Predation on shellfish farms along eastern Adriatic coast – recent experiences

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SLOBODNA DALMACIJA

PAKLENA BEŠTIJA – *A MONSTRUM ANIMAL*

14.11.2016. | 11:14

'Monstrum od ribe' osvaja Jadran: Nakotila se kao štakor, to je čudovište koje ne možeš zaustaviti

Deset godina bez rješenja

Stonski školjkari već desetak godina traže pomoć u saniranju šteta koje komarča, orada, ovrata, podlanica radi njihovim nasadima. Domaći je zovu paklenom beštijom, proždrljivom ribetinom koja se bezobzirno hrani na njihovim trudima - nasadima dagnji i skupocjenih kamenica…….

– Izaziva ogromne štete, i svake je godine ima sve više. Odahnemo tek zakratko kada ode u dublja mora na mrijest. Ali kada se vrati, izgladnjela, mršava, tada za nas počinje pakao – kaže stonski školjkar Boris Franušić.

80 tona u dvije noći

Samo ovaj tjedan kraj Plomina u dvije noći neki su istarski ribari uhvatili osam vagona, odnosno 80 tona komarče. I da bi je prodali – jer što bi drugo s toliko ribe, pa makar ona bila i oborita, visoko cijenjena – pod pritiskom nakupaca spuštali su joj cijenu s uobičajenih 25 kuna na 15, ponegdje i po osam kuna za kilogram.

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Damages on mussel farms potentially caused by fish predation—Self service on the ropes?

Tanja Šegvić-Bubić[a], Leon Grubišić[a], Nikola Karaman[b], Vjekoslav Tičina[a], Krstina Mišlov Jelavić[b], Ivan Katavić[a]

Show more

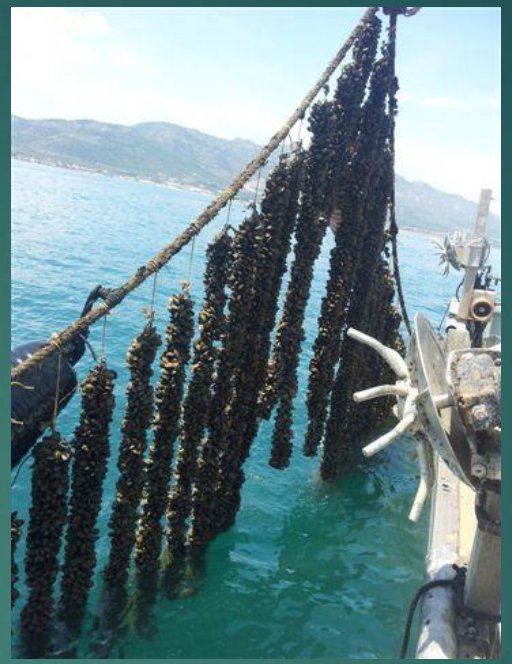
Composition and quantity of dominant fish species at cage-farm

Feeding habits of wild seabream sampled around cage farm

An estimate of black mussels lost by predation (%)

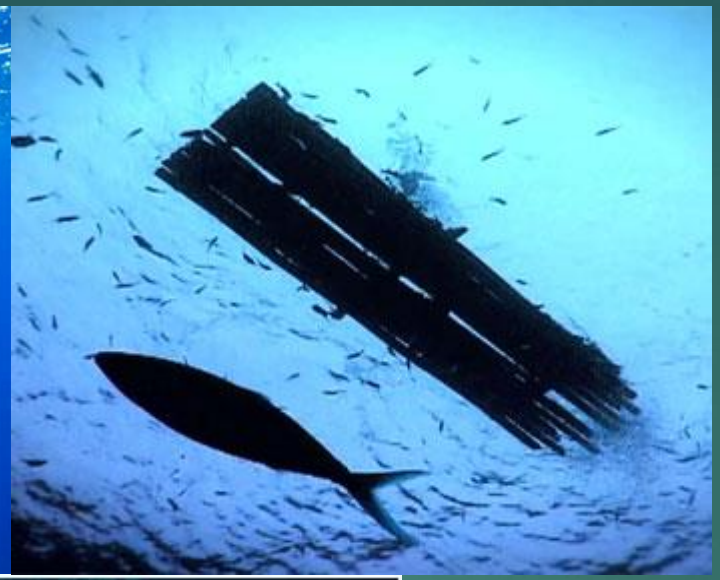
Predation intensity related to depth & time

Daily work



Problems !?

Fish and shellfish installation and FAD efects - traditional means fisheries of pelagic fish species

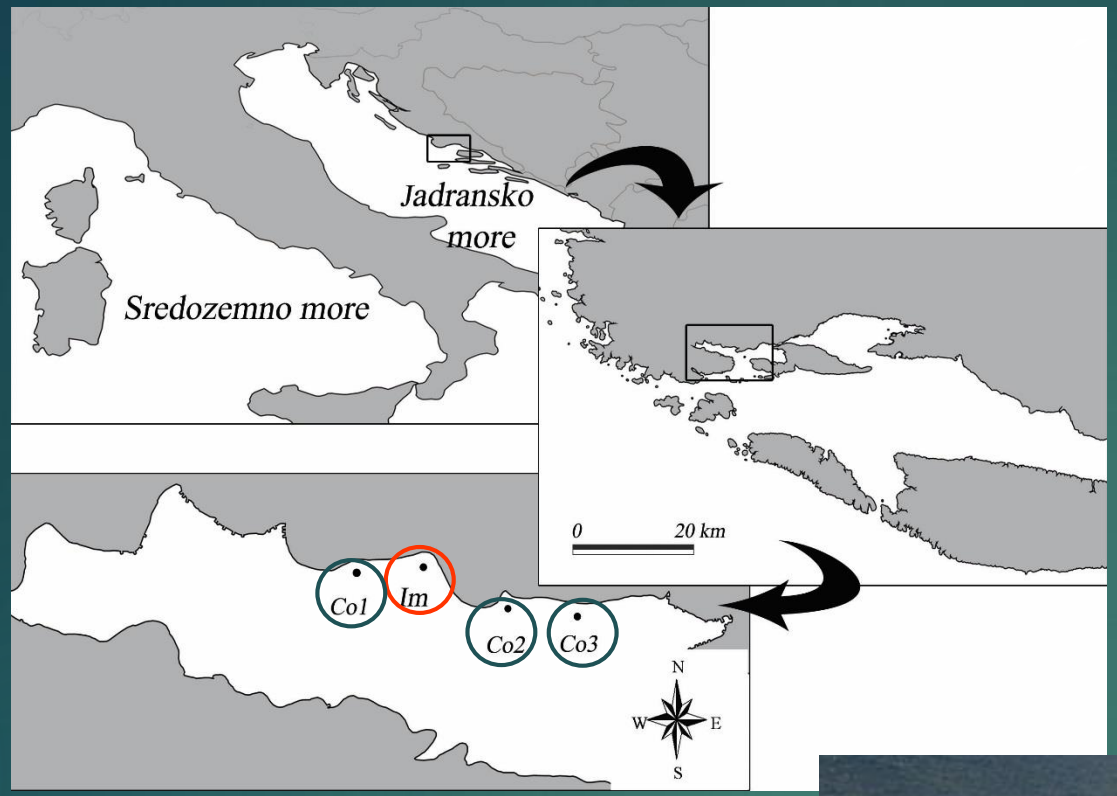


•*Boops boops,*
Belone belone,
Oblada melanura,
Mugilidae …
& *Sparus aurata…*

- shading effect
- fouling of benthic communities
- fish juveniles
- predator-prey interaction

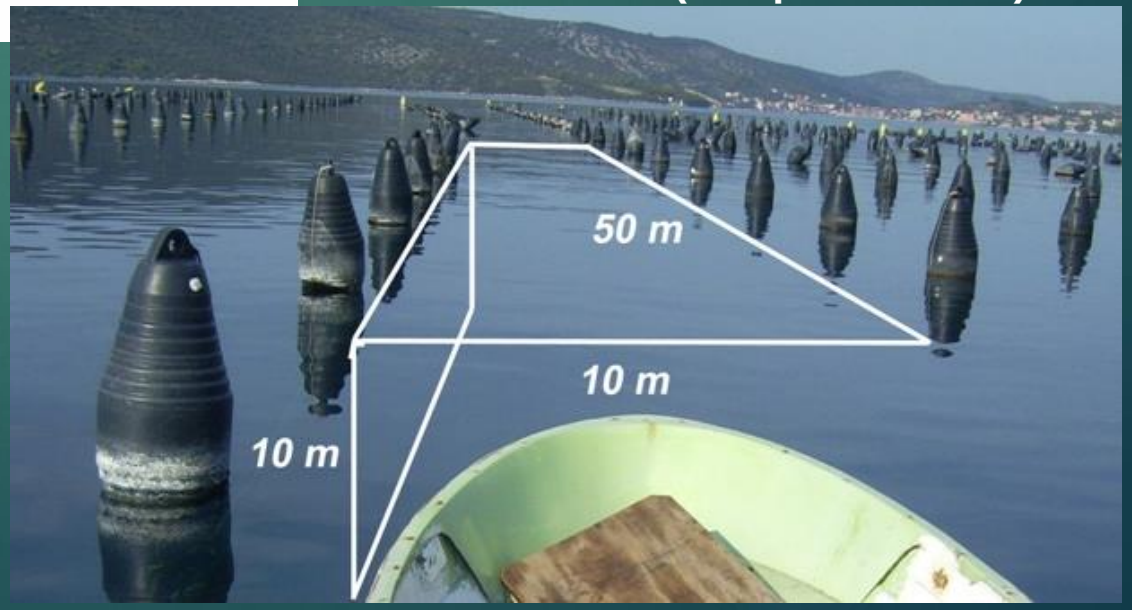
& fish feeding

Predator – prey interaction analysis on shellfish farms in Marina Bay

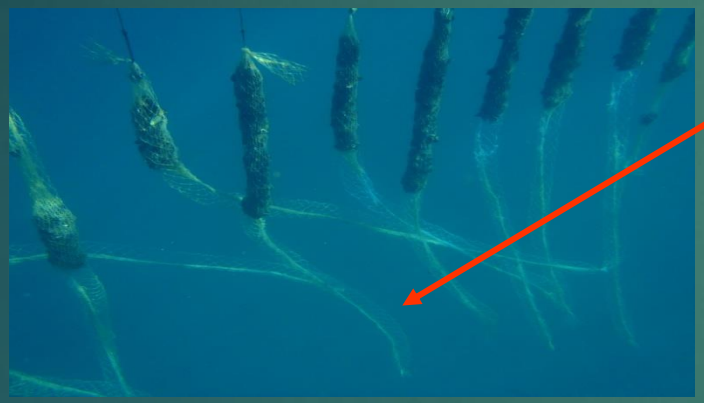


Sampling in space and times aiming to run the following analysis:

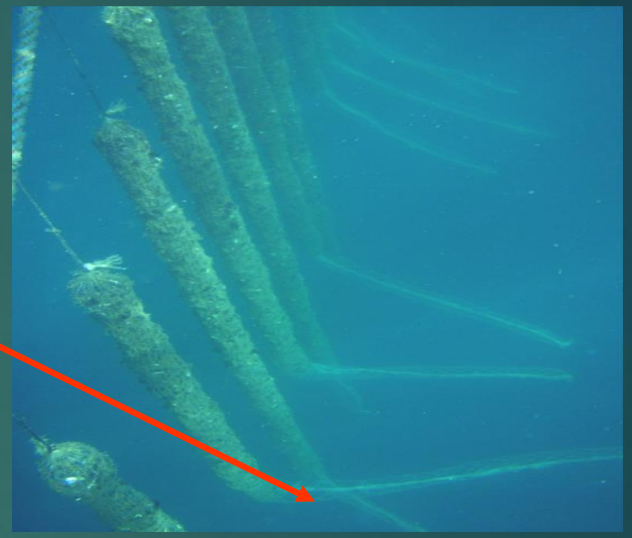
- **Farmed fish (I) *vs.Control*(C)**
- **Location (Farmed one and Control three)**
- **Years (2008 & 2009)**
- **Season (spring,summer, autumn,winter)**
- **Frequencies (twice by season)**
- **stations (two per location)**



- **ESTIMATE OF SHELLFISH LOSES AT THE STOCKING ON FLOATING LONGLINES**
- MONITORING 423 NEWLY STOCKED PERGOLAS IN SEPT. **2009**
  - INITIAL LENGTH OF PERGOLAS AT STOCKING
  - LENGTH FILLED WITH MUSSELS 24 HRS LATER
  - REMAINING LENGTH AFTER 7 DAYS



PREDATION

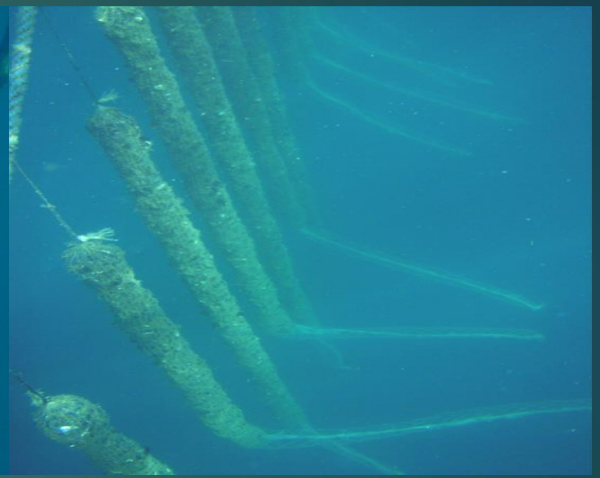


- losses **after 24 h** (%) = 100 × (total pergolas length (Lt) – remaining mussels stocked length (Lt1)) / Lt,
- losses **after 7 days** (%) = 100 × (Lt2)) / Lt

- pergolas length – weight relation (40 measurements)
  - 3 kg mussels per meter of pergolas (652 ± 47 ind/m, L = 34,3 ± 2,54mm)

- three stations at depth (up to 10m, 14m, 18m)

Consequences



In the seven (7) days time period loses of black mussels were at a range of **54%** **compared to initial stock**

Šegvić-Bubić, T., Grubišić, L., Karama., Tičina, V., Mišlov Jelavić, K., Katavić, I.(2011) **Damages on mussel farms potentially caused by fish predation - self service on the ropes?**. // *Aquaculture*. **319**, 497-504.

Loses of mussels (h) after stocking at a shellfish farm

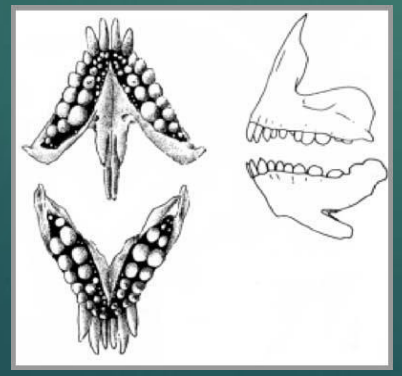
Depth at sampling	Loses of musshels (%)	
	24h	168h
Depth < 10m	35.7%	4.5%
Depth <14m	6.5%	3.9%
Depth <18m	2,1%	1.3%

Source of varijability	df	F	*p*
Time	1	88,11	0,001
Depth	2	118,40	0,001
Time × Depth	2	116,96	0,001
Remains	838		
Total	843		

- two way univariant PERMANOVA

Seabream feeding behaviour on shellfish farm

Type of prey	Wight of prey *(%W)*
Bivalves	
Mytilus galloprovincialis	69.7
Gastropods	9.5
Pisces	7.8
Amphipods	5.3
Isopods	4.2
Polychaeta	2.3
Algae	1.2



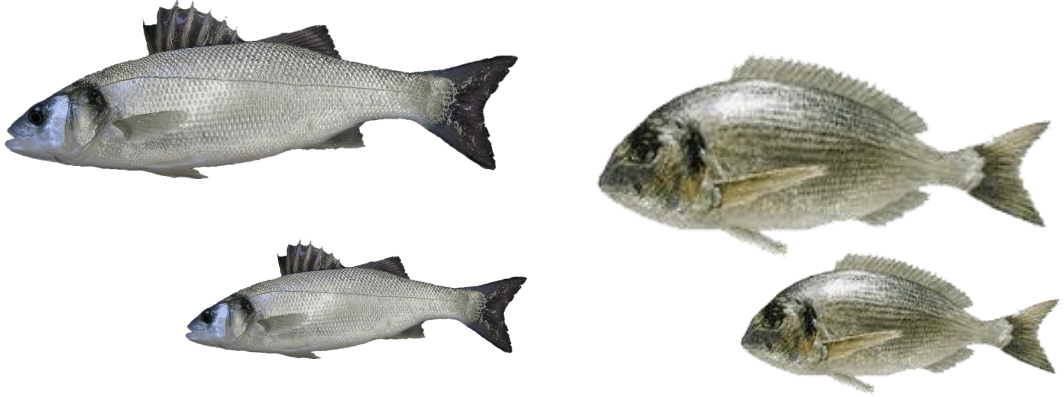
- 40 stomacs → **87,5%** full of food items

  12,5% empty

black mussel

– most frequent prey

Can fish reproduce in the cages ? How and Why?



- The main method for ongrowing of gilthead sea bream and sea bass in floating sea-cages - fish are kept for a period about 18 months until they reach marketable size - 3 fish in 1 kg)

- The need for product diversification (fillets) and the better price that larger-sized fish attain, plus consumer's habits of North European tourists has increased proportion of larger fish in Spain and Greece in particular

- Both sea bass and seabream in the third years of farming may mature as femals and thus produce fully mature eggs

	European Sea Bass			Gilthead Sea Bream		
	300-400 g	400-600 g.	>600 g.	300-400 g.	400-600 g.	>600 g.
Albania	100%	0%	0%	100%	0%	0%
Croatia	90%	10%	0%	90%	10%	0%
Cyprus	18%	65%	17%	36%	62%	2%
Greece	45%	40%	15%	43%	44%	13%
Italy	75%	15%	10%	85%	10%	5%
Israel	90%	10%	0%	90%	10%	0%
Malta	4%	10%	84%	28%	63%	4%
Morocco	0%	15%	85%	0%	0%	0%
Montenegro	83%	16%	2%	83%	16%	2%
Spain	25%	50%	25%	30%	55%	15%
Turkey	80%	15%	5%	90%	8%	2%

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AQUACULTURE ENVIRONMENT INTERACTIONS
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Evidence for 'escape through spawning' in large gilthead sea bream *Sparus aurata* reared in commercial sea-cages

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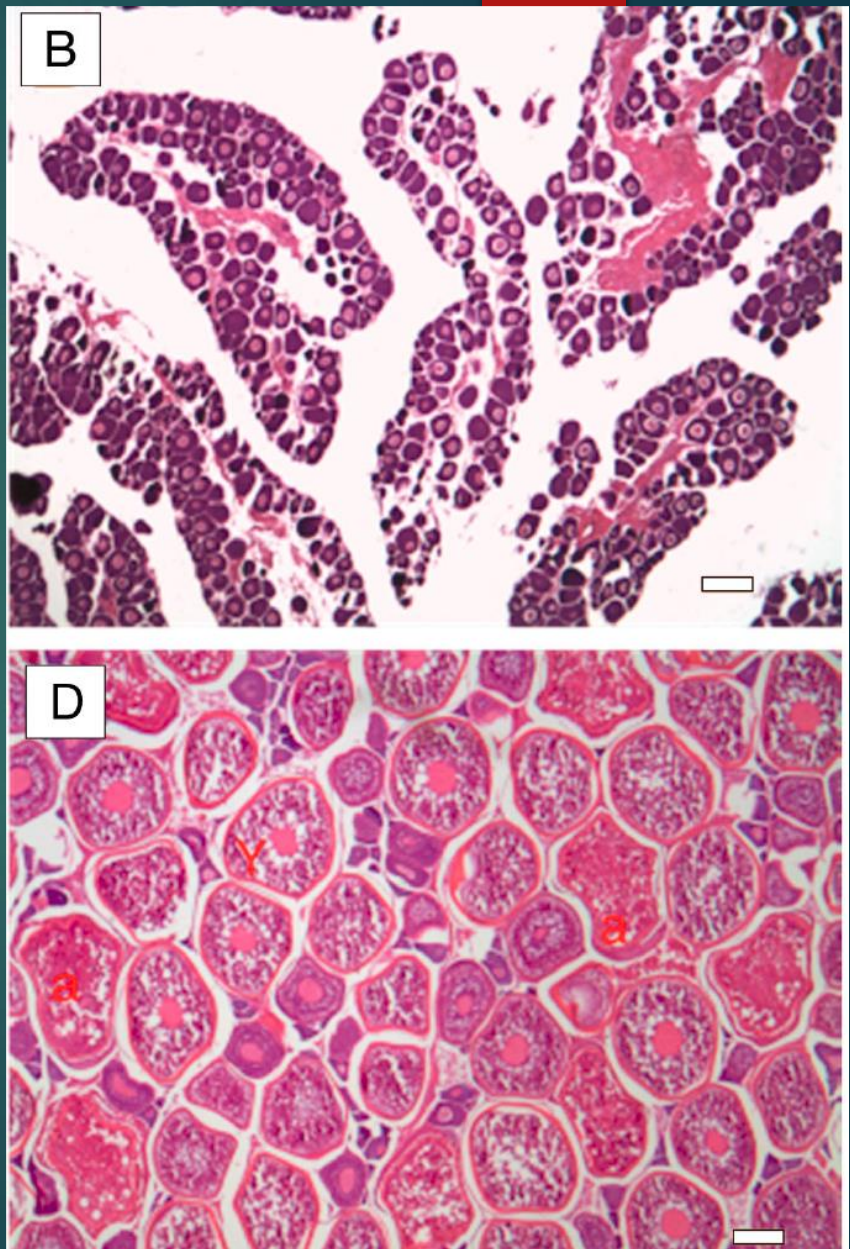
Ecological and socio-economic consequences

A conservative case:
If only 5 to 10% of seabream produced in the Mediterranean (>130,000 t/year) reach a size of sex-reversal, it is estimeted an average annual release up to

700 billion ($7x10^{11}$) embrios.

Than, if one per million survives to adulthood there will be 700,000 fish per year added to the seabream wild stock

Male (above) and female (down) seabream gametogenesis in the captivity



Farmed (left) & wild seabream (right)

Seabream scales: wild (left) and farmed (right)

(Izguierdo-Gomez, 2011)

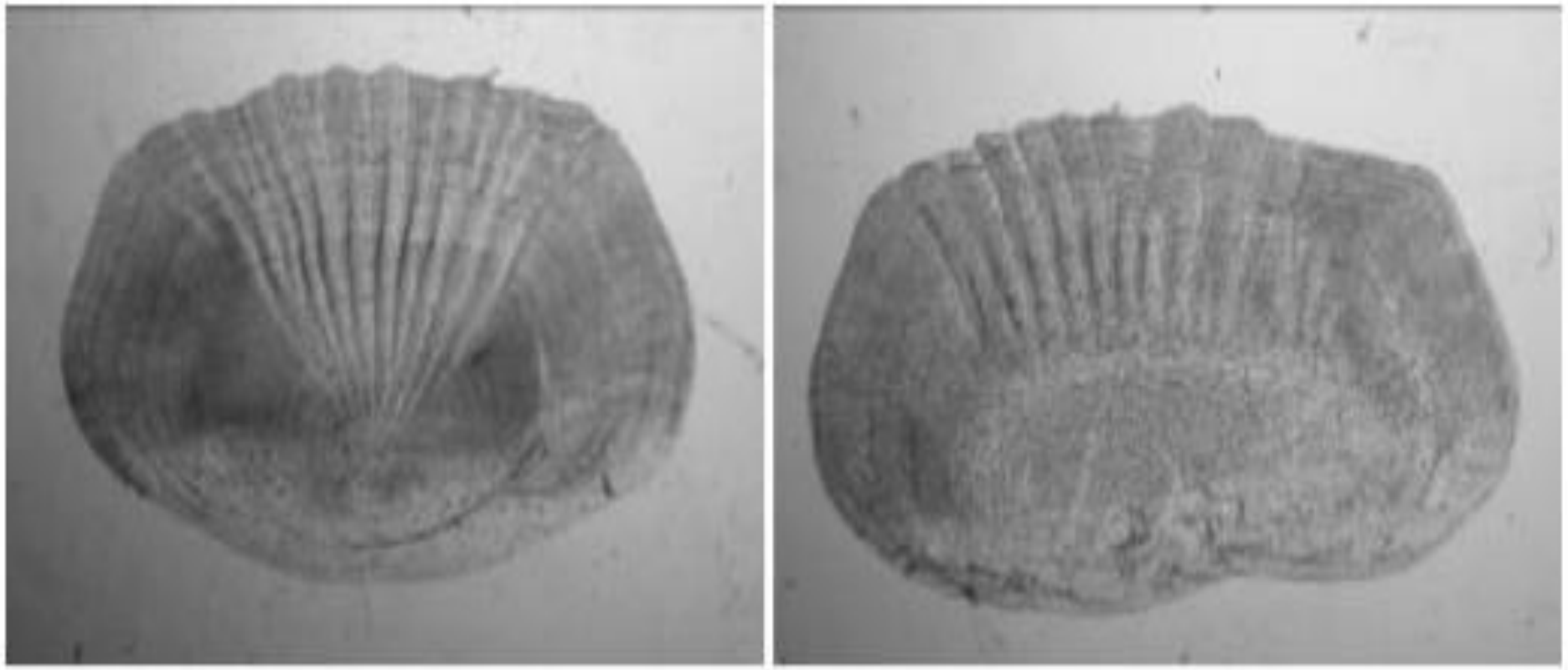


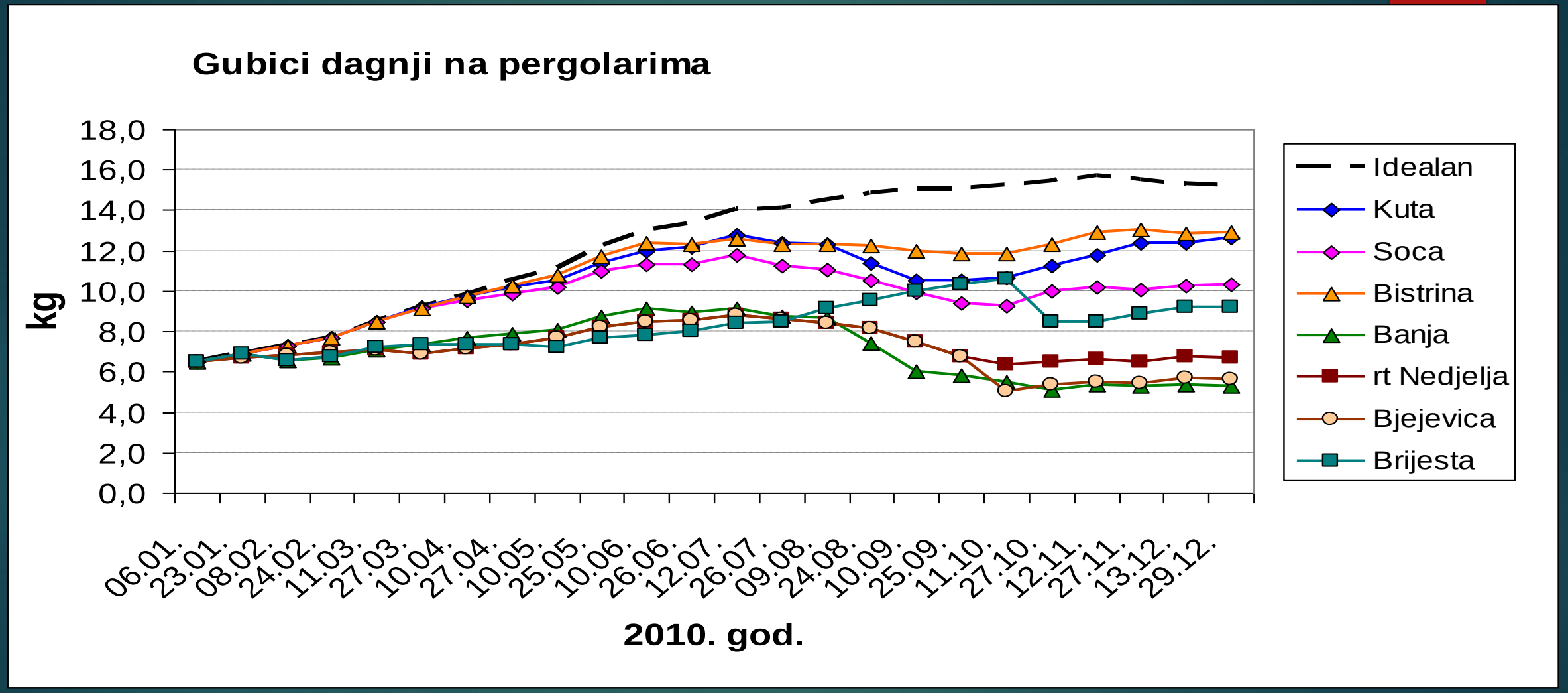
Figure 1. Right: Scale from a wild seabream individual. Left: Scale from a farmed seabream individual with a regenerated nucleus.

Main differences between wild and farmed seabream and sea bass

(Grigorakis, 2007; Arechavala-Lopez et al. 2011)

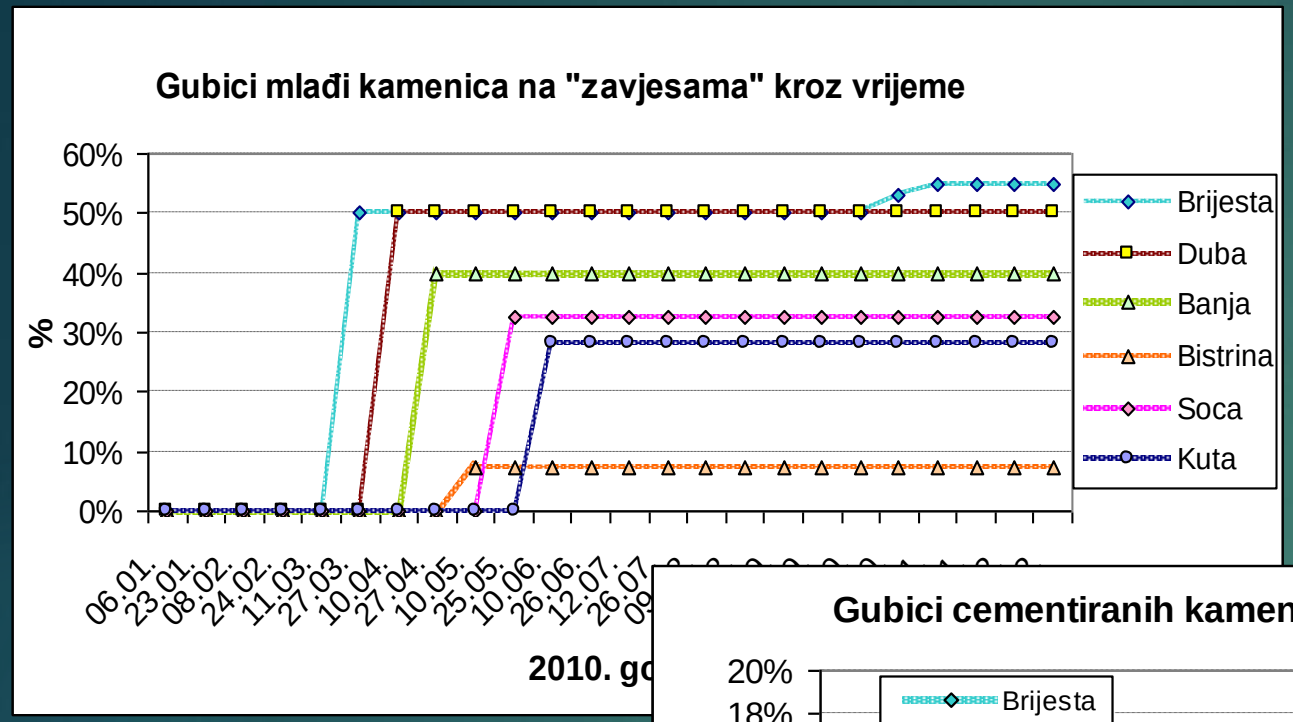
Characteristics	*Sparus aurata*		*Dicentrarchus labrax*	
	Wild origin	**Farm origin**	**Wild origin**	**Farm origin**
Body condition, morphology [a,b]	- Lower body height, higher RPI, lower K,	- Higher body height, lower RPI, higher K,	- Lower head height, higher CI, lower K, slight sharp head	- Higher head height, lower CI, higher K,
Scales [a]	- Clear annual rings	- High presence of regenerated nucleus and malformations	- Clear annual rings	- Annual rings absent
Fins [a]	- Low erosion signs	- Pectoral and upper caudal fin highly frayed	- Low erosion signs, caudal fin usually splitted	- Occasional erosion signs, specially dorsal fin
Skin [b]	- Skin thinner	- Harder skin with thicker walls	- No data	- No data
Teeth [a,b]	- More developed, sharper, conical	- Small rounded and squared shape	- More developed and sharper	- Less developed and rounded
Colour [a,b]	- Iridescent	- Duller	- High contrast grey	- Shiny silver
Smell [b]	- Softer, fresh seaweed	- Heavier, like fish oil	- Softer, fresh seaweed	- Heavier, like fish oil
Taste [a,b]	- Dry/fibrous mouth sensation, firmer texture	- Higher juiciness and tenderness	- Dry/fibrous mouth sensation, firmer texture	- Higher juiciness and tenderness

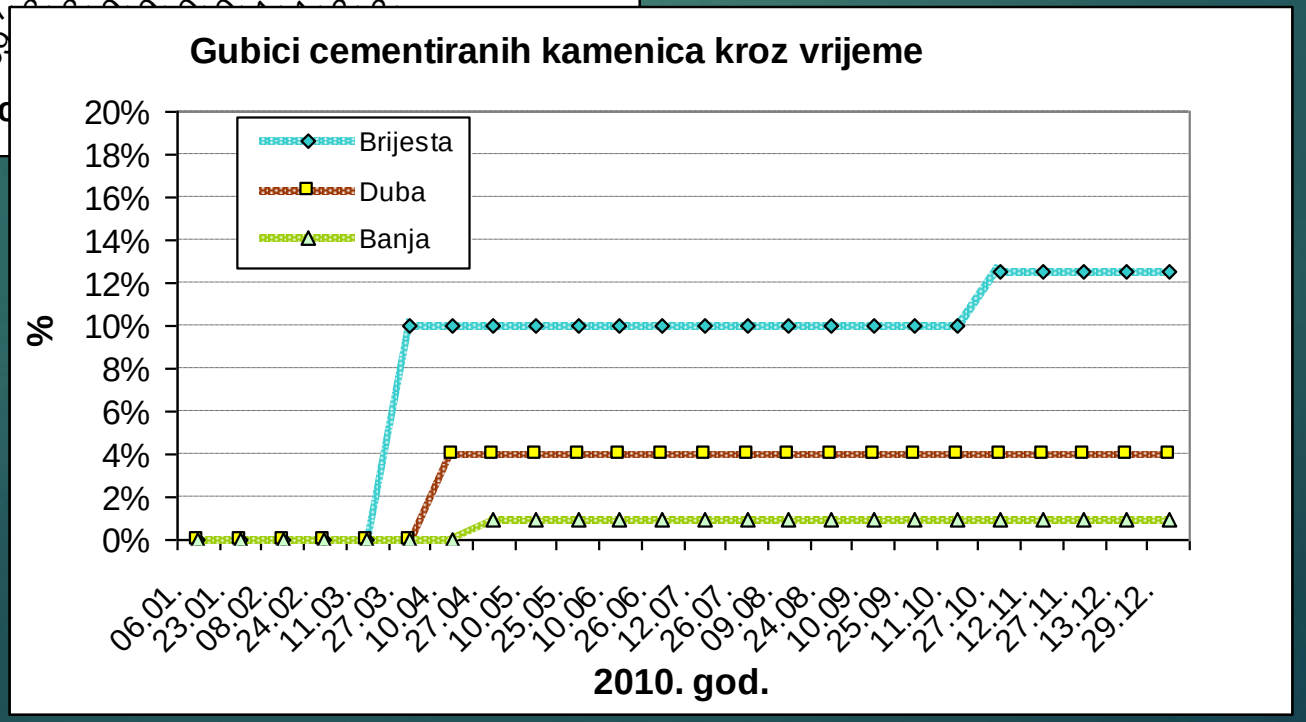
Loses of mussels hanged on floating lines



(Source: Bilić, 2011)

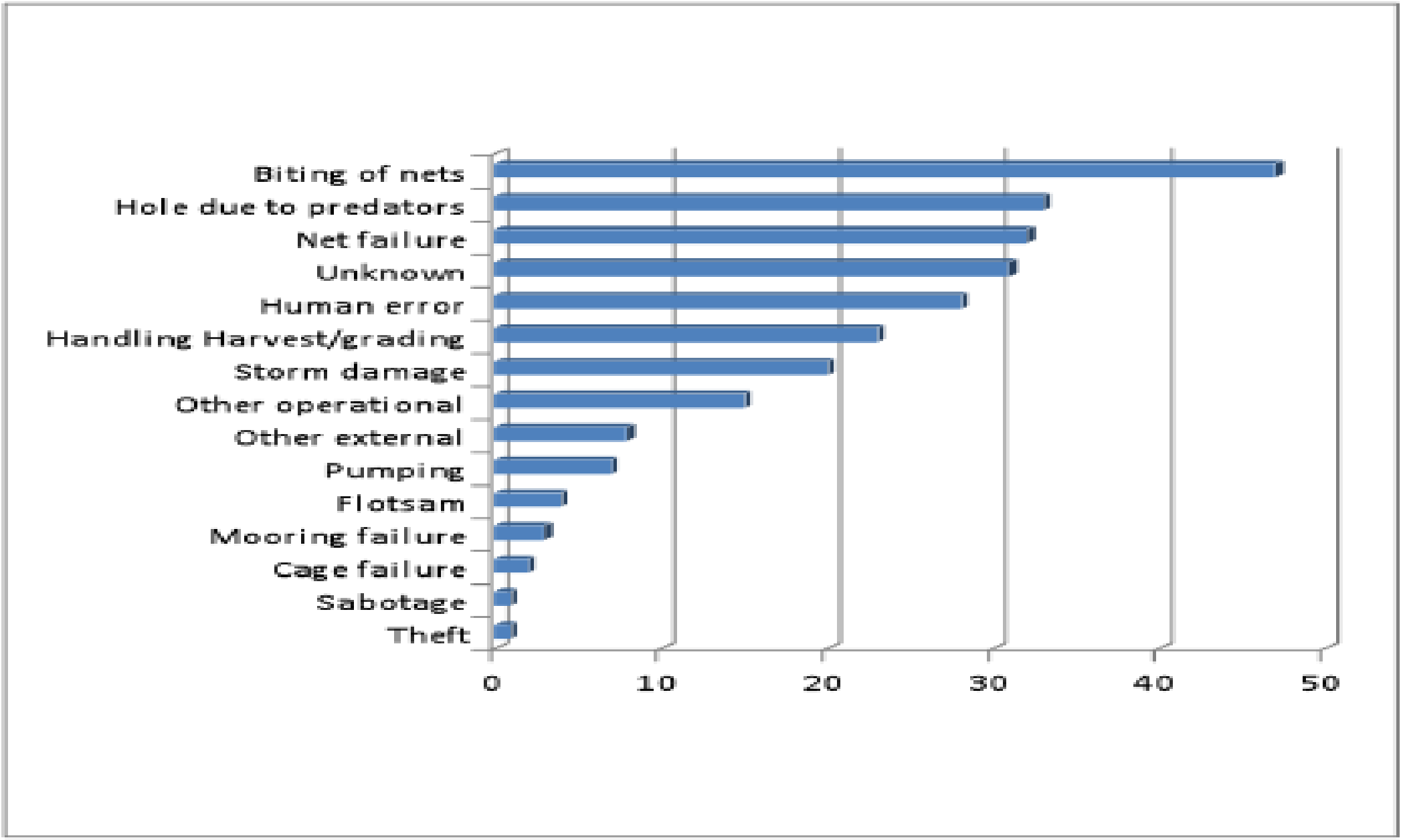
Loses of oysters: juveniles and cemented ones (down)





(Source: Bilić, 2011)

Causes of escapes *(Jackson et al, 2011)*



POSSIBILITIES TO MITIGATE PROBLEMS OF PREDATION

• data base on genetic structure of wild and cultured specimens

Control enforcement above reproductive portion of farmed fish

• prevent introduction of “non native” gens
• fish selection as close as possible to natural one

• enforcement of cage system; anchoring; recapture

• sterile individuals (triploids)

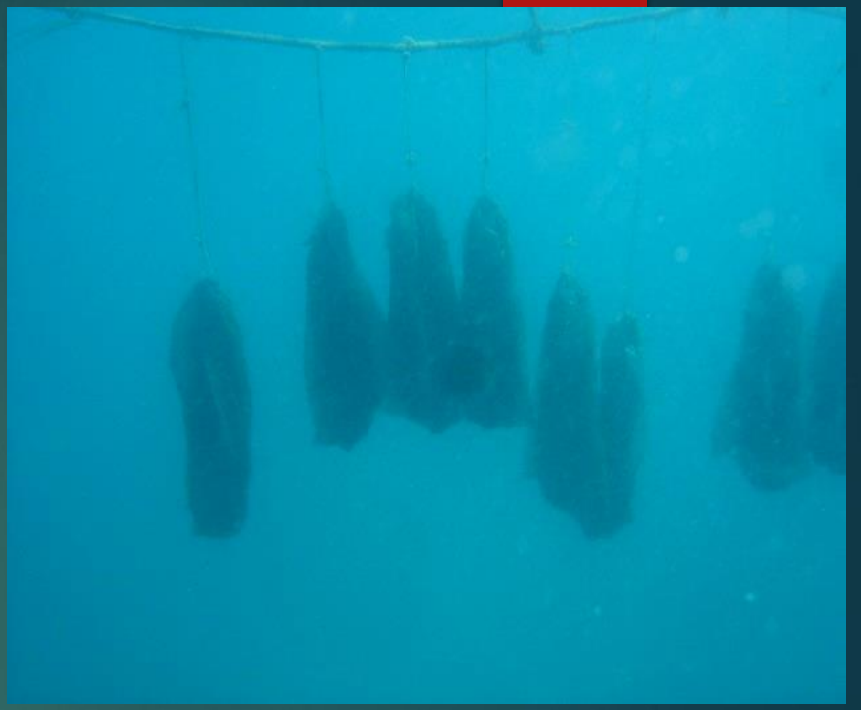
How to prevent seabream egg escape ?

- The use of a curtain-like egg collector could prevent the dispersal of eggs away from the cages

- Being an estuary dependent species, a precautionary mitigation measure to minimize consequences of egg escape would be to prohibit the culture of larger sea bream of sizes beyond that of sex reversal in areas clos to known spawning grounds of the species

In practice……..

- Mechanical protection
  - So called “Spanish sacs”
  - Protective nets
- Sound protection
  - variety of sound frequencies (experimental phase)



Pool walls with sponges

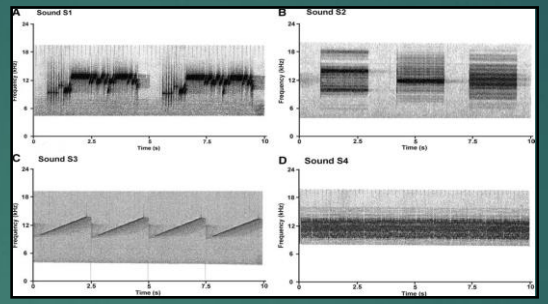
Underwater loundspeaker & mussels (food for fish)

Experimental set up

Tagged mussels

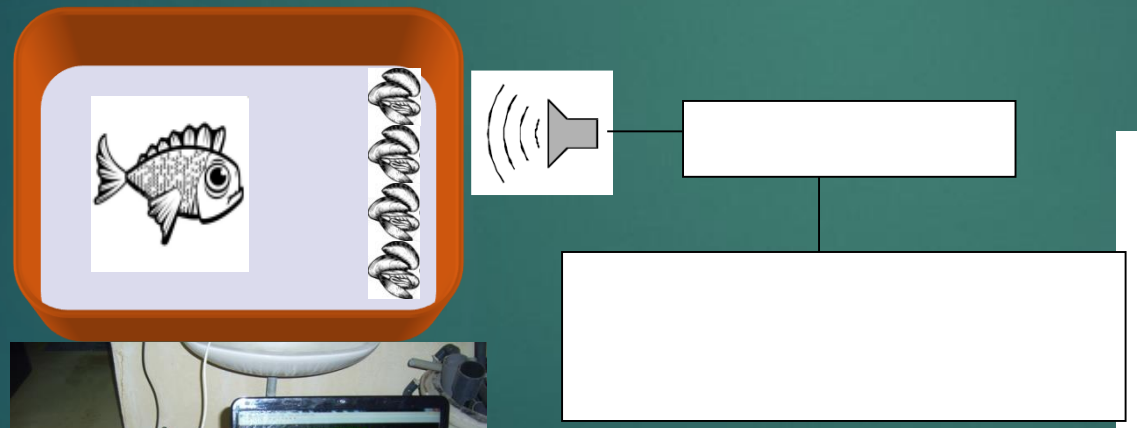
Project: Shellfish guardian

Financed by: Proof of Concept Grant fund, 2011



program **WaveAnalyzer**
(dr.sc. Ivo Mateljan, FESB)
signals were generated in
discrete form

Basic system for underwater sound generation



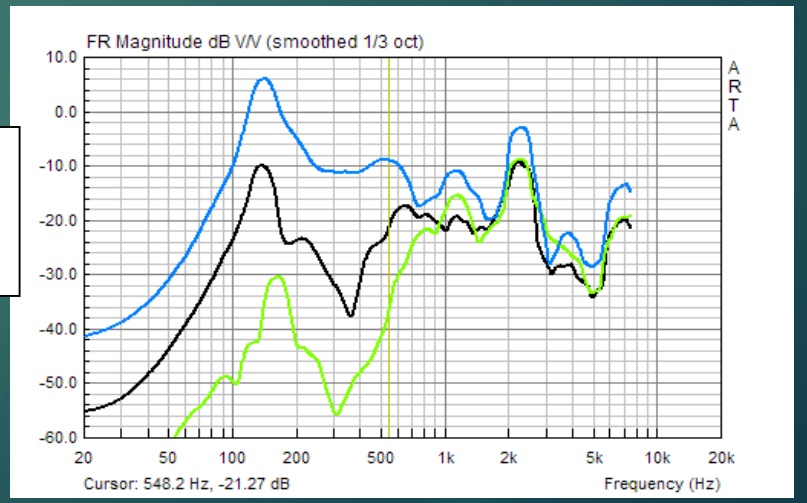


Figure shows that absorption foam is effective in frequency bellow 500Hz

Sound protection - Marina Bay; a preliminary observation

Sound protection

Without sound protection


Thanks for your attention