

# Internship Report

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At

*Faunagua, Bolivia*

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## **Acknowledgement**

First I would like to thank Dr. P. van Damme, the director of Faunagua, for giving me the opportunity to do an internship within the organization. For me it was a unique experience to be in Bolivia and to study an interesting animal species. It also helped to get back my interest in ecological research and to have new plans for my future career.

I also would like all the people that worked in the office of Faunagua in Cochabamba. With their patience and openness they created an enjoyable working environment.

Furthermore I want to thank all the scientist and students, with whom I did the fieldwork. We experienced great things together and they have shown me a beautiful part of their country.

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## Contents

Acknowledgement.....	I
Summary .....	III
1. Introduction.....	1
2. Description of the internship.....	2
2.1 The organization Faunagua .....	2
2.2 Internship activities.....	3
2.2.1 River dolphin census 1: Distribution and population status of the Bolivian river dolphin ( <i>Inia boliviensis</i> ) in the rivers Mamoré, Madeira, Abuna and Negro .....	3
2.2.2 River dolphin census 2: Abundance and distribution of the Bolivian river dolphin ( <i>Inia boliviensis</i> ) in the rivers Ibare, Mamoré, Apere, Tijamuchi .....	6
2.2.3 Workshop “Nacional Plan de Acción para la Conservación del bufeo <i>Inia boliviensis</i> ” .....	7
2.2.4 Environmental education.....	9
3. Reflection on the internship.....	15
4. Conclusion .....	18
References.....	15
Appendices.....	16
Appendix I: Weekly overview of internship activities.....	17
Appendix II: Checksheets .....	19
Appendix III: Report – Stomach content of a juvenile river dolphin ( <i>Inia boliviensis</i> ).....	22

## Summary

Within my study Biology I am interested in animal ecology and especially of cetaceans. It was a great opportunity for me to do a four month internship in Bolivia within the NGO Faunagaua. The internship was concentrated on the river dolphin, *Inia boliviensis*, a unique cetacean present in Bolivia. At the beginning of the internship I had set several learning goals regarding the improvement of knowledge and skills on NGO's, on the river dolphin species and research methodologies.

During my stay several activities have contributed to achieve a number of goals. I went two times to the field to do direct-count surveys of river dolphins. The objective of these projects is to estimate the distribution and abundance of the *Inia boliviensis* in the rivers Mamoré, Madeira, Abuna, Negro, Apere, Ibare and Tijamuchi. Physical and chemical characteristics of the rivers are taken to understand how the environment influences the distribution and abundance.

Next, I participated in a workshop, in which the first steps were taken in the development of an action plan for the conservation of *Inia boliviensis* in Bolivia. The objective was to elaborate and coordinate a national strategy with several stakeholders. For several strategy lines objectives and activities were formulated: Investigation and monitoring; Environmental education and local participation; Rules and politics; Management and organizational strengthening; Alternatives of conservation and sustainable development; Communication strategies; and Responsible tourism.

In my last activity I took part in an education program to inform primary schoolchildren about the river dolphins and to generate a positive attitude for the conservation of these animals and their ecosystems. The program is based on five key elements: the biology of the species, its habitat, the interaction with man, the threats generated by man and the solutions or proposals for conservation. Regarding to these elements several activities were carried out.

In conclusion, the internship was a useful experience. I have find out what my strengths and weaknesses are; I gained new knowledge and skills and met many new people. I achieved many of my learning goals, however for some the conditions did not permit to achieve them as I wanted.

I got insight into the work of an NGO. The financing of projects is an important factor and forces to be flexible in attitude and approach. I learned more about the biology and ecology of river dolphins and the threats they face in Bolivia. Working together with the different stakeholders and by education these threats have to be approached. To succeed in conservation of the species, the sharing of knowledge, ideas and opinions is of importance. There is still a lot to discover and research methods can be improved.

At last this internship has given me new insights and motivation to pursue a career in ecological research abroad. To prepare myself for my future career I can improve several things. I can work on my communication skills so that I am able to present and express myself more confidently. I could perform certain tasks in research better if I have more experience in the research methodologies applied in cetacean studies.

## **1. Introduction**

This report is a short description of my four month internship carried out as compulsory component of the MSc. Biology. The internship was carried out within the organization Faunagua (Bolivia) in 2009. Since my I am interested in animal ecology and especially of cetaceans, the work was concentrated on the river dolphin, *Inia boliviensis*, a unique species dolphin species for this country.

At the beginning of the internship I formulated several learning goals, which I wanted to achieve:

- to understand the functioning and working conditions of a non-governmental organization;
- to see what is like to work in a professional environment;
- to see if this kind of work is a possibility for my future career;
- to use my gained skills and knowledge;
- to see what skills and knowledge I still need to work in a professional environment;
- to learn about the organizing of a research project (planning, preparation, permissions etc.)
- to learn about research methodologies (field methods/methods to analyze data)
- to get fieldwork experience/collect data in an environment unknown for me;
- to get experience in working in another country/with persons from another culture;
- to enhance my communication skills;
- to build a network.

This internship report contains my activities that have contributed to achieve a number of my stated goals. In the following chapter a description of the organization Faunagua and the activities is given. After this a reflection on my functioning, the unexpected circumstances and the learning goals achieved during the internship are described. Finally I give a conclusion on the internship experience according to my learning goals.

## **2. Description of the internship**

### **2.1 The organization Faunagua**

Faunagua is a non-governmental organization (NGO) founded in 2004. It works on the development and implementation of projects, which contribute to local development, sustainable use and conservation of the aquatic ecosystems and resources in Bolivia. The organization facilitates the collaboration between local communities, investigators, national authorities and private institutions. In its vision the aspect of local people is very important. Therefore, in all projects local people are taken into account. By respecting customs and traditional knowledge and without danger for the environment, Faunagua tries to improve the quality of life of local populations (indigenous communities, rural people and fishermen).

An overview of the projects of Faunagua:

- The development of strategies for sustainable exploitation, management and conservation of hydrobiological resources and fishery;
- Studies on the biology and ecology of fauna (*Pteronura brasiliensis*, *Inia boliviensis*)
- Identification of threats for aquatic fauna and fishery
- Development and implementation of management plans for aquatic fauna (Several fish species; Turtles: *Podocnemis expansa* and *P. unifilis*; Caiman: *Caiman yacare*; Giant otter: *Pteronura brasiliensis*; River dolphin: *Inia boliviensis*);
- Monitoring: fauna and aquatic habitats
- Establishment and monitoring of alternative production networks of handicrafts of crocodile and fish skins
- Development of cartographic information
- Strengthening of responsible tourism
- Studies on the possible impact of hydroelectrical dam constructions

For NGO's the availability of resources is one of the main factors that determines the scope and duration of projects. To be able to carry out projects of several months, but also projects of several years, sufficient external financial support is needed. Each financier has its own criterions for applying projects. Faunagua can obtain projects by presenting research proposals to more general funds; applying projects only have to be related to a certain theme, for example water. Another possibility is to apply for funds that are more specific. For these funds research institutes have to draft plans related to a specific subject or area defined by the financier.

When funding is realised specific technicians have to be found. The technicians are responsible for the different parts in a project: the collection of data, the analysis and writing/presentation. Within Faunagua three technician groups could be distinguished: technicians working on collection and elaboration of data, technicians mainly working in GIS and people responsible for the communication.

Almost every project contains a part of data collection in the field. This could be interviews with local people or data has to be collected on ecosystem characteristics, animal distribution etc. Because of weather conditions data collection on ecosystem characteristics and animal distribution is mainly carried out in the in the dry period when the water levels are low (approx. from June to November).

Concerning the Bolivian river dolphin (*Inia boliviensis*), Faunagua intensified her work in 2007. In that year with support of WWF Colombia, WWF Bolivia, and WCS Bolivia, Faunagua together with the organization Omacha of Colombia, carried out a dolphin survey in the rivers Mamoré (June 2007) and Iténez (August 2007). The objectives of this expedition were to estimate the abundance of the *Inia boliviensis* in both rivers. With this, the development and use of a robust statistical method was important. At this time Faunagua continues to facilitate projects that contribute to the conservation of the river dolphin in Bolivia.

## 2.2 Internship activities

My internship was completely focused on Bolivian river dolphin research. It was planned to participate in a project, which should investigate the abundance and distribution of dolphins in lakes along the Mamoré River. Unfortunately caused by organizational problems this project is postponed to next year. Therefore I had to change my activities. Finally I participated in two river dolphin census projects, presented a workshop and participated in an education program. In the next paragraphs each activity is discussed in more detail. A time schedule of the activities during my internship is given in Appendix I.

### 2.2.1 River dolphin census 1: Distribution and population status of the Bolivian river dolphin (*Inia boliviensis*) in the rivers Mamoré, Madeira, Abuna and Negro

This paragraph describes the first river dolphin census in which I participated. First some background is given on the species and the physical and chemical characteristics of the surveyed rivers. Then the methodology used in the field is described.

#### *Inia boliviensis*

In the past the river dolphins residing in Bolivia were considered as a subspecies (*Inia geoffrensis boliviensis*) of the *Inia geoffrensis*. Through recent molecular/genetic studies these dolphins are recognized as a separate species, the *Inia boliviensis* (BANGUERA- HINOSTROZA *et al.*, 2002; MARTÍNEZ-AGÜERO *et al.*, 2006; RUÍZ- GARCÍA *et al.*, 2008).

The *Inia boliviensis*, in Bolivia also known as “buefo”, is geographically limited in its distribution because of rapids and falls in the Madeira River between Guayaramerín (Bolivia) and Porto Velho (Brasil) (DA SILVA, 1994). In Bolivia the species is found in water bodies of the Amazon basin, like the sub-basins of the rivers Mamoré and Iténez within the departments Cochabamba, Santa Cruz, Beni and Pando.

Despite the uniqueness of this species there is still little known. The ‘Vulnerable’ state indicates the need for more knowledge (the Red book on vertebrates of Bolivia the *Inia boliviensis*; Tarifa, 2009).

#### **Physical and chemical characteristics of the surveyed rivers**

In October 2009 (low water season) four rivers were surveyed: Mamoré, Madeira, Abuna and Negro (Figure 1). The four rivers surveyed differ in several aspects. Morphometrically the Madeira and Mamoré are wide rivers, whereas the width of the surveyed parts of the Negro and Abuna is smaller.

Furthermore the rivers differ in physical and chemical characteristics. Each river contains water of a different origin, which results in a different appearance and chemical constitution. According to NAVARRO 2003 white-, clear-, black-waters and mixed-waters can be distinguished. The Mamoré River is a white-water river with water of Andean origin. White-water rivers have relatively high amounts of sediments, a pH higher than 6, conductivity between 50 and 120 $\mu$ S/cm and a low transparency. The Negro River can be classified as a black-water river, containing water of local origin. The classification of black-waters differs in literature cause of deviating physical-chemical characteristics (NAVARRO and MALDONADO, 2002; SIOLI, 1984). According to NAVARRO 2003 the pH is between 4.7 and 5.4, which is caused by the decomposition of organic matter. The conductivity is between 5.8 and 10 $\mu$ S/cm, the transparency is higher than white-water rivers and the Negro contains little sediments. The Abuna River can be characterised as a mixed-water river with physical-chemicals intermediate of white-water and black-water rivers. The pH is between 5.4 and 6.0 and the conductivity between 10 and 22 $\mu$ S/cm. It contains less sediment than white-waters transparency quite similar to white-waters.

Despite the large differences in the physical-chemicals between rivers it seems that this does not directly influence the distribution of dolphins (ALIAGA-ROSSEL, 2000; MCGUIRE, 2002). The availability of

prey is seen as an important component of habitat use (MCGUIRE and WINEMILLER, 1998; MARTIN and DA SILVA, 2004)

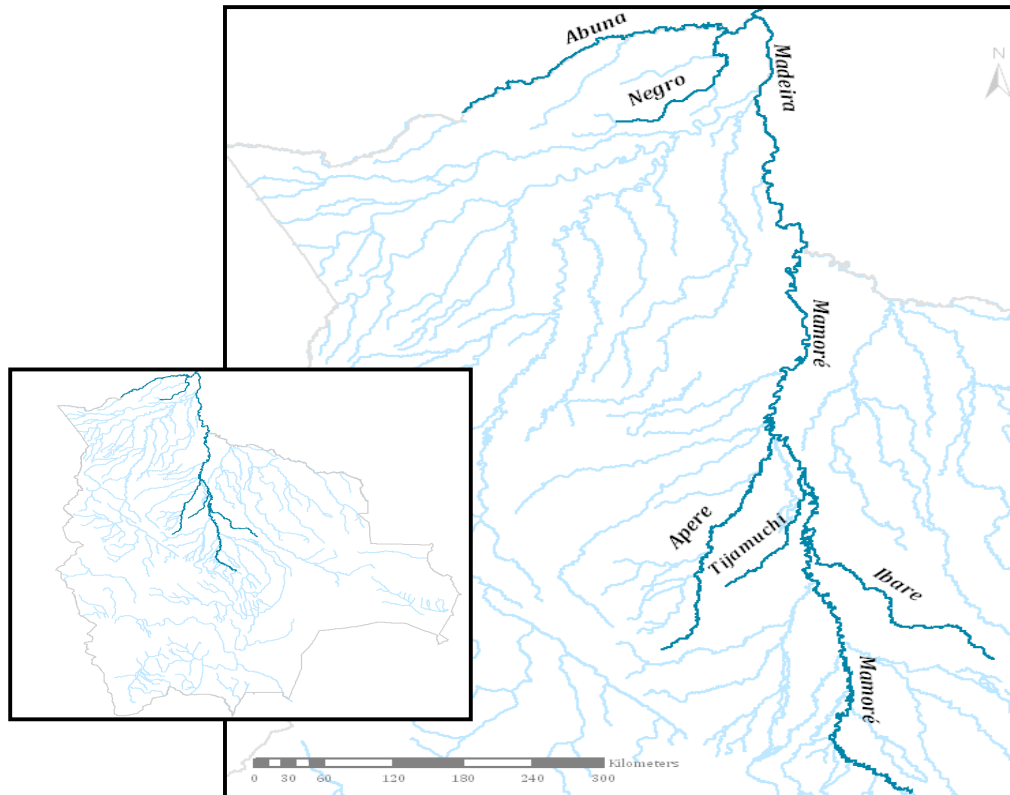


Figure 1. Map of the rivers surveyed in the two river dolphin censuses, Bolivia.

### Objective

This study was carried out close to the Brazilian border in the northern area of the Bolivian Amazon basin (Departments of Beni and Pando). Of this area hardly any data is present on the distribution and abundance of *Inia boliviensis*. Knowledge on the river dolphin in this area is required, because the planned construction of hydroelectric dams in the Madeira River (Jirau and San Antonio, Brazil) and in the Beni River (Cachueta Esperanza, Bolivia) could have consequences for the population in Bolivia.

The main objective of this study is: *The evaluation of the role of the rapids and falls within the rivers Mamoré and Madeira for the distribution of the river dolphins, Inia boliviensis.*

This general objective is specified in the following research themes:

- The determination of the distribution and abundance of *Inia boliviensis* in the four rivers Mamoré, Madeira, Abuna and Negro;
- The characterization of the habitat of *Inia boliviensis*;
- The evaluation of the habitat use (main channel, confluences, streams and bays) of *Inia boliviensis*;
- The evaluation of the role of rapids and falls in the distribution of *Inia boliviensis*.



### Methodology

The surveys were conducted between 7:00 and 17:00. The rivers were navigated downstream and upstream. To categorize the habitat, during the downstream transects several physical and chemical measures were taken in all the rivers. Every two kilometres the river was crossed and the measures taken. By means of a GPS the starting position was recorded and the river width (m) was measured. During crossing, the river depth was measured with a depth sounder (Garmin). The same device allowed registering the presence and the number of fish. To measure the transparency (cm) a Secchi disc was used. The conductivity ( $\mu\text{S}/\text{cm}$ ), Total Dissolved Components (TDC,  $\text{mg}/\text{l}$ ), pH and temperature ( $^{\circ}\text{C}$ ) were measured by a multi-parameter tester (HI 98129). All the measures were taken in the middle of the river.

Dolphins were counted during the upstream transects. In the wider rivers Mamoré and Madeira the boat navigated around 50 metre of one of the riverbanks. Every two kilometre the boat crossed the river to the other bank (Figure 2). In the rivers Abuna and Negro the boat navigated in the middle of the river (Figure 3). The dolphin observations were carried out by three observers; all situated two metres above the water level (sitting on the roof of the boat). Two observers orientated to the front of the boat and one observer backwards orientated was situated at the back of the boat.

One of the front observers filled in the Esfuerzo (Effort) checksheet (Table 1, Appendix II). Information was noted at the start and end of each transect (every 2 km), every dolphin sighting and every ten minutes without a dolphin sighting. The other observers looked out for dolphins and registered dolphin sightings on the Proa and Popa checksheets (Table 2, Appendix II). The dolphin observers communicated each observation to confirm the number of dolphins and to prevent double counts.

### Questionnaire

Several questionnaires were conducted to gather information on how river dolphins are perceived by local people (fishermen, farmers etc.). The questionnaire contained questions on presence of river dolphins and interactions with people. The results will be used to support the findings of the census and for the development of environmental education programs.

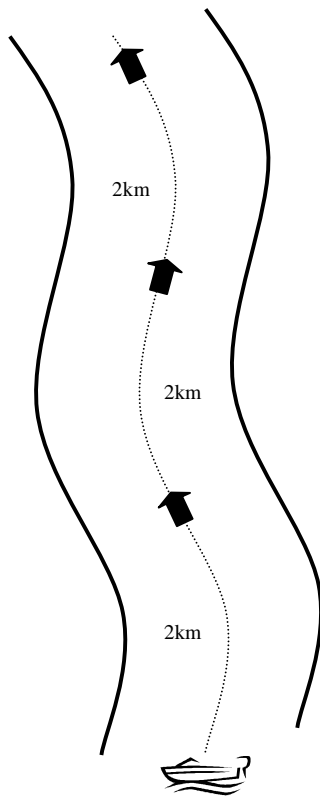


Figure 2. Survey path in narrow channels

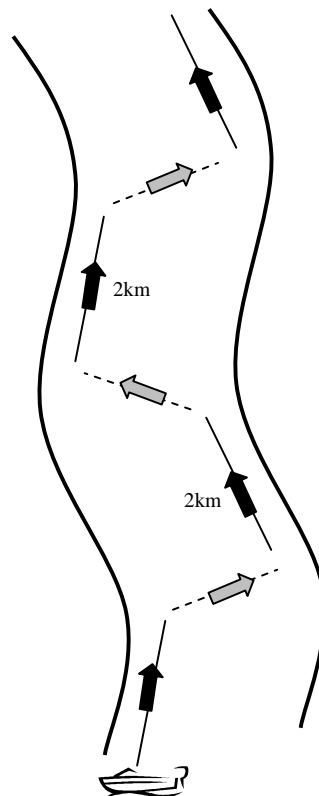


Figure 3. Survey path in wide channels

### 2.2.2 River dolphin census 2: Abundance and distribution of the Bolivian river dolphin (*Inia boliviensis*) in the rivers Ibare, Mamoré, Apere, Tijamuchi

In Bolivia the research on river dolphins is in an early stage. Besides there are many things unknown of the species, the research methodologies are still developing. In this study (census 2) the methodology to count dolphins and to take physical and chemical measured differed from the first described census. Beside the Objectives only these differences are discussed in this paragraph.

#### **Objectives**

The main objective of this study is to determine the distribution and abundance of *Inia boliviensis* in the four rivers Ibare, Mamoré, Apere, Tijamuchi (Department of Beni). An additional objective is to record the habitat physically and chemically, but also the influence of human activities like navigation and fishing is considered.

#### **Methodology**

In this study the white-water Mamoré and three of its tributaries Ibare, Apere and Tijamuchi were surveyed. At the time of study (November, rising water) the other rivers (Ibare, Tijamuchi and Apere) could be classified as mixed black- and white-waters. The mixed water type is caused by the inflow of water from the faster rising Mamoré.

Conform the method, two transects (upstream/downstream) were conducted. In one transect only was surveyed for dolphins. In the other transect the physical and chemical measures were taken and was also surveyed for dolphins. Dolphins were also counted in the second transect to confirm the counts of the first transect. In the wider Mamoré River the boat navigated around 50 meters of the river bank. The side was altered every two kilometre and when obstacles did not allow further navigation. In the rivers Ibare, Apere and Tijamuchi the boat navigated through the middle of the river.

The same physical and chemical measures were taken as described in the study above. However the method differed. In the smaller rivers Ibare, Apere and Tijamuchi the physical and chemical measures were taken every one and half kilometre instead of every two kilometre. In the Mamoré this was every 25 kilometre. The measures were only taken at one point in the middle of the river and the presence of fish was not registered. The river width in this project was measured by means of a laser rangefinder.

In standing position three observers watched for dolphins. Two observers were standing at the bow of the boat looking for dolphins at either sight. When a dolphin was sighted one person registered all the dates described in table 3 (Appendix II). This person noted also specific environmental information (weather changes, villages, boats, fishery, deforestation etc.).

The recording of a dolphin differed slightly in the Mamoré River from the other rivers. Because the boat did not navigate through the centre, the distance from the closest river side and the angle of observation from the boat was registered. In the other rivers only the GPS point was recorded to indicate the position of the dolphin.

#### **Necropsies**

Two dead dolphins were encountered during the survey. A neonate was found in the Niquisi River and a juvenile was found in the Apere River. Both animals were necropsied. Special attention was paid to the stomach contents. The neonate stomach contained solely milk. However the stomach of the juvenile dolphin was full of fish remains. These remains were identified at the Ecological Institute of the University Mayor de San Andrés (La Paz). By means of fish bones, the presence of four families could be confirmed: *Auchenipteridae*; *Characidae* (subfamily *Tetragonopteridae*); *Doradidae*; *Heptapteridae*. The majority belonged to the family of *Doridae*, of which between four to eight individuals of the same size could be identified.

Little is known about the feeding ecology of river dolphins. For the *Inia geoffrenis* in Brazil 43 different fish species of 19 families are found (BEST and DA SILVA 1993). For the *Inia boliviensis* in Bolivia

there is hardly any data on prey species. PILLERI (1969) found some fish and a crab in Bolivian dolphins, but had not specified his findings on a species level. PILLERI and GIHR (1977) suggest the finding of fish from the Characidae family. The findings will be published in a little report, because it is seen as a contribution to the knowledge of the food ecology and to stimulate the research on this topic (Appendix III).

### **Results**

Although the data is not analyzed yet, it could be said that far more dolphins are sighted in this area than in the rivers surveyed in northern Bolivia (census 1). However in the Tijamuchi River seems that there were fewer dolphins encountered than in the past (personal communication). Interviews with local farmers support this observation. The reason for this is unclear; it could be that there are more human dolphin interactions (e.g. fishery). Another option could be that a part of the population in this river has moved to other rivers. Although river dolphins can move over quite some distance, it is unclear whether they have migratory behaviour (MARTIN and DA SILVA, 2004; MCGUIRE and HENNINGSEN, 2007).

#### *2.2.3 Workshop "Nacional Plan de Acción para la Conservación del bufeo Inia boliviensis"*

Organised by Faunagua, but in collaboration with many organizations\*, a workshop was held in which the first steps were taken to formulate an action plan for the conservation of the *Inia boliviensis* in Bolivia: Taller Nacional para la formulación del Plan de Acción para la Conservación de *Inia boliviensis* en Bolivia, 25-27 November, Trinidad.

The objective of this workshop was to elaborate and coordinate a national strategy with several stakeholders. Representatives of national authorities, scientists, local communities and private institutions discussed together about actions necessary within the next 5 years.

The workshop activities were carried out in small groups and in plenary sessions. The first activity was the formulation of a vision of the action plan. Wherefore goals were formulated that ideally should be achieved after 5 years. The vision includes more knowledge on the ecology of the river dolphins and their threats and more public awareness.

The next activity concentrated on strategy lines, which were selected in advance of the workshop. For every strategy line the objective; the expected results within 5 years; the actions and activities; the priority and planning of actions and activities; and who might carry out the actions/activities, was formulated.

The strategy lines and their objectives discussed in the workshop were:

- Investigation and monitoring: to generate biological and ecological knowledge (distribution, abundance, genetically etc.), which will help to define and to carry out conservation strategies for the river dolphin and its habitat.
- Environmental education and local participation: to diffuse information about river dolphins and to generate positive attitudes within local populations for the conservation.
- Rules and politics (national, departmental, municipal and local actors): to contribute in the complementation, articulation, diffusion, and implementation of rules for the conservation of the species and its ecosystems.
- Management and organizational strengthening: to strength the capacities of institutions/organizations for a better management in the conservation.
- Alternatives of conservation and sustainable development: to generate tools and economical, social, environmental and cultural beneficial for key actors, who are important for the conservation of the species.

- Communication strategies (national and international): to develop and carry out projects to inform the general public and to increase awareness and support for conservation.
- Responsible tourism: to evaluate the potentials of the river dolphin to attract tourism to Bolivia and the possibilities for local people to participate and benefit. With this a framework has to be developed to regulate tourism.

Because I participated most in the development of the investigation and monitoring strategy, I will discuss this in more detail. The objective of this component is to generate information on the biology and ecology (distribution, the state of the populations and the use of the habitat) of dolphins in the Bolivian rivers. Furthermore investigation is needed to identify threats. The technical information generated can be used to develop the best conservation strategies.

Expected results and the activities/actions (stated in the workshop of high priority) to achieve this:

- To get to know the distribution and population status of the river dolphin in Bolivia.
- To estimate the abundance and distribution, data have to be collected. Especially information is needed of rivers in which no or hardly any research is done.
- To evaluate ecological conditions of ecosystems used by river dolphins.  
Research is needed on habitat use, residence areas and movements in combination with physical and chemical measuring in the ecosystems. Potentially the river dolphin could serve as an indicator of conditions and changes of aquatic systems.
- To establish knowledge on the impact of human activities.
- The mortality caused by fishery and other human activities should be measured.
- The impact of prey availability and habitat quality related to the construction/presence of hydroelectric dams have to be evaluated and analysed (taken into account the distribution and abundance of *Inia boliviensis*); The (potential) impact of tourism on the distribution and abundance of dolphins have to be evaluated.
- Consolidate a information system on the biology and geographical distribution of river dolphins

At this moment the results are being elaborated in a book. By means of help of the government this book will be published. The book will serve as a guideline/tool for institutions or individuals doing activities related to the conservation of the Bolivian river dolphin.

\*Fundación OMACHA (Colombia), Wildlife Conservation Society (WCS) and World Wildlife Fund (WWF) sponsoring by WWF, Fundación PUMA, Conservación Internacional (CI), VIVA, Rufford Small Grants (RSG) and the Whale and Dolphin Conservation Society (WDCS)

### 2.2.4 Environmental education

Environmental education is part of the river dolphin conservation project. The objective is to increase the knowledge on river dolphins, the threats they face and so stimulate conservation action on local scale. In Bolivia the environmental education on the *Inia boliviensis* is in its early stages. This means that an education program on this species is in development and that information has to be collected on: the general knowledge of people, the most effective ways of communication and the activities that are successful to convey the message of conservation.

The education program is based on five key elements to promote awareness and participation of local peoples with respect to the dolphin and its environment:

- the biology of the species,
- its habitat,
- the interaction with man,
- the threats generated by man and
- the solutions or proposals of conservation.

Education on schools is one part of the bigger education program (also a website and an exposition are in development). At this moment the education program is developed for primary schools in both rural and urban areas. In two morning sessions the children do several activities related to the five key elements. The first activities are to determine the general knowledge and perception of river dolphins and their environment. This will help to adapt the following activities. In the next activities the children are informed about the dolphins, their habitat and the threats. After these, activities are more concentrated on the possible solutions for threats and on conservation. When the two day education program is finished schools will be stimulated to continue with the environmental education.

The first trial of this program was in a primary school in Loma Suárez, a village close to Trinidad. Around 40 children from different class years were present. The first day was meant to introduce the river dolphin and to verify the knowledge present. The session started with an introduction game to establish a positive atmosphere. After the game the children were divided into four groups. In the first activity the children were asked to draw on big papers things they already knew about the river dolphin and its environment. The children were very active in this assignment. Unexpectedly they could tell many things. Especially the older children could give detailed information, for example on prey species eaten by the dolphins. Probably this high knowledge level was due to the fact that the majority of these children came from fishing families. The next activity was a brief presentation, about the biology and ecology of the river dolphin, given by the education team. Afterwards the children could ask and were asked questions about the presentation. During the last activity, dependent on age, the children got books to colour or to read. (These were not yet developed specially about the river dolphin)

The second day was dedicated to a puppet play. It is chosen to include a puppet play in the program, because it encourages children to discuss environmental issues in a playful and easy way. The play discussed a topic about the harmful effects of rubbish in the environment. The characters used were an adult river dolphin, a girl (which represents the human version of the dolphin known from local stories), a brother and a sister from the city, a (migratory) fish, a giant otter, a turtle, a park ranger. The children were very concentrated and reactive during the play. Afterwards there was a short discussion on what the children had seen.

For the last activity the children were divided in groups according to age. The groups had to think about a story they would like to play with the puppets for the other groups. The story did not have to be realistic, but was meant to trigger the children to think about the topic. In a later stage the intent is that teachers are going to direct the children. Together they have to formulate new themes, stories and solutions. To stimulate this, the puppets were left in the school.

During these days I have seen that it is really important to have trials on schools. Some activities worked better than others. For example the activity in which the children had to play their own story with the puppets did not work well. I think that having the puppets in their hands was emotionally seen already enough. Furthermore, it is important to verify the knowledge present in the group. When that is known the following activities can be adapted and the effect of the program can be increased.

Although this kind of education could be useful in conservation, I think that education not mainly should focus on children, but also on adults. Through children the parents could be reached. They tell for example what they have learned and they bring their books. However an education program is a minor part of the daily life of these children and I think that children sooner take over ideas and behaviour of their parents or other adults.

### **3. Reflection on the internship**

In this chapter I reflect on the internship. Regarding my learning goals I shortly discuss my experiences; if I have achieved my goal, whether I experienced difficulties and what I think I have to improve.

#### ***Learning goals***

- **The functioning and working conditions of a non-governmental organization**

At the beginning I did not have any experience of working within a NGO. Although I have seen one, I understand better the functioning like the organization structure and setting up projects. Trying to operate as a non-profit organization I saw the importance of financial support and personal capacity. The dependence on external institutions and people force you to have a flexible attitude. During my stay I also experienced the dependence. There was often uncertainty whether and when projects could start. In the first instance the dependence and uncertainty was annoying, but it forced me to be flexible and to see what other things I could do.

- **Enhancing communication skills**

More than I had expected I experienced language difficulties. I thought that I could communicate well in English and with my basic knowledge of Spanish, however the majority of persons I worked with talked in Spanish. Therefore I was reserved in communication at the beginning, but in the course of months it went better.

My stay has contributed to my communication skills, but I would like to pay more attention to it in the future. I can come across as reserved and uncertain. To contribute more to projects and to progress faster, I want to learn to make a more confident impression and to express my ideas and opinions more certain.

- **The use of skills and knowledge gained in the university**

It is difficult to say what skills and knowledge gained in my study I could put in practise in my internship. I can think of the use of the experience from my thesis (about the food ecology of harbour porpoises) for the necropsies.

In the ecology courses that I have taken I learned about ecological concepts and doing ecological research in general; I was taught some basics on data collection, data processing and setting-up research projects. This is reasonable and I have seen that within research projects you acquire the skills and knowledge needed.

- **Skills and knowledge that might be improved to work in a professional environment**

Although you learn and develop the necessary skills and knowledge while working in an organization, there are several things that I could improve already.

I did not have totally clear what activities I could have done to reach my learning goals. Therefore during my stay I had some difficulties to determine tasks that I could carry out. In advance of my internship I talked with the organization about the project in which I could participate, however clear agreements on my activities were not made. A more assertive attitude from my side could have helped. To prevent uncertainties in future projects I will pay more attention to making clear agreements and back-up plans.

Other aspects to which I want to pay attention in general are: defining a clear research question and determine what data collection and analysis is suitable. I often have the tendency to concentrate more on data collection activities. Also in the internship I have seen that it is important to have your research clear, because it guides you in the process.

The participation in the workshop made me enthusiastic. Before I had some doubts whether such workshops could end in useful results, because there are many stakeholders each with their own interests. However in this workshop all stakeholders were really committed. It was interesting to hear the ideas and discussions between the different stakeholders. These kinds of meetings are of importance, because they contribute to a better understanding among the different parties. It permits that information can be passed and topics can be discussed in more depth. It is also a way to make each other enthusiastic and it stimulates to put things into action. Through the workshop I learned about conservation and management, but I want to learn more about it. Especially the regulation, protection and management by policy and the way how human-animal conflicts could be mitigated are interesting topics.

- **Organizing projects**

Within the internship I did a lot of fieldwork. Because of this I have seen of what aspects you have to think while organising a project (equipment, boat navigators, and permissions).

Furthermore I have learned how an education program can be set up and what things have to be taken into account. It is important determine the knowledge present and to adjust the program to each group. It is of importance to convey an objective and supported message taking the viewpoints of people into account. I became also aware that local people have a lot of knowledge that could help in research and conservation.

Before the internship I did not have any experience in environmental education and I had no idea if it could work. In the future I would like to do some environmental education, because I have seen now that people can be reached and that you can receive a lot of new insights.

- **Research methodologies (field methods/methods to analyze data)**

I increased my knowledge on methodologies used to investigate rivers and the distribution and abundance of river dolphins. I got ideas what weaknesses methods for studying freshwater cetaceans can have. For example, the survey timing has to be considered. Most surveys are during the low water period because the environmental conditions are then the best. However the differences and effects of changing water stages on the dolphin distribution is unknown. Also the search effort is an important aspect. Several observers are needed who search for dolphins in a reliable and consistent manner. Searching for several hours can cause a decrease in attention of the observers. It is also difficult to make one standardized method. The differences in river-channel morphology make it difficult to allow one standard method.

There was one goal that I could not reach in this internship. I planned to work on a project in more depth. This means, be part of the whole project from the preparation till the data analysis and interpretation of the results. Unfortunately, the actual project in which I should participate was postponed (investigation of lakes along the Mamoré River). Therefore a new plan of activities had to be made. I planned to help in the data analysis of the first dolphin census, but this was also postponed by the project leader. The participation in the second dolphin census came unexpectedly and a little late in my internship period and there was no time left to do analyses. I would have liked to practise more within my internship, but at the end I only learned about data analyses from the literature.

- **Working in another country with persons from another culture**

The internship was an opportunity to get immersed on a deeper level in another culture. It was really experiencing to see how other people live. It also helped to look at things from a different perspective.

Beside language, I did not experience difficulties caused by different cultural backgrounds. An interesting and open attitude of the people has helped.

An internship abroad was also a good way for me to see whether I could work outside the Netherlands. I hardly experienced problems and I got really fast used to the different way of living. Also the fieldwork came easy to me and I felt a full member of the project teams.



- **The influence on future career plans**

Before my internship in Bolivia, I had some doubts about my future career. I was not sure if I would like to continue in research after finishing my MSc. I also did not know what type of research I would like to do. Through this internship, I have seen what elements of my career I like and I got enthusiastic again to continue in research. I have found out that part of the research should contain fieldwork as I did in the internship. I would like to continue in the research on river dolphins in Bolivia. In this country, the research on dolphins is little so there are many interesting aspects to study.

## **4. Conclusion**

On the whole, this internship was a useful experience. I have gained new knowledge, skills and met many new people. I achieved several of my learning goals, however for some the conditions did not permit.

I got insight into professional practice. I learned the different facets of working within a NGO. I experienced that financing, as in many organisations, is an important factor for the progress of projects. Related to my study I learned more about the biology and ecology of river dolphins and the threats they face. There is still a lot to discover and to improve. The methods used at the moment are still not standardized and a consistent method is in development.

In Bolivia education is an important aspect of the conservation of the dolphin species. I have seen that local people can contribute to conservation, for example with their knowledge. Furthermore I experienced that it is of importance that the education is objective and that you have to be aware of the view of other people. Environmental education is not one sided, but it is a way of sharing knowledge, ideas and opinions.

The internship was also good to find out what my strengths and weaknesses are. This helped me to define what skills and knowledge I have to improve in the coming time. It would be better that the knowledge level of the language is sufficient to contribute fully to projects. After my master I think that I could start my working career. However I could perform certain tasks in research better if I practice/know more the research methodologies applied in cetacean studies. It would also be better if I can present and express myself more confidently.

At last this internship has given me new insights and motivation to pursue a career in ecological research abroad.

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# Appendices

## Appendix I

### Weekly overview of internship activities

#### *Week 1 (25-08, Bolivia)*

- Literature study: study area, previous proposals, technical report of previous expedition, Distance sampling, GIS classification, design and field methods for sighting surveys of cetaceans
- Discussion about the method with project leader (census 1)

#### *Week 2 (01-09, Bolivia)*

- Meeting with participants of dolphin project: discussion about objectives, methods and checksheets
- Literature study: rivers
- Checksheets adapted
- GIS: classification of imagines

#### *Week 3 (08-09, Bolivia)*

- GIS: working on map of the study area

#### *Week 4 (15-09, Bolivia)*

- Literature study: methods of previous years
- Discussion about the questionnaire for census 1
- Discussion about the necropsy protocol
- Preparation for next meeting

#### *Week 5 (22-09, Bolivia)*

- Preparations fieldwork
- Fieldwork: Mamoré River

#### *Week 6 (29-09, Bolivia)*

- Fieldwork: Mamoré
- Preparations fieldwork
- Fieldwork : Madeira, Abuna, Negro

#### *Week 7 (06-10, Bolivia)*

- Fieldwork: Negro, Abuna, Madeira

#### *Week 8 (13-10, Bolivia)*

- Fieldwork: Madeira
- Writing internship report

#### *Week 9 (20-10, Bolivia)*

- Writing internship report
- Import of data: physical-chemical measurements, dolphin sightings
- Literature study: DISTANCE program
- GIS: working on map of the study area

*Week 10 (27-10, Bolivia)*

- GIS: working on map of the study area
- Discussion of article project leader census 1
- Meeting dolphin project: preparations for workshop

*Week 11 (03-11, Bolivia)*

- Helped with first analyzes on physical-chemical measurements
- Meeting dolphin project: education project and workshop
- Preparation education project
- Prepared list of necessities for fieldwork (census 2)

*Week 12 (10-11, Bolivia)*

- Preparations fieldwork
- Fieldwork : Ibare, Mamoré, Apere

*Week 13 (17-11, Bolivia)*

- Field work: Apere, Mamoré, Tijamuchi, Ibare (necropsies)

*Week 14 (24-11, Bolivia)*

- National Workshop – Trinidad
- Environmental education – Loma Suarez

*Week 15 (01-12, Bolivia)*

- Writing internship report
- Identification stomach content of necropsied dolphin

*Week 16 (The Netherlands)*

- Writing internship report
- Translation report about necropsies

## Appendix II

Table 1. *Esfuerzo (Effort) checklist census 1 – Information that is registered by one of the front observers to describe the transects and dolphin sightings*

<b>Esfuerzo data</b>		
<i>INFORMATION</i>	<i>CODE</i>	<i>DESCRIPTION</i>
Date		Day, Month, Year
Time		Hour, Minute, Second
Transect		Number of transect
Coordinates		Latitude, Longitude (UTM)
Distance		Distance from the boat sides (port, starboard) to the river sides
Event	S	New stratum
	T	New transect
	D	10 min of the route
	P	Start effort of strip transect
	E	End effort of strip transect
	L	Start effort of line transect
	X	End effort of line transect
	O	Observation
	N	Change of navigation
	W	Change of water conditions
	Z	Change of other conditions
	C	Change of observer position
	R	Reduction velocity
B	Regression of transect	
Stratum	C	Confluence
	I	Island
	L	Lake
	N	Canal
	R	River
	T	Tributary
Speed		Velocity of the boat (km/h)
Type of river side	F	Inundated forest
	T	Bosque tierra firme – Solid ground forest
	L	Floating pasture
	G	Pasture
	S	Barranca
	B	Beach
	Rc	Rocks

River status	1	Calm
	2	Moderate
	3	Rough
Water type	B	Black
	W	White
	M	Mixed
Glare strength	0	none
	1	some (no hinder of observation)
	2	moderate (is uncomfortable but observation is possible)
	3	severe (observation is not possible)
Glare angle		The angle of sun glare on the water surface (side)
Observation capacity	1	poor
	2	moderate
	3	good
	4	excellent

Table 2. *Proa* (front of the boat), *Popa* (back of the boat) checksheet census 1 – Information that is registered by one front and one back observer to describe the dolphin sightings

<b>Proa/Popa data</b>	
<i>INFORMATION</i>	<i>DESCRIPTION</i>
Observation	Number of observation
Date	Day, Month, Year
Time	Hour, Minute, Second
Transect	Number of transect
Coordinates	Latitude, Longitude (UTM)
Distance	Distance from the boat side (port, starboard) to the observed dolphin(s) (m)
Angular side	Port or starboard at which the dolphin is observed
Angle	The angle at which the dolphin is sighted (°)
Group size high	The highest number of dolphins sighted
Group size low	The lowest number of dolphins sighted
Group size best	The number of dolphins sighted confirmed by the observer at <i>Proa</i> or <i>Popa</i>
Cohesion	A single observed dolphin (1) or dolphins in an apparent aggregation (2)



*Table 3. Checksheet census 2 – Information that is registered by one of the observers to describe the dolphin sightings*

<i>INFORMATION</i>	<i>DESCRIPTION</i>
Date	Day, Month, Year
Time	Hour, Minute, Second
Coordinates	Latitude, Longitude (UTM)
Speed	Velocity of the boat (km/h)
Distance river side	Distance from the boat sides (port, starboard) to the river sides (m)
Distance dolphin	Distance of dolphin to the closest river side (Mamoré) (m)
Angle	Port or starboard at which the dolphin is observed (Mamoré) (°)
Group size	The number of dolphins belonging to a sighted group
Cohesion	The dolphins belong to a group or are individuals

### Appendix III

Report – Stomach content of a juvenile river dolphin (*Inia boliviensis*) - This report is in preparation.

#### **Stomach Content of a Juvenile River Dolphin, *Inia boliviensis*, an Endemic Dolphin Species of the Upper Madeira Basin, Bolivia**

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#### **Abstract**

The river dolphin or bufeo (*Inia boliviensis*) is an endemic cetacean of the upper Madeira River basin in Bolivia; nevertheless there are few biological studies on this species. This report presents the first record of the diet of an individual juvenile bufeo within its distribution. In two rivers of the upper Madeira river basin in Bolivia during the rising water season, a newborn and a juvenile bufeo were found dead. The standardized necropsy suggests that both deaths were caused by fishing nets. The juvenile has the caudal fin removed probably caused by a machete; while the newborn did not present any sign of violence, and the stomach content was only milk. For the juvenile at least 12 individuals from four fish families (Characidae: Tetragonopterinae; Auchenipteridae; Heptapteridae and Doradidae) are consumed; highlighting the Doradidae family and small Characidae. None of the fish are commercial species and are not consumed by humans. Therefore, we consider that both bufeos did not have direct interaction with the nets and due to lack of experience probably were accidentally entangled while chasing fish, and were killed by drowning (as the newborn), or sacrificed by fishermen. These events are widely reported in the literature and they are one of the factors that threaten the survival of this species.

**Key Words:** river dolphin, *Inia*, diet, necropsy

The Bolivian river dolphin, also known as bufeo (*Inia boliviensis*), is an endemic species of the upper Madeira River basin and is the unique cetacean present in Bolivia. Through a series of rapids and falls between Guayaramerin (Bolivia) and Portho Belho (Brazil) the bufeo is isolated from the population of *Inia geoffrensis* in the Amazon basin (Ruiz-García et al., 2008). The biological knowledge of the Bolivian bufeo is limited; with only few studies on the distribution and abundance (Pilleri, 1969; Pilleri & Gühr, 1977; Aliaga-Rossel, 2002; Aliaga-Rossel & McGuire, in press). In the “Libro Rojo de la Fauna Silvestre de Vertebrados de Bolivia; Red book of Bolivian Wildlife Vertebrates” (Aguirre et al., 2009), bufeo is categorized as *vulnerable*, indicating the need for more basic information on this species. Even though the information comes from a single individual, this note presents the first record of the diet of a juvenile river dolphin and as such contributes to the knowledge of this species.

During the rising water season (mid-November) haphazardly a neonate and juvenile river dolphin (*Inia boliviensis*) were found dead in the Niquisi and Apere rivers respectively (Table 1). These clearwater rivers are both situated in the Mamoré River basin – Bolivia, in the region called “Llanos de Moxos”, which is characterized by having little geographic relief. Between December and March 60% to 80% of the annual precipitation occurs (Pouilly et al., 2004). The water levels are closely related to the precipitation.

The region belongs to a subtropical humid forest life zone, covered with dense evergreen forests and wooded grasslands, with a mean temperature of 26.5 °C. Livestock breeding is the main human activity in the area. Furthermore, various indigenous communities depend on agriculture for their subsistence and the activity of non-commercial fishing is currently increasing.

The ictofauna of the region comprises a total of 35 families and 283 species, with a strong domination of Characiformes and Siluriformes representing 85 % of the species (Lauzanne et al., 1991). It also consists of a group of large-sized fish (which can exceed one meter of standard length, SL) that are part of commercial fisheries like the Surubí (*Pseudoplatystoma fasciatum* and *P. tigrinum*), the Pacu (*Piaractus brachypomus* and *Colossoma macropomum*) and others (*Phractocephalus hemiliopterus*, *Brachypaltostoma* spp.). An important part of the fishing included medium-sized fish, of which the majority is used for self-consumption and the minority for sale of crafts. Some of these fish can be quite abundant like the Sábalo (*Prochilodus lineatus*), Piranha or Palometa (*Pygocentrus* sp., *Serrasalmus* spp., *Mylossoma duriventre*), Blanquillo (*Calophysus macropterus*, *Hypophthalmus* sp.), Curvina (*Plagioscion squamosissimus*) and others. Nevertheless, the majority are small sized like Curimatidae (*Potamorhina latior*, *Psectrogaster* spp., *Curimatella* spp.) which form large groups. Moreover, a large diversity of Loricariidae (*Loricaria*, *Hypostomus*, *Liposarcus*, *Hypoptopoma*), Doradidae (*Doras*, *Opsodoras*, *Astrodoras*, *Platydoras* etc.) and small Characidae, locally called sardinas (*Atyanax* spp., *Moenkhausia* spp., *Tetragonopterus*, *Cheirodon*, *Serrapinnus* etc.) can be found (Lauzanne & Loubens, 1988).

The necropsies (Geraci & Lounsbury, 1993) suggested that both dolphins died in fishing nets. The tail fluke of the juvenile dolphin was removed, possibly caused by a machete. The neonate (a few months old) did not show any signs of violence, with the exception of some marks probably caused by the fishing net. Both individuals were in good condition and appeared to have organs that were in good state. Skin appearance, organ coloration and other indicators predicted the time of death as less than six hours. The neonate did not have teeth and its stomach only contained milk. The juvenile dolphin almost had all teeth; however, the majority of the molars were just appearing through the gum. All stomach compartments were examined; the content was in a relative good state. For the diet analysis, the complete stomach was removed from the abdominal cavity. The content of the stomach compartments was carefully washed out and then collected. Then the dry samples were transported to the Colección Boliviana de Fauna (CBF) and identified using guides as well as the reference collection (Table 2).

In total, twelve individual fish belonging to four families were identified: Auchenipteridae, Characidae (subfamily Tetragonopterinae), Doradidae and Heptapteridae (Table 2). The majority of the species (n = 8) belonged to the family Doradidae (Table 2). Through comparison with reference material of the CBF, the standard length was estimated between 100 and 150 mm SL. The smaller sized fish belonged to Heptapteridae with less than 50 mm. Characidae were between 50 and 100 mm SL. For Auchenipteridae a fragment of the pectoral girdle, including the pectoral bone were recovered (Table 2). The specimen had a body width size at the pectoral girdle larger than 60 mm, this enabled to estimate that the SL was larger than 200 mm.

Except for the species belonging to the Characidae family, the other species of the order Siluriformes, usually have crepuscular and nocturnal behaviour. The Doradidae include several crepuscular and nocturnal species that stay hidden during the day in tree cavities or between vegetation along riversides. The species can easily be recognized through the lateral scales, and sometimes by fish-bones. They can form large shoals which are frequently multispecies.

The presence of different families in the bufeo's diet is not surprising since the heterodont dentition already suggest that the diet of the river dolphins include a great variety of prey (Aliaga - Rossel & Mc Guire, in press). This is new data since the diet composition of *I. boliviensis* is hardly known. Pilleri (1969) indicates that adult individuals consume crabs and several unidentified fish species, including members of the Characidae family (Pilleri & Gihl, 1977). Aliaga-Rossel (unpublished data) in a necropsied adult dolphin reported the presence of two individuals of the Gasteropelecidae family, which are common in the region. Studies in Brazil on *Inia geoffrensis* reported 43 different species in 19 families (5 to 80 cm, average 20 cm), including 51% pelagic, 33% benthic and 16% lacustric (Best & da Silva, 1993). Also, the presence of a small turtle is reported (da Silva & Best, 1982). De Carvalho (1961) recorded the Serrasalmididae family;

In Colombia, Layne & Caldwell (1964) found *Myleus* sp.; and Trebbau & van Bree (1974) in Venezuela indicated a Red-tailed catfish (*Phractocephalus hemiolipiterus*) as a prey species of river dolphins. Furthermore, McGuire & Winemiller (1998) reported four species (one individual of the Serrasalmidae family, the Siluriforme, the Characidae and one Prochilodontidae (*Semaprochilodus* sp.).

Finally, a nematode was found which could be a fish parasite, and would represent a secondary ingestion. However, nematodes are found in a large number in *I. geoffrensis*, some are host-specific but there is no evidence that they cause pathological infections (Best & da Silva, 1993; McGuire & Winemiller, 1998).

Considering the size and probable species, none of the fish found in the stomach content of the juvenile dolphin corresponded to a commercial fishery; only the large sized individual could be part of subsistence fishing that is usually practiced by use of line and hook or small nets. We consider that both dolphins did not have direct interaction with the nets but were distracted fishing or it is possible that, due to lack of experience, the dolphins died when they got accidentally entangled in the nets; or when they were removed from the nets or intentionally killed to avoid the destruction of the nets (as the juvenile) and using later their fat as bait. These events are widely reported in the literature and they are one of the factors that threaten the survival of this species (Reeves et al., 2003). Aliaga-Rossel (2002) and Aliaga-Rossel & McGuire (in press) indicated fishing nets as a threat for juvenile and neonate dolphins, because of their little experience they can get caught while they fully concentrate on hunting for pelagic and small fish species. The observed increase of fishermen in the region could have negative consequences for young individuals and this can have direct consequences for the population.

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**Table 1.** Physical and chemical characteristics of the rivers Apere and Niquisi during the rising water season (November 2009).

<b>Physical and chemical characteristics</b>	<b>Niquisi River</b>	<b>Apere River</b>
Transparency (cm)	23.25	20
pH	6.6	7
Temperature (C°)	30	31
TDS (mg/L)	80	84
Conductivity (µS/cm)	163	170.5
Water depth (m)	16	12.15

**Table 2.** Prey in stomach content of a juvenile bufeo (*Inia boliviensis*) found in the Apere River during the rising water season (November 2009).

Family	Item	No.	Size <sup>1</sup>	Remarks <sup>2</sup>
Doradidae	Skull	3	37.4-38.4 (38.02)	complete
	Operculum	3		2 R. / 1 L.
	Hyomandibular	5		3 R. / 2 L.
	Pectoral girdle	8	19.08*	4 complete, 4 incomplete
	Vertebras	117		
	Weberian apparatus	3		
	Hipural bone	4		
	Dorsal fish bone	4	18-22 (20)	1 broken
	Pectoral fish bone	18	20.6-28.5 (25.35)	8 R. / 8 L.
	Fin rays	various		
	Lateral scales	87		
	Gill segments	various		
	Auchenipteridae	Pectoral girdle	1	68.64*
Pectoral fish bone		2	55.7	1 R. / 1 L.
Fin rays		various	25-37 (30.08)	
Heptapteridae	Pectoral girdle	2	9.5*	complete
	Vertebras	52		
	Hipural bone	1		
	Fin rays	various		
Characidae	Cleithrum	2		1 R. / 1 L.
	Vertebras	82		
	Hipural bone	1		
Unidentified	Otoliths	13	<1	
	Bone fragments	various		unidentified
	Nematode	various		probably a fish parasite

<sup>1</sup>Size in mm; range (mean); \*width.

<sup>2</sup>L = Left; R = Right.