



The 9th APEC/RDEAB
Workshop On Agricultural Biotechnology



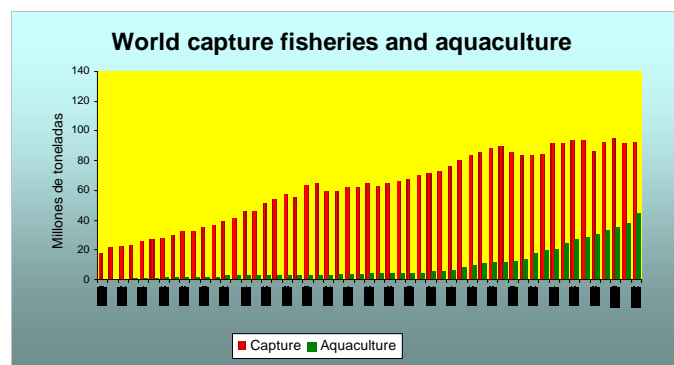
“Biotechnology Applications to Fish Breeding in Chile”



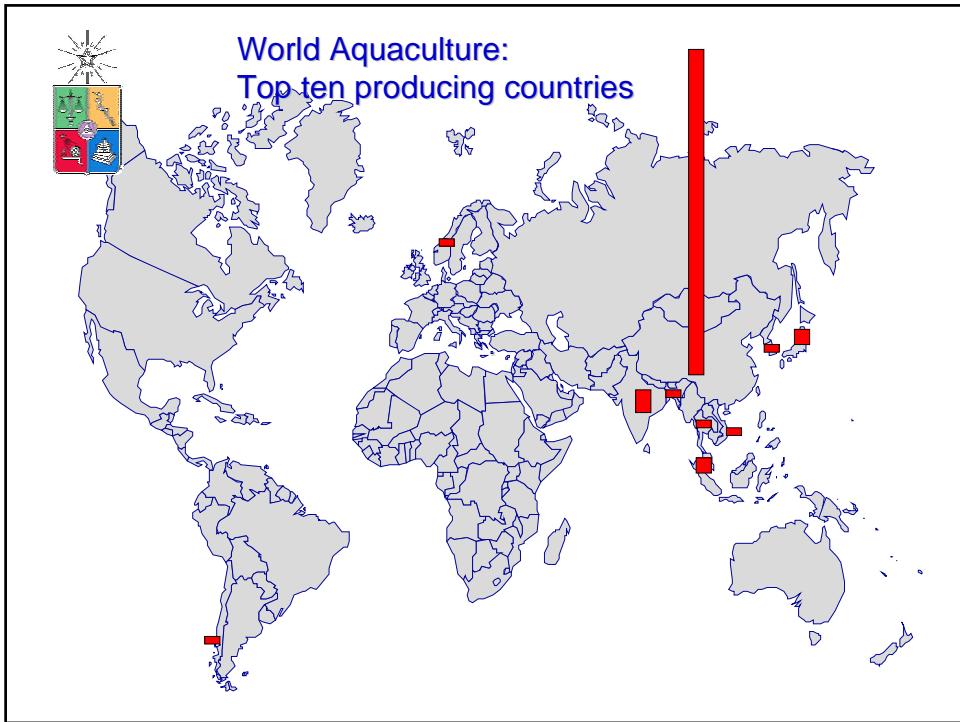
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- Aquaculture have grown at an annual rate of 9.2% since 1979
- Capture fisheries have grown at an annual rate of only 1.4%
- Terrestrial animal production have grown at an annual rate of 2.8%
- Global production from capture fisheries and aquaculture, have provided an apparent per capita supply of 16.2 kg



AQUACULTURE: EXTENSIVE PRODUCTION SYSTEMS

This block illustrates extensive aquaculture systems through several examples:

- Egipto:** A photograph of a large outdoor fish pond with a date stamp of 05/04/2004.
- China:** A map of China is shown in green, with the word "China" written on it.
- Carps in China:** A photograph of a large silver fish being held by a person.
- Tilapias, South E. Asia y North Africa:** A photograph of a tilapia fish.
- India:** A map of India and Southeast Asia is shown in green, with the word "India" written on it.
- S. E. Asiatico:** A photograph of people working in a pond, with the text "S. E. Asiatico" written below.
- Clam:** A photograph of a clam shell.



AQUACULTURE: INTENSIVE PRODUCTION SYSTEMS



Salmons and trouts in
Norway, Chile and others

MODELS FOR AQUACULTURE DEVELOPMENT



IN COUNTRIES LIKE CHILE AQUACULTURE WILL FOLLOW THE
SAME PATTERN OF GROWTH AND DEVELOPMENT AS THAT
OF ANIMAL PRODUCTION





As a result, many scientific and technological tools have been developed and gradually incorporated to aquaculture activities, which are common to agriculture, especially to animal husbandry.

reproductive management



market technology



use of biotechnology



Disease management and control



nutrition and feeding



genetics and breeding

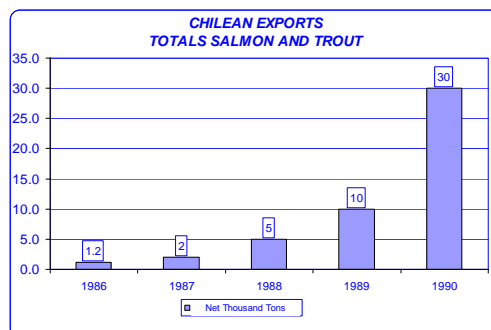


Post harvest and processing



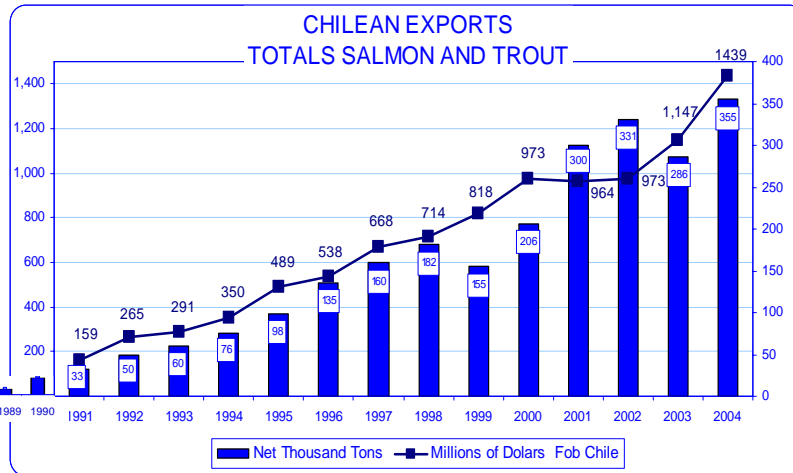
LA SALMONCULTURE IN CHILE

There were 36 production centers in 1986 producing 1.200 Net tons

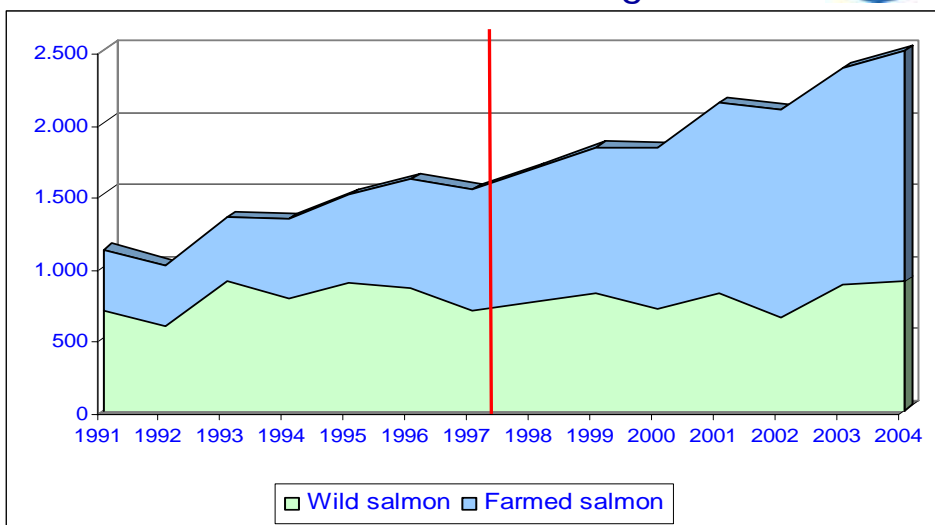




LA SALMONCULTURE IN CHILE



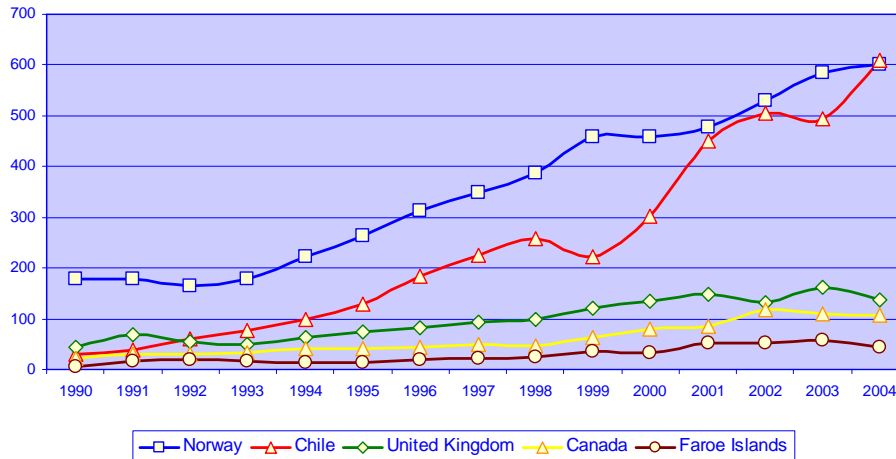
World production of Salmon & Trout Thousand tons round weight



World production of farmed Salmon & Trout



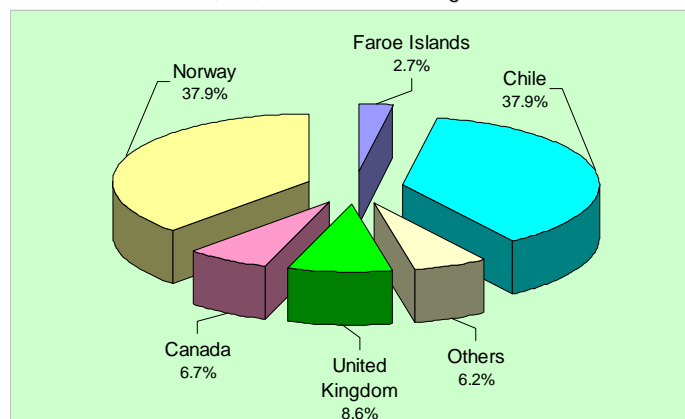
Thousand tons round weight



World production of farmed Salmon & Trout 2004



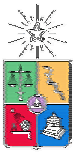
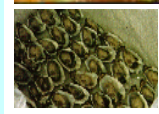
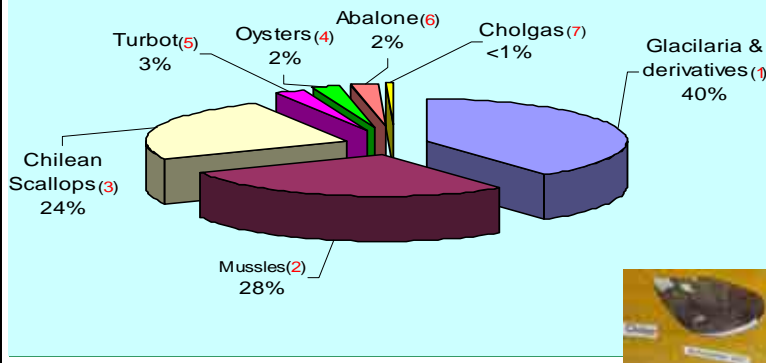
1,586,000 Tons round weight





CHILEAN AQUACULTURE

TOTAL EXPORTS OF CHILEAN AQUACULTURE BY SPECIES
2003/2004



FAMILY BASED BREEDING PROGRAMS IN AQUACULTURE

Trygve Gjedrem (2004)

Species	Country	Company	Started	Families tested per year	No of traits	Industry prod. of the strain, 1000 tons
Atlantic Salmon	Norway	AquaGen ¹	1971	400	7	200
	Norway	SalmoBreed	1999	300	7	200
	Norway	Marine Harvest				
	Norway	Rauma				
	Chile	GENTEC/AFGC	1996	150	2	
	Chile	AquaChile	1997	200	4	44
	Canada	ASBDP		90	2	
	Faroe Island					
	Iceland	Stofniskur	1995			
	Scotland	Landcatch		200	6	
Coho	Ireland	Marine Harvest	1998			
	Chile	AquaChile	1997	120	4	10
	Chile	IFOP	1992	100	2	5
Rainbow trout	Canada					
	Norway	AquaGen ¹	1971	300	5	30
	Norway	SalmoBreed	2000	150	8	30
	Finland	MTT	1992			
	Chile	GENTEC/AFGC	1997	150	1	
Chile	AquaChile	2000	120	3	7	

^{1/} Started by AKVAFORSK(AF)

^{2/} Started by CSIRO Marine Research and University of Tasmania



FAMILY BASED BREEDING PROGRAMS IN AQUACULTURE
Trygve Gjedrem (2004)

Species	Country	Company	Started	Families tested per year	No of traits	Industry prod. of the strain, 1000 tons
Nile tilapia	Philippines	GENOMAR ¹	1989			
	Equador	/AFGC	2004			
	Vietnam	RIA 1(AF)	1999	100	3	
Seabream	Greece	ENALIOS/AFGC	2002	50	3	
Seabass	Greece	ENALIOS/AFGC	2003	50	3	
Cod	Norway	Inst. Fisheries	2003			
	Norway	MarineBreed	2002	50	3	
	Iceland		2004			
Turbut	Spain	Stolt Seafarm		50	1	
Channel catfish	USA					
Rohu carp	India	CIFA(AF)	1993	60	1	
Shrimp	Columbia	CENIACUA/AFG	1998	210	3	5
	Hawai	HHA				
Pacific oysters	USA	MBP	1996	100	3	
	Australia	ASI ²	1996	50	3	0.5-1.0
	New Zealand		1997			
Scallops	Chile	APOCH/fiop	1998	80	1	
Mussel	New Zealand					
Abalone	Iceland	Stofniskur				
	Chile	UCN	2002	100	1	

¹ Started by AKVAFORSK(AF)
² Started by CSIRO Marine Research and University of Tasmania



The very high genetic variability and the higher fecundity of aquatic species allows the application of higher selection intensities resulting in greater selection responses than those observed in terrestrial animals.

Atlantic salmon	10.6-14.2 %	Gjerde et al., 1986
rainbow trout	13.0%	Gjerde et al., 1986
channel catfish	12-20 %	Dunham, 1987
Coho salmon	10.1 %	Hershberger et al., 1990
Coho salmon	9.4-10.3%	Neira et al., 2002, 2005
Tilapias	17.0%	Eknath, 1997
Marine Shrimp	4.4%	Fjalestad et al., 1997



SALMON BREEDING PROGRAM

OBJECTIVE:

The general objective of the breeding program is to improve the efficiency of the production system, in economic terms, through a continuous modification of the traits of interest by genetic means, in order to obtain high quality fishes, competitive for the international market.



- 100-150 females mated to 35 – 45 males are selected each generation generating fullsib and halfsib families

- Each cohort is individually hatched, keeping only those families that successfully pass tests for diseases (BKD, IPN ...)
- This very severe sanitary management is also applied to massive ova production





- 1500 alevins randomly chosen from each family are raised in separate tanks until they are individually tagged or freeze marked



- Management is design to ensure that all families are given the best and identical environmental conditions until individually marked



IDENTIFICATION

Genetic evaluation is based on individual identification of fishes



ELECTRONIC TAGGING



FREEZE MARKING
(REPLICATES)

