



Chinese stripe-necked turtle (*Mauremys sinensis*)

Early preventive work against Chinese stripe-necked turtles on Réunion Island

Nature Océan Indien

■ NOI is a non-profit for the protection of nature and the environment, founded in 2007. Its main objective is to contribute to gaining knowledge on and to conserving the species and environments of Réunion Island. The association is involved in protecting endemic reptiles and their habitats, notably through efforts to raise awareness.

■ NOI maintains a monitoring group for invasive alien reptiles that aims to:

- detect new introductions to the island and to rapidly set up projects to prevent their spread;
- avoid the spread of invasive alien species already established ;
- gather information on the distribution of certain species about which little is known.

■ The association employs two scientific officers. Contact: Mickaël Sanchez - mickael.sancheznoi@gmail.com

Group for invasive species on Réunion (GEIR)

■ The work group for invasive species is managed by the regional environmental directorate. Its members include an array of institutions, agencies, associations, professionals and contact persons working on invasive species that threaten the natural heritage of the island, the local economy and human health. GEIR works to coordinate local stakeholders, to plan projects and to implement the strategy against invasive species on Réunion in the framework of the operational programme against invasive species.

■ Internet site: <http://www.especesinvasives.re>

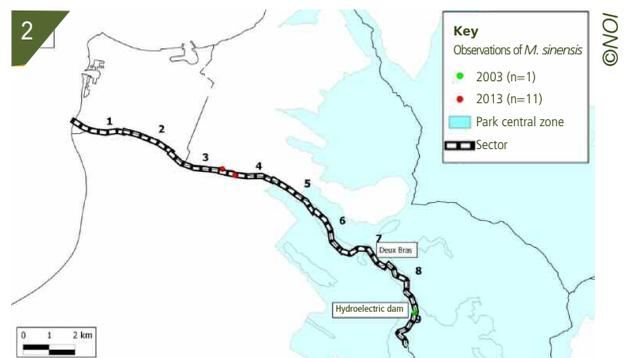
Intervention site

■ Réunion Island is a French overseas department in the Indian Ocean. Together with Maurice and Rodrigues, it forms the Mascarenhas Archipelago.

■ The Chinese stripe-necked turtle was first observed in 2003 in the natural environment of Réunion in the Galets River, downstream of the hydroelectric dam, at the place called Deux-Bras, in the NW section of the island, in the towns of La Possession and Saint-Paul.

■ The Galets River is 35.3 kilometres long, originates in the Mafate natural amphitheatre and forms a border for the towns of Le Port, La Possession and Saint-Paul.

■ In 2013, six juvenile turtles were observed along the river,



1. The study site.
2. Map of the study sectors and sites where turtles have been observed since 2003.

approximately ten kilometres downstream from the point of the initial observation, just upstream of a pool. In that the species has been widely sold as a pet on Réunion, it is probable that at least two adult turtles escaped from a farm and laid eggs at least once in the natural environment.

■ The work presented in this management report was carried out on an 18-km reach of the river, split into nine sectors, each two kilometres long (see Figure 2). The upstream sections of the reach are located in the central zone of the Réunion national park.

Disturbances and issues involved

■ The diversity of natural environments on Réunion is exceptional, with a high level of endemism and fairly well conserved environments, e.g. native vegetation covers 30% of the island surface on average. The island is part of the biodiversity hotspot among the islands in the SW Indian



Ocean. Since its discovery between 900 and 1200, the combined effects of overuse, hunting, opening of land and the introduction of species has resulted in the extinction of many native and endemic species. Réunion is number six worldwide on the list of islands having suffered the greatest number of extinctions.

■ The invasion of natural environments on Réunion by introduced species is seen as the main cause of biodiversity loss. A total of 16 herpetofaunal species out of 19 (12 lizards, 2 ophidians and 2 amphibians, representing 80% of the species on the island) were introduced and subsequently naturalised. One-third of these species were introduced intentionally and 56% accidentally (mainly via maritime channels).

■ The impacts of Chinese stripe-necked turtles have not been documented. The species may compete for habitats and resources with native species (<https://www.business.qld.gov.au/industry/agriculture/species/invasive-animals/prohibited/chinese-stripe-necked-turtle>, Queensland government, 2016). The omnivorous turtles may have an impact on native species in the Galets River, notably on aquatic molluscs, the insect larvae and pupae, crustaceans and fish.



3. A Chinese stripe-necked turtle along the Galets River.

Interventions

■ Observations and initial captures

■ Chinese stripe-necked turtles were first observed on Réunion in 2003 in the Galets Rivers near Deux-Bras. On 15 January 2013, the same observer (E. Hoarau) reported six juvenile turtles upstream from a pool in the Galets River. Surveys, lasting one to three hours, were carried out five times (17 and 24 May, 7, 21 and 28 June 2013), on different tributaries in the same sector, but no turtles were observed.

■ On 13 July 2013, a turtle was glimpsed near a bed of aquatic grass. One week later, the first five juveniles were captured. On 25 July, a new outing was organised and several tributaries along a 3-km stretch were inspected. Six juvenile turtles were captured. On 31 August, two more juvenile turtles were captured.

■ In total, 13 juvenile turtles were captured, measured (length of shell and plastron) and weighed. They were all approximately the same size and weight (36 mm long and 9 g). They were then placed under the custody of an authorised holder. Three turtles died following the captures and were recorded at the National museum of natural history (MNHN-RA 2016.0031 and 2016.0032) and the Museum of natural history in Saint-Denis on Réunion (MHN 2015.7.16).

■ Objective of the interventions

■ The discovery of the juvenile turtles in the natural environment raised numerous questions concerning their origin, species dynamics and distribution on Réunion. The objectives of the early work to prevent their spread were to:

- determine the distribution of the species in the Galets River;
- capture all the observed specimens in order to stop the possible invasion process;
- assess the feasibility of completely removing the species from the river;
- learn where the species came from.

■ Discussions with other stakeholders and partners

■ A planning meeting was held with the regional environmental directorate (a member of GEIR), the Réunion national park and the departmental fishing federation. NOI requested assistance for the work in the field and three official personnel were provided by the national park for one day of surveys. The capture of turtles in the central zone of the park was authorised.

■ Review of the literature prior to the surveys

■ Prior to the field work at the end of the year and to guide the searches for the animals, a review of the literature looked into the biology, ecology and ethology of the species, its sale and its use. Experts were also consulted from the University of Taiwan and the Centre for the observation and protection of turtles and their environments, in France.

■ Field surveys

■ Sectors 3 to 9 were deemed the most important and surveys were carried out in them (see Map 6). Due to a lack of time and resources, sectors 1 and 2 were seen as of secondary importance and were not surveyed. One to six people inspected the left bank tributaries, i.e. those furthest to the south and most exposed to sunlight where the sunbathing sites of the turtles were most likely.

■ At the end of 2013, the sectors were surveyed on 19 and 26 October, 12, 13, 14 and 15 November, and 4 December, for a total of seven days. A careful search was made for the turtles and any indications concerning their presence (partially consumed leaves and plants). The muddy areas with ample vegetation (grass beds, side channels, canals, isolated pools, etc.) were inspected by hand. All observation sites were identified by GPS. To avoid any risk of leptospirosis, the teams wore gloves when searching in muddy areas.

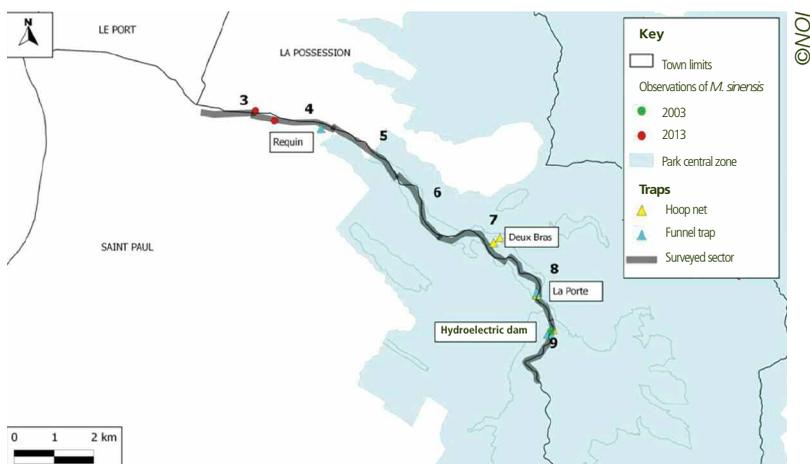
■ Trapping

■ Two types of traps were set up in areas conducive to the species:

- funnel traps;
- hoop nets (Grauvel-type nets, 30 x 60 cm).

■ The traps were laid on 12, 13 and 14 November, near the hydroelectric dam and in three places called “la Porte”, “Deux-Bras” and “Gueule Requins”. Sardines were used as bait.

■ The minimum time during which the traps were left open was 15 hours. On all sites taken together, the hoop nets were open a total of 122 hours and the funnel traps a total of 90 hours.



Map showing the surveyed sectors and the position of traps.



Sites conducive to *M. sinensis* that were investigated.
 4 - A riverbed with aquatic grasses.
 5 - A stagnant section with a mud bottom.
 6 - A swampy area.
 7 - A pool located upstream of the hydroelectric dam.



Results and costs

■ Results

■ No turtles were captured during the time the traps were open. None were observed and no indications of their presence were noted during the surveys.

■ The 13 turtles captured in July 2013 probably came from a single nest hatched in the natural environment. That would imply that there are at least two adult turtles that were not detected. Given the behavioural traits of the species and the large area surveyed, it is possible that a number of turtles were not seen or that they were outside the surveyed area (notably upstream). Turtles may also have been captured by local residents (who reported finding turtles) and poaching is also frequent in the area.

■ The work done did not produce results enabling an assessment of the risks of a long-term establishment of the species on Réunion. The Chinese stripe-necked turtle may be considered an introduced species, but it is not sure that it will become naturalised. Its definitive establishment remains a possibility and long-term monitoring would appear necessary.

■ Assessment

■ Approximately 13 kilometres of river were inspected during the surveys. Depending on the day, between one and six people participated in the work. A total of 26 hours were put into the surveys, including 12 hours for sectors 3 to 5 and 14 hours for sectors 6 to 9. Given the number of people involved, that represented 96 man-hours.

■ The entire operation was funded by the Réunion regional environmental directorate. An NOI employee participated in the surveys, the other participants were volunteers. The volunteers worked for a total of 17 man-days representing an equivalent cost of 2 213 euros (17 days x 130.20 euros). The cost of the work by the three park agents who participated in the surveys for one day is not known and not included in the final budget calculation of the project.

Information on the project

■ Article reporting on the observations on Réunion in the Bulletin Phaethon (published by the local Nature & Patrimoine association).

■ Information on the GEIR internet site:

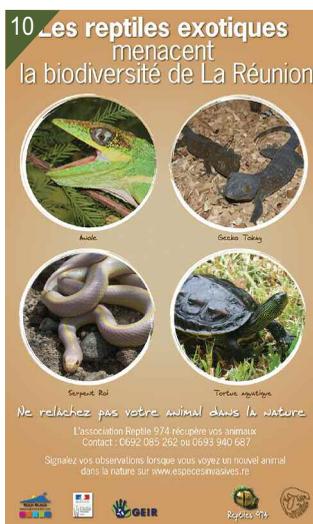
<http://www.especiesinvasives.re/especies-invasives/les-portraits/article/emyde-de-chine>.

■ Newspaper articles and information bulletins.

■ Efforts to raise awareness concerning reptiles introduced to Réunion targeting pet shops and the main association of reptile breeders on the island (publication of a poster).

Outlook

■ The employees of the fishing federation and of the national park keep an eye out for the turtles during their routine inspections of the river. An adult turtle was observed in 2016 in a remote basin (climbing equipment required) located further upstream than the capture sites in 2013. Surveys will be carried out in 2017.



8. A team in the field.

9. Traps used to capture the turtles.

a) Funnel trap.

b) Hoop net.

10. Poster to raise awareness concerning invasive alien reptiles on Réunion.

Item	Item details	Quantity	Unit cost (euros)	Total cost (euros)
Equipment				
Equipment	Bag and field clothing	1	95.60	95.60
	Hoop net	2	–	36.55
	Plastic gloves	8	9.70	100.50
	Scale and field equipment	1	167.40	167.40
Study				
Review of the literature	Rev. of lit. and discussions with experts	3	130.20*	390.60
Field work	Initial visits	6	130.20*	781.20
Data processing	Data processing and analysis	1	130.20*	130.20
Report and publication	Drafting of report	6	130.20*	781.20
GEIR presentation	Presentation to GEIR	1	130.20*	130.20
Project coordination	Project & admin. coordination	2	130.20*	260.40
Mission and overhead costs				
Meals	1 meal per day per person in the field	10	6.00	60.00
Travel costs	Meetings (500 km / week in the field)	531	0.332	176.29
Overhead costs	Overhead costs, 8.5%	–	–	–
Miscellaneous	Printing, etc.	1	79.78	79.78

Summary of costs	
Equipment	400.05
Payroll	2 473.80
Mission and overhead costs	316.07
Subtotal	3 189.92
Volunteer work	2 213.40*
Park agents	NA
TOTAL	5 402.92

* Costs estimated as equivalent to payroll costs for a day of survey work (collective agreement for the sector, coefficient 380).

Table listing project costs.

Regulations

■ No particular prohibitions concern the species on Réunion Island. It is sold in local pet shops (juvenile turtles are sold for 10 to 20 euros).

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This management report was drafted in February 2017 by the work group for biological invasions in aquatic environments, set up by the French biodiversity agency and IUCN France, in addition to those already presented in the second volume of the book titled "Invasive alien species in aquatic environments, Practical knowledge and management insights", in the Knowledge for action series published by the French biodiversity agency. (<http://www.onema.fr/sites/default/files/ENIEV/cat7a-EEE-vol2.html>)



For more information

- NOI internet site: <http://www.nature-ocean-indien.org/>
- GEIR internet site: <http://www.especesinvasives.re/geir/>
- Probst J.-M. & Sanchez M., 2013. L'Émyde de Chine *Mauremys sinensis* (Gray, 1834) (Testudines : *Geoemydidae*), une tortue aquatique naturalisée à La Réunion ? Bulletin Phaethon, 33 : 55-56.
- Sanchez M. et Probst J.-M., 2016. L'herpétofaune alloctone de l'île de La Réunion (Océan Indien) : état des connaissances en 2015. Bull. Soc. Herp. Fr. (2016) : 49-78.
- Sanchez M. et Probst J.-M., 2013. L'Émyde de Chine *Mauremys sinensis* dans la rivière des Galets (île de La Réunion) : compte-rendu des actions de lutte précoce. Rapport Nature Océan Indien. 22 pp + annexes.
- Soubeyran Y., 2008. Espèces exotiques envahissantes dans les collectivités françaises d'outre-mer. État des lieux et recommandations. Collection Planète Nature. Comité français de l'IUCN, Paris, France.