
Original article

Measuring the impact of invasive species on popular culture: A case study based on toy turtles from Japan

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Abstract

The red-eared slider turtle (*Trachemys scripta elegans*) is native to portions of the United States of America (USA) and adjacent northeastern Mexico. The bright and colorful hatchlings have long been popular as pets globally but numerous individuals have been released into the wild establishing populations in areas well outside their native range. As a result, slider turtles are now introduced worldwide on all continents, with the exception of Antarctica, and many temperate and tropical islands, including Japan. They are very successful at establishing breeding populations in a variety of habitats, even those in proximity to human development. Once established in large populations, they compete with native turtle species sometimes to the detriment of the latter. Tin toy turtles were popular in Japan for decades, and they were an important export item after World War II. From the 1920s to the 1950s, prior to the widespread establishment of slider populations in Japan, the toys were characterized by muted earth-tone colors representative of native species of Japanese turtles. After the 1950s, toy turtles exhibited brighter combinations of yellow, red and green more typical of slider turtles. This transition may reflect demand for more colorful toys by importing countries like the USA. Alternatively, the change was coincident with the importation of large numbers of colorful slider turtles to Japan via the pet trade and their subsequent establishment and numerical dominance in Japanese wetlands. This switch in toy turtle colors may reflect a cultural transition in awareness of what constitutes the appearance of a typical turtle in Japan. Sliders appear to have been accepted by Japanese consumers as a new cultural norm in the appearance of turtles, a case of art imitating life.

Key words: culture, invasive species, red-eared slider turtle, shifting-baseline, tin toys

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Introduction

The establishment of exotic species of plants and animals outside their natural habitats is a major problem facing modern conservation efforts (Lambertini et al., 2011; Lampert et al., 2014). Some of these exotic species become invasive and a great deal of research is focused on their ecological and economic impacts (Pimentel et al., 2005) to

native species, ecosystems, and society. Familiar examples of invasive species include kudzu (*Pueraria montana*), tamarisk (*Tamarix ramosissima*), Gypsy moths (*Lymantria dispar*), zebra mussels (*Dreissena polymorpha*), Burmese pythons (*Python bivittatus*), and Norway rats (*Rattus norvegicus*), to name only a few (U.S. Congress, 1993). More difficult to measure are the impacts of invasive species on popular culture. Yet, as some researchers have noted, understanding

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the human dimension of invasions is critical to effectively managing the problems they create (García-Llorente et al., 2008).

When invasive exotic species have persisted for a long time they may eventually be recognized by the public as “natural” or “native” due in part to the phenomenon of “shifting baselines” (Knowlton and Jackson, 2008) where each generation tends to view the *status quo* as “normal”. For example, tumbleweed or Russian thistle (*Salsola* spp.) is so ubiquitous in western landscapes of the U.S.A. that few recognize it as an invasive plant that was established in the United States of America (USA) in the 1880s (Young, 1991). It is now viewed as an icon of the American West, as much a part of that landscape as cowboys and cattle. The same could be said for wild horses and burros, established in the New World hundreds of years ago by the Spaniards but now viewed as highly romanticized elements of western USA landscapes. Cultural associations can change in only a few generations as to what belongs in certain contexts and what doesn't. In this essay, we examine the potential impact that an invasive exotic turtle species from the USA, the red-eared slider turtle (*Trachemys scripta elegans*), appears to have had on Japanese culture as reflected through toys.

Turtles are iconic animals that are utilized, symbolized, and even revered by cultures throughout the world and across thousands of years. However, some turtles can be invasive species too. The red-eared slider (RES: *Trachemys scripta elegans*), native to the lower Mississippi River and adjacent drainages in the USA and northeastern Mexico (Ernst and Lovich, 2009; Vogt and Legler, 2013), has been introduced around the world via the pet trade (Kikillus et al., 2010; Rödder et al., 2009). The colorful and small hatchlings are popular until they become adults that are more difficult to care for. Often, these unwanted pets are liberated into local wetlands where they become established as competitors and carriers of disease and parasites, with negative consequences for native turtle species (Pearson et al., 2015).

Perhaps nowhere is this ascendancy to invasive status more apparent than in Japan where RESs are now the dominant turtle species in many urban and agricultural wetlands of that country. During 2003, turtle surveys at 802 sites in 46 Japanese prefectures found that 90% of 5,966 turtles captured were invasive species with RESs making up 62% (3,708) of all captures (Ramsay et al., 2007)! Slider turtles were introduced into Japan sometime prior to 1972 (Lever,

2003). A more complete chronology of the RES invasion of Japan was provided by Kamezaki (2015). In the latter half of the 1920s, RES were imported to Japan from Louisiana, USA. By 1955, RES were increasingly common in Japanese pet shops. By 1966, television commercials aired that promoted RES as gifts with the purchase of confections. By 1980, Japan was the largest consumer of RES from the USA. In the 1990s, reports of RES populations increasing at the expense of native species of Japanese turtles began to circulate. Since then, millions more have been imported. In 1993 alone, the U.S. exported 665,624 live RES to Japan according to figures in a report by the Humane Society of the United States (Salzberg, 1994).

The success of RESs earned them a spot on the IUCN list of the 100 most invasive alien species in the world (Lowe et al., 2000). That success is due, in large measure, to the fact that RESs are opportunistic omnivores able to tolerate a wide range of conditions and habitats (Ernst and Lovich, 2009) even living in radioactive wetlands as shown by research at the University of Georgia, Savannah River Ecology Laboratory (Lamb et al., 1991). Their adaptability is reflected in their native range as turtles of the genus *Trachemys* have the widest latitudinal distribution of any non-marine turtle ranging from 35° south – 42° north in the New World (van Dijk et al., 2014). The wide distribution of slider turtles also contributes to their status as the most studied turtle species in the United States and Canada (Lovich and Ennen, 2013). With all deference to this beautiful and adaptable species, they are basically the pigeon (*Columba livia*) of the turtle world because of their near-global reach. They are now established on all continents except for Antarctica.

In the winter of 2014, one of the authors (JEL) was invited to give the keynote presentation at the Second Japanese Symposium on Freshwater Turtles held in Kobe. The topic of the presentation was the ecology of RES turtles in North America. Scientists and conservationists in Japan recognized the increase in RES and the associated decreases in native species like the Japanese pond turtle (*Mauremys japonica*) or nihon ishi game. Japanese scientists are searching for a better understanding of RES biology that might help them manage the invader and benefit native turtles.

While visiting Japan, JEL was able to examine a small collection of toy turtles, most made of tin, assembled by one of the authors (KY). The collection suggested a transformation of colors over time

from those reflecting the muted earth-tone colors of native species prior to World War II, to bright green, red and yellow colors like those of *T. scripta* in later years. We hypothesized that this was due to increasing recognition of the invasive species *T. scripta* as a common turtle in Japan by the public due to importation and establishment of large numbers of this species with concomitant declines of the native and naturalized, more drably-colored species. This hypothesis prompted a more extensive examination of the collection by Mr. Nobuo Kumagai, Director of the Osaka Tin Toy Institute in Japan. The results of our investigation provide an example of the impact that invasive species can exert on popular culture through toys.

Turtle species in Japan

Japan has at least nine taxa of non-marine turtles that have established breeding populations (van Dijk et al., 2014) and two of those are from North America including RESs and common snapping turtles (*Chelydra serpentina*). Seven species appear to be native or are based on introductions from mainland Asia. Only five are considered to be indigenous to Japan (Table 1) based on the current weight of scientific evidence. The Japanese pond turtle (nihon ishi game) is endemic to the central and southern Japanese Islands of Honshu, Shikoku, and Kyushu and is found nowhere else in the world (Figure 1). Its status as a native species has not been questioned. Another species, the Reeves' turtle (*Mauremys reevesii*) or "kusa game" (Figures 2, 3) has a similar distribution in Japan but also ranges widely in adjacent China and Korea. Long thought to be a native species, the absence of *M. reevesii* from the well-documented turtle fossil record of Japan suggested otherwise (Lovich et al., 2011). Recent molecular analyses (Suzuki et al., 2011), along with examinations of old Japanese encyclopedic literature on animals and plants, by Japanese scientists support an introduction of that species to Japan from adjacent mainland Asia at some time in the past (around or even before the middle of the 19th Century). Most indigenous species are characterized by dull brownish coloration on the adult shell (Table 1) but *Cuora flavomarginata* or "semaru hako game" has bright yellow markings on the head (Figure 4). This contrasts with the RES, a turtle conspicuously marked with bright red, yellow and green pigmentation (Figure 5).

Toy turtles in Japan

Toy turtles from Japan came in a multitude of shapes, sizes and colors over the course of almost a century. A selection of these toys is shown in Figure 6 along with a list of their attributes in Table 2.

1920s–1941. During this Pre-war time period, tin toy turtles were often marked with the symbol "C.K", the initials of Chokichi Kuramochi, the President of a famous tin toy company. Some of these were exported to the USA. Toy turtles from this era had muted colors dominated by browns like native (*M. japonica*) and semi-natural (e.g., *M. reevesii*) Japanese turtle species (Figure 6). The golden age of pre-war export of Japanese toys was around 1935 and the Kuramochi Shoten Company was a major manufacturer.

1945–1952. In 1941, World War II began and metal toy making stopped in Japan for the duration of the war. In 1945, the war was over and toys manufactured from 1945–1952 bore the mark "Made in occupied Japan." Some of these were exported to the USA. As can be seen in Figure 6, dull brown was still found on some toys but yellow was also seen, a prominent color on the head and part of the shell of the native Japanese (southern Ryukyu) species *Cuora flavomarginata* or "semaru hako game". The bright red color dominating toy number 5 is not representative of any living species of turtle.

1950s–1970s. During this era, a mixture of colors and patterns prevailed in Japanese toy turtles. An increasing number of toys were dominated by greens, yellows, oranges and reds (Figure 6), all colors found on RESs at some point in their life. At the beginning of this time period, newspaper accounts announced the availability of RESs in Japanese pet shops. Sovereignty was officially restored to Japan in 1952 with the implementation of the Treaty of San Francisco, officially ending World War II and modernizing its relationship with the USA, including trade. Japan's economy improved beginning the golden age of post war export. Toy making focused on export and colors targeted American pop style. In the 1970s, tin turtle toys were replaced by toys made of plastic, retaining the colorful greens, reds and yellows of their last tin counterparts. In 1971, with the establishment of the Japan Toy Safety Standard, toys began being stamped with the "ST" mark.



Figure 1. Japanese pond turtle (*Mauremys japonica*) or nihon ishigame. Photograph by Katsuya Yamamoto. Note the muted earth-tone coloration.



Figure 2. A juvenile Reeves' turtle (*Mauremys reevesii*) or kusa game. Photograph by Katsuya Yamamoto. Note the muted earth-tone coloration on the shell.



Figure 3. Reeves' turtle (*Mauremys reevesii*) or kusa game. Photograph by Katsuya Yamamoto. Large male adults like this one can be almost completely black.



Figure 4. Yellow-margined box turtle (*Cuora flavomarginata*) or semaru hako game from Iriomote in the Yaeyama Islands, Japan. Photograph courtesy of Iriomote Wildlife Conservation Center, Ministry of Environment, Japan.



Figure 5. The red-eared slider turtle (*Trachemys scripta elegans*) or mississippi aka-mimi game is brightly marked with red, yellow and green pigments, especially as juveniles and young adults. Hatchlings have a bright green carapace. Photograph courtesy of Mark Feldman.

Discussion: toys as a reflection of cultural awareness

Toys are powerful semiotic reflections of culture or symbolic replicas of nature and the real world (Fleming, 1996). Japanese toys and cartoons have had profound effects globally as witnessed with Gojira (Godzilla), the Mighty Morphin Power Rangers, Pokemon and other media and merchandising sensations. In her book, "*Millenial monsters: Japanese toys and the global imagination*," Anne Allison (2006) chronicles the global ascendancy of Japanese cultural influence through toys. She notes the resourcefulness of Japanese toy makers who recrafted tin cans discarded from U.S. military rations

into toy jeeps and dolls (Tanner, 1994). By 1947 such toys became the first Japanese export of the postwar period (Allison, 2006). Based on our observations, it appears that the earliest toys were based on the appearance of native turtle species.

The progression of toy turtles from browns and other drab colors to the reds, greens and yellow colors that became so prominent in modern times may simply be a reflection of demand for more colorful toys by importing countries like the USA. A test of that hypothesis using other types of Japanese toys over a similar time period is beyond the scope of this study but remains an important next step. Alternatively, the shift in colors may reflect a cultural transition in awareness of what constitutes the appearance of a “local” turtle. RESs are now so ubiquitous compared to native Japanese turtles that they present a new cultural norm for the appearance of turtle toys, a case of art imitating life. If this is true, society’s lack of familiarity with native biodiversity and their embrace of exotic species as part of the natural world present a serious challenge to effective conservation efforts. Is it possible that the cultural power of toys could be used to promote conservation awareness of native turtles by celebrating the colors and patterns of indigenous species?

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Table 1. List of non-marine turtle species found in Japan and suspected to have breeding populations. The list includes species presumed to be indigenous to Japan, introduced from mainland Asia at some point of in the near of distant past, or introduced from distant continents. All names are from “Turtles of the world, 7th edition: annotated checklist of taxonomy, synonymy, distribution with maps, and conservation status” by the Turtle Taxonomy Working Group 2014 available at http://www.iucn-tfsg.org/wp-content/uploads/file/Accounts/crm_5_000_checklist_v7_2014.pdf.

Common name	Scientific name	Adult shell colors	Comments
Chinese softshell turtle (suppon)	<i>Pelodiscus sinensis</i>	Grayish brown	Appears to be mixtures of indigenous and exotic (continental) genotypes
Common snapping turtle (kami-tsuki game)	<i>Chelydra serpentina</i>	Brown	Introduced from North America
Japanese pond turtle (nihon ishi game)	<i>Mauremys japonica</i>	Brown	Indigenous
Red-eared slider (mississippi aka-mimi game)	<i>Trachemys scripta elegans</i>	Bright green and yellow in females, beige and black in large males	Introduced from North America
Reeve’s turtle (kusa game)	<i>Mauremys reevesii</i>	Brown, black	This species may have been introduced to Japan in or before middle of the 19th Century
Ryukyu black-breasted leaf turtle (riukiu yama game)	<i>Geoemyda japonica</i>	Dark orange or yellowish to brown	Indigenous
Yellow-margined box turtle (semaru hako game)	<i>Cuora flavomarginata</i>	Brown, yellow	Some authors consider <i>C. evelynae</i> , the Ryukyu yellow-margined box turtle, to be a separate species. Indigenous
Yellow pond turtle (minami ishi game)	<i>Mauremys mutica</i>	Brown to dark brown	Introduced from Taiwan, continental Asia, or both
Southern Ryukyu pond turtle (yaemama ishi game)	<i>Mauremys mutica kami</i>	Light brown to grayish	Indigenous

1920? ~ 1941



#1



#2



#3



#4

1947 ~ 1950



#5



#6



#7



#8



#9

1951 ~ 1955



#10



#11



#12



#13



#14



#15



#16



#17

1955 ~ 1965

1965 ~ 1970



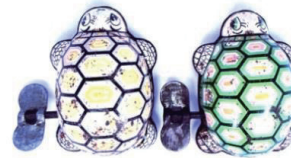
#18



#19



#20



#21



#22

1971 ~ 1980?



#23



#24



#25



#26

Figure 6. Japanese toy turtles in the Katsuya Yamamoto collection. Numbers are cross-referenced to Table 2 containing attributes for each toy. Note the obvious progression from colors dominated by brown and black to those dominated by red, yellow and green over time. Years shown are for each assemblage of toys and do not necessarily match the time periods discussed in the text.

Table 2. Japanese toy turtle attributed and manufacturing marks in the Katsuya Yamamoto collection. Numbers are cross-referenced to Figure 6 showing each toy.

Toy #	Estimated year of manufacture	Composition	Country of manufacture marking	Stamping (company)	Comments
#1	1920~1941	tin	made in Japan	C.K (KURAMOCHI SHOUTEN Co.)	-
#2	1920~1941	tin	made in Japan	C.K (KURAMOCHI SHOUTEN Co.)	-
#3	1920~1941	tin	made in Japan	-	prewar print
#4	1920~1941	tin	Japan	SF (unknown)	prewar print
#5	1947~1950	tin + celluloid	made in Occupied Japan	ALPS (ALPS Co.)	seal of occupied Japan
#6	1947~1950	tin	made in Occupied Japan	MASUDAYA SAITOU Trading Co.?	seal of occupied Japan
#7	1947~1950	tin	made in Occupied Japan	MASUDAYA SAITOU Trading Co.?	seal of occupied Japan
#8	1951~1955	tin	-	MASUDAYA SAITOU Trading Co.?	another color of #7?
#9	1951~1955	tin	-	MASUDAYA SAITOU Trading Co.?	next model of #7?
#10	1955~1965	tin	made in Japan	K (OTA KISABUROU SHOUTEN Co)	-
#11	1955~1965	tin	made in Japan	(mark of rabbit face) (USAGIYA Co.)	-
#12	1955~1965	tin	made in Japan	T.P.S (TOKYO PLAYTHING SHOUKAI Co.)	-
#13	1955~1965	tin	made in Japan	K (OTA KISABUROU SHOUTEN Co)	-
#14	1955~1965	tin	made in Japan	K (OTA KISABUROU SHOUTEN Co)	-
#15	1955~1965	tin	made in Japan	TM: (MASUDAYA SAITOU Trading Co.)	-
#16	1955~1965	tin	-	-	-
#17	1955~1965	tin	made in Japan	-	-
#18	1965~?	plastic	made in Japan	HAIJ (BANSEI GANGU Co.)	plastic used
#19	1965~1969	tin + plastic	made in Japan	Toy Hero (unknown)	-
#20	1965~1969	tin + plastic	made in Japan	TOMY (TOMY Co.)	-
#21	(1970~1975?)	tin	made in Japan	Toy Hero (unknown)	prototype of #23?
#22	(1970~1975?)	tin	made in Japan	-	-
#23	1971~1980?	tin	made in Japan	YOKOTA (unknown)	Confirmation of Japan Toy Safety Standard: ST mark
#24	1971~1980?	tin	made in Japan	N (NAKAYAMA SHOUKAI Co.)	Confirmation of Japan Toy Safety Standard: ST mark
#25	1971~1980?	plastic	-	-	Confirmation of Japan Toy Safety Standard: ST mark
#26	1971~1980?	plastic	made in Japan	YOKOTA (unknown)	Confirmation of Japan Toy Safety Standard: ST mark

侵略的外来種の庶民文化への影響を測る： 日本のカメの玩具にもとづくケーススタディ

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ミシシippiaカミミガメ (*Trachemys scripta elegans*; 以下アカミミガメ) はアメリカ合衆国の一部と隣接するメキシコ合衆国の北東部の在来種である。鮮やかな色彩に富んだ孵化幼体は、人気のペットとして世界的に長く親しまれてきたが、その一方でおびただしい数の個体が自然分布しない地域に持ち込まれて野外に放され、定着してしまっている。その結果アカミミガメは、現在では南極大陸を除くすべての大陸と、日本を含む温帯や熱帯の多くの島々に広がり、都市近郊を含む様々な環境で、繁殖個体群を確立してしまっている。そしていったん大規模な個体群として定着すると、在来のカメ類と競合し好ましくない影響を与えることも珍しくなくなっている。ブリキ製のカメの玩具は何十年にもわたる日本の人気商品であり、第二次世界大戦後は、重要な輸出品の一つともなってきた。日本における広範囲なアカミミガメ個体群の確立に先立つ1920年代から1950年代にかけては、こうした玩具は、日本の在来カメ類に象徴される地味な色合いによって特徴づけられていた。ところが1950年代より後になると、玩具のカメはアカミミガメに典型的な黄色、赤色、緑色といったより鮮やかな色の組み合わせを示すようになった。このような変化は、単にアメリカ合衆国をはじめ玩具の輸出先での、より色鮮やかなものを求める需要を反映しただけである可能性も完全には排除できない。しかしこの傾向が、ペット動物の貿易活動を通じた多数の色鮮やかなアカミミガメの日本への輸入、そして続く日本の陸水域でのこのカメの定着や、数的優位化の進行の影響を受けて生じたと捉える方が、よりありそうに思われる。つまり上記のような玩具のカメの色の切り替わりは、日本で見られる典型的なカメ類における、外観構成の認識の文化的変遷を反映している可能性があり、もしそうであるならば、アカミミガメは日本においてカメ類の外観の新しい文化的典型と認識され、実生活で遭遇する事物を真似たアートの新たなモデルとなったとみなすことができる。

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