

A qualitative risk assessment of *hookah* diving as fishing technology in small-scale fisheries.

Oswaldo Huchim

Juan Carlos Seijo

School of Natural Resources
Universidad Marista de Merida

NAAFE Forum
La Paz, México
March 22-24, 2017



Hookah Diving

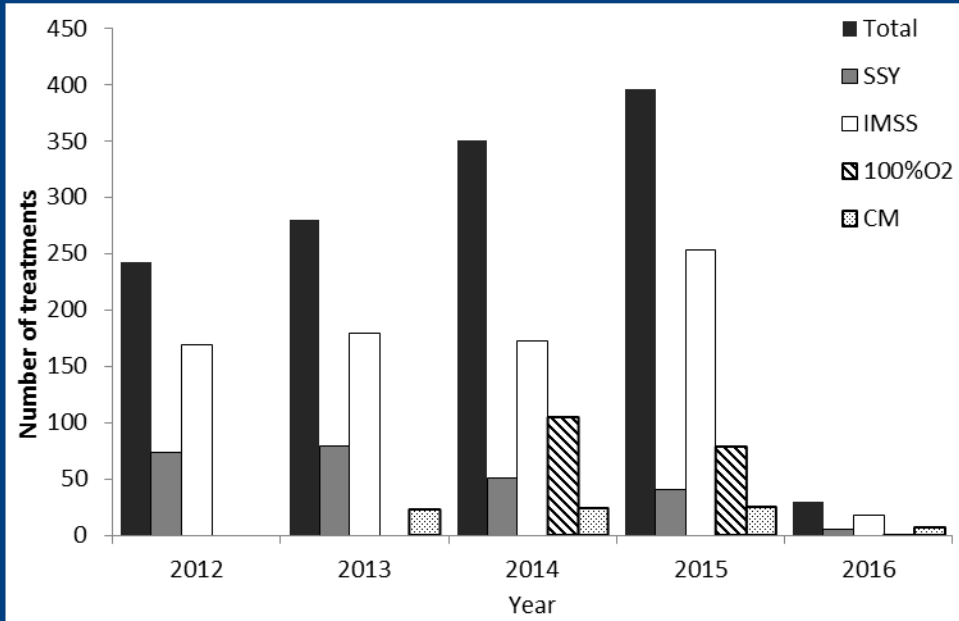
- Fishing method and gear used worldwide in small-scale fisheries to harvest many of the marine high value species.



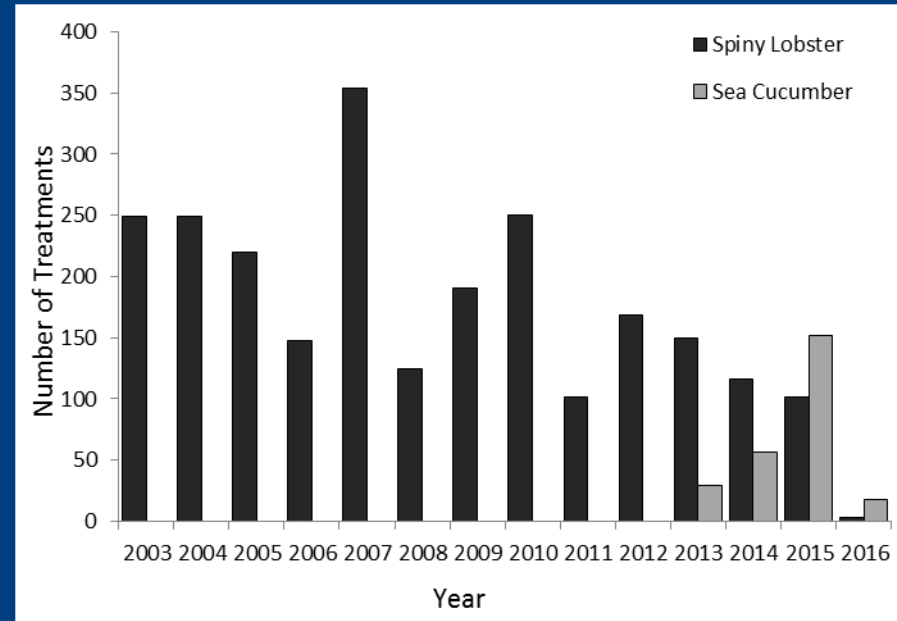
- In the Yucatan diving fisheries:
 - a) 1,300 fishers targeting Caribbean spiny lobster (*Panulirus argus*).
 - b) 1,701 fishers targeting sea cucumber (*Isostichopus badionotus*).

Problem Context

- Decompression sickness (DCS) and carbon monoxide poisoning (COP) are diseases related to *hookah* diving.



HBO₂ therapies given to Yucatan fishers in four Hyperbaric Programs.



HBO₂ therapies given to fishers from the northeastern coast of Yucatan.

The qualitative risk assessment

- Risk assessments in fisheries and aquaculture are mainly expressed on quantitative terms and/or numerical models.
- The qualitative risk analysis is a good option for data limited situations¹.

¹Smith et al. 2007; Fletcher 2005, Astle et al. 2006, Boa 2012

Literature/Experts



Fishers' perception

Methods

Score	Consequence level
0	• Negligible
1	• Minor
2	• Moderate
3	• Severe
4	• Major
5	• Catastrophic

Survey Topics
Fishers wellbeing
Non-fatal injuries
Chronic Diseases as risk factors
Carbon monoxide poisoning
Decompression sickness

Consequence levels of potential risks to fishers health using hookah diving as fishing method.

Methods

Likelihood level	Score	Description
<i>Negligible</i>	0	Impossible to occur
<i>Remote</i>	1	Never heard, but not impossible
<i>Rare</i>	2	May occur in exceptional circumstances
<i>Unlikely</i>	3	Uncommon but has been known to occur in other places
<i>Possible</i>	4	Evidence suggest that is possible to occur locally
<i>Occasional</i>	5	May occur sometimes
<i>Likely</i>	6	It is expected to occur

Qualitative likelihood of occurrence of the undesired events affecting fishers health (Modified from Fletcher 2005).

Risk Category	Impact Value	Likely management response
Negligible	0	No direct management is needed
Low	1-6	No specific management actions needed
Moderate	7-12	Increase awareness for a safety diving practice
High	13-20	Diving certification and risk protocols should be enforced
Extreme	20-30	Forbidding diving as fishing method should be considered

Risk Categories and outcomes (Modified from Fletcher 2005).

Study site



QRA:

- 105 fishers
- 5 hyperbaric physicians

Current impact of diving:

- Logbooks of HBO₂ therapies



Results: *Fishers Risk Perception Analysis*

Consequences of diving as fishing method to the fishermen wellbeing	Impact Value	Consequence Level	Qualitative Likelihood	Risk Category
Do you think diving as fishing method has impacts on your wellbeing?	8.5	Moderate	Possible	Moderate
Are there possibilities of get injured because of hookah diving?	9.9	Severe	Possible	Moderate
Are Chronic Degenerative Disease (CDD) related to the diving activity?	3.8	Severe	Unlikely	Low
Is there a risk of DCS because of diving as fishing method in artisanal fisheries?	12.5	Major	Possible	High
Diving with HDS could cause carbon monoxide poisoning (COP)?	8.2	Minor	Unlikely	Moderate

Results: Physicians Risk Perception Analysis

Consequences of diving as fishing method to the fishermen wellbeing	Impact Value	Consequence Level	Qualitative Likelihood	Risk Category
Do you think diving as fishing method has impacts on your wellbeing?	22.5	Severe	Likely	Extreme
Are there possibilities of get injured because of hookah diving?	19.6	Severe	Likely	High
Are Chronic Degenerative Disease (CDD) related to the diving activity?	21.0	Severe	Occasional	Extreme
Is there a risk of DCS because of diving as fishing method in artisanal fisheries?	21.8	Major	Occasional	Extreme
Diving with HDS could cause carbon monoxide poisoning (COP)?	17.8	Major	Possible	High

Results: Fishers Risk Perception Analysis

- Risk analysis by decompression sickness (DCS) events

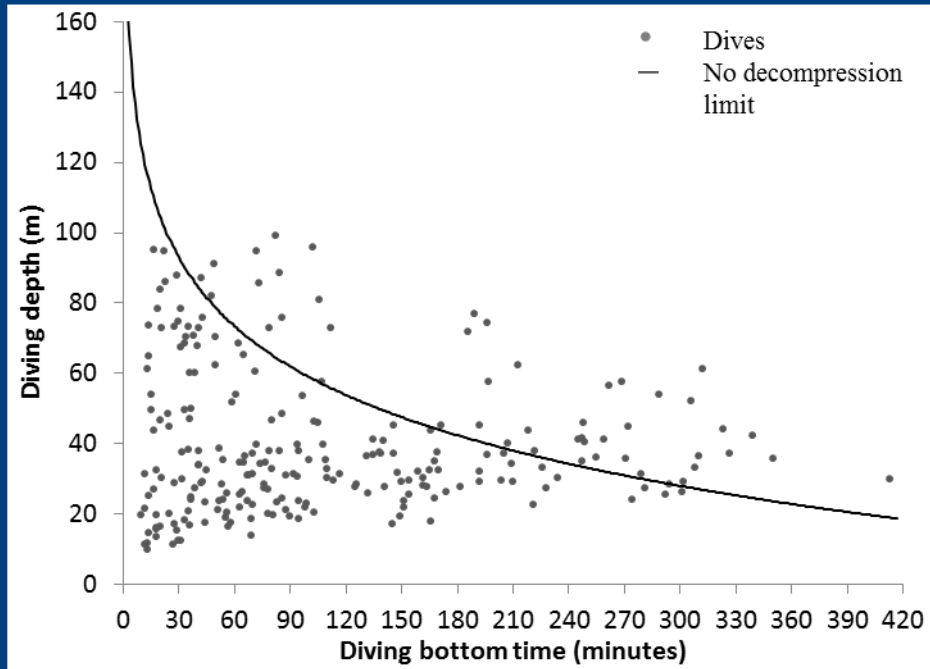
Consequences of diving as fishing method to the fishermen wellbeing	DCS events		
	0	1-3	>4
Is there a risk of DCS because of diving as fishing method in small-scale fisheries?	10.4	11.1	16.8
Diving with HDS could cause carbon monoxide poisoning (COP)?	7.4	7.4	9.1

Results: Actual hookah diving risk

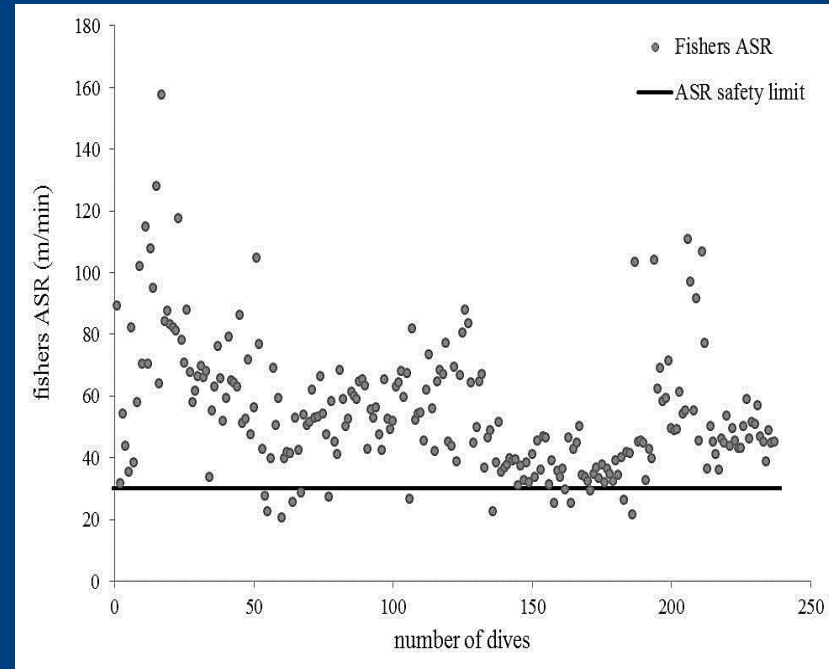
- In the 2014-2015 fishing season:
 - a) 116 HBO₂T were provided to 111 *P. argus* fishers
 - b) 157 HBO₂T for 98 *I. badionotus* fishers.
- Only 27% did not have a previous decompression event.
- The range of DCS events per fisher was from 1 to 20 events.

Age group	<i>P. Argus</i> fishers (n=111)	<i>I. Badionotus</i> fishers (n=98)
20-29	36	19
30-39	37	35
40-49	31	30
50-59	7	14

Results: Actual hookah diving risk



Dives performed by fishers compared to the US Navy no decompression limit recommendation (continuum line).



Ascent speed rate (ASR) of dives performed by fishers compared to ASR limit recommendation in the Safety Diving Manual.

Results: Chronic diseases among fishers

- Nutritional status:
 - 28% were overweight
 - 61.9% were obese
 - 85% had abdominal obesity
- Blood Pressure:
 - 21% had high BP levels
 - Only 36% already new about high BP
- Glucose levels.
 - 19% had high glucose levels
 - Only 31% already new about high glucose level.



Economic implications



Price/*P. argus* kg: USD 28.00

Fees	USD
Cooperative Administration Expenses	0.60
Union Administration Expenses	0.25
Taxes	0.10
Retirement Fund	0.05
Hyperbaric Therapy Fees	1.40
Holiday Savings	1.25
Diver Insurance	0.15
Buying Ice	0.10
Freight for catch selling	0.15
Catch Selection and Storage	0.45
Total amount subtracted per kg	4.50



Concluding remarks

- Low risk perception is influenced by the lack of awareness about the diving risk factors.
- Fishers were concern about what they know, but not about what they ignore.
- Actual health impact is an important issue among diving fishers.
- The risk analysis method allow us for:
 - a) Identifying priority decisions regarding fishing technologies in small-scale fisheries.
 - b) Building capacities for health prevention.
 - c) Increasing community awareness of possible consequences of current fishing technology.

Acknowledgement

- To the Rio Lagartos fishers for participated in this study.
- To the Fishing Cooperatives and Fishers Union for the facilities and logistics to undertake the study.
- To the MD students from the Medicine School of the Marist University of Mérida for the medical screening undertaken to the fishers.

A photograph of a small boat on the water at sunset. The sun is low on the horizon, creating a bright glow and reflecting on the water. The boat has a canopy and two people are visible inside. The text "Thank you" is overlaid on the image.

Thank you



Universidad Marista
MÉRIDA