

## The value of improving biodiversity in a rocky habitat ecosystem by removing ALDFG

*Stefania Tonin*

*Department of Design and Planning in Complex Environments  
University IUAV - Venice*

Marine pollution from **ghost nets/gear** is a worldwide problem causing negative impacts to marine life and habitats, accounting for about **one-tenth** of all marine litter, translating into hundreds of thousands of tonnes annually

Dumping of fishing nets at sea is recognized as a global problem since 2009 (UNEP/FAO) but there still remain **inadequate or limited policies** to address their mitigation.

### Biological problems:

**640,000 tons** of fishing gear spread across the oceans every year

**135 species** endangered

**100.000** marine mammals and

**1.000.000** marine birds entangled or suffocated every year

### Economic damages:

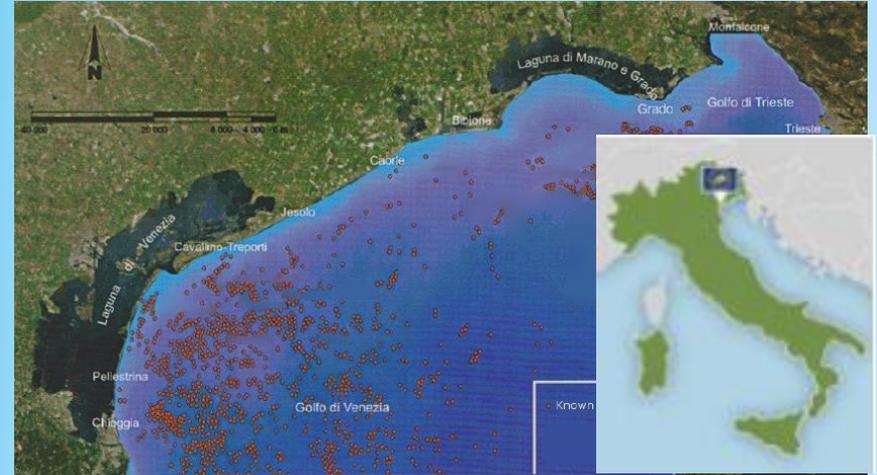
**10% target species** lost by commercial fisheries in USA

**5.6 M \$** lost in Australia

**2.9 M £** spent by local authorities in Denmark, Sweden, UK, Norway to clean and repair the damages due to ghost nets

In the northern Adriatic sea there are over **3000 rocky habitats** (called *tegnùe*) rich in biodiversity

Information on **economic impact** and **negative effects** of ghost nets on **biodiversity** are scarce, particularly in the (northern) Adriatic



## GHOST: main objectives

Assess the impact of ALDFG on biodiversity and promote concrete measures of restoration of high biodiversity areas

Estimate the economic value of biodiversity improvement resulting from ALDFG removal/reduction

Produce an effective strategy for ALDFG management in coastal areas (i.e. prevention, mitigation, and recycling)



2

**DEPOSIT**

MARINE WASTE  
IS DEPOSITED IN  
CONTAINERS AT  
THE PORTS

[www.upcyclingtheoceans.com](http://www.upcyclingtheoceans.com)  
by ECOALF Foundation

'prevention is better than cure'

- Do people know about marine biodiversity?
- Do people care about marine biodiversity improvement? And how much would people be willing to pay for that?
- What are the main determinants of people's WTP?

- Contingent valuation method:
  - Stated preference method—it relies on people stating what they would do under hypothetical circumstances, rather than on observing people's actual behaviors.
  - Based on survey
  - On-line questionnaire administered to a stratified sample of population in Italy (computer- assisted web interviews - CAWI)

# The Model

Respondent' indirect utility function

$$V(P, M, Q, S)$$

Where P= price; M=income; S=socio-economic characteristics  
Q=quality of the environment

Respondent will answer YES if the utility she/he will derive from improving the marine habitat ( $Q^1$ ) and paying the price P, is higher than not having improved coralligenous biodiversity ( $Q^0$ ) and paying the price P=0

$$\Pr(YES) = \Pr[V(M - P, Q^1, S) + \varepsilon_1 \geq V(M - P, Q^0, S) + \varepsilon_0]$$

Where  $\varepsilon$  is the unobservable component of utility

Assuming the random variable  $\varepsilon$  follows a logistic probability distribution, it can be written:

$$\Pr(YES) = \frac{1}{1 + e^{-\Delta}}$$

Where  $-\Delta$  is:

$$V(M - WTP, Q^1, S) > V(M - P, Q^0, S)$$

## The WTP estimation

Using logistic regression technique, the mean maximum WTP for conservation and improvement of marine biodiversity in coralligenous habitat can be calculated by:

$$\text{Mean max WTP} = \frac{1}{\beta_1} \left[ \ln(1 + \exp^{\alpha + \beta_2 Q + \sum \beta_i S_i}) \right]$$

## The empirical model

$$\begin{aligned} WTP = & \alpha_0 + \beta_1 bid + \beta_2 income + \beta_3 knowseabio + \beta_4 knowbio + \beta_5 heardbio \\ & + \beta_6 collegephd + \beta_7 kfishindam + \varepsilon_i \end{aligned}$$

# Questionnaire: structure

- Warm up questions (frequency to the beach, motivations, activities and perception of the quality of marine areas)
- Knowledge of biodiversity and marine biodiversity (how to improve it, because it is important, as a way to adopt, perception of quality, etc.)
- Marine protected areas (knowledge, personal experience, effects and impacts, willingness to pay, etc.).

- Biodiversity of coralligenous /tegnùe (description, knowledge, perception of benefits, etc)
- The threats to coralligenous habitat in the Adriatic sea (description, perception of the main human negative impacts, etc.)
- How to protect and improve coralligenous habitat

## •CV scenario and WTP questions

- 3 different scenarios valuation: removal and restoring of biodiversity
- Socio-demographics questions, attitudes and environmentally friendly behaviors

# The survey: the marine biodiversity of North Adriatic sea



**La biodiversità marina dell'Alto Adriatico: Qual è la tua opinione?**

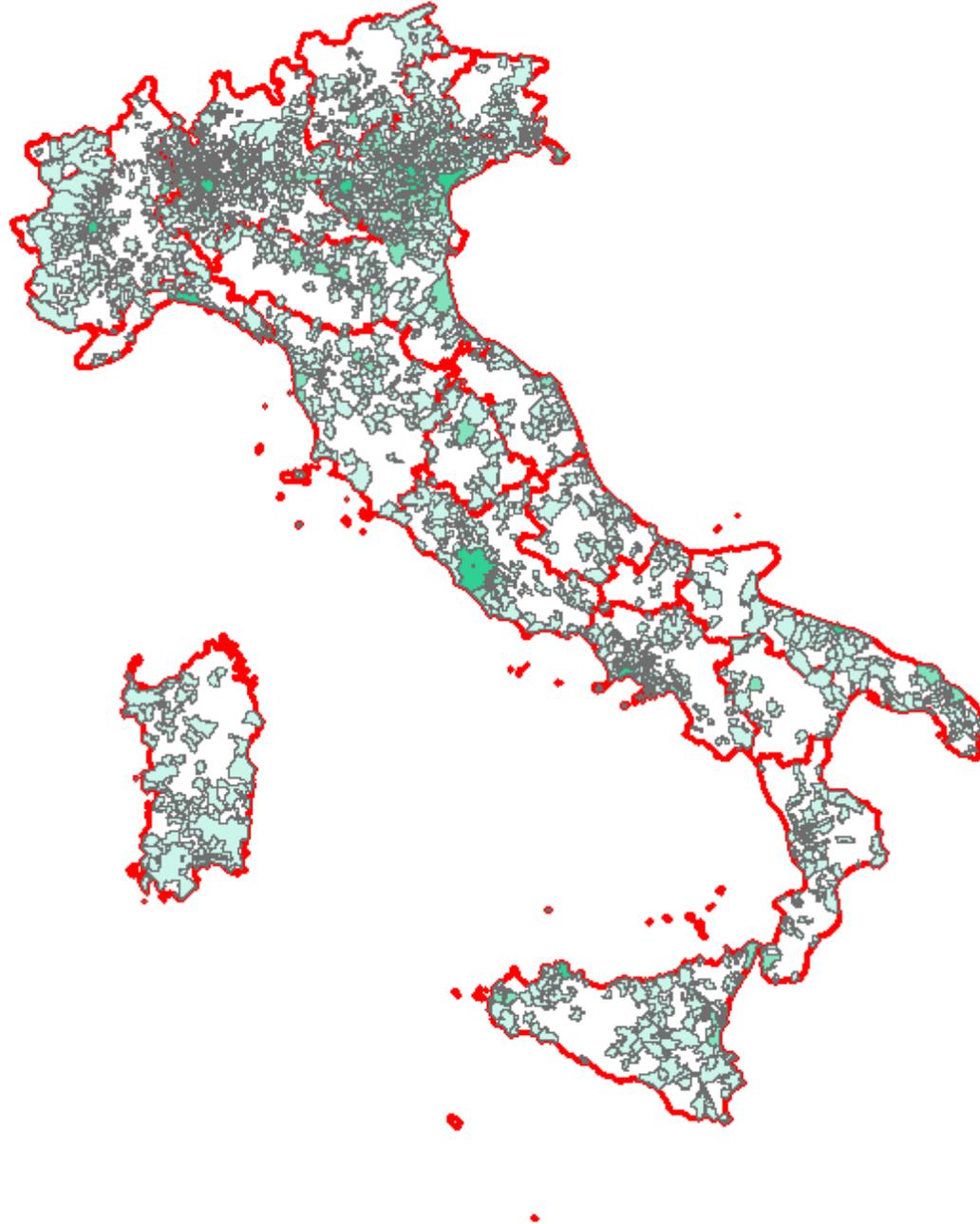
Questa indagine è condotta dal Dipartimento di progettazione e pianificazione in ambienti complessi dell'Università Iuav di Venezia per fini di ricerca.  
In questo questionario ci occupiamo di biodiversità marina e di come sia possibile conservare e migliorare la qualità della biodiversità in alcune aree marine di pregio, note come formazioni coralligene.

**Tu fai parte di un campione rappresentativo della popolazione italiana e la tua partecipazione a questo studio è molto importante.**

Le informazioni raccolte tramite i questionari saranno trattate in maniera anonima ed in conformità alla Legge 31/12/1996, n. 675 riguardante la 'Tutela delle persone e di altri soggetti rispetto al trattamento dei dati personali.'

Avanti

# The sample of respondents



## Descriptive statistics (N=4000)

<b>Variable</b>	<b>Description</b>	<b>Mean</b>	<b>Stand. Devn.</b>
Male	Dummy equal to 1 if the respondent is a male	0.52	0.50
Age		40.39	13.53
High school diploma	Respondent has high school diploma	0.51	0.50
Collegedegree	Respondent has college degree or post-graduate education	0.23	0.42
Household size	Number of household members	3.14	1.17
Children5	Respondent has children of ages $\leq 15$	0.15	0.42
Household income (€/year)	After-tax household income	27,432	16,843

## Respondents' knowledge of marine biodiversity, coralligenous habitat, etc. (N=4000)

<b>Variable</b>	<b>Description</b>	<b>Percent of the sample</b>
Knowmarbio	Have heard before of marine biodiversity and know what it means	60
Heardmarbio	Have heard before of marine biodiversity but not know what it means	31
knowcorbio	Have heard before about biodiversity of coralligenous habitat	28
kfishingdam	Know that indiscriminate fishing may be dangerous for biodiversity in coralligenous habitat	65

# Evaluation scenario 1: removal of fishing net

## 8.1 Un'azione concreta per proteggere e migliorare gli habitat coralligeni

### Primo intervento del progetto europeo:

Nel corso di un'immersione in un'area coralligena del Nord Adriatico, i subacquei rilevano la presenza di una rete abbandonata che avvolge una formazione coralligena creando un danno generale per l'ambiente marino e per le specie animali e vegetali presenti.

I subacquei segnalano la presenza della rete al Numero Verde della Fondazione. La Fondazione assicura che la rimozione di questa rete su un'area coralligena di circa 20 mq (che corrisponde alla superficie di una camera da letto standard) può essere effettuata in sicurezza dai sub specializzati.

Una volta rimossa la rete, gli studi scientifici dimostrano è possibile ottenere un miglioramento e un ripristino della biodiversità di circa il 20% dopo un anno dall'intervento e, se il danno non si ripete grazie all'adozione del regolamento, un miglioramento continuo negli anni a seguire fino al ripristino completo della biodiversità.

La foto qui sotto mostra la rete che deve essere rimossa.



Fonte: Laguna Project 2015

# Evaluation scenario 2: Removal of static fishing gear (lobster pot, rake, anchors, fish trap, etc)



# Evaluation scenario 3: Removal of fishing related litter (cordage, mussel socks and lures)





## A concrete action to protect and improve coralligenous habitat

The intervention above described has a cost that is determined by on-spot investigation costs, removal and disposal costs.

The result of this intervention will improve the biodiversity by 20% in a year.

*"Would you be willing to pay €X in a one-time payment, as a liberal grant, to the Foundation for the restoration project above described if biodiversity quality will improve by 20% and knowing that the money will be used exclusively for the Northern Adriatic coralligenous?"*

- Yes
- No

**Payment Vector**

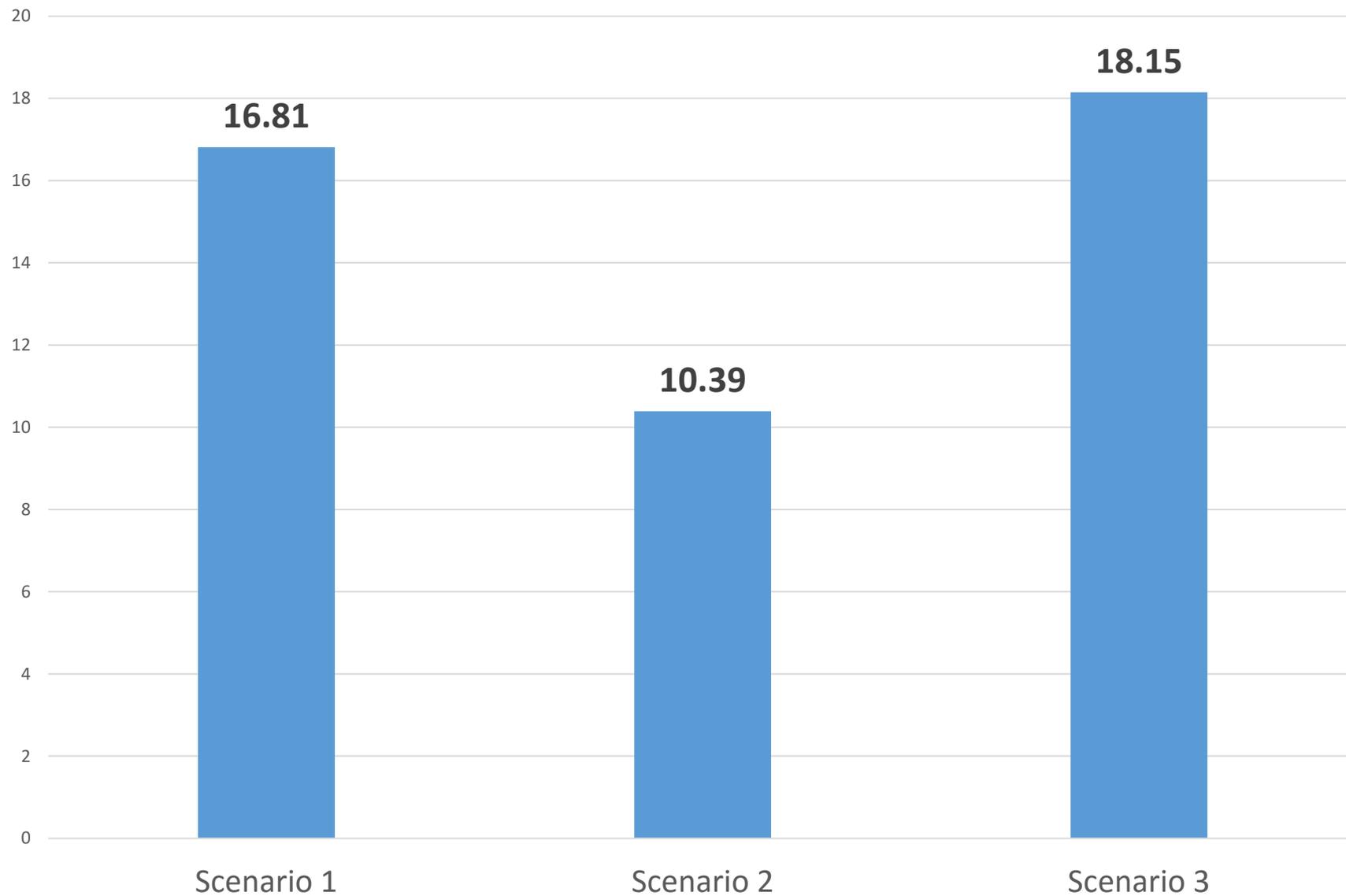
2€	5€	10€	15€	20€	30€	40€	50€	70€	100€
----	----	-----	-----	-----	-----	-----	-----	-----	------

# Results: models with no covariates – logit models

Variable	Model 1: Scenario 1 (p-value )	Model 2: scenario 2 (p-value )	Model 3: scenario 3 (p-value )
bid	-0.025398 (-9.35)	-0.0198021 (-7.76 )	-0.0221705 (-8.63)
Constant	0.4268796	0.205744	0.4023065
N of obs	1000	1001	1000
LR chi2(1)	107.95 (0.000)	69.77 (0.000)	88.08 (0.000)
Log likelihood	-622.52	-636.98	-637.51
<b>MEAN WTP</b>	<b>€16.81 (10.20- 22.18)</b>	<b>€10.39 (0.05 - 17.59)</b>	<b>€ 18.15 (10.68-24.21)</b>



# Respondent's WTP



## Results: full sample and model with covariates – logit model

Variable	Model: no covariates (p-value )	Model 2 (p-value )
Bid	-0.022392 (14.88)	-0.0253547 (15.87)
Constant	0.3436458	-1.159462 (-6.64)
Income		0.0000161 (6.57)
Knowseabio		0.6391872 (3.90)
Knowbio		0.724932 (7.60)
Heardbio		0.3735764 (2.25)
Collegephd		0.1537894 (1.65)
Kfishingdam		0.4853558 (5.36)
N of obs	3000	3001
LR chi2(1)	263.36	512.94
Log likelihood	-1899.06	-1774.27
<b>MEAN WTP</b>	<b>€15.35</b>	<b>€16,17</b>

# Main conclusions

- People care about marine biodiversity and they are willing to pay for improving it
- WTP varies with the scenarios provided to respondents
- Direct knowledge of marine biodiversity of the coralligenous habitats implies higher WTP
- Inform policy makers about preferences for biodiversity conservation in terms of different removal options

## Thank you for your attention



Web site: [www.life-ghost.eu](http://www.life-ghost.eu)

Facebook: [www.facebook.com/progettoghost](http://www.facebook.com/progettoghost)

Youtube: [www.youtube.com/progettoghost](http://www.youtube.com/progettoghost)

E-mail: [info@life-ghost.eu](mailto:info@life-ghost.eu)