

The role of the Goodeid Working Group (GWG) in the captive maintenance of the Goodeid fishes



Ilyodon furcoides

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2014-15 North American GWG Chair

Goodeids were the most diverse and numerous freshwater fishes of central México, but now they are in trouble



Allotoca dugesii



Allodontichthys zonistius



Manantlán Stream, Jalisco



Lake Pátzcuaro, Michoacán



Amado Nervo Springs, Durango



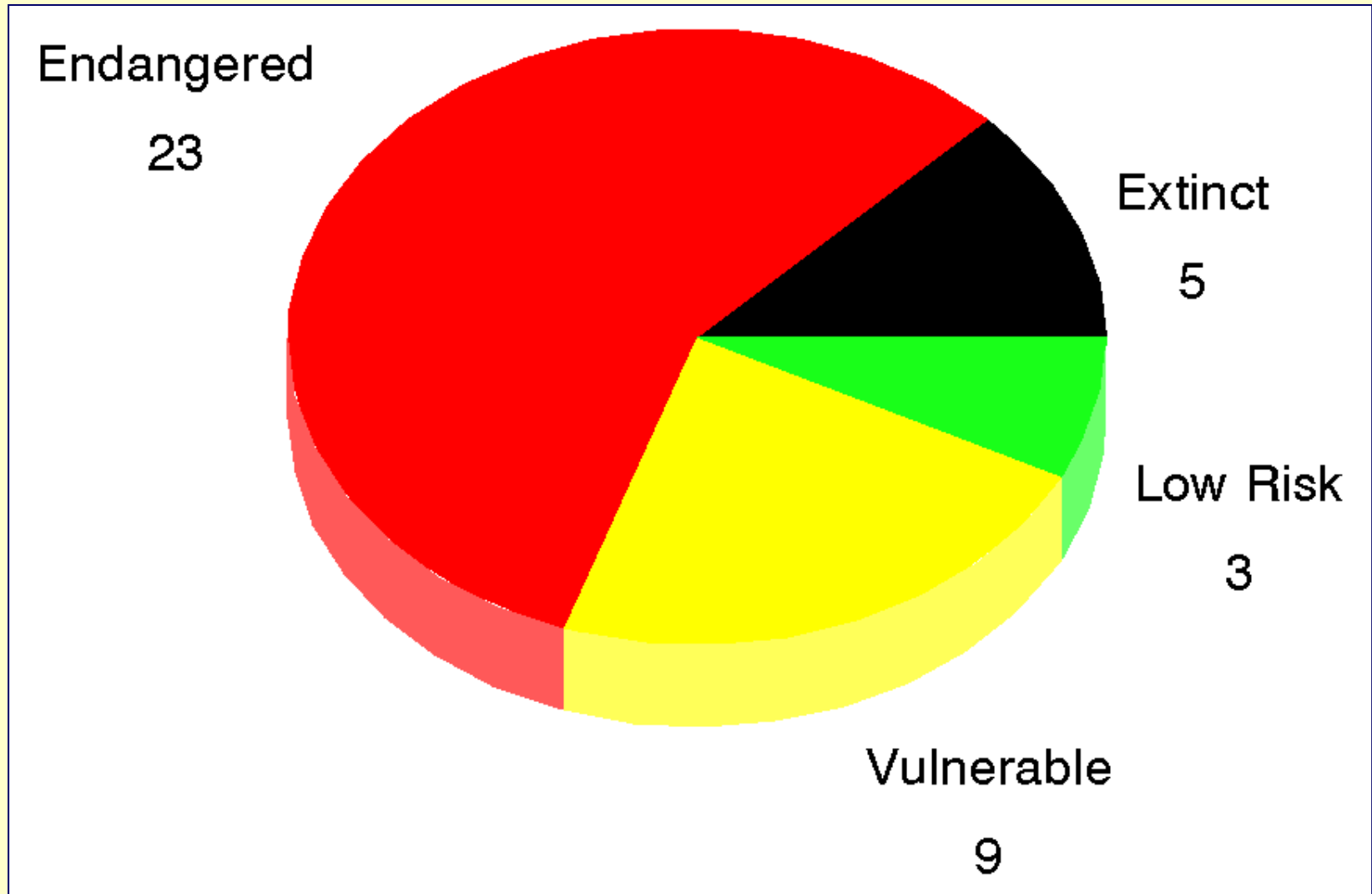
Xenophorus captivus



Skiffia lermæ

Current status of 40 Mexican Goodeid species

3 extinctions since 2001



The Goodeid crisis led to the formation of the Goodeid Working Group (GWG)

Screenshot of the Goodeid Working Group (GWG) website.

The browser address bar shows the URL: <http://www.goodeidworkinggroup.com/>. The browser tabs include "MyDNR Portal" and "goodeidworkinggroup.com".

The website header features the GWG logo and the text "Goodeid Working Group".

The left sidebar contains a navigation menu with the following links:

- HOME
- ABOUT US
- ARCHIVE
- FORUM
- LINKS
- GOODEIDS
- SPECIES-PROFILES
- DONATE

Below the navigation menu, there is a login section:

Username: *

Password: *

Below the login section, there are links for:

- Create new account
- Request new password

The main content area features a large image of a Goodeid fish. Below the image, the text reads:

Goodeids

The Goodeid Working Group is a voluntary and international Working Group. It has been established in 2009, 1st May in Stoholm/Denmark as a reaction on the critical situation of a lot of Goodeid species and populations in the wild and the unnoticed extinction of captive strains... [» more](#)

At the bottom of the page, there is a pagination indicator: 1 2 3.

Overall Conservation Goals of GWG

- Foster captive maintenance of rare Goodeids by hobbyists and zoos
- **Support conservation of Goodeids in México in captivity and the wild**
- Educate the public on Goodeid conservation matters



Chapalichthys encaustus

Captive Maintenance Goals

Preserve natural genetic, morphological, and ecological diversity within and among populations

1) Encompass within-population diversity and avoid genetic drift and in-breeding depression

2) Encompass among-population diversity and avoid out-breeding depression



Encompassing within-population genetic diversity

Genetic drift: Random shifts in the frequency of “alleles” (= variations of a particular gene) over time; most pronounced in small populations in which alleles can easily be completely lost.

In-breeding depression: Loss of fitness (and diversity) from mating of closely related individuals, caused by increased expression of harmful recessive alleles. Most pronounced in small populations.

What is a “small population”?

Conservation Biology: 50-100 pairs (!!)

What can a hobbyist do?

Keep larger numbers of fewer species
Make exchanges among breeders
Supplement from wild stocks if possible



Encompassing among-population genetic diversity

Out-breeding depression: Loss of fitness (and diversity) from mating of un-related individuals from isolated populations with different genetic characteristics (e.g., different co-adapted gene complexes).

What is an “isolated population with different genetic characteristics”?

Conservation Biology:
“Evolutionarily Significant Unit” (ESU)

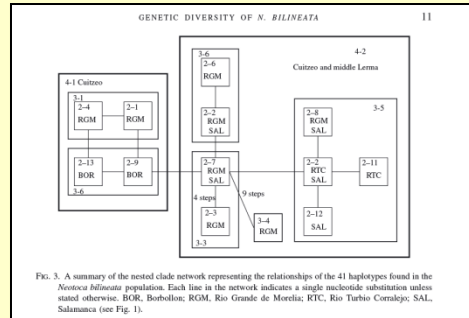
What can a hobbyist do?

Know the ESU of your fish
Avoid inter-breeding ESU's



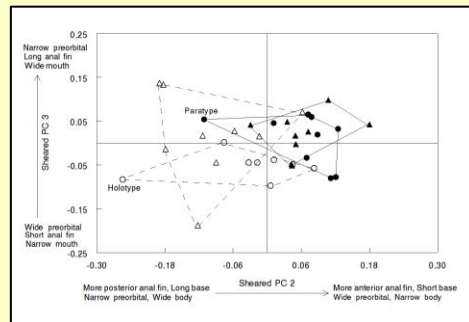
How do we define ESU's?

1) Molecular genetics



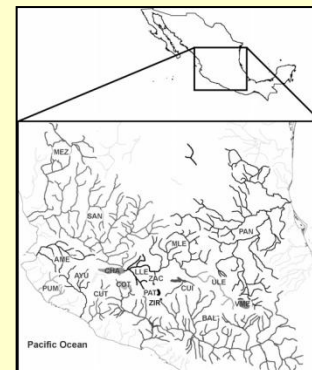
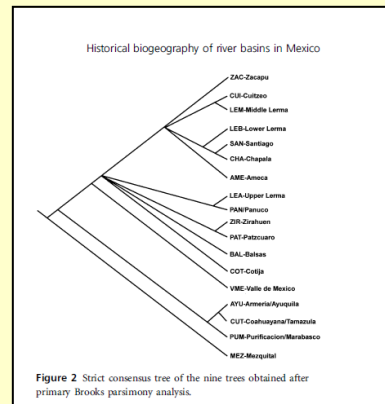
Ornelas García et al. 2012. Genetic diversity...*Neotoca bilineata*. J. Fish Biol. 79

2) Morphology



Lyons 1997 Morphological variation within *Xenotaenia resolanae*... Ichthyological Explorations Freshwaters 7:267-272

3) Zoogeography



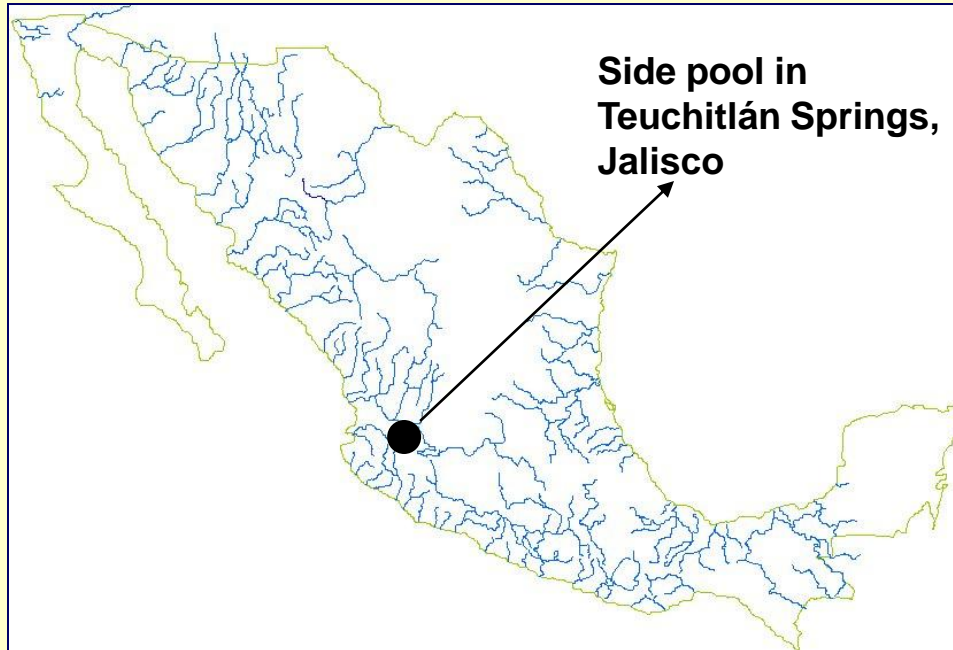
Domínguez Domínguez et al. 2006 Historical biogeography of some river basins in central Mexico as evidenced by their goodeine freshwater fishes... Journal of Biogeography 33:1437-1447

Many species have only one ESU

Often the existing wild populations are very small, already in-bred



Zoogoneticus tequila



Side pool in
Teuchitlán Springs,
Jalisco



Others highly differentiated – *Characodon*: 10 ESU's

Each group of springs with a unique population

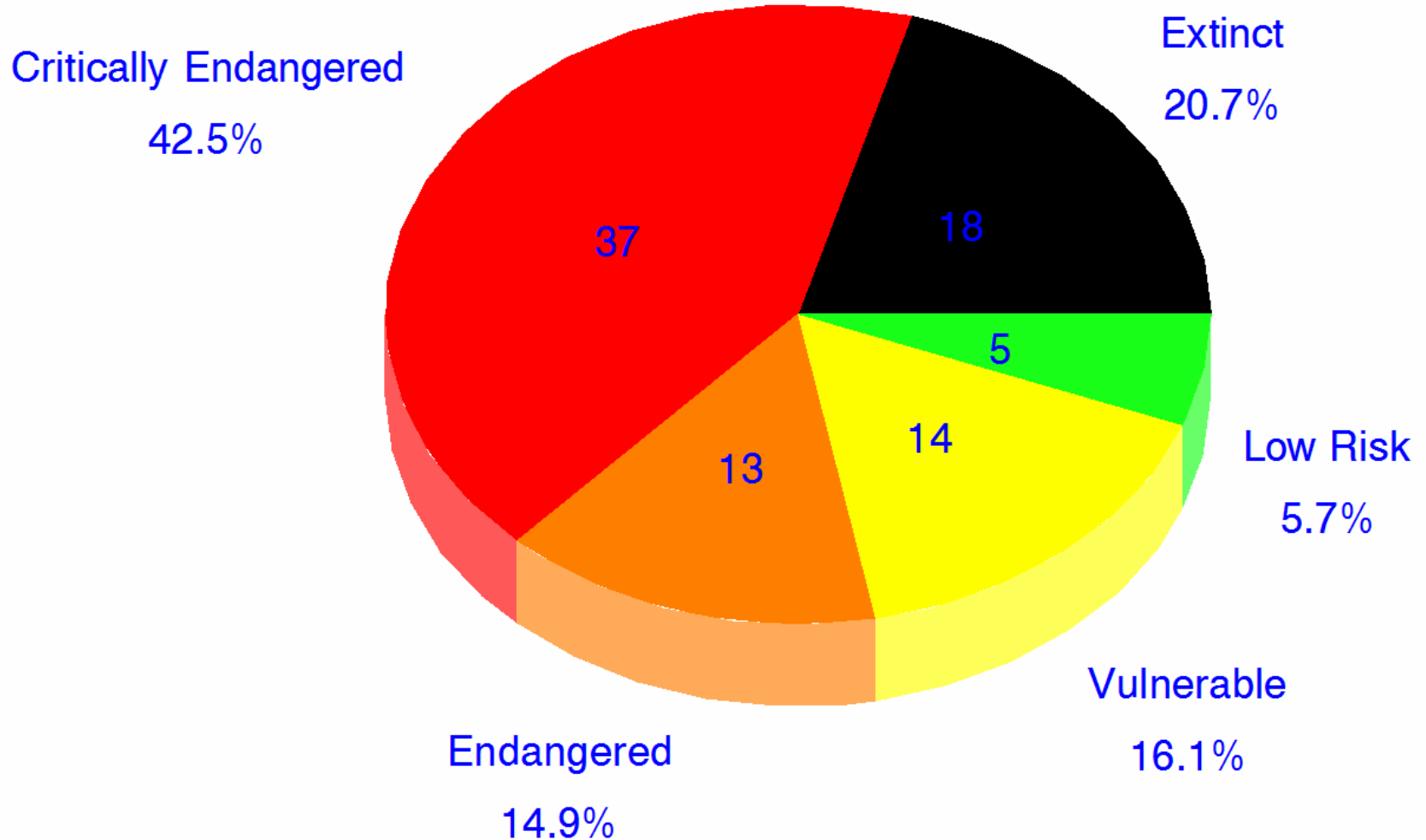


Isolated springs in Río Mezquital basin, Durango



[illegible]

Most of the 87 ESU's in serious trouble



Inventory of “viable” captive populations of ESU’s

Viable: at least 25 individuals, multiple generations, consistent successful reproduction



Five categories of captive holdings:

None

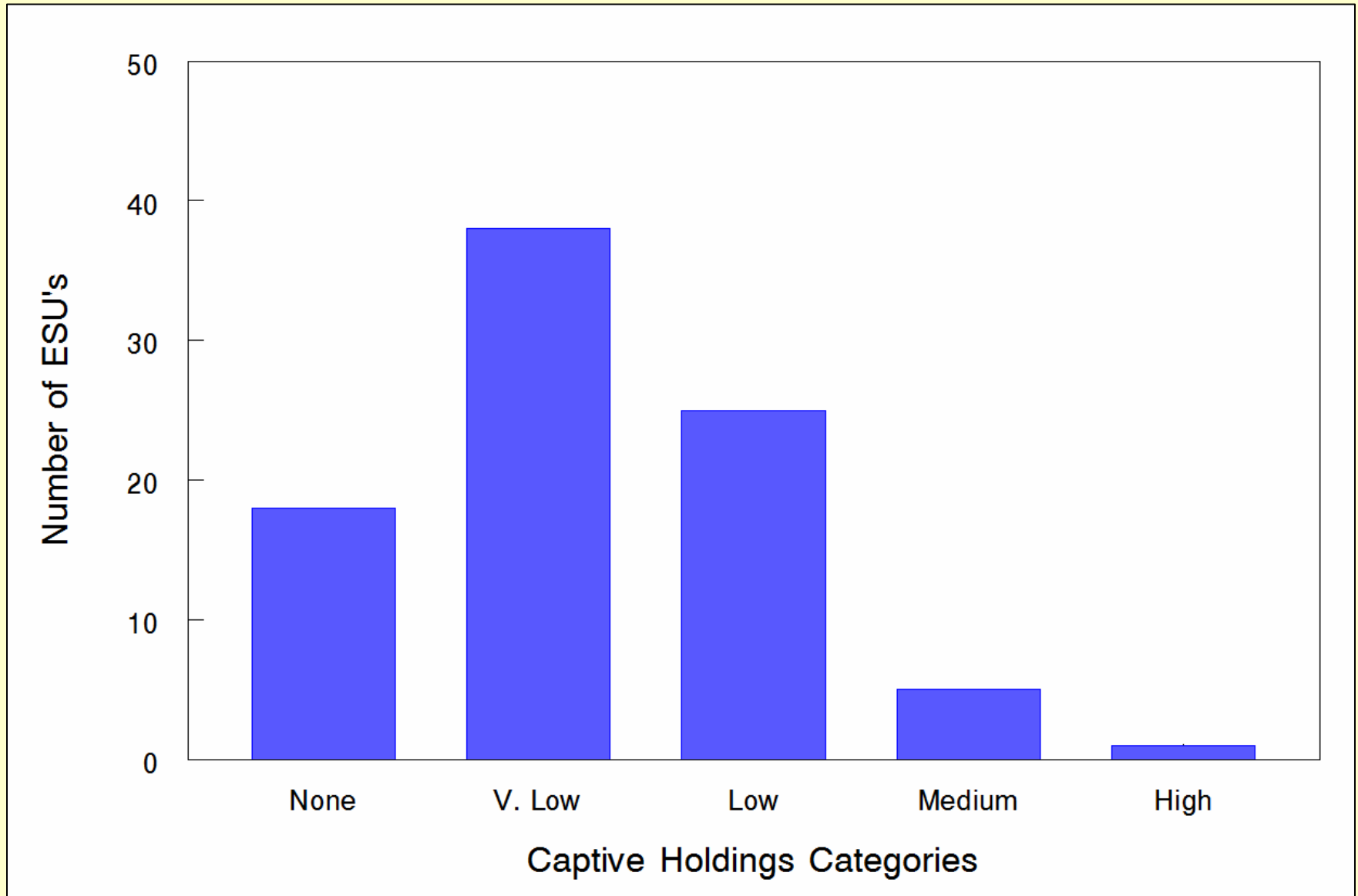
Very low: < 5 viable populations worldwide (inc. hobbyists)

Low: 5-10 populations

Medium: 11-25 populations

High: > 25 populations

Limited captive populations for most ESU's



Many ESU's not adequately represented in captivity

Worldwide Viable Captive Holdings

Status	None	Very Low	Low	Medium	High	Total
Extinct	10	6	1	1		18
Critically Endangered	4	24	7	1	1	37
Endangered	1	6	6			13
Vulnerable	3	2	7	2		14
Least Concern			4	1		5
Total	18	38	25	5	1	87

Most urgent needs for captive maintenance

Four critically endangered ESU's with no captive specimens



***Alloophorus robustus* – Balsas basin**

Low-V. Low for 3 other extant ESU's



***Ameca splendens* – Magdalena basin**

High for Teuchitlán ESU, Very Low for Sayula ESU



***Girardinichthys multiradiatus* – Lerma
Basin – Taxingu-Amulco Area**

No captive specimens for Balsas, Zempoala ESU's,
Very Low for Lerma Basin – Maravatio Area



***Zoogoneticus quitzeoensis* – Lerma basin**

Low for Morelia-Zacapu ESU

Proposed GWG Captive Maintenance Objectives:

For overall GWG:

- Establish & maintain multiple populations of as many ESU's as possible
- Document & track status of captive populations for each ESU



For individual GWG members:

- Keep large populations of a few ESU's (rather than small pops of many)
- For each ESU, mix in new fish from other hobbyists & wild as possible
- Let others know what you have and share fish and knowledge
- Keep different ESU's separate; don't mix!!!

Questions?

Lake Pátzcuaro, Michoacán

