Lake Chapala's fisheries: coping and adapting to water level fluctuations

Dr. Carmen Pedroza

UNAM

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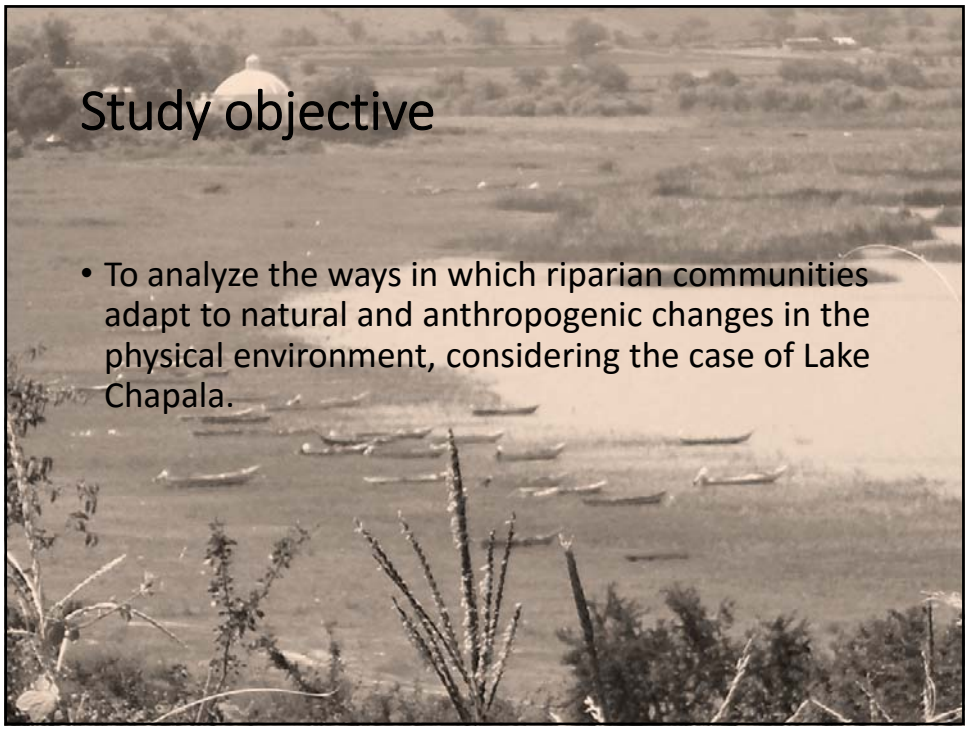
Outline of the presentation

- Objective
- Methodological approach
- Lake Chapala's characteristics
- Problems
- Adapting and coping
- Final remarks



Study objective

- To analyze the ways in which riparian communities adapt to natural and anthropogenic changes in the physical environment, considering the case of Lake Chapala.

Methodological approach

1) Fieldwork was carried out during two periods 2011 and 2012 in Lake Chapala, Mexico.

This included interviews with fishers and women in the processing activity in two communities.

***2)* Catch dynamics**

- Catch temporal variations were analyzed considering the **catch index** proposed by Arreguín-Sánchez (2006). This expresses catch rate change as:

$$IC_a = ln(C_a / C_{\bar{a}})$$

- IC_a is the catch index
- C_a is the catch level in year a
- $C_{\bar{a}}$ is the average catch during the studied period
- If the index value (*IC*) is zero, this means that there is no change in one year in relation to the average.

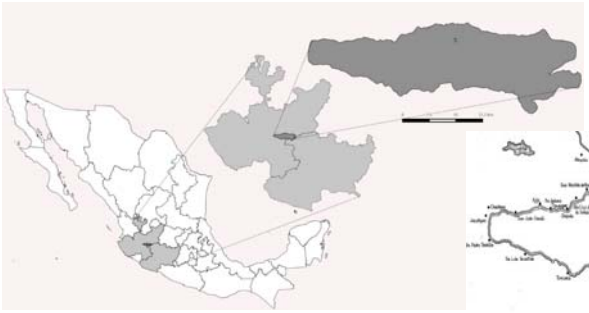
3) To analyze catch relations, through the **catch index**, considering water level variations **a Pearson correlation** analysis was used the significance level was of a = 0.05.

Lake Chapala main characteristics

- Lake Chapala is a shallow tropical lake, the **largest** in Mexico and the 3rd largest in Latin America.
- As **a shallow tropical lake** is prone to periodic lake level fluctuations.
- Actual maximum mean depth is 7 m
- Currently its main fisheries are tilapia and carpe. Tilapia was introduced in the lake in the 1979 and carpe at the end of the 19th century.
- Carpe was introduce in 1898 to develop aquaculture
- Tilapia was introduced in 1964 as a **food security** and economic development strategy for rural communities

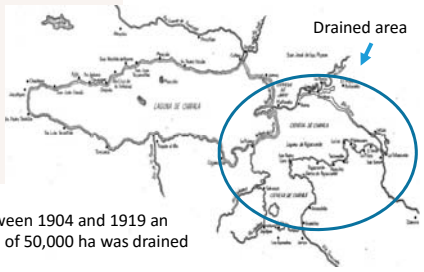
Location and area

Current area



Current Area 114,659 h

Original area



Between 1904 and 1919 an area of 50,000 ha was drained

Main decline factors

Natural factors

- Natural water level fluctuations
- El Niño
- Rain fall has decreased
- Evaporation = 10mm per day during hot season

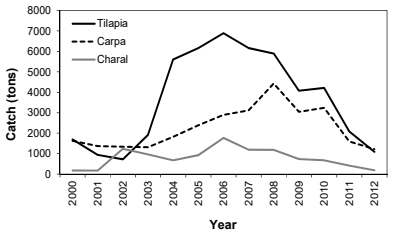
Human factors

- Water extraction for hydropower generation and irrigation.
- **Rio Lerma** inflow has substantially decreased due to the 554 dams constructed along the Chapala basin.
- Infrastructure
- Chapala **sources 60%** of the water demand for the city of Guadalajara.
- Pollution

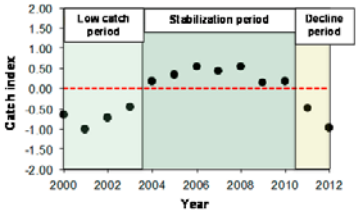
Lake Chapala is listed as one of the most threatened natural resources in the western hemisphere by the United Nations Environmental Program.

Impact on fisheries

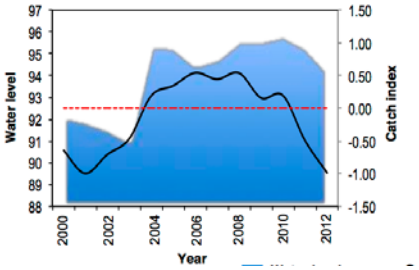
Catch Levels



Catch index



Water levels and catch index



	General	Tilapia	Carpe	Charal
Lake Chapala	0.6850	0.7361	0.7047	0.2509

When the water level was low, the index presented the highest negative values. When the water level increased the catch index also increased.

Adaptive responses

Lake conditions		Fishing activity	
Problems	Strategy	**Problems**	Strategy
Water levels	-Migration -Following the water (Fishing camps) -To fish in deeper areas -Farming the lake undercover land	**IUU fishing**	-Increase fish volume to compensate low prices - Reduction on mesh size - New fishing techniques (*mangueadora)* -Reduce costs
Pollution	-To wash the fish -To wash nets using chlorine	**Introduced species (low prices)**	-Fileting (Value addition) -Local sales
Sewage discharges	- NA		

Adapting strategies

- Adaptation of fishing gears and mesh size

Water level changes in the lake: fishing and farming

Searching for the water

Women in the labor market as a coping strategy to climate change

- Women's work is crucial for fishing communities because when there is not fish in the lake they complement or provide the household income. Value addition.

Final remarks

- The government has historically given priority in their water management policies to livestock and agriculture, recognizing fishing as incompatible with these activities.
- Some adaptive strategies make more damages to the fishery.
- The example of the fishing activity on Lake Chapala demonstrates how water mismanagement impacts negatively on productive activities and the well-being of rural communities.
- Lack of **water and pollution** affects fish volume and quality, and also affects local restaurants because it stop tourist from visiting the area.
- There are local communities **highly dependent** on fishing in terms of food security and cash.

- Pedroza-Gutiérrez, C., & López-Rocha, J. A. (2016). “Key constraints and problems affecting the inland fishery value chain in central Mexico”. *Lake and Reservoir Management*, *32*(1), 27-40.

- Pedroza-Gutiérrez, C., & Chavolla Mc, Ewen (2016?), “Conviviendo con la escasez. Cultura y adaptabilidad pesquera en el Lago de Chapala”. Accepted for publication: *Revista Perfiles*.

Acknowledgements

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Thank you for your attention