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A Survey on Alien Pet Reptiles in Taiwan

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ABSTRACT: In the recent past, the rate of alien species introduction has increased enormously, which is one of the main causes of the loss of biodiversity throughout the world. Pet trade is one of the important channels that lead alien species to invade local ecosystems. In Taiwan, alien reptiles have become popular pets in recent years that increased the risk of invasion. In order to evaluate the probability of alien reptile invasion, it is essential to know how many species of alien reptiles are present in the pet market. From March 2004 to February 2005, we investigated the alien pet reptiles in Taiwan. We checked the pet shops, aquaria and night markets to record the sales of reptiles in Northern, Central, and Southern Taiwan. We visited a total of 341 venders, some of which were visited more than once, and identified 239 species of alien reptiles. From this list, we suggested 10 popular, 14 dangerous, and 8 CITES I species for careful management and strict regulation. A small number of large pet shops carry most of the species, which suggests the sources of importation is limited to a few wholesalers, probably distributed in a few major ports within the island. It would be more efficient to focus on the upstream wholesalers in order to monitor the reptile trade markets. The sheer number of animals found in the pet trade poses the risk of invasion. Other factors, such as the similarity between the pet's original and new environment, reproductive potential, habitat requirement, and diets of these reptiles, are suggested to be crucial in evaluating the risk of alien pets.

KEY WORDS: Invasion, Trade, Biodiversity.

INTRODUCTION

In recent years, the rate of alien species introduction has increased enormously because human population and human activities altering the environment have escalated rapidly (Pimentel et al., 2000). Humans are traveling faster and farther and in greater numbers than ever before. Merchandise is being traded more freely among nations. These human activities increase the spread of species of plants, animals and, microbes worldwide (Pimentel et al., 2001). Some non-native species may be introduced originally for agriculture, but have since become pests. These pests not only cause serious damage in agriculture and animal husbandry, but also threaten the human health (Wittenberg and Cock, 2001). In addition, alien species introduction is one of the main causes of the loss of biodiversity throughout the world (Wilcove et al., 1998; Mack et al., 2000). Invasions of alien species are thought to be responsible for 42 % of the decline of native species listed as endangered or threatened (Pimentel, 2002). According to researches of the Nature Conservancy of North America and Environmental Defense Fund, invasion of alien species is the second most common factor that threatens the survival of 6,500 species in USA (Lavers, 2001). Alien species could displace native species by predation, competition and hybridization, and might even change the local ecosystem. The impact of alien species to biodiversity is more severe in islands than that on continents because island ecosystem has less resistance to alien species (Whittaker, 1998).

In a preliminary survey, more than 120,000 species of non-native species of plants, animals and microbes are established in the United States, British, Australia, South Africa, India, and Brazil (Pimentel et al., 2001; Pimentel, 2002). About 20-30% of introduced species are pests and cause major environmental problems. The invasion of these non-native organisms caused more than $314 billion/year in damage and control costs in these six nations (Pimentel et al., 2001; Pimentel, 2002). Alien species invasion will be an ongoing problem in the future. Many countries are actively investigating areas such as the mechanisms of successful invasion (Moyle and Light, 1996; Williamson and Fitter, 1996), and assessment and prediction of alien invasions (Kareiva et al., 1996;

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Pimentel et al., 2000; Pimentel, 2001; Leung et al., 2004; Weigle et al., 2005).

Alien reptile species can cause tremendous damages to native ecosystems. One of the most famous examples is the brown tree snake (*Boiga irregularis*), which was accidentally introduced to Guam immediately after World War II. Soon afterwards, the snake population reached a density of 100 per hectare, and dramatically reduced native bird, mammal and lizard populations. Of 13 species of native birds in Guam, only 3 still exist in the wild (Rodda et al., 1997). Other than the damage to Guam's biodiversity, the brown tree snake also caused public health problems due to its venom. The total cost to deal with the problem caused by the brown tree snake is more than US$5.6 million/year (Pimentel, 2001).

In Taiwan, three alien reptiles species have established populations in the field. Two are lizards (*Mabuya multifasciata*; *Anolis sageri*) and one is a turtle (*Trachemys scripta*) (Lue et al., 2002). It is suspected that both lizards accidentally reached Taiwan through cargo transport, but the truth remains unclear. However, it is clear that *T. scripta* was introduced to Taiwan more than 30 years ago via pet business. Many turtles had been released to the field when the interests of their owners oozed away. The feral populations of *T. scripta* (red-eared sliders) had been recorded in the wild (Chen and Lue, 1998). How, and to what extent these invasive reptiles affect native species or ecosystem remains unknown. In recent years, keeping reptiles as pets has become popular in some European and North American countries, (Telecky, 2001; Langton, 1990). Similar situation is also true in Taiwan. This results in more and more escapes or releases of the pets by their owners. In order to assess the risk of alien reptile invasion in Taiwan, it is essential to know how many species, and in what amount of alien reptiles are on the pet market. We report our survey in this paper.

METHODS

Because pet shops are mostly clustered at big cities, we investigated pet shops in metropolis in northern, central, and southern Taiwan. Areas in northern Taiwan include Taipei city and Taipei county; Taichung city and county are included in the central Taiwan area; southern Taiwan includes Chiayi city and county, Tainan city and county, Kaohsiung city and county and Pingtung county. We visited the pet shops, aquaria and night markets that might sell pet reptiles in three areas at least once. Several large shops were chosen and were visited seasonally. From March 2004 to February 2005, four seasonal surveys were conducted in northern Taiwan, two in central Taiwan, and three in southern Taiwan.

We identified the species in the shops by their special characters and recorded species name, amount, price, and names of the shops. For certain species that cannot be identified on site, we used spy video camera (FBI 0204; 1.2GHz) to record the images of the animals for later identification.

RESULTS AND DISCUSSION

We recorded a total of 341 venders from which 428 shop-time records were obtained. Among the 341 venders, 167 (49%) did not carry, and 174 (51%) carried alien pet reptiles. The number of venders that selling alien pet reptiles in northern, central, and southern Taiwan were 113 (50%), 13 (100%), and 41 (41%), respectively, whereas the checked shop-times in these three areas were 137, 13, and 94, respectively. We recorded a total of 239 species of alien reptiles. These included 2 species of Crocodylia (1 family, 2 genera); 85 species of Testudines (11 families, 50 genera); 126 species of Sauria (17 families, 66 genera), and 26 species of Serpentes (3 families, 9 genera) (Table 1, Appendix 1). We have 23, 26 and 10 records that could not identify their family, genus and species respectively. More lizard species are present on the market than any other reptile groups; this is probably due to fact that lizards are docile and includes the most species (4450) among reptiles. Number of species, however is not so important as docile character. For example, snakes have the second highest number of species (2,900) in the world, but only 26 species were found in the market. On the other hand, turtles had 85 species in pet market although its total species is only 285 in the world. Both turtles and lizards had around 30%, but snakes had less than 1% of the species in the pet market.

Normally, when a pet is more popular more shops will carry them and the quantity of each species in pet market is a reasonable index of popularity. From this index, the top ten popular animals include 6 turtles, 3 lizards, and 1 snake (Table 2). Turtle clearly is the most popular pet reptiles in Taiwan. As the numbers of animals and/or popularity are high in the market, it will also have a higher chance of escape from or abandoned by its owner. Consequently, for invasive species management we suggested the top ten species merit tight attention. Other than threatening the survival of native species and local ecosystems, alien reptiles may also be harmful to humans. In this study we found 14 species of reptiles that fit this category (Table 3). These species have either large body size or powerful jaws that may be harmful to

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Table 1. Taxonomic arrangement of pet reptile species in Taiwan.

Class	Order	Family	Genus	Species +Subspecies
Reptilia	Crocodylia (1 family)	Alligatoridae	2	2
Reptilia	Testudines (11 families)	Bataguridae	14	18+2
		Carettochelyidae	1	1
		Chelidae	7	11
		Chelydridae	2	2
		Emydidae	7	14+1
		Kinosternidae	3	8+1
		Pelomedusidae	2	3
		Platysternidae	1	1
		Podocnemididae	1	1
		Testudinidae	7	22+3
		Trionychidae	2	4
Reptilia	Squamata Sauria (17 families)	Agamidae	11	17+1
		Anguidae	1	1
		Chamaeleonidae	5	15
		Cordylidae	1	1
		Corytophanidae	3	4
		Crotaphytidae	2	2
		Gekkonidae	24	38
		Hoplocercidae	1	1
		Iguanidae	3	3
		Lacertidae	2	3
		Opluridae	2	3
		Phrynosomatidae	2	4
		Polychrotidae	1	3
		Scincidae	7	10
		Teiidae	2	4
		Tropiduridae	1	1
		Varanidae	1	16
	Squamata Serpentes (3 families)	Boidae	6	6+2
		Colubridae	5	12+13
		Pythonidae	2	8+1

Table 2. Ten most popular alien pet reptiles in Taiwan.

Species name	Common name	Number of animal	Frequency[1]	IS[2]
Trachemys scripta	Red-eared Slider	3764	0.70	Yes
Carettochelys insculpta	Pig-nosed Turtle	734	0.28	No
Iguana iguana	Green Iguana	546	0.33	No
Macroclemys temminckii	Alligator Snapping Turtle	487	0.28	No
Geochelone elegans	Indian Star Tortoise	426	0.29	No
Eublepharis macularius	Leopard Gecko	335	0.29	No
Pogona vitticeps	Beared Dragon	209	0.24	No
Pseudemys concinna	Eastern River Cooter	165	0.16	No
Geochelone carbonaria	Red-foot Tortoise	164	0.19	No
Lampropeltis getula	Common King Snake	124	0.26	No

[1] Frequency = found shops-times / 248 investigated shops-times
[2] IS = invasive species (Yes) in Taiwan or not (No)

humans or even cause death. These animals also need to be monitored carefully. What is more, a total of 111 species are listed as CITES I, II, or III species (http://www.cites.org/eng/disc/species.shtml) (appendix 1). International trade already threatens these species, and their trade must be regulated strictly.

In our survey, we found there were seasonal differences in the reptiles' species composition. For example, we found more than 22 additional new species in each new season from 4 pet shops in northern Taiwan (Table 4). This suggested the Whole sales imported different animals from different countries in different seasons. We also found larger shops had more species and in greater quantities. Over 89% (213/239) of all species were found in just 10 large shops from 173 shops. This indicates that a few wholesalers are responsible for the importation of most of the species. Small pet shops seemed to have obtained their sources from these few wholesalers, and often had only the most popular species in the stores. However, the wholesalers in different area of Taiwan might be

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Table 3. Dangerous alien pet reptiles that may harm human or even cause death.

Species name	Common name
Alligator mississippiensis	American Alligator
Caiman crocodiles	Spectacled Caiman
Chelydra serpentine	Common Snapping Turtle
Macroclemys temminckii	Alligator Snapping Turtle
Tupinambis merianae	Black and white tegu
Tupinambis rufescens	Red tegu
Tupinambis teguixin	Common tegu
Varanus niloticus	Nile Monitor
Varanus salvadorii	Salvadori's Monitor
Varanus salvator	Common Water Monitor
Python sebae	African Rock Python
Python reticulates	Reticulated Python
Python molurus	Burmese Python
Eunectes murinus	Green Anaconda

Table 4. Additional new species for four pet shops in consecutive seasons in Northern Taiwan.

	Mar-May	Jun-Aug	Sep-Nov	Dec–Feb
Additional new species *	-	29	22	22
Total species	73	77	73	83
Records	133	148	124	115

* The number of species that are not present in the previous season.

Independent. This was supported by the fact that shops in northern, central and southern Taiwan always have some unique reptile species that were not found in other areas. The unique species that restrict to certain area were not due to the effect of investigation efforts and season. The investigation effort was highest in northern Taiwan, which covered four seasons. Although the shop-times is lower for the other two areas, and the survey did not cover the whole four seasons, each area still had its own unique species (appendix 1). If the importation pathways were restricted to a few wholesalers, it would be more efficient to monitor sales condition of reptile sales in Taiwan from these few upstream wholesalers.

The red-eared slider was the most abundant pet reptile in Taiwan. Its quantity (3,764) was much higher than any others species (<1000) (Table 2). It also had the longest history of being a pet, and was the only invasive species of all the alien pet reptiles in Taiwan. This suggested the total quantity of an alien pet might correlate positively to its risk of being an invasive species. Nevertheless, other factors, such as the similarity between the pet's original and new environment, reproductive potential, habitat requirement, and food habits, are also important in determining the likelihood of any reptile species to invade any part of the island,

We propose a more strict regulation for the trade of reptiles' species in order to minimize the risk of alien species invasion. In addition, standard procedures should be established for the evaluation of pet animals as potential invaders.

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Appendix 1. List of alien pet reptiles in Taiwan.

Order (Suborder) Family	Species name	Locality[1]	CITES[2]
Crocodylia			
Alligatoridae	*Alligator mississippiensis*	C	II
	Caiman entate es	NS	II
Testudines			
Bataguridae	*Chinemys kwantungensis*	C	
	Cuora amboinensis	NS	II
	Cuora galbinifrons	NS	II
	Cuora trifasciata	S	II
	Cyclemys entate	N	
	Geoclemys hamiltonii	N	I
	Geoemyda spengleri	C	III
	Heosemys grandis	N	II
	Heosemys spinosa	CS	II
	Malaclemys terrapin marcrospilota	NCS	
	Malaclemys terrapin terrapin	NCS	
	Mauremys caspica	NCS	
	Melanochelys trijuga	N	
	Morenia ocellata	N	I
	Orlitia borneensis	C	II
	Pyxidea mouhotii	NCS	II
	Rhinoclemmys pulcherrima	NC	
	Rhinoclemmys pulcherrima manni	NC	
	Sacalia quadriocellata	N	
	Siebenrockiella crassicollis	N	
Carettochelyidae	*Carettochelys insculpta*	NCS	II
Chelidae	*Chelodina longicillis*	N	
	Chelodina siebenrocki	NCS	
	Chelus fimbriatus	NCS	
	Elseya novaeguineae	N	
	Emydura subglobosa	NCS	
	Hydromedusa tectifera	NS	
	Phrynops geoffroanus	N	
	Phrynops hilarii	NS	
	Phrynops rufipes	N	
	Phrynops williamsi	S	
	Platemys platycephala	C	

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Appendix 1. (*Continued*)

Order (Suborder) Family	Species name	Locality[1]	CITES[2]
Chelydridae	*Chelydra serpentina*	NCS	
	Macroclemys temminckii	NCS	
Emydidae	*Chrysemys picta dorsalis*	NCS	
	Chrysemys picta	NCS	
	Clemmys guttata	S	
	Emys orbicularis	NS	
	Graptemys geographica	N	
	Graptemys kohnii	NCS	
	Graptemys nigronoda	NCS	
	Graptemys pseudogeographica	N	
	Graptemys pulchra		
	Graptemys versa	NC	
	Pseudemys floridana peninsularis	S	
	Pseudemys nelsoni	NS	
	Pseudernys concinna	NCS	
	Terrapene carolina	N	II
	Trachemys scripta	NCS	
Kinosternidae	*Kinosternon baurii*	N	
	Kinosternon leucostomum	NS	
	Kinosternon scorpioides cruentatum	NC	
	Kinosternon scorpioides	NC	
	Kinosternon subrubrum	NS	
	Kinosternon subrubrum hippocrepis	NS	
	Staurotypus triporcatus	N	
	Sternotherus carinatus	NCS	
	Sternotherus minor	N	
	Sternotherus odoratum	NS	
Pelomedusidae	*Pelomedusa subrufa*	NS	III
	Pelusios sinuatus	S	
	Pelusios subniger	NS	
Platysternidae	*Platysternon megacephalum*	NC	II
Podocnemididae	*Podocnemis unifilis*	NS	
Testudinidae	*Geochelone carbonaria*	NCS	II
	Geochelone chilensis	NC	II
	Geochelone deuticulata	NCS	II
	Geochelone elegans	NCS	II
	Geochelone gigantea	NCS	II
	Geochelone pardalis babcoclci	CS	II
	Geochelone pardalis	CS	II
	Geochelone platynota	S	II
	Geochelone radiata	NC	I
	Geochelone sulcata	NCS	II
	Indotestudo elongata	NC	II
	Kinixys natalensis	NC	II
	Kinixys belliana	NC	II
	Kinixys erosa	C	II
	Malacochersus tornieri	NCS	II
	Manouria emys	NC	II
	Manouria impressa	N	II
	Pyxis arachnoides	NCS	I
	Pyxis planicauda	S	I
	Testudo graeca graeca	NCS	II
	Testudo graeca terrestris	NCS	II
	Testudo graeca	NCS	II
	Testudo hermanni	NCS	II
	Testudo horsfieldi	NCS	II
	Testudo marginata	NCS	II
Trionychidae	*Apalone ferox*	NCS	
	Apalone mutica	S	
	Apalone spinifera	NCS	
	Chitra indica	C	II
Squamata (Sauria)			
Agamidae	*Ceratophora stoddartii*	S	
	Chlamydosaurus kingii	NCS	

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Appendix 1. (*Continued*)

Order (Suborder) Family	Species name	Locality[1]	CITES[2]
	Hydrosaurus pustulatus	NS	
	Leiolepis belliana	NS	
	Lyriocephalus scutatus	S	
	Phrynocephalus maculatus	N	
	Physignathus cocincinus	NS	
	Physignathus lesueuri	NS	
	Pogona barbata	N	
	Pogona vitticeps	NCS	
	Stellio (Laudakia) stellio	N	
	Uromastyx acanthinurus	NS	II
	Uromastyx aegyptius	NCS	II
	Uromastyx hardwicki	NS	II
	Uromastyx maliensis	N	II
	Uromastyx ocellatus ornatus	NCS	II
	Uromastyx ocellatus	NS	II
	Xenagama taylori	NS	
Anguidae	*Ophisaurus apodus*	N	
Chamaeleonidae	*Bradypodion fischeri tavetanum*	N	II
	Brookesia perarmata	N	I
	Brookesia stumpffi	S	II
	Calumma parsonii	S	II
	Chamaeleo calyptratus	NCS	II
	Chamaeleo deremensis	N	II
	Chamaeleo dilepis	NS	II
	Chamaeleo hoehnelii	S	II
	Chamaeleo jocksoni	N	II
	Chamaeleo johnstoni	NS	II
	Chamaeleo melleri	NS	II
	Furcifer lateralis	N	II
	Furcifer oustaleti	NS	II
	Furcifer pardalis	NS	II
	Furcifer(Chamaeleo) verrucosus	N	II
Corytophanidae	*Basiliscus plumifrons*	S	
	Basiliscus vittatus	NS	
	Corytophanes cristatus	S	
	Laemanctus longipes	N	
Crodylidae	*Crodylus cataphractus*	N	
Crotaphytidae	*Crotaphytus collaris*	NS	
	Gambelia wislizenii	S	
Gekkonidae	*Agamura persica*	N	
	Chondrodactylus angulifer	N	
	Cloeonyx brevis	N	
	Cosymbotus platyurus	N	
	Eublepharis macularius	NCS	
	Geckonia chazaliae	NS	
	Gekko gecko	NS	
	Goniurosaurus kuroiwae	N	
	Goniurosaurus luii	NS	
	Hemitheconyx caudicinctus	NCS	
	Homopholis wahlbergii	N	
	Lialis burtonis	N	
	Nephrurus amyae	N	
	Nephrurus levis	N	
	Oedura castelnaui	N	
	Paroedura pictus	NS	
	Phelsuma lineata	NS	II
	Phelsuma madagascariensis	NS	II
	Phelsuma laticauda	N	II
	Phelsuma quadriocellata	N	II
	Ptychozoon kuhi	N	
	Ptyodactylus hasselquistii	S	
	Rhacodactylus auriculatus	N	
	Rhacodactylus ciliatus	NCS	
	Rhacodactylus leachianus	NS	
	Stenodactylus sthenodactylus	N	

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Appendix 1. (*Continued*)

Order (Suborder) Family	Species name	Locality[1]	CITES[2]
	Tarentola mauritanica	NS	
	Teratolepis fasciata	NS	
	Teratoscincus microlepis	N	
	Teratoscincus roborowski	N	
	Teratoscincus scincus keyserlingii	N	
	Tropiocolotes tripolitanus	N	
	Uroplatus ebenaui	N	II
	Uroplatus fimbriatus	NS	II
	Uroplatus henkeli	N	II
	Uroplatus lineatus	N	II
	Uroplatus phantasticus	N	II
	Uroplatus sikorae	N	II
Hoplocercidae	*Hoplocercus spinosus*	N	
Iguanidae	*Ctenosaura oinset*	N	
	Dipsosaurus dorsalis	NS	
	Iguana iguana	NCS	II
Lacertidae	*Lacerta lepida*	S	
	Lacerta trilineata	N	
	Meroles oinsettia	N	
Opluridae	*Chalarodon madagascariensis*	N	
	Oplurus cyclurus	N	
	Oplurus quadrimaculatus	N	
Phrynosomatidae	*Phrynosoma modestum*	N	
	Phrynosoma platyrhinos	NS	
	Sceloporus malachiticus	N	
	Sceloporus oinsettia	S	
Polychrotidae	*Anolis carolinensis*	N	
	Anolis equestris	NS	
	Anolis garmanni	S	
Scincidae	*Chalcides ocellatus*	NS	
	Corucia zebrata	N	II
	Egernia depressa	N	
	Eumeces schneideri	N	
	Scincus scincus	NS	
	Tiliqua gerrardi	N	
	Tiliqua nigrolutea	S	
	Tiliqua scincoides	N	
	Tiliqua(Trachydosaurus) rugosus	NC	
	Tribolonotus gracilis	NS	
Teiidae	*Cnemidophorus uniparens*	N	
	Tupinambis merianae	S	II
	Tupinambis rufescens	NS	II
	Tupinambis teguixin	NCS	II
Tropiduridae	*Leiocephalus personatus*	S	
Varanidae	*Varanus acanthurus*	N	II
	Varanus beccarii	N	II
	Varanus bengalensis	N	I
	Varanus doreanus	N	II
	Varanus exanthematicus	NCS	II
	Varanus flavescens	N	I
	Varanus gouldii	NS	II
	Varanus indicus	N	II
	Varanus jobiensis	N	II
	Varanus macraei	N	II
	Varanus niloticus	NS	II
	Varanus prasinus	N	II
	Varanus rudicollis	N	II
	Varanus salvadorii	N	II
	Varanus salvator	NS	II
	Varanus timorensis	N	II
Squamata (Serpentes)			
Boidae	*Boa constrictor domesticus*	NS	II
	Boa constrictor	NS	II
	Candoia carinata	N	II

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Appendix 1. (*Continued*)

Order (Suborder) Family	Species name	Locality[1]	CITES[2]
	Epicrates cenchria cenchria	NS	II
	Epicrates cenchria maurus	NS	II
	Eryx colubrinus	NS	II
	Eunectes murinus	N	II
	Lichanura(Charina) trivirgata	NS	II
Colubridae	*Ahaetulla prasins*	S	
	Dendrelaphis pictus	N	
	Elaphe guttata	NCS	
	Elaphe guttata emoryi	NS	
	Elaphe guttata guttata	NCS	
	Elaphe obsoleta lindheimerii	N	
	Elaphe obsoleta quadrivittata	N	
	Heterodon nasicus	NS	
	Heterodon platyrhinos	S	
	Lampropeltis alterna	N	
	Lampropeltis calligastra	NS	
	Lampropeltis getula californiae	NCS	
	Lampropeltis getula floridana	NS	
	Lampropeltis getula getula	N	
	Lampropeltis getula holbrooki	N	
	Lampropeltis getula nigrita	NS	
	Lampropeltis getula	NCS	
	Lampropeltis mexicana	NS	
	Lampropeltis pyromelana	N	
	Lampropeltis triangulum amaura	N	
	Lampropeltis triangulum annulata	S	
	Lampropeltis triangulum campbelli	NCS	
	Lampropeltis triangulum elapsoides	N	
	Lampropeltis triangulum sinaloae	N	
	Lampropeltis triangulum stuarti	N	
Pythonidae	*Morelia amethystina*	N	II
	Morelia spilota	NS	II
	Morelia viridis	NS	II
	Python curtus	NCS	II
	Python curtus brongersmai	NCS	II
	Python molurus bivittatus	NCS	II
	Python regius	NCS	II
	Python reticulatus	N	II
	Python sebae	N	II

[1] Species was found in N: Northern Taiwan, M: Central Taiwan, S: Southern Taiwan.
[2] CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.

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臺灣外來種爬行寵物的初步調查

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摘　　要

近年來世界各地外來種的引進快速的成長並造成當地生物多樣性的破壞。而寵物交易行為是外來種引進的重要管道之一。在台灣，外來種爬行動物在寵物市場的交易日漸活絡，這些物種入侵的可能性也就相對提高。為了評估這些外來種爬行動物入侵的可能，先行了解有多少種類在寵物市場上是首要工作。從 2004 年 3 月至 2005 年 2 月，我們調察臺灣北中南三地 341 家的水族館，共發現 239 種外來種爬行動物。從其中我們建議了 10 種最熱門、14 種危險及 8 種屬於 CITES I 的物種，這些物種需優先管理及追蹤調查。在我們的調查中發現少數大型的商家擁有大多數的外來種爬行動物，這可能是因為主要引進的通路僅限制在少數進口商中。所以在未來監測外來種寵物市場，針對上游的進口商進行管理應可獲得較有效率的結果。外來種引進的數量、原生地和當地環境相似度、生殖潛力、棲地需求及食性都可能是評估入侵風險相當重要的因子。

關鍵詞：入侵、買賣、生物多樣性。

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