



Breeding is good for E.U. !

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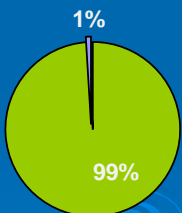
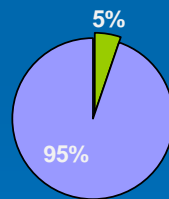
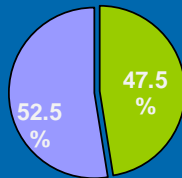
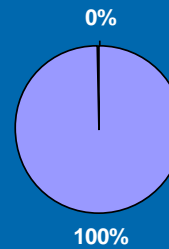
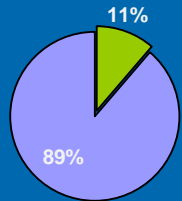
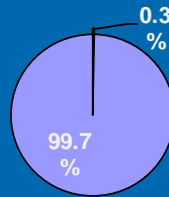
Quality Assurance in Freshwater Aquaculture
16, 17 October 2008 - Treviso, Italy

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Fish is (and will be) a **farmed** product



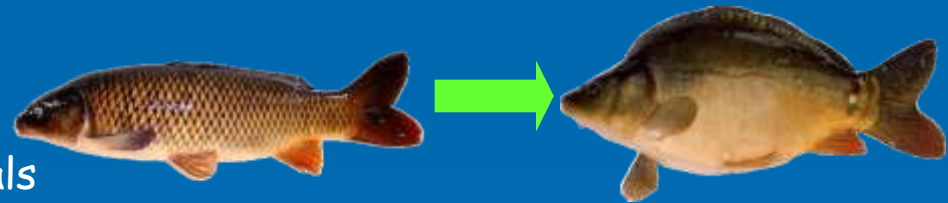
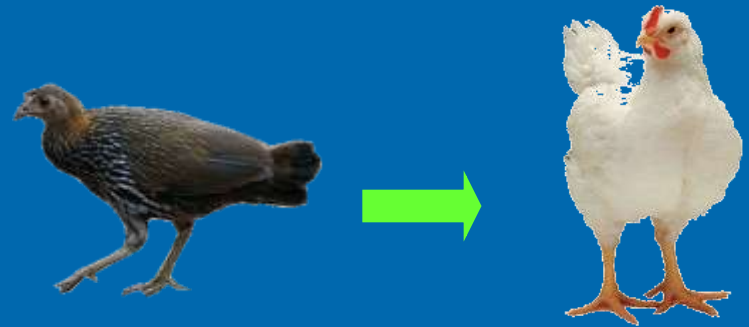
... but breeding of many species is still in its infancy !

Source :FAO/Fishstat, 2005 data

Other farm animals are domesticated and selected

Why domesticate ?

- Limit dependance on natural stocks
- Improve sanitary status of stocks
- Better adaptation to farming
- Model the animal to the market needs



Specificities of fish

- Many wild stocks with different potentials
- Most species not or hardly domesticated
- Our luck: ability to speed up and control the domestication process



Breeding can do a lot !

➤ Comparison of 1957 and 2001 broiler strains

1957



Day 43

Day 57

Day 71

Day 85

➤ Body weight
810g → 3950g

➤ Carcass Yield
60.8% → 74.4%

➤ Breast Yield
11.4% → 21.3%

2001



All were fed 2001 feed

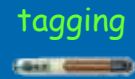
How does breeding work ?

Directed matings
50-1000 parents
(closed stock)



Selection of best individuals and families based on performance, pedigree, (markers)

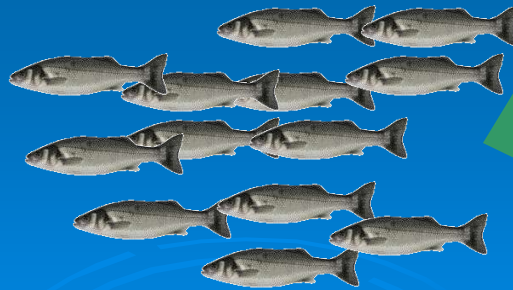
1000-50.000 progeny from 50-1000 families



Performance evaluation

Within population

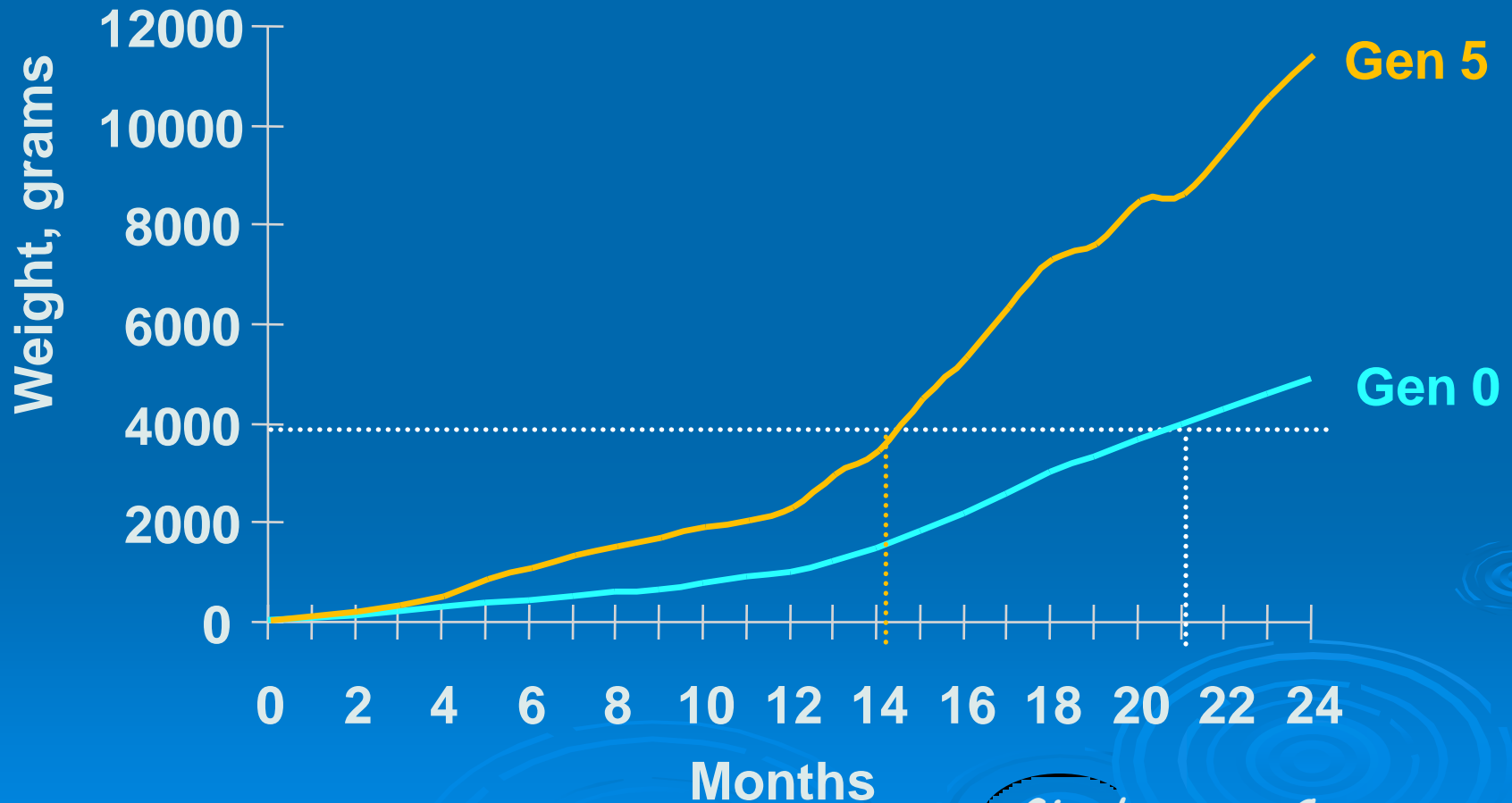
Progressive combination of the favourable genes for the traits considered



Major facts about breeding

- Any trait can be selected for (growth, processing yields, shape, fat %, disease / stress resistance,...)
 - ➔ can shape the animal to a desired standard
- Gain is cumulative over generations
 - ➔ what is gained is gained
 - ➔ there is (almost) no limit
- Possibility to make the breeding objective evolve

Evolution of growth in salmon



Gjerde, pers. Comm.

One generation in sea bass

Control: 390g at 21 months



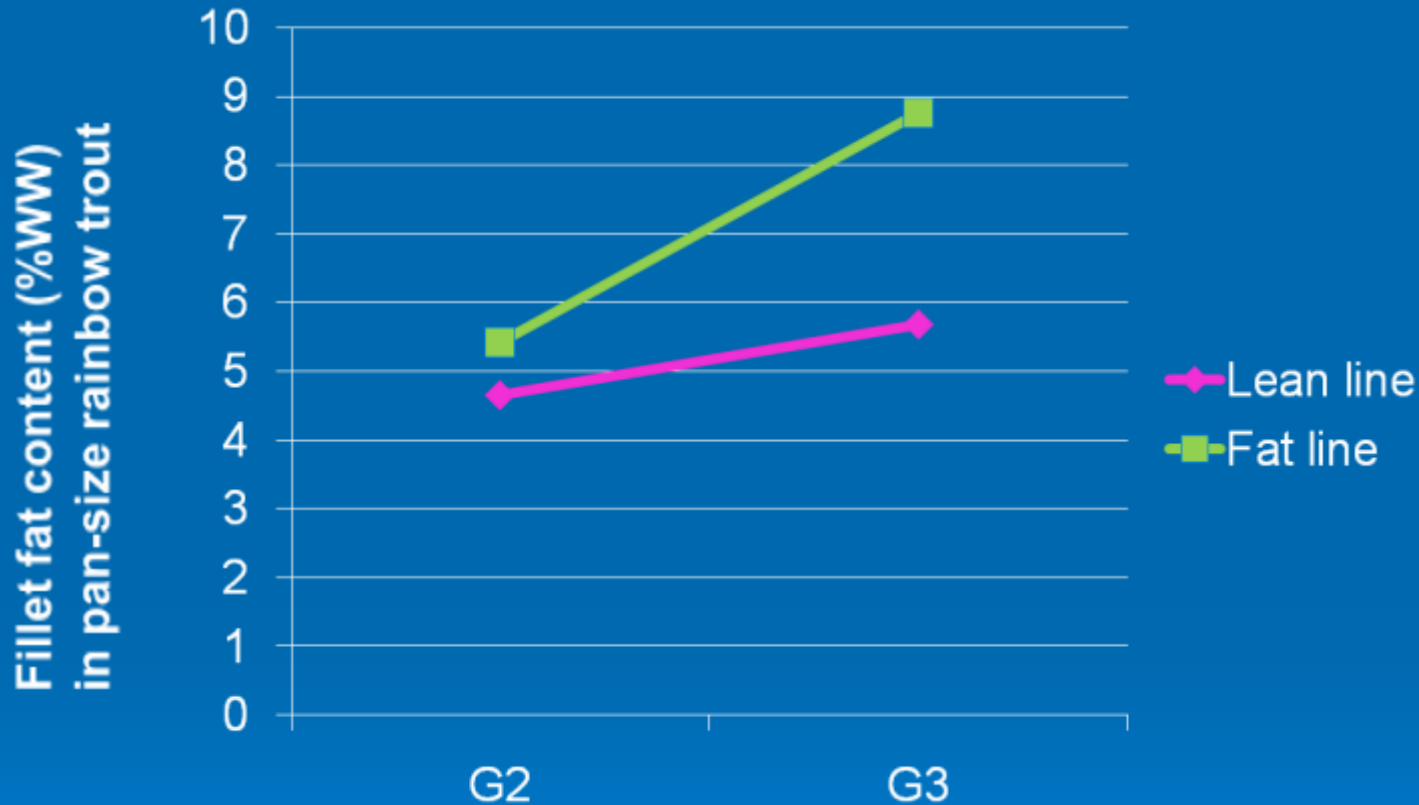
Selected: 469g



→ Gain 5-6 months to harvest size in 10 years, or harvest at 700g

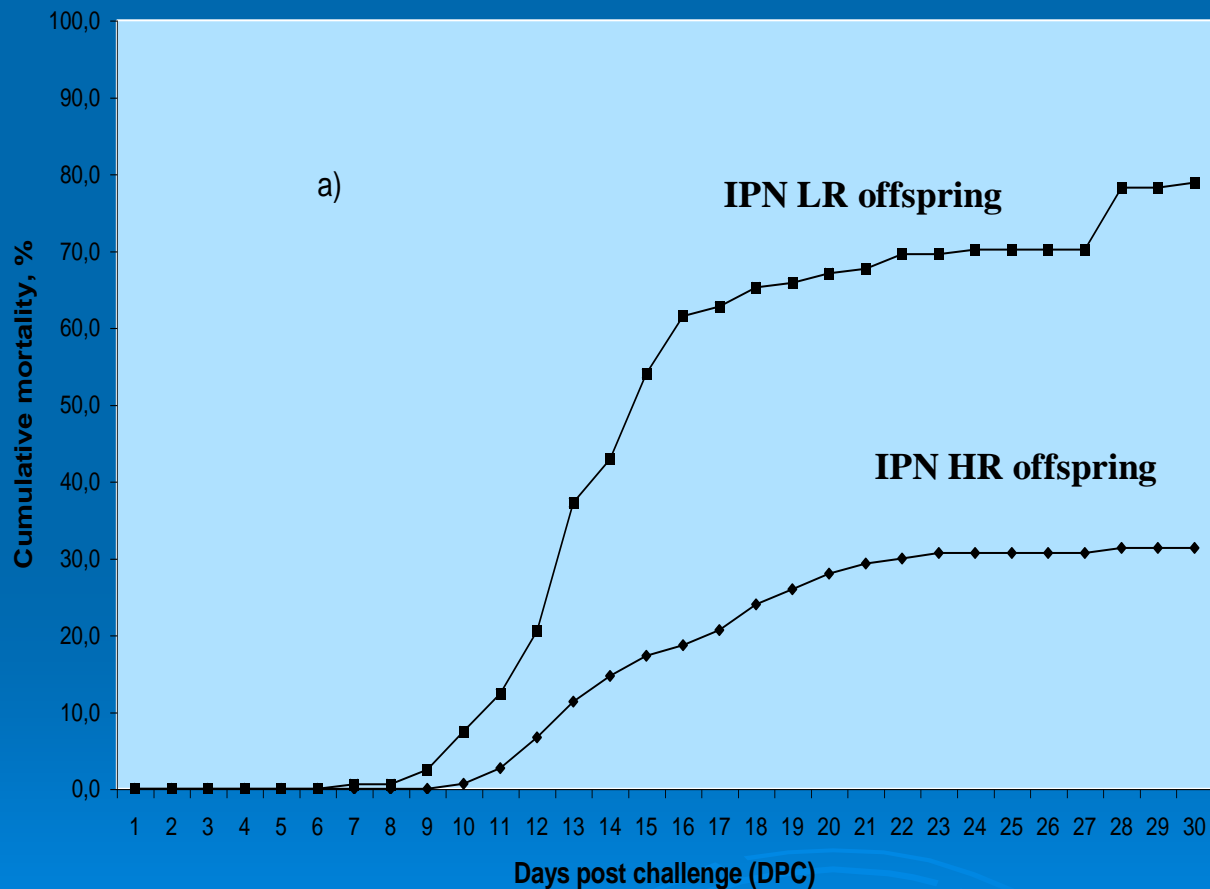
Vandeputte et al, Aquaculture, in press

Quality also...



Quillet et al, 2005, Aquaculture 245 49-61
Quillet et al, 2007, Aquaculture 269 220-231
Quillet et al, comm. pers.

...and disease resistance



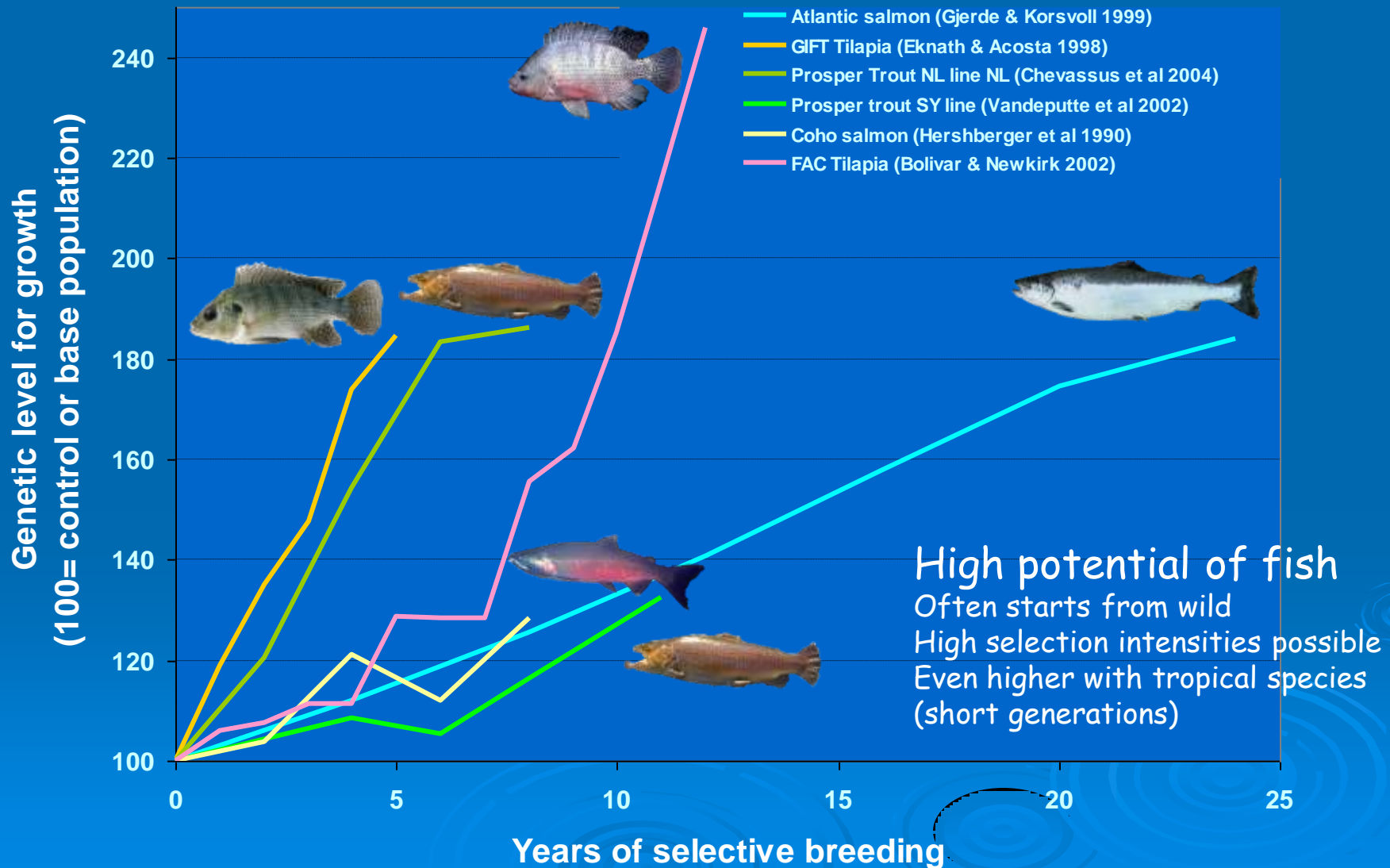
Smolts in IPN bath challenge
1 generation of selection
305 families

28 HR parental families
(1.9% mortality in challenge)

9 LR parental families
(85% mortality in challenge)

Offspring produced from both

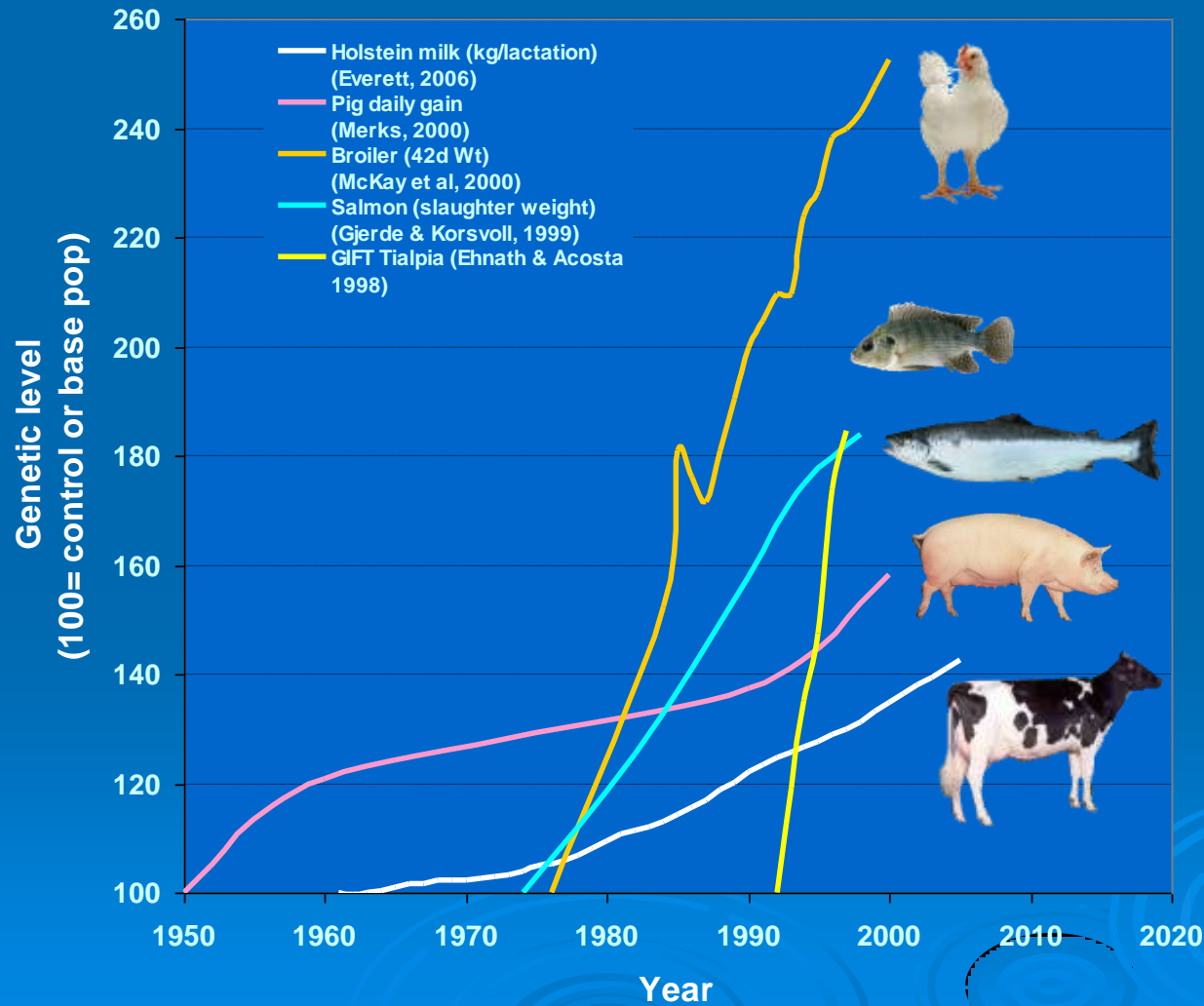
Breeding for productivity in fish



What do we gain from selection ?

- From a national perspective, the Benefit/Cost ratio is estimated to be :
 - 15 in salmon (Gjedrem, 1997),
 - 8.5 to 60 in tilapia (Ponzoni et al, 2007),
 - 22 to 420 in common carp (Ponzoni et al, 2008).
- Depends a lot on the traits selected for and on the evolution of feed efficiency with growth rate

Breeding in fish can lead to quick results



Potential problems with breeding

- Breeding efficiency is best achieved in the long term
 - sustained effort and support necessary
- Undesirable side effects on fitness traits
 - have to be monitored and genetic basis explored
- « Genetic pollution » of wild stocks with escapees
 - is it worse than with non selected stocks ?
 - containment with sterile (triploid) fish
- Breeding is not always the best solution

Breeding is good for EU aquaculture !

- There is a considerable biological potential
- Excellent scientific and technical knowledge
- A growing industry should use the most efficient technologies (including breeding)
- An overall benefit foreseen for the EU aquaculture sector













AquaBreeding survey

polled organisations
and
selected species



32 breeding programs
29 organisations
12 species

...

Species	Nb. of breeding programs	Country
 <i>Oncorhynchus mykiss</i>	8	Denmark Finland France France France Norway Norway
 <i>Salmo salar</i>	6	Ireland Norway Norway Norway Norway UK
 <i>Sparus aurata</i>	5	France Greece Greece Greece Israel
 <i>Dicentrarchus labrax</i>	2	France Greece
 <i>Gadus morhua</i>	2	Norway Norway
 <i>Scophthalmus maximus</i>	2	France Spain
 <i>Crasostrea gigas</i>	2	France France
 <i>Salmo trutta</i>	1	France
 <i>Acipenser baeri</i>	1	France
 <i>Solea solea</i>	1	The Netherlands
 <i>Oreochromis niloticus</i>	1	The Netherlands
 <i>Argyrosomus regius</i>	1	France

Species	Year	Number of breeding programs	Number of parents	Number of offspring	Number of lines	Number of traits	Number of technologies	Number of molecular tools	Number of selection types	Number of breeding programs	Number of seeds
Arabidopsis thaliana	2000	10	100	1000	10	10	10	10	10	10	10
Arabidopsis thaliana	2005	15	150	1500	15	15	15	15	15	15	15
Arabidopsis thaliana	2010	20	200	2000	20	20	20	20	20	20	20
Arabidopsis thaliana	2015	25	250	2500	25	25	25	25	25	25	25
Arabidopsis thaliana	2020	30	300	3000	30	30	30	30	30	30	30

National view of breeding programs

Selected traits

Reproductive technologies

Mean number of parents per line

Molecular tools and protection strategies

Type of selection and alternative genetic improvement

Breeding programs and trade of "seeds"

