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## The Status of Distribution for Native Freshwater Turtles in Korea, with Remarks on Taxonomic Position

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**Abstract** – Korean freshwater turtles are divided into native turtles, *Chinemys reevesii* in Geoemydidae, *Pelodiscus sinensis* in Trionychidae, and imported turtles, *Trachemys scripta elegans*, *T. s. scripta*, *Pseudemys rubriventris* and *Ocadia sinensis*. In this study, we determined the distribution of Korean freshwater turtles based on a field study and literature study, and considered the taxonomic position of unidentified native turtles. The study was carried out between May 2010 and November 2011 during the day time, and the capturing tool used to collect turtles consisted of net and metal frame. *C. reevesii* and *P. sinensis* were found in 16 and 11 places, respectively. *C. reevesii*, which inhabits the Korean peninsula, is a taxonomically controversial species, but it is presumed that the turtle belongs to *Mauremys*. Moreover recent taxonomic studies of the soft-shell turtle have shown that the Korean native species is *P. maackii*, and *P. sinensis* was imported from abroad and has been in the natural habitats of Korea since 1970s. The exterior shape and skeletal form of *P. maackii* and *P. sinensis* are nearly similar. However, the skin color and yellow spots on the shell could be used to distinguish the two species.

**Key words** : *C. reevesii*, *P. maackii*, *P. sinensis*, distribution, taxonomic studies

### INTRODUCTION

Testudines are most successfully evolved group (Ernst and Barbour 1989; Gaffney 1990), and, internationally, they consist of 14 families, 319 species and 146 subspecies (Bickham *et al.* 2007). The Korean peninsula contains both aboriginal turtles, *Chinemys reevesii* in Geoemydidae, *Pelodiscus sinensis* in Trionychidae, (Kang and Yoon 1975), and foreign turtles that adapted to Korean environment are reported (NIBR 2012); *Trachemys scripta elegans*, *T. s. scripta*, *Pseudemys rubriventris* and *Ocadia sinensis*. *Chinemys reevesii* are protected as an endangered species level II and a natural monument. The freshwater turtle is widely distributed throughout Korea, China, Japan and Taiwan, including South East Asia

(Ota 1991; Szyndlar 1991; Iverson 1992). It lives in small lakes, ponds and streams in Korea except in Jeju-do (Song 2007). According to recent studies, *C. reevesii* was discovered only in one-tenth of places investigated and its population size was extremely small; thus, preservation is urgent (NIBR 2011). *P. sinensis* has been found in the Amur River and Ussuri River in Southeast Siberia, Korean peninsula, Hainan, South Central China and Vietnam (Iverson 1992; Ernst *et al.* 2000), and *P. sinensis* has been discovered in similar places as *C. reevesii* (Song 2007).

Although national studies on endangered turtle groups are underway, only a small number of academic study on Korean freshwater turtles have been conducted, including mitochondrial gene analysis of *P. sinensis* (Jung *et al.* 2006), skin diseases (Syasina *et al.* 2006), distribution, environmental features and feeding behavior in Seomjin-gang and Nam-gang areas (Lee and Park 2010). Freshwater turtles can be easily surveyed over the country in streams, ponds, swamps and

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rice fields. However, according to the studies by the Ministry of Environment, the population of native turtles has been considerably decreasing since 1986. This decrease was believed to be caused by water pollution, habitat destruction and overhunting. The reckless release of foreign turtles without ecological data and studies has also been one cause for the decrease in native turtles. Despite this decrease in native turtles, there have been no studies on the distribution of freshwater turtles in the Korea peninsula. In addition, the old scientific name for *C. reevesii* and *P. sinensis* are still being used in Korea, even after the name was revised through previous systematic studies. Especially, in the case of *P. sinensis*, the scientific name was written wrong because of confusion between the new species and adapted species (Fritz *et al.* 2010).

Turtle traps and field-scopes were placed in rivers, reservoirs and ponds were for this field study. Previous studies were also reviewed to confirm the distribution of native turtles in Korea. In addition, the scientific name of the freshwater turtles was appropriately changed. Based on the findings of this study, the state of inhabitant and the taxonomic position of the turtles should be considered in the future.

## MATERIALS AND METHODS

### 1. Survey area

The survey was scrutinized focusing on the water system that the freshwater turtles were reported by literature and news releases. Additionally, we selected and surveyed ponds or reservoirs near the water system.

### 2. Observation survey

Turtles feeding or sunning on the surface of water, trees, rocks and artificial structures were observed between May 2010 and November 2011 during the day time. Each of the researchers were equipped with a radio and searched for the animals on each side of reservoir using binoculars and field scopes (ATM 80 HD, Swarovski).

### 3. Capture survey

A net (3.5 cm × 3.5 cm) and metal frame (70 cm × 70 cm × 150 cm) were used to collect turtles and 20 ~ 30 g of pork

was fixed by cable in the trap as bait. Traps were located to the edge of the water and put it into the sand or mud. If the bottom of the water consisted of stone, the trap was fixed on the tree by ties. In the summer, the traps were installed in an unusual pattern during the night and collected the next morning, due to the high temperature. At least two and up to 10 traps were set up at each location.

## RESULTS AND DISCUSSION

*Chinemys reevesii* and *Pelodiscus* sp. were discovered in 16 and 11 locations, respectively (Table 1). Although *Pelodiscus* sp. was found in ten areas, it was not clear between two soft-shell turtles that were reported in Korea and morphologically very similar. Two soft-shell turtles were shown to inhabit Korea and they are morphologically very similar.

The taxonomic position of *C. reevesii* remains controversially. The turtle was named *Emys reevesii* by Gray (1831). In the late twentieth century, the name was revised and the species was placed in the genus *Chinemys* by Smith (Ernst and Barbour 1989; Iverson 1992; Zhao and Adler 1993). However, when cladistic analysis based on morphological data was used, it was classified as Geomydidae (Hirayama 1984; Gaffney and Meylan 1988; Yasukawa *et al.* 2001). Using morphology and molecular biology analysis, Shaffer *et al.* (1997) found that the genus *Chinemys* was close to the genus *Heosemys*. In another study, the genus *Chinemys* and genus *Ocadia* were included in genus *Mauremys* (Wu *et al.* 1998; McCord *et al.* 2000; Honda *et al.* 2002; Barth *et al.* 2004; Spinks *et al.* 2004; Feldman and Parham 2004). In contrast, Parham *et al.* (2001) asserted that *C. reevesii* and *C. nigricans* were distant from the genus *Mauremys*, which was based on molecular data. In addition, Spinks *et al.* (2004) suggested that *C. reevesii* and other species that had been classified to genus *Chinemys* and genus *Ocadia* for a long time be subordinated in genus *Mauremys*. Thus, based on the study by Spink *et al.* (2004), the turtle in the Korean peninsula was classified as *M. reevesii*.

Soft-shell turtles in Korea were first reported by Slevin (1925) as *Amyda maackii*. He collected 16 turtles in Gongju, Chungcheongnam-do. The black line on the interocular and temporal of the Korean turtle was found to be thicker than the line on the Chinese turtle and it contained many more yellow spots on its back. In addition, Slevin (1925) reported

**Table 1.** The state of freshwater turtles observing site







No.	Site	Location	Reeves' turtle	Soft-shelled turtle
1	Paldang-ho	Namyangju-si, Gyeonggi-do	1	
2	Ppuri park	Chimsan-don, Buk-gu, Daegu	12	
3	Reservoir Beopjusa	Sanae-ri, Songnisan-myeon, Boeun-gun, Chungcheongbuk-do	1	
4	Dal-cheon	Sanoe-myeon, Boeun-gun, Chungcheongbuk-do	1	1
5	Habin-ji	Jicheon-myeon, Chilgok-gun, Gyeongsangbuk-do		3
6	Banggwang-ji	Banggwang-ri, Gwangui-myeon, Gurye-gun, Jeollanam-do	1	
7	Dangchon-ji	Suwol-ri, Gwangui-myeon, Gurye-gun, Jeollanam-do	2	
8	Bongseo-ji	Bongseo-ri, Gurye-eup, Gurye-gun, Jeollanam-do	10	1
9	Odong-ji	Bongseo-ri, Gurye-eup, Gurye-gun, Jeollanam-do	1	1
10	Donsan-ji	Bongseo-ri, Gurye-eup, Gurye-gun, Jeollanam-do	1	
11	Baenanggimi-seupji	Jin-ri, Heuksan-myeon, Sinan-gun, Jeollabuk-do		1
12	Yo-cheon	Ibaek-myeon, Namwon-si, Jeollabuk-do	1	4
13	Cheon-cheon	Cheoncheon-myeon, Jangsu-gun, Jeollabuk-do	1	7
14	Prayer house (temporary)	Cheongnim-ri, Sangseo-myeon, Buan-gun, Jeollabuk-do	1	
15	Geumho-ji	Geumsan-myeon, Jinju-si, Gyeongsangnam-do	8	
16	Deokam-ji	Jeongchon-myeon, Jinju-si, Gyeongsangnam-do		1
17	Bangdong-ji	Sinan-myeon, Sancheong-gun, Gyeongsangnam-do	1	
18	Geodong-ji	Sindeung-myeon, Sancheong-gun, Gyeongsangnam-do	4	3
19	Oebang-ji	Saengbiryang-myeon, Sancheong-gun, Gyeongsangnam-do		
20	Bokgok-ji	Sinjeon-ri, Idong-myeon, Namhae-gun, Gyeongsangnam-do	1	
21	Yongjeon-cheon	Punggak-myeon, Cheongdo-gun, Gyeongsangnam-do		5
22	Geumoh-ji	Namtong-dong, Gumi-si, Gyeongsangbuk-do		1

that the only difference between the Korean turtle and Chinese turtle was the external color. Dakashima (1935) classified the turtle in Korea as *A. maackii* and recorded that it moved into Japan. He also reported that *A. sinensis* was imported from Taiwan to Okinawa, Japan. However, Pope (1935) classified the three species, *schlegelii*, *sinensis* and *maackii* in genus *Amyda*, as one species, *A. sinensis*, and reclassified the soft-shell turtles in the Korean peninsula as *A. sinensis*. Until the late of 1980s, there were no additional studies on soft-shell turtles and *A. sinensis* was thought to be the only species in Korea. On the other side, Cho (1949) did not accept Pope (1935)'s view and classified the turtle as *A. maackii*. Shannon (1956) reported that turtles collected in Hantan River and Gongju in South Korea and Pyongyang in North Korea were *A. sinensis*. He initially wanted to report that the turtle was *A. maackii* and stated that it was distributed in Korea and a branch of Southern Amur River; however he followed Pope (1935)'s opinion and recorded it as *A. sinensis*. *Amyda maackii* and *A. sinensis* have been named the soft-shell turtles found in South Korea. After changing the genus from *Amyda* to *Trionyx*, each of Kang and Yoon (1975) and Paik (1989, 1990) reported it as *A. sinensis* and *Trionyx maackii*. In the late 1990s, most documents used *P. sinensis*. Moreover, in the case of North Korea, Won (1971) and Kim and Han (2009) concluded that *A. maackii* was a synonym of *Trionyx sinensis* and accepted the scien-

tific name, *T. sinensis*. However, Chkhikvadze (1987) reclassified the turtle that lives in Northeast China and adjacent region between Korea and Russia to *T. maaki* (= *maackii*). Also, the genus name of the Korean soft shelled turtle was changed from *Trionyx* to *Pelodiscus* once more by several taxonomic studies. Despite the fact that Jung *et al.* (2006) classified it as *P. sinensis* based on mitochondrial analysis using a male turtle from soft-shell turtle farm in Deagu, Fritz *et al.* (2010) reanalyzed both Jung's result and the group of turtles in East Asia and clarified the turtle in Jung's study as *P. maackii*. Stuckas and Fritz (2011) reported that each *P. maackii* and *P. sinensis* were independent species, because the genes of the two species were different. Based on biological distributions, *P. maackii* inhabits the Amur River, Far East Russia, Northeast China and Korea peninsula, and the Type locality of *P. sinensis* is Macao located adjacent to Southern China. Therefore, *P. maackii* is a Korean native turtle and *P. sinensis* is not.

*Pelodiscus sinensis* has been traded in Asia region since B.C., and was exported to the world from China in the late 1900s. Japan imported this species in 1970s, so we estimated that the turtle actually entered Korea between the 1970s and 1980s. *P. maackii* and *P. sinensis* are now frequently found in the wild in Korea. According to Slevin (1925) and Pope (1935), there are no skeletal differences between these two turtle species and they only diverge in color. The table

**Table 2.** Comparison table between Korean soft-shell turtle and Chinese soft-shell turtle

	Dorsal part	Ventral part	Neck and foreleg
Korean soft-shell turtle ( <i>Pelodiscus maackii</i> )	 Quite smooth back shell and clear yellow spots on back	 Yellowish ventral	 Clear and many yellow spots on neck and forelegs
Chinese soft-shell turtle ( <i>Pelodiscus sinensis</i> )	 Small bumps on back as a mole	 Yellowish white ventral	 No yellow spots

for distinguishing the two turtles was prepared with previous data (Chkhikvadze 1987; Yang *et al.* 2011) and individuals observed in the wild (Table 2).

In conclusion, we suggest that *M. reevesii* is the appropriate scientific name for Reeve's turtle and *P. maackii* is the correct scientific name for Korean soft-shell turtle.

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