



## COLLABORATION FOR ENVIRONMENTAL EVIDENCE

### SYSTEMATIC REVIEW No. 78

#### ARE ENVIRONMENTAL EDUCATION INITIATIVES EFFECTIVE FOR THE CONSERVATION OF JAGUAR?

#### CONSULTATION DRAFT REVIEW PROTOCOL

**Lead Reviewer:** *Emiliana Isasi-Catalá*  
**Postal Address:** *Laboratorio de Manejo y Conservación de Fauna, Departamento de Biología de Organismos, Universidad Simón Bolívar, Sartenejas, 89000, Caracas, Venezuela.*  
**E-mail Address:** [zmiliana@gmail.com](mailto:zmiliana@gmail.com)  
**Telephone:** *0058-212-9063111 ext 6022*  
**Fax:**

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## COVER SHEET

|   |   |
|---|---|
| Title                                     | <b>Working title: Are environmental education initiatives effective for the conservation of Jaguar?</b>   |
| Systematic review                         | <b>No. 78</b>   |
| Reviewer(s)                               | <i>Emiliana Isasi-Catalá</i>  |
| Date draft protocol published on website  | <b>10 August 2009</b>   |
| 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>Laboratorio de Manejo y Conservación de Fauna,<br/>Departamento de Biología de Organismos Universidad<br/>Simón Bolívar, Sartenejas, 89000, Caracas, Venezuela,<br/><a href="mailto:zmiliana@gmail.com">zmiliana@gmail.com</a></i> |
| Sources of support                        | <b>PROVITA</b>  |
| Conflicts of interest                     | <b>None expected</b>  |

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## 1. BACKGROUND

The jaguar (*Panthera onca*) is the largest terrestrial predator in the Neotropics and is the only representative of the genus *Panthera* in America (Seymour 1989). It is strongly associated with areas that have considerable vegetation cover, water availability and prey abundance, although it is also able to survive in a number of different environmental conditions (Rabinowitz & Nottingham 1986, Mondolfi & Hoogesteijn 1986, Seymour 1989, Crawshaw & Quigley 1991, Rabinowitz 1992, Jackson 1992, Novell & Jackson).

Like most other felines, the conservation status of jaguar populations is defined principally by the habitat conditions and the interaction level with humans (hunting activities, trade, competition for prey; Nowell & Jackson 1996, Mondolfi & Hoogesteijn 1992, Jackson 1992, Swank & Teer 1992). Up to the 1970s, the species' main threat encompassed poaching activities for its skin. It was for this reason that the jaguar was included in 1973 in Appendix I of The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Seymour 1989, Swank & Teer 1989). Today the jaguar is principally threatened by habitat loss and destruction, indiscriminate hunting of its natural prey and the conflicts that exist between it and humans due to the predation of domestic animals (Nowell & Jackson 1996, Swank & Teer 1992, Hoogesteijn et al. 1992). Consequently the species is catalogued as Nearly Threatened (NT) by the International Union for the Conservation of Nature (IUCN).

The sources of threat that affect the species are not independent of one another. Habitat loss and destruction directly affect the jaguar, reducing its shelter availability, and has a negative effect on the populations of its prey which alongside hunting activities notably reduces the jaguar's food availability (Rabinowitz 1992, Hoogesteijn et al. 1992, Saénz & Carillo 2002, Hoogesteijn et al. 2002). It is believed that this situation encourages the substitution of the jaguar's natural prey by domestic animals, which leads to considerable financial losses and discontentment towards this predator. This conflict between the anthropogenic activities and the jaguar has promoted its active persecution and hunting. Therefore in the present day hunting activities is one of the main causes of mortality (Saénz & Carillo 2002, Hoogesteijn et al. 2002).

Most of the threats to the conservation of the jaguar have both a social and cultural importance. Being at the top of the food chain, the jaguar is considered a potential enemy of humans. It is for this reason persecuted and killed. In a few cultures (especially in indigenous cultures), the jaguar is considered to be a symbol of strength and power, and is therefore hunted for both cultural and religious reasons. On the other hand, in most other societies, humans and jaguars compete for the same prey hence the jaguar is often hunted. Finally, the hunting of the jaguar is associated with man's negative perception towards it. This consequently promotes its search and persecution even in those situations where there are not any predation events of domestic animals (Rabinowitz 1992, Hoogesteijn et al. 1992). Environmental education is very important in changing man's negative perception towards the jaguar. It can be an important tool to improve people's views of conservation and management measures as far as local communities get involved. Environmental education can be on the whole very important for the species and its habitat, as it reinforces the cultural value of the species and its surroundings, as well as the importance of this species as a symbol of many of these human communities.

However, environmental education programs targeting the jaguar conservation are not very common for they require much time and financial effort.

Considering that environmental education is a potentially effective technique to conserve the jaguar, it is necessary to evaluate the impact of the different environmental education programs that have been carried out throughout the jaguar's range, to determine whether environmental education is effective in firstly improving people's knowledge, perception and attitudes towards the jaguar, and secondly people's involvement in the conservation of jaguar populations. The objective of this review is therefore to compile, organise and evaluate the results that have been attained through the assessment of the environmental education programs whose main objective is jaguar conservation using an evidence-based approach (Sutherland et al. 2004). Through this review, it will be determined whether the information available on environmental education for jaguar conservation is sufficient to determine which management strategy is most effective to reduce hunting activities and habitat loss. It will therefore be essential to revise not only the available scientific literature, but also the grey literature as well as interviewing experts to get all of the available data on the topic.

## 2. OBJECTIVE OF THE REVIEW

### 2.1. Primary question

Are environmental education programs effective for the conservation of the jaguar?

**Table 1.** Definitions of components of the primary systematic review question

| <i>Subject</i>                  | <i>Intervention</i>  | <i>Outcome</i>   | <i>Comparators</i>  | <i>Designs</i>  |
|---------------------------------|--|--|---|---|
| Jaguar ( <i>Panthera onca</i> ) | Environmental education programs that are aimed at (1) modifying and improving the people's knowledge level, and (2) increase people's involvement in conservation programs through the reinforcement of the jaguar's image, and its cultural/natural value. | Direct:<br>Increase or stabilisation of jaguar numbers in the area<br><br>Direct:<br>Change in the number of hunting reports of both jaguars and natural prey of the | Studies that report the number of jaguars and jaguar trails before and after the start of the environmental education program<br><br>Studies that report the number of hunting events of both jaguars and their prey before and after the start of the environmental education program. | Quantitative studies that present data that will facilitate the evaluation of the intervention using the comparators and presented variables.<br>Other variables and comparators that may be included once the systematic revision has started. |

| <i>Subject</i> | <i>Intervention</i> | <i>Outcome</i>   | <i>Comparators</i>  | <i>Designs</i>   |
|----------------|---------------------|--|---|--|
|                |                     | Indirect:<br>Change in people's knowledge about the jaguar   | Studies that have recorded possible changes in people's knowledge level of the jaguar, before and after of start the environmental education program.                   | Qualitative studies that contain information and reports that will allow the evaluation of the intervention. |
|                |                     | Indirect:<br>Improvement in people's perception and attitude towards the jaguar.                         | Studies that evaluate possible changes in people's perception and/or attitude towards jaguars, before and after starting the environmental education program.           |  |
|                |                     | Indirect:<br>Change in people's involvement and activism in jaguar conservation activities and programs. | Studies that assess people's involvement or activism in jaguar conservation programs, before and after starting the environmental education program.                    |  |
|                |                     | Indirect:<br>Change in the effectiveness of jaguar conservation measures                                 | Improvement in the acceptance from local population and the effectiveness of the conservation actions before and after of start the program of environmental education. |  |

## 2.2. Secondary questions

Does the effectiveness of environmental education programs for the conservation of jaguar, vary with (1) the type of activity that is carried out by the human target population, and (2) with the number of predator-human conflicts?

Does the effectiveness of environmental education vary with the educational strategy used (technique, target population of the program and others)?

### 3. METHODS

#### 3.1. Search strategy

##### 3.1.1. General sources

A search will be carried out using the following databases:

1. ISI Web of Knowledge: ISI Web of Science: Science Citation Index Expanded. (<http://apps.isiknowledge.com>)
2. Science Direct (<http://www.sciencedirect.com>)
3. Ebsco (<http://web.ebscohost.com>)
4. Scientific Electronic Library Online (<http://www.scielo.org>)
5. JSTOR (<http://www.jstor.org>)

A search will be carried out using the following search engines.

1. Google Scholar ([www.scholar.google.com](http://www.scholar.google.com))
2. [www.alltheweb.com](http://www.alltheweb.com)
3. [www.dogpile.com](http://www.dogpile.com)

The search using databases, catalogues and search engines will be carried by only one reviewer.

The search will consider the following keywords:

1. *Panthera onca*
2. *Panthera onca* AND “Environmental education”
3. *Panthera onca* AND “Educational campaigns”
4. *Panthera onca* AND Educa\* AND “Cultural value”
5. *Panthera onca* AND Educa\* AND “Natural value”
6. *Panthera onca* AND Educa\* AND “Knowledge of the species”
7. *Panthera onca* AND Educa\* AND “Attitude towards the species”
8. *Panthera onca* AND Educa\* AND “Perception towards the species”.
9. *Panthera onca* AND Educa\* AND “Participation”.
10. *Panthera onca* AND Educa\* AND “Activism”.
11. *Panthera onca* AND Educa\* AND “Human activities”
12. *Panthera onca* AND Educa\* AND Manag\*
13. *Panthera onca* AND Educa\* AND Conflict\*
14. *Panthera onca* AND public awareness AND conflict

Considering that locally and regionally, a considerable number of common names are used to describe the jaguar, the above search will stretched out to include the most representative common names of the species. The list of key words will be extended in the following way: Jaguar\* OR Yaguar OR Onça\* OR Tiger\* OR “Tig Marqué”.

The search using the above keywords will be performed in English, Spanish, Portuguese and French.

For internet searches the first 100 references of each search will be reviewed. These references will have to be available in Word, Pdf o other similar formats.

### **3.1.2. Specialist sources**

IUCN / SSC Cat Specialist Group - Digital Cat Library (<http://www.catsg.org/catsglib>)

The search of grey literature will be carried out and will consider reports, theses, unpublished research manuscripts, reports of management activities that have been carried out within the protected areas, legal reports (hunting, deforestation), notifications of problematic animals and others. To do this, the following institutions or the libraries of the following institutions will be visited: Ministerio del Poder Popular para el Ambiente, INPARQUES, Museo de la Estación Biológica de Rancho Grande, UNELLEZ, Fundación La Salle, and others. Experts will also be interviewed to get more information on the topic. The latter will be carried out to improve the gathering of grey literature.

## **3.2. Study inclusion criteria**

### **3.2.1. Relevant subject(s):**

The subject of this review is the jaguar (*Panthera onca*) in his entire range of distribution.

### **3.2.2. Type of intervention:**

The intervention of this review will encompass environmental education programs and campaigns whose main objective is jaguar conservation.

We propose to use two types of indicators of the effectiveness of environmental education programs direct with results in the long term and secondary with results in the short and medium term. Direct indicators considered are: i) Increase or stabilisation of jaguar numbers in the area and ii) change in the number of hunting reports of both jaguars and natural prey of the latter. Secondary or indirect indicators are designed to firstly modify or improve the human blank population's knowledge, perception or attitude towards the jaguar, and secondly to increase people's involvement in conservation programs. This indicators are: i) change in people's knowledge about the jaguar, ii) improvement in people's perception and attitude towards the jaguar, iii) change in people's involvement and activism in jaguar conservation activities and programs, and iv) change in the effectiveness of jaguar conservation measures

Other variables can be included in the analysis.

### **3.2.3. Types of comparator:**

Ideally, studies considered in this review will mention temporal comparators of the indicators proposed above (knowledge level, attitude and perception, involvement, effectiveness of activities and programs associated with hunting events of jaguars and that of their prey, number of jaguars in an area). These temporal comparators

will encompass data of before and after the start of the environmental education campaigns aimed at jaguar conservation.

However studies will also be included that will permit the comparison at a spatial scale of areas where environmental education programs have been established, as well as areas that lack any form of management. All this will be carried out considering any potential reasons of heterogeneity that may exist.

#### **3.2.4. *Types of outcome:***

All studies that contain information about the effectiveness of environmental education programs will be included in this review. Two indicator types of the environmental education programs will be presented: direct short term indicators as well as mid-term and long-term indicators. The direct indicators will be dependent on changes in the human population's knowledge, involvement or attitude towards the jaguar and the conservation of the latter which result from the development of different environmental education programs. Here we will try to determine whether the environmental education programs produce: i) an increase in people's perception and knowledge towards the jaguar, ii) improvement in people's perception and attitude of the jaguar and iii) increase in people's involvement in programs and activities which are jaguar conservation related.

The indicators that will be considered will be the following: i) increase in the effectiveness of the general conservation measures for the jaguar, ii) decrease in the number hunting records of jaguars and in that of its prey and iii) increase or maintenance jaguar numbers in the area.

Other variables may be included in the review as the latter progresses.

#### **3.2.5. *Types of study:***

All studies included in this review will present information on the relevant subject, the intervention and the variables/indicators that assess the effectiveness of the intervention. The studies will need to have quantitative measures of the proposed variables. However, studies that have descriptions or qualitative data will be reviewed to evaluate the quality of the information. Theoretical studies may also be considered if applicable to this review.

#### **3.2.2. *Potential reasons for heterogeneity:***

A few factors that may affect the comparison of results of the different studies in this review are the following.

1. Ecological factors and species characteristics:
  - Ecosystem characteristics
  - Presence of other predators
  - Local threats for the Jaguar
2. Design, creation and management environmental education programs:
  - Educational methods used

- Size of blank population
  - Continuity of environmental education program
3. Social and institutional factors:
- Social and economic status of blank population
  - Cultural value of the jaguar
  - People involved in the management of the protected area
  - Land use
  - Availability of funds and institutional support

Other general variables that may affect the analyses are: climatic patterns, social development and local economic policies, human population density and structure, and others.

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 this 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 whether they have been 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 assessed once again.

### **3.3. Study quality assessment**

The quality of the studies will be determined from the revision/analysis of the entire text of the selected documents, by a single reviewer. The studies will be classified according to readjusted hierarchically criteria proposed by Pullin and Knight (2001). These criteria will have to be adjusted and detailed, although the following criteria will be initially presented:

**Table 2.** Criteria for the classification of study quality (Based on Pullin & Knight 2001)

| <i>Category</i> | <i>Criteria</i>  |
|-----------------|--|
| I               | Strong evidence from well designed experiments (controlled and random experiments) with an appropriate sample size.  |
| II-1            | Evidence from well designed controlled experiment but without randomness.  |
| II-1            | Evidence derived from a comparison of differences between different locations or situations that are or aren't influenced by the independent variable ("treatment" vs. "control"). |
| II-3            | Evidence derived from several time series or blunt results of uncontrolled experiment.   |
| III             | Opinions of experts which are based on qualitative field results, descriptive studies and reports from expert committees.  |
| IV              | Inadequate evidence due to methodological problems (simple size, duration, etc.) or unexplained evidence.  |

After having carried out the above categorization/classification, a second reviewer will evaluate/assess a sample of 25% of the studies to verify/ensure that the criteria are clearly defined and have been correctly used to classify the studies. The results will be contrasted using a Kappa analysis in which criteria will be considered to be adequate and replicable if they have a value equal or greater than 0.6. If the calculated Kappa values are lower than 0.6, the criteria will again be revised/reviewed, and the studies reassessed/re-evaluated.

### **3.4. Data extraction strategy**

The data extraction for this review will be performed by a single reviewer, who will summarise and organize the data in previously designed tables. These tables will be evaluated and adjusted according to the results of pilot studies. Tables will be created to firstly compile qualitative data, as well as quantitative data of the previously defined variables for the evaluation of the intervention.

A sample of 25% of the studies will be evaluated by a second reviewer to verify whether the data extraction criteria and the effectiveness of the tables are adequate.

During the data extraction, the following study characteristics will be recorded: study type (experimental, theoretical), location, date, potential reasons for heterogeneity, study quality category as well as other characteristics. To evaluate the quality of the studies, data will be extracted to be able to categorise the studies according to the criteria in Table 2. It will be necessary to compile information on the possible sources of bias and on the measures taken by researchers to try and mitigate the latter. The following sources of error and experimental bias 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 strength)

These potential bias sources will be independently assessed in a predefined scale that will 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. A study will be considered to be acceptable if the bias percentage does not exceed 40% of the total marks.

### **3.5. Data synthesis**

The methods used to analyse and synthesise the data will vary according to the type of data found in the studies that are included in the review. Summary tables will be created to compile the information on the authors, organization, study year, study area, bibliographical sources, and others.

For each of the analysed studies, summary sheets and tables will be created in which the most important extraction information will be noted: characteristics and quality of the study, potential reasons of heterogeneity, most important results (qualitative and quantitative), and others. In these summary tables a summary narrative describing the study will be included.

If sufficient quantitative data are extracted, quantitative analyses will be carried out as it could be: semi-quantitative synthesis, secondary analyses and meta-analyses. The statistical treatments that will be used to analyse the data will vary according to the type and quantity of data. All of the quantitative data will be summed up in tables so that they may be contrasted and analysed in an orderly fashion.

## **4. POTENTIAL CONFLICTS OF INTEREST AND SOURCES OF SUPPORT**

None expected.

We would like to thank PROVITA, for initiating the first project of Evidence-based Conservation in Venezuela, and for including us in the work team. Thanks to Professor Jafet Nassar for all the support and guidance that he has given us from the beginning of the exercise.

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