The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Ericka Vanessa Correa
Project title	Fish Habitat Preferences in the Upper Apurimac Rivers (Peru): Toward the development of local and regional models in the Andes to estimate environmental flows
RSG reference	17858-1
Reporting period	Sep-19-2015 to Sep-19-2016
Amount of grant	£5000
Your email address	Evanessa.correa@gmail.com
Date of this report	Sep-14-2016

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To conduct an inventory of fish species of the Santo Tomas and Vilcabamba river sub-basins (Apurimac River Basin, Peru)			✓	Ten morpho-species were recognised and were highly representative of the basin.
Establish the relationship between the local distribution of the species and microhabitat conditions at sampling stations in the streams of the upper Apurimac (Peru) and Beni (Bolivia) Rivers Basins.			✓	The habitat uses and preferences were variegated and depended on species.
To develop a comparative analysis of fish habitat preferences in those two basins to determine preferences on local, regional and Andean frameworks.			✓	Some habitat preferences can be explained in a local framework only, while others can be amplified in a regional extension and others in an Andean level.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

During the fieldwork of the project the government started an emergency state in four provinces of the region, which includes the two ones that we were visiting, due to protests against a company that operates in the zone. However, we had authorisations of the city halls and communities around, so we could get and assess the rivers with no problem. In addition, every time we get a village we talked to the authorities, and if it was difficult for them to understand the idea of the collections in Spanish in the most remote villages, my assistant explained to them in Quechua (one of the native languages in the Andes). It was amazing how people connected with the motives of this project once we talked in their own language.

3. Briefly describe the three most important outcomes of your project.

The next outcomes were reached during and after the fieldwork:

- A fish identification guide. A document in the form of plates that contains a photographic database of fishes and rivers were they live in the upper basin of Apurimac River.
- A degree thesis: A thesis with data collected in this project was written and submitted to the Graduate Unit of the Faculty of Biological Sciences of San Marcos University.
- Training for young scientists and local people. Two talented scientists were trained during the fieldwork. One of them will carry out a similar project in the issue, what means the continuity of these unprecedented scientific studies in Peru. Besides of that, people from the different districts and communities were taught to collect fish and data for studies like this, both in the field and as a presentation (through talks in a simple language in the last trip) assuring long-lasting conservation efforts and forming consciousness about the role of fishes and the power of local participation on biological conservation issues.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

We organised two talks in the city halls that represented the most populated districts (one of them was the capital of the province), to show the most relevant results of the project in a simple language and avoiding technical words. Also, people of the villages were encouraged to participate in the fish collections, and in case they could not get into the river or stream, they stayed in the riverbank helping with other activities such as measuring fishes or handing us any material we required. Additionally, local people were given a copy of the guide to know more of the diversity of fishes that they have in their rivers. Finally, I was interviewed in the local radio about this project, remarking that it includes education and conservation components, that it has the support of the government (through the national authority of water), university, investigation institutions (Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos –MUSM- and Institute de Recherché pour le Development -IRD) and foundations like Rufford; and inviting people to the open talk in the afternoon for them to do the same as we did in the with material and equipment that they have for the future conservation of their own rivers.

5. Are there any plans to continue this work?

Yes, there are. In the short term, I was invited this November to teach field instructions to local people and city hall officials on how to make collections and registrations in the streams and rivers, with the aim of training more people than the few that joined the team during the field work of this project; they will be trained more directly to make the registrations themselves and with the tools they already have.

Besides, I will enrol in a doctorate programme that will amplify the influence of this work by including more Andean and Jungle areas to the region that was already studied, which can be comparable to studies in other countries and even continents. Social components can be studied as well, due to the gaps we observed in the development of this work.

6. How do you plan to share the results of your work with others?

Part of the methods and objectives were already shared in the form of corrections to the national normativity (Resolución Jefatural Nº 154-2016-ANA, Anexo 3) which approves the methodology to determine environmental and ecological flows in Peru, that mention habitat preferences as a requisite to estimate ecological flows.

Other field trips and conferences will be offered in cities, in which participants will be trained in the concepts, methods and data analysis that we applied during the project. Academically, the dissemination of the program and the project will be effective among members of MUSM and San Marcos, and conferences for the general public can be organised. Also, the results can be shared with contacts of the National Water Authority (Ministry of Agriculture) to enhance the efforts of the government normativity that still has to be developed in terms of ecological flow.

The thesis that has derived from this project will be available as public for students, researchers, public and private institutions, stakeholders or any other interested person to access electronically to the webpage of the university. Additionally, the main results will be available on the Rufford Foundation site.

Finally, part of this investigation will be submitted to scientific journals to be peer-reviewed.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

The Rufford Foundation grant was used during the dry season in the Southern Highlands of Peru (September and October, 2015) and in this year (August, 2016) to carry out the conservation component of the project. A great desk based portion of the work was already done and the rest is under revision in the Faculty.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Round-trip tickets Lima-Cusco -Lima	913.00	821.19	91.81	We could get the tickets at a lower cost.
Rental truck and gasoline	2130.00	1746.00	384.00	We could hire the truck at a lower cost.
Driver's payment	376.00	324.84	51.16	We could hire the driver at a lower cost.
Accommodation	1466.00	803.00	663.00	Available places to stay were cheaper.
Food	1114.00	712.09	401.91	Food in the visited districts was cheaper than budgeted.
Field Equipment and materials	981.00	310.85	670.15	We could use part of remaining money in this item.
Electrofisher transport to Lima	1090.00	0.00	1090.00	We did not have to pay for this transportation. An IRD researcher carried it from France to Peru.
Laboratory supplies, materials, stationery and maps printing	1505.00	100.00	1405.00	The Department of Ichthyology lend us space and materials for this project, except for containers and ethanol. We could use part of remaining money in these items.
Guide design, printing, and plastering	872.00	180.53	691.47	Printing was much cheaper than budgeted.
Thesis editing, printing, photocopying and filling	152.00	0.00	152.00	I did not do this yet.
Total	10599.00	4998.50		

9. Looking ahead, what do you feel are the important next steps?

First, the region needs an important and big massive awareness campaign remarking the importance research on their natural environment. People in the area doesn't know a lot about how wildlife is related to its habitat and how biological processes could be influenced by human intervention. City halls are thinking about it and they took a first step on the issue by organising other conferences and talks. We will give talks that include visits to the field this November.

Local people need to organize their own monitoring of the habitat preferences of fishes, to register data in simple ways that they can understand. I can design charts for them to have a good registration of their observations and samples. The analysis of data can be send via email.

Besides of that, they must take action against the impact of human influences on their rivers and streams, and that is a joint effort that should include various actors, such as municipalities, owners of fish farms, water local and national authorities and citizens. The academy has already taken action and there is a lot of enthusiasm to look forward to continue working in the Apurimac River Basin.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?

Yes, I did. Any official I talked to during the fieldwork knew that the Rufford Foundation funded the project. Also, during the radio interview I mentioned the RSGF. I used the RSGF in the fish guide, in the presentation that I prepared and in the front cover of my thesis. To see material with the logo, please go to Appendices 1, 2 and 3.

11. Any other comments?

I am greatly thankful to the Rufford Foundation that provided the project with this vital grant. The Rufford Foundation played an important role that will contribute with fish conservation in the Amazon basin and therefore in the world. I would like the Rufford Foundation to know that there were other institutions that contribute with important roles helping me to come these plans true, like IRD, the Department of Ichthyology of MUSM, Municipalidad de Cotabambas, Municipalidad de Challhuahuacho and Autoridad Nacional del Agua (ANA-Ministerio de Agricultura).

PECES Y RÍOS DE COTABAMBAS Y GRAU

Vanessa Correa[1], Marc Pouilly[2] y Hernán Ortega[1]
1 Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos
2 Institut de Recherche pour le Développement
Con el apoyo de The Rufford Foundation, la Municipalidad Provincial de Cotabambas y la Municipalidad Distrital de Challhuahuacho
Fotos: V. Correa (evanessa.correa@gmail.com)

Creagrutus ouranonastes
CHARACIFORMES: CHARACIDAE
"Mojarrita"

Knodus sp.
CHARACIFORMES: CHARACIDAE
"Mojarrita"

Chaetostoma sp.
SILURIFORMES: LORICARIIDAE
"Carachama"

Astroblepus sp. 1
SILURIFORMES: ASTROBLEPIDAE
"Bagrecito"

Astroblepus sp. 2
SILURIFORMES: ASTROBLEPIDAE
"Bagrecito"

Astroblepus sp. 3
SILURIFORMES: ASTROBLEPIDAE
"Bagrecito"

Astroblepus sp. 4
SILURIFORMES: ASTROBLEPIDAE
"Bagrecito"

Astroblepus sp. 5
SILURIFORMES: ASTROBLEPIDAE
"Bagrecito"

Astroblepus sp. 6
SILURIFORMES: ASTROBLEPIDAE
"Bagrecito"

Oncorhynchus mykiss
SALMONIFORMES: SALMONIDAE
"Trucha"

Orestias mundus
CYPRINODONTIFORMES: CYPRINODONTIDAE
"Challhua"

RÍO PALCARO
Tambobamba
3 332msnm

PECES Y RÍOS
DE COTABAMBAS Y GRAU

Vanessa Correa[1], Marc Pouilly[2] y Hernán Ortega[1]
1 Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos
2 Institut de Recherche pour le Développement
Con el apoyo de The Rufford Foundation, la Municipalidad Provincial de Cotabambas y la Municipalidad Distrital de Challhuahuacho
Fotos: V. Correa (evanessa.correa@gmail.com)

RÍO RÉCORD
Challhuahuacho
3 614msnm

RÍO PUNANQUI
Tambobamba
3 585msnm

RÍO COCHA
Haquira
3 675msnm

RÍO PUMAMARCA
Pumamarca
3 734msnm

RÍO PUMAMARCA
Pumamarca
3 904msnm

QUEBRADA ANTUYO
Pumamarca
3 905msnm

RÍO ÑAHUINLLA
Coyllurqui
2 345msnm

RÍO PALLCA
Huayllati
3 182msnm

RÍO CHACAPAMPA
Pampahuite
3 833msnm

RÍO PAMPUTA
Huancuire
4 051msnm

RÍO TRAPICHE
Progreso
3 969msnm

RÍO VILCABAMBA
Vilcabamba
2 359msnm

PREFERENCIAS DE HÁBITAT DE PECES DE LA CUENCA ALTA DEL RÍO APURÍMAC (COTABAMBAS Y GRAU, APURÍMAC)

Blga. Ericka Vanessa Correa Roldán
Maestría en Biodiversidad y Gestión de Ecosistemas
Universidad Nacional Mayor de San Marcos

Asesores: Mag. Hernán Ortega Torres (UNMSM)
Marc Pouilly (IRD)

26 Agosto de 2016

1. INTRODUCCIÓN

PERÚ | Ministerio de Agricultura | Autoridad Nacional del Agua

Reglamento de la Ley de Recursos Hídricos

Ley Nº 29338

Lima, ENERO de 2010

Proliferation of Hydroelectric Dams in the Andean Amazon and Implications for Andes-Amazon Connectivity

Matt Finer[1,2*], **Clinton N. Jenkins**[3]

1 Save America's Forests, Washington D.C., United States of America, **2** Center for International Environmental Law, Washington D.C., United States of America, **3** Department of Biology, North Carolina State University, Raleigh, North Carolina, United States of America

Abstract

Due to rising energy demands and abundant untapped potential, hydropower projects are rapidly increasing in the Neotropics. This is especially true in the wet and rugged Andean Amazon, where regional governments are prioritizing new hydroelectric dams as the centerpiece of long-term energy plans. However, the current planning for hydropower lacks adequate regional and basin-scale assessment of potential ecological impacts. This lack of strategic planning is particularly problematic given the intimate link between the Andes and Amazonian flood plain, together one of the most species rich zones on Earth. We examined the potential ecological impacts, in terms of river connectivity and forest loss, of the planned proliferation of hydroelectric dams across all Andean tributaries of the Amazon River. Considering data on the full portfolios of existing and planned dams, along with data on roads and transmission line systems, we developed a new conceptual framework to estimate the relative impacts of all planned dams. There are plans for 151 new dams greater than 2 MW over the next 20 years, more than a 300% increase. These dams would include five of the six major Andean tributaries of the Amazon. Our ecological impact analysis classified 47% of the potential new dams as high impact and just 19% as low impact. Sixty percent of the dams would cause the first major break in connectivity between protected Andean headwaters and the lowland Amazon. More than 80% would drive deforestation due to new roads, transmission lines, or inundation. We conclude with a discussion of three major policy implications of these findings. 1) There is a critical need for further strategic regional and basin scale evaluation of dams. 2) There is an urgent need for a strategic plan to maintain Andes-Amazon

REPUBLICA DEL PERU

CUT: 79157

RESOLUCIÓN JEFATURAL Nº 154 -2016-ANA

Lima, 15 JUN. 2016

“Se entenderá como caudal ecológico al volumen de agua que se debe mantener en las fuentes naturales de agua para la protección o conservación de los ecosistemas involucrados, la estética del paisaje u otros aspectos de interés científico o cultural”.

El principal componente de la medición de caudal ecológico es la determinación de las preferencias de hábitat.

Metodología para Determinar Caudales Ecológicos

11.4. Evaluación del estado de las condiciones hidrobiológicas

Para cada sección del río en los tramos de estudio, se realizará el estudio de especies del ecosistema (perifiton, macroinvertebrados bentónicos, necton, vertebrados mayores, macrófitas y vegetación ribereña). Luego de realizado el estudio de las especies del ecosistema; así como, sus parámetros comunitarios y/o poblacionales, se deberá desarrollar un análisis sobre la elección de las especies a evaluarse en la estimación de los caudales ecológicos, por razones ecológicas, sociales y/o económicas. En el caso de métodos de simulación de hábitat, serán necesarias la evaluaciones de distribución de las especies en los diferentes tipos de hábitats (meso hábitats) y su uso, selección y preferencias de hábitat de las especies acuáticas; ya que estas relaciones, en especial la de preferencias de hábitat, es insumo indispensable del método de simulación de hábitat para estimar el caudal ecológico. Además, si el método lo exige, se elaborará el modelamiento de la relación de la especie y el hábitat físico, a través dos o más modelos estadísticos. En el caso de los métodos holísticos, también se obtendrán las preferencias de hábitat como evidencia de la relación que existe entre las especies elegidas y su medio físico.

Se realizará la evaluación detallada de las condiciones hidrobiológicas en las secciones del río; para ello se efectuarán estudios cualitativos y cuantitativos detallados aplicando metodologías replicables de las especies de flora y fauna acuática, identificando si hay o no especies endémicas, de importancia ecológica y social; descripción del ciclo de vida de las especies, construcción de la cadena trófica, evaluación de aspectos biológicos claves (migración, reproducción, etc.) y evaluar la potencial capacidad de supervivencia de la fauna acuática. Se

- Las preferencias de hábitat han sido poco estudiadas mundialmente, y no se cuentan con investigaciones relacionadas a este insumo en el Perú.
- El área de estudio carece de publicaciones relacionadas a peces, aunque se realizó un EIA en el área que incluye un estudio de peces.
- El presente estudio constituiría un importante aporte ya que respondería a la necesidad de establecer modelos biológicos que representan el uso y preferencia de los hábitats de los peces.

2. ANTECEDENTES

Tabla 3. Conceptos relacionados a la interacción de las especies y su hábitat

Término	**Concepto (Hall *et al.* 1997)**
Uso	Distribución de la especie en el ecosistema
Selección	El tiempo que pasa esta especie en cada microhábitat que usa.
Preferencia	Jerarquización de la selección.

Se destacan los trabajos de:

- Allouche, 2002
- Velez-Espino, 2003
- Hightower et al., 2012
- Pouilly y Aguilera, 2012
- Girard *et al.* 2013

3. OBJETIVOS

- **Objetivo General**

Determinar las preferencias de hábitat de las especies de peces en la cuenca alta del río Apurímac.

- **Objetivos Específicos**
  - Describir el hábitat de las especies de peces.
  - Realizar un inventario de peces.
  - Explicar la distribución de microhábitats.
  - Conocer la relación entre las especies y los microhábitat (velocidad, profundidad y substrato) para obtener las curvas de preferencia de los peces.

5. MATERIALES Y MÉTODOS

5.1 ÁREA DE ESTUDIO

Se localizó en el Departamento de Apurímac,en las provincias de Cotabambas y Grau, donde se establecieron 19 estaciones de muestreo.

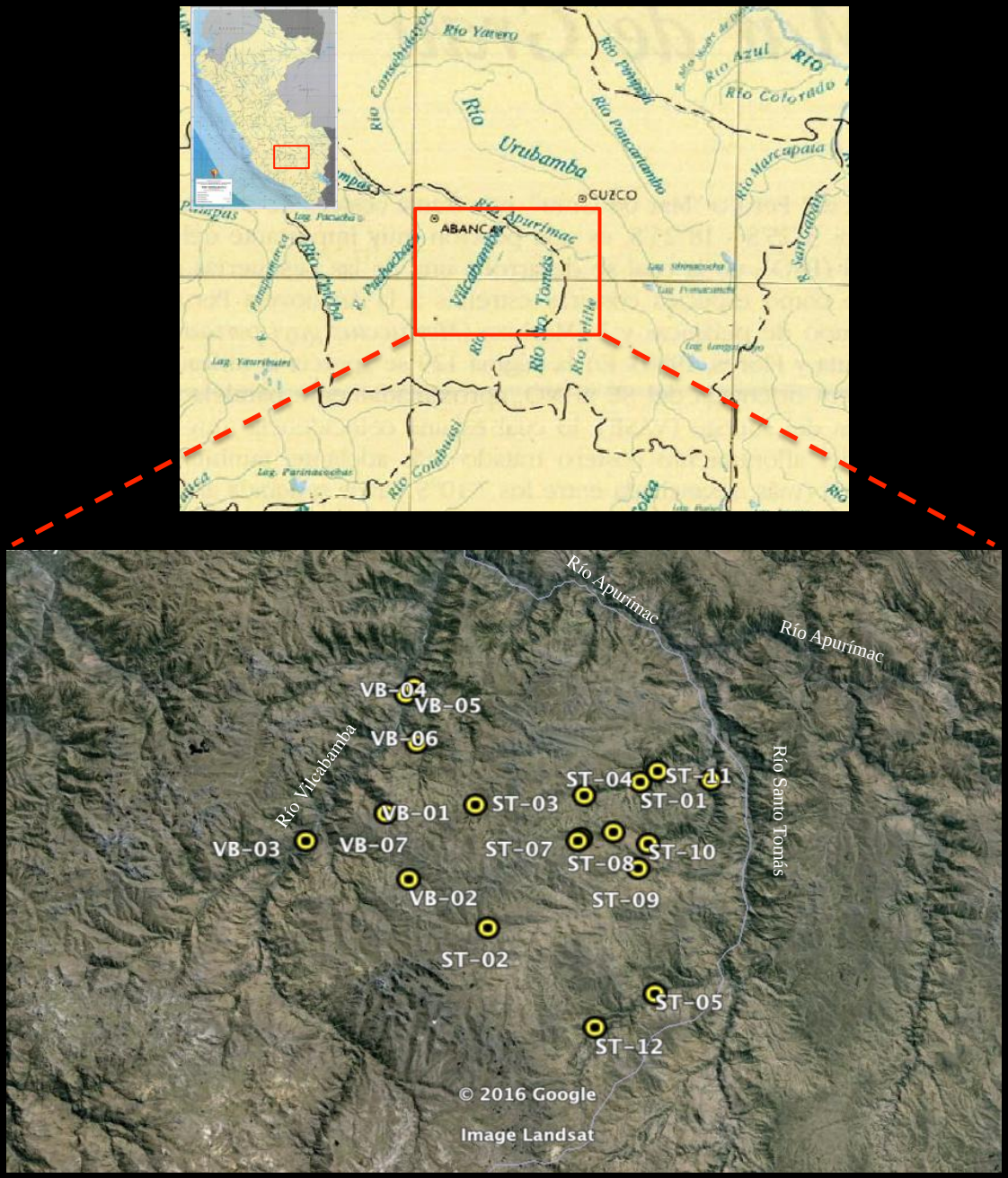


Figura 1. Área de estudio del proyecto.

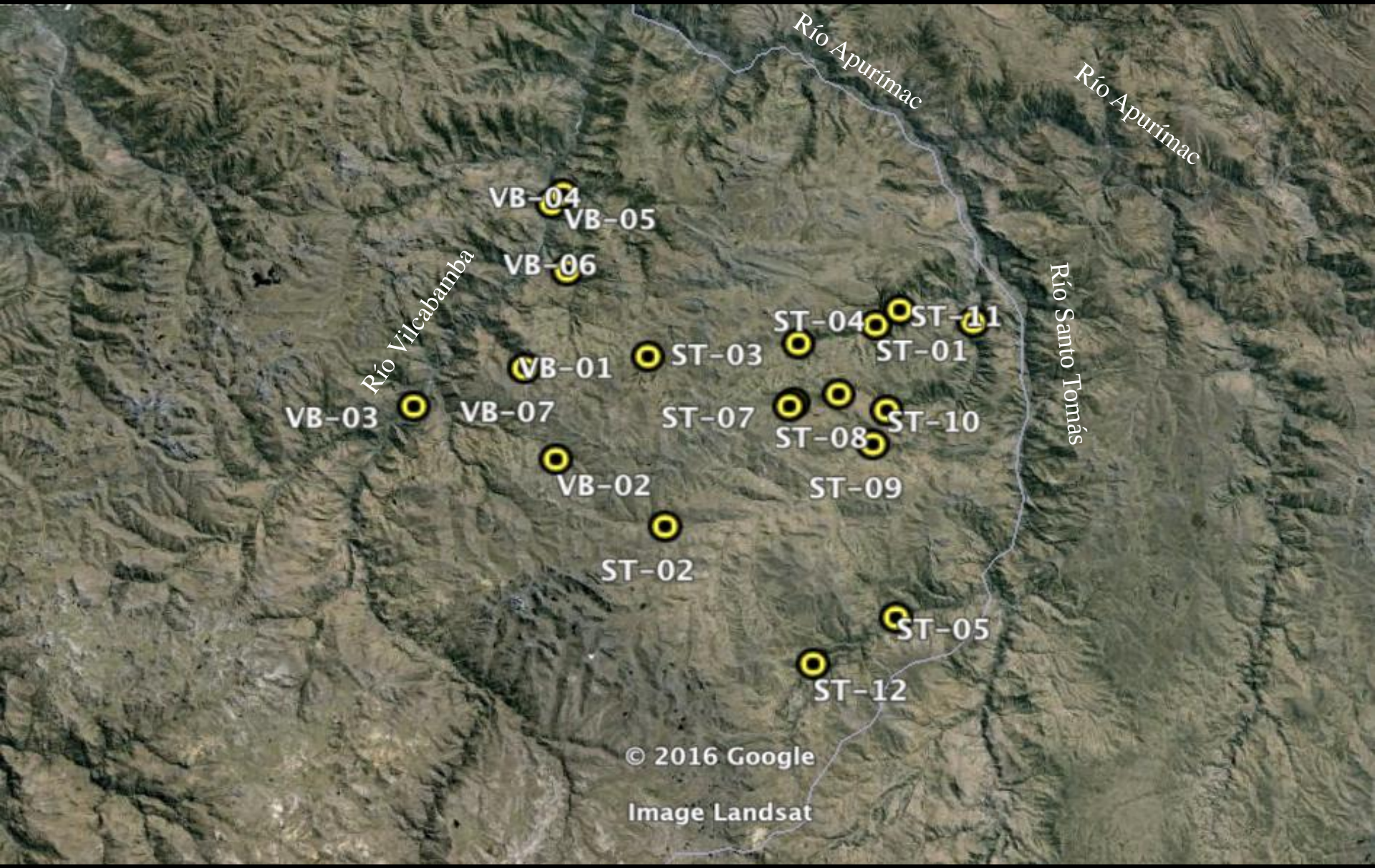


Figura 2. Estaciones de muestreo en el área de estudio.

Tabla 4. Ubicación espacio-temporal de las estaciones de muestreo.

Código de Estación	Localidad	Cuenca	Provincia	Distrito	Comunidad/ Locación	Ubicación geográfica en UTM - WGS 84		Altitud (m. s. n. m.)	Fecha
						E: 18L	N:		
ST-01	Río Palcaro	Santo Tomás	Cotabambas	Tambobamba	Tambobamba	803814	8455114	3332	18-10-2015
ST-02	Río Challhuahuacho	Santo Tomás	Cotabambas	Challhuahuacho	Escohorno	784143	8434648	3907	19-10-2015
ST-03	Río Palcaro	Santo Tomás	Cotabambas	Tambobamba	Tambobamba	796575	8453272	3843	20-10-2015
ST-04	Río Palcaro	Santo Tomás	Cotabambas	Tambobamba	Tambobamba	806216	8456672	3187	20-10-2015
ST-05	Río Cocha	Santo Tomás	Cotabambas	Haquira	Haquira	805451	8425736	3153	21-10-2015
ST-06	Río Pumamarca	Santo Tomás	Cotabambas	Pumamarca	Pumamarca	796005	8447696	3904	22-10-2015
ST-07	Quebrada Antuyo	Santo Tomás	Cotabambas	Pumamarca	Pumamarca	796027	8447622	3904	22-10-2015
ST-08	Río Pumamarca	Santo Tomás	Cotabambas	Pumamarca	Pumamarca	800306	8448238	3734	23-10-2015
ST-09	Río Challhuahuacho	Santo Tomás	Cotabambas	Challhuahuacho	Challhuahuacho	803425	8443282	3629	24-10-2015
ST-10	Río Challhuahuacho	Santo Tomás	Cotabambas	Challhuahuacho	Challhuahuacho	804755	8446468	3614	24-10-2015
ST-11	Río Punanqui (Río Challhuahuacho aguas abajo)	Santo Tomás	Cotabambas	Tambobamba	Tambobamba	813188	8455280	3585	25-10-2015
ST-12	Río Cocha	Santo Tomás	Cotabambas	Haquira	Haquira	797664	8421352	3675	26-10-2015
VB-01	Río Pamputa	Vilcabamba	Grau	Huancuire	Pamputa	782510	8451440	4051	27-10-2015
VB-02	Río Trapiche	Vilcabamba	Grau	Progreso	Progreso	773990	8441872	3969	27-10-2015
VB-03	Río Vilcabamba	Vilcabamba	Grau	Vilcabamba	Vilcabamba	760465	8447260	2657	28-10-2015
VB-04	Río Vilcabamba	Vilcabamba	Grau	Vilcabamba	Vilcabamba	773212	8468616	2359	29-10-2015
VB-05	Río Ñahuilla	Vilcabamba	Grau	Coyllurqui	Progreso	774383	8469184	2345	29-10-2015
VB-06	Río Pallca	Vilcabamba	Grau	Huayllati	Progreso	774847	8460574	3182	30-10-2015
VB-07	Río Chacapampa	Vilcabamba	Grau	Pampahuite	Progreso	770996	8450434	3833	30-10-2015

PERÍODO DE MUESTREO: 18 AL 30 DE OCTUBRE DE 2015

Río Récord (o Río Challhuahuacho)

Río Palcaro

Río Pumamarca

Río Pamputa

Figura 3. Algunas estaciones de muestreo

MÉTODOS

1. **Fase de gabinete pre-campo**

   Preparación de mapas, fichas y obtención de financiamiento, obtención de permisos, organización de trabajo de campo.

2. **Fase de campo**

   Registros, colectas, preservación de muestras. Reunión con autoridades locales.

3. **Fase post-campo**

   Procesamiento de datos, certificación de depósito de muestras en el Museo de Historia Natural de la UNMSM, elaboración de tesis, capacitaciones, elaboración de informes.

Fase de Campo

Figura 4. Equipo multiparámetro

¿Qué miden los equipos?

Figura 5. Medición de la amplitud de cauce.

¿Cuál es la temporada adecuada para realizar el muestreo?

Figura 4. Qué puntos de muestreo debo elegir?

Figura 4. Pescando

Figura 7. Medición de talla

Figura 6. Medición de datos velocidad, profundidad y substrato.

Fase post-Campo

Procesamiento de la información

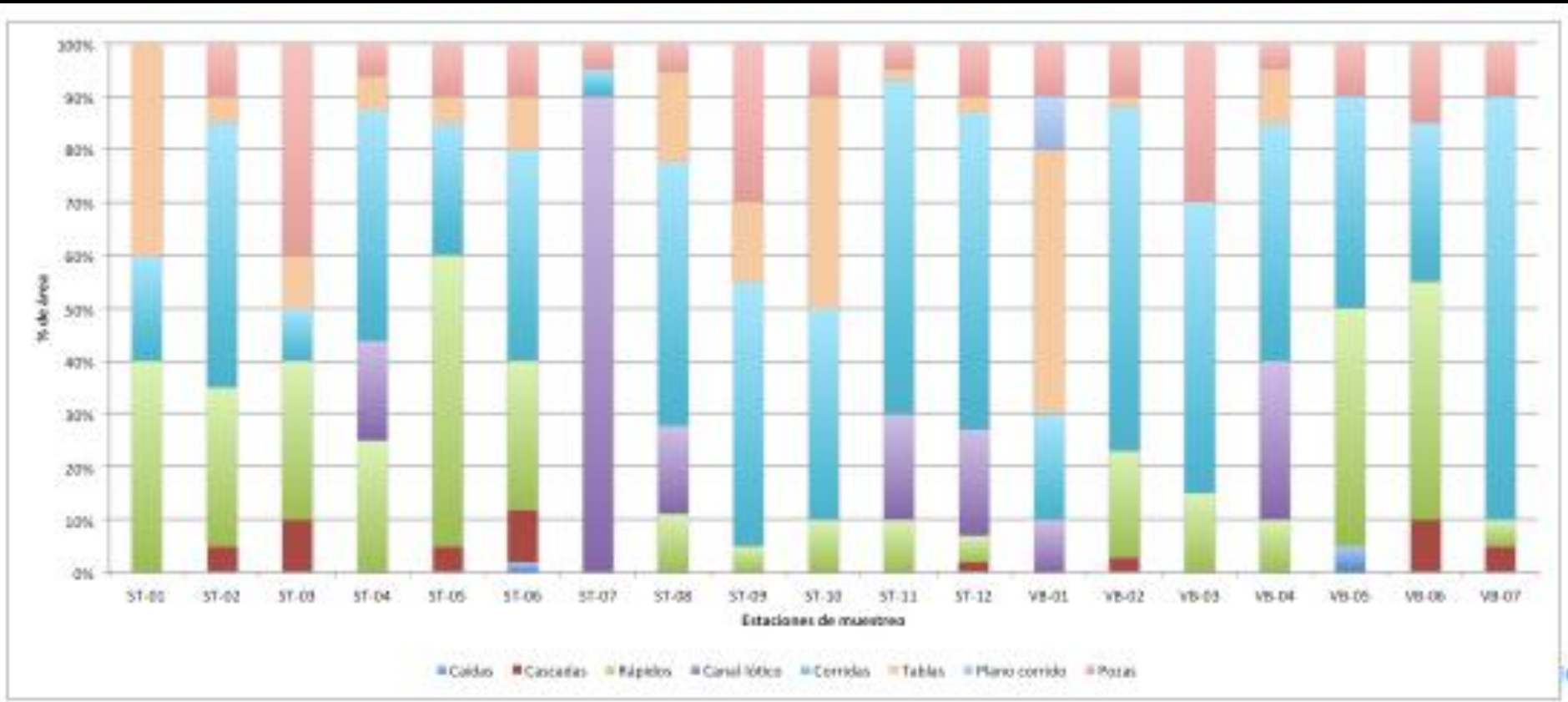
Se relacionaron los datos de velocidad, profundidad y substrato con los datos de peces (abundancia), para elaborar curvas de preferencia.

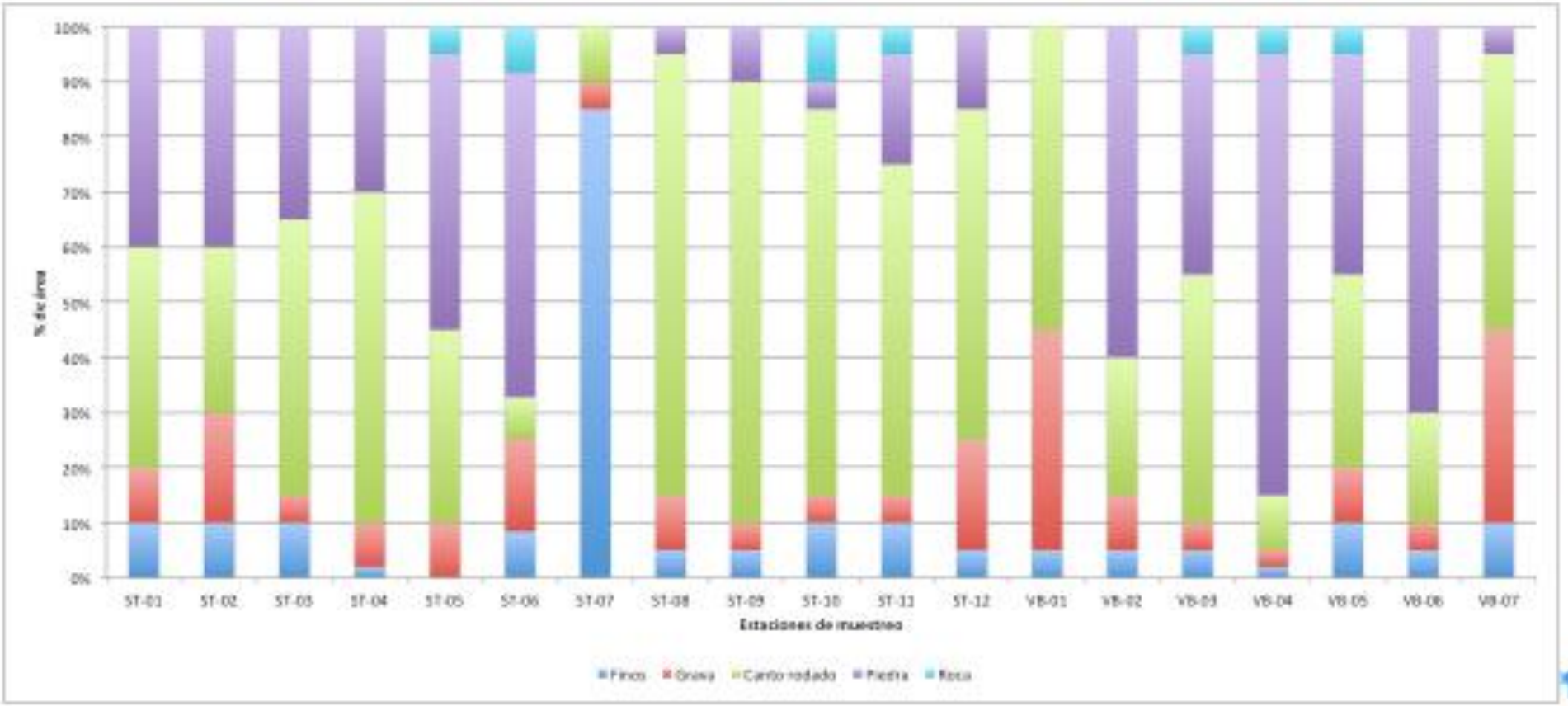
Las curvas de preferencia de cada especie fueron comparadas.

(Coordinación para el envío de datos)

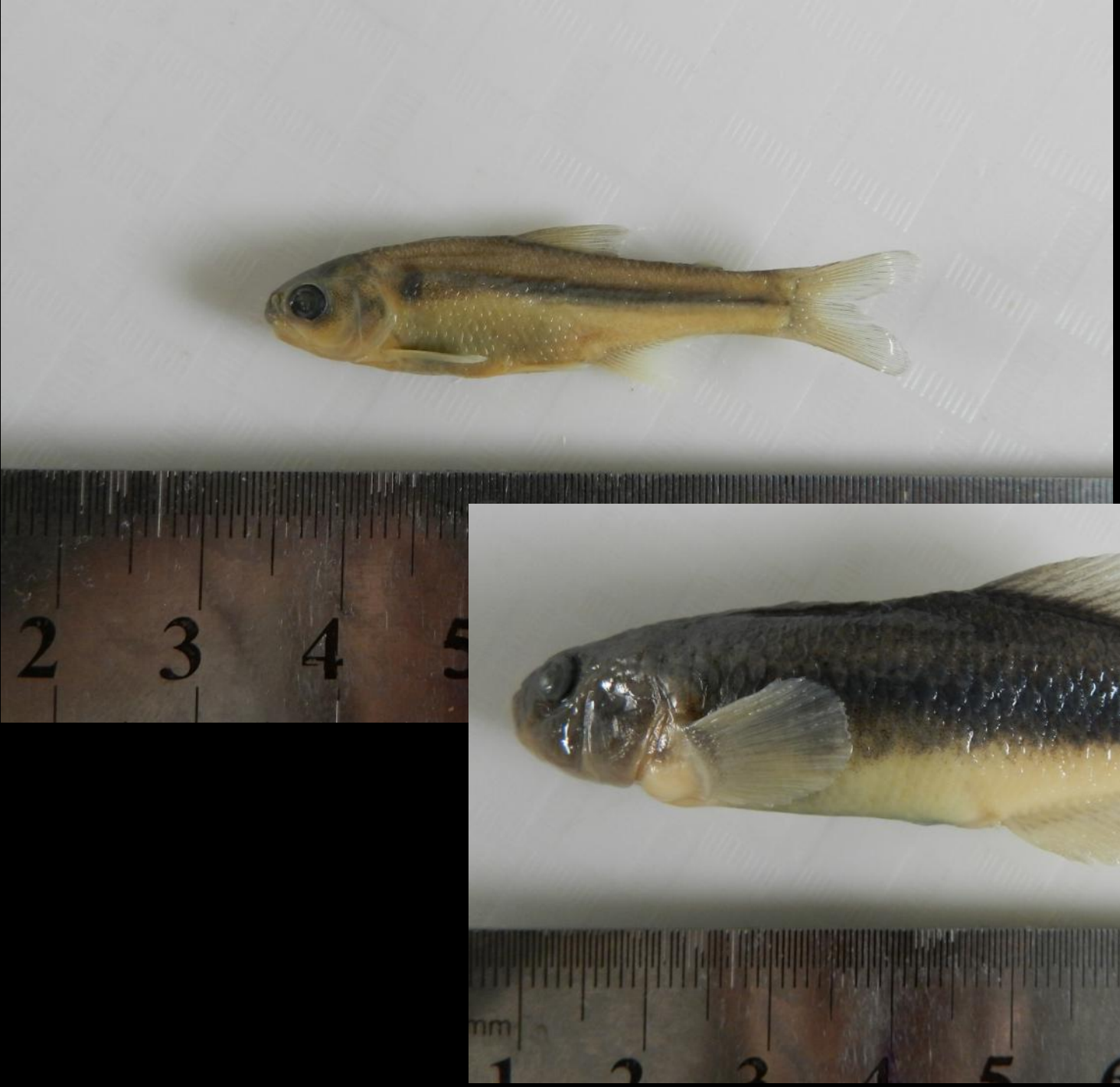
RESULTADOS

Código	Localidad	Cuenca	Parámetros *In*			
			Temp. (°C)	pH	Conductividad (uS/cm)	STD (ppm)
ST-01	Río Palcaro	Santo Tomás	15	7.63	252	126
ST-02	Río Challhuahuacho	Santo Tomás	11	8.57	205	102
ST-03	Río Palcaro	Santo Tomás	13.9	7.2	130	65
ST-04	Río Palcaro	Santo Tomás	18.2	7.69	198	50
ST-05	Río Cocha	Santo Tomás	16	8.3	132	66
ST-06	Río Pumamarca	Santo Tomás	16.1	8.5	126	63
ST-07	Quebrada Antuyo	Santo Tomás	16.1	7.49	244	122
ST-08	Río Pumamarca	Santo Tomás	15.9	8.38	179	89
ST-09	Río Challhuahuacho	Santo Tomás	14.6	7.88	155	77
ST-10	Río Challhuahuacho	Santo Tomás	16.6	7.95	147	72
ST-11	Río Punanqui (Río Challhuahuacho aguas abajo)	Santo Tomás	15.3	8.29	182	91
ST-12	Río Cocha	Santo Tomás	10.5	7.93	78	40
VB-01	Río Pamputa	Vilcabamba	9.1	7.94	185	91
VB-02	Río Trapiche	Vilcabamba	15.8	7.96	137	69
VB-03	Río Vilcabamba	Vilcabamba	15.7	9.92	345	172
VB-04	Río Vilcabamba	Vilcabamba	18.9	8.26	310	155
VB-05	Río Ñahuilla	Vilcabamba	15.6	8.08	332	167
VB-06	Río Pallca	Vilcabamba	14.5	8.82	230	114
VB-07	Río Chacapampa	Vilcabamba	12.4	7.97	41	21


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% de área
ST-01
ST-02
ST-03
ST-04
ST-05
ST-06
ST-07
ST-08
ST-09
ST-10
ST-11
ST-12
VB-01
VB-02
VB-03
VB-04
VB-05
VB-06
VB-07
Estaciones de muestreo
Caídas
Cascadas
Rápidos
Canal lótico
Corridas
Tablas
Plano corrido
Pozas


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% de área
ST-01
ST-02
ST-03
ST-04
ST-05
ST-06
ST-07
ST-08
ST-09
ST-10
ST-11
ST-12
VB-01
VB-02
VB-03
VB-04
VB-05
VB-06
VB-07
Estaciones de muestreo
Finos
Grava
Canto rodado
Piedra
Roca

Orden	Familia	Especies o morfoespecies	ST-01	ST-02	ST-03	ST-04	ST-05	ST-06	ST-07	ST-08	ST-09	ST-10	ST-11	ST-12	VB-01	VB-02	VB-03	VB-04	VB-05	VB-06	VB-07	Total
Characiformes	Characidae	*Bryconamericus osgoodi sp.*																22				22
		Creagrutus ouranonastes																12				12
Siluriformes	Loricariidae	*Chetostoma sp.*																4		1		5
	Astroblepidae	*Astroblepus sp. 1*	38			23					3	3	11				4		2			84
		Astroblepus sp. 2	3			10						3	6						6	3		31
		Astroblepus sp. 3	1			1																2
		Astroblepus sp. 4										1	7				1			2		11
		Astroblepus sp. 5	14									1	1				23	15				54
Cyprinodontiformes	Cyprinodontidae	*Orestias mundus*							16						3							19
Salmoniformes	Salmonidae	*Onchorhynchus mykiss*	21	33	29	35	71	83		13	28	6	13	36		5	16		4	7	5	405
Total			77	33	29	69	71	83	16	13	31	14	38	36	3	5	44	53	12	13	5	**645**



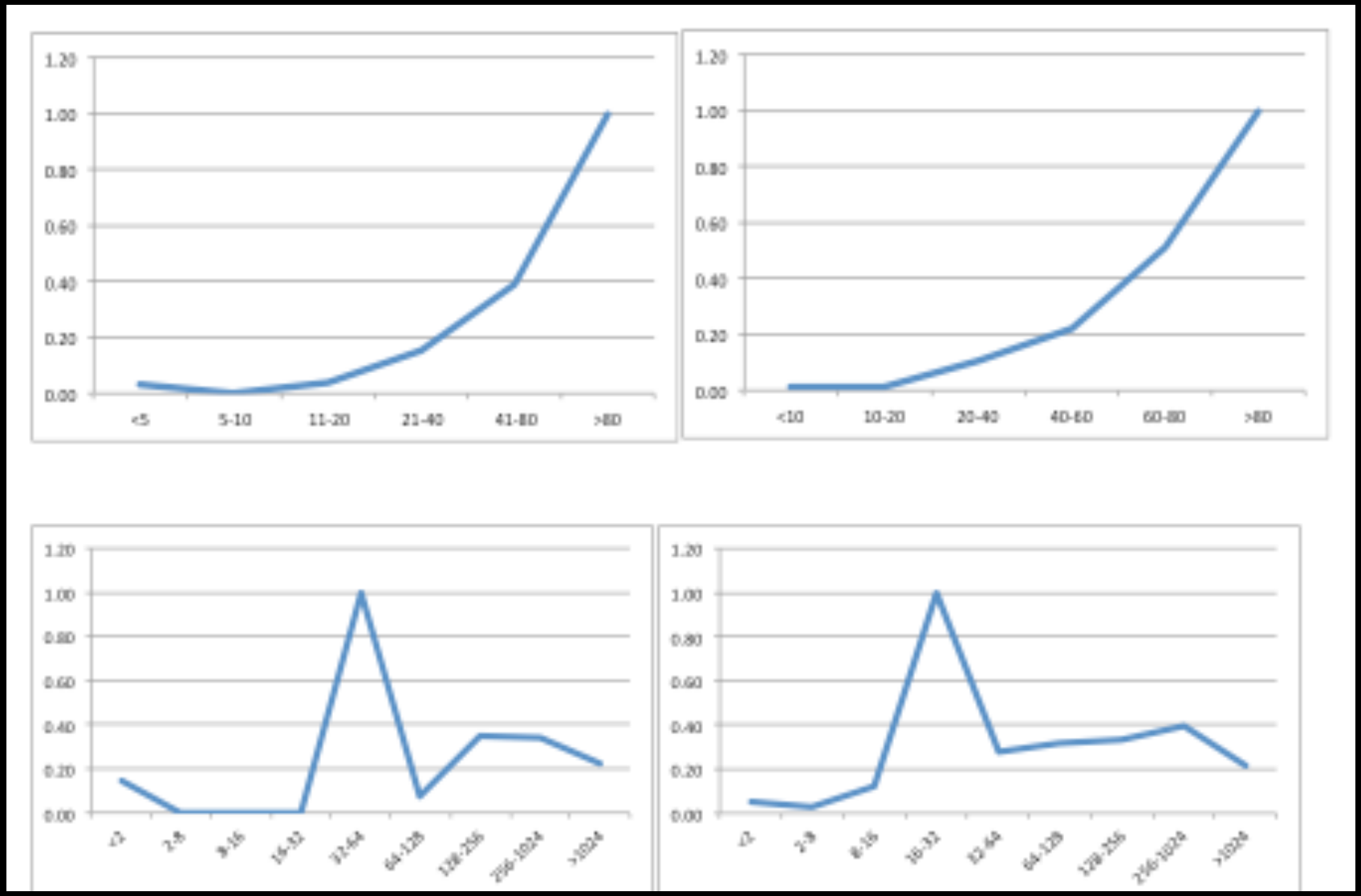
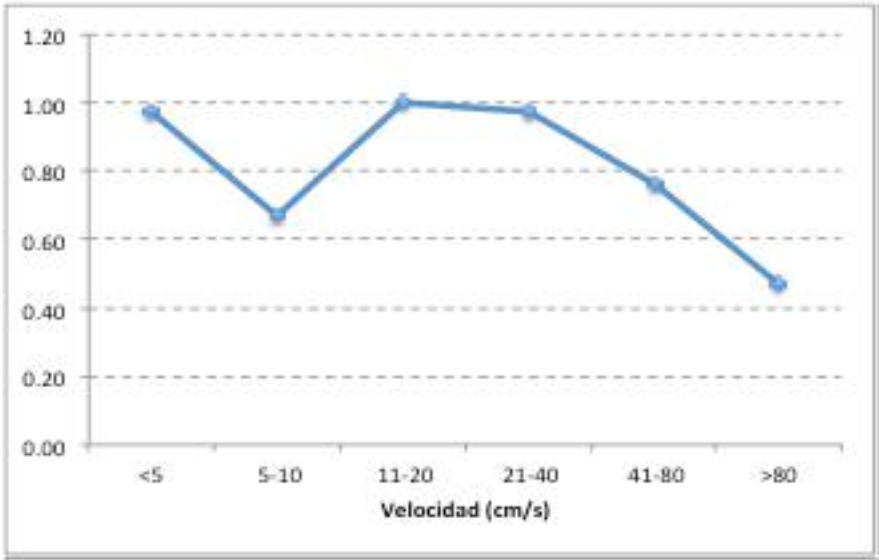
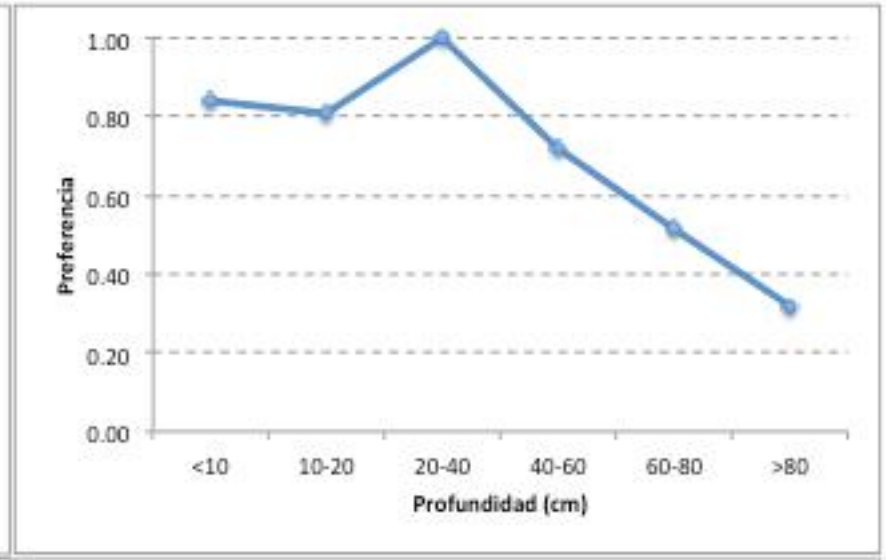
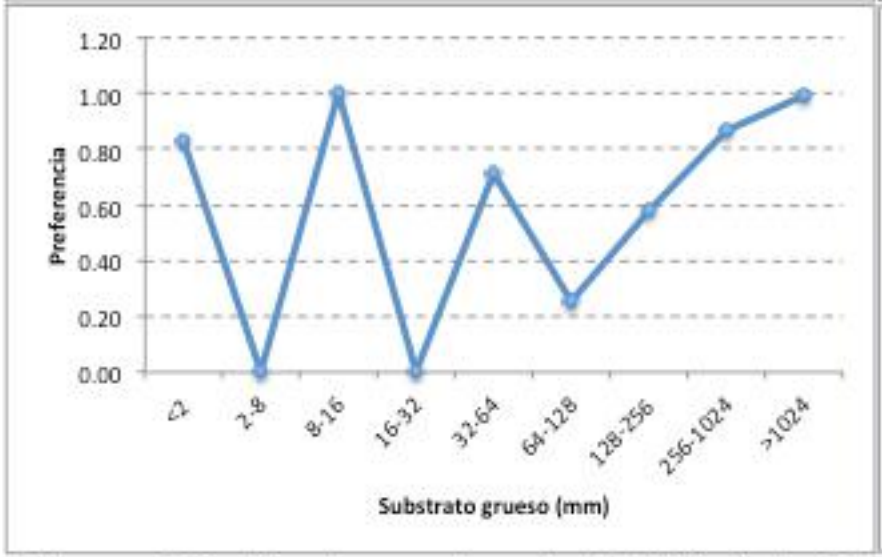


Figura 21. Preferencias de hábitat de Astroblepus spp.







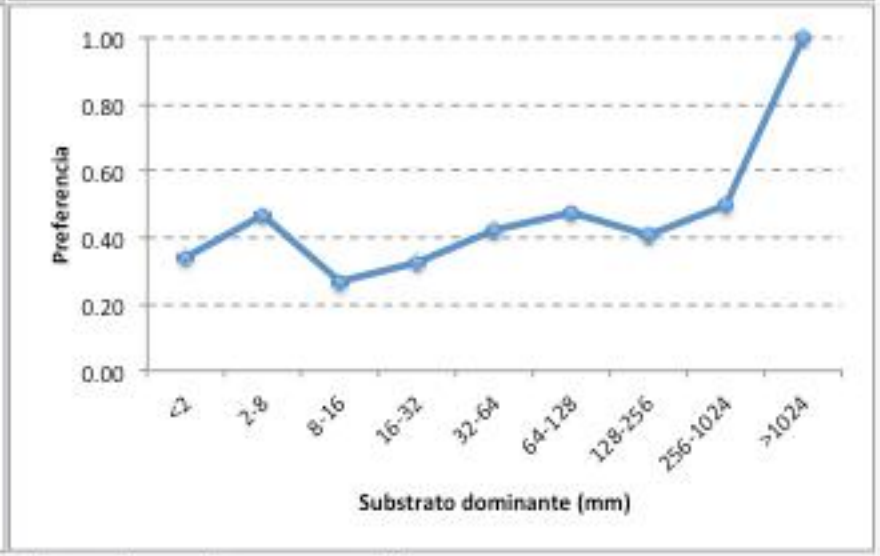


Figura 22. Preferencias de hábitat de *Onchorhynchus mykiss*.

7. CONCLUSIONES

- Las carácterísticas fisicas y químicas correspondieron a ecosistemas lóticos altoandinos.
- Todos los cursos de agua visitados en la cuenca alta del río Apurímac fueron de tipo clara.
- La distribución de mesohábitats en la cuenca alta del río Apurímac estuvo acorde con el tipo de ecosistemas altoandinos, y estuvieron influenciados por la altitud, la topografía y la pendiente.

- El inventario, composición, riqueza y abundancia de peces de la cuenca alta del río Apurímac fue representativa de la cuenca y la región altoandina.
- Las preferencias de hábitat de los peces del área pueden considerarse dentro de un marco local y regional dependiendo de la especie.

- *Creagrutus ouranonastes* prefiere velocidades y profundidades bajas y substrato dominante de tipo fino, en un marco andino.
- A través de los Andes, *Astroblepus* spp. prefiere velocidades moderadas.
- Regionalmente, *Orestias* spp. prefiere velocidades y profundidades bajas, substrato grande de tipo canto rodado fino y substrato dominante de tipo fino.
- *Onchorhynchus mykiss* prefiere velocidades y profundidades bajas, substrato grande de tipo roca y grava y substrato dominante de tipo roca, en un marco regional.
- Localmente, *Chaetostoma* prefiere velocidades moderadas, profundidades variables y substrato de tipo bloque.

PRÓXIMOS PASOS

- SUSTENTAR LA TESIS.
- PUBLICAR LAS PREFERENCIAS DE HÁBITAT DE LOS PECES.
- TRANSMITIR RECOMENDACIONES A LA AUTORIDAD NACIONAL DEL AGUA (ANA).
- CONTINUAR CON LOS REGISTROS Y CAPTURAS (POR PARTE DE LAS AUTORIDADES LOCALES).
- REALIZAR EL ENVÍO DE DATOS PARA SU RESPECTIVO PROCESAMIENTO.
- ASEGURAR LA CONSERVACIÓN DE LOS RÍOS A TRAVÉS DE UN TRABAJO CONTINUO, CONJUNTO Y COORDINADO.

Gracias!!!

TESIS DE MAESTRÍA

Bach. ERICKA VANESSA CORREA ROLDÁN

FEBRERO DE 2016

UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS

(Universidad del Perú, Decana de América)

ESCUELA DE POSGRADO

FACULTAD DE CIENCIAS BIOLÓGICAS

UNIDAD DE POSGRADO

PREFERENCIAS DE HÁBITAT DE PECES EN LA CUENCA ALTA DEL RÍO APURÍMAC (COTABAMBAS Y GRAU, APURÍMAC), EN UN MARCO LOCAL, REGIONAL Y ANDINO

Tesis para optar el grado académico de Magíster en Biodiversidad y Gestión de Ecosistemas

Tesista: Bach. ERICKA VANESSA CORREA ROLDÁN

Con el apoyo de:

The Rufford Foundation
www.rufford.org

ANA
Autoridad Nacional del Agua

LIMA-PERÚ

2016

Tesista:

Bach. ERICKA VANESSA CORREA ROLDAN

Profesor Asesor:

Mag. T. HERNÁN ORTEGA TORRES
Departamento de Hidrobiología y Pesquería,
Facultad de Ciencias Biológicas
Departamento de Ictiología
Museo de Historia Natural
Universidad Nacional Mayor de San Marcos

Co-Asesor:

Dr. MARC POUILLY
Institut De Recherche Pour Le Développement (IRD)