

CONSERVATION OF THE ENDANGERED NUDE-BREAM (*GYMNOCHARACINUS BERGII*) IN SOMUNCURA PLATEAU, PATAGONIA, ARGENTINA

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PROJECT FRAME

The Nude-bream, *Gymnocharacinus bergii* (Fig. 1) is a strictly endemic fish of Patagonia Argentina. The distributional range of this fish is restricted to the Valcheta stream, an 80 km watercourse placed at the Somuncura plateau in Río Negro Province. However, the Nude-bream only occur at the beginnings 10 km of this watercourse. The first portion of the Valcheta stream has higher temperatures than other watercourses in the region, because it start at thermal springs. The Nude-bream is a habitat specialist species with a strait range of thermal requirements for its life cycle. For this reason, the Nude-bream only occurs isolated, at some places of the Valcheta stream, related with the occurrence of thermal springs. Currently, several factors related with human activities are contributing to the degradation and fragmentation of the habitat of this species. However, the most important threats are the presence of two exotic salmonid species that predate on this bream, the rainbow trout (*Oncorhynchus mykiss*) and the common trout (*Salvelinus fontinalis*). Because its critical status, the Nude-bream was declared as endangered species by the IUCN. This project did the firsts steps towards the long lasting protection of the Nude-bream populations.

MAIN GOAL

The main goal of this project was to improve and promote the conservation of the endemic Nude bream, *Gymnocharacinus bergii*, in the Valcheta stream, Somuncura plateau (Patagonia, Argentina).



SPECIFIC OBJECTIVES

1. To evaluate main population parameters for this species
2. To assess habitat requirements and effect of main threats on this fish
3. To write a preliminary conservation action plan for this species
4. To perform a set of activities aimed to raise awareness



Fig. 3. Individuals of *G. bergii* recorded during our fieldwork.

MAIN POPULATION PARAMETERS OF NUDE-BREAM

We assessed three population parameters: occupancy, minimum abundance and population structure (proportion of adults and juveniles). We performed four campaigns to the study area (Fig. 1). The first campaign was performed during February of 2013, the second one was performed in March of 2013, the thirteenth one was performed in November of 2013 and the fourth campaign was done in February of 2014. The objectives of these campaigns were: a) to select and set the survey sites; b) to account for threats in the field; c) to get a more insight about the target species in its habitat; d) to estimate detectability,

occupancy, abundance and population structure, and; e) to develop education activities (Fig. 2).

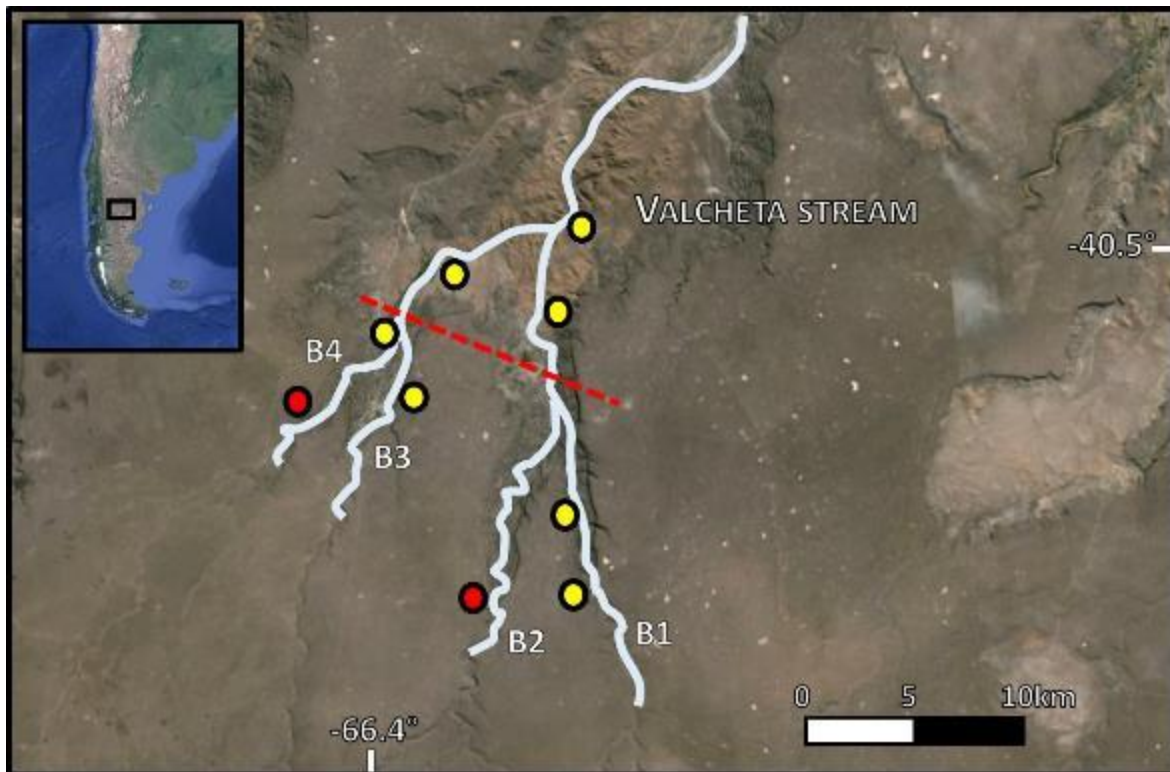


Fig. 1. Map of Valcheta stream with the four branches that represent the beginnings of the watercourse and the distributional range of Nude-bream. The red dotted line represents both, the current distribution of *G. bergii* (below the line) and the known distribution of exotic salmonids before this work (upper the line). The red spots are new sites where salmonids were detected by this work, whereas yellow spots are sites where the exotic fish *Cheirodon interruptus* was discovered by this project (see details below).

OCCUPANCY

Occupancy models were developed using the software Presence 5.9. We estimated occupancy and compared it between the different branches of the stream in order to assess the existence of differences between sites. We sampled 128 sites along the Valcheta stream (Fig. 2). Of these sites, we resampled 39 sites in three opportunities. We confirmed the presence of *G. bergii* (Fig. 3) in 22 of these 39 sites.



Fig. 2. The field work included several activities like the prospection of new sites, meetings with local farmers and park rangers and different kinds of surveys.

At the Table 1 we present a summary of detectability and occupancy values obtained for *G. bergii*. We also detail main models used for estimations with Akaike values (AIC) for each one. AIC values indicate which model is the most adequate to explain our data (higher values of AIC represent less explanatory models).

Table 1. Occupancy models for Nude-bream. General: models that do not consider sites (each one of the four branches of the stream) as covariates; Sites: models that consider sites as covariates; Delta AIC: difference between AIC and the minimum AIC of both models; Ψ : occupancy; p : detectability; SE: Standard error.

	Model	Delta AIC	Ψ (SE)	p (SE)
<i>Gymnocharacinus bergii</i>	General	0.00	0.99 (0.13)	0.89 (0.52)
	Sites	2.00		

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As we can see in Table 1, *G. bergii* shows higher occupancy values and higher detection probabilities in its distributional range, it means, in the beginnings of the Valcheta stream. The most explanatory model was the one that do not consider sites as covariates. This make senses if we consider that the species occur at the four branches of the stream. However, if we consider the occupation of the species at the whole watercourse, the occupation value becomes very small. This is because the occurrence of the species is highly restricted to the first 10 km of the beginnings of the stream. Although that we performed exhaustive surveys at several points of the Valcheta stream, we could not found individuals beyond this first 10 km.

MINIMUM ABUNDANCE

Abundance estimation was performed based on surveys at the four branches of the stream, which represent the whole distributional range for the species. These surveys were done in synchronicity. Abundance was defined as the number of individuals counted in samples of 5 meters of shore. It was very difficult to count individuals in the water, for this reason, in those cases in which abundance was high, we took pictures of the water surface and then we counted the individuals in the picture. This method is a non-effective method to get precise values of abundance. However, we used it as a preliminary step in order to get an idea about the relative abundances of the species. We also selected this method during this first step of our work because is a non-invasive method instead of other more stressfully methods like mark recapture, and we wanted to know the status of the species before choosing for a marking method. In this frame, the results obtained by our work must be considered only in a preliminary way. However, these results are useful to know the minimum value of abundance for the species and as basis for future researches.

Minimum values of abundance for each branch of the stream are presented at Table 2. We also used these minimum values to extrapolate a minimum population size for Nude-bream. For this aim, we extrapolated the total area surveyed to the total range for the species. The distributional range of the species at branch 1 is of 5km (we surveyed a total of 0.9 km). In the branch 2, the range of the species is of 6.5km (we surveyed 1km). In the branch 3, the range of the species is of 7 km (we surveyed 1.2 km); whereas in the branch 4, the distribution of the species reaches 7km (we surveyed a total of 0.6km). We surveyed a value of approximately 16% of the total distributional range for the species.



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Table 2. Minimum abundances and minimum population size for *G. bergii*. MA: minimum abundance; B1, 2, 3 y 4: branches 1, 2, 3 and 4 respectively of the Valcheta stream; MPS: minimum population size for the species

	AM-B1	AM-B2	AM-B3	AM-B4	MPS
<i>Gymnocharacinus bergii</i>	610	1,200	390	580	20,231

As we can see at the Table 2, the Nude-bream has good minimum densities in its distributional range. This information is better if we consider that results shows minimum abundances, so, the real densities would be higher. These results are of key importance to the development of future researches.

POPULATION STRUCTURE

In order to get a first approach regarding the population structure of this species, during November of 2013 and February of 2014 we captured individuals using box-net traps ($n = 10$). We distributed the traps in the four branches of the stream. The traps were active during one day at each month in each branch of the stream and it were checked two times per day (at the morning and at the afternoon). The individuals captured were classified as juveniles (with scales) or adults (without scales) and released at the capture point. The results are showed at Table 3.

Table 3. Individuals captured at each of the four branches of the Valcheta stream. Values are presented as the average \pm standard error of the percentages of adult individuals. Total individuals captured are presented in parentheses.

	Branch 1	Branch 2	Branch 3	Branch 4
Nov. 2013	62 \pm 12 (89)	41 \pm 15 (124)	28 \pm 09 (105)	42 \pm 21 (142)
Feb. 2014	37 \pm 24 (67)	49 \pm 26 (86)	22 \pm 17 (93)	51 \pm 05 (74)

In the Table 2 we can see that juveniles represent the higher percentage of individuals at the four branches and during the two months assessed (with exception of branch 1 in November of 2013 and branch 4 in February of 2014). Although it are preliminary results, population structure data gathered suggests that in the four branches it exists reproduction events that allow the occurrence of juvenile individuals and the incorporation of new individuals to the population

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During this first step of our project, we decided to work with a small sample of individuals by using only 10 traps. By this way, we avoid to mark individuals eluding a high pressure on them. However, as said before, the obtained results must only be considered in a preliminary way and further studies will be necessary in order to get a more precise knowledge about the population structure of this species.

We cannot get enough population data to perform a robust population viability analysis. However, we have yet a basis of information that will be very useful to perform future studies aimed to get a more precise insight about the ecology of the species.

HABITAT REQUIREMENTS AND EFFECT OF MAIN THREATS

Regarding habitat requirements, we observed that individuals are more abundant at the very beginnings of the stream and they show a decrease in abundance waterdown, along the first 10 km of the stream. However, the species is present in different abundances along the four branches of the stream. In this frame, it is difficult to evaluate which are the main variables that affect the presence of the species, because it is present in several kinds of microhabitats.

Based on the obtained abundance data, it seems that most of the individuals preferred warmer waters (as those present in the very beginnings of the stream); quiet waters (individuals are less common or absent at current waters); clear waters (individuals are less abundant or absent in sites with a high degree of eutrophication due to trampling of livestock), and with some vegetation (that individuals use as food and as shelter).

Regarding effect of threats we recorded that some kinds of human disturbs (as the creation of small channels and/or dams) seems not affect Nude-bream occurrence nor abundance. However, we did not assess if these disturbs would affect the *fitness* or some physiological feature of individuals. Further studies must assess these hypotheses in order to get a more deep insight about the effect of human disturbs on this species.

With respect to the effect of exotic salmonids, we analyzed the stomach content of four trouts and we found evidences of bream's predation. However, and because the state of the individuals found at the stomachs, we are not sure if they are individuals of Nude-bream or individuals of the exotic bream *Ch. interruptus* (because both species have similar sizes and shapes). Independently of the bream's species that were found in stomach contents of trouts, these data suggest that trouts can predate on Nude-bream. Another indirect evidence of this fact is that in data gathered by Ortubay in 1993, the occurrence of Nude-bream was

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confirmed in some sites where currently individuals are absent, but trouts are present. This could be indicating that Nude-brems are avoiding sites with higher densities of trouts. Moreover, the presence of the trouts at the beginnings of the four branches of the stream had not been even recorded before. Some authors said that this absence would be related with some kind of rejection of higher temperatures by trouts. However, during this project, we recorded some individuals of trouts at the beginnings of the branches 2 and 4 of the Valcheta stream, indicating that the current distributional range of salmonids in the watercourse is higher than the known distribution (see Fig. 1). These are bad news if we consider that the very beginnings of the stream are the preferred sites for Nude-bream.

During our fieldwork, we also discovered the existence of two new threats never recorded before in the area, which could have a negative effect on Nude-bream. The first one was the wild board (*Sus scrofa*). This exotic and very dangerous species have never seen before in the area. However, currently is common to see individuals, and its population would seems to be thriving at the area. Wild boards, as same as domestic pigs, can promote eutrophication of some sites of the stream, making the habitat less suitable for Nude-brems. The second exotic species was the Silver-bream, *Ch. interruptus* (Fig. 3), never recorded before in the Valcheta stream. Because its importance as a threat for the Nude-bream, we included a short evaluation about this exotic species below.

Another threat is the eutrophication of the watercourse due to the trampling of livestock. We recorded this threat at the four branches of the stream. We also observed that individuals of Nude-bream are less abundant at those sites with higher degrees of eutrophication. In this frame, as was seen before, the livestock represents a threat for this species that should be managed.

One last threat, not considered before are flood events in the area. During 2013, an unusual flood occur at all the distributional range of this species. These floods can move individuals downstream, pushing them to less suitable habitats (less warmer and more current waters). If these events would occur more frequently in the following years it will probably have a negative effect on Nude-bream population that should be considered in future conservation works.

A NEW DISCOVERY: THE EXOTIC SILVER-BREAM AS A THREAT FOR THE NUDE-BREAM

We discovered the Silver-bream (*Ch. interruptus*) during our field surveys at the Valcheta stream. The previous known distributional range for the Silver-bream reaches the Colorado River located 240 km at the north of the point at which it was currently detected. A great frequency of Individuals of this species were observed sharing the habitat with the Nude-bream but it also were saw in sites where the



Nude-bream is currently absent. Individuals were also observed sharing the habitat with exotic salmonids and other small exotic fishes, previously recorded in the Valcheta stream.

We assumed that it is highly probable that this species turned as a threat for Nude-bream. Our assumption is related with some facts: a) the Silver-bream has similar feed habitats than Nude-bream, being a hard competitor because its higher phenotypic plasticity; b) both species share the habitat; c) previous surveys in the area did not found the Silver-bream, which can be related with a rapid thrive of this species at the Valcheta stream; d) Silver-bream was observed in high densities at different sites during our surveys, and; e) there exist documents that confirm that Silver-bream is an aggressive competitor which has already colonize some rivers in Argentina.

Based on these probes we suppose that the Silver-bream should be considered as a potential high threat for Nude-bream. In this frame, we wrote a manuscript that is being reviewed for publication by journal **Biología Tropical**, and we wrote a conservation action plan document that was presented at the Department of Protected Areas of Río Negro Province (se below).

TO PERFORM A SET OF ACTIVITIES AIMED TO RAISE AWARENESS

We developed and spread a lot of educational material, like pamphlets, stickers, posters and banners related with the conservation of the target species and its habitat (Fig. 4).

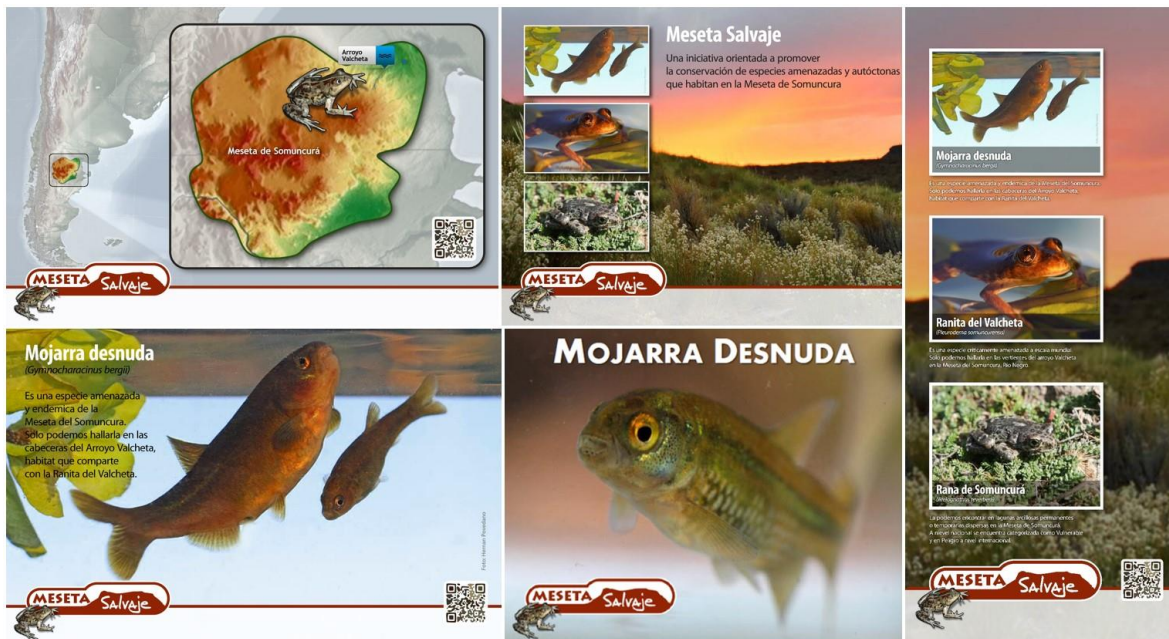


Fig. 4. Printed material about the conservation of the Nude-bream and its habitat



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We also are developing a project aimed to make a permanent exhibition at La Plata Museum, framed on the Conservation of this species. This outcome will be of key importance in a frame of awareness raising related with the conservation of the Nude-bream and its habitat, considering that La Plata Museum is one of the most recognized museums at Argentina (the inauguration of this exhibition is planned by July of 2014). We also developed a banner for it permanent exhibition at Valcheta Museum (Fig. 5).



Fig. 5. Banner exposed at Valcheta museum.

Within the educational activities, we have developed some workshops at the school of Chipauquil, in which we promoted the edition of a magazine entitled “*La Chipauquiltera*”, designed by the children of this institution (Fig. 6). We also performed a workshop with the participation of local park rangers at La Plata Museum (Fig. 7), and some education activities at the school of Valcheta (Fig. 8).

At a mediatic level we wrote two notes that were published at the *Río Negro* newspaper (one of the most important newspapers of Patagonia):

<http://www.rionegro.com.ar/diario/descubren-posible-amenaza-para-la-mojarra-desnuda-1458597-9545-nota.aspx> and <http://www.rionegro.com.ar/diario/meseta-salvaje-en-valcheta-1391613-9574-nota.aspx>.

At web level, together with other teams working at the area, we created a web page aimed to show the importance of the Somuncura plateau and its endangered species <https://www.facebook.com/EstepaSalvaje> and a video that was uploaded at YouTube:

<https://www.youtube.com/watch?v=qWy0x40gC2M&feature=youtu.be>



Fig. 6. “La Chipauquilera” magazine, performed by children of the school of Chipauquil, showing information related to the Conservation of the Nude-bream.



Fig. 7. Educational workshop performed at La Plata Museum.



Fig. 8. Educational workshops performed at the school of Chipauquil (up) and at the school of Valcheta (down).

TO WRITE A PRELIMINARY CONSERVATION ACTION PLAN FOR THIS SPECIES

We wrote the first preliminary **Conservation action plan for the Nude bream and its habitat** (see appendix). This conservation action plan (CAP) was based on a previous but unpublished document (developed in 1993) that discuss some management actions for the Valcheta stream. In the CAP, we discussed the

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previous and current discovered threats for Nude-bream and we propose a set of concrete actions to alleviate or to eradicate these threats. The CAP was presented at the Department of Protected Areas of Río Negro Province. During the next months, we will be in touch with personnel of the Department of Protected Areas in order to promote a deep discussion and the promotion of the activities showed in the CAP.

