Action Plan for North America

Sustainable Trade in Turtles and Tortoises

Commission for Environmental Cooperation

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Action Plan for North America

Sustainable Trade in Turtles and Tortoises

Wood turtle (*Glyptemys insculpta*)

John Brandauer

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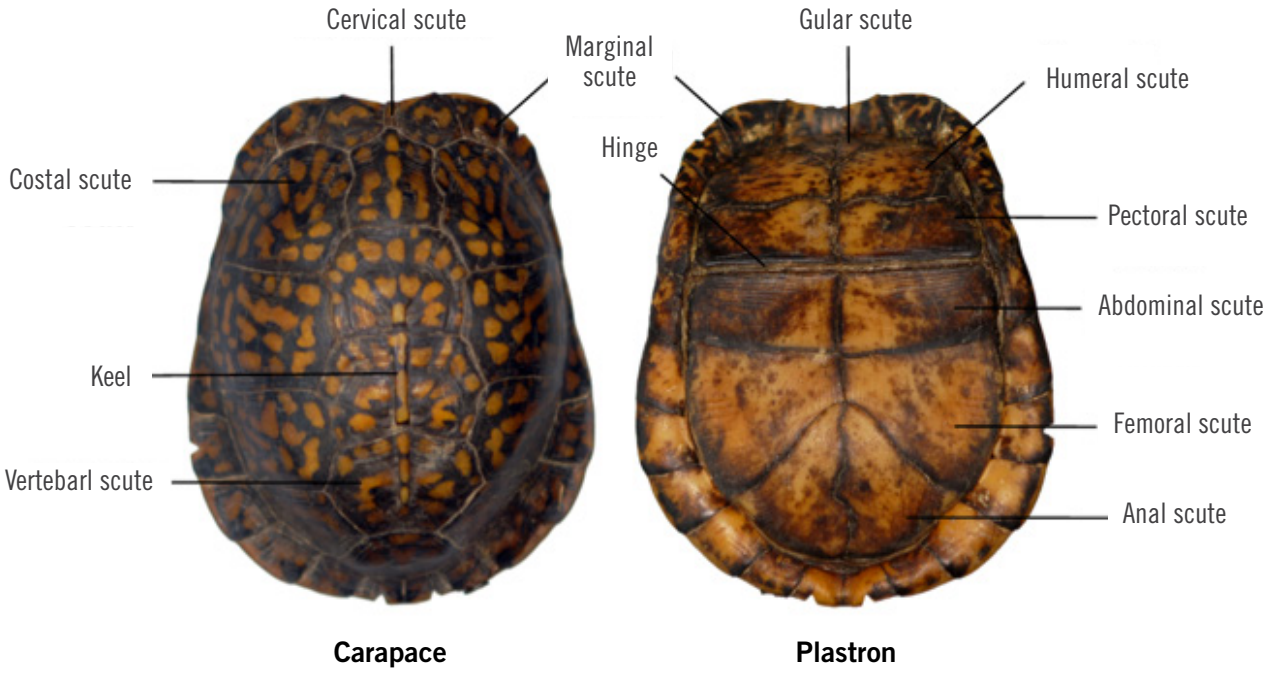
List of Abbreviations and Acronyms

CBSA	Canada Border Services Agency
CEC	Commission for Environmental Cooperation
CFIA	Canadian Food Inspection Agency
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Conabio	*Comisión Nacional para el Conocimiento y Uso de la Biodiversidad* (National Commission for the Knowledge and Use of Biodiversity; Mexico)
Conanp	*Comisión Nacional de Áreas Naturales Protegidas* (National Commission of Natural Protected Areas; Mexico)
CoP	Conference of the Parties (CITES)
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DGVS	*Direccion General de Vida Silvestre* (General Directorate for Wildlife; Mexico)
DNA	deoxyribonucleic acid
ECCC	Environment and Climate Change Canada (formerly Environment Canada)
ESA	Endangered Species Act of 1973 (United States)
EU	European Union
FDA	Food and Drug Administration (United States)
IUCN	International Union for Conservation of Nature
LGVS	*Ley General de Vida Silvestre* (General Wildlife Law; Mexico)
NDF	non-detriment finding
NOM-059	Official Mexican Standard NOM059-SEMARNAT-2010 (Mexico)
PEP	*Program de Especies Prioritarias* (Priority Species Program of Conanp; Mexico)
PIT	Passive Integrated Transponder (tagging system)
Profepa	*Procuraduría Federal de Protección al Ambiente* (Office of the Federal Attorney for Environmental Protection; Mexico)
SARA	Species at Risk Act (Canada)
Semarnat	*Secretaría de Medio Ambiente y Recursos Naturales* (Secretariat of Environment and Natural Resources, Mexico)
SSC	Species Survival Commission of the IUCN
SUMA	*Sistema Nacional de Unidades de Manejo para la Conservación de la Vida Silvestre* (National System of Management Units for the Conservation of Wildlife; Mexico)
TFTSG	Tortoise and Freshwater Turtle Specialist Group of the SSC
TTWG	Turtle Taxonomy Working Group of the TFTSG
UMA	*Unidades de Manejo y Aprovechamiento Sustentable de Vida Silvestre* (Units for Management and Sustainable Exploitation of Wildlife; Mexico)
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
US	United States
USFWS	United States Fish and Wildlife Service
WAPPRIITA	Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act (Canada)
WAPTR	Wild Animal and Plant Trade Regulations (Canada)
WED	Wildlife Enforcement Directorate of ECCC

Figure 1. **Basic anatomy of a turtle shell**



Peter Paul van Dijk

Note: Dorsal (carapace) and ventral (plastron) views of an adult specimen of *Terrapene carolina* with its head, legs and tail withdrawn inside its shell.

Blanding's turtle (*Emydoidea blandingii*)

batwrangler

Abstract

This document is one of a set of five action plans that were prepared as part of a project by the Commission for Environmental Cooperation (CEC) to promote legal, sustainable and traceable trade in selected North American species that are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The five action plans were produced under the guidance of the CITES Authorities of Canada, Mexico and the United States.

Twelve turtle and tortoise species, from seven genera, were selected as "priority turtle species" and are the subject of this action plan. Information was compiled for the species as a group, including: the impact of trade on conservation and livelihoods; completion of CITES non-detriment findings (NDFs); and identification of challenges for CITES enforcement. The 12 species were also assessed as to their distribution, conservation status, trade and commercial value.

A total of 18 recommended actions are proposed to improve cooperation among North American stakeholders; promote research on captive husbandry of *Dermatemys mawii*; develop policy for sustainable commercial turtle production and recovery of wild populations; and develop enforcement capacity-building. These actions were devised based on the information compiled for this document and from consultation with stakeholders.

Executive Summary

This action plan presents 18 recommended actions for promoting sustainable trade in the priority turtle and tortoise species, and provides an overview of the species' distribution, conservation status, and trade, and information relevant to their management. These actions focus on: improving cooperation among North American stakeholders; research on captive husbandry of *Dermatemys mawii* for commercial purpose; developing and implementing policies that promote recovery of wild populations; and building enforcement capacity. The information found in this action plan was compiled via literature review, data analysis and consultation with experts and stakeholders from Canada, Mexico and the United States. A stakeholder workshop was held in Mexico City on 25–26 October 2016.

This action plan is one of a set of five action plans that were prepared as part of a project by the Commission for Environmental Cooperation (CEC) to promote legal, sustainable and traceable trade in selected North American species that are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The five action plans were produced under the guidance of the CITES Authorities of Canada, Mexico and the United States.

Priority Species

Twelve turtle and tortoise species were selected for this project. These priority species include five aquatic or semi-aquatic turtle species (*Clemmys guttata*, *Dermatemys mawii*, *Emydoidea blandingii*, *Glyptemys insculpta* and *Malaclemys terrapin*); four gopher tortoise species (*Gopherus agassizii*, *G. berlandieri*, *G. morafkai*, and *G. polyphemus*); and three box turtle species (*Terrapene carolina*, *T. nelsoni* and *T. ornata*).

Four of these species naturally occur in Canada, ten occur in the United States, and six occur in Mexico. Only *T. carolina* ranges into all three countries.

The global conservation status of the priority species, as assessed by the International Union for Conservation of Nature (IUCN), ranges through Critically Endangered (*D. mawii*); Endangered (*C. guttata*, *E. blandingii* and *G. insculpta*); Vulnerable (*G. agassizii*, *G. polyphemus* and *T. carolina*); Near Threatened (*M. terrapin* and *T. ornata*); Least Concern (*G. berlandieri*); and Data Deficient (*T. nelsoni*). *Gopherus morafkai* has not been assessed on the current IUCN Red List.

In 2014, the Turtle Taxonomy Working Group of the IUCN Tortoise and Freshwater Turtle Specialist Group drafted provisional reassessments of some of the priority species. These reassessments indicate that at the next formal Red List update, the status of *G. agassizii* is likely to be changed to Critically Endangered; *G. polyphemus* to Endangered; *G. morafkai* and *M. terrapin* to Vulnerable; and *G. berlandieri* to Near Threatened.

In Canada, *C. guttata* and the Nova Scotian population of *E. blandingii* are considered Endangered. *Glyptemys insculpta* and the Great Lakes/St. Lawrence population of *E. blandingii* are considered Threatened. These species are protected under provincial legislation throughout their Canadian distribution. *Terrapene carolina* is considered Extirpated.

In Mexico, *D. mawii* is considered Endangered, *G. agassizii* is Threatened, and *T. carolina*, *T. ornata* and *T. nelsoni* are all Subject to Special Protection.

In the United States, *D. mawii* is listed as Endangered and the northern population of *G. agassizii* is listed as Threatened, under the Endangered Species Act (ESA). The southern population of *G. agassizii* (now *G. morafkai*) is listed as Threatened (Similarity of Appearance). The level of state protection for these species varies between jurisdictions. All *Gopherus* species are protected from collection for commercial or personal purposes by the laws of each state in which they range.

Trade Overview

In Canada, the commercial importation of live turtles as pets is prohibited under the Health of Animals Act. Live turtles may be imported into Canada for zoos, scientific and educational purposes, and only with permits issued by Canadian Food Inspection Agency (CFIA). Permits may be issued for importation for personal purposes, but they are usually limited to pets that have been in the possession of their owners for some time before travelling or moving to Canada. Due to the prohibition on imports, the Canadian market for pet turtles has been met through smuggling—primarily from the United States—and captive breeding of animals already in the country. Illegal importation continues and the ancestry of most captive-bred turtles in Canada is likely to trace back to specimens that originally entered the country illegally. Pet turtles in Canada generally sell for much higher prices than in the United States. The higher prices offer an added incentive to smuggle specimens into the country.

Mexico does not appear to be a significant market for most of the priority turtle species, with the exceptions of *D. mawii* and *G. berlandieri*. Both species are native to Mexico, are traded domestically and are exported from Mexico for commercial purposes. Meat from *D. mawii* is in high demand in Mexico and other Central American countries, particularly at Easter time. Because of overhunting, *D. mawii* may be the most endangered turtle species in Mexico. Illegal hunting and trade continues, and populations continue to decline. Registered individuals may legally breed, sell and export *G. berlandieri*, and specimens are readily available for sale in Mexico for pets. Some specimens are offered with documentation to show that they were legally captive-bred, but specimens that were illegally bred or captured in the wild are also available. One Mexican breeder suggested that the sale of illegal tortoises is a huge problem and very difficult to control.

In the United States, the trade in turtles is highly commercialized. Some states allow the collection of wild turtles for domestic and international trade, while captive-breeding operations range from hobbyists to large-scale turtle farming. Regulations governing possession, breeding, and trade of tortoises and freshwater turtles vary by state and species. The US Food and Drug Administration (FDA) prohibits the sale of live turtles with a carapace of less than four inches in length, although smaller turtles may be exported. Larger turtles may be imported and sold. A single farm exists in Maryland that produces large quantities of *M. terrapin*. The other priority turtle species are bred in small-scale ("backyard") facilities and not farmed in large quantities. Captive breeding of *Terrapene* species is commonplace among backyard breeders, but collectively they do not appear to produce great numbers. Captive production of *C. guttata*, *E. blandingii*, and *G. insculpta* appears to be even lower.

Recommended Actions

The following table provides a summary of the actions recommended for promoting the conservation of *Dermatemys mawii* in Mexico, and their legal, sustainable trade of priority turtle and tortoise species throughout North America. Completion of the recommended actions is subject to available funding.

No.	Goals	Actions
1	Ensure that progress on the recommendations in this action plan is reported and measurable.	**Measuring progress**: The governments of Canada, Mexico and the United States should develop and implement a process for tracking and reporting on efforts to fulfill the recommendations of this action plan, such as a dedicated website or other method.
2	Support collaborative North American efforts directed at promoting sustainable, traceable trade and conservation of priority CITES Appendix II species.	(a) **Trinational working group**: The governments of Canada, Mexico and the United States should support and monitor collaborative efforts to promote sustainable, traceable trade and conservation of native species deemed to be of priority concern—including CITES Appendix II turtles and tortoises. (b) **Funding strategy**: The governments of Canada, Mexico and the United States (to the extent possible, and in consideration of domestic priorities) should develop a long-term strategy for funding this action plan, emphasizing realization of the high-priority actions.
3	Support the sustainable trade and conservation of North American turtles by improving collaboration and cooperation between academia, government, industry and nogovernmental organizations; and promoting turtles as a priority for conservation actions.	(a) **Annual Mexican workshop**: The Government of Mexico, in collaboration with Canada and the United States (when appropriate), academia, and nongovernmental organizations (as pertinent), should host an annual workshop that brings together researchers, managers and enforcement staff, to: share information about freshwater turtle and tortoise science and trade; establish research and management goals; establish and revise a priority species list; and develop or revise policy (including NOM-059) for securing turtle conservation. (b) **Priority turtle species field studies**: The governments of Canada, Mexico and the United States, in collaboration with academia and nongovernmental organizations, should conduct field research and surveys of populations of the priority turtle species, to compile a better understanding of populations, threats and other basic aspects of their biology and conservation.

No.	Goals	Actions
4	Promote research on captive husbandry of *Dermatemys mawii*, so as to improve and facilitate initiatives for producing the species for primarily commercial purposes.	(a) ***Dermatemys* farming study**: The Government of Mexico, in collaboration with Central American–range States, academia and nongovernmental organizations, should conduct a study on the feasibility of farming *D. mawii* for commercial meat and/or the pet trade. This should include a review of regulations and the potential impact on in-situ conservation, and analysis of economic prospects and risks. (b) ***Dermatemys* husbandry study**: The Government of Mexico, in collaboration with Central American–range States, academia, nongovernmental organizations, and freshwater turtle breeders, should fund and support husbandry research for *D. mawii*, to determine: optimal incubation practices; stocking densities and pond design; sex identification; growth and feeding rates; waste management; and disease prevention. (c) ***Dermatemys* nesting study**: The Government of Mexico, in collaboration with Central American–range States, academia and nongovernmental organizations, should fund and support research to determine how, when and where adult female *D. mawii* nest in the wild and in captivity. (d) ***Dermatemys* fertility study**: The Government of Mexico, in collaboration with Central American–range States, academia and nongovernmental organizations, should jointly fund and support research to compile information on *D. mawii* fertility and sperm storage.
5	Develop policy and procedures to promote sustainable commercial turtle production in conjunction with the recovery of wild populations.	(a) ***Dermatemys* integrated conservation policy**: The Government of Mexico, in collaboration with academia and nongovernmental organizations, should develop a detailed program for linking commercial farming of *D. mawii* to in-situ conservation, protected area designation and management, enforcement, and possibly population augmentation with captive-bred specimens from the commercial facilities. (b) ***Dermatemys* captive release policy**: The Government of Mexico, in collaboration with academia and nongovernmental organizations, should develop policy and procedures to ensure genetic compatibility, disease-free status, and survival prospects of captive-born *D. mawii* released to the wild. (c) ***Dermatemys* farming policy**: The Government of Mexico, in collaboration with academia and nongovernmental organizations, should develop regulations and procedures to prevent wild specimens of *D. mawii* from being laundered through commercial farms. (d) **Best management practices (BMPs) guidelines**: The USFWS should prioritize completion and distribution of the BMP guidelines on turtle farming that were drafted at the 2011 USFWS workshop.

No.	Goals	Actions
6	Provide enforcement officers with the information and resources necessary to adequately respond to illegal turtle trade and to protect wild turtle populations.	(a) ***Dermatemys* enforcement**: The Government of Mexico should increase funding for and prioritize enforcement activities to protect existing wild *D. mawii* populations and new populations established through captive-release, and to monitor commercial farming operations and specimens in trade. (b) **Turtle trade enforcement workshop**: The governments of Canada, Mexico and the United States, in collaboration with international authorities, academia and nongovernmental organizations, should host a workshop on turtle collection and trade for enforcement officers. This workshop should highlight the problem of illegal turtle collection and trade, and provide training on appropriate investigative and enforcement actions for detecting and responding to illegal trade. (c) **Mexican turtle enforcement policy**: The Government of Mexico should establish policy for disposal of live turtles seized in enforcement actions. Standard operating procedures (SOPs) should be established for releasing specimens or housing them in appropriate facilities. (d) **Photographic identification systems**: The governments of Canada, Mexico and the United States, in collaboration with academia and nongovernmental organizations, should support and fund further development and validation of registration systems to identify and recognize individual specimens of priority turtle species, and should encourage use of the system among authorities, captive-production facilities, and field researchers. Consideration for such systems should include databases for microchips, scute-notching, and photo-identification protocols.
7	Review existing Canadian regulations and policy for importing turtles.	**Canadian regulatory review**: The Government of Canada should review the Health of Animals Act and related policy for importing turtles, and evaluate the current risk for transmitting salmonella from turtles in the pet trade.

Background

In 2015, the governments of Canada, Mexico and the United States initiated a collaborative project through the Commission for Environmental Cooperation (CEC) to strengthen the conservation and sustainable trade of 56 North American taxa that are included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The project, aligned with the CEC strategic priority on sustainable consumption and production, aims to provide guidance in the form of five action plans for reducing illegal and/or unsustainable harvest and trade; improving biological knowledge to allow science-based management decisions; and promoting traceability, species conservation and livelihoods of stakeholders, throughout trade.

CITES came into force in 1975 and calls on the cooperation of the signatory countries to ensure that international trade does not threaten vulnerable specimens of wild animals and plants with extinction, and that trade is regulated and maintained at sustainable levels. To implement CITES, each Party to the Convention must designate one or more Management Authorities in charge of administering the permitting system, and one or more Scientific Authorities to advise them on the effects of trade on the conservation of species. Appendix II of CITES includes more than 34,000 species for which international trade is regulated to avoid over-exploitation and ensure their survival.

Process for Developing this Action Plan

The initial step in developing this action plan was a review of North American species listed in Appendix II of CITES, by the CEC project's Steering Committee, comprising CITES Authorities from Canada, Mexico and the United States. In total, 55 species and one genus were selected as "priority species" for the project. These species were selected because they are all native to North America and traded by more than one of the three North America countries. Furthermore, the Steering Committee determined that regional information exchange and collaboration would facilitate species conservation, CITES implementation, and trade legality, traceability and sustainability. These 56 taxa were organized into five groups: parrots, sharks, tarantulas, timber species (specific cacti and tropical hardwoods), and turtles and tortoises.

Then, a comprehensive review of the 56 taxa was developed to compile information on each species' conservation status, trade dynamics and commercial value. In addition, sustainable-use practices were documented, as was the impact of the species' trade on conservation, and the information needed for making CITES non-detriment findings (NDFs).[1] Species-identification challenges for CITES enforcement were reviewed and opportunities for promoting sustainable trade and conservation were discussed.

On 25–26 October 2016, a stakeholder consultation was held in Mexico City to gather information and recommendations for actions to promote sustainable trade and conservation of the priority turtle species. This document draws on the information from the comprehensive review, at the stakeholder consultation, and consultations with CITES Authorities of Canada, Mexico and the United States.

This action plan includes information on 12 turtle and tortoise species, from seven genera. The information was compiled for the species as a group, and included: the impact of trade on conservation and livelihoods; making CITES non-detriment findings (NDFs); and identification challenges for CITES enforcement. Information on the distribution, conservation status, trade and commercial value of the 12 species was also collected. A total of 18 recommended actions are proposed, to: improve cooperation among North American stakeholders; promote research on captive husbandry of *Dermatemys mawii*; develop policy for sustainable commercial turtle production and recovery of wild populations; and develop enforcement capacity-building. These actions were devised based on the information compiled for this document and from consultation with stakeholders.

1. Articles III and IV of the Convention text state that export permits for species listed in Appendices I and II may only be issued after the Scientific Authority of the exporting country has concluded that the export will not be detrimental to the survival of the species. Such a result from the evaluation process is known as a "non-detriment finding." Resolution Conference 10.3 outlines the role of the Scientific Authority, and Resolution Conference 16.7 provides recommendations for the process of making non-detriment findings (CITES 1973, 1997, 2013).

Overview of the Priority Turtle Species

Of the 12 priority turtle species that were selected for this analysis, four naturally occur in Canada, nine in the United States, and seven in Mexico. Only one species, *Terrapene carolina*, ranges into all three countries.

The priority turtle species may be subdivided into three general groups: freshwater turtles, box turtles and gopher tortoises. Detailed species accounts, which include information on appearance, distribution, conservation status and trade, are provided in the *Priority Turtle Species* section.

Freshwater turtles

These turtles are aquatic or semi-aquatic species represented by *Clemmys guttata*, *Dermatemys mawii*, *Emydoidea blandingii*, *Glyptemys insculpta* and *Malaclemys terrapin*

Clemmys guttata and *E. blandingii* generally inhabit small-sized, shallow, densely vegetated wetlands, swamps and marshes, while *G. insculpta* primarily occurs in and near fast-flowing streams in hilly areas; all three occur in Canada and the United States, but not Mexico. *M. terrapin* is unique among turtles in being an inhabitant of tidal saltmarshes and other brackish-water estuarine and lagoon habitats; it is restricted to the United States and Bermuda. These four species are members of the family *Emydidae*.

Dermatemys mawi is the only living member of the family *Dermatemydidae*, and is native to Mexico (and Belize and Guatemala), where it may be found in large permanent lowland waterbodies such as rivers, lagoons and lakes. It does not occur in Canada or the United States (TFTSG 2016b; van Dijk 2016a; van Dijk and Harding 2016; van Dijk and Rhodin 2016; Vogt et al. 2016).

Gopher tortoises

Gopher tortoises are completely terrestrial species. *Gopherus berlandieri* is native to both Mexico and the United States, and *G. polyphemus* is endemic to the United States (Tortoise and Freshwater Turtle Specialist Group 1996a). In July 2011, researchers split *G. agassizii* into two species, *G. agassizii* and *G. morafkai*. This reduced the distribution of *G. agassizii* to 30% of its former range, and it is now considered endemic to the Mojave Desert of the United States (Murphy et al. 2011). *Gopherus morafkai* inhabits the Sonoran Desert of Mexico and the United States, and areas further south. In 2016, researchers split *G. morafkai* into two species: *G. morafkai* and *G. evgoodei* (Edwards et al. 2016). *Gopherus evgoodei* has not yet been considered for recognition as valid for the purposes of CITES.

Box turtles

Box turtles are terrestrial members of the family *Emydidae*, and are in the genus *Terrapene*. There are four species, three of which are included in the list of priority species: *T. carolina*, *T. nelsoni* and *T. ornata*.

Terrapene carolina is the only priority turtle species that is distributed in all three countries. The taxonomy of the *T. carolina* group is dynamic, with several research results recommending recognition of the isolated Mexican subspecies *T. carolina mexicana* and *T.c. yucatana*, as independent species, while other studies argue for continued subspecies status (TTWG 2014). *Terrapene ornata* is naturally found in both Mexico and the United States, while *T. nelsoni* is endemic to Mexico (TFTSG 2016c, d).

North American Government Authorities and Legislation

This section provides a short overview of the national laws and regulations that are specifically referenced in this document, along with a review of the government agencies or departments that are charged with their implementation.

Canada

Under Canada's Constitution, the provinces and territories have jurisdiction over wildlife within their borders, and the federal government has jurisdiction over coastal and inland fisheries, wildlife on federal land, and migratory birds. The federal government also has jurisdiction over international and interprovincial trade (Canada 1867). Hence, the management and conservation of native turtle species is the responsibility of the provinces, and CITES implementation is the responsibility of the federal government.[2]

Environment and Climate Change Canada (ECCC) is the lead federal department for implementing CITES in Canada—including issuing permits, making non-detriment (and other) findings, and enforcement.

Border enforcement of CITES is the responsibility of the Wildlife Enforcement Directorate (WED) of ECCC under the authority of the Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act (WAPPRIITA) and the Wild Animal and Plant Trade Regulations (WAPTR). WED works in collaboration with the Canada Border Services Agency (CBSA).

The purpose of WAPPRIITA is to protect species of animals and plants by implementing CITES and regulating the species' international and interprovincial trade, responsibilities which include the following (Canada 1992):

- Prohibition of the import and export of CITES specimens except with a permit or where permitted by the regulations.
- Prohibition of the importation of an animal or plant that was taken in contravention of any foreign law.
- Prohibition of the possession of specimens which have been imported in contravention of the legislation.

WAPTR provides specific definitions, interpretations and exceptions that are necessary for implementing WAPPRIITA (Environment Canada 2003). The species of animals and plants that are listed in the Appendices of CITES are compiled in Schedule 1 of WAPTR (Canada 1996). Schedule 1 must be amended after any change to the CITES Appendices in order for the provisions of WAPPRITTA to apply to the change.

The importation of turtles is also regulated under the Health of Animals Act and the Health of Animals Regulations, which are implemented by the Canadian Food Inspection Agency (CFIA) (Canada 1990). The purpose of the Health of Animals Act is to control diseases and toxic substances that may affect animals and/or be transmitted from animals to humans. The Health of Animals Act prohibits the importation of animals (or anything else) into Canada, as necessary, to prevent diseases or toxic substances from being introduced into or spread within the country (Canada 1990; CFIA 2011). The Health of Animals Regulations implement the Health of Animals Act (Canada 2015; CFIA 2011).

The commercial importation of live turtles as pets is prohibited under the Health of Animals Act. Live turtles may be imported into Canada for zoos, and scientific and educational purposes, and only with permits issued by CFIA. Permits may also be issued for importation for personal purposes, but they are usually limited to pets that have been in the possession of their owners for some time before travelling or moving to Canada (CFIA, in litt.).

Native species of turtles may be afforded additional protection via the Species at Risk Act (SARA). The purpose of SARA is to conserve Canadian wildlife species

2. There are no species of turtles native to any of Canada's territories.

U.S. Fish and Wildlife

Gopher tortoise (*Gopherus polyphemus*)

and to facilitate the recovery of threatened, endangered or extirpated species (Environment Canada 2013). The status of species of concern is based on assessments provided by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a committee of experts that determines the Canadian national status of native wildlife (including animals, plants, mosses and lichens) that may be at risk of extinction or extirpation. COSEWIC assessments incorporate science, and Aboriginal and community knowledge. The Committee meets on an annual basis (COSEWIC 2009).

COSEWIC's wildlife species assessments are taken into consideration by the Government of Canada when establishing the Legal List of Species at Risk. The species that are subject to the provisions of SARA are listed on Schedule I of the Act. If a turtle species is listed under SARA as "Extirpated," "Endangered" or "Threatened," then ECCC must prepare a strategy for its recovery.[3] If a species is listed as "Special Concern," ECCC must prepare a management plan containing measures for the conservation of the species and its habitat (Canada 2002; Ecojustice 2012).

Mexico

The Secretariat of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat) is responsible for protecting, restoring, and conserving the ecosystems, natural resources and assets of Mexico; it is also responsible for promoting sustainable development. Semarnat is ultimately responsible for

3. A recovery strategy identifies the broad policies and approaches needed to reverse the population decline of a species (Fisheries and Oceans Canada 2011).

conserving native species and for implementing CITES (Reuter, in litt.; Semarnat 2017).

Semarnat meets its mandate through the activities of a number of sub-entities within the Secretariat, including the following (Reuter, in litt.):

- The General Directorate for Wildlife (*Direccion General de Vida Silvestre*—DGVS).
- The National Commission for the Knowledge and Use of Biodiversity (*Comisión Nacional para el Conocimiento y Uso de la Biodiversidad*—Conabio).
- The Office of the Federal Attorney for Environmental Protection (*La Procuraduría Federal de Protección al Ambiente*—Profepa).
- The National Commission of Natural Protected Areas (*Comisión Nacional de Áreas Naturales Protegidas*—Conanp).

DGVS is responsible for the management of wildlife in the country and the implementation of the General Wildlife Law (*Ley General de Vida Silvestre*—LGVS) In addition, DGVS acts as the CITES Management Authority in Mexico and is responsible for issuing permits, keeping records and liaising with the CITES Secretariat. DGVS also manages the National System of Management Units for the Conservation of Wildlife (*Sistema Nacional de Unidades de Manejo para la Conservación de la Vida Silvestre*—SUMA), which includes the approval of plans for the Units for Management and Sustainable Exploitation of Wildlife (*Unidades de Manejo y Aprovechamiento Sustentable de Vida Silvestre*—UMA). The purposes of UMA are the restoration, protection, maintenance, recovery, reproduction, repopulation, reintroduction, and rehabilitation of wildlife; its sustainable use, recreational use and exhibition; and environmental education of the public (DOF 2000). Furthermore, DGVS can authorize the release of wildlife back into the wild, when appropriate. (Camarena Osorno; Reuter, in litt.).

Conabio is responsible for promoting, coordinating, supporting and implementing activities to improve the knowledge of biological diversity, its conservation and its sustainable use. Conabio serves as the CITES Scientific Authority in Mexico and is responsible for making non-detriment findings (NDFs) (Camarena Osorno; Reuter, in litt.).

Profepa is a decentralized administrative body of Semarnat that has technical and operational autonomy. Profepa was created to respond to and control environmental deterioration. One of Profepa's primary tasks is to enforce compliance with environmental regulations. It is also responsible for enforcing CITES in Mexico under, the authority of the LGVS (Camarena Osorno; Reuter, in litt.).

Conanp is responsible for conserving species considered at risk under its Priority Species Program (*Program de Especies Prioritarias*—PEP) (Reuter, in litt.), and for managing 176 federally protected natural areas—including national parks, biosphere reserves, nature sanctuaries and natural monuments (Semarnat 2012).

The LGVS regulates the sustainable use, conservation and management of native wild animals and plants. It regulates the protection of species or populations that are at risk, including both terrestrial and aquatic species (DOF 2000; Linder and Kaplan 1952; Mexico 2016). The LGVS establishes the national policy for wildlife protection and sustainable use, via the SUMA program and the Official Mexican Standard NOM059-SEMARNAT-2010 (NOM-059) on Mexican species at risk. In addition, the LGVS regulates the creation of UMAs.

Article 55 of the LGVS implements CITES in Mexico. The LGVS also includes some provisions that are stricter than are required by the Convention.

The Regulations of the LGVS (*Reglamento de la Ley General de Vida Silvestre*—RLGVS) enable and implement the LGVS and provide the essential requirements for the integration of SUMA and the inclusion, establishment, management and operation of the UMAs (DOF 2014).

NOM-059 is the "reference instrument" of the LGVS. It defines the criteria that must be met for a species to be considered "at risk," provides the criteria for reviewing the conservation status of native Mexican terrestrial and aquatic species of animals and plants, and categorizes those species that require special protection (DOF 2010). The exploitation of NOM-059 species is allowed only under a UMA framework, and hence a management plan approved by DGVS (Camarena Osorno, in litt.).

NOM-059 establishes four risk categories: Probably Extinct (in the wild), Endangered, Threatened, and Subject to Special Protection (DOF 2010). These categories are defined in Appendix A of this report.

The United States

In the United States, the management of native fish and wildlife, including turtles, is primarily the responsibility of the individual states. This includes regulating collection, intrastate movement, and possession (Nanjappa and Conrad 2011). The federal government has jurisdiction over import and export and the management of turtle populations on federal lands, and under the provisions of section 8A of the Endangered Species Act of 1973 (ESA) (USA 1973) is responsible for implementing the provisions of CITES. The US Fish and Wildlife Service (USFWS) is the federal agency responsible for implementation of CITES—including permit issuance, completing NDFs and other findings, and enforcement.

The goal of the ESA is to conserve endangered or threatened species throughout all (or a significant portion) of their range. This includes the conservation of the ecosystems on which these species depend (NOAA 2015). Under the ESA, species listed as Endangered (with limited exceptions) may not be imported or exported, possessed, sold or transported. They may not be taken within the United States or on the high seas (USA 1973). Generally, these same prohibitions and exceptions also apply to species listed as Threatened. However, for some species designated as Threatened, a special rule may be implemented which provides prohibitions and exceptions that are tailored to the conservation needs of the particular species (USA 1971). Not all CITES-listed species are also ESA-listed, and not all ESA-listed species are afforded protection under CITES.

All fish or wildlife that are imported into or exported from the United States must be declared to the USFWS via a special form (USFWS FORM 3-177).[4]

In addition, wildlife may normally only be imported or exported through specifically designated ports (USFWS 2016b). Failure to comply with these requirements is a violation of the ESA and its implementing regulations.

In addition to the ESA, the Lacey Act makes it illegal to import, export, transport, sell, receive, acquire, or purchase, in interstate or foreign commerce, any fish or wildlife that was taken, possessed, transported, or sold in violation of any foreign law. The Lacey Act also prohibits the import, export, transport, sale, receipt, acquisition or purchase, in interstate or foreign commerce, of any plant taken, possessed, transported or sold in violation of any foreign law that protects plants or that regulates certain activities associated with those plants (Cornell 2017). Importing turtles into the United States that were taken or exported in violation of a foreign law would be a violation of the Lacey Act (USA 1900, 1981; USFWS 2015b).

Peter Paul van Dijk

Eastern box turtle (*Terrapene carolina*)

Domestic trade in turtles is also regulated in the United States. Since 1975, the US Food and Drug Administration (FDA) has prohibited the domestic sale of live turtles that have a carapace length of less than 4 inches, and viable turtle eggs. Exceptions may be made for scientific, educational, or exhibition purposes (CFR 2015).

4. "Fish or wildlife" is defined in section 3 of the ESA as any member of the animal kingdom, including any parts, products, eggs, or offspring, and including dead bodies or parts (USA 1973).

Trade in Priority Turtle Species

This section provides an overview of the impact of trade in priority turtle species on conservation and livelihoods. The North American trade in priority turtle species primarily involves live animals. The dynamics of that trade are somewhat different in the three countries, and vary between the different species.

Canada

Prior to 1975, hatchling red-eared slider turtles (*Trachemys scripta elegans*) were imported in large numbers from the United States and were available in most pet shops across the country. By the mid-1960s, medical professionals became concerned about the popularity of pet turtles and their role in outbreaks of salmonellosis in children (Altman et al. 1972; Lamm et al. 1972; Rosenstein et al. 1965; Williams and Helsdon 1965).[5] In 1975, Agriculture Canada responded to this concern by introducing regulations that prohibited the importation of live turtles into Canada (D'Aoust and Lior 1978).

The commercial importation of live turtles as pets is prohibited under the Health of Animals Act. Hence, since commercial import was ended in 1975, the Canadian market for pet turtles has been met through smuggling—primarily from the United States—and through captive breeding from "legacy" specimens within Canada (Cooper, pers. obs.). Illegal importation continues and the ancestry of most captive-bred turtles in Canada is likely to trace back to specimens that originally entered the country illegally.[6] Pet turtles are available for sale in Canada, but generally at much higher prices than in the United States. The higher prices commanded for live turtles in Canada provide an added incentive to smuggle specimens into the country.

Mexico

For more than 30 years, Mexico was a significant market for farmed hatchling turtles exported from the United States (Boudreaux, pers. comm.). Prior to 2014, Mexico annually imported about 2 million hatchling *T. s. elegans* (red-eared sliders) from Louisiana breeders (Boudreaux, in litt.). This comprised approximately 11% of all US turtle exports (Senneke 2006). In September 2014, Mexico prohibited the importation of that species. Currently Mexico imports approximately 20,000 baby turtles of other (sub) species from Louisiana turtle farms (Boudreaux, in litt.).

Mexico does not appear to be a significant market for most of the priority turtle species. No imports of priority species into Mexico were recorded during 2009–2014, and almost none of these species was found to be advertised for sale in the country. The two exceptions were *D. mawii* and *G. berlandieri*, both of which are native and traded domestically and exported from Mexico for commercial purposes.

As a result of overhunting, *D. mawii* may be the most endangered turtle species in Mexico (Vogt et al. 2016). The species is protected, but illegal offtake and trade continues, and populations continue to decline (Barcenas Garcia 2016).

Unlike the other priority turtle species, which are traded as pets, *D. mawii* is primarily traded for its meat. The species is a gut-fermenting vegetarian, meaning it can eat fallen leaves or other lignin-type vegetarian debris and obtain necessary nutrients and energy. It also has morphological adaptations (pharyngeal papillae) to absorb oxygen directly from the water, and does not need to expend energy swimming to the surface to breathe. Because of its diet and sedentary lifestyle, its meat is white and odorless (Vogt, pers. comm.). Meat from the species is in high demand in Mexico and other Central American countries

5. *Salmonella* bacteria have been found in the guts of all species of reptiles that have been investigated, including turtles and tortoises. The bacteria are shed in the feces of these animals. Transmission to humans may occur via handling of a reptile, an object contaminated by a reptile (e.g., its cage or dishes), its feces, or contaminated food or water, including the water in which freshwater turtles swim. Anyone who handles a reptile or potentially contaminated items should thoroughly wash their hands. Children under 5 years of age and people with compromised immune systems should not be in contact with reptiles (IICAB 2013).
6. See, for example, the case of Kai Xu, arrested while attempting to cross the land border between Detroit, Michigan (US), and Windsor, Ontario (Canada), with 51 live freshwater turtles of four species concealed in baggy sweat pants and other garments worn by the traveler (CBC 2015). Another recent example involved Dong Yan, who was convicted in February 2016 of illegally importing 38 turtles of five species by strapping them to his person (Canada 2016).

(Vogt et al. 2016), particularly at Easter time. In Mexico, meat of illegally taken *D. mawii* sells for approximately US$23 per kilogram (P.P. van Dijk, unpubl. data).

A few hatchling *D. mawii* enter the global pet trade, although they appear only rarely. In Japan, they reputedly sell for hundreds of dollars each (P.P. van Dijk, unpubl. data). Specimens have reportedly been offered for sale on Japanese Internet auction sites for as much as US$2,250 (ATPTF 2011). An Internet search found one young specimen (14 centimeters) advertised by a German seller for US$550 (Terraristik 2016). Surprisingly, a Mexican advertisement from 2014 was also found that offered *D. mawii* for sale, but no price was given (QueBarato! 2014).

Live specimens of *G. berlandieri* are also readily available for sale in Mexico for pets. Individuals who have registered UMAs for *G. berlandieri* may legally breed, sell and export the species. One Mexican breeder reported that he has approximately 20 breeding *G. berlandieri*, and produces 100 to 180 hatchlings per year, depending on the amount of rain and temperatures. He sells tortoises domestically across the country, and has exported to China, Germany, Japan, Spain and the United States (Garza Ortiz, pers. comm.).

A search of Mexican Internet classified advertisements found numerous offers of live *G. berlandieri* for sale. Some ads offered documentation to show that the specimens for sale were legally captive-bred. Other ads made no such claim (Todoclasificados 2016). The prices for the tortoises ranged from US$20 to US$215, and tended to be much higher for specimens that came with documentation. It is possible that some of these specimens were illegally bred or captured in the wild. One Mexican breeder suggested that the sale of illegal tortoises is a huge problem, and very difficult to control. He notes that Internet ads from many people in different parts of Mexico offer tortoises for sale without any legal documents (Garza Ortiz, pers. comm.).

United States

In the United States, unlike Canada or Mexico, the trade in turtles is highly commercialized. Some states allow the collection of wild turtles for domestic and international trade, while captive-breeding operations range from hobbyists to large-scale turtle farming. Turtle collection and production serves a variety of trade and consumer demands, both domestic and abroad, including use as pets, for consumption, for medicinal and educational purposes, and to supply breeding and rearing farms and facilities.

The take of turtles from the wild is regulated independently by the individual US states in which turtles are found. Some states allow the collection, trade, and export of certain species, while others do not. Thousands of *T. carolina* and *T. ornata* are collected from the wild every year for personal use (and in some instances the domestic pet trade) primarily from South Carolina and possibly from New Mexico. *Terrapene* species are protected from commercial offtake throughout the other states in which they occur, but many allow their capture and possession for personal use. *Malaclemys terrapin* may be commercially taken in Louisiana and New York, while the New Jersey commercial offtake was closed in the summer of 2016. Capture for commercial purposes is not allowed for *C. guttata, E. blandingii,* or *G. insculpta* anywhere in the United States. Collection and possession for personal purposes is permitted in a range of states for each of these species (Nanjappa and Conrad 2011).

Regulations governing possession, breeding, and trade of tortoises and freshwater turtles vary by state and species. An overview is provided by Nanjappa and Conrad (2011).

In 1975, the US Food and Drug Administration (FDA) imposed regulations aimed at reducing the risk of turtle-associated salmonellosis in children. In order to minimize the risk of salmonella transmission to children, without closing down a domestic industry, the FDA prohibited the sale of live turtles with a carapace of less than four inches in length (CFR 2015). Turtles under four inches may be exported, but they cannot be sold domestically as pets. Larger turtles may be imported and sold.

In response to the FDA regulations, some commercial farmers grow out their hatchlings to four-inch size before selling them into the wholesale trade, from where they may be distributed to chain pet stores and other retailers for unrestricted sale to the public. An exemption to the size restriction is permitted for hatchlings sold for scientific, exhibition or educational purposes. Prospective buyers may be advised, for example, to keep track of monthly growth increments, which is claimed to be sufficient to qualify as an educational purpose (van Dijk, unpubl. data).

As noted previously, gopher tortoises are protected by state law throughout their US distribution, and two species (*G. agassizii* and *G. polyphemus*) are federally listed

Andrea Izzotti

Diamondback terrapin (*Malaclemys terrapin*)

under the ESA. The combination of state and federal laws, as well as conditions imposed by State or other authorities, means it is illegal in the United States to collect, commercially breed, or trade these species in most circumstances. It is possible, however, for qualified members of the public to adopt *Gopherus* tortoises that have been rescued and cannot be returned to the wild. These adoptions are made on the conditions that the specimens be kept strictly confined to the owner's premises, and not be bred or traded (van Dijk, pers. obs).

There may be some underground trading or laundering of wild-collected *Gopherus* specimens. Considering the availability of legal animals for adoption and the legal ramifications of being caught with an illegal specimen, the incentive for intentional illegal possession and trade of the *Gopherus* tortoises may be low in the United States. Moreover, these species demand relatively high husbandry skills for their captive care, require comparatively large enclosures as adults and have a mundane appearance in comparison to other, legally available, tortoise species. These factors reduce their desirability for hobbyists. Correspondingly, based on discussions and "wanted" postings on reptile trading bulletin boards, the demand for the *Gopherus* specimens among tortoise hobbyists worldwide appears to be comparatively low (van Dijk, unpubl. data).

Trade and Conservation

Experience in Asia since the 1990s has found that unmanaged and unregulated collection of wild tortoises or freshwater turtles can bring populations to collapse within three to five years. Once market demand has been established, a collapsed wild population will likely lead to the exploitation of new populations elsewhere in the same country, in other countries, or on other continents. This trend has been observed in Asia and elsewhere (TFTSG 2011; van Dijk et al. 2000). The Tortoise and Freshwater Turtle Specialist Group (2011) documented that turtle exports from the United States increased steeply at the same time that Asian turtle populations were depleted and protected. Correspondingly, the numbers of tortoises and freshwater turtles exported from Africa appear to have increased sharply in recent years (van Dijk, unpubl. data).

Legal trade may facilitate illegal trade in look-alike species which may be rarer, more valuable, and/or more sensitive to exploitation impacts. Similarly, trade in legally produced specimens from captive breeding facilities may enable "laundering" of wild-sourced specimens claimed to be captive-bred. These issues are explored in detail in the evaluation of illegal turtle trade in Annex II of CoP17 Doc. 73: Tortoises And Freshwater Turtles (Testudines Spp.) (CITES 2016b).

The positive effects of trade in tortoises and freshwater turtles are more difficult to quantify. They presumably include increased public awareness and concern for turtles because of contact with turtles as pets, at exhibits and as articles of consumption. Public awareness is assumed, though not proven, to translate to direct and indirect support for turtle conservation.

It is broadly accepted that ranching and other management programs that regulate the commercial harvest of wild crocodilians have led to the recovery of depleted populations in some countries (e.g., *Alligator mississippiensis* in the United States, *Crocodylus porosus* in Australia). In contrast, no examples are available for similar commerce-driven programs that have improved the conservation outlook for turtle species or populations. However, such improvements could possibly be achieved through carefully designed and implemented management measures (van Dijk, pers. obs.).

Potentially, local turtle populations could become sources of long-term sustainable income by the exploitation of a small portion of the annual hatchling production or overall population. This could be subject to community management, to provide additional conservation and protection to the core breeding population. An example of this management approach is the sustainable use of *Podocnemis unifilis* in Peru (CITES 2014, 2015).

Closed-cycle captive breeding can presumably reduce consumer demand on wild populations by providing a sustainably produced alternative supply. Captive breeding could also provide specimens for restoring or augmenting depleted wild populations (subject to adequate safeguards). Conversely, captive breeding facilities could also "launder" wild-caught animals as captive-bred, or breed illegally caught adults and claim their offspring are descended from legally held adults. Potentially, captive breeding could also increase the consumer demand for a species. For these reasons, a system is needed for registering the unique markings of individual specimens of adult breeding animals and their offspring (van Dijk, pers. obs.). A number of marking systems have been used to uniquely identify individual turtle specimens, including shell notching (Cagle 1939), shell engraving and tattooing (John and Shepherd 2014), microchipping (Gibbons and Andrews 2004), and photo-documentation (Bender 2001). DNA parentage analysis is likely to become affordable and thus widespread in the future. Currently, the repositories where such information is stored are scattered, sometimes poorly curated, and usually not easily accessible by law enforcement officers. Thus, there is no easy way to identify the origins of specimens in trade that bear markings or carry microchips (van Dijk, pers. obs.).

Trade and Livelihoods

Canada

There are no large-scale turtle farms in Canada. Captive-bred turtles are produced by hobbyists and/or reptile breeders who work with numerous different types of reptiles. Given the relatively small market for turtles in Canada, and the expense of heating the enclosures for large numbers of reptiles, it is not economically feasible to make a living by solely breeding turtles in Canada (Cooper, pers. obs.).

Captive-bred turtles may be sold to new owners directly by the breeder, or may be sold to a pet shop or a dealer, who then markets and re-sells them. It is likely that some illegally collected or imported specimens are laundered as specimens that were claimed to have been captive-bred in Canada.

Mexico

Captive breeding of native wild species is legal in Mexico, through the UMA program. Approximately 20 UMAs in Mexico have registered captive-breeding facilities for tortoises or freshwater turtles (Camarena Osorno, in litt.). These UMAs collectively involve 12 species of tortoises and freshwater turtles, including two UMAs managing *D. mawii*, six holding *G. agassizii* (or *G. morafkai* and/or *G. evgoodei*), and two holding *G. berlandieri*. None of the UMAs was registered for more than one priority turtle species.

The captive breeding of *D. mawii* in Mexico offers the potential for sustainable and economically valuable turtle production that also benefits conservation. The meat of this species is in great demand for human consumption due to its delicate taste. There is an existing consumer market that is willing to spend significant money for it. The pet market for the species is relatively limited. Nonetheless, this species sells for high prices in the international pet trade—although this is likely a function of rarity rather than broad demand.

Most turtle species grow slowly, but specimens of *D. mawii* grow comparatively quickly: from a hatchling to a 10-kilogram adult in about 10 years or less. Mature females can produce up to 50 eggs per year. A turtle farm in Nacajuca, near Villahermosa, Tabasco, was established in 1978 to investigate the captive production of *Dermatemys*, using 55 adult specimens confiscated from illegal trade. By 2006, the captive population had increased to over 1,000 animals, of which over 90% had been hatched and reared at the facility. Most of the original founder stock was still alive and present (Legler and Vogt 2013). Evidently, it is possible to produce the species in captivity in significant quantities. However, there is still little understanding of how, when and where *Dermatemys* nest, and the optimal captive maintenance conditions remain to be refined. A substantial amount of experimental work still needs to be done to tie together the incomplete information on fertility and sperm storage, nesting, nest site selection, optimal incubation practices, sex determination, optimal stocking densities at different sizes, optimal pond design and management, and growth rates in relation to food sources and feeding rates.

United States

The freshwater turtle farming industry in the United States is extensive in both its production volume and the range of species produced. Most farmed turtle production originates in Louisiana and involves hatchlings of robust, habitat-generalist species for the pet trade, or to supply aquaculture operations overseas. The most voluminously produced species remains *T.s. elegans*. However, the closure of the European Union (EU) market to this subspecies, and the increase in the East Asian aquaculture industry has pushed the US turtle-farming industry to increase production of other taxa (USFWS and DJ Case 2011).[7]

A single farm exists in Maryland that produces large quantities of *M. terrapin*. The other priority turtle species are bred in small-scale ("backyard") facilities and not farmed in large quantities (van Dijk, unpublished data). A substantial number of these small-scale facilities operate across the United States, with a concentration in Florida. These breed a wide range of native and exotic tortoise and freshwater turtle species. Most facilities keep pairs or small groups of adult breeding animals and produce small to modest numbers of offspring (a few to hundreds of hatchlings per species, per breeder). Captive breeding of *Terrapene* species is commonplace among backyard breeders, but collectively they do not appear to produce great numbers and it is unlikely that their output can supply the potential market demand. Captive production of *C. guttata*, *E. blandingii*, and *G. insculpta* appears to be even lower, given (casual) observations at trade shows and other trade platforms (van Dijk, pers. obs.).

7. Turtle farm production now involves slider turtle subspecies and intergrades/hybrids (*T.s. scripta*, *T.s. troostii*), map turtles (*Graptemys pseudogeographica*, *G. ouachitensis*, and their hybrids), common and alligator snapping turtles (*Chelydra serpentina* and *Macrochelys temminckii*, respectively), softshelled turtles (*Apalone ferox*, *A. spinifera*, *A. mutica*), cooters and redbellies (*Pseudemys* species), and musk turtle species (genus *Sternotherus*).

Challenges to CITES Implementation

Non-detriment Findings

In 2015, guidance for making NDFs for tortoises and freshwater turtles was presented in a CITES Animals Committee document (TFTSG 2015). The document notes that tortoises and freshwater turtles exhibit life histories that are characterized by late maturity; great longevity; modest annual reproductive output; high mortality of eggs, hatchlings and juveniles; and high annual survivorship of adults. Correspondingly, the removal of eggs or hatchlings has a much lower impact on the population than the removal of mature breeding animals.

Enforcement

The North American trade in turtles and tortoises almost exclusively involves live animals, although there is some trade in shells and other curios; meat, in the case of *Dermatemys*; and an unquantified trade in medicinal preparations containing turtle parts and derivatives. In the case of live specimens, most of these species are readily identifiable by their markings and other physical features. The attractive coloration of species such as *C. guttata* and *M. terrapin* is part of their desirability as pets. Therefore, identification of specimens in trade to species should not

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Western box turtle (*Terrapene ornata*)

pose significant challenges. Enforcement officers who need to identify these species can rely on the many turtle field and trade identification guides that are available.[8]

Some species, however, have been bred (and inbred) in captivity long enough that specimens with aberrant colors or patterns are being produced. For example, most adult specimens of *C. guttata* are black with bright yellow spots. But specimens with no spots are sometimes available. Even more abnormal colors have been available, including unspotted, "caramel"-colored specimens (Turtle Source 2010a). These specimens look different from the illustrations in field guides, and could present a significant identification challenge for enforcement officers. However, these specimens are currently exceptional and rare in trade. These sorts of identification problems would, therefore, be very uncommon.

Native *Gopherus* tortoises may not be traded in the United States, and their possession is severely restricted. The similarity in appearance among the species poses a significant challenge to identifying specimens in trade. For example, the identification key to the genus provided in Iverson (1992) uses characters such as the distances between claws, scute proportions, and carapace color to identify the different species. Until a few years ago, *G. agassizii*, *G. morafkai* and *G. evgoodei* were all considered to be a single species (Edwards et al. 2016; Murphy et al. 2011), emphasizing their external similarity. It is unlikely that any key could be prepared that would work for all individuals, or across different life stages, for the different *Gopherus* species (van Dijk, unpubl. data). In addition, identification of specific individuals may be needed to conclusively connect them to legal-origin documentation. Significant numbers of live, captive-bred *G. berlandieri* could potentially be legally imported into the United States from Mexico. If that occurs, authorities will need to distinguish between legally versus illegally sourced and owned specimens.

A possible response would be to require that registered microchips be implanted into imported *G. berlandieri*, thereby facilitating easy identification and tracking of the specimen. Eventually, however, the imported specimens would be bred in the United States and their offspring would be made available for sale and trade. These US-born specimens would present an identification challenge, and could possibly allow specimens of *Gopherus* to be illegally traded through purposeful misidentification.

As noted previously, there is a substantial market for *D. mawii* meat in Mexico, and there is potential for sustainable and economically profitable captive production of the species. However, safeguards would need to be formulated, implemented and monitored to ensure that no specimens from the wild were added to, or laundered through, commercial farms (this applies to the commercial captive breeding of any turtles). The applicable regulations in Mexico governing captive production and domestic trade in the species may require amendment. CITES protocols concerning the capture, processing, packaging and trade chain of caviar may provide inspiration on how to regulate domestic production and sale of *Dermatemys* meat. Stock inventory measures could include Passive Integrated Transponder (PIT) tags for specimens; development and validation of photographic identification systems; and/or parentage confirmation via DNA analysis.

If commercialization of *Dermatemys* is to have a positive conservation effect, it needs to be effectively tied to in-situ conservation of the remaining wild populations. This could include a combination of protected area designation and management, adequate enforcement of protective laws and regulations, and (potentially) population augmentation with captive-bred specimens from the commercial facilities. The release of captive-bred specimens would need to take place with adequate safeguards regarding genetic compatibility, disease-free status, and survival prospects of captive-born and possibly headstarted animals in nature. Some creative consideration would need to be given to how commercial production could incentivize measures for effective in-situ conservation.

8. Examples include books such as Behler and King (1979); Ernst and Barbour (1989); Ernst and Lovich (2009); Vetter (2004); and Internet websites such as iNaturalist (2016). In 1999, Environment Canada published a guide to the identification of turtles and tortoises that was targeted specifically for use by enforcement officers (Canada 1999). Identification materials for CITES-listed tortoise and freshwater turtles were reviewed in CITES document CoP17 Doc. 73, Annex 4 (CITES 2016b).

Priority Turtle Species

This section provides description, distribution, conservation status and trade overview of each priority species. The physical descriptions provided below are based on the appearance of a "typical" specimen as found in its wild state. It is important to note, however, that individual specimens of the same species vary in size, color and pattern. The morphological terms used to describe the basic anatomy of a turtle shell are shown in Figure 1.

The IUCN Red List Categories, and categories for species at risk in Canada, Mexico and the United States referenced in this section are defined in Appendix A.

D. Coetzee

Clemmys guttata (Schneider, 1792)

Common names

Spotted turtle (English)
Clemmyde à gouttelettes, Tortue ponctuée (French)
Tortuga moteada (Spanish)

Description

Clemmys guttata is a small species that may grow to a maximum length of 14.3 centimeters. The carapace is smooth, not keeled, and typically blue-black in color, with many small, round yellow spots.[9] Some specimens may not be spotted. The plastron is yellow or light orange, with black blotches which may merge to cover most of the plastron. The head is black and may have yellow spots (Behler and King 1979; COSEWIC 2014b; Ernst and Barbour 1989; Ernst and Lovich 2009). Captive-bred specimens may exhibit aberrant colors and/or patterns (Turtle Source 2010a, c).

Male turtles have long, thick tails, brown eyes and a tan-colored chin. Females have orange eyes and a yellow chin (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Distribution

Clemmys guttata is native to Canada and the United States.

In Canada, the species occurs in disjunct populations in southern parts of the provinces of Ontario and Quebec (COSEWIC 2014b). In the United States, *C. guttata* ranges through the states of Connecticut, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Vermont, Virginia and West Virginia (TTWG 2014; van Dijk 2016a).

Conservation status

Clemmys guttata is listed as Endangered on the International Union for Conservation of Nature (IUCN) Red List (van Dijk 2016a).

In Canada, *C. guttata* is listed as Endangered on SARA, and is therefore, completely protected on federal lands (Canada 2002). *Clemmys guttata* is also protected under provincial legislation throughout its Canadian distribution (Ontario 2007; Quebec 1989).

In the United States, *C. guttata* is not listed under the ESA. Regulations governing personal possession, and commercial breeding efforts, based on specimens of legal provenance, vary by State. In 2011, the species could be legally collected for personal purposes in the States of Florida, North Carolina, South Carolina and West Virginia. (Nanjappa and Conrad 2011).

Trade

In North America, *Clemmys guttata* is commercially traded exclusively as live specimens for the pet trade. Captive-bred, normally-colored specimens sell for US$250–$300 in the United States, and for up to US$600 in Canada (Arachnophiliacs 2016; Backwater Reptiles 2016; Nauti-Lass 2016; Reptile City 2016; Snakes at Sunset 2016; Turtle Source 2010c). In the United States, in 2010, specimens with aberrant colors, including juveniles with no spots, were selling for US$495, and caramel-colored juveniles were selling for US$5,995 (Turtle Source 2010a, b, c). *Clemmys guttata* was not found for sale in Mexico.

9. The carapace is the upper (dorsal) half of a turtle's shell. The bottom (ventral) half is called the plastron.

Data downloaded from the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC) CITES Trade Database showed that during 2009–2014, the United States exported 77 live specimens of *C. guttata*, all of which were captive-bred and exported to Hong Kong in 2014. Neither Canada nor Mexico reported exports of *C. guttata* in 2009–2014 (CITES 2016a).

Humberto Bahena Basave

Dermatemys mawii (Gray, 1847)

Common names

Central American river turtle (English)
Termatemyde de Mawe, Tortue de Tabasco (French)
Tortuga blanca, tortuga de Tabasco, tortuga plana, tortuga ribereña centroamericana (Spanish)

Description

Dermatemys mawii is a large species, with a maximum carapace length of 65 centimeters. In adults, the streamlined carapace is smooth, not keeled, and only slightly domed. In older animals, the dorsal scutes become fused such that the sutures between them disappear.[10] The carapace is dark gray to olive in color. The plastron is cream-colored. The head is relatively small in relation to the body and has a distinctly upturned, elongated snout. The head is mainly gray or olive, with fine black speckling, while the lower jaw is white. The legs are dark gray in color (Legler and Vogt 2013).

Male *Dermatemys* develop a distinctive bright yellow to orange upper surface of the head, and have long, thick tails and a deep caudal notch in the plastron. In contrast, the crown of the head of females is only slightly more yellow than the sides, neck or limbs, while their tails are short and barely reach the edge of the carapace (Legler and Vogt 2013; Vogt et al. 2016).

Distribution

Dermatemys mawii is native to Belize, Guatemala and Mexico, and possibly Honduras. In Mexico, the species occurs in large rivers in the states of Campeche, Chiapas, Quintana Roo, Tabasco and Veracruz, with records from the northern, karst region of the Yucatán peninsula requiring confirmation (Legler and Vogt 2013; TTWG 2014; Vogt et al. 2016).

Conservation status

Dermatemys mawii is listed as Critically Endangered on the IUCN Red List (Vogt et al. 2016). In Mexico, *D. mawii* is listed as Endangered, and in the United States the species is listed as Endangered under the ESA (DOF 2010, USFWS 2016a).

Trade

Dermatemys mawii is primarily traded as a source of meat. The species eats fallen leaves and other lignin-type vegetarian debris. It also has morphological adaptations to absorb oxygen directly from the water, and does not need to swim to the surface regularly to breathe. Because of its diet and sedentary vegetarian lifestyle, its meat is white and odorless (Vogt, pers. comm.). Therefore, its meat is in high demand in Mexico and other Central American countries (Vogt et al. 2016), especially during the Easter season.

10. Scutes are the keratinous plates that cover the shell of a turtle. They cover a layer of interlocking bones.

The species is protected in Mexico, but illegal collection and trade continues to reduce populations (Barcenas Garcia 2016). In Mexico, *D. mawii* meat sells for approximately US$23 per kilogram (Vogt, pers. comm to van Dijk, 2016).

Juvenile *D. mawii* are occasionally found in the international pet trade. These are believed to come from private farms (Legler and Vogt 2013). A review in July 2016 found no specimens for sale in Canada or the United States. In Japan, they may sell for hundreds of dollars each (van Dijk, unpubl. data). Specimens have reputedly been offered for sale on Japanese Internet auction sites for up to US$2,250 (ATPTF 2011). One young specimen was advertised by a German seller on an Internet website for US$550 (Terraristik 2016). In 2014, *D. mawii* were offered for sale on a Mexican website, but no price was provided (QueBarato! 2014).

Data downloaded from the UNEP-WCMC CITES Trade Database showed that during 2009–2014, Mexico exported both live and non-living specimens of *D. mawii*. In 2009, Mexico exported 300 non-living specimens to the United States, for scientific purposes; and in 2013, Mexico exported 100 live, captive-bred specimens to Japan and China. Fifty specimens were exported to each country for commercial purposes. No specimens were exported from Canada or the United States during 2009–2014 (CITES 2016a).

The captive production of *D. mawii* in Mexico could potentially be sustainable, economically valuable, and beneficial to conservation. *Dermatemys* meat is in great demand because of its delicate taste, and there is an existing market that is willing to pay for it. In addition, although the pet market for freshwater turtles that grow as large as this species is relatively limited, specimens sell for relatively high prices. A proportion of the captive-bred specimens could be head-started, in order to accelerate the recovery of the wild population.[11]

In captivity, *D. mawii* can be produced in significant quantities. A hatchling *D. mawii* can grow to a 10-kilogram adult in approximately 10 years, and mature females can potentially produce up to 50 eggs per year. In 1978, a turtle farm in Nacajuca, Tabasco State, Mexico, was established to investigate the captive production of *D. mawii*. The farm started with 55 confiscated adult specimens. By 2006, the captive population had increased to over 1,000 animals, more than 90% of which had been hatched at the facility. Furthermore, most of the founder stock was still alive (Legler and Vogt 2013). However, there is still little understanding of how, when and where *D. mawii* nest, or their optimal husbandry conditions.

If commercialization of *Dermatemys* is to positively affect conservation, it needs to be linked to in-situ conservation of wild populations. This could comprise several initiatives, including establishing and managing protected areas, increased enforcement effort, and (as noted) augmenting wild populations with captive-bred specimens from commercial facilities. The release of captive-bred specimens would need to ensure genetic compatibility and disease-free status, and consider survival prospects of captive-born animals. In addition, safeguards would need to be implemented to ensure that specimens from the wild were not laundered through commercial farms.

Since *Dermatemys mawii* is listed as Endangered under the ESA in the United States (USFWS 2016a), imports would only be allowed if such imports enhance the species' survival in the wild. Therefore, while captive-produced *Dermatemys* could potentially be exported from Mexico or other range countries (subject to positive NDFs), they could not be imported into the United States unless some form of enhancement of the wild populations is demonstrated. Such enhancement could possibly take the form of donating a portion of the revenue generated from such exports to projects devoted to in-situ conservation of wild populations, or of releasing a portion of captive-bred offspring to augment wild populations (subject to safeguards to ensure genetic compatibility and disease-free status).

11. Headstarting involves rearing hatchlings in captivity until they are large enough to be less susceptible to natural predation, and then releasing them into their natural habitat. The assumption is that larger juveniles will have a greatly increased chance of surviving to adulthood and successfully being recruited into the reproducing population.

batwrangler

Emydoidea blandingii (Holbrook, 1838)

Common names

Blanding's turtle (English)
Emyde de Blanding, *Tortue mouchetée* (French)
Tortuga de Blanding (Spanish)

Description

Emydoidea blandingii grows to a length of 28.4 centimeters. The carapace is elongated and smooth. The plastron has a movable hinge that allows some specimens to completely close their shell. In color, the carapace is dark gray to black, with tan to yellow irregular spots or flecks. The plastron is yellow, with large, dark blotches on the outer posterior corner of each scute. The blotches form a symmetrical pattern and may obscure much of the yellow coloration (Behler and King 1979; COSEWIC 2005, 2007; Ernst and Barbour 1989; Ernst and Lovich 2009).

The legs and dorsal surface of the head are dark gray, but the lower jaw is bright yellow (Behler and King 1979; COSEWIC 2005; Ernst and Barbour 1989; Ernst and Lovich 2009).

Male turtles have a concave plastron, a longer tail, with the vent behind the carapace margin, and a dark upper jaw, while females show a flat plastron, with the vent located under the carapace margin, and have a yellow upper jaw (Ernst and Lovich 2009).

Distribution

Emydoidea blandingii is native to Canada and the United States.

In Canada, the species occurs in disjunct populations in southern and southwest areas in the provinces of Ontario and Quebec, respectively. A small, separate population also occurs in central southwest Nova Scotia. In the United States, *E. blandingii* occurs in the states of Illinois, Indiana, Iowa, Ohio, Michigan, Minnesota, Missouri, Nebraska, Pennsylvania, South Dakota and Wisconsin. There are also small localized populations in the states of Maine, Massachusetts, New Hampshire and New York (COSEWIC 2005; TTWG 2014).

Conservation status

Emydoidea blandingii is listed as Endangered on the IUCN Red List (van Dijk and Rhodin 2016).

In Canada, the Nova Scotia population of *E. blandingii* is listed as Endangered on SARA, and is therefore completely protected on federal lands (Canada 2002). The Great Lakes/St. Lawrence populations of *E. blandingii* are listed as Threatened (COSEWIC 2005, 2007, 2014b). *Emydoidea blandingii* is also protected under provincial legislation throughout its Canadian distribution (Nova Scotia 1998; Ontario 2007; Quebec 1989).

In the United States, this species is protected from commercial or personal collection from the wild in the great majority of States where it occurs; only in South Dakota is collection for personal possession permitted. Regulations governing personal possession, and commercial breeding efforts based on specimens of legal provenance, vary by State. (Nanjappa and Conrad 2011).

Trade

In North America, *Emydoidea blandingii* is commercially traded exclusively as live specimens for the pet trade. Captive-bred juveniles sell for approximately US$360 in the United States (Backwater Reptiles 2016; Reptile City 2016; Turtle Source 2010c). No specimens were found for sale in Canada or Mexico.

Data downloaded from the UNEP-WCMC CITES Trade Database showed that during 2009–2014, the United States exported 119 live specimens of *E. blandingii*, all of which were captive-bred and exported to Hong Kong in 2013. Neither Canada nor Mexico reported exports of *E. blandingii* during 2009–2014 (CITES 2016a).

John Brandauer

Glyptemys insculpta (LeConte, 1830)

Common names

Wood turtle (English)
Tortue des bois (French)
Galápago de bosque, tortuga del bosque (Spanish)

Description

Glyptemys insculpta grows to a length of up to 24 centimeters. The carapace is wide, low and keeled. The large dorsal scutes are slightly pyramidal in shape and deeply furrowed with concentric growth rings, giving the carapace a rough, sculptured texture. In color, the carapace is brown to dark gray and may have fine yellow or black lines. The plastron is yellow, with dark blotches (Behler and King 1979; COSEWIC 2007; Ernst and Barbour 1989; Ernst and Lovich 2009).

The head is dark in color but the skin of the neck and forelegs ranges from dull orange-yellow to deep red (Behler and King 1979; COSEWIC 2007; Ernst and Barbour 1989; Ernst and Lovich 2009). Captive-bred specimens may exhibit aberrant colors and/or patterns, including more yellow coloration than normal, or peach coloration with "wild" markings (Turtle Source 2010b, c).

Male turtles have long thick tails, a concave plastron, and more intense red coloration (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Distribution

Glyptemys insculpta is native to Canada and the United States.

In Canada, the species occurs in disjunct populations in southern areas of the provinces of Nova Scotia, New Brunswick, Quebec and Ontario (COSEWIC 2007). In the United States, *G. insculpta* ranges through the states of Connecticut, Delaware, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia and Wisconsin. The species may be extirpated from its tiny area of occurrence in Ohio (TTWG 2014; van Dijk and Harding 2016).

Conservation status

Glyptemys insculpta is listed as Endangered on the IUCN Red List (van Dijk and Harding 2016).

In Canada, *G. insculpta* is listed as Threatened under SARA (COSEWIC 2005, 2007, 2014b), and is therefore completely protected on federal lands (Canada 2002). *Glyptemys insculpta* also receives a level of protection under provincial legislation throughout its Canadian distribution (New Brunswick 1980; Nova Scotia 1998; Ontario 2007; Quebec 1989).

In the United States, this species is protected from all commercial and most personal collection from the wild in the great majority of States where it occurs; collection for personal possession is permitted only in Maine and West Virginia. Regulations governing personal possession, and commercial breeding efforts, based on specimens of legal provenance, vary by State. (Nanjappa and Conrad 2011).

Trade

In North America, *Glyptemys insculpta* is commercially traded exclusively as live specimens for the pet trade. Captive-bred, normally-colored specimens sell for US$300–$595 in the United States, and for up to US$645–$760 in Canada (Arachnophiliacs 2016; Nauti-Lass 2016; Snakes at Sunset 2016; Turtle Source 2010c). In the United States, turtles with more yellow coloration than normal sold for US$495–$695, and "hypo-pastel" specimens (peach in color, with "wild" markings) sold for US$5,995 (Turtle Source 2010a, b, c). *Glyptemys insculpta* was not found for sale in Mexico.

Data downloaded from the UNEP-WCMC CITES Trade Database showed that during 2009–2014, the United States exported a total of 139 live specimens of *G. insculpta*, all of which were captive-bred and exported to Hong Kong. Live specimens of *G. insculpta* were exported from the United States in each year. Neither Canada nor Mexico reported exports of *G. insculpta* during 2009–2014 (CITES 2016a).

Tigerakvok

Gopherus agassizii (Cooper, 1863)

Common names

Agassiz's desert tortoise, Mojave Desert tortoise (English)
Gophère d'Agassiz, Tortue du désert, Tortue fouisseuse d'Agassiz (French)
Tortuga del desierto, tortuga del desierto de California (Spanish)

Description

Gopherus agassizii grows to a length of up to 38 centimeters. The carapace is oblong, dorsally flattened and has a serrated posterior margin. The centers of the dorsal scutes are slightly raised. The plastron is smooth and the anterior (gular) scutes are elongated and forked.

In color, the carapace is tan to black and the centers of the scutes may be yellow. The plastron is also tan to black and the scutes may also have yellow centers. In contrast to freshwater turtles, the anterior surfaces of the forelegs of tortoises are covered with enlarged scales, and the toes are not webbed (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

The head is typically tan in color but may be reddish or brown. The eyes are greenish yellow. The skin of the legs is tan or brown (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Male turtles are larger than females, and have long thick tails, a concave plastron and more powerful claws. During the mating season, males exhibit prominent integumentary glands under the chin (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Distribution

In July 2011, researchers split *G. agassizii* into two species, *G. agassizii* and *G. morafkai*. This reduced the distribution of *G. agassizii* to 30% of its former range, and it is now considered endemic to the Mojave Desert of the United States (Murphy et al. 2011). The species ranges through three US states: southeastern California, southern Nevada and southwest Utah (TTWG 2014).

Conservation status

Gopherus agassizii is listed as Vulnerable on the IUCN Red List (TFTSG 2016a).

In Mexico, *G. agassizii* is listed as Threatened (DOF 2010).

In the United States, the northern population of *G. agassizii* is listed as Threatened under ESA. The southern population of *G. agassizii* (now considered to be *G. morafkai*) was listed as Threatened due to Similarity of Appearance, in 1990 (USFWS 2016a); however, *G. morafkai* in its own right was deemed not to warrant listing in 2015 (USFWS 2015a). *Gopherus agassizii* is protected from collection for commercial or personal purposes by the laws of each state in which it ranges.

The splitting of *G. agassizii* into two species reduced the distribution of *G. agassizii* to 30% of its former range (Murphy et al. 2011). This meant that the wild population of the species was much smaller than previously thought, thereby affecting the species' conservation status.

Trade

At the time of writing, no specimens of *G. agassizii* were found for sale in Canada, Mexico or the United States. A review of the UNEP-WCMC CITES Trade Database found no evidence of commercial trade in the species in the years 2009–2014. There were, however, non-living specimens of *G. agassizii* exported for scientific purposes from Mexico and the United States in several of these years (CITES 2016a).

Gopherus agassizii is protected by state law throughout its US distribution, and federally listed under the ESA. Hence, it is illegal to collect, breed or trade *G. agassizii* in the United States. Specimens that have been rescued and cannot be returned to the wild may be adopted by members of the public. These specimens must be confined to the owner's premises, and may not be bred, sold or traded. Considering the availability of animals for adoption and the penalties for illegal possession, the illegal trade of *G. agassizii* is likely low.

Clinton & Charles Robertson

Gopherus berlandieri (Agassiz, 1857)

Common names

Berlandier's tortoise, Texas tortoise (English)
Gophère du Texas, Tortue fouisseuse de Berlandier (French)
Tortuga de Texas, galápago tamaulipeco (Spanish)

Description

Gopherus berlandieri grows to a length of up to 23 centimeters. The carapace is oblong, dorsally flattened and has a serrated posterior margin. The centers of the dorsal scutes are barely raised, while the prominent growth rings give the carapace a rough, sculptured texture. The plastron is smooth and the anterior (gular) scutes are elongated and slightly forked. The head is slightly pointed, and the upper jaw is somewhat hooked. (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

In color, the carapace is brown to black and the centers of the scutes may be yellow. The plastron is yellowish, with more or less extensive black pigmentation.

The head is yellowish-brown to black in color, as are the legs. The eyes are greenish yellow (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Male turtles have somewhat longer, narrower carapaces, and a concave plastron. During the mating season, males exhibit prominent integumentary glands under the chin (Behler and King 1979; Ernst and Barbour 1989).

Distribution

Gopherus berlandieri is native to Mexico and the United States.

In Mexico, *G. berlandieri* ranges through four states: eastern Coahuila, northern Nuevo León, Tamaulipas and eastern San Luis Potosí (TTWG 2014).

In the United States, *G. berlandieri* is found in southern Texas (TTWG 2014).

Conservation status

Gopherus berlandieri was listed as Least Concern on the IUCN Red List (TFTSG 1996a). However, at the time of writing, the status of *G. berlandieri* had not been updated since 1996. In 2014, the Turtle Taxonomy Working Group (TTWG) of the IUCN SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG) completed a provisional reassessment of the species as Near Threatened (TTWG 2014).

In the United States, *G. berlandieri* is not listed by the ESA (USFWS 2016a), but is listed as Threatened in the State of Texas, where it is illegal to collect or possess the species (Nanjappa and Conrad 2011).

Trade

In North America, *G. berlandieri* is commercially traded as live specimens for the pet trade. In Mexico, individuals who have registered UMAs for *G. berlandieri* may legally breed, sell and export the species.

Specimens are openly advertised for sale in Mexico, with prices ranging from a low of US$21 to a high of US$214 (Todoclasificados 2016). Some ads offered documentation to show that the specimens for sale were legally captive-bred. Other ads made no such claim. Prices tended to be much higher for specimens that came with documentation. It is possible that some of these specimens were bred without requisite permits, or were captured in the wild. One Mexican breeder suggested that the sale of illegal tortoises is a huge problem, and very difficult to control. He notes that Internet ads from many people in different parts of Mexico offer tortoises for sale without any legal documents (Garza Ortiz, pers. comm.).

This species would probably sell for much higher prices in Canada and the United States, if available. However, at the time of writing, no specimens of *G. berlandieri* were found for sale in Canada or the United States. An Internet search found one adult pair advertised for sale in the EU, for US$1,769 (Terraristik 2016).

Data downloaded from the UNEP-WCMC CITES Trade Database showed that during 2009–2014, Mexico exported a total of 186 live specimens of *G. berlandieri.* Of these, 21 were exported for scientific purposes and 165 were exported for commercial purposes. All the animals were captive-bred. Ten specimens were exported to the United States, for scientific purposes. The other 176 specimens were exported to East Asia and the EU. No specimens were exported to Canada (CITES 2016a).

In 2013, two non-living specimens of *G. berlandieri* were exported from the United States to Switzerland for scientific purposes, and in 2011, three captive-bred live specimens were exported to Germany for commercial purposes. No specimens were exported from Canada during 2009–2014 (CITES 2016a).

Gopherus berlandieri is protected in the State of Texas—the only US state in which it occurs (Nanjappa and Conrad 2011). It is, therefore, illegal to collect, breed or trade the species in Texas. Specimens of *G. berlandieri* could potentially be legally imported from Mexico to other US states, where they could be kept, bred and traded.

Peter Paul van Dijk

Gopherus morafkai (Murphy, Berry, Edwards, Leviton, Lathrop & Riedle, 2011)

Common names

Morafka's desert tortoise, Sonoran Desert tortoise (English)
Tortue du désert du Sonora (French)
Tortuga del desierto de Sonora, tortuga de los cerros (Spanish)

Description

In July 2011, researchers split the wide-ranging desert tortoise into two species, *G. agassizii* and *Gopherus morafkai* (Murphy et al. 2011). Subsequently, early in 2016 the southern populations inhabiting the Sinaloan thornscrub biome of southern Sonora and northern Sinaloa, Mexico, were split off as a third species: *Gopherus evgoodei* (Edwards et al. 2016).

Gopherus morafkai grows to a length of nearly 27 centimeters (Germano et al. 2002). The carapace is oblong, dorsally flattened and has a slightly serrated posterior margin. The plastron is smooth and the anterior (gular) scutes are not normally elongated and forked. The head is rounded and the anterior surface of the forelegs are covered with enlarged scales. The toes are not webbed (Murphy et al. 2011).

The color of *G. morafkai* varies by size, age and location. The carapaces of adult tortoises are generally dark in color, exhibiting shades of gray, brown, olive and black. The limbs tend to be the same color as the carapace. Protected areas of skin tend to be lighter in color (Murphy et al. 2011).

Distribution

Gopherus morafkai is native to Mexico and the United States. In Mexico, *G. morafkai* is restricted to most of the State of Sonora (Edwards et al. 2016). In the United States, *G. morafkai* is found in Arizona south and east of the Colorado River (Edwards et al. 2016; TTWG 2014).

Conservation status

Gopherus morafkai has not been specifically assessed for the IUCN Red List, but was part of earlier assessments of *Gopherus agassizii*. In 2014, the TTWG completed a provisional assessment of the species as Vulnerable (TTWG 2014).

In Mexico, *G. agassizii* is listed as Threatened (DOF 2010). Potentially, this status should also apply to *G. morafkai*, given that the populations covered by that listing were taxonomically transferred from *G. agassizii* to *G. morafkai* (and *G. evgoodei*).

In the United States, the southern population of *G. agassizii* (now considered to be *G. morafkai*) was listed as Threatened, due to Similarity of Appearance, in 1990 (USFWS 2016a). In 2015, the USFWS found that listing the southern population of desert tortoises (i.e., *G. morafkai*) as Threatened or Endangered under the ESA was not warranted (USA 2015).

Trade

At the time of writing, no specimens of *G. morafkai* were found for sale in Canada, Mexico or the United States. No trade in the species for any purpose was recorded in the UNEP-WCMC CITES Trade Database for the years 2009–2014 (CITES 2016a). However, given that the species was only recognized as valid for CITES purposes at CoP16 (effective June 2014), it is possible that specimens have been internationally traded as *G. agassizii*.

U.S. Fish and Wildlife

Gopherus polyphemus (Daudin, 1802)

Common names

Gopher tortoise (English)
Gophère polyphème, Tortue fouisseuse de Floride, Tortue gaufrée (French)
Tortuga terrestre de Florida (Spanish)

Description

Gopherus polyphemus grows to more than 39 centimeters in length. The carapace is oblong, dorsally flattened and has a slightly serrated posterior margin, and is generally smooth, apart from the growth lines on each scute. The head is broad and, typical of tortoises, it possesses enlarged scales on the anterior face of the forelegs, and the toes are not webbed (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

In color, the carapace is brown to gray-black and the plastron is yellow to gray. The head and legs are gray-black. The eyes are brown. Juveniles may show extensive yellow coloration on shell, head and limbs. (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Male turtles have a concave plastron. During the mating season, males exhibit prominent integumentary glands under the chin (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Distribution

Gopherus polyphemus is native to the United States. The species is found in six US states; ranging through southern areas of Alabama, Louisiana, Mississippi, Georgia, South Carolina and much of Florida (TTWG 2014).

Conservation status

Gopherus polyphemus was listed as Vulnerable on the IUCN Red List (TFTSG 1996b). However, at the time of writing, the status of *G. polyphemus* had not been updated since 1996. In 2014, TTWG completed a provisional reassessment of the species as Vulnerable (TTWG 2014).

In the United States, the western population of *G. polyphemus* is listed as Threatened, while the eastern population is a candidate for listing (USFWS 2016a). *Gopherus polyphemus* is protected from collection for commercial or personal purposes by the laws of each state in which it ranges (Nanjappa and Conrad 2011).

Trade

At the time of writing, no specimens of *G. polyphemus* were found for sale in Canada, Mexico or the United States. A review of the UNEP-WCMC CITES Trade Database found no evidence of commercial trade in the species during the years 2009–2014. However, the United States exported one live, captive-bred specimen for personal purposes in 2012, and two non-living specimens for scientific purposes in 2013 (CITES 2016a).

It is illegal to collect, breed or trade *G. polyphemus* in the United States. Specimens that have been rescued and cannot be returned to the wild may be adopted by members of the public. These specimens must be confined to the owner's premises, and may not be bred, sold or traded. Considering the availability of animals for adoption and the penalties for illegal possession, the illegal trade of *G. polyphemus* is likely low.

Peter Paul van Dijk

Malaclemys terrapin (Schoepff, 1793)

Common names

Diamondback terrapin (turtle) (English)
Malaclemmyde du Nord (French)
Tortuga espalda de diamante (Spanish)

Description

Malaclemys terrapin grows to a length of up to 29 centimeters. The carapace is oblong and keeled. The scutes of the carapace have deep growth rings, and some populations and/or subspecies have prominent knobs on the vertebral scutes that give the carapace a strongly sculptured texture. In color, the carapace is gray to tan, brown or black. If the carapace is light in color, the dorsal scutes are marked with concentric dark rings and markings. Carapaces with a dark base color may show bold yellow centers, in some populations. The plastron is yellow or greenish, with varying degrees of dark clouds, blotches or streaks (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

The head and legs are whitish-gray to black in color, with dark flecks, spots or streaks. The jaws are light in color and the prominent eyes are black (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Male turtles are much smaller (with a maximum length of 14 centimeters) than females, have longer tails and have a narrower head (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009).

Distribution

Malaclemys terrapin is native to the United States and Bermuda. In the United States the species ranges through the coastal areas of 16 US states that border the Atlantic and Gulf coasts. These states are Alabama, Connecticut, Delaware, Florida, Georgia, Louisiana, Maryland, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Rhode Island, South Carolina, Texas and Virginia (TTWG 2014).

Conservation status

Malaclemys terrapin is listed as Near Threatened on the IUCN Red List (TFTSG 2016b).

In the United States, *M. terrapin* is not listed under the ESA. Commercial collection from the wild is allowed under certain conditions in the states of Louisiana and New York, and the species may be collected for personal purposes in a number states (Nanjappa and Conrad 2011). Commercial collection in the state of New Jersey was closed in the summer of 2016 (DEP 2016).

Trade

Historically, *M. terrapin* was collected in large numbers as a source of meat. In the early 20th century, stew made from the species, steeped in sherry, was a popular delicacy in the United States and populations were significantly decreased. The great depression, combined with prohibition, helped reduce the demand for the expensive dish. Today *M. terrapin* is commercially traded in North America primarily as live specimens for the pet trade (USA 2013). However, in recent years, large numbers of *M. terrapin* hatchlings have been exported to China and Hong Kong. Some of these hatchlings will likely have entered the pet trade, but a proportion probably went to farms to be reared either as a source of meat or to create breeder stock for the further production of the species.

In the United States, captive-bred juveniles sell for approximately US$100–$125 and wild-caught adults sell for US$80–$100 (Nauti-Lass 2016; ReptilesNCritters 2016). No specimens were found for sale in Canada or Mexico.

Data downloaded from the UNEP-WCMC CITES Trade Database showed that during 2009–2014, the United States exported 15,812 live specimens of *M. terrapin.* These animals were captive-bred and exported for commercial purposes. Most of these animals (15,448) were exported to Hong Kong and China. The other 364 specimens were exported to Japan, Thailand and Taiwan. Neither Canada nor Mexico reported exports or imports of *M. terrapin* during 2009–2014 (CITES 2016a).

Peter Paul van Dijk

Terrapene carolina (Linnaeus, 1758)

Common names

Eastern box turtle (English)
Tortue-boîte de Caroline (French)
Tortuga de caja común, tortuga de Carolina (Spanish)

Description

Specimens of *T. carolina* are characterized by their dome-shaped, keeled carapace, which may be mildly serrated at the rear. A single hinge develops at an early age across the center of their plastron. The hinge divides the plastron into two movable sections, which allows these turtles to tightly close their shell and completely enclose themselves. The maximum carapace length is 23.5 centimeters but most adults rarely exceed 16 centimeters (Behler and King 1979; Burge and Jones 2008; Ernst and Barbour 1989; Ernst and Lovich 2009; Legler and Vogt 2013).

The color of the carapace varies, and includes yellow, orange or brown spots, blotches and/or streaks on a brown to black background. The plastron is tan to brown and may be plain or blotched. The skin color is brown or black, with yellow or orange markings. There are extensive differences in coloration patterns between the different subspecies, as well as great individual variability in coloration and, to some extent, shell shape (Behler and King 1979; Burge and Jones 2008; Ernst and Barbour 1989; Ernst and Lovich 2009; Legler and Vogt 2013).

Adult *T. carolina* are sexually dimorphic. Full-grown males are typically larger than females and may develop flared marginal scutes along the rear of the carapace. Males have strong, curved claws on their hind feet, whereas females have slender, less curved claws. Males also have larger heads, with brighter colors, and typically have orange or red eyes. The eyes of females are brown. The rear of a male's plastron usually has a concave area while females typically have a flat plastron (Behler and King 1979; Burge and Jones 2008; Ernst and Barbour 1989; Ernst and Lovich 2009).

Six subspecies are generally recognized: *T.c. carolina* occurs in Canada and much of the eastern United States; *T.c. bauri* occurs in Florida, United States; *T.c. major* occurs in the Gulf Coast region of the United States; *T.c. mexicana* inhabits the Mexican States of Tamaulipas, San Luis Potosí and Veracruz; *T.c. triunguis* inhabits the Midwestern region of the United States; and *T.c. yucatana* occurs in the Yucatán Peninsula of Mexico. Many of these subspecies have been considered separate species by some taxonomists, but for the purposes of this study they are treated as subspecies of *T. carolina*, consistent with prevailing CITES nomenclature for these animals (TTWG 2014).

Distribution

Terrapene carolina is native to Canada, Mexico and the United States.

In Canada, *T. carolina* historically occurred in southern Ontario, although it is now considered extirpated (COSEWIC 2014a).

In Mexico, *T. carolina* forms two disjunct populations, in six different states. One population ranges through southern Tamaulipas, eastern San Luis Potosí and northern Veracruz. The other population is found in Yucatán, northern Campeche and Quinta Roo (Legler and Vogt 2013; TTWG 2014).

In the United States, *T. carolina* occurs across much of the country, ranging as far west as southeastern Kansas, central Oklahoma and eastern Texas (TTWG 2014).

Conservation status

Terrapene carolina is listed as Vulnerable on the IUCN Red List (van Dijk 2016b).

In Canada, *T. carolina* is officially considered Extirpated (COSEWIC 2014a), although specimens are occasionally found in Point Pelee National Park, at the southern tip of Ontario. It is not known if these specimens are natural or are released former pets (Davy, pers. com. to Cooper, 28 July 2016).

In Mexico, *T. carolina* is Subject to Special Protection (DOF 2010).

In the United States, *T. carolina* is not listed under the ESA. *Terrapene carolina* may legally be commercially collected in the State of South Carolina, and may be collected from the wild for personal purposes in many states. Regulations governing personal possession, and commercial breeding efforts based on specimens of legal provenance, vary by State (Nanjappa and Conrad 2011).

Trade

In North America, *T. carolina* is commercially traded almost exclusively as live specimens for the pet trade, although artifacts made from their shells, such as traditional Native American rattles, may occasionally be traded. In the United States, pet trade specimens of *T. carolina* are typically advertised by subspecies, although it is not clear whether the different subspecies commanded significantly different prices. On average, captive-bred juveniles sell for US$75–$120 in the United States, and for US$305–$420 in Canada (Arachnophiliacs 2016; Backwater Reptiles 2016; Exotic Pets 2016; Nauti-Lass 2016; Reptile City 2016). Wild-caught adults sell for US$100 in the United States (ReptilesNCritters 2016). At the time of writing, no wild-caught specimens were found for sale in Canada. Specimens of *T. carolina* sell for approximately US$125 in Mexico (Reuter, in litt.). One US seller also offers hybrids of *T. carolina* and *T. ornata* for US$100–$200 (Underground Reptiles 2016).

Data downloaded from the UNEP-WCMC CITES Trade Database showed that Canada exported two live captive-born specimens, for personal purposes, during 2009–2014. Canada also imported a total of eight live *T. carolina*—four for personal purposes and four for zoo purposes. Five of these specimens were captive-born and three were wild-caught (CITES 2016a).

The United States exported a total of 39 live specimens of *T. carolina* during 2009–2014: 14 for personal purposes, one for zoo purposes, and 24 for commercial purposes. These turtles were captive-born. In addition, the United States also exported four, wild-caught, non-living specimens for scientific purposes. The specimens exported for commercial purposes were exported to China and Japan. The United States imported two live captive-born specimens, for personal purposes, during 2009–2014 (CITES 2016a).

No imports or exports of *T. carolina* were reported by Mexico in 2009–2014.

Significant numbers of *T. carolina* are collected from the wild every year for the domestic pet trade, primarily from South Carolina. The species is commonly bred by hobbyists and small-scale commercial breeders.

Field Herp Forum

Terrapene nelsoni (Stejneger, 1925)

Common names

Sierra box turtle, spotted box turtle (English)
Tortue-boîte du Mexique occidental (French)
Tortuga de monte, tortuga manchada, tortuga de caja manchada, tortuga manchas (Spanish)

Description

The carapace of *T. nelsoni* is dome-shaped but somewhat flattened, with a weakly developed medial keel. The carapace does not have posterior serrations. The plastron has a central transverse hinge, allowing the two halves of the plastron to tightly close the shell. The head is large, with a strongly hooked upper jaw. Adult *T. nelsoni* average 13.4 centimeters and may reach a maximum of 16 centimeters (Ernst and Barbour 1989; Legler and Vogt 2013).

The color of the carapace ranges from yellowish or tan to dark brown. Usually, the carapace will exhibit small, scattered, pale brown or yellow spots. The plastron is brown to black. The skin of the head, neck, limbs and tail is yellow to brown, with brown or yellow spots (Ernst and Barbour 1989; Legler and Vogt 2013).

The rear lobe of a male's plastron has a concave area, and males have longer, thicker tails than females (Ernst and Barbour 1989; Legler and Vogt 2013).

Distribution

Terrapene nelsoni is endemic to Mexico. The species ranges through five states: southeast Sonora, southwest Chihuahua, Sinaloa, Nayarit, and northern Jalisco (TTWG 2014).

Conservation status

Terrapene nelsoni is listed as Data Deficient on the IUCN Red List (TFTSG 2016c).

In Mexico, *T. nelsoni* is Subject to Special Protection (DOF 2010). In the United States, *T. nelsoni* is not listed under the ESA.

Trade

At the time of writing, no specimens of *T. nelsoni* were found for sale in Canada, Mexico or the United States. A review of the UNEP-WCMC CITES Trade Database found no evidence of commercial trade in the species during the years 2009–2014. The only trade recorded was of two wild-caught, non-living specimens exported from Mexico to the United States, for scientific purposes, in 2009 (CITES 2016a). Live specimens in Mexico sell for approximately US$1,900 (Reuter, in litt.).

Peter Paul van Dijk

Terrapene ornata (Agassiz, 1857)

Common names

Western box turtle, ornate box turtle (English)
Tortue-boîte ornée (French)
Tortuga adornada, tortuga de adornos, tortuga de caja adornada (Spanish)

Description

Specimens of *T. ornata* are characterized by their dome-shaped carapace and a single hinge across the center of their plastron. The hinge divides the plastron into two movable sections, which allows these turtles to tightly close their shell and completely enclose themselves. The carapace does not normally have a keel, and there are no posterior serrations. *Terrapene ornata* reaches a maximum size of 15.4 centimeters but adults are usually between 10 and 13.6 centimeters (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009; Legler and Vogt 2013).

The color of the carapace is brown or black, with a distinctive pattern of radiating yellowish lines on each scute and often with a yellow middorsal stripe. Each plastron scute has a pattern of yellow and black radiating lines. The head is brown to olive-green, with dorsal yellow spots and yellow jaws. The limb skin color is brown, with some yellow spots (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009; Legler and Vogt 2013).

Males have thicker, widened claws on the inward-turned first toe of their hind feet, and red eyes. The eyes of females are yellow-brown. The rear lobe of a male's plastron has a concave area (Behler and King 1979; Ernst and Barbour 1989; Ernst and Lovich 2009; Legler and Vogt 2013).

Distribution

Terrapene ornata is native to Mexico and the United States.

In Mexico, *T. ornata* is found in three states: northern Sonora, northeastern Coahuila and much of Chihuahua. In the United States, the species ranges through 16 states: Arizona, Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Louisiana, Missouri, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, Wisconsin and Wyoming (TTWG 2014).

Conservation status

Terrapene ornata is listed as Near Threatened on the IUCN Red List (van Dijk and Hammerson 2016).

In Mexico, *T. ornata* is Subject to Special Protection (DOF 2010).

In the United States, *T. ornata* is not listed under the ESA. *Terrapene ornata* may be commercially collected in New Mexico and may be collected from the wild for personal purposes in some states. Regulations governing personal possession, and commercial breeding efforts, based on specimens of legal provenance, vary by State (Nanjappa and Conrad 2011).

Trade

In North America, *T. ornata* is commercially traded exclusively as live specimens for the pet trade. On average, captive-bred juveniles sell for US$150–$170 in the United States, and for US$400 in Canada. (Arachnophiliacs 2016; Backwater Reptiles 2016; Nauti-Lass 2016; Turtle Source 2010c). Adults sell for approximately US$300 in the United States (Turtle Source 2010c). At the time of writing, no specimens were found for sale in Mexico. One US seller also offers hybrids of *T. carolina* and *T. ornata* for US$100–$200 (Underground Reptiles 2016).

Data downloaded from the UNEP-WCMC CITES Trade Database showed that Canada exported two live, captive-born specimens of *T. ornata*, for personal purposes, during 2009–2014. Canada also imported four live, captive-born *T. ornata*, for personal purposes (CITES 2016a).

The United States exported four live, captive-born specimens of *T. ornata*, for personal purposes, during 2009–2014. In addition, one non-living, wild-caught specimen was exported, for scientific purposes. No specimens of *T. ornata* were exported from the United States during 2009–2014 (CITES 2016a).

No imports or exports of *T. ornata* were reported by Mexico during 2009–2014.

Thousands of *T. ornata* are collected from the wild every year for the domestic pet trade, primarily from New Mexico. The species is sometimes bred by hobbyists and small-scale commercial breeders.

Gopher tortoise (*Gopherus polyphemus*)

Fish and Wildlife Research Institute

Recommended Actions

The following actions are recommended for promoting the conservation and legal, sustainable trade of priority turtle species in North America. Completion of the recommended actions is subject to available funding. If the cost of an action can reasonably be considered to be part of normal government spending, then the cost is listed as n/a. If the cost will likely require additional and possibly external funding, then a very rough estimate of the cost is provided.

Measuring, reporting and following up on the recommendations provided in this action plan will be the responsibility of the governments of Canada, Mexico and the United States, in collaboration with academic institutions, nongovernmental organizations and/or individual experts.

No.	Goals	Actions	Cost (US$)	Timeline	Priority
1	Ensure that progress on the recommendations in this action plan is reported and measurable.	**Measuring progress**: The governments of Canada, Mexico and the United States should develop and implement a process for tracking and reporting on efforts to fulfill the recommendations of this action plan, such as a dedicated website or other method.	n/a	2017 (ongoing)	High
2	Support collaborative North American efforts directed at promoting sustainable, traceable trade and conservation of priority CITES Appendix II species.	(a) **Trinational collaboration**: The governments of Canada, Mexico and the United States should support and monitor collaborative efforts to promote sustainable, traceable trade and conservation of native species deemed to be of priority concern—including CITES Appendix II turtles and tortoises.	n/a	2017 (ongoing)	High
		(b) **Funding strategy**: The governments of Canada, Mexico and the United States (to the extent possible, and in consideration of domestic priorities) should develop a long-term strategy for funding this action plan, emphasizing realization of the high-priority actions.	n/a	2018	High
3	Support the sustainable trade and conservation of North American turtles by improving collaboration and cooperation between academia, government, industry and nongovernmental organizations; and promoting turtles as a priority for conservation actions.	(a) **Annual Mexican workshop**: The Government of Mexico, in collaboration with Canada and the United States (when appropriate), academia, and nongovernmental organizations (as pertinent), should host an annual workshop that brings together researchers, managers and enforcement staff, to: share information about freshwater turtle and tortoise science and trade; establish research and management goals; establish and revise a priority species list; and develop or revise policy (including NOM-059) for securing turtle conservation.	20,000 (per year)	2017 (ongoing)	Medium
		(b) **Priority turtle field studies**: The governments of Canada, Mexico and the United States, in collaboration with academia and nongovernmental organizations, should conduct field research and surveys of populations of the priority turtle species, to compile a better understanding of populations, threats, and other basic aspects of their biology and conservation.	20,000 (per year)	2018 (ongoing)	High

No.	Goals	Actions	Cost (US$)	Timeline	Priority
4	Promote research on captive husbandry of *Dermatemys mawii* so as to improve and facilitate initiatives for producing the species for primarily commercial purposes.	(a) ***Dermatemys* farming study**: The Government of Mexico, in collaboration with Central American–range States, academia and nongovernmental organizations, should conduct a study on the feasibility of farming *D. mawii* for commercial meat and/or the pet trade. This should include a review of regulations and the potential impact on in-situ conservation, and analysis of economic prospects and risks.	10,000	2019	High
		(b) ***Dermatemys* husbandry study**: The Government of Mexico, in collaboration with Central American–range States, academia, nongovernmental organizations, and freshwater turtle breeders, should fund and support husbandry research for *D. mawii*, to determine: optimal incubation practices; stocking densities and pond design; sex identification; growth and feeding rates; waste management; and disease prevention.	30,000	2019	High
		(c) ***Dermatemys* nesting study**: The Government of Mexico, in collaboration with Central American–range States, academia and nongovernmental organizations, should fund and support research to determine how, when and where adult female *D. mawii* nest in the wild and in captivity.	30,000	2019	Medium
		(d) ***Dermatemys* fertility study**: The Government of Mexico, in collaboration with Central American–range States, academia and nongovernmental organizations, should jointly fund and support research to compile information on *D. mawii* fertility and sperm storage.	10,000	2019	Medium
5	Develop policy and procedures to promote sustainable commercial turtle production in conjunction with the recovery of wild populations.	(a) ***Dermatemys* integrated conservation policy**: The Government of Mexico, in collaboration with academia and nongovernmental organizations, should develop a detailed program for linking commercial farming of *D. mawii* to in-situ conservation, protected area designation and management, enforcement, and possibly population augmentation with captive-bred specimens from the commercial facilities.	20,000	2019	High
		(b) ***Dermatemys* captive release policy**: The Government of Mexico, in collaboration with academia and nongovernmental organizations, should develop policy and procedures to ensure genetic compatibility, disease-free status, and survival prospects of captive-born *D. mawii* released to the wild.	1,000	2019	High
		(c) ***Dermatemys* farming policy**: The Government of Mexico, in collaboration with academia and nongovernmental organizations, should develop regulations and procedures to prevent wild specimens of *D. mawii* from being laundered through commercial farms.	n/a	2019	High
		(d) **Best management practices (BMP) guidelines**: The USFWS should prioritize completion and distribution of the BMP guidelines on turtle farming that were drafted at the 2011 USFWS workshop.	n/a	2017	High

No.	Goals	Actions	Cost (US$)	Timeline	Priority
6	Provide enforcement officers with the information and resources necessary to adequately respond to illegal turtle trade and to protect wild turtle populations.	(a) ***Dermatemys* enforcement**: The Government of Mexico should increase funding for and prioritize enforcement activities to protect existing wild *D. mawii* populations and new populations established through captive-release, and to monitor commercial farming operations and specimens in trade.	100,000 (per year)	2019 (ongoing)	High
		(b) **Turtle trade enforcement workshop**: The governments of Canada, Mexico and the United States, in collaboration with international authorities, academia and nongovernmental organizations, should host a workshop on turtle collection and trade, for enforcement officers. This workshop should highlight the problem of illegal turtle collection and trade, and provide training on appropriate investigative and enforcement actions for detecting and responding to illegal trade.	60,000	2018	Medium
		(c) **Mexican turtle enforcement policy**: The Government of Mexico should establish policy for disposal of live turtles seized in enforcement actions. Standard operating procedures (SOPs) should be established for releasing specimens or housing them in appropriate facilities.	10,000	2018	High
		(d) **Photographic identification systems**: The governments of Canada, Mexico and the United States, in collaboration with academia and nongovernmental organizations, should support and fund further development and validation of photographic registration systems to identify and recognize individual specimens of priority turtle species, and should encourage use of the systems among authorities, captive-production facilities, and field researchers. Consideration for such systems should include databases for microchips, scute-notching, and photo-identification protocols.	n/a	2019	Medium
7	Review existing Canadian regulations and policy for importing turtles.	**Canadian regulatory review**: The Government of Canada should review the Health of Animals Act and related policy for importing turtles, and evaluate the current risk for transmitting salmonella from turtles in the pet trade.	n/a	2019	Low

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Appendix A: **Categories of Risk**

Canada

The categories for species at risk in Canada, as used for species assessed under SARA, are summarized as follows (COSEWIC 2015):

- **Extinct (-)**: A wildlife species that no longer exists.
- **Extirpated (XT)**: A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.
- **Endangered (E)**: A wildlife species facing imminent extirpation or extinction.
- **Threatened (T)**: A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
- **Special Concern (SC)**: A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
- **Not at Risk (NAR)**: A wildlife species that has been evaluated and found to be not at risk of extinction, given the current circumstances.
- **Data Deficient (DD)**: A category that applies when the available information is insufficient to resolve a species' eligibility for assessment or to permit an assessment of the wildlife species' risk of extinction.

Mexico

The legislated categories for species and populations at risk in Mexico, as summarized from the General Law of Wildlife of Mexico (*Ley General de Vida Silvestre*) (Mexico 2016), are as follows:

- **Probably Extinct (in the wild)**: Those species that no longer can be found in the wild and are only known to exist in captivity or outside Mexican territory.
- **Endangered (in danger of extinction)**: Those species whose ranges or population size have declined dramatically in Mexico, thereby threatening their survival, due to factors such as the destruction or drastic modification of habitat; unsustainable exploitation; disease; or predation.
- **Threatened**: Those species that could be in danger of extinction in the short or medium term, if the factors that threaten their survival continue unabated.
- **Subject to Special Protection**: Those species that could potentially be threatened by factors that threaten their survival, and for which efforts are required to promote their recovery and conservation.

United States

The categories for species at risk established by the United States, as defined in section 3 of the ESA, are as follows (USA 1973):

- **Endangered**: Any species which is in danger of extinction throughout all or a significant portion of its range. Species of insects may be exempt if they are deemed by the Secretary to be pests whose protection would present an overwhelming risk to man.
- **Threatened**: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.:

IUCN Red List Categories

Categories and Criteria of the IUCN Red List (IUCN 2012) are summarized as follows:

- **Extinct (EX)**: A taxon[12] of which no living individuals exist.
- **Extinct in the Wild (EW)**: A taxon that is known to survive only in cultivation, in captivity or as a naturalized population (or populations) well outside its past range.
- **Critically Endangered (CR)**: A taxon that meets any of five established criteria (A to E) and is facing an extremely high risk of extinction in the wild. The criteria for Critically Endangered are based on population size, geographic ranges and/or at least a 50% probability of extinction within 10 years or three generations.
- **Endangered (EN)**: A taxon that meets any of five established criteria (A to E) and is facing a very high risk of extinction in the wild. The criteria for Endangered are based on population size, geographic ranges and/or at least a 20% probability of extinction within 20 years or five generations.
- **Vulnerable (VU)**: A taxon that meets any of five established criteria (A to E) and is facing a high risk of extinction in the wild. The criteria for Vulnerable are based on population size, geographic ranges and/or at least a 10% probability of extinction within 100 years.
- **Near Threatened (NT)**: A taxon that has been evaluated against the criteria and does not qualify as Critically Endangered, Endangered or Vulnerable—but is close to qualifying for, or is likely to qualify for the category Threatened in the near future.
- **Least Concern (LC)**: A taxon that has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa qualify for this category.
- **Data Deficient (DD)**: A taxon for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.
- **Not Evaluated (NE)**: A taxon which has not yet been evaluated against the criteria.

12. The name applied to any taxonomic group in biological nomenclature (e.g. kingdom, phylum, class, order, family, genus, species, etc.) (Merriam-Webster 2016).

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