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Economic Assessment of Small Scale Longline Fisheries in Oaxaca, Mexico. A cross section data approach

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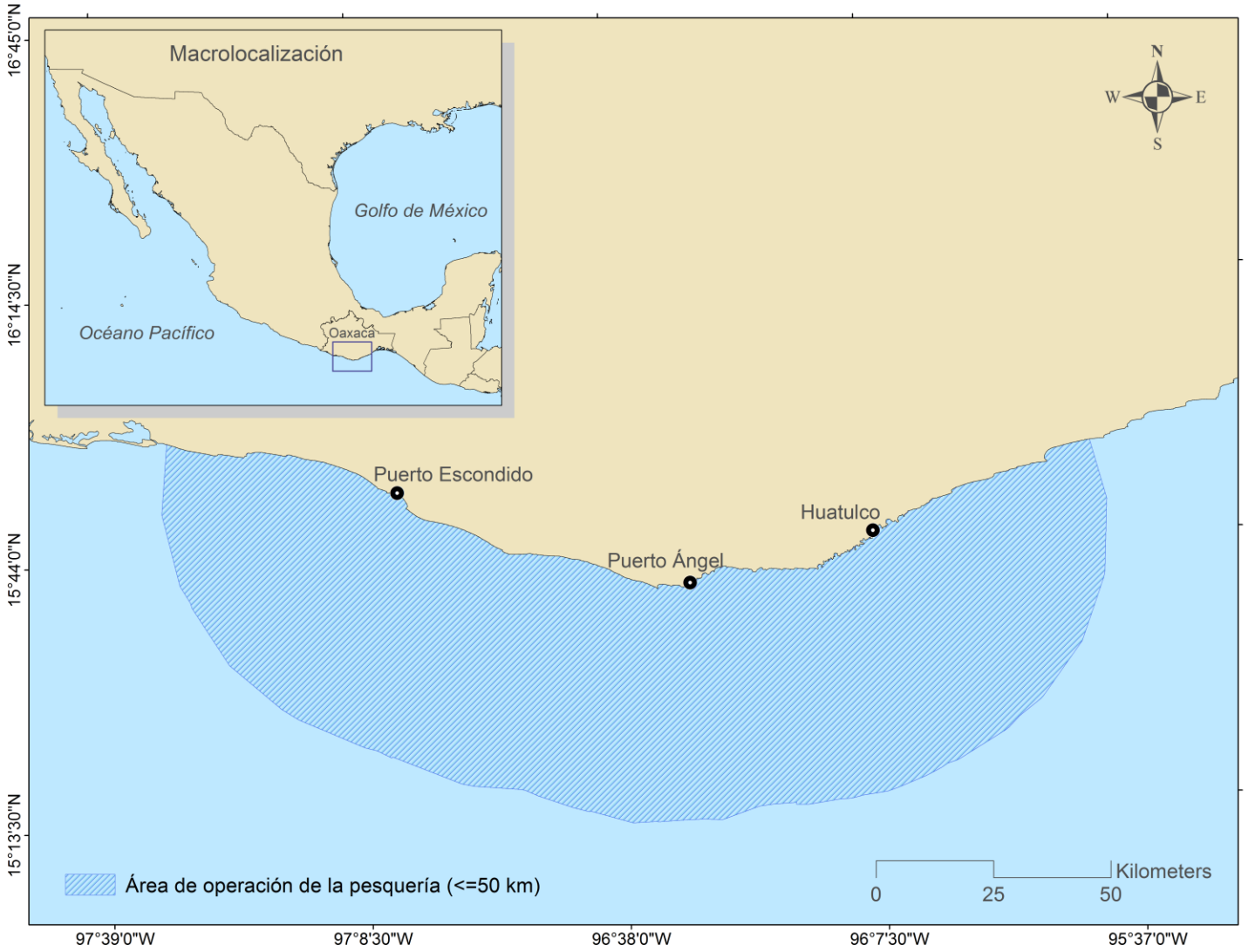
Background

- EPO regional Sea Turtle Bycatch Program since 2004
- From Mexico to Peru
- Change J hooks to circle hooks
- To avoid sea turtle entagle and reduce mortality
- In Mexico sea turtle are in risk to bycatch by small scale longline fisheries (SSLF)
- This fisheries implemented use of circle hooks

SSLF operation area



Materials and methods

- Economic viability of SSF proposed by Schuhbauber and Sumaila (2016)
- Individual net benefit approach (NBI)
  - Total revenues, total cost & subsidies
- Using GLM
- Including different atributes
  - Quantitative or qualitative data
  - As part of NBI
- Random proportional distribuited sampling trough May to September 2015

Materials and methods

- Survey to collect ex-vessel information:
  - Catch of the day (weight and number of caught fish),
  - Fishing operation: coast distance, hooks, longline length, bait used
  - Economics: ex-vessel price, fix and variable cost, fuel and oil expenses and subsidies
- Historical landings:
  - Local data from 2004 to 2014
  - Catch species (target, bait and bycatch)

- Harvest (catches)

$$H = f(\mathrm{cd}, \mathrm{km}, \mathrm{d}, \mathrm{t}, \ldots, \mathbf{Z})$$

- Total income

$$TI = f(TC2, w, num, p, \ldots, \mathbf{X})$$

- Net benefits

$$NB2 = f(TI, TC)$$

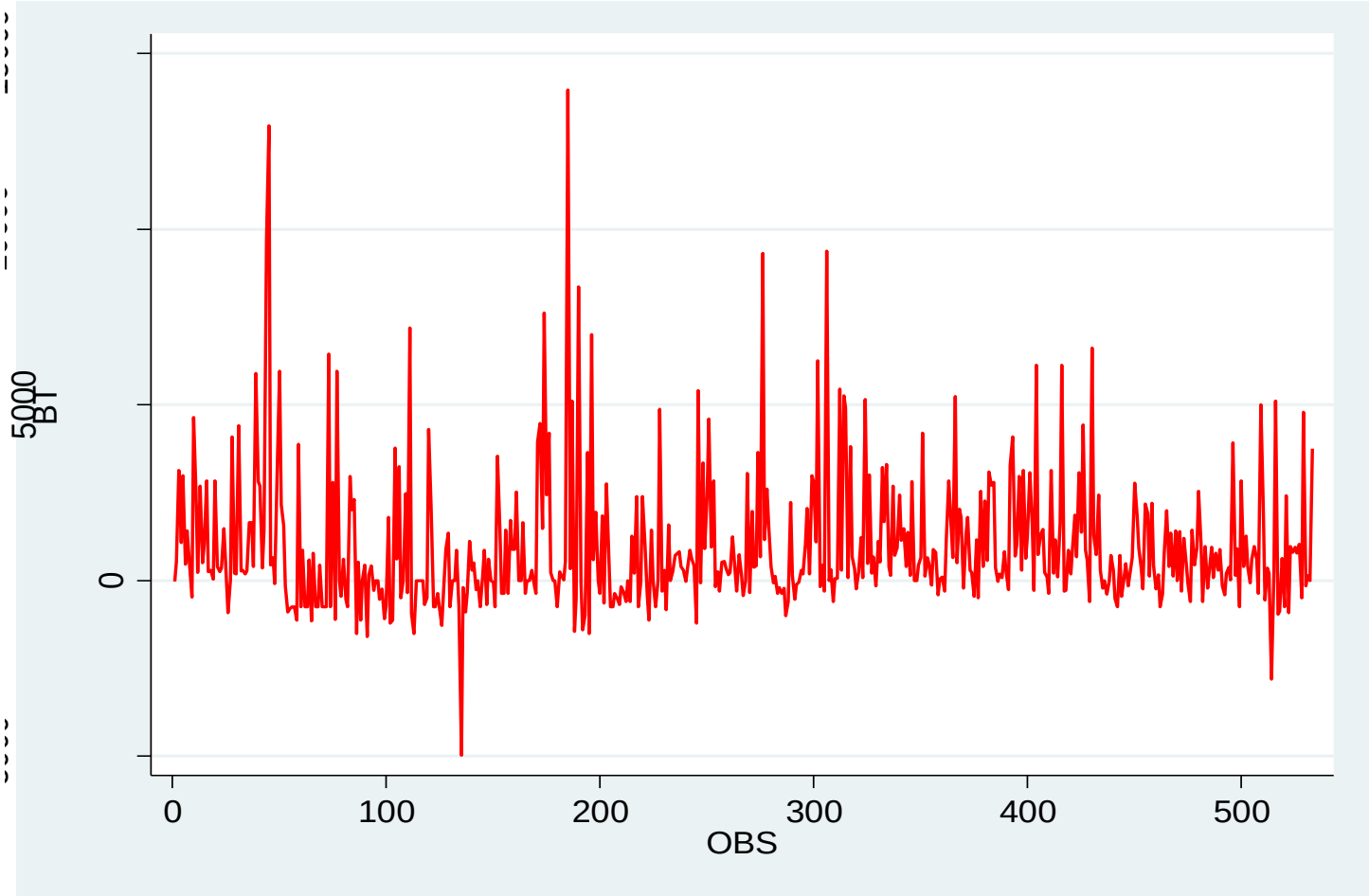
- Cobb-Douglas function

$$Y = f(aL^{\alpha}K^{\beta})$$

Results

Variable	N	Min	Max	Mean	Std. Dev.
Skipjack tuna income	531	0.00	1,650.00	17.514	104.220
Total income	531	0.00	17,000.00	1,470.557	2,069.914
Total cost	531	15.22	5,509.75	526.693	555.882
Bait cost	531	110.70	300.00	178.999	51.340
Total cost 2	531	215.21	5,620.45	657.867	617.875
Net benefit	531	-4,969.75	13,959.00	943.864	1,944.720
Net benefit 2	531	-5,080.45	13,659.00	812.689	1,941.007

Source: Fishermen survey



- 71% boats not incur in losses
  - Among 62 y 65% of boats obtain positive benefits
  - 6% of boats have nul benefits
- 29% of boats incur in losses

Variate	E1-R1		E2-NR		C1-R1		C2-R2	
	R1		NR		R1		R2	
	Dependent: log(BT2)		Dependent: log(IT)		Dependent: log(H)		Dependent: log(H)	
	n=167		n=233		n=355		n=166	
	Coef.	Prob>Z	Coef.	Prob>Z	Coef.	Prob>Z	Coef.	Prob>Z
log(TI)	1.8616	0.0000	----	----	----	----	----	----
log(TC2)	-0.8496	0.0000	----	----	----	----	----	----
log(p)	----	----	1.1129	0.0000	----	----	----	----
H	----	----	0.0144	0.0000	----	----	----	----
1/cd	----	----	-0.7752	0.0036	-1.2706	0.0000	-1.0037	0.0096
b	----	----	0.1321	0.0337	----	----	----	----
log(w)	----	----	----	----	0.6992	0.0000	----	----
log(hr)	----	----	----	----	0.2681	0.0022	----	----
arrival	----	----	----	----	0.1764	0.0638	----	----
log(num)	----	----	----	----	----	----	0.7754	0.0000
sqr(hr)	----	----	----	----	----	----	0.2337	0.0827
c	-1.7237	0.0000	2.2230	0.0053	1.5079	0.0000	2.7369	0.0000
R^2	0.8017		0.8984		0.3985		0.5632	
R^2 Ajustado	0.7968		0.8975		0.3916		0.5551	
F-Stat	163.7317		1016.3480		57.9689		69.6231	
Prob F-Stat	0.0000		0.0000		0.0000		0.0000	
LL	-107.6584		-135.5169		-444.0887		-170.8042	
AIC	1.349203		1.1890		2.5301		2.1061	
BIC	1.442556		1.2334		2.5846		2.1811	

Source: Self elaboration

H: Total harvest in kilos, TI: Total income (MX$), TB2: Total benefit (includes TC2), w: weight in kilos, cd: coast distance (miles), hr: time longline left in water (hours), b: used bait on fish day; p: Price (MX$), num: number of harvested individuals, TC2: Total cost by boat (MX$, include fuel, oil and bait cost), arrival: 0: if boat arrive before noon; 1: other, log: natural logarithm base 10, F: F-Stat, LL: Log-likelihood, AIC: Akaike information criterion, BIC: Bayesian information criterion

Variates	Cobb-Douglas	
	Dependient: lh	
	n=338	
	Coef.	Pr>z
K	0.175	0.0440
L	0.242	0.0040
c	2.067	0.0000
LL	-475.3584	
AIC	2.8644	
BIC	-1,586.6090	
Source: Self elaboration		

$$K = \log(hooks \cdot cd)$$

$$L = \log\left(\frac{hr \cdot cd}{f}\right)$$

Conclusions

- No sea turtle is hooked or entangled any more
- Since adption of circle hooks
- Bycatch species to sport fishing
- Bait species enhance harvest
- Increase trends on captures in both bait and reserve species
- Fishermen ask for studies about bait species

Conclusions

- E1-R1 and C2-R2
  - Use bait species enhance the statistical significance
  - Highlighting relevance of these species
- Cobb-Douglas model
  - Inelastic elasticities for K and L
  - Decreasing returns to scales
- Coast distance in harvest models is a determining factor

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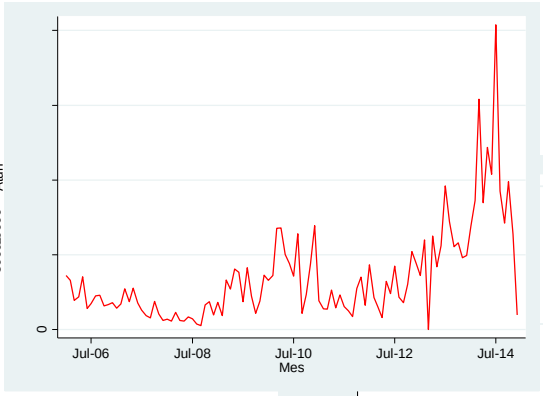
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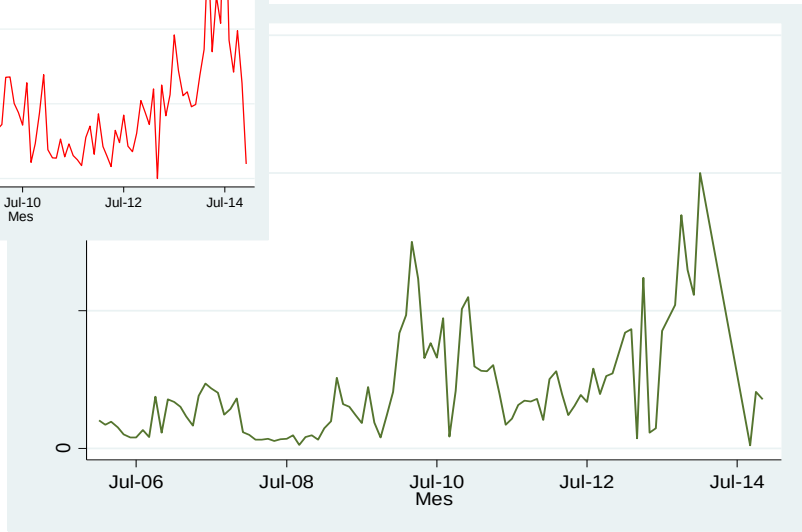
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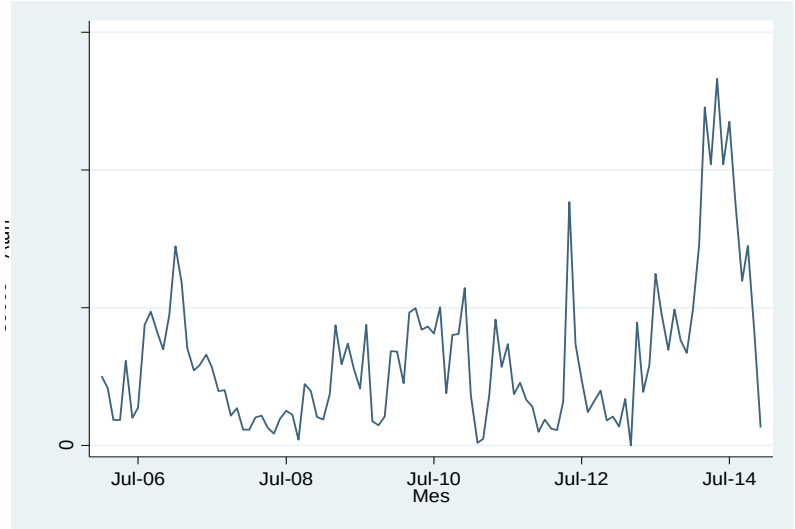
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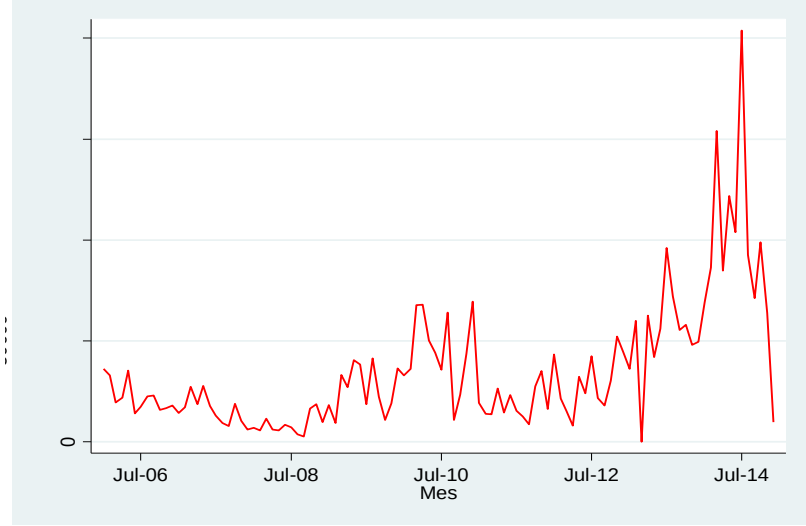
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