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# First record of *Ocadia sinensis* (GRAY, 1834) on Lamma Island, Hong Kong, China, with comments on the distribution, habitats, vulnerability and captive propagation of the species in China

### Abstract

During a trip to Lamma Island, Hong Kong, China, three specimens of *Ocadia sinensis* (GRAY, 1834) were found in a swamp in the centre of the island. According to the literature, *Ocadia sinensis* is not thought to naturally occur in Hong Kong Territory. This finding indicates the opposite, as local farmers interviewed claim to be familiar with this species on Lamma Island for at least the last seventy years. This might be the only remaining population of the species in Hong Kong territories and should receive further attention. Critical comment on the currently

accepted distribution of the species is given, with data on habitat, vulnerability and farming within its range.

### Introduction

Lamma Island (22°12N/114°07E), originally named Pok Liu, is situated appr. 2 km southwest of Hong Kong Island, has a total area of 13.55 km<sup>2</sup>, is inhabited by appr. 6,000 villagers, and is the 3<sup>rd</sup> largest of the some 260 islands of Hong Kong. The largest village on the island is Tung O situated at the Yung Shue Wan (Banyan Tree Bay) in the northwest of the island. The island



Fig. 1. Tung O, situated at the Yung Shue Wan, Lamma Island.

is still in a more natural state (especially in the south) than most other Hong Kong islands despite the fact, that Hong Kong's main electric's power plant is situated there.

The majority of the island consists of lowland, especially in the center, where large areas of wetland exist. Some hills, with the highest one being Mount Stenhouse (353 m elevation) in the southern part of the island exist.

According to the sparse literature on the herpetofauna of Hong Kong (ROMER 1978, KARSEN *et al.* 1986, 1998, BOGADEK & LAU 1997, LAU *et al.* 2000), *Ocadia sinensis* (GRAY, 1834) has only been recorded once during World War II, when a single adult specimen was dug up from a dried pond in the Internment Camp of Stanley Village, SE-HongKong Island, as reported and figured in HERKLOTS (1951). KARSEN *et al.* (1998) mentioned that an *Ocadia-sinensis*-like turtle was seen in Lam Tsuen River near Tai Po, New Territories, in 1980 that could not definitely be confirmed as *Ocadia sinensis*.

KARSEN *et al.* (1998) doubted the natural occurrence of *Ocadia sinensis* in Hong Kong Territories and believed that HERKLOTS' specimen is a "captive release" as it was found in an artificial pond. Furthermore, according to KARSEN *et al.* (1998) most suitable habitat for the species in Hong Kong has been polluted, destroyed or has too little aquatic vegetation to sustain viable populations of *Ocadia sinensis*. Interestingly, CHEN & LUE (1998, 1999) reported that *Ocadia sinensis* in northern Taiwan occurs in rivers without any aquatic vegetation other than occasional algae.

The nearest "verified" record (see below) of *Ocadia sinensis* to Hong Kong is in the wetland areas near Shenzhen, Guangdong Province, China (GEMA 1989, XIE *et al.* 2001).

### Field report

During a visit to Hong Kong in autumn 2005, Lamma Island was surveyed, primarily

to collect data on the occurrence of *Cuora trifasciata* (BELL, 1825) on this island. Until now, only one juvenile specimen of *Cuora trifasciata* was captured on the island (LAU *et al.* 2000, LAU pers. comm.) at Mount Stenhouse. The species is rather unknown to the locals, thus making the natural occurrence of this species on this island rather doubtful (see BLANCK *et al.* 2006). The only other turtle species ever reported from the island is *Chelonia mydas* (LINNAEUS, 1758), which nests on the sandy beaches of Tung O Wan and Sham Wan, in the east and south of Lamma Island. While KARSEN *et al.* (1998) stated, that the last nesting occurred in 1995, ANONYMOUS (2003) mention that eight female *Chelonia mydas* have nested at Sham Wan beach between 1997 and 2003. These beaches are protected from June to October. *Chelonia mydas* is the only species of turtle known to most Lamma Villagers.

We started at Tung O and headed toward the southern end of the island. As no automobiles are present on Lamma Island and bicycle travel is too difficult most of the route, we decided to go by foot. The first goal was to interview locals wherever possible to see if they knew of any turtles occurring on the island. For this, photo images of all southern Chinese turtles were used. In Tung O, none of 15 local villagers interviewed knew about any freshwater turtles occurring in the vicinity of the village, but most of them knew of the marine turtle *Chelonia mydas* at Sham Wan beach. Thus we continued our walk southward through a very extensive swamp area, surrounded by several small farms in the center of the island. A very old farmer in this area was interviewed and asked if he knew of any turtles existing on the island. Interestingly, he said yes, mentioning Shan Wan, but also, that there are turtles in his local swamp. After being shown the turtle photos, he recognized *Ocadia sinensis*, but not *Cuora trifasciata*. This was surprising, since there are no records



Fig. 2.  
Swampy wetland, appr. 2 km S.E. of Tung O, with electric power plant in the background.



Fig. 3.  
Small hillside brook, Mt. Stenhouse, Lamma Island.



Fig. 4.  
Freshwater crab, possible prey of *Ocadia sinensis*.



Fig. 5.

Juvenile in figs. 10-13 in its natural habitat.



Fig. 6.

Swampy stream area where the female was seen with a Chinese pond heron (*Ardeola bacchus*).



Fig. 7.

The field and the channel close to which the juvenile was found.

of *Ocadia sinensis* in Hong Kong Territories other than the dubious one mentioned above. A possible explanation was that there might be recent captive releases. The farmer claimed that *Ocadia sinensis* is abundant in the swamp and is also found in his field from time to time and that he knows this species since he was a child, thus the species must at least exist in this swamp for 70 years or more. Interested in that information, we planed to revisit the swamp on our return from the south. We interviewed several more farmers along the way, many of which knew *Ocadia sinensis*, but none *Cuora trifasciata*. Not even near Mt. Stenhouse was anyone familiar with *Cuora trifasciata*, but everyone knew *Chelonia mydas*. There are some smaller streams at Mt. Stenhouse, but it is doubtful, that a natural population of *Cuora*

*trifasciata* exists there. Without any trace of *Cuora trifasciata*, we left Mt. Stenhouse and traveled back toward Yueng Shue Wan. We arrived at the swamp at about 4 pm with about 1.5 hours left to get to the ferry off the island. Thus we decided to search for *Ocadia sinensis*. Another farmer working in his PakChoi field, was interviewed, and identified *Ocadia sinensis* telling the same story as the other farmers, that he knew this species for many years. His farm was adjacent to the swamp, separated by a small, almost still, muddy stream, without any notable aquatic vegetation, about 200 cm wide and 20-120 cm deep. We walked along the stream on the farm side, trying to find a way to cross the water. Fairly soon, we saw a small brown chunk of earth, that resembled a turtle on land, in a shaded area of the field,



Fig. 8. Small stream where a male *Ocadia sinensis* was captured, central Lamma Island.

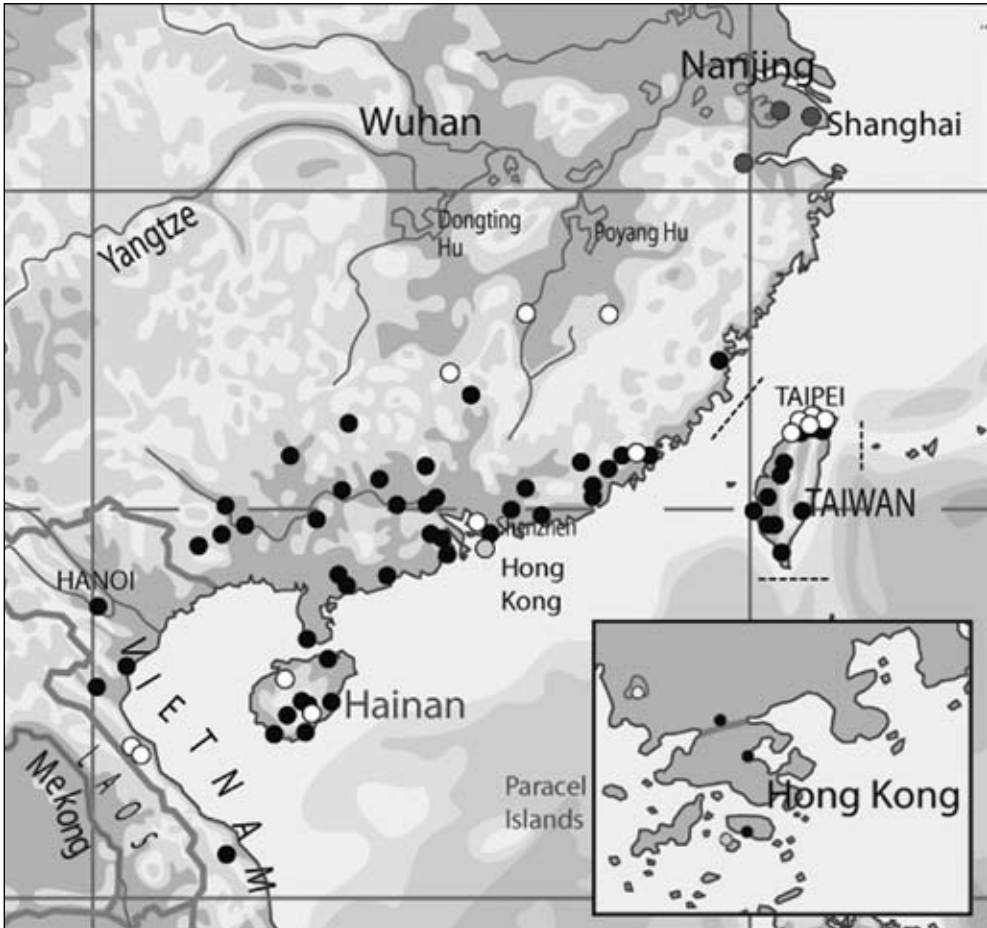


Fig. 9. Key to locality records for *Ocadia sinensis*. Dark gray dots: Questionable locality records of *Ocadia sinensis*. Black dots: Unverified records of *Ocadia sinensis* (without further data or city market origin, literature & museum data). Gray dot: Herein confirmed locality record from Lamma Island, Hong Kong, China. White dots: In detail discussed wild-caught records of *Ocadia sinensis* (museum data, literature or pers. obs.).

next to the path and the stream. Indeed, it was a juvenile *Ocadia sinensis*! Thirty minutes later, an adult male *Ocadia sinensis* was captured in another clear, 20 cm deep, 80 cm wide, slow moving stream descending from a nearby hill, appr. 100 m away from the above juvenile. The male's plastron pattern lacked the reddish brown sediment stains, found in the juveniles. An adult female was spotted in a wider part of the same stream as the juvenile, but was inaccessible to us at the time.

Unfortunately, time did not permit further collecting, but finding 3 turtles in 1 hour without intense effort, especially finding a juvenile and an adult pair, led us to believe, that there is a viable population of *Ocadia sinensis* existing in this swamp. From the farmers accounts, the species is either native to the island, and possibly thus the last remaining Hong Kong population, or is of long term introduced origin. Further supporting a natural origin of the Lamma Island *Ocadia*

*sinensis* is that both specimens captured most resembled the coloration of supposed Chinese mainland specimen having dark reddish-brown carapacial keels, as opposed to the lighter colored Taiwan form intense orange carapace keels (see VETTER & VAN DIJK 2006) and the rather brown specimens from Vietnam and Hainan. The Taiwan and Vietnam specimens are the varieties commonly sold in the Hong Kong pet markets and the Chinese food and pet markets.

This population must be researched further, as the herpetofauna of Lamma Island has been poorly researched in the past and protective measure should be taken. Kadoorie Farms has been informed of this population.

The freshwater parts of Mai Po marshland and the Long Valley wetlands, both in northwestern New Territories, Hong Kong, might be another location, where *Ocadia sinensis* occurs, since suitable habitat exists there and the nearest supposed population is just 20 km away. This needs further research.

### Distribution

*Ocadia sinensis* is said to occur in Guangdong (first reported by GRAY [1856] of probably market origin; first record from Guangdong with a possibly accurate locality data by MELL [1922]), Hainan (first reported by SIEBENROCK 1906), Fujian (first reported by STANLEY 1914) and Guangxi (first report by LIN 1984) provinces, China, in Taiwan (first report by SWINHOE 1863) and in northern (first reported by BOURRET 1939) and central Vietnam (first reported by SIEBENROCK 1903). There are records for Shanghai, Zhejiang (Soochow = Suzhou) and Jiangsu (Hang-

chow = Hangzhou) provinces, China (first reported by STANLEY 1914) but both records are either from markets or are misidentified *Chinemys reevesi* (GRAY, 1831), see MELL (1938). Another record from Jiangxi Province, China by DAVID (1873) could be questionable (at this time known Jiangxi was known as Kiangsi, while Guangxi was known as Kwangsi, so possibly misspelled, but see below), as is DAVID (1873) reporting southwestern China as a part of the distribution area of *Ocadia sinensis*, likely another misidentification. However, ZHONG (2000, 2004) reported the species from the River Panyang near Xinjiang and from the vicinity of Riujin, both southern Jiangxi Province. This report is unverified yet, but if it is true, these would be the first true records from the wild on mainland China, nearly 400 km north of the other reported localities in Guangdong and Fujian Provinces. GEE (1930) adds Korea, without further reference, probably confusing it with *Chinemys reevesii*. GEE (1930) also gives the first report of *Ocadia sinensis* in Hong Kong, but without precise data. IVERSON (1992), JENKINS (1995) and ROGNER (1995) speculate that the species



Fig. 10. Juvenile *Ocadia sinensis* captured in the swamp, central Lamma Island.



Fig. 11. Dorsolateral view of the juvenile in fig. 5.

might occur in Laos, but with no specimen proof yet.

As with most distant past distribution data, these early records were accepted by most subsequent authors without further research: BOETTGER (1888), GEE (1930), FELIX (1965), PETZOLD (1965), PRITCHARD (1979), ZHAO (1986), ERNST & BARBOUR (1989), IVERSON (1992), ZHOU & ZHOU (1992), ZHAO & ADLER (1993), ZHANG *et al.* (1998), ZHAO (1998), ERNST *et al.* (2000), HENDRIE (2000), LAU & SHI (2000), XIE *et al.* (2001), MCCORD & JOSEPH-OUNI (2004), SCHILDE (2004), and VETTER & VAN DIJK (2006).

It is very interesting that *Ocadia sinensis* was well known from Hainan, Vietnam and Taiwan a century ago, but not from Guangdong, Guangxi, Jiangxi or Fujian Provinces, China, with most records from these areas from markets of larger cities only. Especially in Guangxi, where it was first reported (a dead male specimen) in 1984 by LIN, in Wuming near Nanning, the capital of the province and one of the most important reptile trading places at that time and an area where several large

turtle (including *Ocadia sinensis*) breeding farms where started in the early 1980's, its occurrence is very doubtful. Since this first record all following accounts are most probably from the markets of the larger cities of the Province (XIE *et al.* 2001) with no documented sightings of the species in the wild in Guangxi Province. The species has been documented from the wild with proof just from Hainan (POPE in SCHMIDT 1927) Province, China, in most parts of Taiwan (CHEN 1998, CHEN & LIU 1998, 1999) and from Ha Tinh and Thanh Hoa provinces, Vietnam (BOURRET 1941, HENDRIE 2000, pers. comm., ZIEGLER 2002). Reports from Guangdong (MELL 1922, 1938,



Fig. 12. Frontal view of the same specimen as in fig. 5.

GEMA 1989) and Fujian (CHENG & HAN-PO 1965) provinces, China are believed to be authentic records but are not 100 % certain. MELL's record is derived from a sole specimen he received from his Chinese collectors, said to have been captured in a wide mountain stream in the Longtou Shan, east of Shaoguan city, northern Guangdong Province, China. This area is located at rather



Fig. 13. Ventral view of the juvenile in fig. 5, with reddish sediment stained plastron.





Fig. 14. *Ocadia sinensis* and other turtle species for sale in QingPing Market, Guangzhou, Guangdong Province, China.

high elevations, the brook appr. 100 m above sea level running through a 550 m high mountain valley, whereas the other known proven Populations of the species do occur in the lowland. However, this locality would be the nearest to the Jiangxi Reports from ZHONG (2000, 2004) and if one compares the city records from Fujian and Guangdong Province, most of them are close to the central mountainous area, as is this record.

The records provided by GEMA and CHENG & HAN-PO are questionable as well, since it is not clear if they were captured by the authors in the wild or “collected” in a city market, as commonly done by Chinese and western researchers and their hired collectors for publishing new locality data and distribution patterns of many species (e.g. ZHAO 1986, YAO & LIU 1995). These practices led and still lead to much confusion regarding the complex distribution of many Asian Chelonian species.

Considering that this species is presently common in the Chinese pet trade; was rarely offered in the Guangzhou Markets in the early 20<sup>th</sup> century (according to MELL 1938); and is readily bred in many southern Chinese turtle farms, it seems to be fairly unknown from (ZHOU pers. comm., pers. obs.) Guangdong and Guangxi Provinces, mainland China (data provided above). This pattern is similar to *Mauremys mutica* (CANTOR 1842) which seems to show the same distributional gaps (see Fong *et al.* 2007).

This raises the question; does *Ocadia sinensis* naturally occur in Guangdong, Jiangxi, Fujian and especially Guangxi Province? It seems plausible, that *Ocadia sinensis* extended its range (in either direction) from Vietnam to Taiwan (all where it is confirmed to occur in the wild), via Hainan, but does not seem to naturally occur in most of southern Chinese mainland, at least there are no sustainable records from this herpetologically rather well



Fig. 15. *Ocadia sinensis* and *Trachemys scripta elegans* in the temple pond of the *Yuantong Si Buddhist Temple*, Kunming, Yunnan Province, China.



Fig. 16. Breeding pond for *Ocadia sinensis* in a turtle farm in Hainan Province, China.  
Photo: Zhou Ting.



Fig. 17. Dorsolateral view of the adult male *Ocadia sinensis* captured in fig. 8.

researched area. We thus postulate the likely presence of a few radiating populations of *Ocadia sinensis* in Guangdong (if the above records are true) and coastal Fujian provinces, and at the Vietnam-Guangxi province, China border area. The species may also occur in extreme southern Hunan and Jiangxi provinces, China, if the records of MELL (1922) from near Shaoguan, northern Guangdong Province, China, and ZHONG (2000, 2004) from near Xinjiang and Riujin, southern Jiangxi Province, China, are accurate, but then it must probably have different habitat preferences than the other known populations. While ZHONG (2000, 2004) reported the species from Jiangxi, SHEN *et al.* (1998) did not report any specimens of *Ocadia sinensis* from Jiangxi nor Hunan provinces, despite their intense literature and in situ turtle research. It is possible, that *Ocadia sinensis* does not cross the topographic and climatic barrier of the Nan Ling mountain range into

these provinces, as this is the case in *Cuora trifasciata* (see BLANCK *et al.* 2006) and that the findings of ZHONG (2000, 2004), in Jiangxi are further escaped or released specimens, however, since there are two records and not just one, this should be researched.

The climatic zones help to explain why *Ocadia sinensis* seems to reach its northernmost distribution in central Fujian, China, about the same latitude as northern Taiwan and its southernmost distribution in central Annam, Vietnam, mostly along the coast, reaching approx. 200 km inland.

The following theories possibly explain the lack of knowledge of this species from mainland China:

1. *Ocadia sinensis* once inhabited the southern Chinese mainland, but was extirpated in the last century.
2. Being rare at present and occurring at best in fragmented populations throughout

this region, no serious field research exists for this species in China, thus so few reports are available.

3. The species presently is known to occur naturally only in Vietnam, and on the islands of Hainan, Taiwan and likely some areas of Hong Kong. We suspect it inhabited the coastal lowlands of China during the Pleistocene ice age, 1.8 million years ago, at which time the islands mentioned above were connected to the mainland for a few hundred thousand years (STERLING *et al.* 2003). The species eventually disappeared from these mainland habitats due to the rising sea level following the ice ages, with relic populations remaining on the above islands only.

4. If the records of MELL (1922, 1938) and ZHONG (2000, 2004) and some of the localities in the central Fujian and Guangdong Highlands are true, a relic population inhabiting the mountain valleys of this area might be possible, the question is why no museum

specimens are available from this rather well researched area.

#### Habitat

According to the data provided by MELL (1922, 1938), SMITH (1923, 1931), POPE (1935), BOURRET (1939), CHENG & HAN-PO (1965), CHEN & LUE (1998, 1999) and by these authors, *Ocadia sinensis* inhabits shallow, soft bottomed (mud and sand), still or slow moving waters like brooks, streams, small rivers, lakes, ponds, wetlands, marshes and swamps in coastal subtropical lowlands at an elevation of 0-150 m. It also inhabits rice fields (as assumed by ROGNER 1995 and DE BRUIN & ARTNER 1999), canals, reservoirs and catchments (BOURRET 1941, FELIX 1965, PETZOLD 1965, PRITCHARD 1979, KARSEN *et al.* 1986, 1998, ERNST & BARBOUR 1989, ZHOU & ZHOU 1992, ZHANG *et al.* 1998, CHEN *et al.* 2000, ERNST *et al.* 2000, HENDRIE 2000, LAU *et al.* 2000, MCCORD & JOSEPH-OUNI 2004).



Fig. 18. Ventral view of the male *Ocadia sinensis* in fig. 17.

### Vulnerability and Farming

In the early 20<sup>th</sup> century this species was abundant and wide-spread (SMITH 1923, 1931, POPE in SCHMIDT 1927, POPE 1935, BOURRET 1941, FELIX 1965, PETZOLD 1965) in China (at least on Hainan Island), Taiwan and Vietnam. It is now regarded as rare on Hainan Island and in Vietnam (PRITCHARD 1979, ZHAO 1998, DE BRUIN & ARTNER 1999, HENDRIE 2000, ZIEGLER 2002), with only the Taiwan population still seemingly fairly abundant (CHEN 1998, CHEN & LUE 1998, 1999, CHEN *et al.* 2000) while the Chinese mainland populations are still questionable if (still) existent. As with most Asian turtle species, *Ocadia sinensis* is threatened by TCM, human consumption and habitat destruction, moreso in China.

*Ocadia sinensis* is the only Chinese geoemydid species presently found in the ponds of southern Chinese Buddhist temples, as seen by the authors in the last few years in Kunming, Yunnan Province, Guangzhou, Guangdong Province, Wuzhou, Guangxi Province and Lantau, Hong Kong SAR, China, while many other Asian species were reported from the localities until the late 1990's (PETRAS, VALENTIN, pers. comm.).

Presently, *Ocadia sinensis*, *Mauremys mutica* and *Chinemys reevesii*, are the most common geoemydid turtle species found in all observed Chinese TCM and food markets. In a survey of the Guangzhou Qing Ping Market, Guangdong Province, China, in autumn 2005, we estimated appr. 15,000 specimens of these three species present in just one day. Fortunately, an estimated 98 % of these specimens appeared to be captive bred. On another visit to Qing Ping Market in April 2007 this was different however; several hundred large females of seemingly wild origin, many from Vietnam according to morphology were present, easily distinguishable from the fast grown, deformed but intact farm bred specimens. In Kunming's Bird and Flower market, Yunnan Province, China, it is the most common Chinese geo-

emydid species sold; all specimens appeared to be captive bred.

*Ocadia sinensis* is captive bred by the millions in dozens of Chinese turtle farms, the largest of which are in Guangxi, Hunan and Hainan provinces, China (SHI & PARHAM 2001, SHI & FAN 2002, ZHOU *et al.* 2005, pers. obs.). This captive breeding seems to almost satisfy the market demand for now, but will not help to supplement the remaining wild populations, as farmed specimens are of mixed origin and thus not suitable for release. It is unclear as to what extent Chinese farms replenish their breeding colonies with wild-caught specimens, but this is certainly done, which is another major threat to the wild populations.

*Ocadia sinensis* shows geographic variation that should be investigated before the remaining wild populations are gone.

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