



Halibut farming in Europe

St. John

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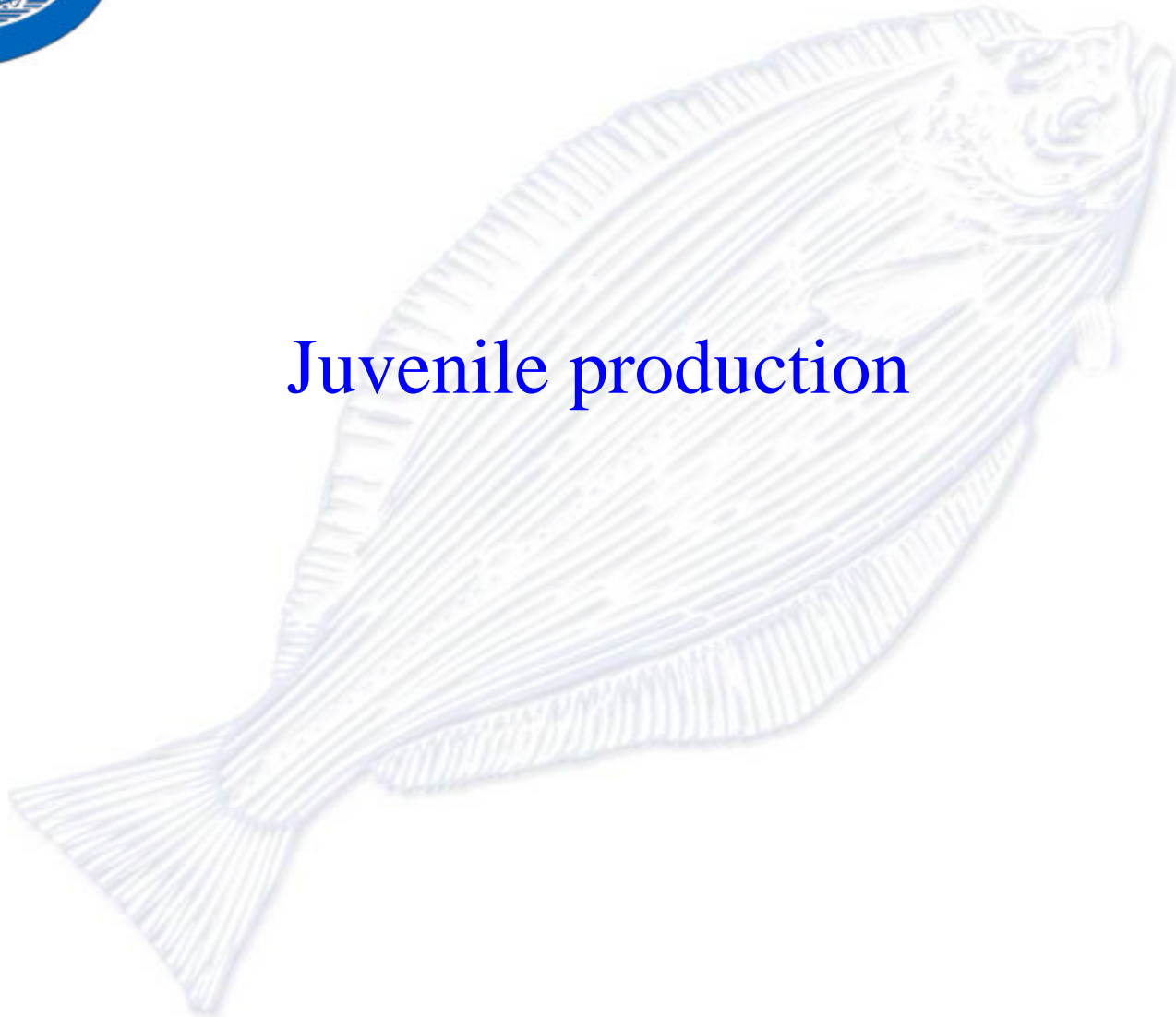


Challenges of Halibut farming

- Juvenile production
 - Complicated larval rearing
 - Quality of juveniles (pigmentation, eye migration and growth potential)
 - Disease (IPN and VNN)
- On growing
 - Needs surface area for growth
 - Long growth cycle
 - Capital intensive production
- Market Development



Juvenile production





FISKEY (Fiskeldi Eyjafjardar)

- The company was established in 1987
- The aim was the mass production of halibut juveniles for on-growing and marketing of farmed halibut.

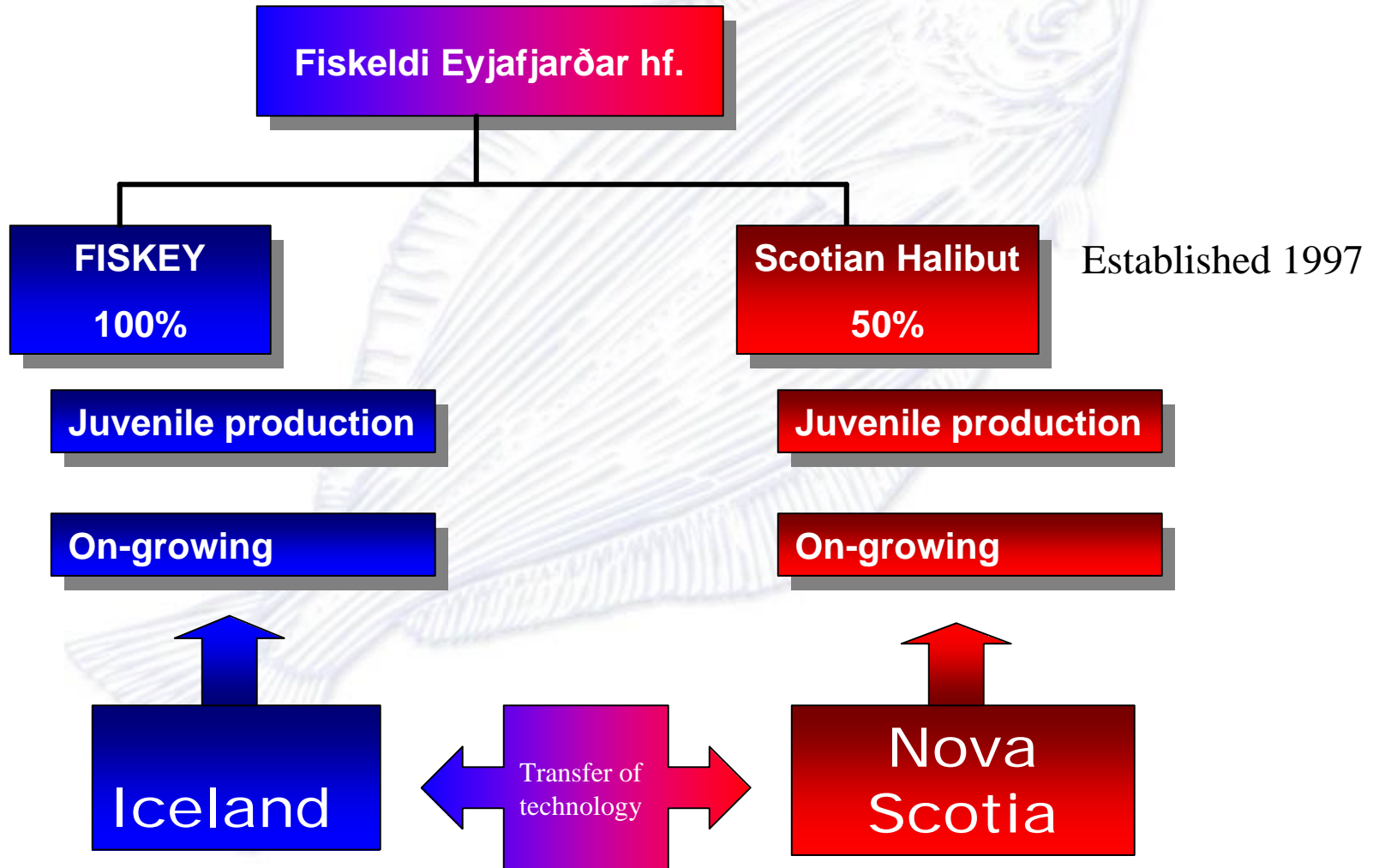
Successful mass production of juveniles in 1998

First fish on the market in 1999

Largest juvenile producer in the world for the last 5 years

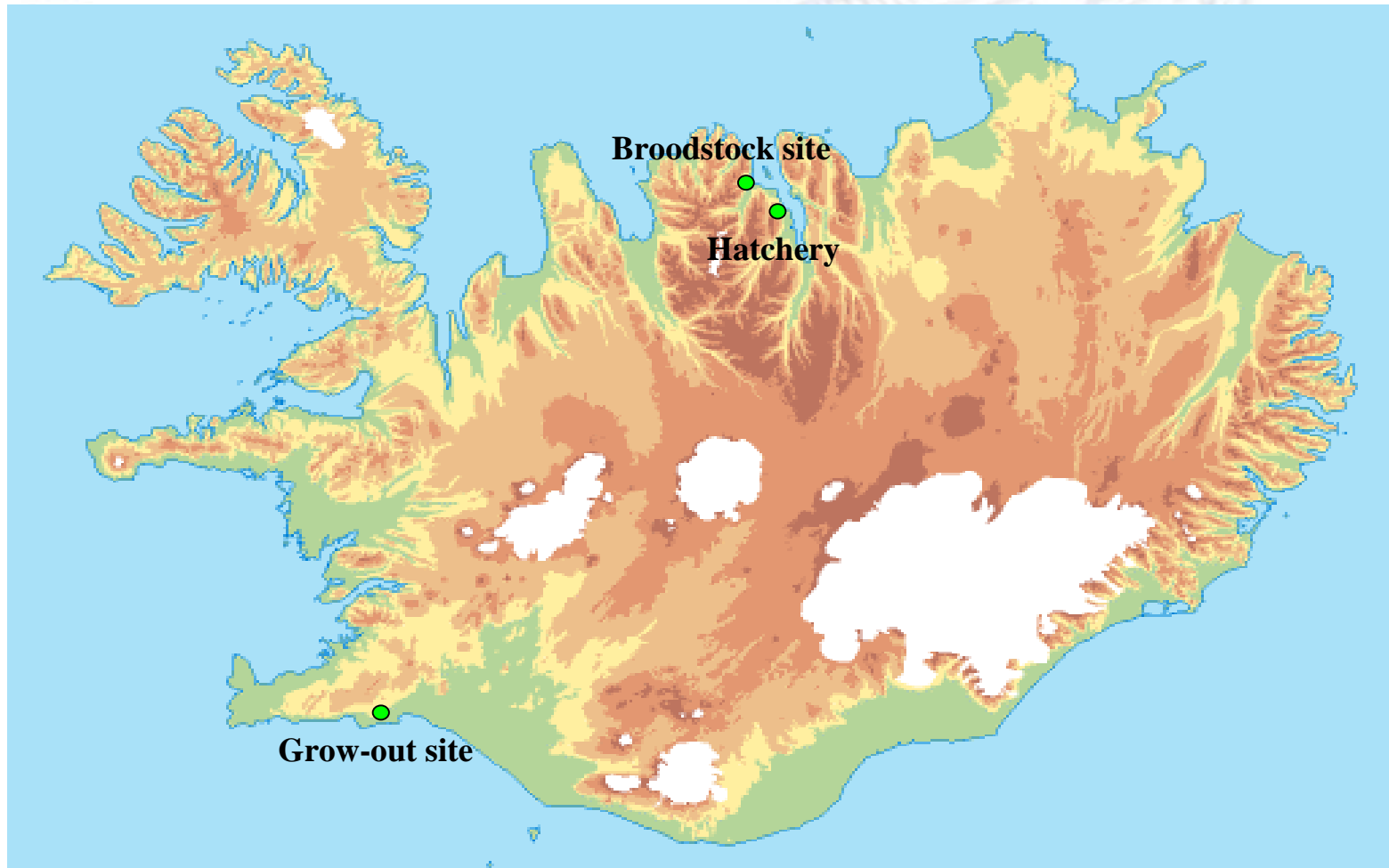


Organization chart





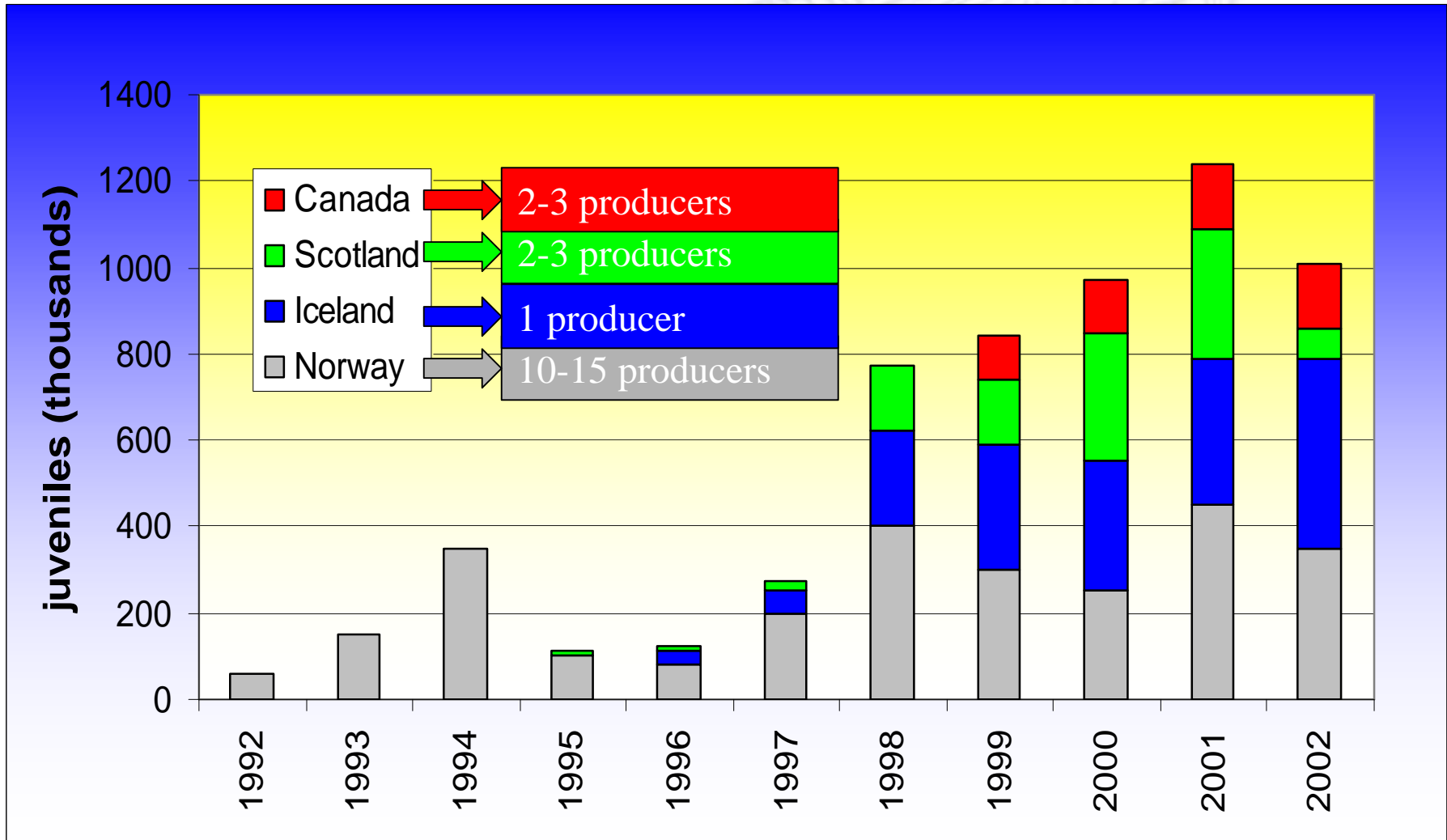
Fiskey's production sites





Juvenile production

Historical data

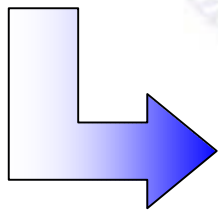




Juvenile production - Fiskey

- Focus on intensive production since 1991
 - Indoor facilities where all environmental parameters can be controlled
 - Brood stock spawning time manipulated (light manipulation)
 - Live feed cultivation (predicted quality and quantity)

Year	Number (>5g)
1996	35.000
1997	50.000
1998	220.000
1999	290.000
2000	300.000
2001	340.000
2002	440.000
2003E	700.000



Stable and gradual increase in production

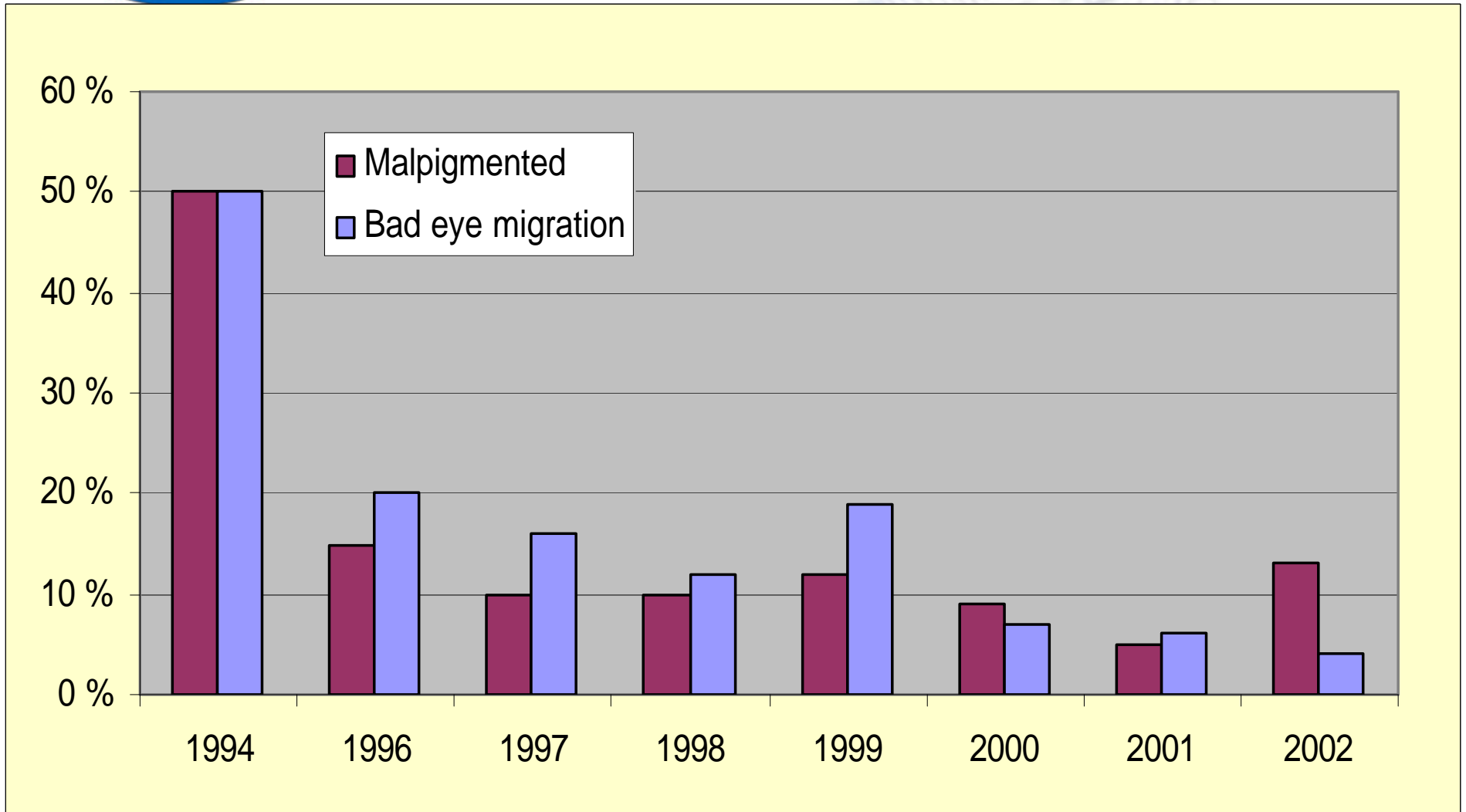


Juvenile Quality

- Metamorphosis
 - Halibut larvae go through a complex change from symmetric larvae (round fish) to an asymmetric juvenile (flatfish)
 - Deficient nutrition before and during metamorphosis results in poor developed fish.
 - Poor eye migration
 - Reduced performance in on-growing (visual feeder)
 - Malpigmented fish
 - Lack of pigment cells on skin results in vulnerability to sun exposure (sunburn)
 - Marketing complications?



Juvenile Quality - Fiskey





Juvenile Health - Fiskey

- Disease free status
 - Intensive production allows for better health management.
 - Regular screening for pathogenic virus and bacteria
 - Long history of disease free status

• IPN and VNN has successively caused problems in Norway and Scotland.



Juvenile Performance

- Healthy fish.
 - Successful juvenile production (high survivals) indicate optimal conditions and is therefore likely to result in undamaged fish with good growth potential.
- Ultimate measurement of quality is overall performance up to market size fish.
 - Implementing breeding program (genetic enhancement) is vital.
 - Breed out early maturing males.
 - Breed in fast growing fish of good flesh quality.
 - Latest DNA technology is a useful aid

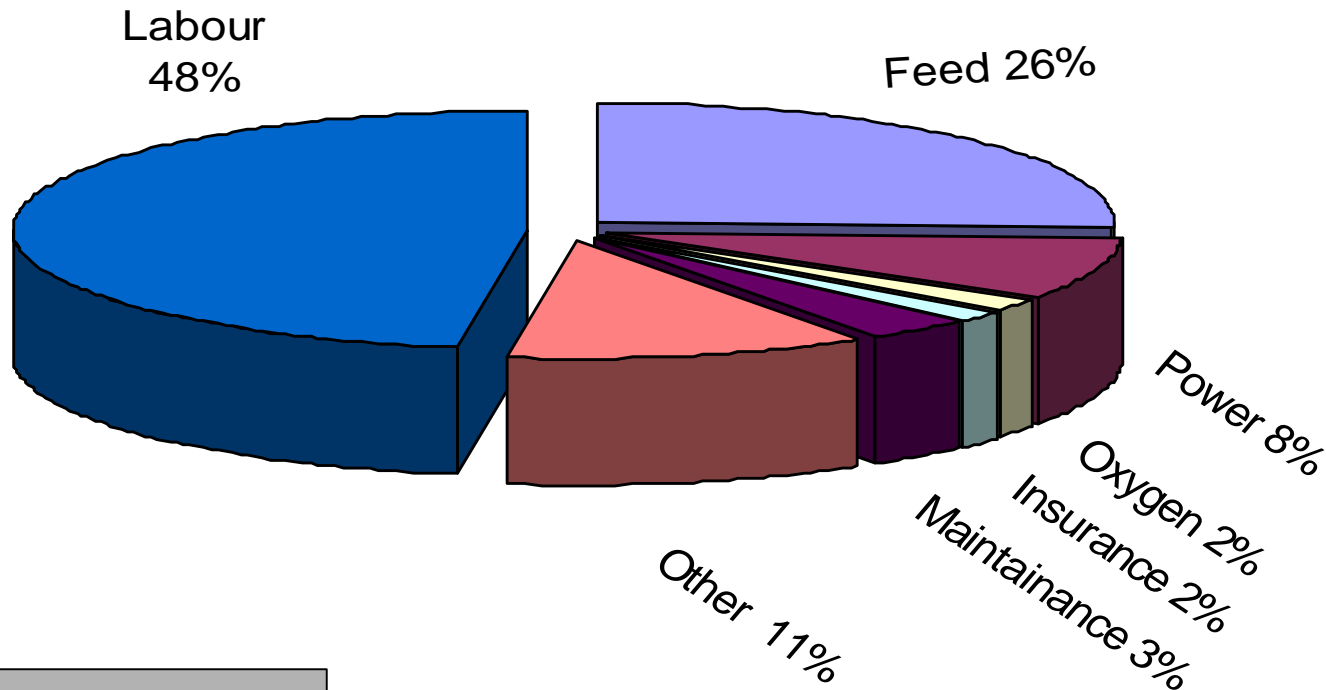
Work on first generation (F1) as soon as possible



Juvenile cost

Increased production and automation can reduce Labour cost

Increased survival reduces feed cost



Depreciation and interest not included



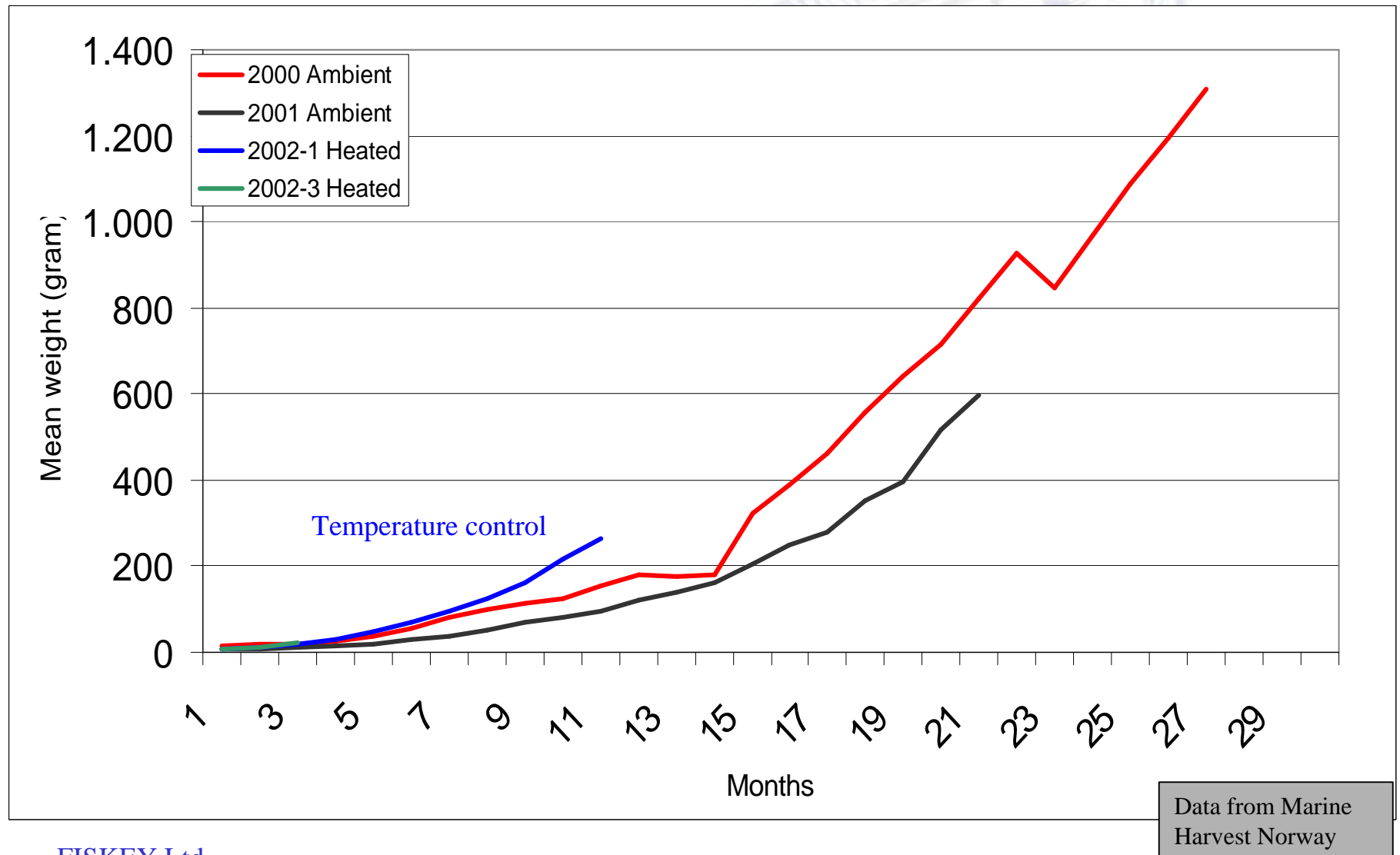
On growing



- Recent developments in Norway look promising.
 - Nursery stage prolonged (0.5-2 kg)
 - Optimal conditions up to 1kg can reduce total growth time 8-12 months
 - Lower mortality in land based tanks than cages which is important because of the high value of each fish.
 - Shelf system designed
 - Improves growth and FCR
 - Better yields from each cage
 - Automatic feeding system
 - Improves FCR
 - Save labour cost

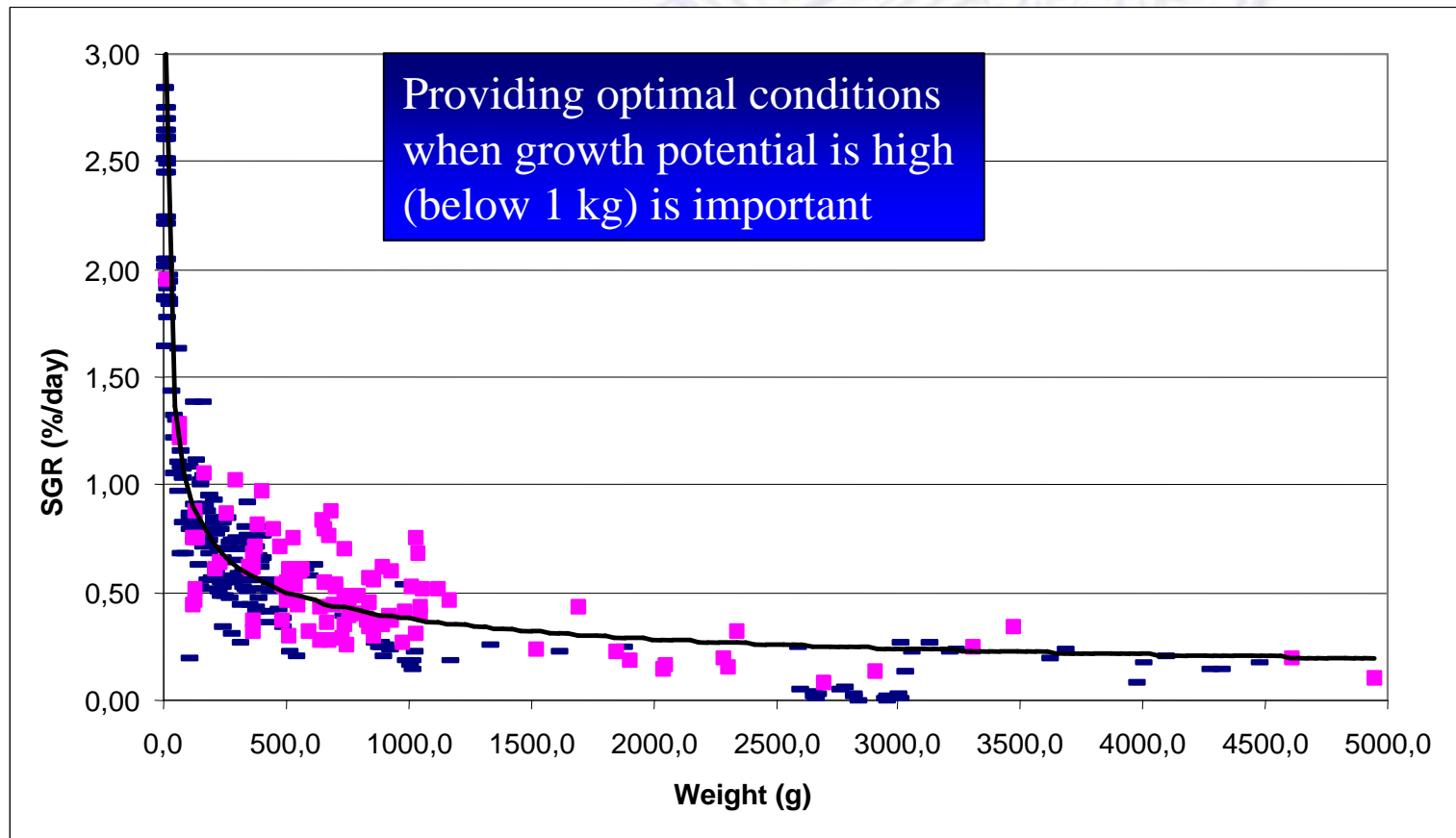


Growth – Impact of temperature control





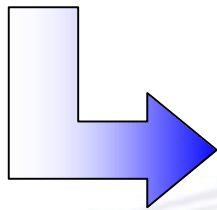
Growth – Impact of size





On Growing – Need for Nursery

- Maintaining optimal temperature for fish below 1 kg is essential to reduce growth cycle
- Small fish have higher growth potential than large fish

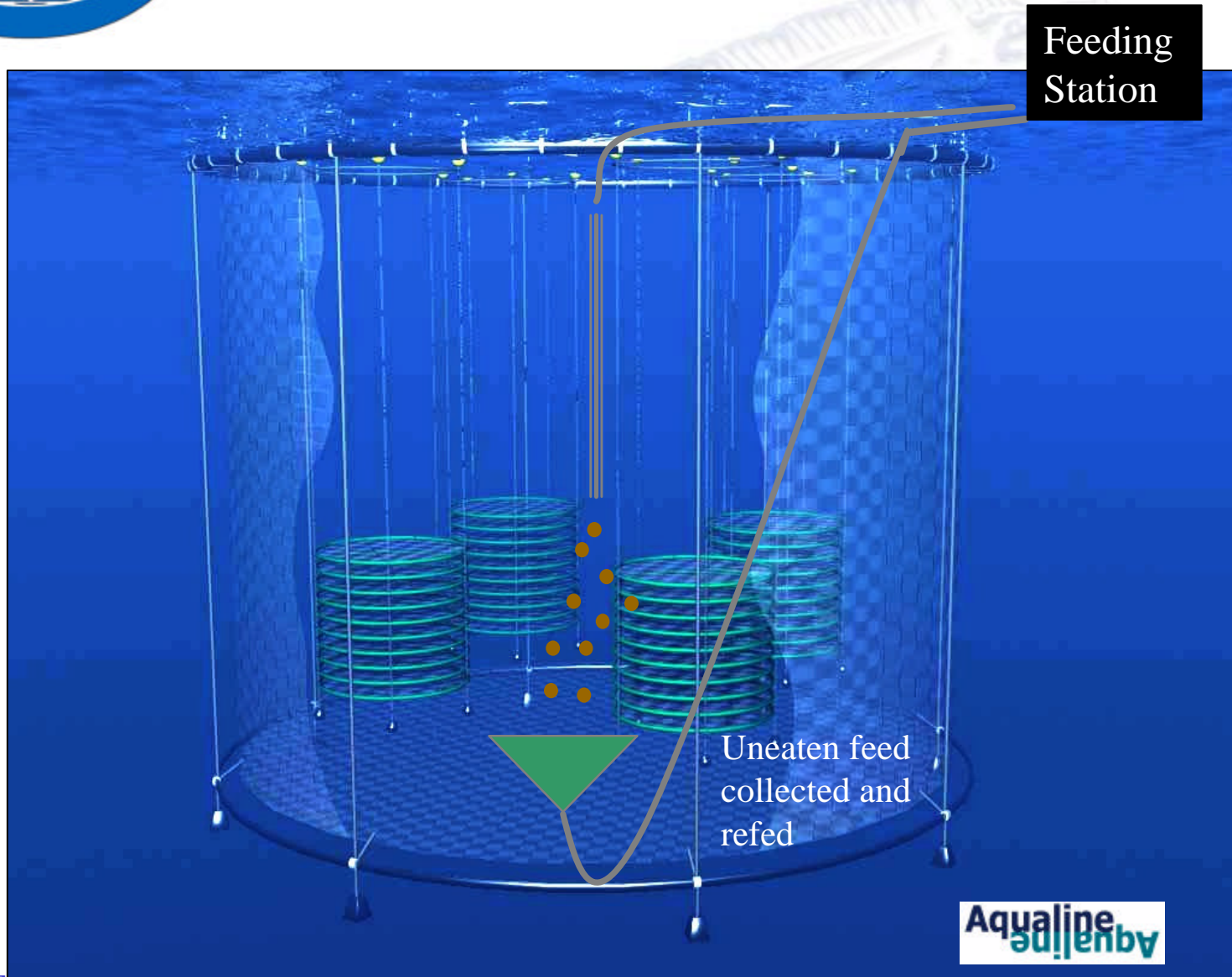


**Land based Nursery
essential**

Resirculation systems improve
economy of operation and provide
better temperature control



Halibut cage system





Cage systems

- Low investment compared to land based farms.
 - 1000 tn land based farm costs 15-20 million \$ (CAN)
 - 1000 tn cage system costs 1.5-2.0 million \$ (CAN)
- Shelves allow for much better yield from the cages
 - Up to 50-75 kg/m² can be expected.
- Deep cages (>10 m)
 - Fish better protected from sun
 - More stable conditions (temperature, salinity, current etc.)



Halibut production

- There are few Halibut producers and they will tend to be big
 - Economy of scale reached at 500-1000 mt
 - Intensive capital investment (buildup of biomass for 3-4 years)
- The production in Europe for the next 3-4 years will reach 3000-5000 MT
 - Largest producers will probably be:
 - Marine Harvest (Norway)
 - Dønna Marin (Norway)
 - Stolt Sea Farm (Norway)
 - Nordic Seafarms (Norway)
 - Marine Harvest (Scotland)



Production Cost in Norway

Land based on growing Up to 1-1.5 kg
 2 sea sites
 Yearly production level (MT) 1.000
 Juveniles put to sea 225.000
 Price per juvenile 5,60 USD
 FCR 1,25
 Av. harvesting weight 5 kgs
 Av. production time 36 months

	USD	USD/kg	%
Cost of juvenile	1.260.000	1,26	18,8 %
Feeding costs	1.400.000	1,40	20,9 %
Insurance costs	392.000	0,39	5,9 %
Wages and benefits	700.000	0,70	10,5 %
Energy, O2 costs	224.000	0,22	3,3 %
Depreciation	490.000	0,49	7,3 %
Other operating exp.	560.000	0,56	8,4 %
Cost of production	5.026.000	5,03	75,1 %
Process. and transp.	756.000	0,76	11,3 %
Net financing costs	910.000	0,91	13,6 %
Total costs	6.692.000	6,69	100,0 %

= 3,0 USD/Lbs.

Salmon

USD/kg	%
0,30	12%
1,10	43%
0,05	2%
0,20	8%
0,12	5%
0,37	14%
2,14	84%
0,35	14%
0,07	3%
2,56	100%

= 1,2 USD/Lbs.

Data from Nordic
Seafarms (Norway)



Market

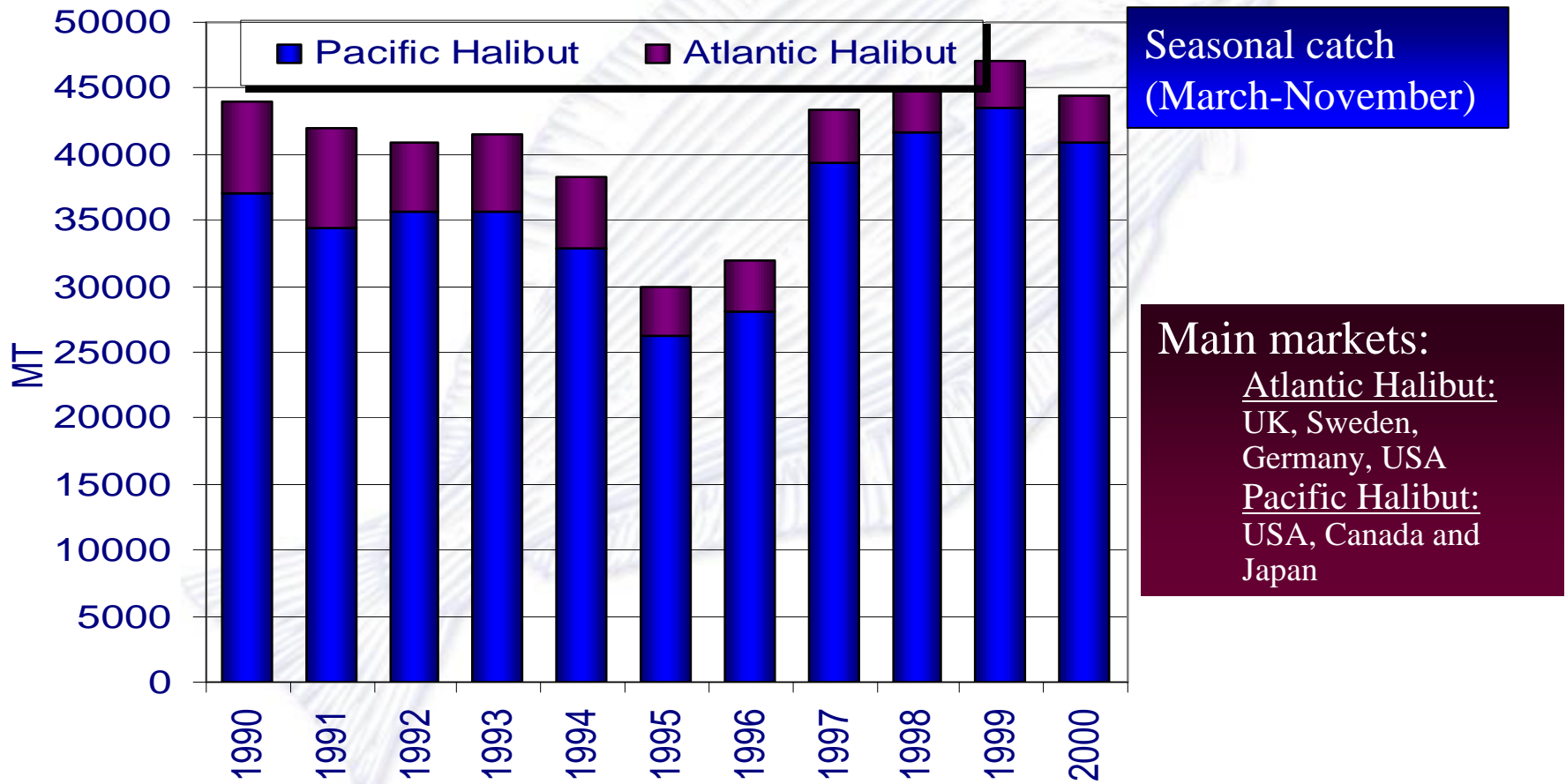


Prospects

- Atlantic halibut is one of the most highly prized edible fishes
 - Tasty, firm white meat.
 - Can be prepared as steaks or fillets
- High price niche product.
- Atlantic Halibut farmed in less than 1000 MT today

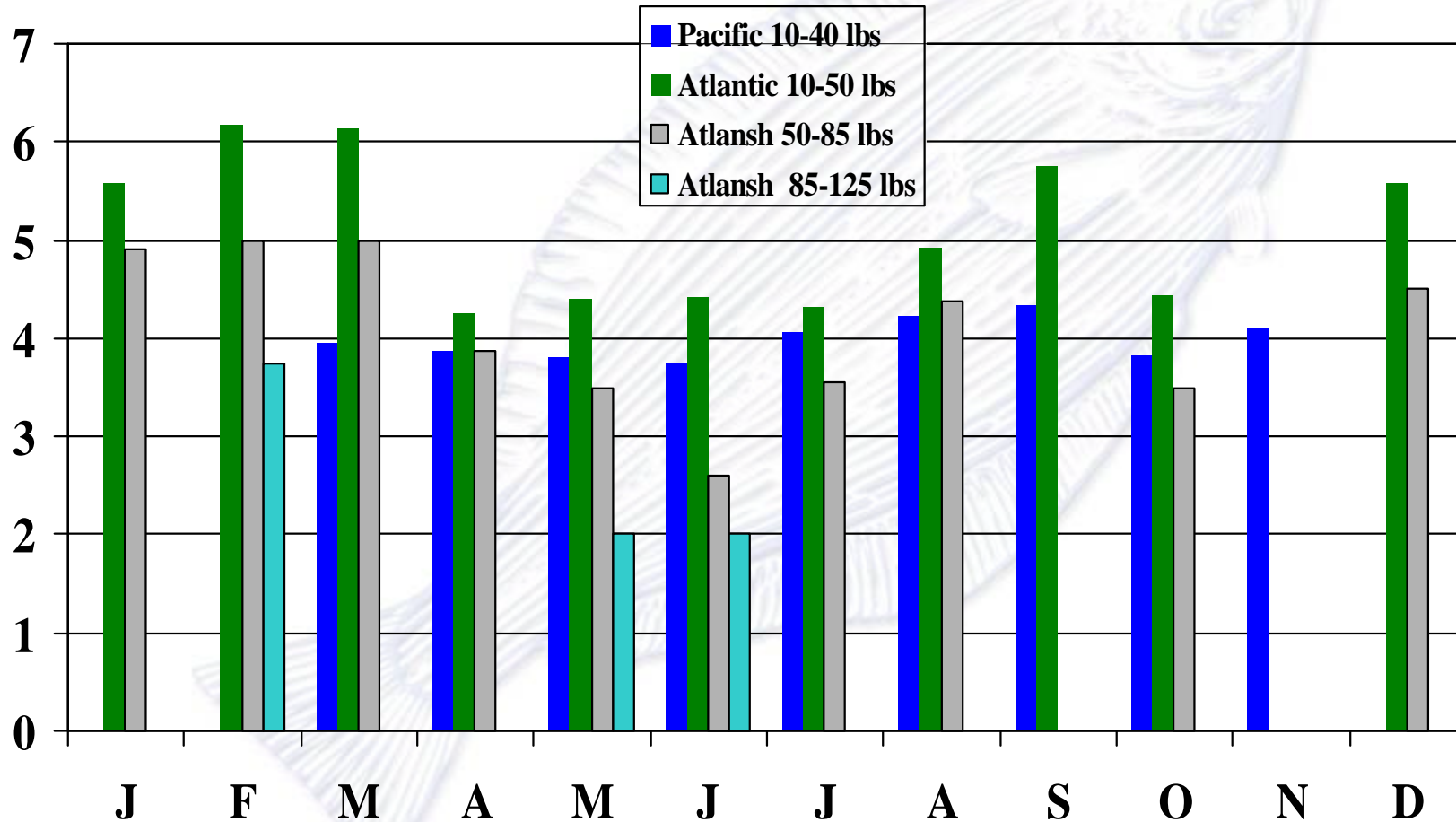


Wild Catch of Halibut





Price USD/lbs (2001)





Market Development

- Largest market for Halibut is in North America
- Most of the fish produced in Europe will be sold on the European market.
 - Some production will enter North American market but then there is an additional 20% transport cost.

Canadian producers benefit from closeness to the market



Thank you