

# The Chinese Soft-shelled Turtle *Pelodiscus sinensis* (Testudines: Trionychidae) near the High and Upper Rhine in Germany and Switzerland

Thore Koppetsch<sup>1,2,\*</sup>

Soft-shelled turtles (Trionychidae) comprise 33 species and are distributed from North America to Africa and Asia (Uetz et al., 2021). This ancient and highly aquatic group can be found in freshwater streams, ponds and lakes, as well as brackish waters (with at least a single species, *Trionyx triunguis* (Forskål, 1775), occurring partly in marine habitats of the Levantine Sea (e.g., Taskavak and Akcinar, 2009)), particularly in tropical or subtropical regions. Although not comparable to the occasional presence of leatherback sea turtles *Dermochelys coriacea* (Vandelli, 1761) even above the Arctic circle (Willgohs, 1957), soft-shelled turtles of the genus *Pelodiscus* occur also at high latitudes of temperate regions and can be found in the Amur and Ussuri River basins of south-eastern Siberia in the Russian Far East (Van Dijk et al., 2014). While various representatives of this genus had been assigned to a single taxon, the Chinese soft-shelled turtle *Pelodiscus sinensis* (Wiegmann, 1835), both phylogenetic and taxonomic studies revealed that this complex actually represents seven distinct lineages (Fritz et al., 2010; Stuckas and Fritz, 2011), including *P. maaekii* (Brandt, 1857) showing the northernmost distribution, or the recently discovered and highly endangered *P. variegatus* Farkas et al., 2019 from Vietnam.

Apart from its wide native distribution in East Asia, *P. sinensis* was introduced in numerous other countries – both unintentionally and deliberately. At present, *P. sinensis* can be found in various countries outside its native range and particularly at several locations in the

tropics, such as Brazil, Indonesia, Malaysia, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam, but also in Japan, South Korea, and the USA. The species has been furthermore confirmed to occur on remote islands including Guam, Hawaii, and the Northern Mariana Islands (McKeown and Webb, 1982; Sy et al., 2004; Diesmos et al., 2008; Jensen and Das, 2008; Félix-Silva et al., 2013; Van Dijk et al., 2014; Uetz et al., 2021). These introductions are not primarily associated with the frequent use of *P. sinensis* role as a model organism for developmental, physiological and genetic studies, but are predominantly the result of economical breeding and trade, as this species is a relevant food resource in various Asian countries (Fritz et al., 2010; Gong et al., 2018). A remarkable amount of about 300 million *Pelodiscus* turtles is sold per year in China alone (Shi et al., 2008), highlighting what dimension the trade of the species actually has. In addition, though to a lower extent than in the context of consumption, *P. sinensis* also has gained more and more interest in the pet trade (Goh and O’Riordan, 2007; Gong et al., 2009). However, these turtles cannot be considered as an attractive pet easily to handle due to their comparatively large size that requires appropriate tank volumes, and their aggressive behaviour and tendency to potentially harmful bites. Hence, it is not surprising that numerous unexperienced keepers try to get rid of their grown-up specimens by releasing them – though illegally – into the wild.

During the last years, also in Europe various records of Chinese soft-shelled turtles have been reported, like in the Balkans (Bosnia and Herzegovina, Croatia and Slovenia) (Brejcha et al., 2014), Bucharest in Romania (Iftime and Iftime, 2021), on the Iberian Peninsula (Malkmus, 2006; Garcia-Berthou et al., 2007; Balmori, 2014; Poch et al., 2020), in France (OFB and UICN France, 2021), and even in the Baltic region in Latvia (Pupina and Pupina, 2011, 2016). Also central European records have been made, e.g., in Vienna, Austria or near Diessen and Erfurt, Germany (Gerlach, 1960;

<sup>1</sup> Herpetology Section, Zoologisches Forschungsmuseum Alexander Koenig, Adenauerallee 160, 53113 Bonn, Germany.

<sup>2</sup> Natural History Museum, University of Oslo, P.O. Box 1172 Blindern, 0318 Oslo, Norway.

\* Corresponding author. E-mail: t.koppetsch@leibniz-zfmk.de

Anonymous, 2010; Brejcha et al., 2014). In Switzerland a pet keeper of a large *P. sinensis* got rid of his specimen by transferring it illegally to the Masoala Hall in the zoological garden in Zürich (Anonymous, 2021), and another animal of this species had been released in the wild at the Gübensee, a lake near St. Gallen in north-eastern Switzerland. Its discovery there in autumn 2013 resulted in various capture attempts, that attracted particular attention in the local media (Gadze, 2013), until the specimen was finally relocated from this site. In this study, I report on two additional cases of Chinese soft-shelled turtles introduced into southern Germany and Switzerland (Fig. 1).

The first individual was discovered at the Quellsee (47.5306°N, 7.6190°E), a pond located near Basel city, in the Swiss canton Basel-Landschaft on 23 May 2021. This water body covers an area of about 0,012 km<sup>2</sup> and has a depth of maximally 2.5 m. The pond is connected to the river Birs that is leading to the Rhine. Its shore zone is covered with dense banks of reed (*Phragmites australis*) and canes (*Juncus spp.*). While the presence of introduced red-eared sliders *Trachemys scripta elegans* (Wied-Neuwied, 1838) and the European pond turtle *Emys orbicularis* (Linnaeus, 1758) was already known (Stucki, 2007), I additionally found, apart from several individuals of painted turtles *Chrysemys picta* (Schneider, 1783), a large specimen of *P. sinensis* at the shore of the pond (Fig. 2A). This individual was about

35 cm long (carapace length) and was hiding partly under dead plant material. Interestingly, this specimen was approaching marsh frogs *Pelodytes punctatus* (Pallas, 1771), although this turtle species is known to feed primarily on molluscs in other regions (Works and Olson, 2018). However, when perceiving me observing and starting to take photographs, the turtle immediately fled into the centre of the pond, where it came to the surface again and allowed a clear and unambiguous identification (Fig. 2B).

The second individual was found at a small pond (47.5861°N, 7.6086°E) in a park area (“Dreiländergarten”) in Weil am Rhein, in southern Germany. This water is connected indirectly with the Rhine via a small stream leading to the river Wiese. Here the specimen of *P. sinensis* was observed on 26 and 27 June 2021, while basking in the sun (Fig. 2C). In this shallow and herbaceous water body the following other species of water turtles were present: Red-eared sliders *Trachemys scripta elegans*, yellow-bellied sliders *T. s. scripta* (Schoepf, 1792), painted turtles *Chrysemys picta*, false map turtles *Graptemys pseudogeographica* (Gray, 1831) and a single Chinese stripe-necked turtle *Mauremys sinensis* (Gray, 1870) (Fig. 2D), with the latter species having been only recently reported to overwinter even in Central Europe (Jablonski et al., 2018).

Both locations where Chinese soft-shelled turtles were recorded are separated by a distance of only about 6 km. Regarding the possible invasive potential and impact of *P. sinensis* on the local fauna in this region, it is worth mentioning that both locations are directly or at least indirectly connected to flowing water that would allow dispersal in the drainage area of High and Upper Rhine. Here, and also for other suitable habitats in Western Europe, the subsequent interaction of these large soft-shelled turtles with the native European pond turtle *Emys orbicularis* is not well-understood as well as its potential harmfulness for amphibians and other native water organisms. Their preference for water snails even induced the idea of using *P. sinensis* as a tool for biological controls of the golden apple snail in rice fields (Dong et al., 2012) and at least for the Hawaiian Islands it had been shown that they largely depend on the availability of non-native foods, mainly molluscs (Works and Olson, 2018). However, the impact of these introductions and possible threat of the respective local fauna still remains largely unknown.

The presence of the numerous waters-rich and protected areas with an outstanding biodiversity in



**Figure 1.** Map showing records (black circles) of the Chinese soft-shelled turtle *Pelodiscus sinensis* in Europe (red circle: this study). Map modified after [https://commons.wikimedia.org/wiki/File:Europe\\_laer\\_location\\_map.svg](https://commons.wikimedia.org/wiki/File:Europe_laer_location_map.svg) under CC BY-SA 3.0.



**Figure 2.** Specimen of the Chinese soft-shelled turtle *Pelodiscus sinensis* recorded in a pond near Basel, Switzerland (A) First encounter at the shore (B) Second encounter when approaching the water surface. (C) Habitat of another individual of *P. sinensis* observed in a pond in Weil am Rhein, Germany. (D) A Chinese stripe-necked turtle *Mauremys sinensis* found at the same location. Photos by Thore Koppetsch.

the region of High and Upper Rhine in Germany and Switzerland, e.g., the conservation area and riparian woodlands of the Petite Camargue Alsacienne or the protected areas along the river Wiese, stresses the need to avoid a further dispersal of this species to these sensitive biotopes. Bearing in mind that *P. sinensis* shows one of the broadest climatic suitability outside its native range (Masin et al., 2014) and that it is already considered as a potentially invasive species at least for Germany (Kirschey, 2000), the possibility that Chinese soft-shelled turtles establish and reproduce successfully in this area is not negligible. Due to the fact that even single introductions can result in a long-term presence of these individuals over decades in central Europe (Gerlach, 1960), the probability that these animals accumulate and therefore find suitable reproductive

partners over time is high. In the light of further recently reported introductions of other species of soft-shelled turtles in Europe (e.g., a Florida softshell turtle *Apalone ferox* (Schneider, 1783) released in a pond in Mallorca, Spain) (Serra, 2020), and the wide-spread presence and low-priced offers of juvenile *Pelodiscus* in the pet trade (Kopecký et al., 2013), it has to be plead for a limited trade as well as a responsible treatment and handling of soft-shelled turtle specimens obtained.

**Acknowledgements.** I am grateful to Wolfgang Böhme and Andreas Schmitz for valuable comments on an earlier version of the manuscript, and I am also thankful to the latter for providing a pre-peer review.

## References

- Anonymous (2010): Bissige Wasserschilddröten unterwegs. Available at <https://fischundfang.de/bissige-wasserschilddroeten-unterwegs-13450/>. Accessed on 11 July 2021.
- Anonymous (2021): Turtle Home. Findeltiere. Available at <https://turtlehome.ch/findeltiere/>. Accessed on 11 July 2021.
- Balmori, A. (2014): Utilidad de la legislación sobre especies invasoras para la conservación de las especies de galápagos ibéricos. *Boletín de la Asociación Herpetológica Española* **25**(1): 68–74.
- Brejcha, J., Cizelj, I., Marić, D., Šmid, J., Vamberger, M., Šanda, R. (2014): First records of the soft-shelled turtle, *Pelodiscus sinensis* (Wiegmann, 1834), in the Balkans. *Herpetozoa* **26**: 189–192.
- Diesmos, A.C., Brown, R.M., Alcalá, A.C., Sison, R.V. (2008): Status and distribution of nonmarine turtles of the Philippines. *Chelonian Conservation and Biology* **7**: 157–177.
- Dong, S., Zheng, G., Yu, X., Fu, C. (2012): Biological control of golden apple snail, *Pomacea canaliculata* by Chinese soft-shelled turtle, *Pelodiscus sinensis* in the wild rice, *Zizania latifolia* field. *Scientia Agricola* **69**(2): 142–146.
- Félix-Silva, D., Hernández-Ruz, E.J., Figueiredo M.W., Pezzuti, J.C.B. (2013): Geographic Distribution: *Pelodiscus sinensis* (Chinese softshell turtle). *Herpetological Review* **44**(2): 272.
- Fritz, U., Gong, S., Auer, M., Kuchling, G., Schneeweiß, N., Hundsdoerfer, A.K. (2010): The world's economically most important chelonians represent a diverse species complex (Testudines: Trionychidae: *Pelodiscus*). *Organisms Diversity & Evolution* **10**(3): 227–242.
- Gadze, D. (2013): Ein exotischer Badegast. Available at <https://www.tagblatt.ch/ostschweiz/stgallen-gossau-rorschach/ein-exotischer-badegast-ld.302103>. Accessed on 11 July 2021.
- García-Berthou, E., Boix, D., Clavero, M. (2007): Non-indigenous animal species naturalized in Iberian inland waters. In: *Biological invaders in inland waters: profiles, distribution, and threats*, p. 123–140. Gherardi, F., Ed., Dordrecht, Springer.
- Gerlach, R. (1960): *Salamandrische Welt. Amphibien und Reptilien*. Vienna, Austria, Volksbuchverlag.
- Goh, T.Y., O’Riordan, R.M. (2007): Are tortoises and freshwater turtles still traded illegally as pets in Singapore? *Oryx* **41**(1): 97–100.
- Gong, S.P., Chow, A.T., Fong, J.J., Shi, H.T. (2009): The chelonian trade in the largest pet market in China: scale, scope and impact on turtle conservation. *Oryx* **43**(2): 213–216.
- Gong, S., Vamberger, M., Auer, M., Prashag, P., Fritz, U. (2018): Millennium-old farm breeding of Chinese softshell turtles (*Pelodiscus spp.*) results in massive erosion of biodiversity. *The Science of Nature* **105**(5): 1–10.
- Iftime, A., Iftime, O. (2021): Alien fish, amphibian and reptile species in Romania and their invasive status: a review with new data. *Travaux du Muséum National d’Histoire Naturelle “Grigore Antipa”* **64**: 131–186.
- Jablonski, D., Grul’a, D., Christophoryová, J. (2018): First record of *Mauremys sinensis* (Gray, 1834) and its natural overwintering in Central Europe. *Herpetology Notes* **11**: 949–951.
- Jensen, K.A., Das, I. (2008): Cultural exploitation of freshwater turtles in Sarawak, Malaysian Borneo. *Chelonian Conservation and Biology* **7**: 281–285.
- Kirschey, T. (2000): Das “Neozoen-Problem” aus Sicht des Herpetologischen Artenschutzes. In: *Was macht der Halsbandsittich in der Thujahecke? Zur Problematik von Neophyten und Neozoen und ihrer Bedeutung für den Erhalt der biologischen Vielfalt*, p. 65–72. NABU, Ed., Bonn, Germany, NABU.
- Kopecký, O., Kalous, L., Patoka, J. (2013): Establishment risk from pet-trade freshwater turtles in the European Union. *Knowledge and Management of Aquatic Ecosystems* **410**: 02.
- Malkmus, R. (2006): Aliens auf der Iberischen Halbinsel – eine unterschätzte Bedrohung für die Herpetofauna. *Elaphe* **14**(3): 45–50.
- Masin, S., Bonardi, A., Padoa-Schioppa, E., Bottoni, L., Ficetola, G.F. (2014): Risk of invasion by frequently traded freshwater turtles. *Biological Invasions* **16**(1): 217–231.
- McKeown, S., Webb, R.G. (1982): Softshell Turtles in Hawaii. *Journal of Herpetology* **16**: 107–111.
- OFB and UICN France (2021): *Pelodiscus sinensis*. Base d’information sur les espèces exotiques envahissantes. Centre de ressources Espèces exotiques envahissantes. UICN France et Office français de la biodiversité, Available at <http://especies-exotiques-envahissantes.fr/espece/pelodiscus-sinensis/>. Accessed on 11 July 2021.
- Poch, S., Sunyer, P., Pascual, G., Boix, D., Campos, M., Cruset, E., et al. (2020): Alien chelonians in north-eastern Spain: new distributional data. *The Herpetological Bulletin* **151**: 1–5.
- Pupina, A., Pupins, M. (2016): First records of new aquatic predator *Pelodiscus sinensis* (Wiegmann 1835) in Latvia and preliminary ecological risk assessment of the invasion for autochthonic *Emys orbicularis* (Linnaeus 1758). *Acta Biologica Universitatis Daugavpiliensis* **16**: 61–76.
- Pupins, M., Pupina, A. (2011): First records of 5 allochthonous species and subspecies of Turtles (*Trachemys scripta troostii*, *Mauremys caspica*, *Mauremys rivulata*, *Pelodiscus sinensis*, *Testudo horsfieldii*) and new records of subspecies *Trachemys scripta elegans* in Latvia. *Management of Biological Invasions* **2**(1): 95–107.
- Serra, J.J. (2020): Una intrusa en el campus. Available at <https://www.ultimahora.es/noticias/local/2020/09/04/1193975/intrusa-campus.html>. Accessed on 11 July 2021.
- Shi, H.T., Parham, J.F., Fan, Z.Y., Hong, M.L., Yin, F. (2008): Evidence for the massive scale of turtle farming in China. *Oryx* **42**: 147–150.
- Stuckas, H., Fritz, U. (2011): Identity of *Pelodiscus sinensis* revealed by DNA sequences of an approximately 180-year-old type specimen and a taxonomic reappraisal of *Pelodiscus* species (Testudines: Trionychidae). *Journal of Zoological Systematics and Evolutionary Research* **49**(4): 335–339.
- Stucki, O. (2007): *Strukturen und Funktionen urbaner Kleingewässer um Basel: Quellsee (Brüglinger Ebene) und Étang U (Petite Camargue Alsacienne) als Natur-, Lebens- und Erholungsraum*. Unpublished PhD thesis, University of Basel, Basel, Switzerland.
- Sy E., Farkas B., Buzas B. (2004): The Chinese Softshell Turtle Established in the Philippines? *Turtle and Tortoise Newsletter* **7**: 17–18.

- Taskavak, E., Akcinar, S.C. (2009): Marine records of the Nile soft-shelled turtle, *Trionyx triunguis* from Turkey. *Marine Biodiversity Records* 2: 1–5.
- Uetz, P., Freed, P., Hošek, J. (Eds.) (2021): The Reptile Database. Available at <http://www.reptiledatabase.org>. Accessed on 26 June 2021.
- Van Dijk, P.P., Iverson, J.B., Rhodin, A.G.J., Shaffer, H.B., Bour, R. (2014): Annotated checklist of taxonomy, synonymy, distribution with maps, and conservation status. In: *Turtles of the world. Conservation Biology of Freshwater Turtles and Tortoises: A compilation project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group*, p. 329–479, Rhodin, A.G.J., Pritchard, C.H.P., Van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Iverson, J.B., Mittermeier, R.A., Eds., Lunenburg, USA, Chelonian Research Foundation.
- Willgoos, J.F. (1957): Occurrence of the Leathery Turtle in the Northern North Sea and off Western Norway. *Nature* 179(4551): 163–164.
- Works, A.J., Olson, D.H. (2018): Diets of two nonnative freshwater turtle species (*Trachemys scripta* and *Pelodiscus sinensis*) in Kawai Nui Marsh, Hawaii. *Journal of Herpetology* 52(4): 444–452.