DVS TECNOLOGÍA

Adolfo Alvial Asesorías
Un Respaldo que Distingue

SEABED RECOVERY
(LAKE, RIVER, POND, ESTUARY,……)
SYSTEM - SRF (Servicio de Recuperación de Fondos)

A POWERFUL TOOL FOR THE ENVIROMENTAL RECOVERY AND ECONOMIC VALUE IMPROVEMENT OF FARMING SITES

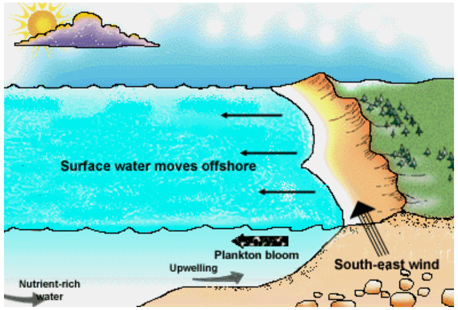
DVS TECNOLOGÍA

Open culture systems & their interaction with the enviroment

Adolfo Alvial
Asesorías
Un Respaldo que Distingue

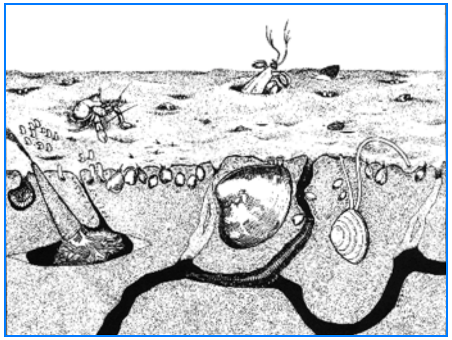
Carrying capacity (max. Biomass holding capacity)

Basic considerations.



The water dynamic: water renewal ➔ O2 availability ➔ capability to sustain biological activity. **Higher dynamics will provide a better enviromental quality.**

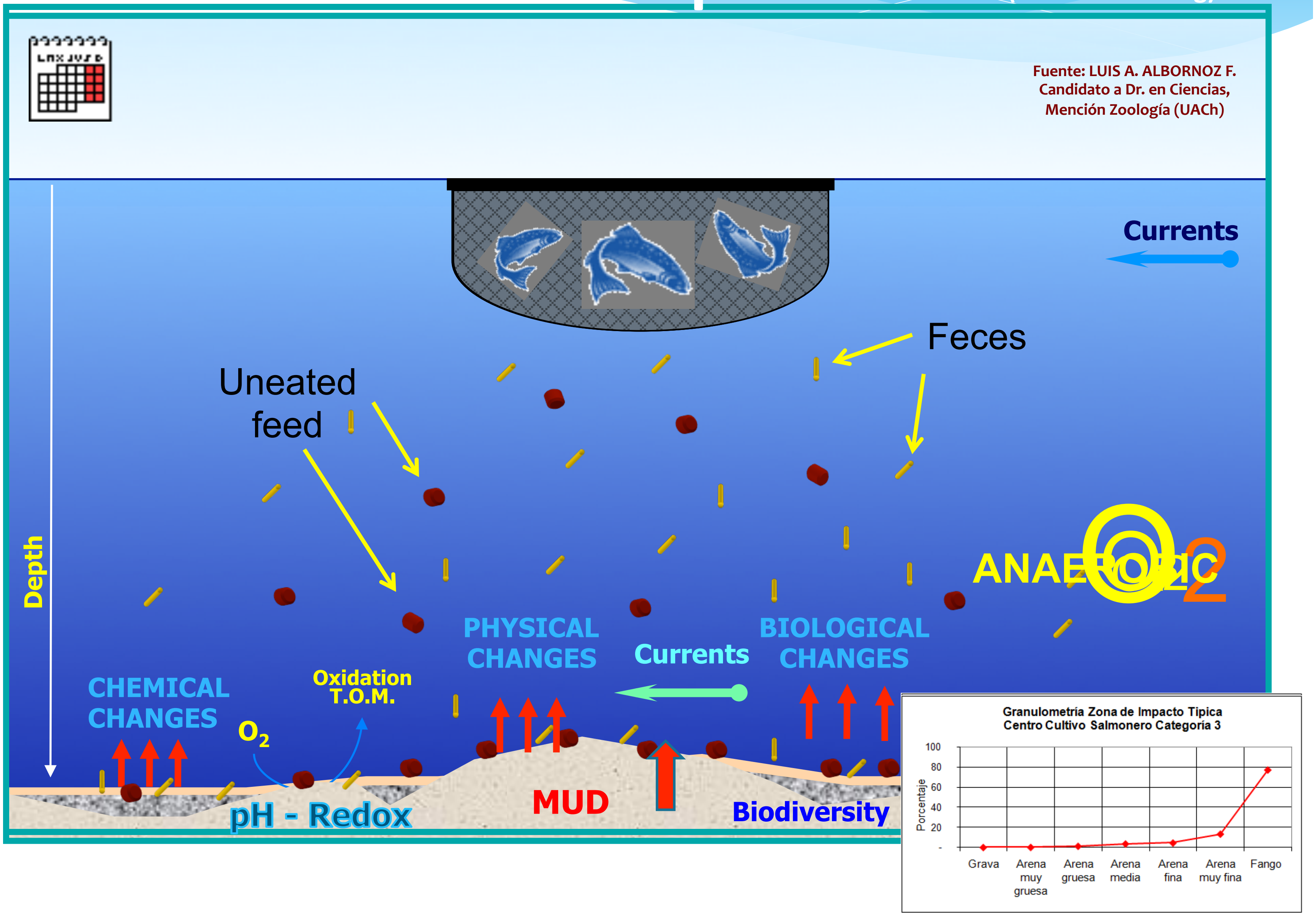
Benthic life & Bioturbation: Big contribution to organic matter degradation. Bioturbation increases the ratio of exposed surface of the sediment (**When in balance ➔ Oxygen enhanced & able to develop, healthy & diverse wildlife, helping to aerobically degrade organic matter**).



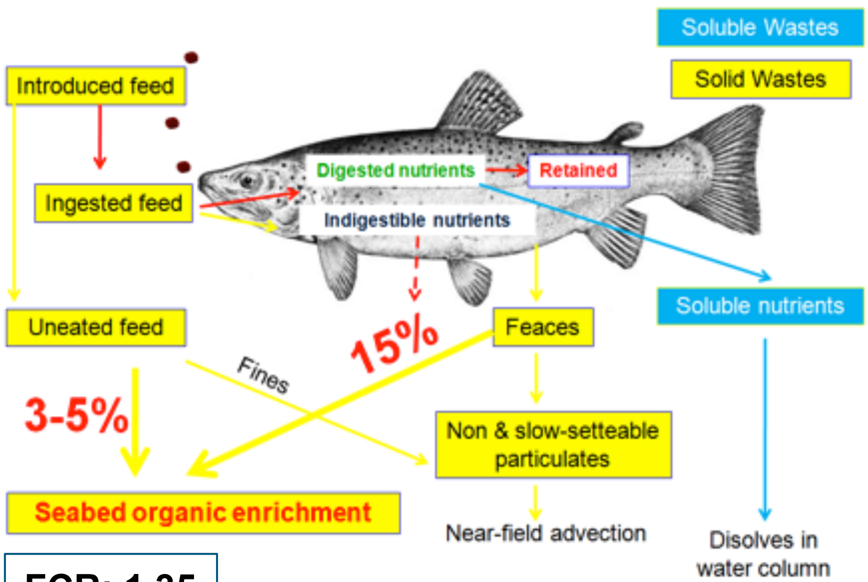
When breached, **biological**, **chemical** & **physical** phenomena are triggered, affecting the bottom and water column. At final stages, environment becomes anaerobic & toxic for benthic life.

Seabed Organic Enrichment

Aquaculture (Salmon Farming)



Where does the feed go…. ??

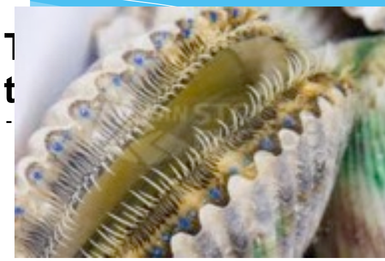


FCR: 1,35

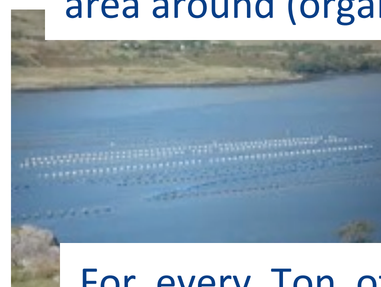
Example from an average farm

# Cages		18	
Cage size :	Length	30	
	Width	30	
	Depth	18	
	Total area directly bellow	16.200	m2
Farming density		12	Kg/m3
Total production (MT)		3.499	MT
Total feed required (MT)		4.724	MT
TOTAL WASTE (feed originated only)		**829**	**MT**
		51,18	**Kg/mt^2**

T … & curre … rger
t … ut the l … e of



Up to 30% of all filtered feed is released to the bottom, turning them anoxic (toxic for benthic life). They also decrease sedimentation in the area around (organic depletion).



For every Ton of whole mussel produced, 1,1 Ton. of feces & pseudofeaces are released. The effect on the seabed will deppend on production system, density and local water dynamics:

Spain: 183,33 Kg organic waste/m2/year (37,56 Lb/Sqft/yr).

Chile: 10,56 Kg organic waste/m2/year (2,16 Lb/Sqft/yr).

How do we avoid organic enrichment from becoming a problem ?

Economic efficiency ($/Kg) vs enviromental overload.

Or is there another way ?

A.- U mass load:

- Adj olding capacity of the si rmine).

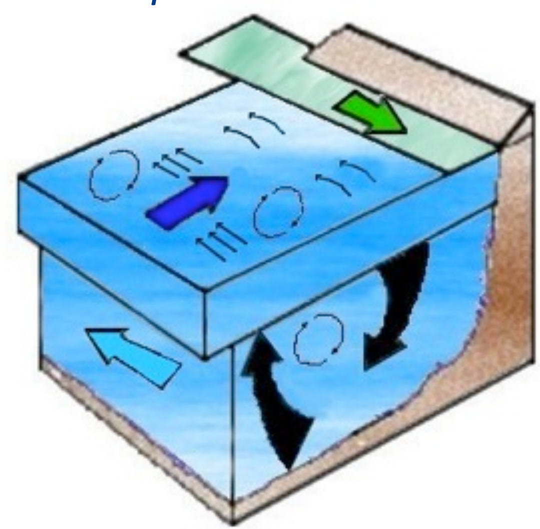
- Mc ally unviable for some term and/or long term)

Then we need to lend Nature a hand by…..

SRF Replicates nature's job…… at a much faster pace

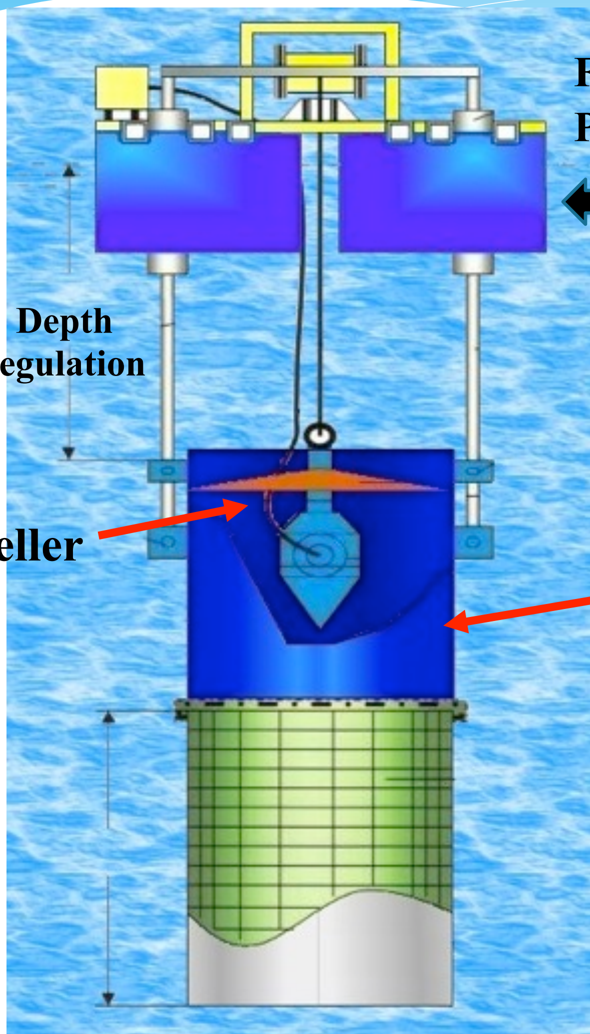
B.- Helping the dynamic processess that keep the water body & seabed in optimal conditions.

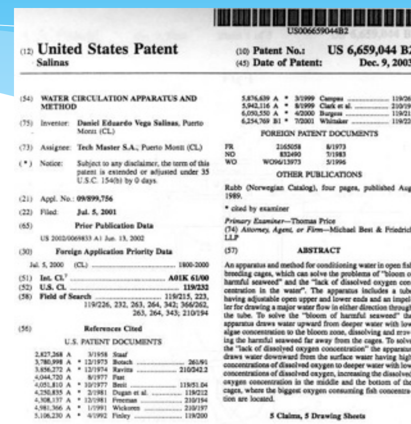
***SRF** improves dynamics by displacing vasts amounts of water activating a series of natural processess .*



OW DOES SRF WORK & WHY DOES IT SOLVE THE PROBLEM ? → Our DMA®

DMA = Desplazador de Masas de Agua / Water Mass Displacer





(12) United States Patent
Salinas

(10) Patent No.: US 6,659,044 B2
(45) Date of Patent: Dec. 9, 2003

(54) WATER CIRCULATION APPARATUS AND METHOD

(75) Inventor: Daniel Eduardo Vega Salinas, Puerto Montt (CL)

(73) Assignee: Tech Master S.A., Puerto Montt (CL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/899,756

(22) Filed: Jul. 5, 2001

(65) Prior Publication Data

US 2002/0069833 A1 Jun. 13, 2002

(30) Foreign Application Priority Data

Jul. 5, 2000 (CL) 1800-2000

(51) Int. Cl.[7] A01K 61/00
(52) U.S. Cl. 119/232
(58) Field of Search 119/215, 223, 119/226, 232, 263, 264, 342; 366/262, 263, 264, 343; 210/194

(56) References Cited

U.S. PATENT DOCUMENTS

2,827,268 A		3/1958	Staaf	
3,780,998 A	*	12/1973	Botsch	261/91
3,856,272 A	*	12/1974	Ravitts	210/242.2
4,044,720 A		8/1977	Fast	
4,051,810 A	*	10/1977	Breit	119/51.04
4,250,835 A	*	2/1981	Dugan et al.	119/212
4,308,137 A	*	12/1981	Freeman	210/194
4,981,366 A	*	1/1991	Wickoren	210/197
5,106,230 A	*	4/1992	Finley	119/200
5,876,639 A	*	3/1999	Campau	119/263
5,942,116 A	*	8/1999	Clark et al.	210/194
6,050,550 A	*	4/2000	Burgess	119/215
6,254,769 B1	*	7/2001	Whitaker	119/226

FOREIGN PATENT DOCUMENTS

FR	2165058	8/1973
NO	832490	7/1983
WO	WO96/13973	5/1996

OTHER PUBLICATIONS

Rubb (Norwegian Catalog), four pages, published Aug. 1989.

* cited by examiner

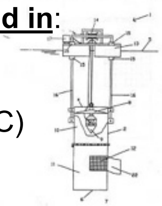
Primary Examiner—Thomas Price
(74) *Attorney, Agent, or Firm*—Michael Best & Friedrich LLP

(57) ABSTRACT

An apparatus and method for conditioning water in open fish breeding cages, which can solve the problems of "bloom of harmful seaweed" and the "lack of dissolved oxygen concentration in the water". The apparatus includes a tube having adjustable open upper and lower ends and an impeller for drawing a major water flow in either direction through the tube. To solve the "bloom of harmful seaweed" the apparatus draws water upward from deeper water with low algae concentration to the bloom zone, dissolving and moving the harmful seaweed far away from the cages. To solve the "lack of dissolved oxygen concentration" the apparatus draws water downward from the surface water having high concentrations of dissolved oxygen to deeper water with low concentrations of dissolved oxygen, increasing the dissolved oxygen concentration in the middle and the bottom of the cages, where the biggest oxygen consuming fish concentration are located.

5 Claims, 5 Drawing Sheets

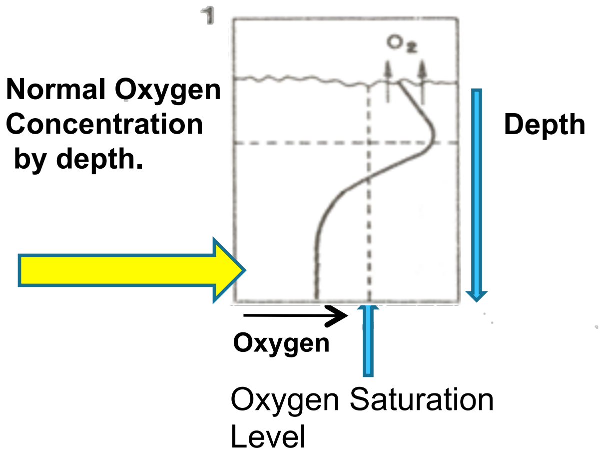
Patented in:
USA
Canada
EU (EEC)
Chile



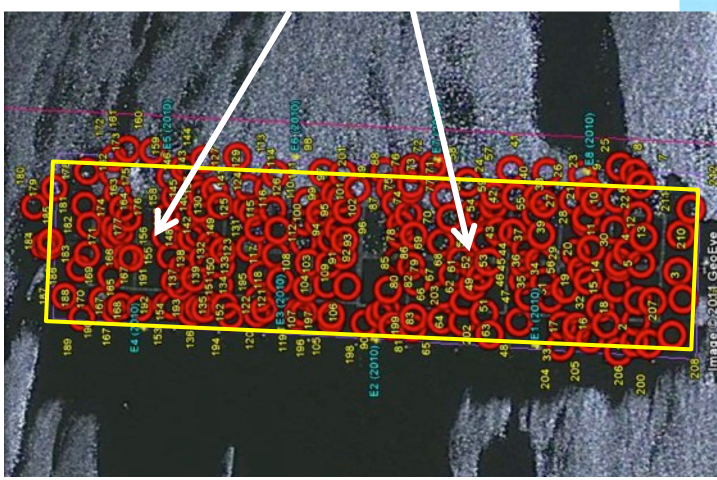
DMA / SRF's Technical specs

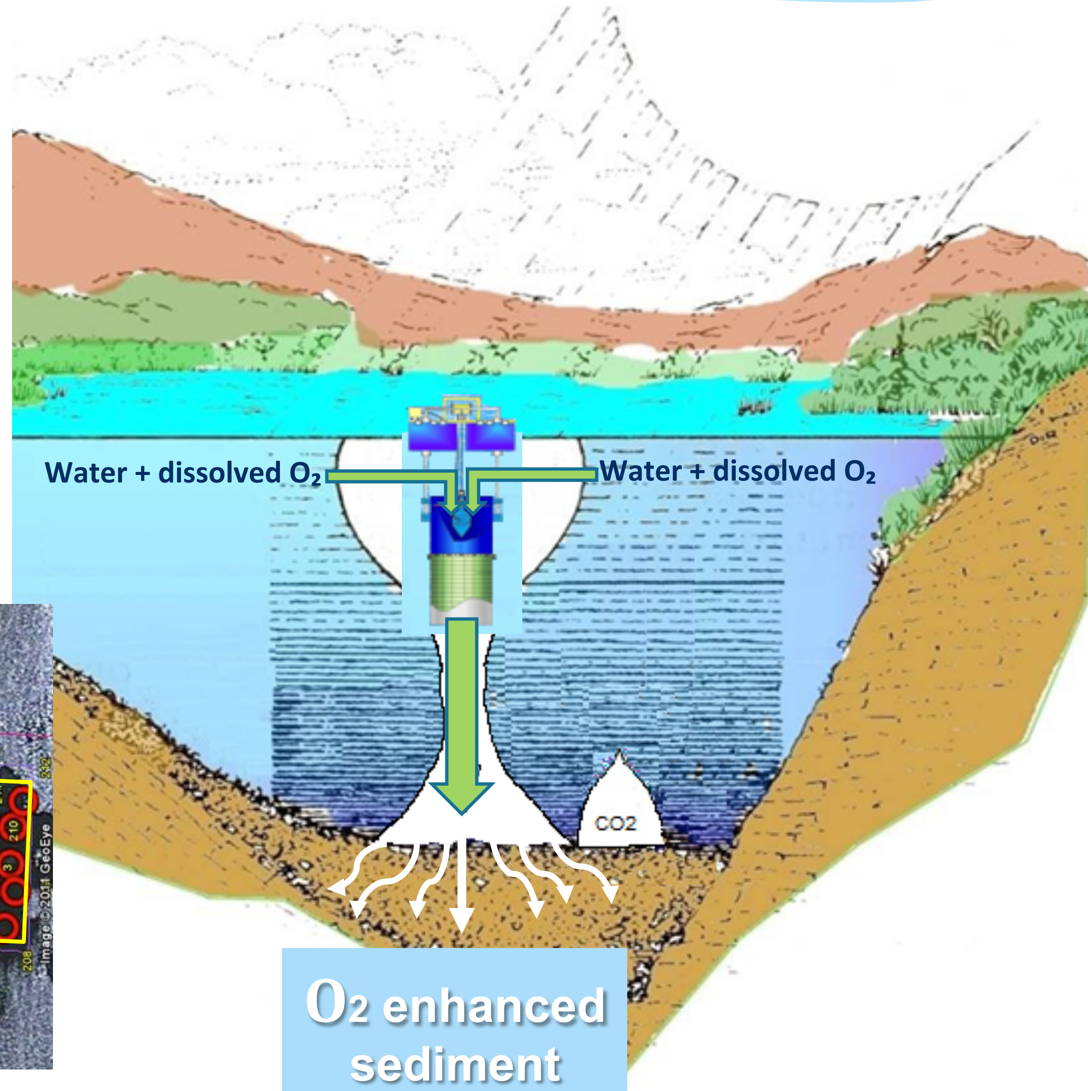
Downwelling water flow	1,2 m³/seg	
Water exchange per point	4.320	m³/hr
Water exchange rate per point	**55**	**m³/m²/hr**
	1.350	**gal/sqft/hour.**

Oxygen vertical distribution: before & during SRF



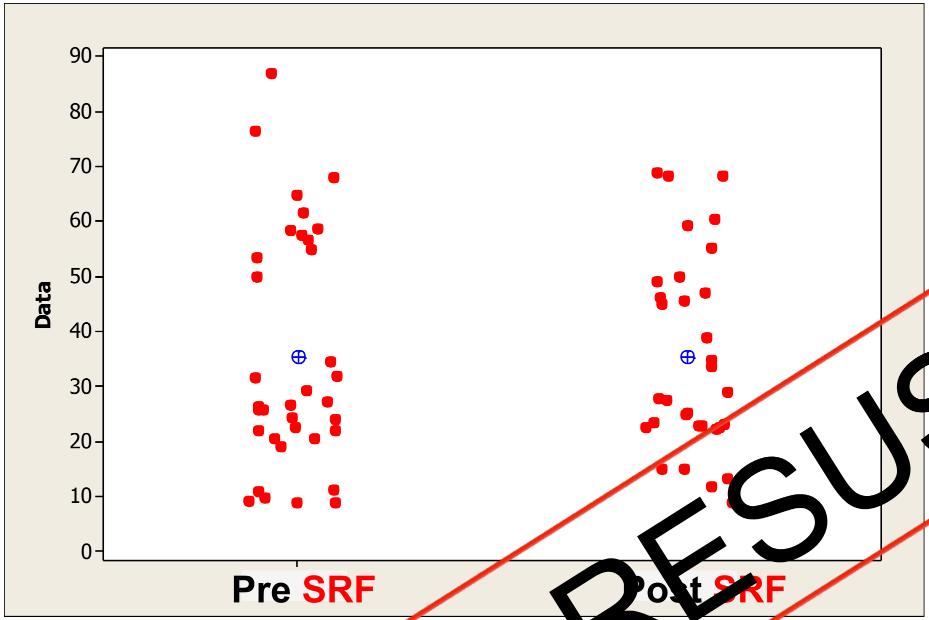
Demarcation,Positioning & mooring by GPS

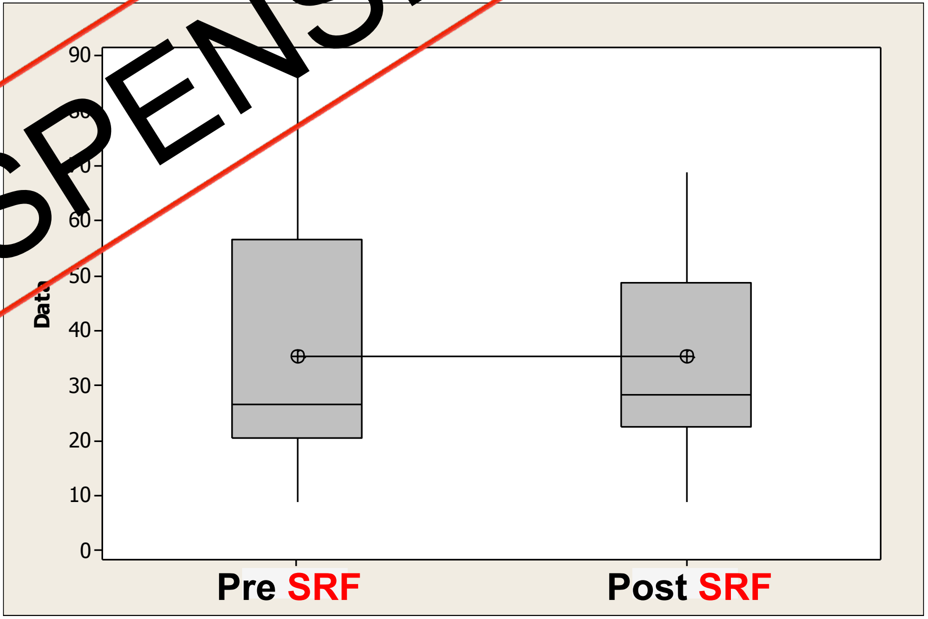




SRF Results (2004 al 2006)

Granulometry (% de Mud)



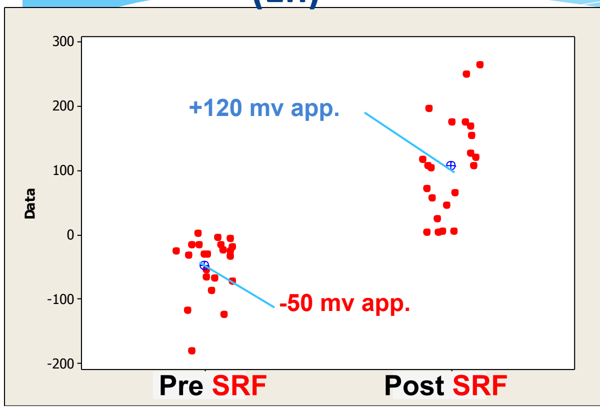


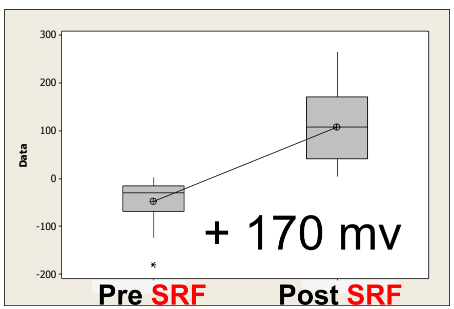
NO RESUSPENSION

Statistical P value = 0.973 No statistical significance

SRF Results (2004 al 2006)

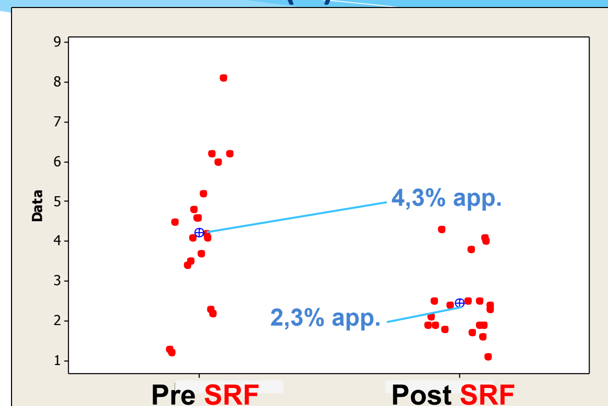
Redox Potential (Eh)

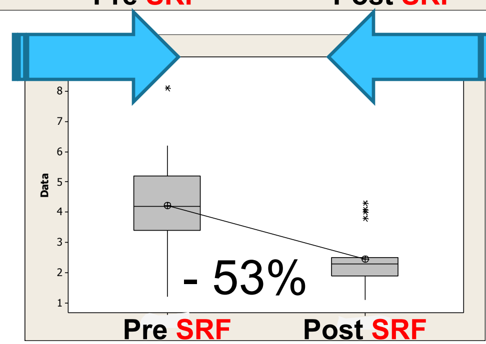




Statistical P vale = 0.000
There is statistical significance

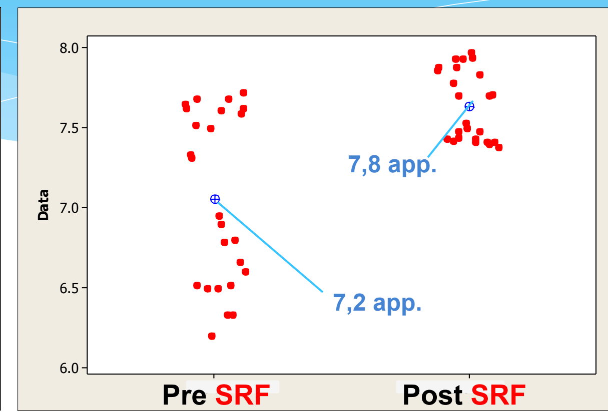
Total Organic Matter (%)

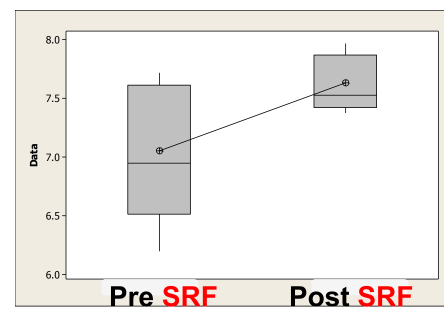




Statistical P vale = 0.001
There is statistical significance

pH



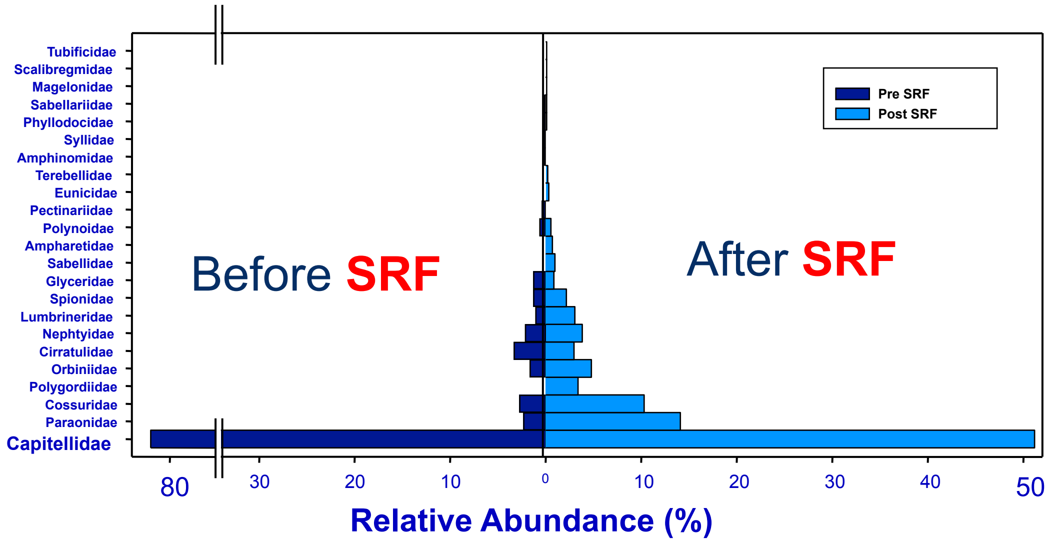


Statistical P vale = 0.000
There is statistical significance

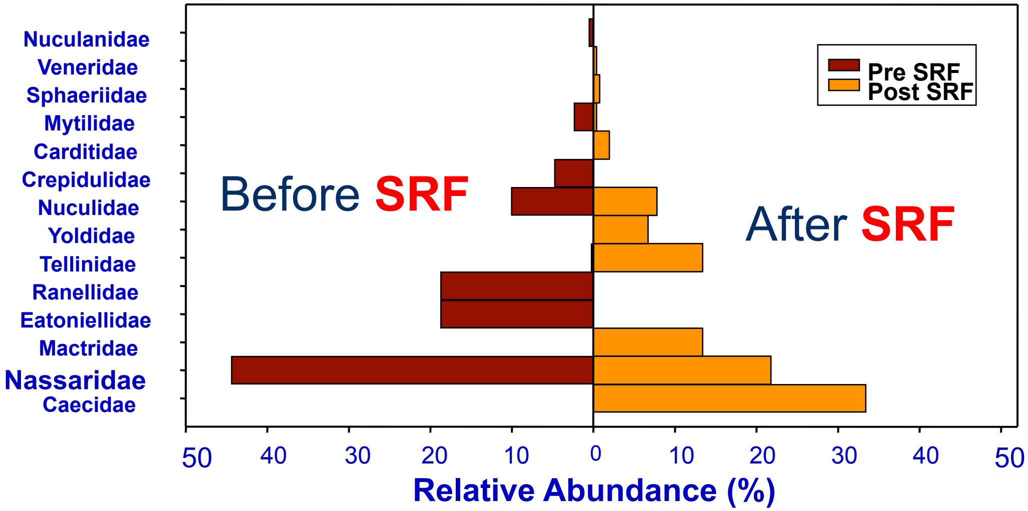
- **One month** to place all chemical values in regulatory compliance.
- **Effect of treatment will last out** from 3 – 4 production cycles according to all recorded performances until now.

Benthic Macrofauna Results (2004 – 2006)

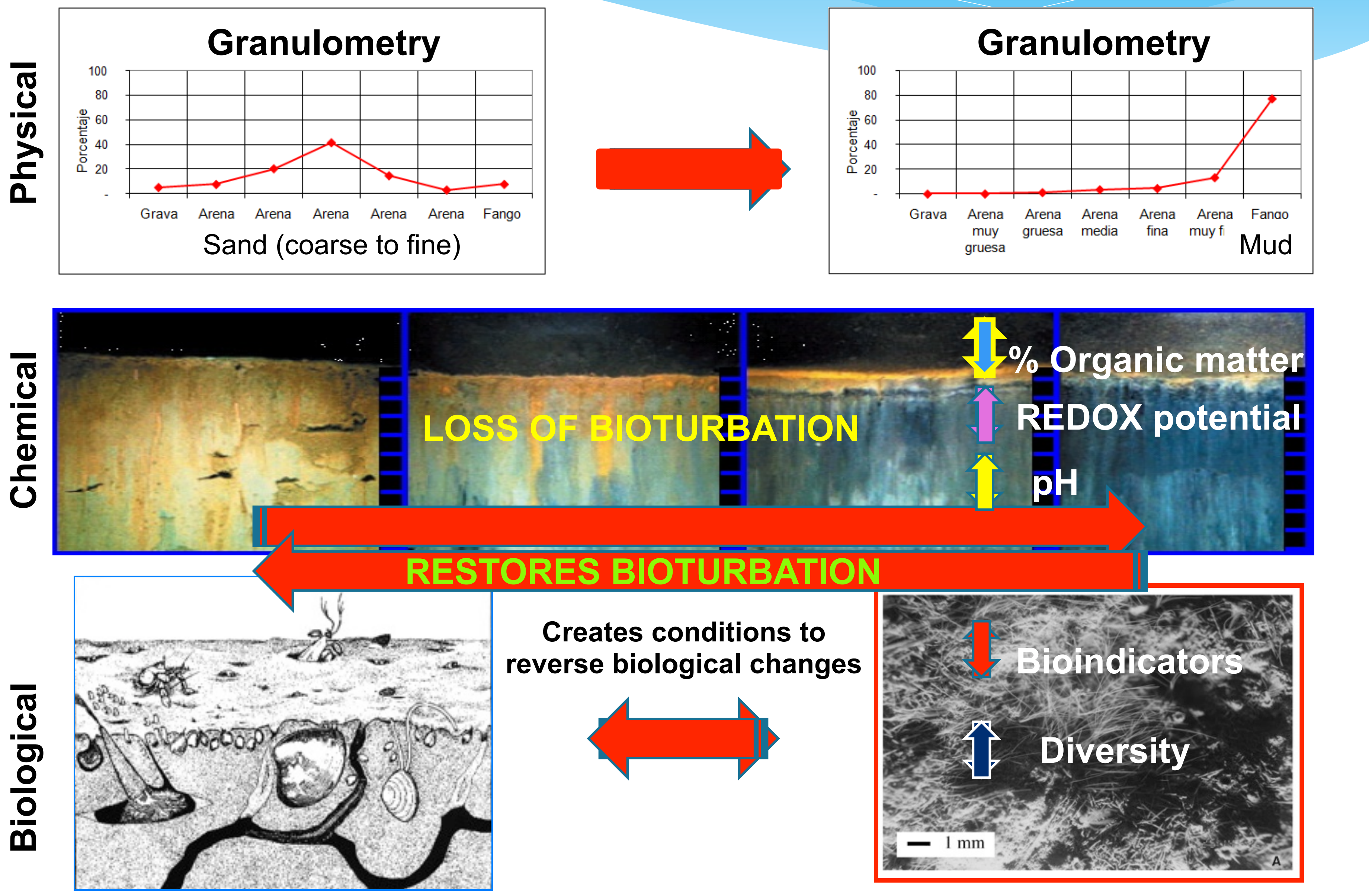
Biodiversity (Annelidae)



Biodiversity (Mollusca)



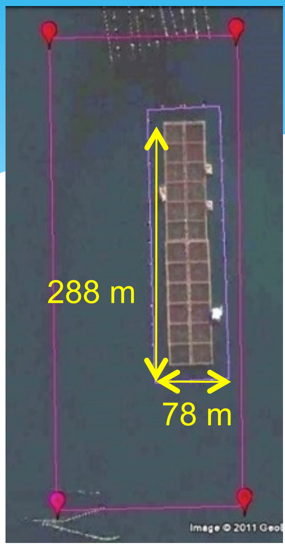
SRF HELPS TO REVERSE THIS PROCESS



Results of an actual SRF project (2006 → 2010…… 2011)

DVS TECNOLOGÍA

Adolfo Alvial Asesorías – Un Respaldo que Distingue



TECHNICAL DATA SRF

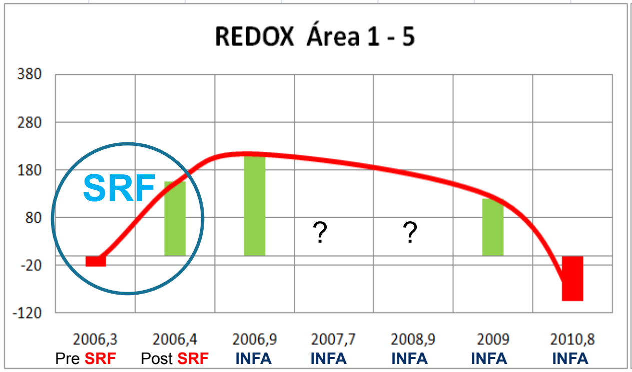
Period & Year : March – April, 2006
Irrigation points : 230
Total area recovered: 23.000 m²

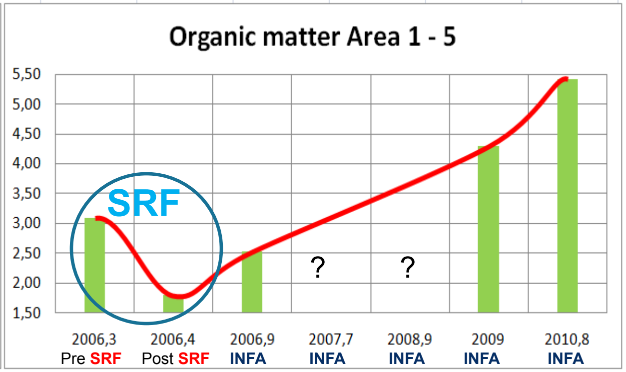
Year	Ton
2006	0
2007	578
2008	1.964
2009	1.752
2010	1.795

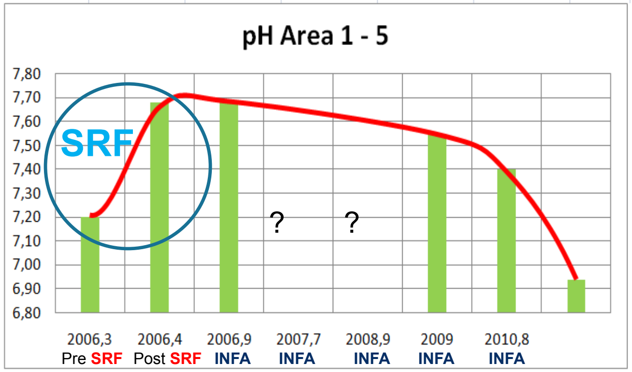
Total: 6.089 Ton

ANAEROBIC…
2011 New SRF

Samples for 2007-2008 INFA* were taken outside the SRF treated Area. Not relevant information.



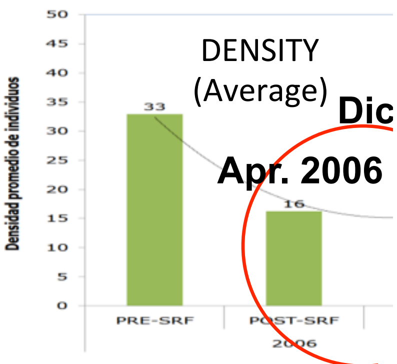




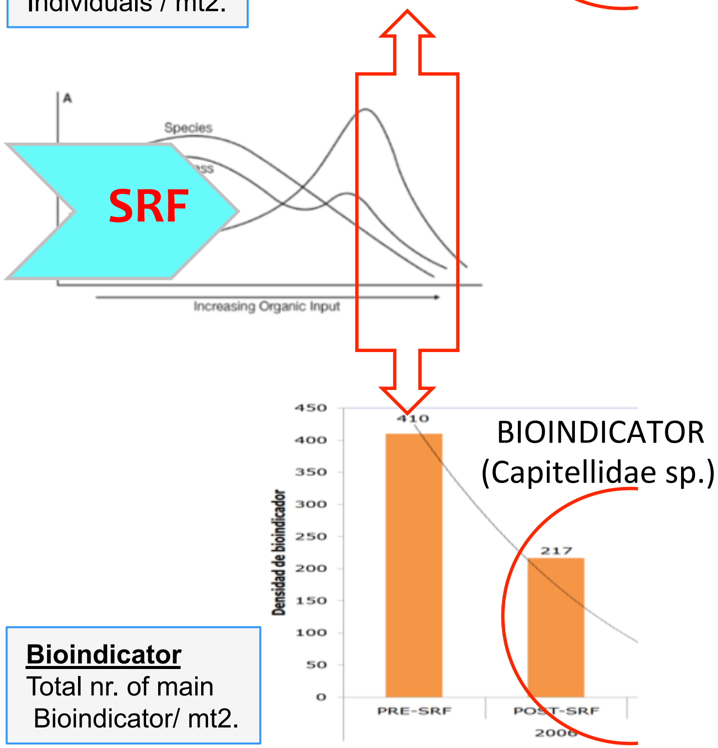
* **INFA**: Informe Ambiental → Enviromental Report & Benthonic Survey.

Benthic Macrofauna

INFAs (2006 al 2010)



Density
Average nr. of Individuals / mt2.



Bioindicator
Total nr. of main Bioindicator/ mt2.

Tipo	Año	Mes	Especie	Densidad promedio
PRE-SRF	2006	Mar	Amphipoda n.d.1	3,3
PRE-SRF	2006	Mar	[illegible]	[illegible]
PRE-SRF	2006	Mar	Cumacea n.d.	3,3
PRE-SRF	2006	Mar	Lumbrineris sp.	3,3
PRE-SRF	2006	Mar	Paraonidae	3,3
PRE-SRF	2006	Mar	Pectinaria elsheri	3,3
PRE-SRF	2006	Mar	Phoxocephalidae	16,7
PRE-SRF	2006	Mar	Prionospio peruana	10,0
PRE-SRF	2006	Mar	**Capitella sp.**	**410,0**
PRE-SRF	2006	Mar	Cirriformia sp.	3,3
PRE-SRF	2006	Mar	Haploscoloplos kerguelensis	3,3
PRE-SRF	2006	Mar	Lumbrineris sp.	6,7
PRE-SRF	2006	Mar	Paraonidae	3,3
PRE-SRF	2006	Mar	Phoxocephalidae	3,3
PRE-SRF	2006	Mar	Polydora sp.	3,3
			(Total sp.: 15) AVERAGE	32,9

[illegible]

Especie	Densidad promedio
Capitella sp.	**216,7**
Capitella sp.	**6,7**
(Total sp.: 22 / 24) AVERAGE	**16,3 / 17,3**

Summarizing…….why SRF ?

Environmental & Biological

- Cuts down Organic Matter % in the seabed sediments.
- "Instant" recovery of main chemical parameters (Eh & pH) favoring conditions for repopulation by the macro and micro fauna (surrounding area & water column).
- **SRF** contributes actively to restore the biological balance and the carrying capacity of a sedimentary environment on which it's applied.
- **SRF** produces a bioturbation-like effect, irrigating the sediments with oxygen enhanced water, shortening benthic physico-chemical and well as biological recovery span time (weeks vs years).

Regulatory, economical & operational

- Environmental remediation and improvement of the sediment's quality avoids closure and/or loss of farming license.
- Keeps the farm operational and in the best production & sanitary conditions.
- Quality and value of aquaculture/farming licences and/or site concession increases due to the sustained remediation of sediments over time.
- Very good & sustainable practice, clears or at least mitigates a large portion of its local ecological footprint (BAP certifiable ?).

Is SRF cost effective ?

COST / BENEFIT ANALYSIS

NO COST WAS ASSIGNED TO:

- Operational disruption & risks involved in relocating a farm.

- Risks & hidden costs related to operating a new production site (farming, logistics, sanitary conditions, animal health, etc.).

- Temporal loss and / or devaluation of a valuable asset (farm site).

¿.....?

Cost/Benefit SRF

Cost / Benefit estimated for a 20 cage farm (each 20x20) (abt. 1.500 MT)

Economic comparison	Total Cost
(Note # 1) Seabed Recovery System (SRF)	USD 65.146

Note # 1: For calculation of the **SRF** tho following parameters were used :

a.- **Total surface to be recovered : 20.358 m²**

b.- **SRF** Rate : USD 2,70 / m²

Additional Costs : USD 0,50 / m² (includes equipment transport, fuel, Laboratory analysis, divers, etc. that are not included in the Service)

TOTAL : USD 3,20 / m²

Note # 2: The lease or rental value of sites varies considerably depending on location, farming conditions, infrastructure available on site etc. We considered a lease fee of **USD 100.000** /year for a minimum of a 3 year period.

UNITARY COST (USD/Kg)

Seabed Recovery System (**SRF**)	USD 65.146
Last out period (# of production cycles between one **SRF** and the next)	3 Cycles
Production per cycle app.	1.536.000 Kgs
Total production between each **SRF**	4.608.000 Kgs
Cost per kilo of fish produced SRF	**USD 0,0141/Kg**

Less than 1,5 cents/Kg (0,68 cents/Lb.) for:

- Working under regulatory compliance
- Farming in an environmentally sound site
- Implementing a responsible & less expensive farming policy
- Increasing the value of an important asset
- A powerful PR tool (tell the world you are taking care !!)
- A big step towards our goal:

"Double in a decade – Responsibly"

SEABED RECOVERY SYSTEM

(LAKEBED , RIVER, POND, ESTUARY……)

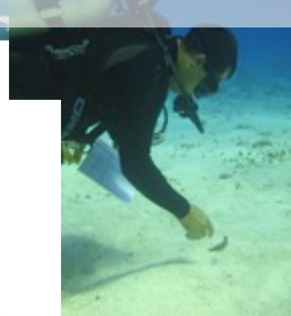
SRF

rv@pamar.cl

Raimundo Vives F.

Skype: raimundo_vives

Cel. +56 9 9 827 7478



DVS TECNOLOGÍA

Adolfo Alvial Asesorías

Un Respaldo que Distingue