METHODOLOGY FOR THE SYSTEMATIC REVIEW OF THE SNAPP- SOUTH AMERICAN CAMELIDS PROJECT

METHODOLOGICAL PROPOSAL

This document is the methodological proposal to be used for the search, organization and analysis of the SNAPP project bibliography: *Addressing the impacts of sarcoptic mange in wild South American Camelids across a landscape of myths and legends.*

SNAPP

The Nature Conservancy

WCS

Objective:

The aim of this research is to obtain evidence to understand the severity and impact of mange on South American camelid populations (SAC), as well as the effectiveness of veterinary treatments, and to identify if there are environmental and management factors of these species that could be related to the onset and prevalence of the disease. During this research it is expected to:

- Promote science-based knowledge to overcome the landscape of myths and legends surrounding disease and management.

- Collect information to compare the severity and impact of mange across the range of SAC, and identify possible common predictors of serious mange infestations.

- Facilitate the exchange of information between the livestock, wildlife and human sectors, for the development of ecologically informed management plans that mitigate the impacts of diseases by informing and supporting central animal health agencies.

Subject of the research:

South American Camelids (SAC): vicuña (*Vicugna vicugna*) and guanaco (*Lama guanicoe*)

Research Questions:

Four major issues have been identified that will be addressed throughout this research: prevalence of mange in SAC, environmental factors associated with mange, factors in the management of SAC associated with mange, and effectiveness of veterinary treatments. For each theme, main research questions were identified:

Theme	Main question
Prevalence and severity of the disease and its impacts on populations	How is the prevalence of mange in SAC? (*¿Cómo es la prevalencia de la sarna en los CSA?*)

Environmental factors related to the appearance, spread and prevalence of the disease	Are environmental conditions correlated with mange prevalence?) *(¿Las condiciones ambientales están correlacionadas con la prevalencia de la sarna en CSA?)*
Management factors related to to the appearance, spread and prevalence of the disease	Does management increase mange prevalence? *¿El manejo de los CSA para el aprovechamiento de fibra y carne aumenta la prevalencia de la sarna?*
Veterinary treatments and effectiveness	What is the effectiveness of the veterinary treatments implemented? *¿Cuál es la efectividad de los tratamientos veterinarios implementados para el control de la sarna en CSA?*

For each question, key sources of heterogeneity were identified that should be taken into account for the evaluation, which allowed the development of secondary questions that seek to direct the research in greater detail. These questions are:

Theme	Secondary questions
Prevalence and severity of the disease and its impacts on populations	- Is the prevalence of mange in SAC different by locality? - Have there been temporal variations in the prevalence of mange in SAC populations? - What factors are associated with the prevalence of mange in SAC: ecological, management, etc? - Is the density of SAC related to the prevalence of mange? - Is the prevalence of mange in SAC associated with the prevalence of the disease in other animals (wild and domestic) with which it shares the habitat? - Can we speak of a pattern of contagion that allows us to evaluate casualties? - Is there evidence of variations in the prevalence of mange in SAC and genetic variability?

	● What is the local perception about the prevalence of mange in SAC?
Environmental factors related to the appearance, spread and prevalence of the disease	● Do local and regional climatic variations have any effect on the occurrence and prevalence of mange in SAC? ● What ecological factors (food availability, water availability, among others) are associated with the occurrence and prevalence of mange in SAC? ● What factors are associated with the decreased availability and quality of food and water that could be associated with the occurrence and prevalence of mange in SAC? ● Is the prevalence of mange linked to the degree of protection of the habitat of the SAC? ● Is there any ecological factor (natural or human-made) that determines the appearance and prevalence of mange in SAC? ● Do ecological factors linked to the occurrence and prevalence of mange in SAC vary regionally or temporally? ● According to local perceptions, what are the most important ecological factors for the emergence and prevalence of mange in SAC?
Management factors related to to the appearance, spread and prevalence of the disease	● Are there differences in the prevalence of mange in SAC depending on the type of management: silvestry vs. semi-captivity? ● Are there differences in the prevalence of mange in SAC when domestic animals are present? ● Can the presence of fences be linked to a higher prevalence of mange in SAC? ● What is the key or critical step in the management of disease transmission in SAC? ● How do local residents perceive the appropriateness of the implemented SAC management practices: good practices vs. bad practices?

	● What is the local perception about the possible relationship between management and the onset and prevalence of mange in SAC?
Veterinary treatments and effectiveness	● Are there differences in the effectiveness of the drugs implemented for the treatment of mange in SAC? ● What is the determining factor for the effectiveness of the treatment? ● Is the effectiveness of treatment related to the percentage of the population of SAC covered? ● Are there temporal or spatial variations in the effectiveness of treatments? ● What factors determine the implementation of a specific treatment at a specific location or time? ● What is the local perception about the effectiveness of mange treatment in SAC?

Indicators and factors:

To evaluate the different questions, a series of indicators is proposed to characterize the intensity of mange and its effects on the populations of SAC, as well as the way in which this situation is perceived by the local population. Additionally, factors (continuous and categorical) that should be taken into account when evaluating these indicators, as well as comparators that will be used throughout the review, were identified.

These details are shown below:

Theme	Indicators	Factors	Levels	Comparators
Prevalence and severity of the disease and its impacts on populations	Prevalence of mange: • Percentage of mange-positive individuals in relation to the total number evaluated • Percentage of individuals with lesions compatible with mange in relation to the total evaluated Degree of severity: • Number of different mange lesions per individual • Percentage of body affected by mange per individual Mortality: • Number of dead individuals with lesions compatible with mange Local perception: • Percentage of local stakeholders with knowledge of the prevalence of mange in camelids • Percentage of individuals with lesions compatible with mange according to local perception	Countries Political district boundaries Capture/management locations Subespecies Camelids age Camelids sex Morphologic characteristics Camelids population density Genetic variability Spatial distribution of genetic populations Parasite load Veterinary treatment Prevalence of mange in domestic camelids Prevalence of mange in other wild species Prevalence of mange in domestic animals	Perú, Bolivia, Chile, Argentina to be defined to be defined to be defined to be defined Females, Males Continuous variable to be defined to be defined to be defined to be defined Populations with and without treatment Continuous variable Continuous variable Continuous variable	Spatial Temporary

Environmental factors related to the appearance, spread and prevalence of the disease	Prevalence of mange: • Percentage of individuals positive for mange in relation to the total evaluated • Percentage of individuals with lesions compatible with mange in relation to the total evaluated	Temperature Precipitations Climatic phenomena Altitude	Continuous variable Continuous variable Niña, Niño to be defined	Spatial Temporary
	Degree of severity: • Number of different mange lesions per individual • Percentage of body affected by mange per individual	Habitat types Habitat availability Food availability Food quality Water availability	to be defined to be defined Continuous variable Continuous variable Continuous variable	
	Mortality: • Number of dead individuals with lesions compatible with mange	Protected areas		
	Local perception: • Percentage of local stakeholders who consider that there is an effect of environmental factors on the prevalence of mange in camelids.	Use of land/human activities Types of hazards Intensity of hazards	to be defined to be defined to be defined	
Management factors related to to the appearance, spread and prevalence of the disease	Prevalence of mange: • Percentage of individuals positive for mange in relation to the total evaluated • Percentage of individuals with lesions compatible with mange in relation to the total evaluated Degree of severity:	Management types Frequency of shearing Chaku practices Infrastructure Handling or clamping	Silvestry, Semi-captivity Continuous variable Good practices vs. bad practices Closed, soft fences Number of people, zones, use of hoods No more than 7 min	Spatial Temporary

	• Number of different mange lesions per individual • Percentage of body affected by mange per individual Mortality: • Number of dead individuals with lesions compatible with mange Local perception: • Percentage of local stakeholders that recognize the implementation of bad management practices for camelids • Percentage of local stakeholders that consider that there is an effect of management on the prevalence of mange in camelids	Shearing time Shearing type Domestic camelids Domestic livestock Fences Semi-captivity time	Manual, Mechanic Presence, Absence or Density Presence, Absence or Density Surface Semi-captivity time	
Veterinary treatments and effectiveness	Degree of severity: • Number of different mange lesions per individual • Percentage of body affected by mange per individual Fiber growth: • Presence of fiber in the area with mange lesions Drug effectiveness Local perception:	Drug types Drug concentration Dose: amount per kg Dosage: frequency of administration Route of administration/application Number of individuals treated Degree of disease severity Camelid age Camelid sex Alternative treatment	to be defined to be defined Continuous variable Continuous variable to be defined Continuous variable to be defined to be defined Male, Female Presence, Absence	Spatial Temporary

	• Percentage of local stakeholders that accept veterinary treatments to combat mange in camelids • Percentage of local stakeholders that consider veterinary treatments to be effective in combating mange in camelids	Alternative treatment types	Burnt oil	

Systematic review design:

The research will be based on the systematic review of already available and published information, considering scientific literature, reports, institutional and non-institutional documents, thesis, unpublished works, among others. The systematic review of the information will be carried out using the bases established by the Center for Evidence-Based Conservation (Sutherland, et al. 2004). Studies that provide quantitative data on the defined indicators, as well as qualitative data that contribute to answering the research questions, will be included.

Information search

The search for information will be based on two strategies: 1) personalized inquiries to professionals and people involved in the study, management and conservation of SACs and 2) search engines (Google Scholar). Consultations with professionals and individuals specialized in the management of SACs and mange will be carried out via the Internet, using as a basis a directory of contacts that has been compiled from the contributions of the different members of the research core group (Annex X). For this purpose, communications will be sent via email explaining the objective of the project and the methodological bases that will be used for the review of the information, and requesting all the information related to the four research topics from those contacted. Authorship of the information will be considered at all times and invitations will be extended to all to participate more actively in the research.

To carry out the revisions in search engines, combinations of keywords will be used that will include the subject of study (scientific and common names most representative of the species), the type of information expected to be collected (based on the proposed indicators) and the factors to be taken into account for each of the questions. The following keywords have been identified:

Search words				
Vicuñas Guanacos South American camelids High Andean Camelids *Vicugna vicugna* *Lama guanicoe*	Mange	Prevalence Injuries Mortality	Climate Habitat Protected areas Human activities Environmental factors Shearing Management Chaku Fences Fiber Treatments Drugs	Local perception

Using this set of keywords, combinations will be constructed for the search, for example:

- Vicuña* AND Mange
- Vicuña* AND Mange AND Prevalence
- Vicuña* AND Mange AND Injuries
- Vicuña* AND Mange AND Mortality
- Vicuña* AND Mange AND "Local perception"
- Vicuña* AND Mange AND "Local perception"
- Vicuña* AND Mange AND "Local perception"
- Vicuña* AND Mange AND "Local perception"
- Vicuña* AND Mange AND Climate
- Vicuña* AND Mange AND Habitat
- Vicuña* AND Mange AND Protected areas
- Vicuña* AND Mange AND Human activities
- Vicuña* AND Mange AND Environmental factors

When searching, the first 100 references will be taken, which must be in a recognized document format (Word, PDF, others).

Work selection

The review will consider all the documents collected that present important information on the subject, the indicators and factors defined for each topic, with emphasis on the search for

gray literature. The selection of papers will be carried out in two stages in order to screen the most relevant studies:

1. Review of title, keywords (if any), abstract or introduction: the title, keywords and abstract/introduction of each document will be reviewed to discard those that are not relevant to the study.

2. Complete document: the complete document will be read to identify those documents that have quantitative information on the identified indicators and factors, or that have qualitative/descriptive information that, although not useful for the established comparisons, may serve to improve the degree of knowledge of the mange problem in SAC.

Information quality

The quality of each selected study will be determined according to the methodology of (Pullin and Knight (2001 and 2003). Each study will be classified according to the following information quality criteria:

Table 1: Criteria for classifying the quality of the studies
(Pullin and Knight, 2001; Pullin and Knight, 2003)

Category	Criteria
I	Strong evidence from a well-designed study (conceptually well-designed, randomized, and controlled experiment) with an appropriate sample size.
II-1	Evidence from a well-conceptualized and controlled study, but without randomization.
II-2	Evidence from a study based on the comparison of differences between places or situations, seeking to correlate factors with the independent variable.
II-3	Evidence derived from several time series or robust results of uncontrolled experiments.
III	Expert opinions based on qualitative field results, descriptive studies and expert committee reports.
IV	Inadequate evidence due to methodological problems (indicators, samples, duration, etc.) or evidence without support or explanation.

Studies classified in categories I and II may be used for quantitative analyses, so the data associated with the variables and factors identified for each research topic should be systematized in databases. Studies classified in category III may be used for qualitative analysis, so it will be necessary to generate a technical summary that can be used in the research. Studies classified in category IV will not be included in the review unless they have some data that could be relevant, in which case they should be treated with caution given the low quality of the study.

Papers classified in category I and II should be evaluated for design quality and data bias using the following criteria and scores:

- **Study proposal:** clear questions (1), unclear questions (0.5), no questions (0).
- **Indicators or variables in relation to the question:** consistent (1), moderately consistent (0.5), inconsistent (0).
- **Method of data collection:** adequate (1), with limitations (0.5), inadequate (0).
- **Scale of the study in relation to the question:** adequate (1), inadequate (0).
- **Sample size:** sufficient (1), insufficient (0.5), n = 1 (0), not specified (0).
- **Data collection:** random and correct (1), non-random but correct (1), random and incorrect (0.5), non-random and incorrect (0).
- **Use of comparators:** with comparators and controlled conditions (1), with comparators and uncontrolled conditions (0.75), with controlled conditions but without comparators (0.25), without comparators and with uncontrolled conditions (0).
- **Statistical treatment:** adequate (1), inadequate (0.5), nonexistent (0).
- **Study biases:** unbiased samples (1), biased samples (0).
- **Measures to reduce study bias:** Yes (1), No (0).

For each study the total score will be obtained, being the maximum 10 and the minimum 0. Studies with a score greater than 6 may be eligible for meta-analysis.

Data systematization

All documents included in the review will be organized in a bibliographic database, using Zotero. Additionally, a descriptive database will be generated for each study in which a technical summary of the study will be systematized, including: source, year, title, species,

country, objective, topic addressed (considering the four topics of this research), methodology, and most relevant results.

Previously designed databases will be used to extract the most important data from the selected studies (characteristics and quality of the study, sources of heterogeneity, most important qualitative and quantitative results, among others).

Data analysis

If sufficient quantitative data are obtained for the proposed indicators, semi-quantitative and secondary analyses will be carried out using descriptive statistical methods or meta-analysis. The statistical treatments used to analyze the data will vary according to the type and amount of data. All quantitative data will be summarized in tables so that they can be contrasted and analyzed in an orderly fashion.

Suggested quote:

Isasi-Catalá, E., Gallegos, A., Hostos-Olivera, L., Martin, A., Walzer, C., Salgado-Caxito, M.,Beltrán-Seminario, F., Montoya, M., Smith, S., Dougnac, C., Gaynor, K., Wallace, R., Camata, D., De la Cruz, F., Mena, J.L., Colchao, P. (2023). *Bases de Datos de la revisión sistemática del proyecto Abordando los impactos de la sarna sarcóptica en camélidos sudamericanos silvestres a través de un paisaje de mitos y leyendas.* Wildlife Conservation Society.

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References cited

Pullin, A.S. and Knight, T.M. (2001) 'Effectiveness in Conservation Practice: Pointers from Medicine and Public Health', Conservation Biology, 15(1), pp. 50–54.

Pullin, A.S. and Knight, T.M. (2003) 'Support for decision making in conservation practice: an evidence-based approach', Journal for Nature Conservation, 11(2), pp. 83–90. Available at: https://doi.org/10.1078/1617-1381-00040.

Sutherland, W.J. et al. (2004) 'The need for evidence-based conservation', Trends in Ecology & Evolution, 19(6), pp. 305–308. Available at: https://doi.org/10.1016/j.tree.2004.03.018.