

COLLABORATION FOR ENVIRONMENTAL EVIDENCE

SYSTEMATIC REVIEW No. 50

**EFFECTIVENESS OF NEST MANAGEMENT AND POPULATION REINFORCEMENT
IN THE RECOVERY OF RIVER TURTLE POPULATIONS IN VENEZUELA**

CONSULTATION DRAFT REVIEW PROTOCOL

Lead Reviewer: *Omar Hernández*
Postal Address: *FUDECI, Palacio de las Academias, Edif. Anexo, Piso 2, Av. Universidad, Bolsa a San Francisco 185 Caracas, Venezuela*
E-mail Address: *omarherpad@gmail.com*
Telephone: *0058-212-4846377, 0058-212-4845967*
Fax: *0058-212-4841310*

This is a draft protocol for consultation. Additional work is in progress. Please do not quote this document or any part therein without prior consent of the authors.

COVER SHEET

Title	Working title: Effectiveness of nest management and population reinforcement in the recovery of river turtle populations in Venezuela
Systematic review	No. 50
Reviewer(s)	<i>Omar Hernández</i>
Date draft protocol published on website	29th July 2008
Date final protocol published on website	
Date of most recent amendment	
Date of most recent SUBSTANTIVE amendment	
Details of most recent changes	
Contact address	<i>FUDECI, Palacio de las Academias, Edif. Anexo, Piso 2, Av. Universidad, Bolsa a San Francisco 185, Caracas, Venezuela, omarherpad@gmail.com</i>
Sources of support	PROVITA
Conflicts of interest	Lack of support from the MPPA in making access difficult to technical reports.

This is a draft protocol for consultation. Additional work is in progress. Please do not quote this document or any part therein without prior consent of the authors.

1. BACKGROUND

Turtles have had a successful evolution and have existed on our planet for the last 300 million years. However, the adaptations that have in the past made the evolution of turtles successful, such as late maturity, high juvenile mortality and longevity with low adult mortality are now turning the turtles' status to vulnerable due to human exploitation and environmental changes (i.e. which have resulted from development) (Turtle Conservation Fund 2002). The characteristics of the life history of most turtles limit the sustainable harvest of wild turtles (Thorbjarnarson et al. 2000). Even moderate harvests of wild populations will probably result in their decline (Crouse et al. 1987).

In many parts of the world, rural human populations depend in some way or other on turtles and on the products of the latter to cover their food needs (Thorbjarnarson et al. 2000). The overexploitation of turtles is therefore the main cause of their population declines (Klemens & Thorbjarnarson 2005).

Globally, turtles face serious problems for they are hunted, killed, exploited, consumed and sold in disproportionate quantities. The eggs, young and adults are used for food, traditional medicine and as pets. They are exploited indiscriminately without considering the reasons why so many of these species are facing extinction and why a few others no longer exist (Turtle Conservation Fund 2002).

According to Ojasti (1995), national reports from Brasil, Colombia, Ecuador, Peru and Venezuela expose the presence of the commercial clandestine but widespread capture of *Podocnemis erythrocephala*, *P. expansa*, *P. sextuberculata* and *P. unifilis* for their sale in cities and towns. However it is very possible that the number of aquatic chelonian sold may be underestimated firstly because of its illegality, and secondly because hunting and fishing statistics have to date not been included in the reports (Ojasti, 1995). Gorzula (1995) estimated that the capture of between 200,000 and 400,000 individuals in the Venezuelan Amazonian forest of the Big-headed Amazon river turtle (*Peltocephalus dumerilianus*), Red-headed Amazon river turtle (*Podocnemis erythrocephala*) and Yellow-spotted side-necked turtle (*Podocnemis unifilis*). In the Capanaparo River, in South-eastern Venezuela, members of the Yaruros ethnic group as well as creoles that inhabit the region have noted unexpected reductions in *P.expansa* populations as well significant reductions in *P. unifilis* populations (Thorbjarnarson et al. 1997).

The most widely documented example in Venezuela of the disproportionate exploitation of turtles is that of the Arrau or Orinoco turtle (*Podocnemis expansa*). Alejandro Humboldt was the first naturalist to report turtle population data. He estimated the presence of 330,000 nests in the Orinoco region (Humboldt 1991). Today in this same region, there are only one thousand nests which are about 0.3% of the 1800 estimates.

Nest predation and floods are the main natural causes of the reduction in the reproductive success of the *Podocnemididae*. Castaño et al. (1993) found that for *Podocnemis erythrocephala* in the Inárida River, nest loss was caused by the following; flooding events (33.3%), ants (33.3%), egg predation by mammals (12%). Only 3% of the nests

produced hatchlings. It was however reported that in areas that lacked any type of vigilance, human predation totalled 100% of the nests. Narvaiza et al. (1999) reported a nest loss of 99.5% of *P. expanda* due to human predation in the Brazo Casiguiare. Similar results were also reported for *P. unifilis* nests. Also the sudden water uprisings can cause considerable turtle nest loss (Fachín & von Muljen 2000). Solni (1997), reported in the Peruvian Amazonian Forest, an annual loss of 10-50% of *P. unifilis* nests due to flooding. In the Caqueta River in Colombia, the translocation of nests areas higher up in nesting beaches prevented the loss of 64% of *P. unifilis* nests due to flooding events (Paéz & Bock 1998).

Considering the elevated predation levels of turtle eggs and hatchlings, as well as the fact that adult populations have been notably reduced due to human pressure, the main problem facing turtle populations is the possibility that there may not be any future generations of certain turtle species leading to the extinction of the latter.

One way of increasing the numbers of future populations and prevent the extinction of the latter, is to ensure the birth of the greatest number of hatchlings and increase probabilities of the latter of reaching adulthood. It is for this reason that in Venezuela some turtle populations are being managed, to prevent species extinction. As part of this management program are the following interventions; nest site vigilance (to prevent the sacking of eggs), the translocation of nest sites to areas higher up in the nesting beach (to prevent nest loss due to flooding), and population reinforcement through the raising and consequent release of hatchlings (in order to help increase their survival probabilities). All of the above methods are meant to increase the numbers of future generations.

The objective of this systematic review is to determine the effectiveness of these management and reinforcement strategies that have been carried out to date to increase the populations of the different freshwater turtle species.

2. OBJECTIVE OF THE REVIEW

Evaluate the effectiveness of nest management and population reinforcement as strategies to recover freshwater turtle populations in Venezuela.

2.1. Primary question

Are nest management and population reinforcement effective strategies to recover river turtle populations in Venezuela?

2.2. Secondary question

Is it possible to use nest management, nest area protection and population reinforcement for all river turtle populations in Venezuela?

3. METHODS

3.1. Search strategy

3.1.1 General searches

The following data bases will be consulted:

Google Académico
Scielo International
Science Citation Index Expanded
Latindex Catalogo
Biosis Previews
Zoological Record

3.1.2 Specialist searches

The libraries, technical reports, theses and archives of the following institutions will be consulted:

Ministerio del Poder Popular para el Ambiente
FUDECI
INPARQUES
Universidad Central de Venezuela
Universidad Nacional Experimental de los Llanos Occidentales Ezequiel Zamora
Universidad Simón Bolívar
Universidad Nacional Experimental Guayana
Fundación La Salle
Universidad Centro Occidental Lisandro Alvarado

3.1.3 Website searches

The web pages and newsletters of the following institutions will be consulted:

IUCN/SSC-Reintroduction Specialist Group
IUCN/SSC, Tortoise and Freshwater Turtle Specialist Group
WWF
WCS
Turtle specialist in Venezuela will also be contacted directly

For the search the following keywords and combination of the latter will be used:

Table 1. Terms in English and Spanish

<i>In English</i>	<i>In Spanish</i>
<i>Podocnemis</i>	<i>Podocnemis</i>
<i>Chelus</i>	<i>Chelus</i>
<i>Phrynops</i>	<i>Phrynops</i>
<i>Platemys</i>	<i>Platemys</i>
<i>Rhinoclemmys</i>	<i>Rhinoclemmys</i>

This is a draft protocol for consultation. Additional work is in progress. Please do not quote this document or any part therein without prior consent of the authors.

<i>Pseudmys</i>	<i>Pseudmys</i>
<i>Batrachemys</i>	<i>Batrachemys</i>
<i>Mesoclemys</i>	<i>Mesoclemys</i>
<i>Rhinemys</i>	<i>Rhinemys</i>
<i>Kinosternon</i>	<i>Kinosternon</i>
<i>Peltocephalus</i>	<i>Peltocephalus</i>
<i>Trachemys</i>	<i>Trachemys</i>
Freshwater turtle, river turtle	Tortugas de agua dulce
Distribution	Distribución
Turtle predation	Depredación de tortugas
Turtle exploitation	Consumo de Tortugas
Hunting	Caza-cacería
Poaching	Cacería furtive
Nest protection	Protección de nidos
Nesting beach	Playas de anidación
Reinforcement/supplementation	Reforzamiento poblacional
Wildlife conservation	Conservación de fauna silvestre
Turtle conservation	Conservación de Tortugas

In each of the searches, the first 100 articles will be selected and review.

3.2. Study inclusion criteria

a. *Relevant subject(s)*: Freshwater turtles in Venezuela

b. *Types of intervention*: Nests and nesting beach management, translocation of nests to safe areas, captive breeding, population reinforcement

c. *Types of comparator*: Populations not subject to management

d. *Types of outcome*: Change in hatching success, nest abundance/density, the sacking of nests, in juvenile population and population structure

e. *Potential reasons for heterogeneity*:

The biology of the species; the breeding strategies of the latter may not facilitate nest management

With the objective of filtering the most relevant studies, we will use the following inclusion criteria in three phases;

1. Title and keywords: only those studies whose title and keywords are associated to the objective of the review will be included
2. Abstract: All the abstracts from the selected studies will be revised and only those satisfying the review criteria will be considered.
3. Entire manuscript: All the studies selected above will be read in full to determine which are suitable for data extraction

In each of the selection phases, a second reviewer will assess a sample of 25% of the studies to verify whether the previously mentioned criteria are clearly defined and

This is a draft protocol for consultation. Additional work is in progress. Please do not quote this document or any part therein without prior consent of the authors.

whether they are correctly used to include or exclude studies from the review. The results will be contrasted using a Kappa analysis, in which the criteria will be considered adequate and replicable if the result of the analysis is equal or greater than 0.6. If the values of the Kappa Analysis are lower than 0.6, the criteria will be readjusted and the studies will be once again evaluated.

3.3. Study quality assessment

Initially in the review, all studies dealing with freshwater turtles in Venezuela will be considered using the previously mentioned search criteria. Both qualitative and quantitative studies will be included as well as scientific and grey literature.

Considering that many of the studies containing quantitative data and consistent methods may be difficult to find, qualitative studies that clearly describe the criteria on which results and conclusions are based, will also be included in the review. If only a few studies are available for a species, all of the latter will be considered in the review.

It will also be necessary to compile information on the possible bias sources and measures that have been carried out by the researchers to try and mitigate the latter. In this sense, the following sources of experimental bias and error will be considered:

- Differences in the scale of the analysis and scale of the studied process
- Selection of the study unit (spatial and temporal autocorrelation)
- Pseudoreplication
- Detection bias (detection probability)
- Omission bias (open population)
- Sample size
- Sample methodology
- Comparator use
- Selection of statistics analysis used
- Probability of making Type II error (statistical length)

The potential bias sources will be independently assessed in a predefined scale that will very likely vary from 0 to 1. Once each of these sources has been evaluated, the results will be summed up to determine the percentage of bias of the study. If the value of the sum is greater than 5, the study may be included in the quantitative analyses of the review.

3.4. Data extraction strategy

For each of the reviewed studies, a table will be used where the following data will be included:

- Author:
- Year:
- Location:
- Species:
- Intervention used:

This is a draft protocol for consultation. Additional work is in progress. Please do not quote this document or any part therein without prior consent of the authors.

Intervention duration and intensity:
Evaluation was carried out before the intervention: yes/no
Summary of methodology used:
Result type: quantitative/qualitative
Results:
Conclusions of study:
Any other information related to the questions of the systematic review.

3.5. Data synthesis

Anticipating the types of studies compiled in this review, it will probably only be possible to perform the synthesis on semi-formal data. Tables will be created in which for each intervention, the results will be analysed (i.e. specifying whether the result was positive or negative).

However, if enough studies with quantitative data are found, a meta-analysis will be performed to estimate the joint effect of the different studies. Depending on the studies found, it will be determined which model is most convenient.

4. POTENTIAL CONFLICTS OF INTEREST AND SOURCES OF SUPPORT

None expected.

5. REFERENCES

- Castaño-Mora, O., Galvis-Peñuela, P.A., Molano, J. G., 2003. Reproductive ecology of *Podocnemis erythrocephala* (Testudines: Podocnemididae) in the lower Inirida river in Colombia. *Chelonian Conservation and Biology*. 4(3):664-670
- Crouse, D.T., Crowder, L.B., Caswell, H., (1987) A state-based population model for loggerhead sea turtles and implications for conservation. *Ecology* 68:1412-1423
- Fachín A., Von Mülhen, E.M., 2003. Reproducción de la taricaya *Podocnemis unifilis* troschel 1848 (testudines: Podocnemididae) en la várzea del medio Solimões, Amazonas, Brasil. *Ecología Aplicada*, 2(1):125-132.
- Gorzula, S., 1995. Diagnóstico faunístico del Estado Amazonas, propuesta para un manejo sustentable. En: A. CARRILLO y M. A. PERERA (Ed). *Amazonas modernidad y tradición*. SADA-Amazonas y Deutche Gesellschafft für Technische Zusammenarbeit, Caracas. 228-247.
- Humboldt, A., 1991. Viaje a las regiones equinocciales del nuevo continente. 1820. Tomo III. Monte Ávila Editores. Caracas, Venezuela.
- Klemens, M.W., Thorbjarnarson, J., 1995. Reptiles as a food source. *Biodiversity and Conservation* 4: 281-298.
- Ojasti, J., 1995. Uso y conservación de la fauna silvestre en la Amazonía. Secretaría Pro-Tempore-Tratado de Cooperación Amazónica, Lima. N° 35.

Páez, V.P., Bock, B.C., 1998. Temperature effect on incubation period in the Yellow-Spotted River Turtle *Podocnemis unifilis*, in the Colombian Amazon. *Chelonian Conservation and Biology*. 3(1): 31-36

Soini, P., 1997. Ecología y manejo de quelonios acuáticos en la amazonía peruana, in *Manejo de Fauna Silvestre en la Amazonía*, ed. G.T., Fang, R.E., Bodmer, R., Aquino, M.H., Valqui, pp.167-173. La Paz, Bolivia.

Thorbjarnarson, J., Lagueux, C., Bolze, D., Klemens, M., Meylan, A., 2000. Human use of turtle: a worldwide perspective. In *Turtle Conservation*, ed. M., Klemens, pp33-84. Smithsonian Institution Press, Washington and London.

Thorbjarnarson, J.B., Pérez, N., Escalona T., 1997. Biology and conservation of aquatic turtles in the Cinaruco-Capanaparo National Park, Venezuela. *Proceedings: Conservations, Restoration, and Management of Tortoises and Turtles. An International Conference*. New York Turtle Tortoise Society. 109-112.

Turtle Conservation Fund. 2002. *A Global Action Plan for Conservation of Tortoises and Freshwater Turtles. Strategy and Funding. Prospectus 2002–2007*. Washington, DC: Conservation International and Chelonian Research Foundation.