

SHORT NOTE [NOTA CORTA]

EMPIRICAL MANAGEMENT OF AN ENDEMIC CICHLID FISH, *Cichlasoma cienagae* HUBBS, 1936

[MANEJO EMPÍRICO DE UNA MOJARRA ENDÉMICA, *Cichlasoma cienagae* HUBBS, 1936]

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SUMMARY

Cichlids are freshwater fish that comprise a very important part of the diet of rural communities in Yucatan Peninsula. Despite of this importance, there is a lack of information related with the management and exploitation of these fishes. Present paper describes the empirical management of an endemic cichlid fish, *Cichlasoma cienagae*, performed by a group of organized fishermen in Progreso, Yucatan. The entire process is an extensive aquaculture program, that involves several stages and is supported by an empirical background of knowledge related with fish biological traits and local aquatic ecosystems. The results obtained by Progreso fishermen could be the basis for develop an appropriated and sustainable plan of management and exploitation of native cichlids in Yucatan Peninsula.

**Keywords:** Native cichlids, small-scale fishery, traditional knowledge, Yucatan Peninsula

RESUMEN

Las mojaras de agua dulce son parte importante de la dieta de las comunidades rurales en la Península de Yucatán. A pesar de lo anterior, hay un vacío de información relacionada con el manejo y explotación de estos peces. En el presente trabajo se describe el manejo empírico de una mojarra endémica, *Cichlasoma cienagae*, que llevan a cabo pescadores organizados en Progreso, Yucatán. El proceso es un programa acuicultural extensivo, el cual comprende diversas etapas y está basado en el conocimiento empírico de las características biológicas de los peces y de los ambientes acuáticos locales. Los resultados obtenidos por los pescadores de Progreso pueden ser la base para desarrollar planes adecuados y sustentables para el manejo y explotación de las mojaras nativas en la península de Yucatán.

**Palabras clave:** Mojaras nativas, pesquerías artesanales, conocimiento tradicional, Península de Yucatán

INTRODUCTION

Cichlid fish, commonly known as freshwater mojaras, have been extensively studied in México and Central America, mainly due to their extraordinary diversity. Presently, information about basic biological traits such as ecophysiology and reproductive biology has been gathered for several species. On the other hand, studies related with management issues (v. gr. Tabasch and Gauadamuz, 2000) are scarce.

In southeastern Mexico, freshwater mojaras are important fish resources for rural communities. Due to this several studies have been carried out on these

species, but only few of these are linked with culture topics (v. gr. Hernández-López, 1987) or their suitability in aquaculture (Chavez-Lomelí *et al.* 1989; Martínez-Palacios and Ross, 1994).

In Yucatan Peninsula, freshwater mojaras support a small-scale fishery. However, studies related with fish management in many cases only cover specific topics such as culture in rustic ponds, or adoption of culture strategies originally developed for introduced species (Lazcano-Barrero and Vogt, 1992). By contrast, there are a lot of papers related with distinct aspects of biology and aquaculture of cichlid fish, in particular of *Cichlasoma urophthalmus* (Chávez-Sánchez, 1990;

Chávez-Sánchez et al. 1990; Martínez-Palacios et al. 1996; Faunce et al. 2002).

The objective of the present paper is two-fold: first, to describe the empirical management of *Cichlasoma cienagae* (Fig. 1), an endemic cichlid which belongs to the *C. urophthalmus* complex and inhabit in the wetlands and brackish environments near Progreso, Yucatan, Mexico (Kullander, 2003; Barrientos-Medina, 2005) and second, to point out some difficulties related with the management of freshwater mojarras in Yucatan Peninsula.



Figure 1. *Cichlasoma cienagae* (91 mm LP) from la Draga, Progreso, Yucatan (UADY 138). Photograph by Víctor Cobos.

### METHODS

Information about the empirical management of *C. cienagae* implemented by the SSS “El Corchito” Cooperative Society, a group of organized fishermen in Progreso, Yucatan, Mexico was collected on September 2001, through semistructured, open-ended interviews (Casley and Kumar, 1988; Huntington, 2000) mainly with prominent members, which were identified using the snow-ball sampling technique (Neis et al., 1999; Wilson and Allan, 2004).

During these interviews, we asked about the historical relationship of the fishermen with this cichlid fish, their traditional knowledge on its biological traits and the empirical management of this species. Additionally, the cooperative chair board members provided us some activity-reports, both private and public. The latter are written especially for the whole community of Progreso.

### RESULTS AND DISCUSSION

The interviews and activity-reports provided by “El Corchito” members were used to describe the empirical management carried over by fishermen. This

management is largely based on traditional knowledge acquired by decades of observations on cichlid behavior and it has been developed by the enthusiastic initiative of fishermen. The consumption of freshwater mojarras is traditional in coastal communities of Yucatan Peninsula. This could explain why fishermen’s relationship with *C. cienagae* is an ancient one: the species has been used as protein source in times of low captures of marine fish targets and during the “nortes” season, by previous generations of fishermen, who really appreciated the value of this cichlid in their diet. Based on its importance, some fishermen started a series of preliminary tests on the culture of this cichlid fish in 1985, under natural conditions. These previous assays were done without any technical assistance, based only in the fishermen’s field observations (Palomo, *com. pers.*).

Based on these experiences, members of “El Corchito” established an extensive aquaculture program for *C. cienagae*, structured in different stages (Table 1). By February 1998, with an empirical knowledge accumulated with years of observations, the cooperative deposited 178 juveniles, obtained in two nearby and natural hatcheries (*Cenote Pájaros* and adjacent channels) located in a wetland locally known as “El Corchito” (21° 17’ N, 89° 38’ W). These water bodies, of variable salinity (between 1 and 25 ppm) and almost constant temperature (ca. 28°C) on a spatial basis (Chumba-Segura, unpublished data), were used as nursery sites where fishes grow and feed naturally. The entire wetland, a fresh-brackish water system, comprises several water bodies, including some cenotes (Rey, Helechos, Pájaros and Venados among others), *aguadas* and channels that join up some of the main water bodies.

Table 1. Description of the empirical management of *C. cienagae*, endemic cichlid fish from Progreso, Yucatan.

STAGE	DESCRIPTION
1. Transfer	Small fishes (<40 mm SL), obtained in several parts of the wetland, are deposited in natural nurseries (cenotes).
2. Release	Young fishes (40-60 mm SL) are released in La Cienega.
3. Natural feeding and growth	Fishes feed and mature naturally at La Cienega.
4. Capture and consumption	Fishes are captured for self-consumption, only by hook and line, when reached over 200 mm SL.

In October 1998, another release was done by the fishermen: approximately 5,000 juvenile fishes (from 40 to 60 mm of total length) were incorporated to the main aquatic biotope, a brackish environment commonly known as *La Ciénega*. In this site, a lagoon system with ephemeral connections to the sea, from nearly marine to hyperhaline features (Zizumbo, 1989), fishes mature and complete their life cycle. After this release, two other similar events took place, in September 1999 and September 2000 (Fig. 2). According to their own annotations, fishermen estimate around one million as the number of young fishes that have been released along several decades of assays. Most of these releases are not well documented.

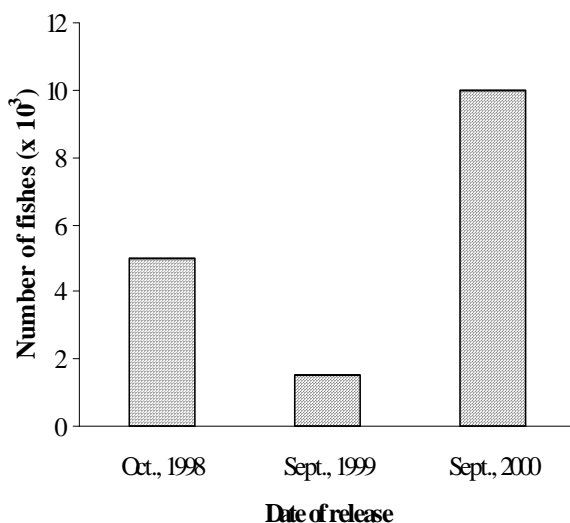


Figure 2. Number of young fishes released from October 1999 to September 2000, according to fishermen observations.

Through these several decades of assays, fishermen made observations on the biology of the species, as well as valuable recommendations upon the management of *C. cienagae*:

- 1) Reproduction takes place two times through the year in the nursery sites, which agrees with previous reports on reproductive traits: freshwater mojarra has a long reproductive season, from April to October (Martínez-Palacios and Ross, 1994). There is a winter break, mainly due to low temperatures produced by the cold winds locally known as *nortes*.
- 2) In the fishermen's judgment, individuals of *C. cienagae* could be harvested at 200 mm of total length, when fishes are considered of

acceptable size for consumption. The only fishing gear approved by them is hook and line; in contrast, throw nets and beach seine are strongly forbidden. Young fishes incidentally captured must be released immediately and nursery sites are restricted to fishing activities. Rowing is not allowed, due to the possible damage to the nests.

- 3) According to their observations, the fishermen think that the population of *C. cienagae* in La Ciénega has been regenerated, as the consequence of the restriction that only specimens over 200 mm of total length should be captured. In addition, they promote their utilization in a subsistence approach, that is, for local consumption.

The empirical management developed by Progreso fishermen, involving the application of the traditional knowledge of resources and ecosystems, does not impact only in the conservation of an endemic component of the local fish fauna. This anecdotic knowledge could also be invaluable as strategy for the improvement of management policies, a major goal in the case of similar data-less fisheries (Pauly, 1995; Kurien, 1998). In the fishermen's point of view, the experience was successful: with low expenses and efforts, they could obtain animal protein for their families and contribute in the conservation of natural nursery sites, such as *petenes* and springs. The property of this accumulated, empirical knowledge is collective, and its transmission and sharing is based in one principle: the well-being of fishermen and their families.

The next step is to develop a research plan with fishermen's contribution, using their knowledge and experience as background, for the biological assessment of the *C. cienagae* population in Progreso. This study could serve as technical support of some management ideas planned by the cooperative's members, which include the design of a sustainable exploitation project, in terms of ecotouristic and aquaculture activities. This kind of studies, exemplifying the interaction between scientists and resource users, will serve to promote the culture and consumption of native cichlids, over exotic species of mojarra (*tilapias*) of well-know ecological disadvantages (Contreras-Balderas and Escalante, 1984; Nirchio and Pérez, 2000).

Although this kind of use for *C. cienagae* would have some ecological and social benefits, there are some restrictions for the extrapolation of previous experiences in a broader context. The main difficulties include the problematic taxonomic identity of freshwater mojarra, inter-populations differences in reproductive biology (Faunce and Lorenz, 2000), low

biomass production and growth rates obtained with other mojarras in similar systems (Flores-Nava and Sánchez-Crespo, 1994) and the scarcity of knowledge on basic biological traits, such as the genetic structure of local populations (Policansky and Magnuson 1998).

With base on the success of the empirical management made by fishermen in Progreso, the culture of native freshwater mojarras could be an excellent alternative for the development and nourishment of coastal and rural communities. The topic was stated almost ten years ago, with excellent perspectives (Martínez Palacios and Ross, 1994). A better agreement, in terms of efforts and resources, between fishermen and government, together with fisheries managers and scientists, could lead to achieve this purpose. Experience in other regions of the world (*v. gr.* Amarashinge and de Silva, 1999) can demonstrates the feasibility of this type of interaction.

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