ANTIFOULING IN THE CHILEAN SALMON FARMING INDUSTRY

Sandra Bravo

Universidad Austral de Chile sbravo@uach.cl

Use of antifouling in the Chilean Salmon Farming Industry

Per Gunnar Kvenseth – Senior Consultant – Villa Salmon - Norway

Sandra Bravo, Ma. Teresa Silva & Claudia Lagos

Universidad Austral de Chile – Puerto Montt - Chile

Chilean salmon Industry

- Started in the beginning of 1980s
- Chile the second largest salmon producer since 1992
- 387.000 ton in 1996 (84% in region X)
- **Only one company involved in organic salmon (2002 – 2005)**
- One of the main technical problems at ongrowing in the sea is;
- FOULING (nets and equipment)
- Variations; seasonal, temp., salinity, tides, etc.
- Fouling can reduce water flow through nets by 40%
- Will have direct effect on fish health (reduces oxygen, increased fish waste and ammonia)
- Attached organisms can act as pathogenes agens

Copper

- The only metal allowed in antifouling for fishfarming nets in Chile
- Copper is defined as an environmental toxin
- Copper can accumulate in algae, oysters, mussels and crabs
- The antifouling effect comes from slowly and constant ”leakage” of copper – giving a zone around the tread (net) permanently surrounded by a thin layer of toxic solution.
- Effective at about 10-20 microgram copper/cm^2/day

Periods of protection against fouling in antifouling nets v/s without antifouling coating (net changing rate)

	Autumn - winter	Autumn - winter	Spring - summer	Spring - summer
Mesh size	With antifouling	*Without antifouling*	With antifouling	*Without antifouling*
Smolt	16-24 weeks	*4-6 weeks*	13-21 weeks	*10-12 days*
On-growing	16-32 weeks	*4-7 weeks*	17-26 weeks	*15-20 days*

Methology

- Data collection (1999-2003)
- Questionary to seven companies selling antifouling paint in Chile
- Also questionary to 20 companies giving antifouling service (users)

Results

Antifouling suppliers to the Chilean market during 1999-2003

Product	Characteristics	Saler	Producer
Flexgard	solvent based waterbase	Aqua Cards	Flexabar Aquatech Co.
Hempanet 7150 A	solvent based	Kupfer	Pinturas Hempel
Norimp 2000	solvent based	Ceresita	Jotun-Henry Clark Ltda
B 04464 Q	solvent based	Sherwin Williams	Sherwin Williams
Aquasafe	solvent based waterbase	Equipos Industriales	Gjoco Industrier AS
Netguard	solvent based	Bayer	Sten-Hansen Maling AS
Aquanet	waterbase		
Netrex*	waterbase	Akva Chile	NetKem AS

Results

Characteristics of antifouling paints used in Chile 1999-2003

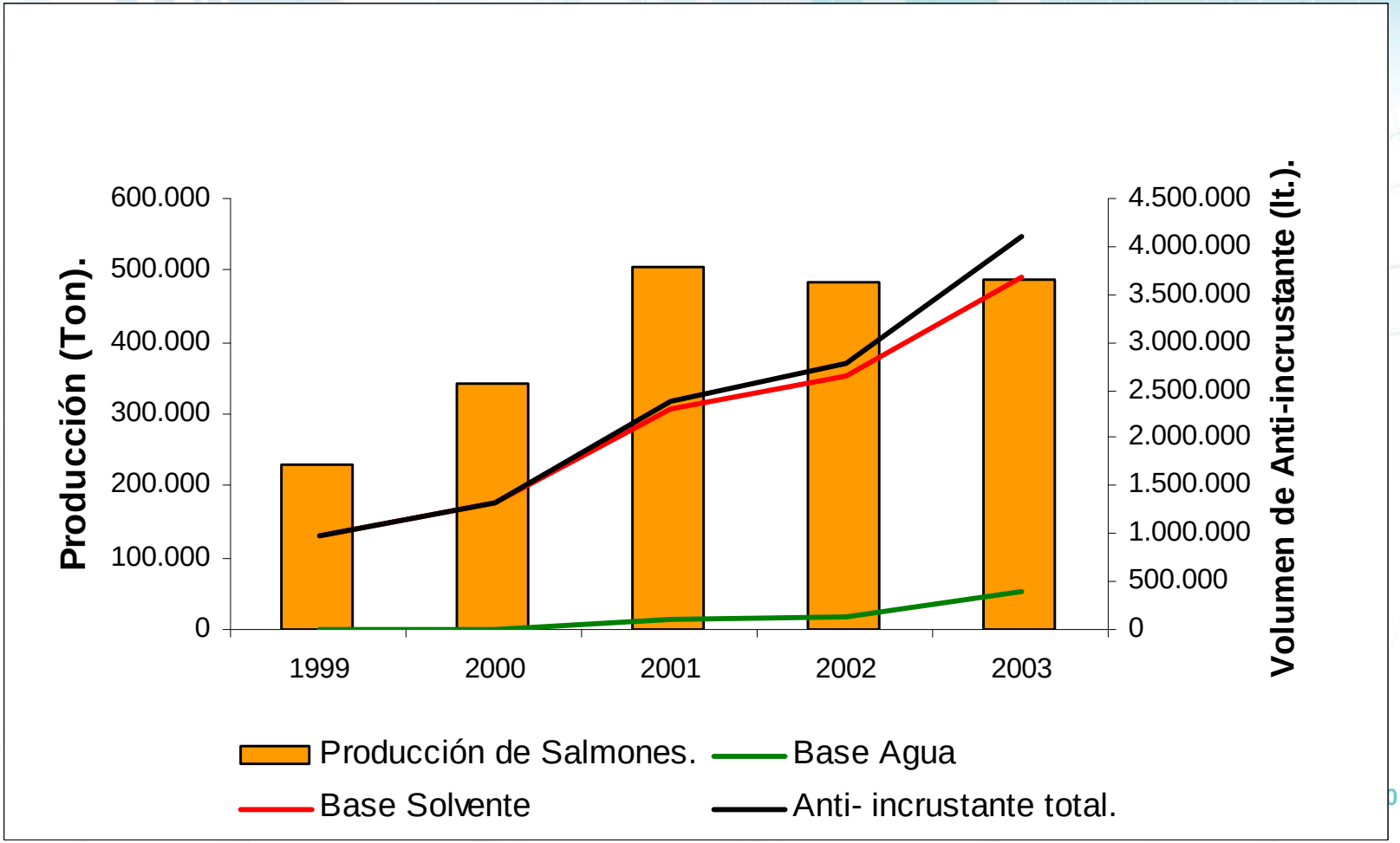
Product	Solvents	Active Ingredient	Binder	Specific gravity (g/cm^3)	Total Solids (%)	(%) Copper (oxid)
Aquasafe	xylol white spirit	copper oxide	natural gum resin	1,27	45	15-25
Aquasafe-W	water	copper oxide	acrylic / wax emulsion	1,27	54	15-30
Aqua-Net	water	copper oxide	Acrylic	1,34	42- 50	10-30
Net-Guard	white spirit xylol	copper oxide	sintetic resin	1,22	48-55	10-30
Norimp 2000	white spirit xylol	copper oxide	Colophony	1.2 – 1.4	57 ± 2	10–20
Hempanet 7150 A	xylol white spirit	copper oxide	Colophony	1.35 ± 0.1	50	10-15
Flexgard	white spirit	copper oxide	natural gum resin	1.56́ – 1.56	67 ± 5	15-20
Flexgard	water	copper oxide		1.45 -1.49	55	10-15
B 04464 Q	white spirit	copper oxide	Colophony	1,2 ± 0,02	59 ± 2	

Results

- **Total sales in 1999 – 1,760,000 litre**
- With 20% Copper -> 460 tons of Copper
- 3,4% waterbased

- **Total sales 2003 – 4,672,886 litre (+ 265,5%)**
- With 20% Copper -> 1200 tons of Copper (Norway ab. 200 tons = 1/6)
- 11,4% waterbased

Salmon production in Chile v/s antifouling used by the industry



Discussion

- **Increase in use – why ?**
  - increase in net cage size,
  - more open sites in use giving difficult service / net changing

- **Quickly invation by fouling** when antifouling (copper) in painted net is ”used up” / leaching is over (seaweed, mollusks, mussels etc.)

- **Low % of waterbased antifouling** in use compared to the Europe industry

Alternative solutions,

- Washers, brushers, high preassure disks, etc. Divers or surface operated. Not a good solution – lots of suspended materials causing gill problems for the salmon, environmental problems (organic loads ?) and difficult to operate (exposed sites ?)

Discussion- cont.

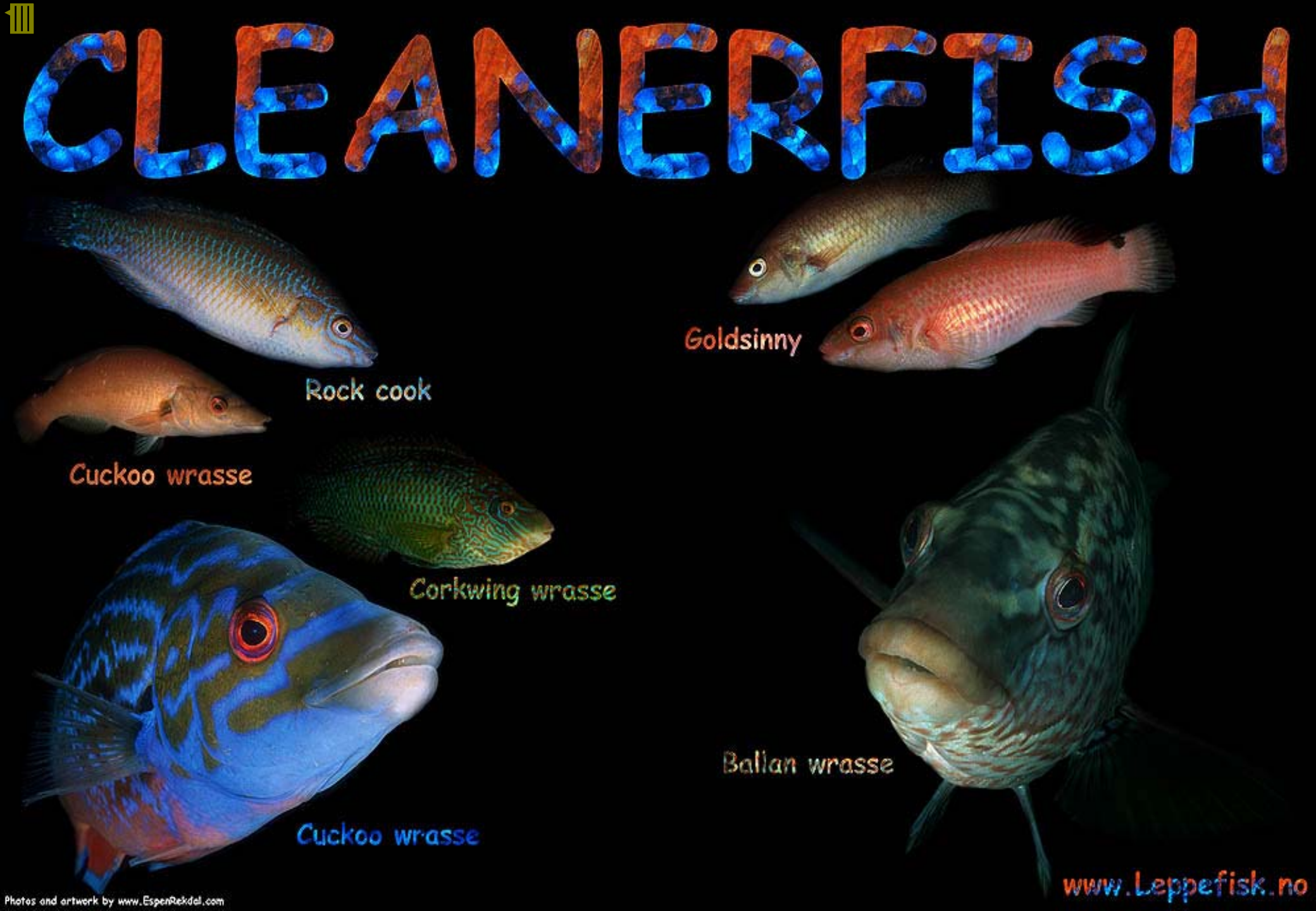
- **Farms in Reg. X with no use of antifouling** (experiments ?) -> changing every 20 day in the summer – every 2 month in the winter
- **Such frequent net handling** can cause escaping fish, stress, poor welfare and diseases if not done a suitable way
- **Copper based paint will be banned in Chile** asap an accaptable alternative is available (copper less hazardouse than TBT – 1/1000)
- **Antifouling (with copper ?) not permitted in lakes in Chile**
- **Strict regulations for net washing and copper outlet to environment (max 1 mg/litre)**

Project financed by Fondo de Investigacion Pesquera (FIP) of the Undersecretary of Fisheries – FIP 2003-28

Antifouling in the Norwegian Aquaculture industry

- Dominated by coppercontaining antifouling – ab 200 tons copper/year
- Industry goal to reduce this to 20 tons/year
- Increased use of paint without toxin (Netpolish, Net coating)
- Purpose to give a smooth sutface of the tread (easy to clean)
- and
- To pack the treads in the net closer together (more difficult for organisms to eatablish)
- Increasing use of unpainted nets and the use of cleaning high preassure disks (surface operated and divers operated) – development driven by organic farmers
- Increased use of ”environmental nets” - two nets attached to each other – one in use – one out of water – sundried – rain exposed
- The Norwegian use of CLEANERFISH reduces the need for antifouling paint – by grazing on the nets

CLEANERFISH



Photos and artwork by www.EspenRekdal.com

www.Leppefisk.no

Challenges with fouling organisms

Organisms growing on the nets in Norway

- Gammarids

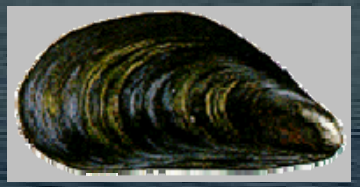
Caprellina

- Hydroids

Tubularia larynx

•Common flowerhead

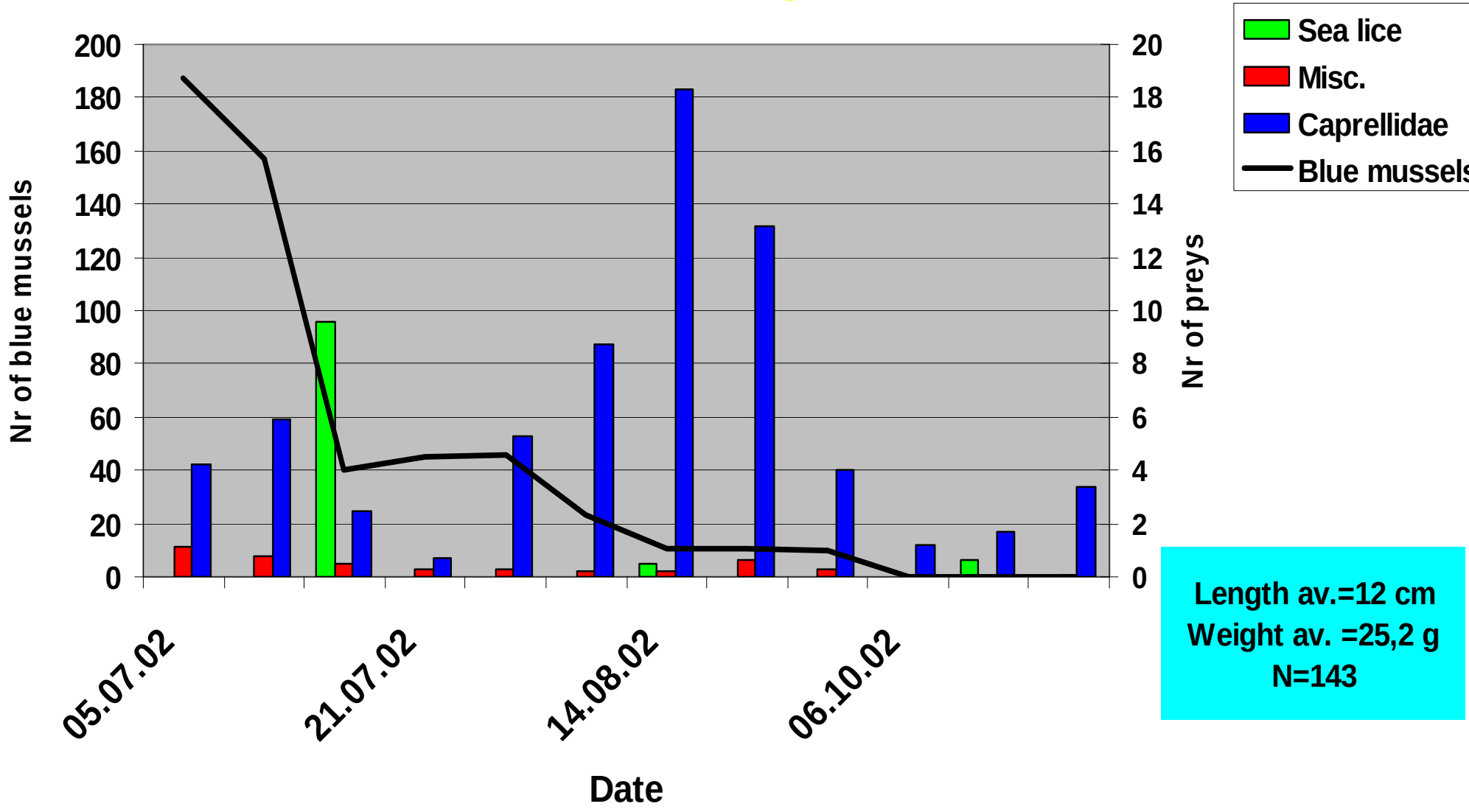
Mytilus edulis



- Round worms

Nematoda

Stomach content analysis Goldsinny 2002



Length av.=12 cm
Weight av. =25,2 g
N=143

Hides

- The netpen environment is rather artificial for the cleanerfish
- We help the cleanerfish we offer alternative places for hiding


Clean my nets –
please !

Mission :

License To Clean ! (1989)


Happy salmon – happy farmer
”The Villa way !”
Sea lice control
No chemicals
Net cage control
Fouling organism
www.villaorganic.com