threatened Species (Table 1). The Critically Endangered species are the Toyama's Cave Gecko and Yamashina's Cave Gecko. Overexploitation might not be the most severe threat these species are facing (Ota, 2000), it can act as an additional pressure driving species towards extinction (Meiri et al., 2018). The Toyama's Cave Gecko occurs on one island not larger than 20 $km^2$ and population declines have been observed (Kidera and Ota, 2017b). While the actual population size is unknown, the extremely restricted range and population declines make means that every specimen taken out of the wild pushes the species another step closer to extinction. The Yamashina's Cave Gecko, the most commonly observed endemic in this study (n=67) is in a similar situation, inhabiting only two islands spanning a total area of 59.4 $km^2$ (Kidera and Ota, 2017a). This species is regarded as uncommon and population declines are thought to occur (Kidera and Ota, 2017a), making the increasing trade (54 specimens for sale in 2017) potentially dangerous for this species in the wild. *Goniurosaurus* spp., like most Eublepharids, lay several clutches a year consisting of two eggs (Kratochvíl and Frynta, 2006), providing potential for captive populations to increase relatively fast. While most *Goniurosaurus* spp. are genuinely bred in captivity (Kratochvíl, 2006), and all advertised were advertised as such, the dire situation of these species in the wild means that any wild harvest will negatively impact the wild populations.

Miyako Grass Lizard *Takydromus toyamai*, a species which also produces several clutches annually consisting of two eggs each (Takenaka, 2014), also faces many additional pressures like habitat loss, habitat fragmentation (Kidera and Ota, 2017e) and predation by invasive predators (Ota and Takahashi, 2008). While this species has a larger range than the above mentioned *Goniurosaurus* spp. it is still very limited with 200 $km^2$, with observed population declines, and its distribution considered severely fragmented (Kidera and Ota, 2017e). Any illegal exploitation for the international pet trade can be the additional pressure that could force subpopulations into an extinction vortex.

Many Japanese species endemic to the Nansei Islands have been observed in trade, both in European countries, and the United States and were even found in Thailand at the notorious Chatuchak Market. The variation in numbers of observed specimens suggests that not all species are equally desirable for the international pet trade i.e. the *Goniurosaurus* and *Takydromus* genus were most popular. For the remaining 45 species, no sign of online trade was found during this study. The fact that Sword-Tail Newts were observed during an opportunistic survey of Chatuchak market highlights that Japanese endemics are also present in other reptile markets.

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The number of advertisements increased steadily from 2001 to 2017. The use of older advertisements increases the number of species known to occur in trade, but absolute numbers are misleading. Advertisements are usually removed from classified websites after the animals are sold, which could suggest that the older advertisements only represent a small percentage of the animals in trade. It is therefore expected that the number of animals traded on these sites is higher than observed. It cannot be excluded that additional Nansei Islands endemic reptiles and amphibians are traded as well, but only through monitoring over a longer period would these be detected. It is likely that any additional endemic species are available, but most likely traded in low numbers.

The survey carried out in Hong Kong and China (Kanari and Xu, 2012), focused on five species, and except for the Kishinoue's Giant Skink *Plestiodon kishinouyei*, all those species were also observed in this study. High numbers of specimens observed for only a few genera suggests that not all Nansei Islands endemics are desirable, or easily obtained, for the international pet trade. Species of the *Goniurosaurus* and *Takydromus* genera, all of which are protected in Japan and many of which are classified as Endangered and Critically Endangered by the IUCN Red List of Threatened Species (IUCN, 2017), are especially vulnerable, as these species are desirable in the pet trade but also face substantial other challenges in the wild like habitat loss or fragmentation (Ota, 2000) or invasive predators (Ota and Takahashi, 2008).

The lack of CITES listings for most of the Nansei Island endemics increases the difficulty in monitoring trade in these species. For several species, their IUCN Red List assessments specifically mention the lack of information on the species' use or trade (e.g. Kidera and Ota, 2017a, b, c, d, e). CITES listings (Appendix II or III) would not prohibit trade but provide tools for law enforcement to confiscate or act upon illegal shipments of these species not only in Japan but also in consumer countries. Based on the numbers observed in trade, an immediate CITES Appendix III listing is recommended for all the Nansei Island endemic species of the *Goniurosaurus* and *Takydromus* genera. While these species are being traded in all major consumer regions, and many animals are genuinely bred in captivity in those regions, listing these species in Appendix III of CITES would immediately provide an additional layer of protection for animals that are being smuggled out of Japan, as all specimens in international trade would require a permit if legitimately procured from Japan. A listing of both species classified as Critically Endangered on the stricter CITES Appendix II should be considered. Special attention should also be given to the species assessed as being Endangered, and that are not protected under the LCES. Full protection for these species should be considered.

Finally, local government authorities should be encouraged to protect all species and subspecies of reptiles and amphibians endemic to the Nansei Islands establish a Prefectural wildlife protection ordinance, as this would strengthen legal protection. The Prefecture of Kagoshima already has such ordinance in place.

## Acknowledgments

We thank Keiko Wakao, TRAFFIC Japan, for providing additional information on legislation in Japan, and for her comments on an earlier draft of this paper. We also thank Loretta Ann Shepherd for her comments and improvements on the earlier draft of this paper. This study was funded by World Wide Fund for Nature (WWF)-US.

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*Accepted: 25 January 2019*

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