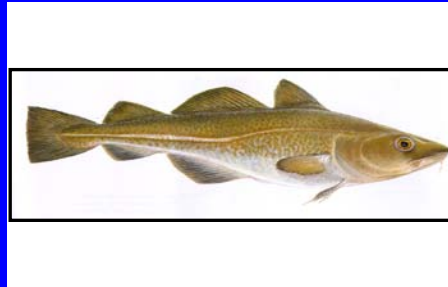




Cod in Icelandic waters: Biology, exploitation and management



Jóhann Sigurjónsson

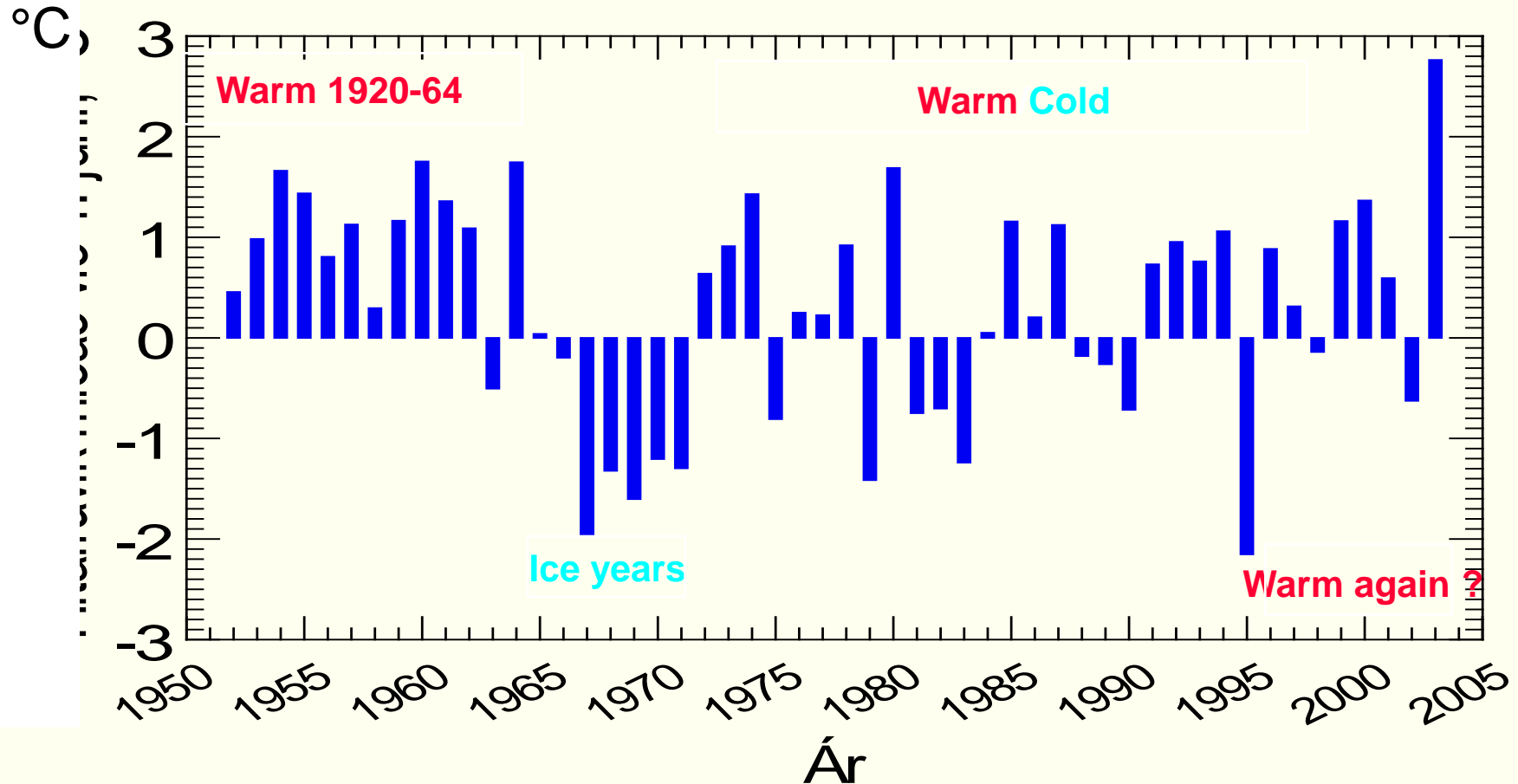
Marine Research Institute, Reykjavik

10th Norwegian-Russian Symposium on
Management strategies for commercial marine species in
northern ecosystems,

Bergen, 27-29 August 2003



Temperature Deviations at Siglunes North Iceland (50m depth) 1950-2003

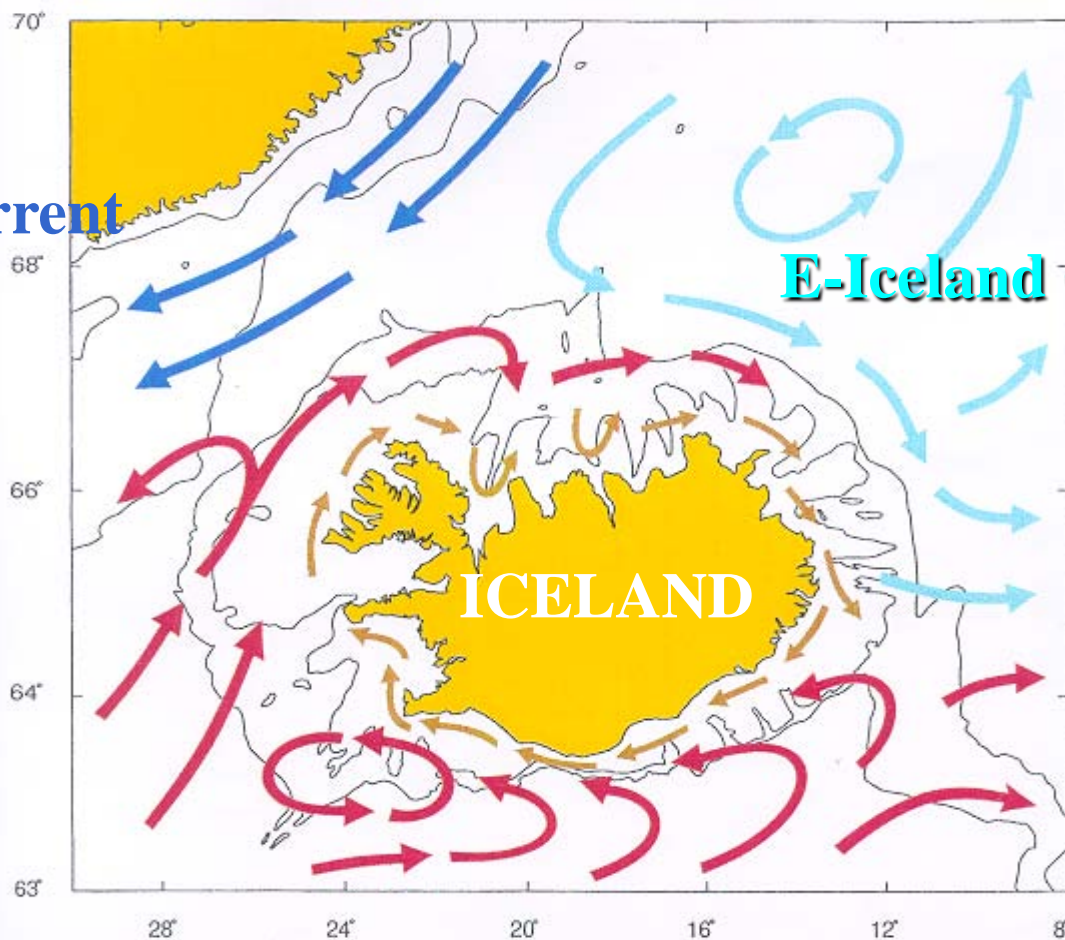




OCEAN CURRENTS

E-Greenland Current
(cold)

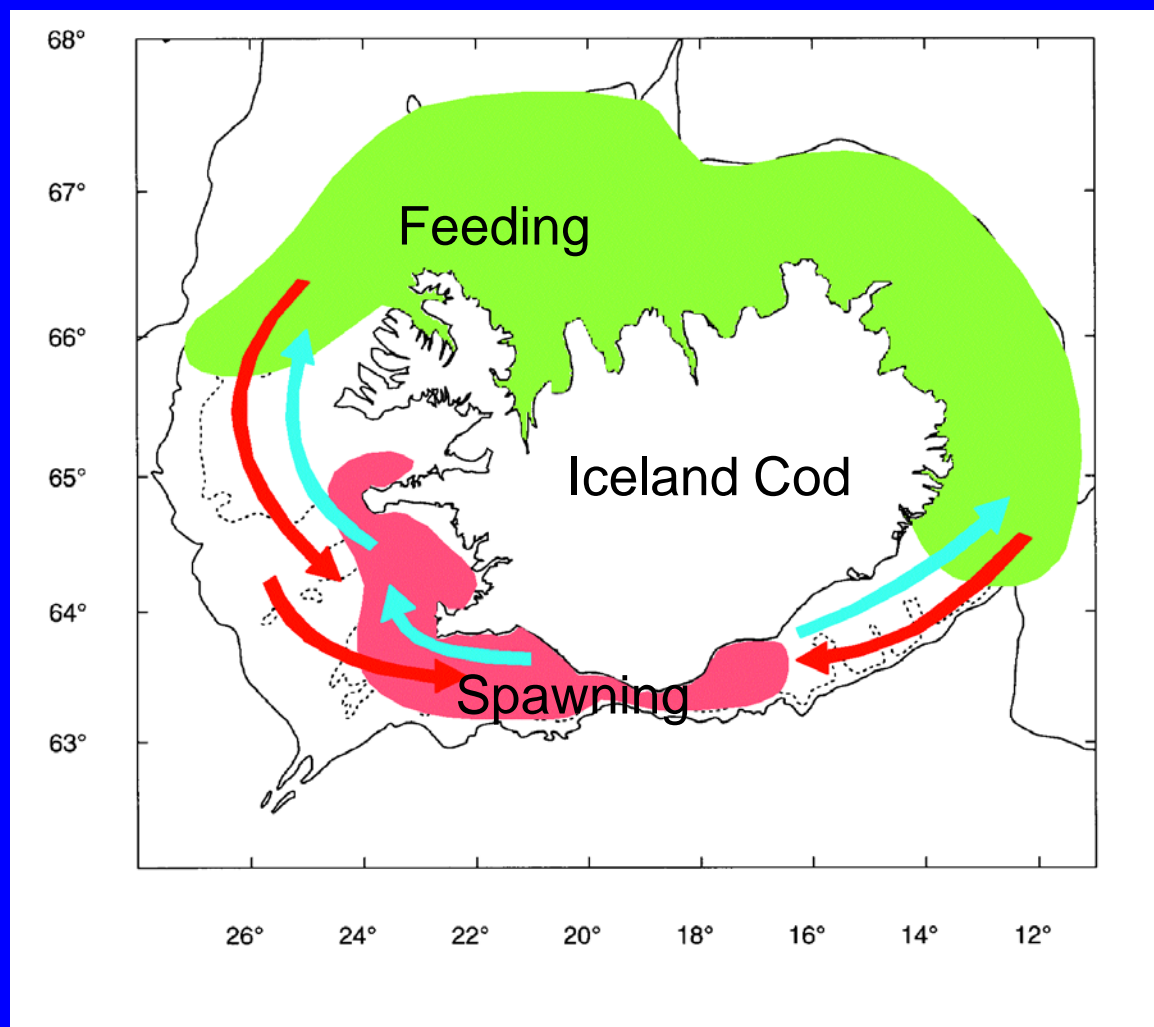
E-Iceland Current
(cold)



Gulf-Stream
(warm)

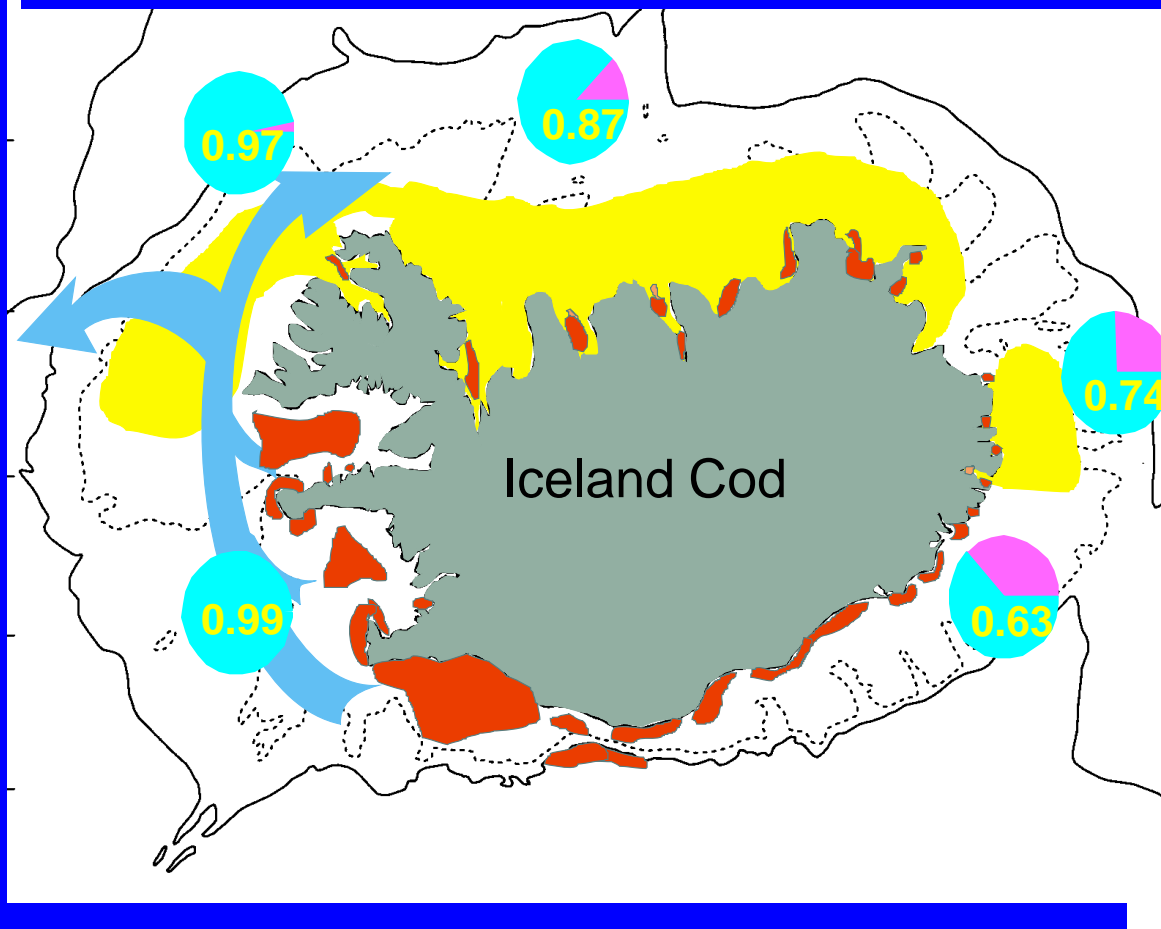


Main spawning areas and feeding migrations



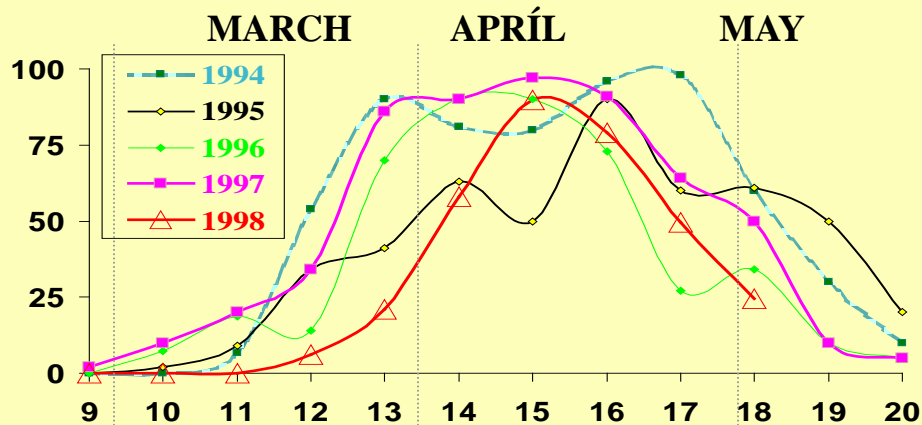


Larval drift from SW Iceland clockwise 1970-1998

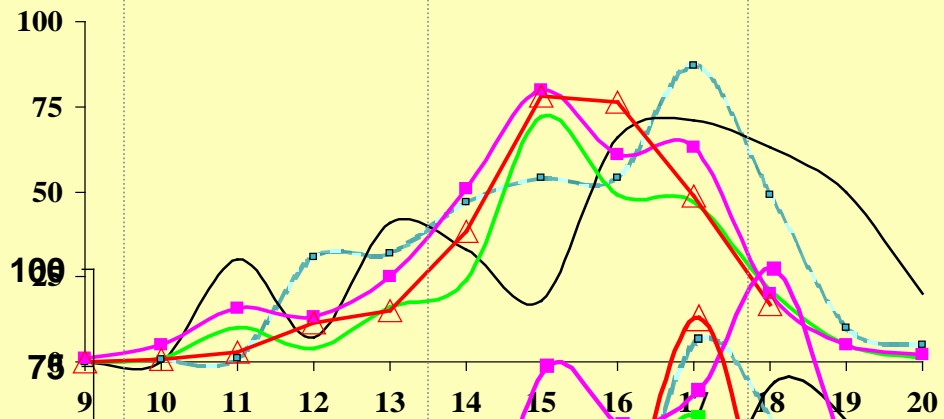


%Females spawning

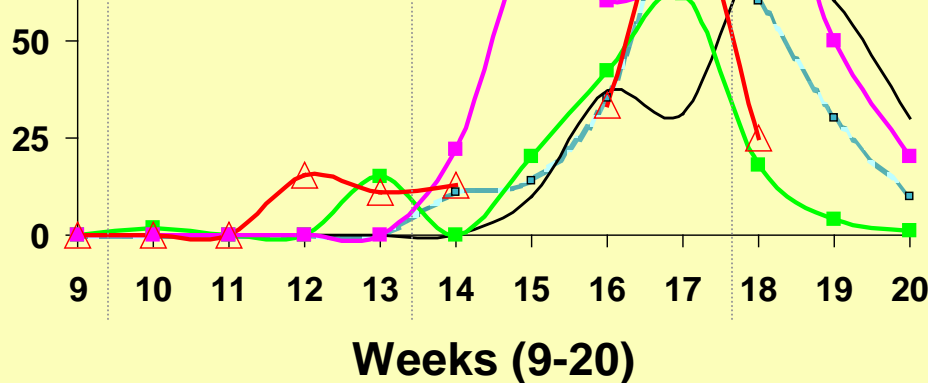
Females
> 100cm



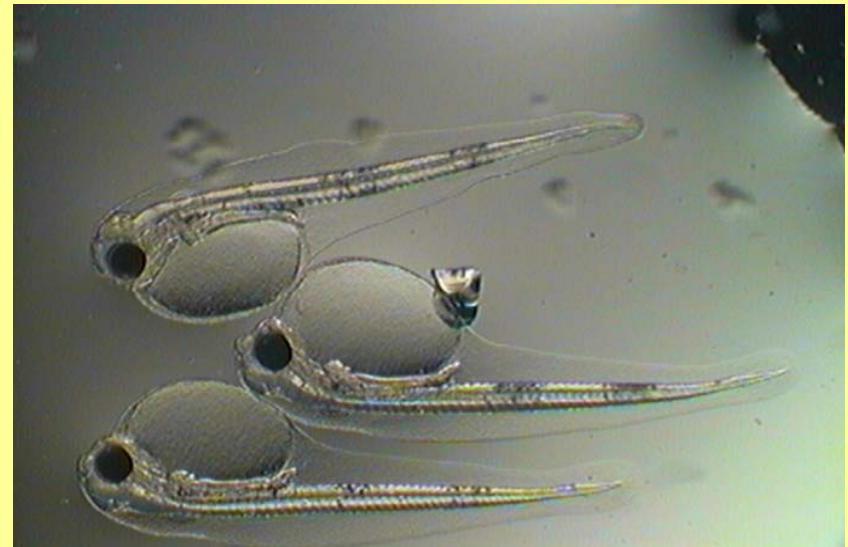
Females
70 - 100cm



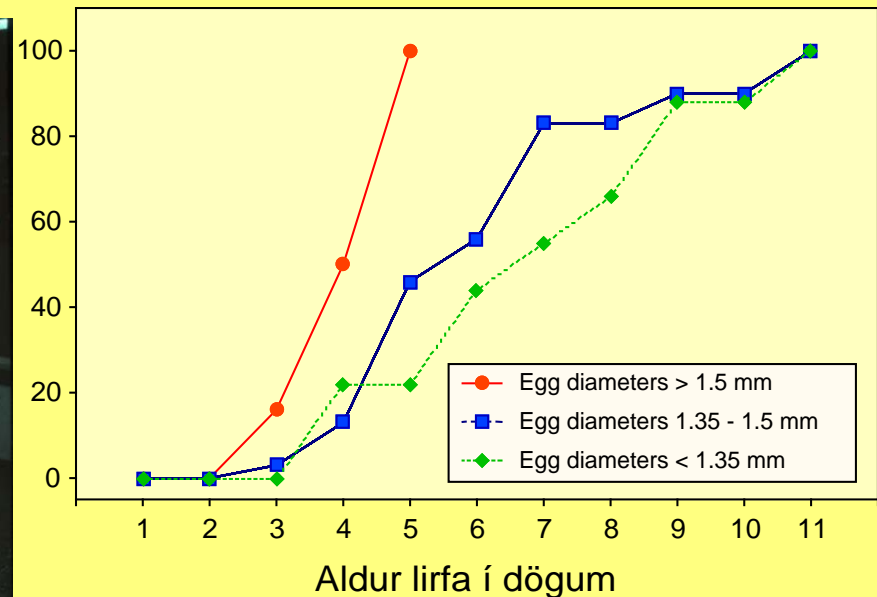
Females
< 70 cm



Cod Spawning

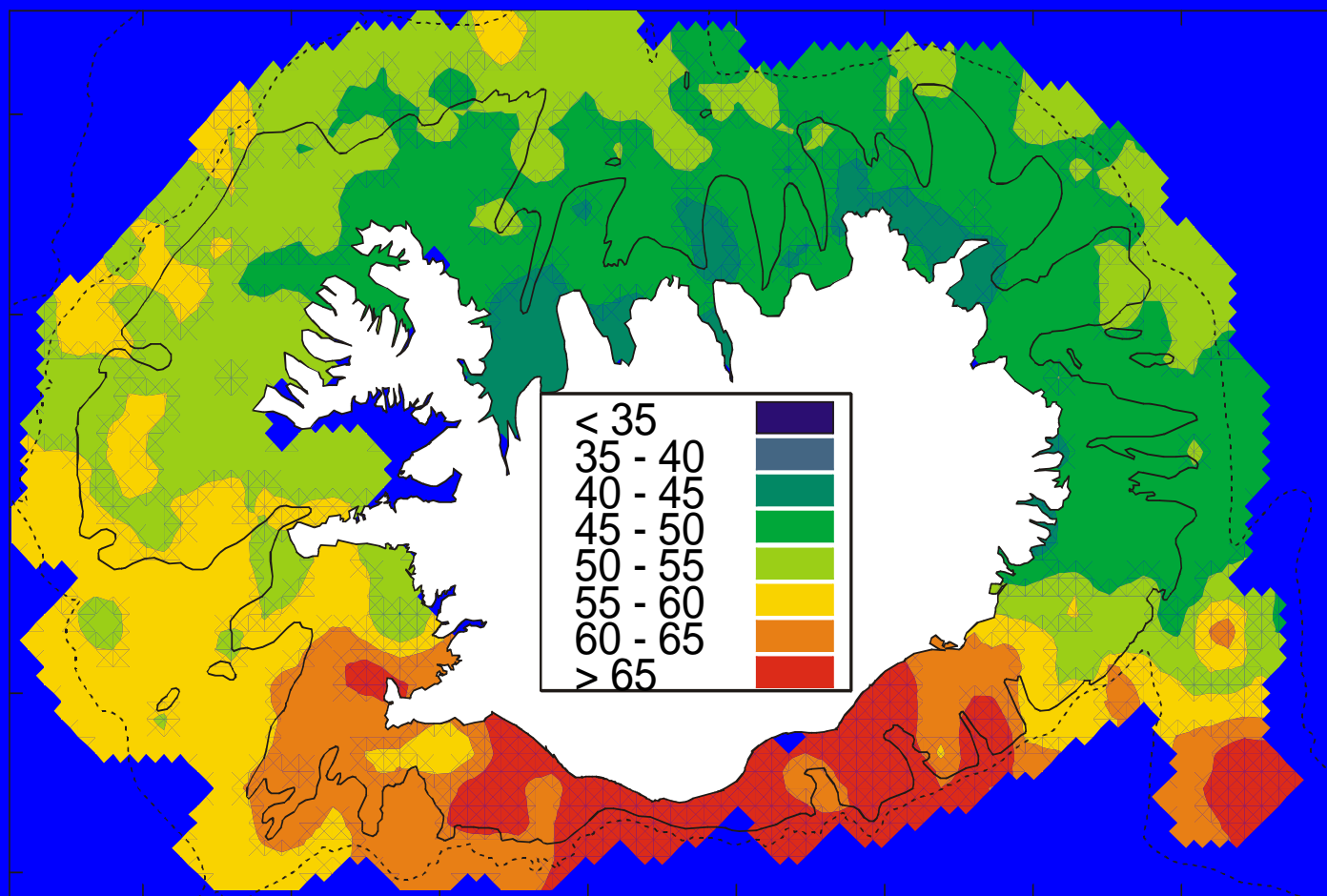


Cod larvae from large egg are bigger, start feeding early, have faster growth, and have higher survival than juveniles from small eggs



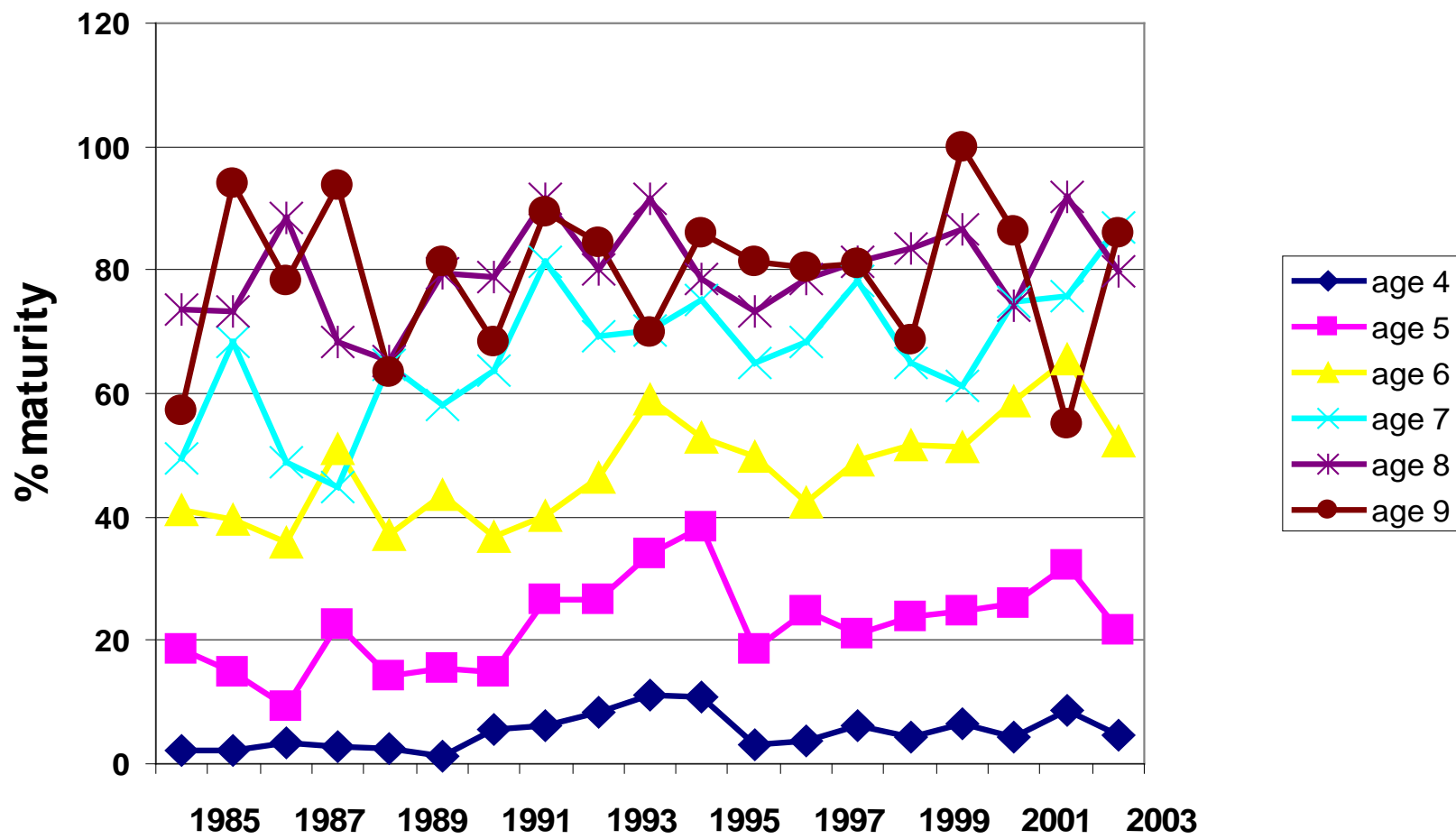


Mean length (cm) of 4 year old Cod



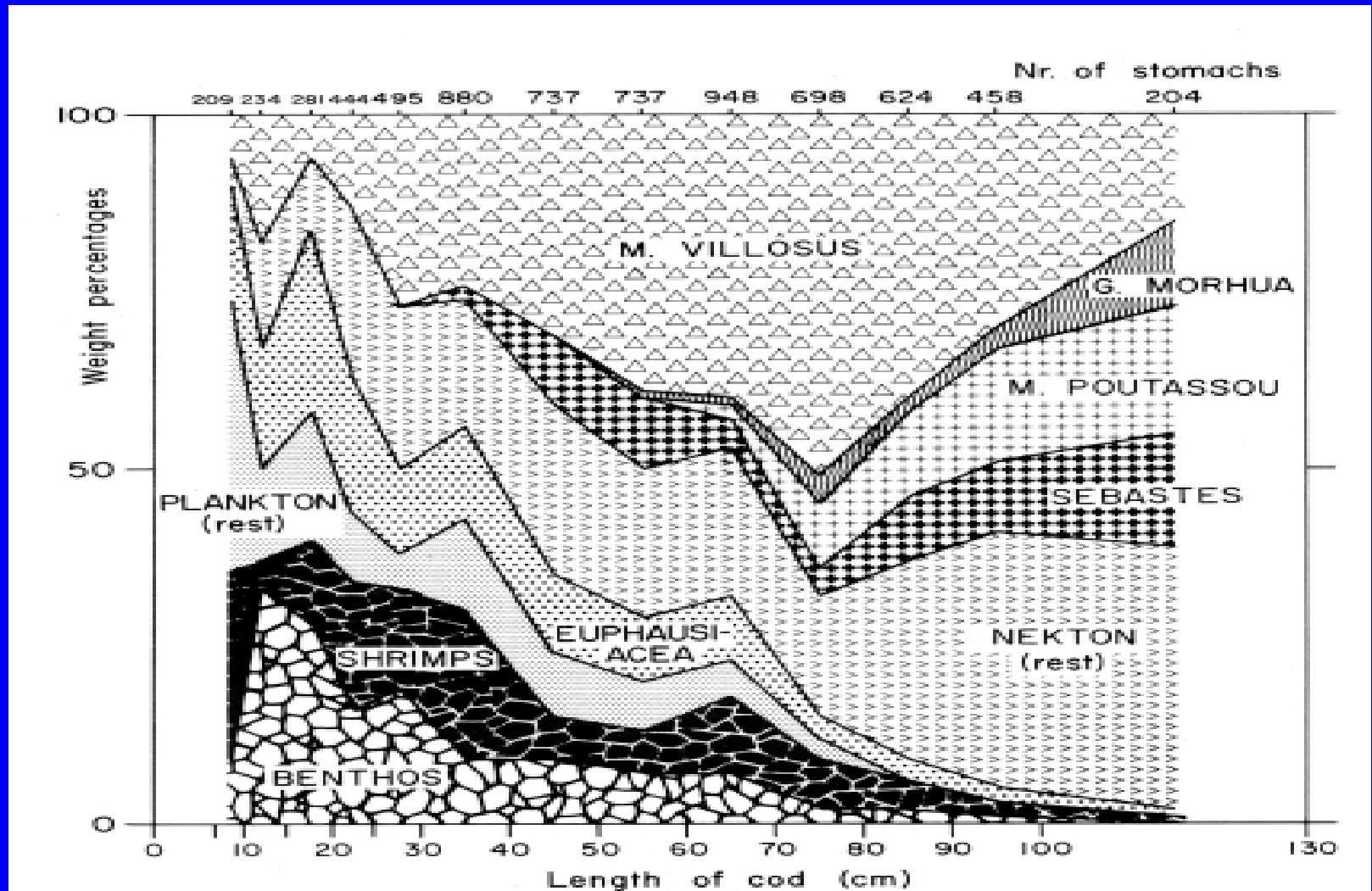


Iceland Cod: Maturity at age in bottom trawl survey in 1985-2003



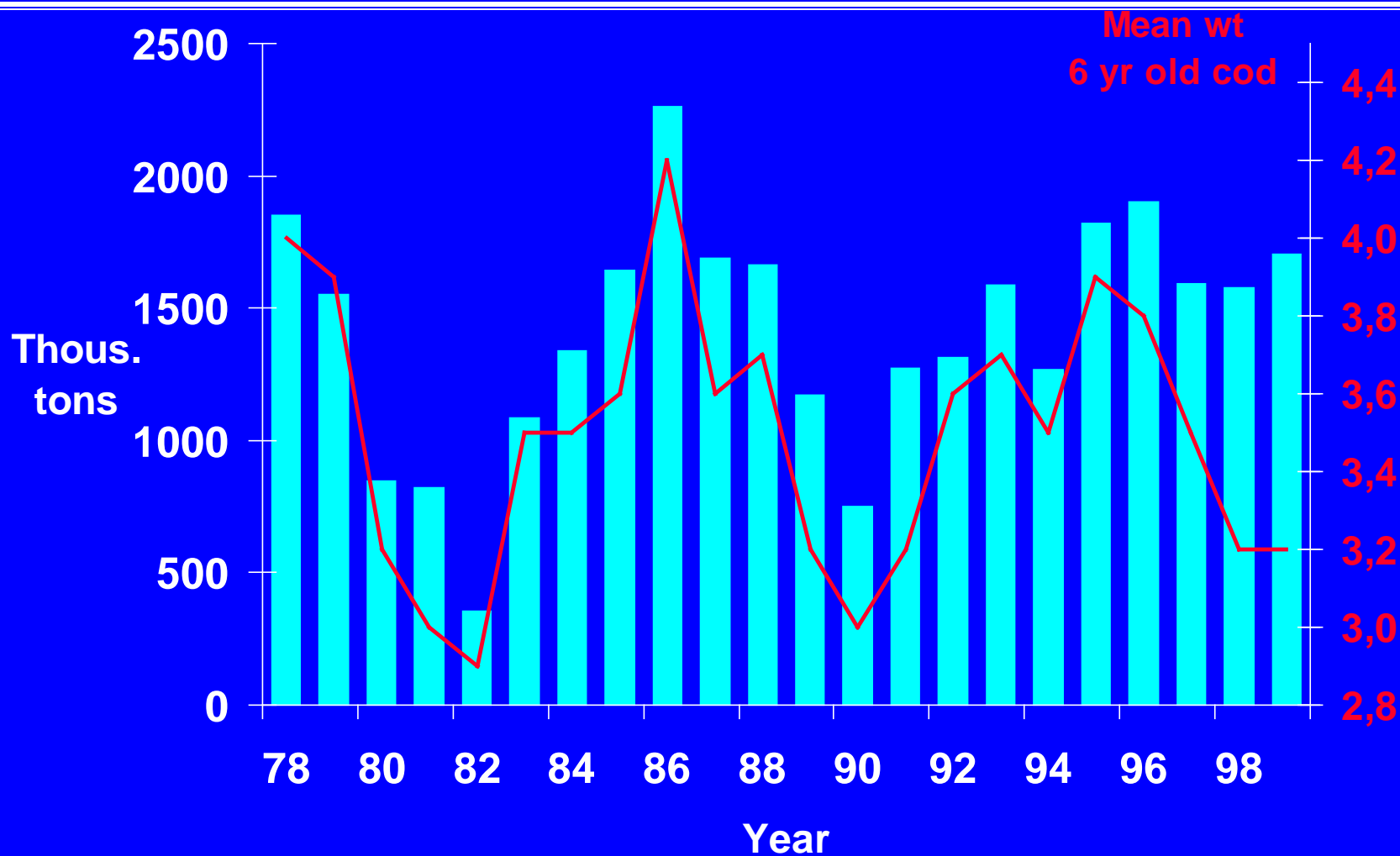


Iceland Cod: Average food composition



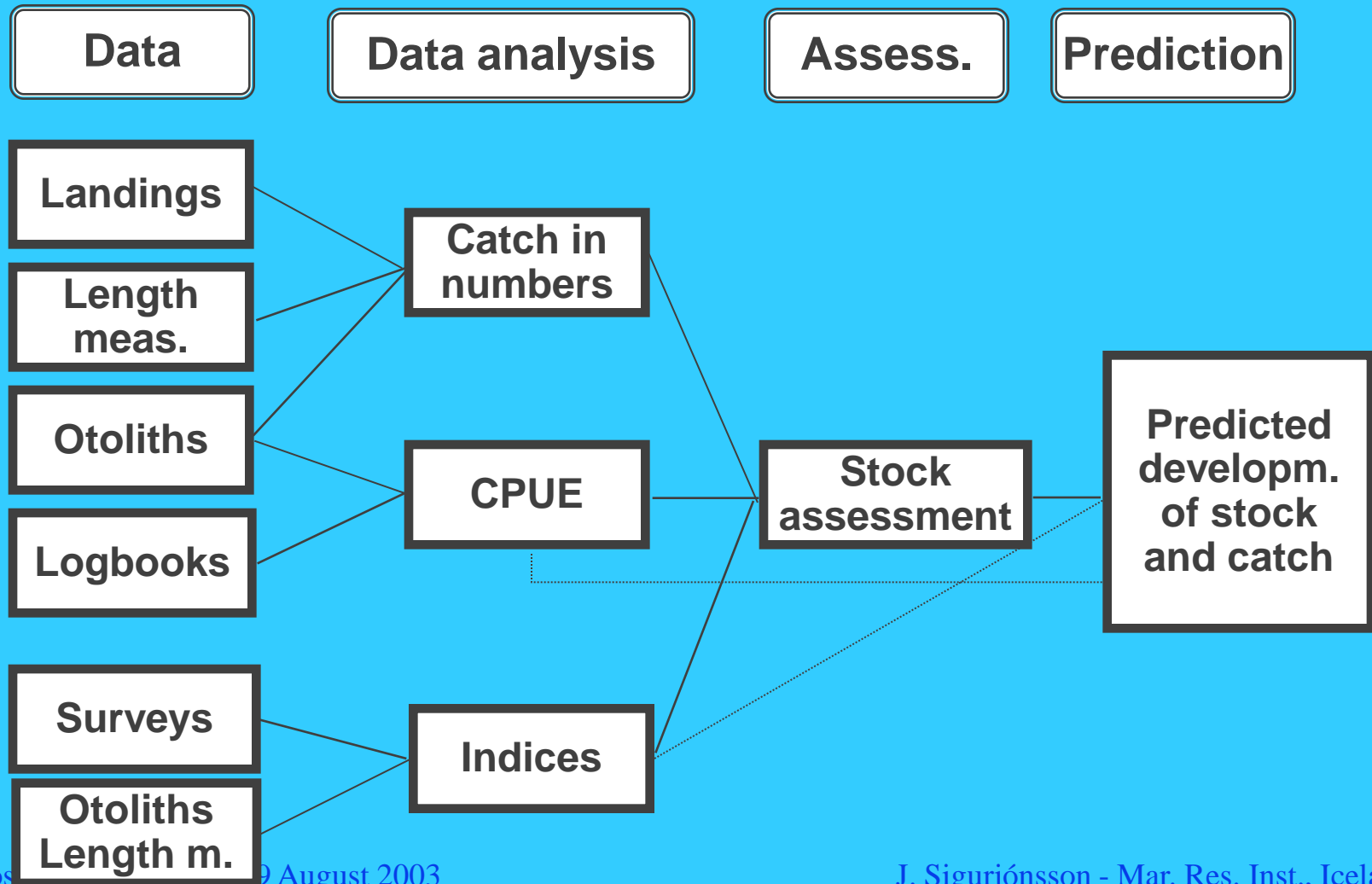


CAPELIN STOCK SIZE AND WEIGHT OF COD THE FOLLOWING YEAR





Components of advice (short-term)

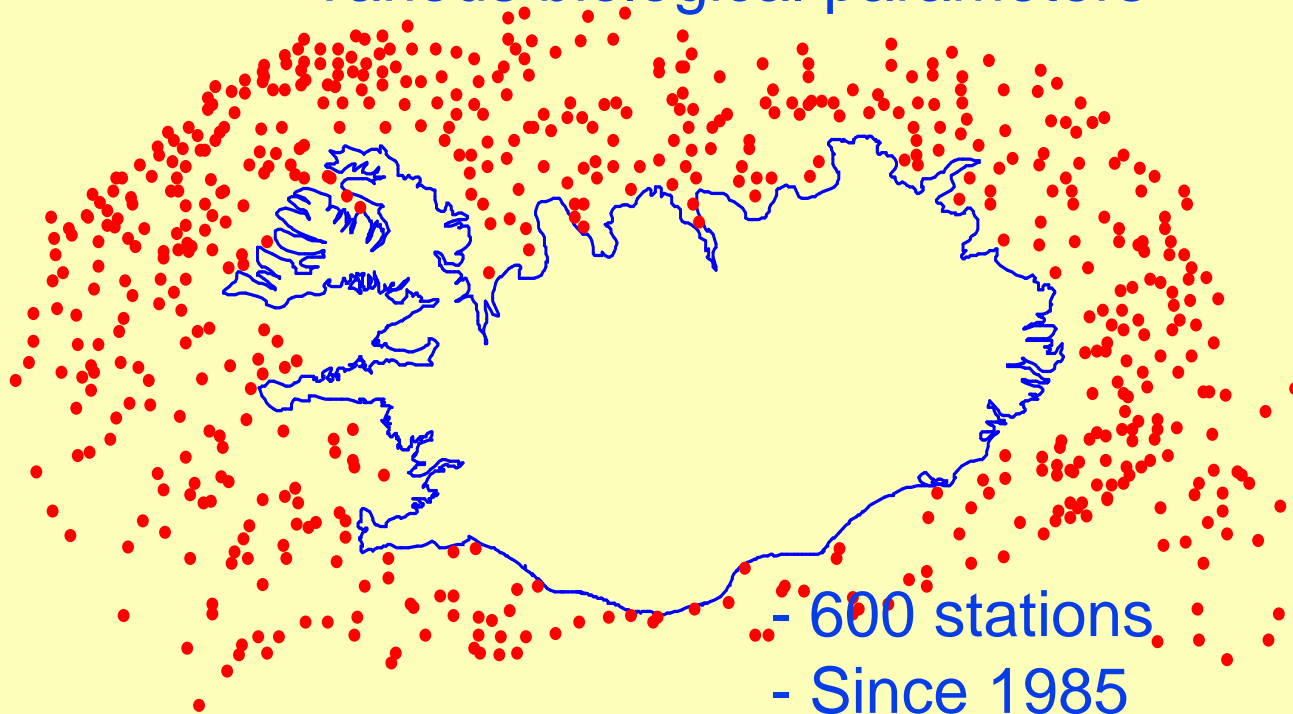




Standardised Groundfish Survey (Spring)



- Independent estimate of relative abundance
- Annual indices of recruitment
- Various biological parameters

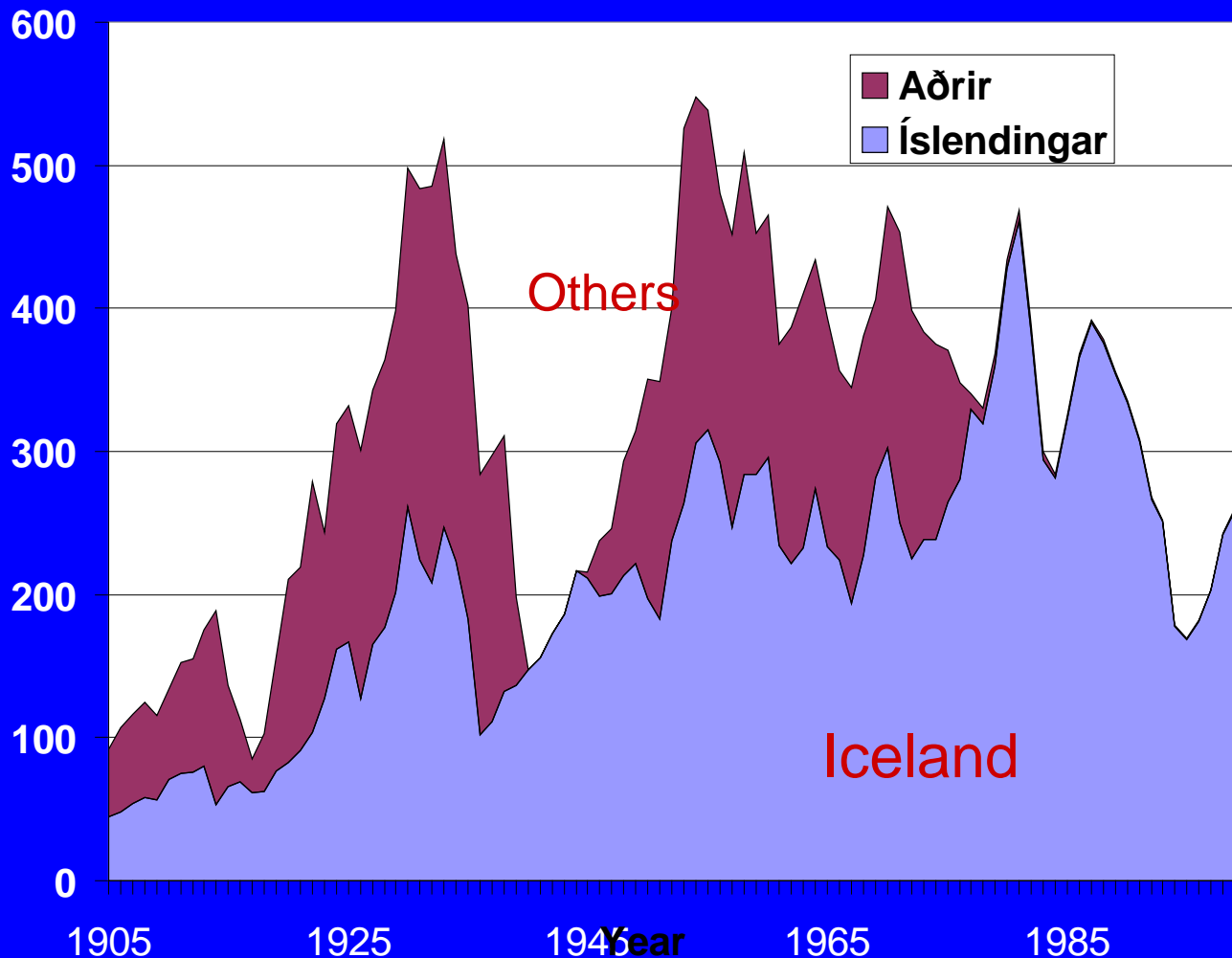


- 600 stations
- Since 1985
- Also autumn survey, Spawning survey



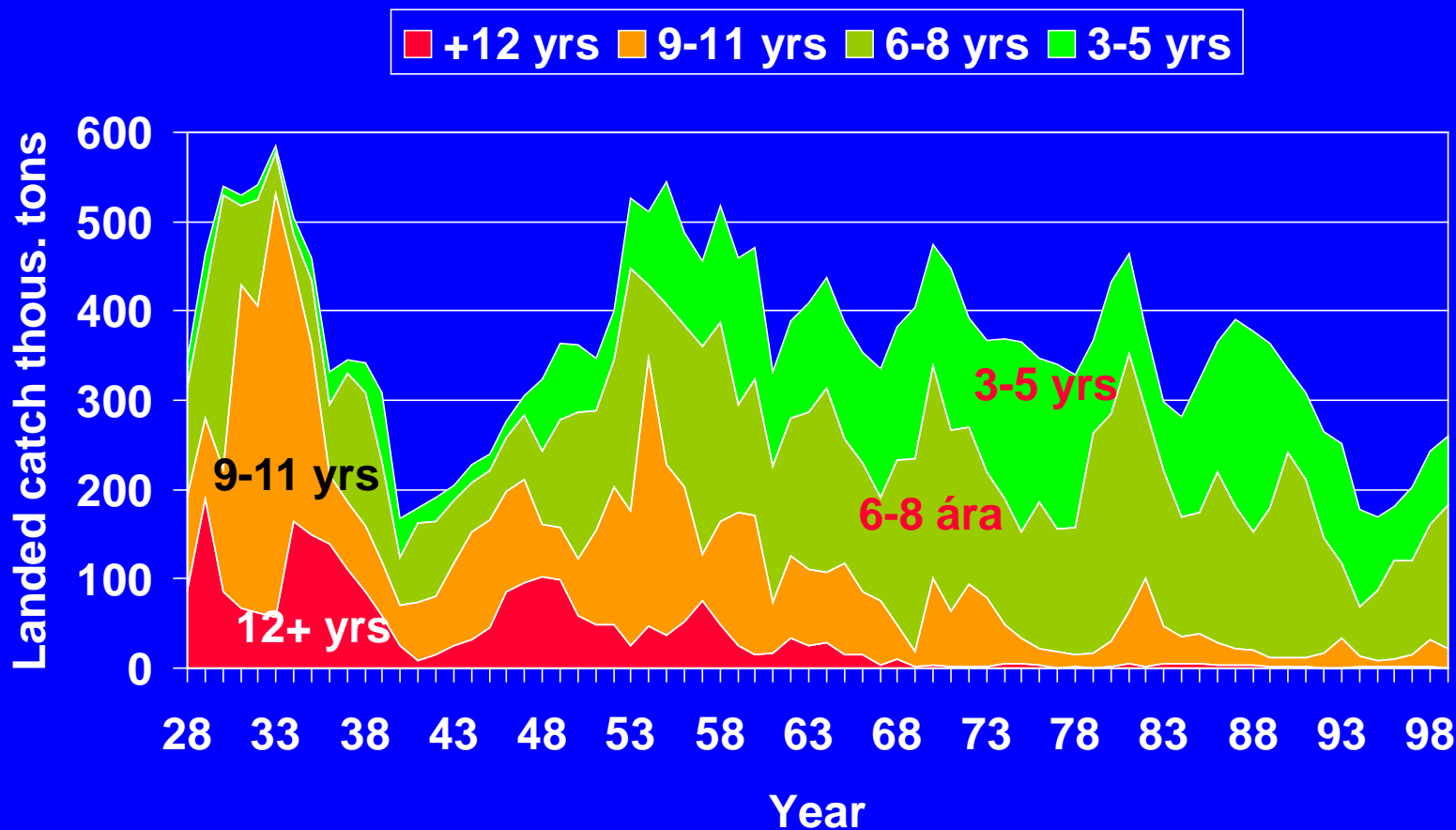
Cod fishery off Iceland 1905-2000

Catch thous. tons



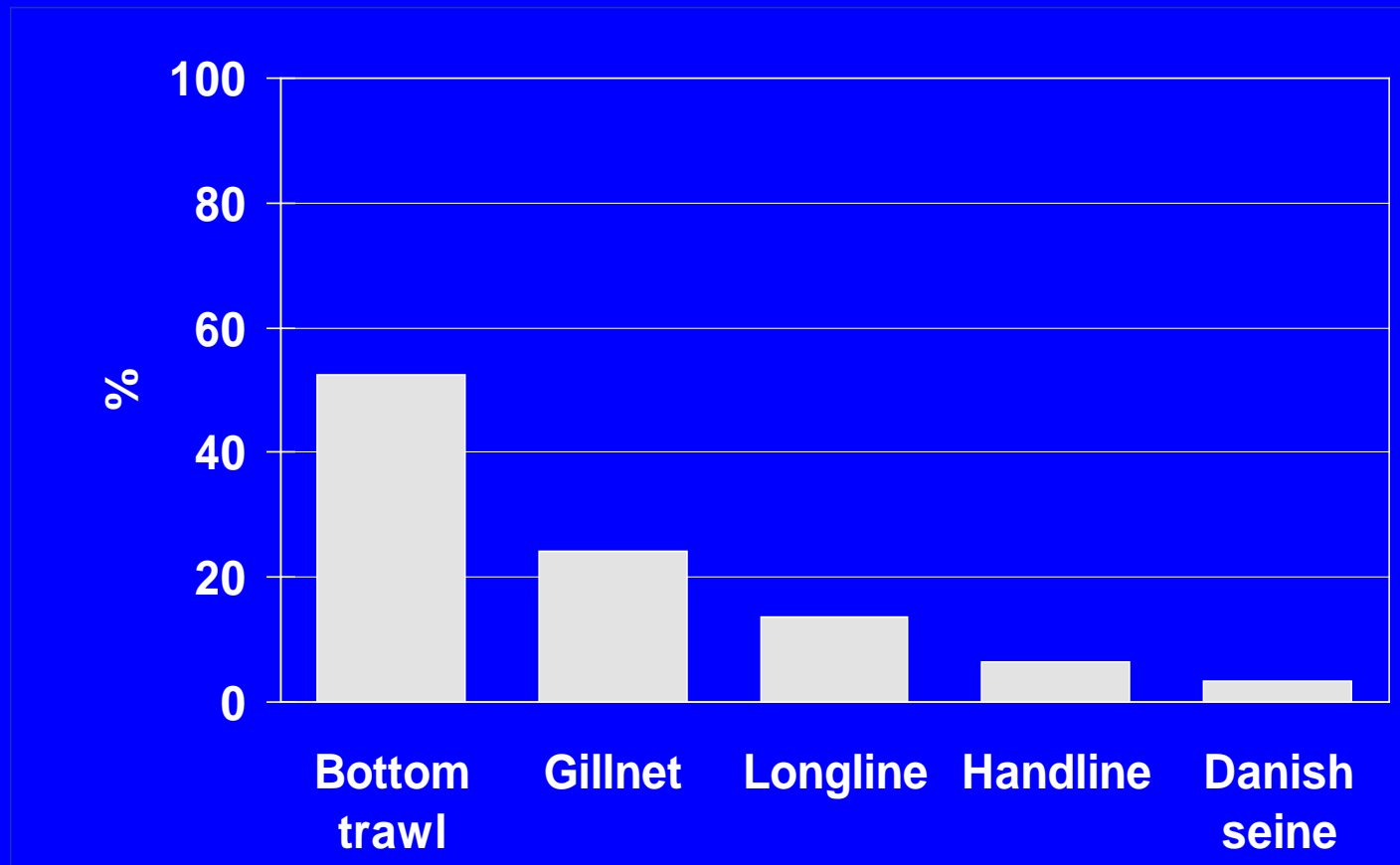


Iceland Cod: Landed catch (thous. tons) by age 1928-1999





Iceland Cod: Landings by fishing gear



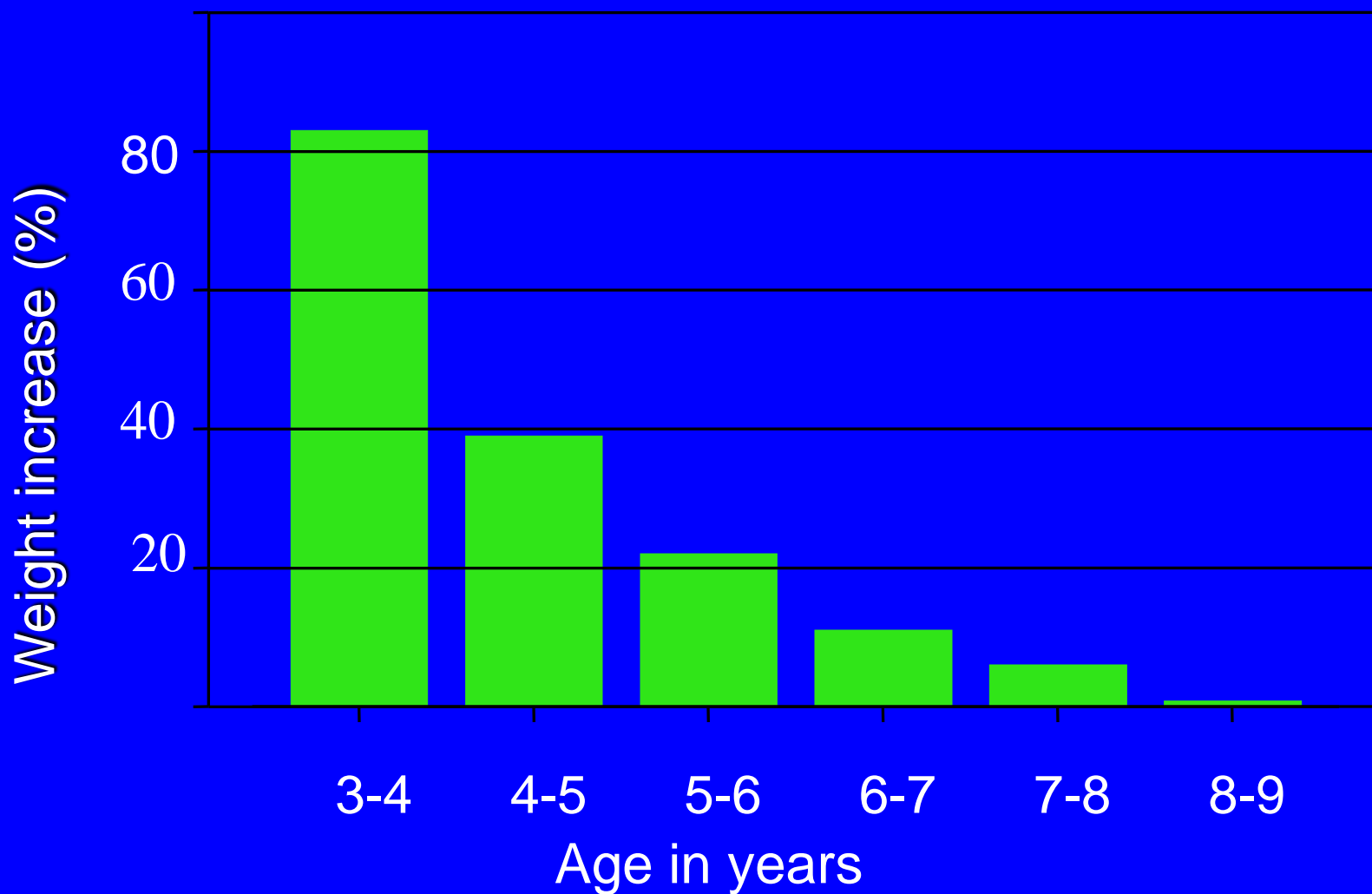


Cod management considerations

- Not beneficial to catch fish at young age - let it grow older
- Apparently low mortality in old fish
- Stock/Recruitment relationship - significant despite variability
- Large females very important for successful spawning

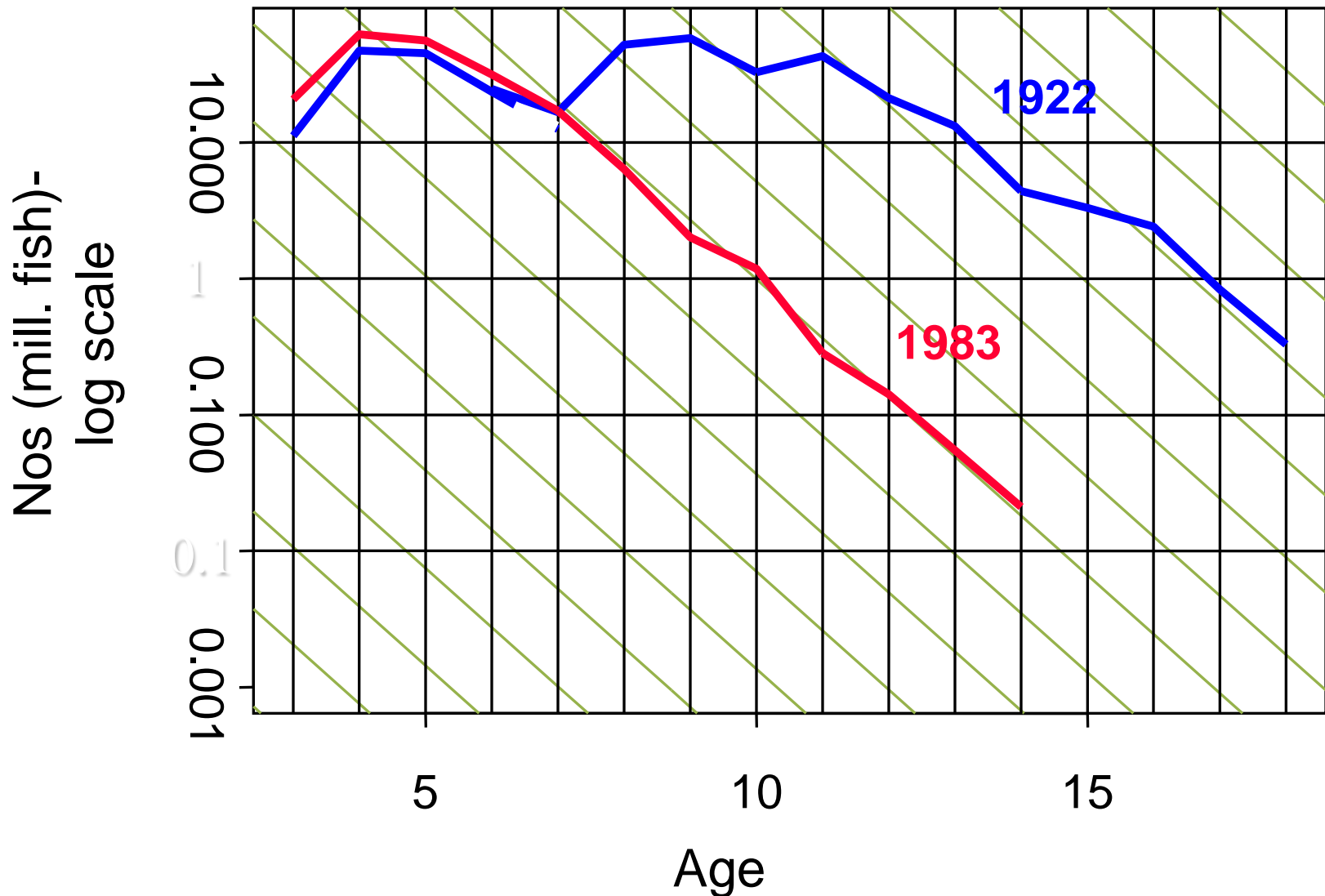


Weight increase in cod by age



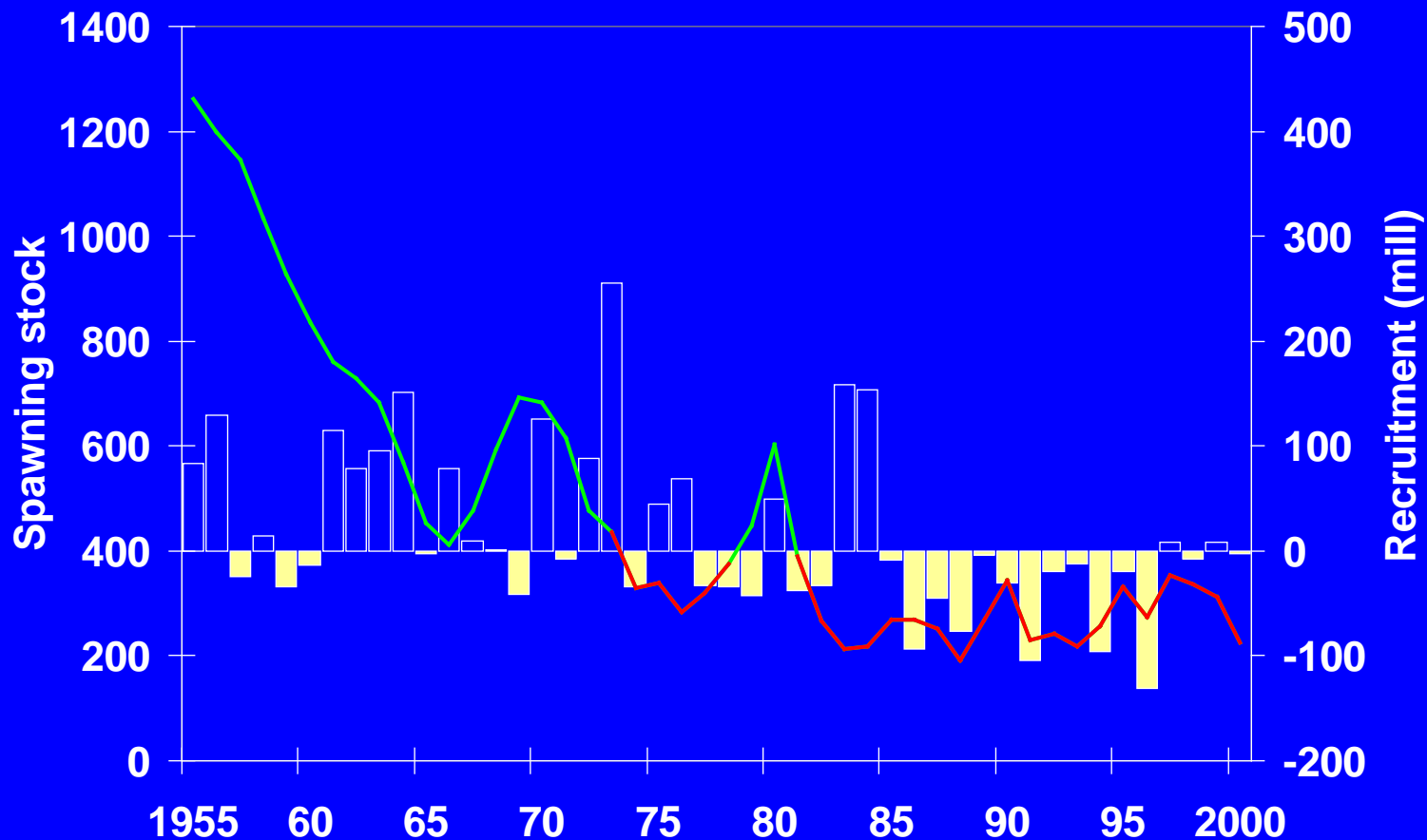


Number of fish in catch: Year class 1922 caught at low F and 1983 at high F





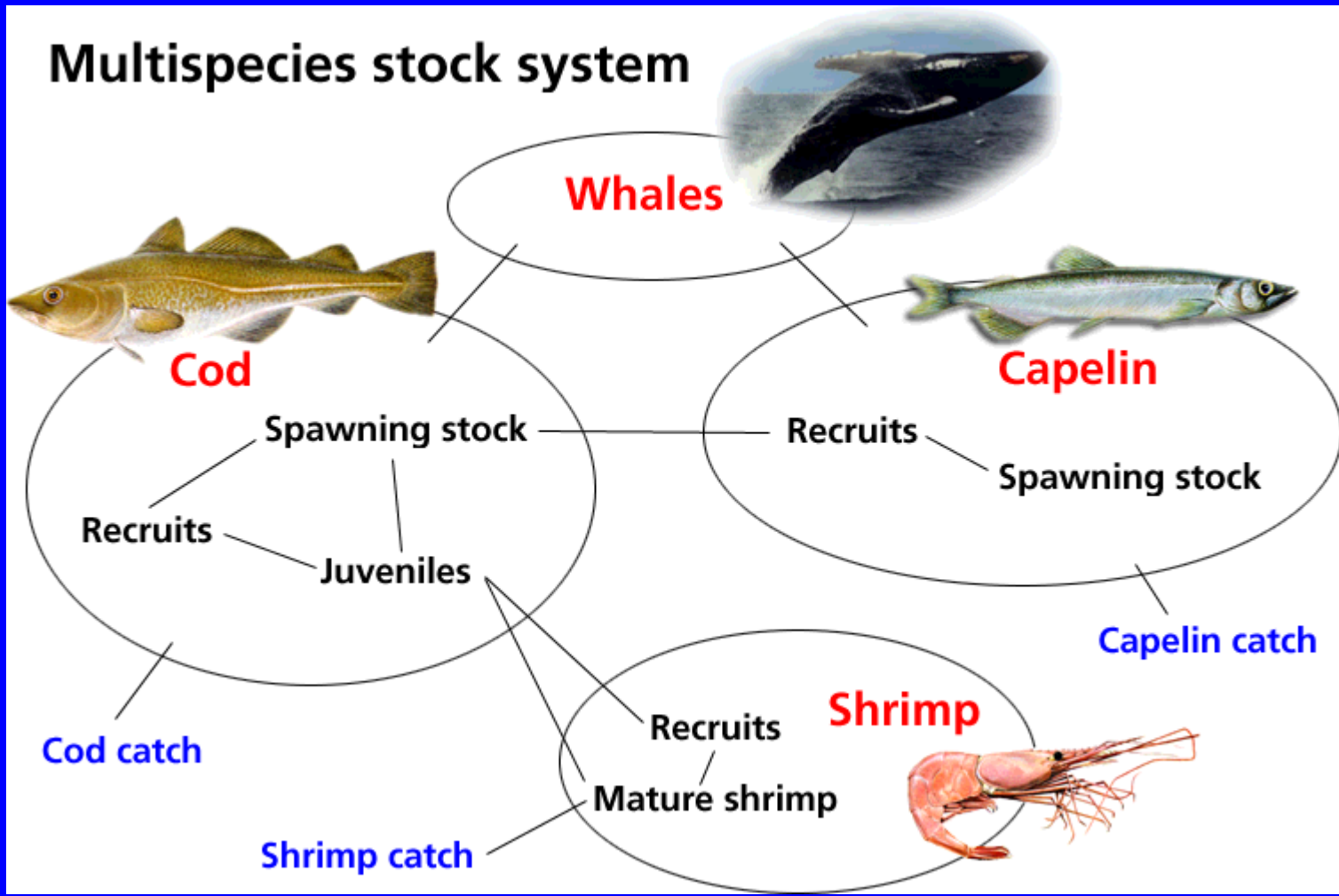
Spawning stock biomass and deviation from mean recruitment of 3yr old cod





Other management measures

- TAC with ITQ's for vessels
- Temporary closures of areas with by-catch of juveniles
- Permanent closures of small fish areas
- Temporary closures of spawning grounds
- Fishing gear area restrictions
- Mesh sizes in trawl 155mm
- Mesh size in gillnets not exceeding 8"
- Sorting grids for juvenile and small cod to escape

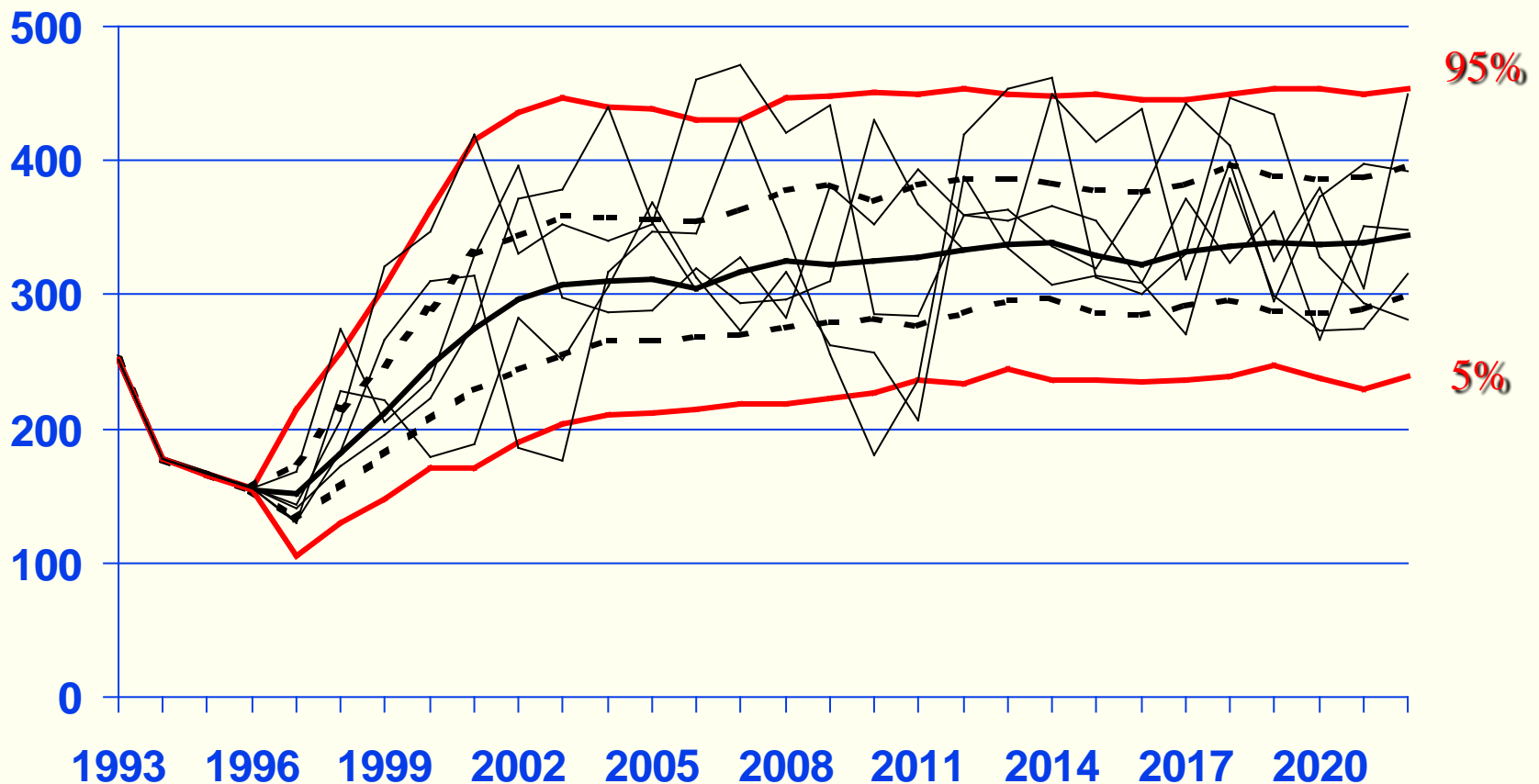




Harvest Control Law (HCL): Assumed future catch of cod off Iceland if 25% of fishable biomass is taken

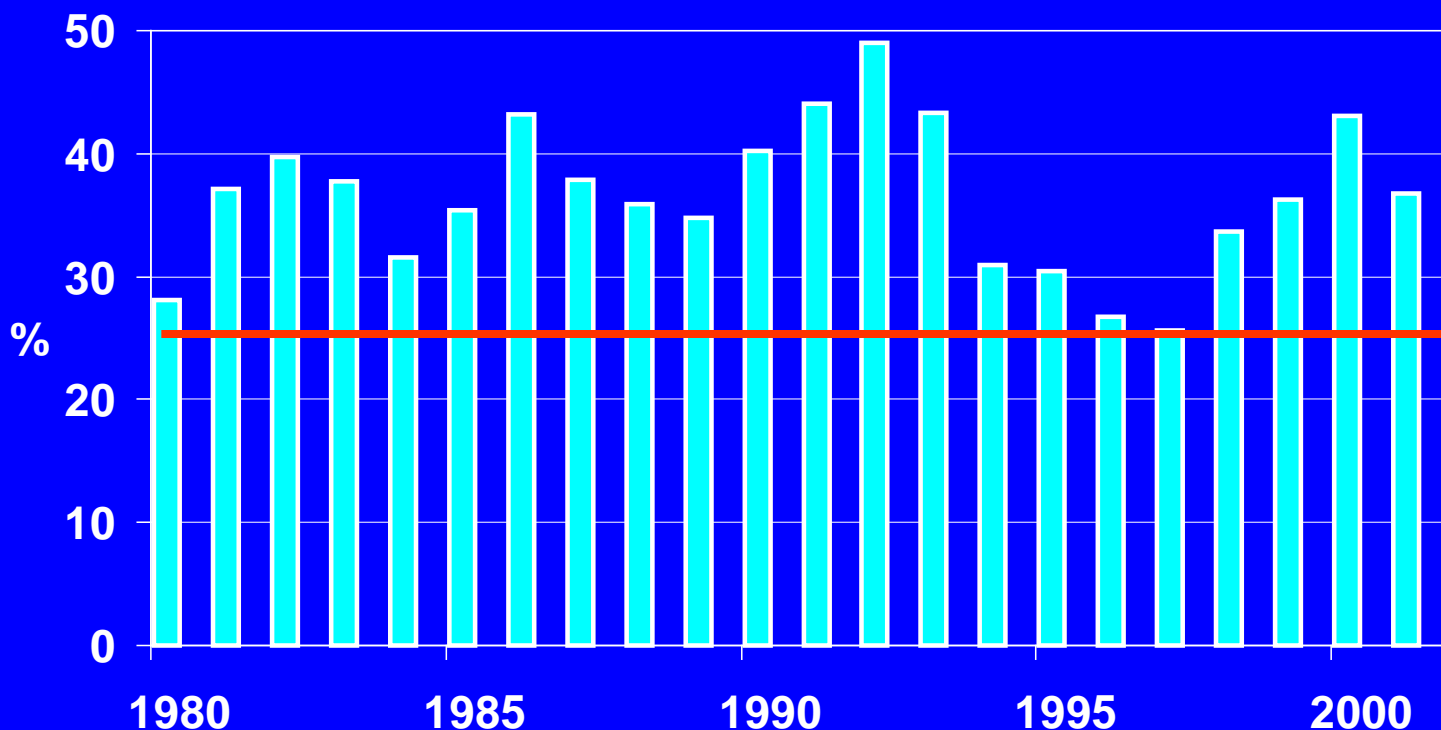
Thous. tons

Risk Analysis



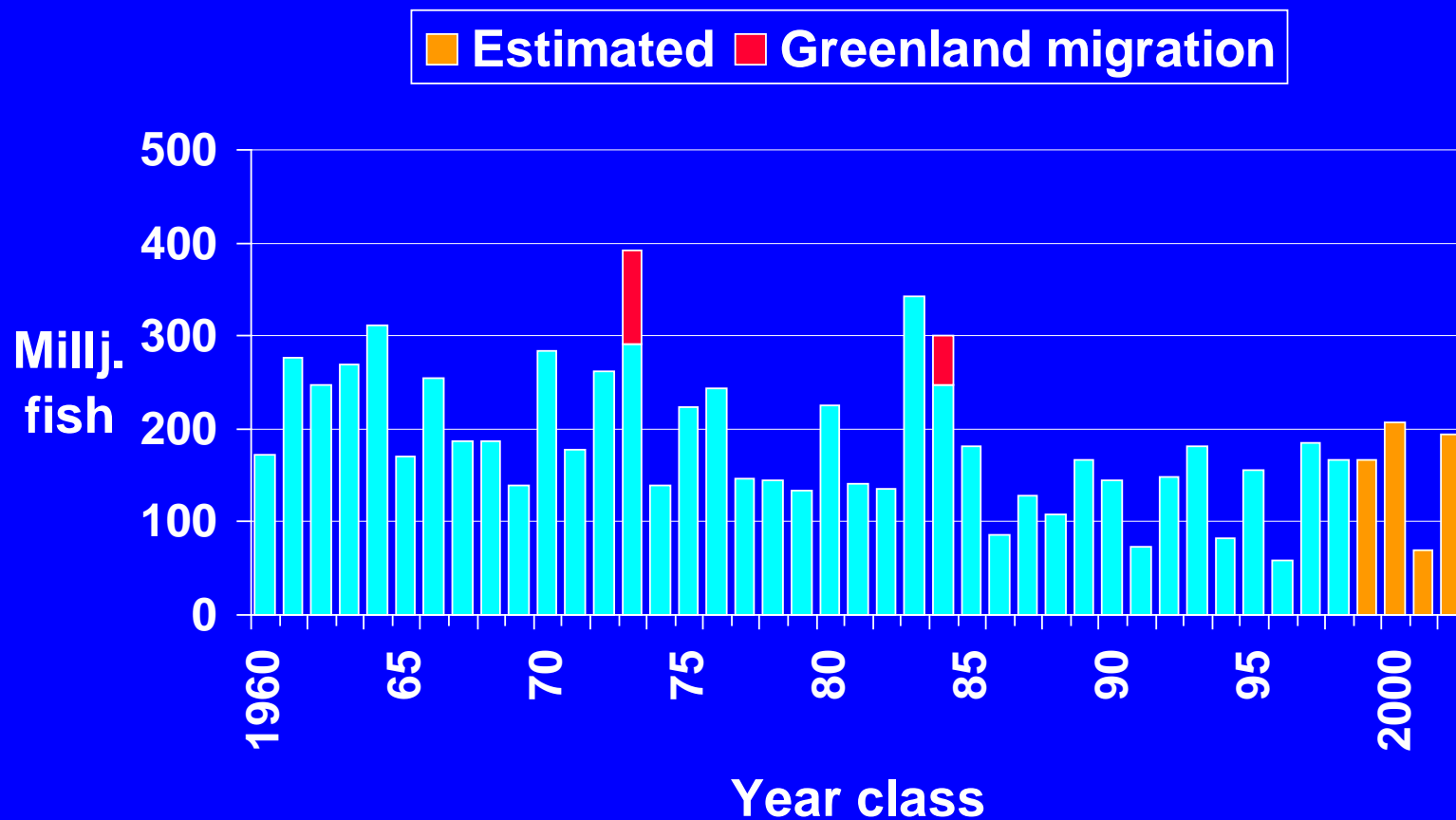


Cod: Proportion harvested (%) of fishable biomass



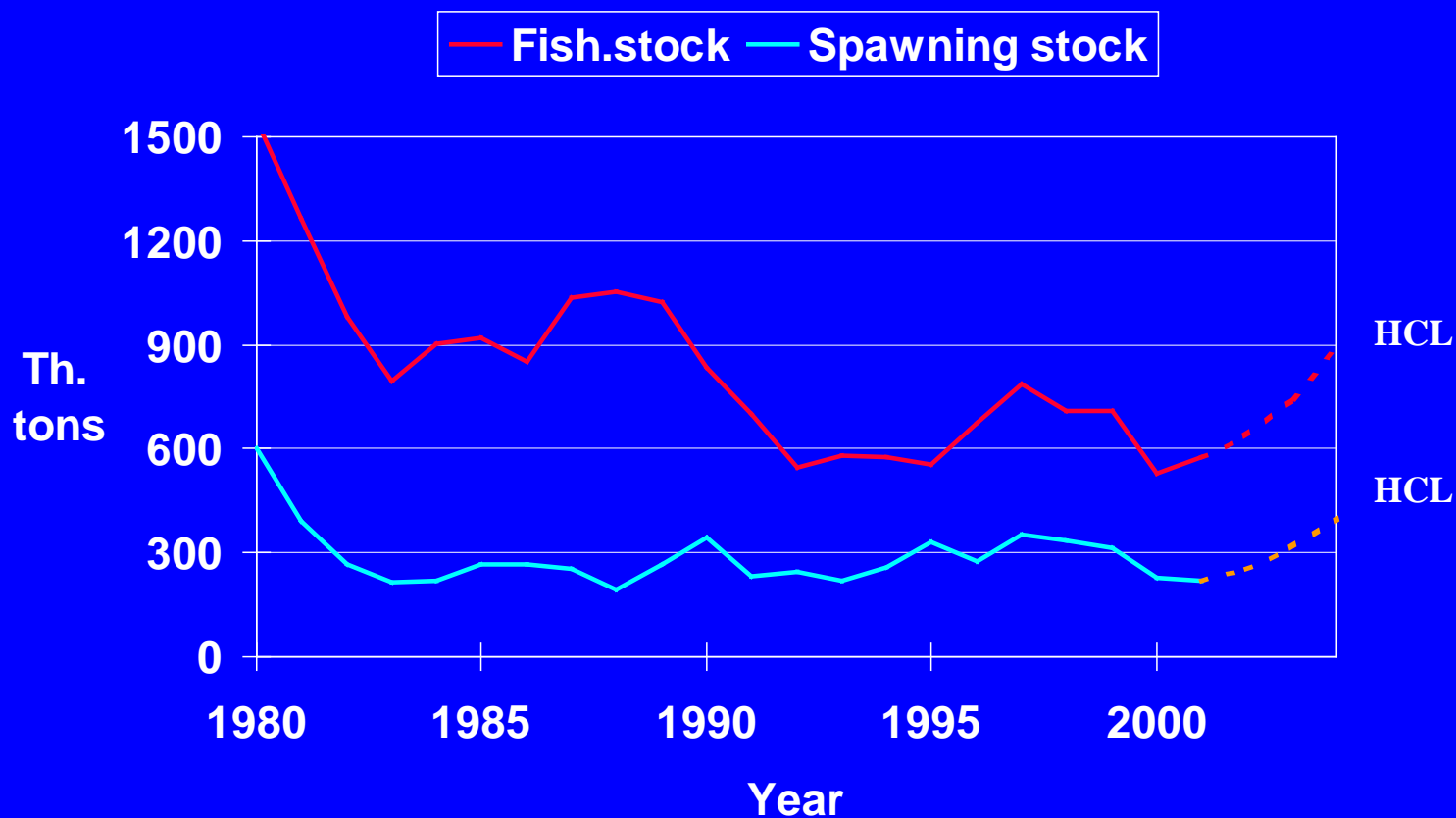


Cod recruitment: 1960-2002 year classes at 3 years of age





COD: History of stock size and likely development according to HCL





Conclusion

- HCL has improved setting of adviceable TAC
- There are reasons for slow recovery of stock
 - Slight but steady overharvest, catch exceeding advice
 - Changed climatic regime
 - Changed exploitation of marine life
 - Increased whale stocks ? Damaged habitat ?
 - Overestimation of stock size



Conclusion (cont'd)

- Management strategy for cod under review
 - not likely to change much, but performance needs to improve
 - 22-23% instead of 25%
 - Stock structure needs to be taken into account

- THANK YOU !