

ICES/PICES/UNCOVER Symposium 2009 on



**Rebuilding Depleted Fish Stocks -  
Biology, Ecology, Social Science and Management Strategies**

*Summary of Theme Session 1*

**Impact of Fisheries and Environmental  
Impacts on Stock Structure, Reproductive  
Potential and Recruitment Dynamics**

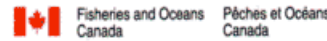
Tuesday, Nov. 3<sup>rd</sup> 2009

*Toyomitsu Horii (Japan) & C. Tara Marshall (Scotland)*



**UNCOVER**

**UNderstanding the Mechanisms of Stock ReCOVERy**



„Stiftung seeklar“

FRESH  
Fish  
Reproduction  
and  
Fisheries

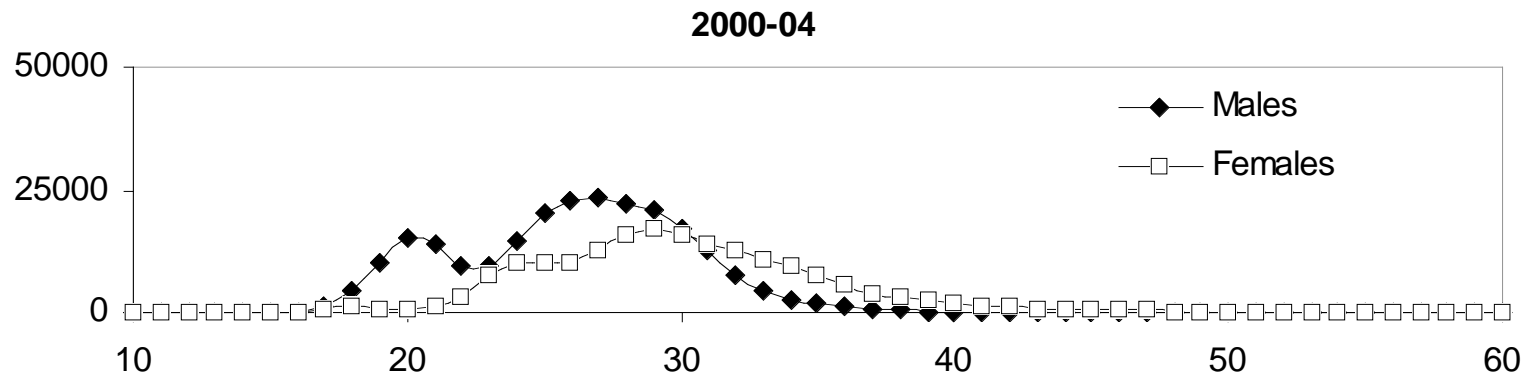
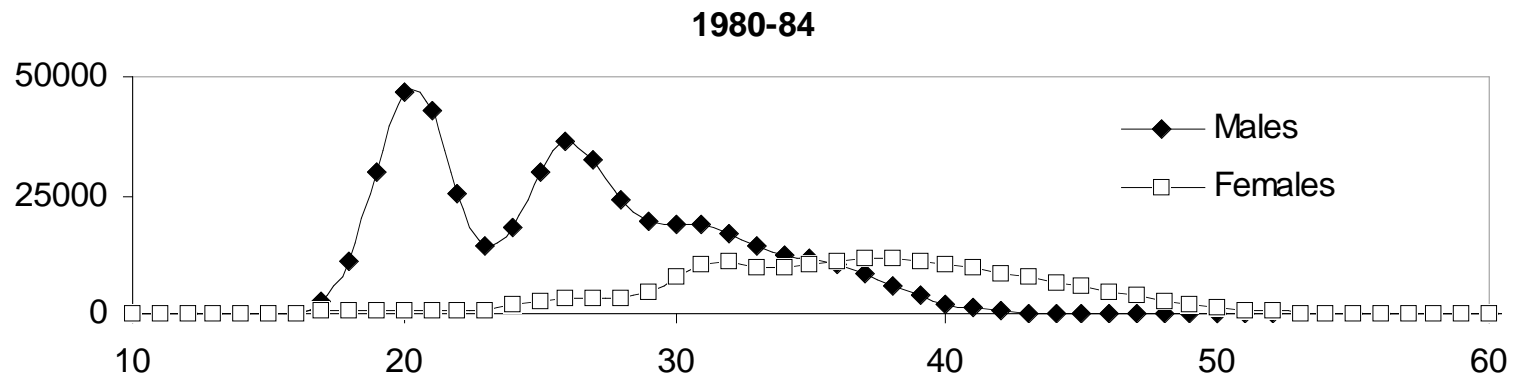


- 13 oral presentations
- Norway (5), Denmark (2), France (2), Canada, Germany, Russia, Japan
- Herring, Cod, Haddock, Anchovy, Plaice, Sprat, Mackerel, Sardine, Abalone
- Single species (6), Multispecies (7)

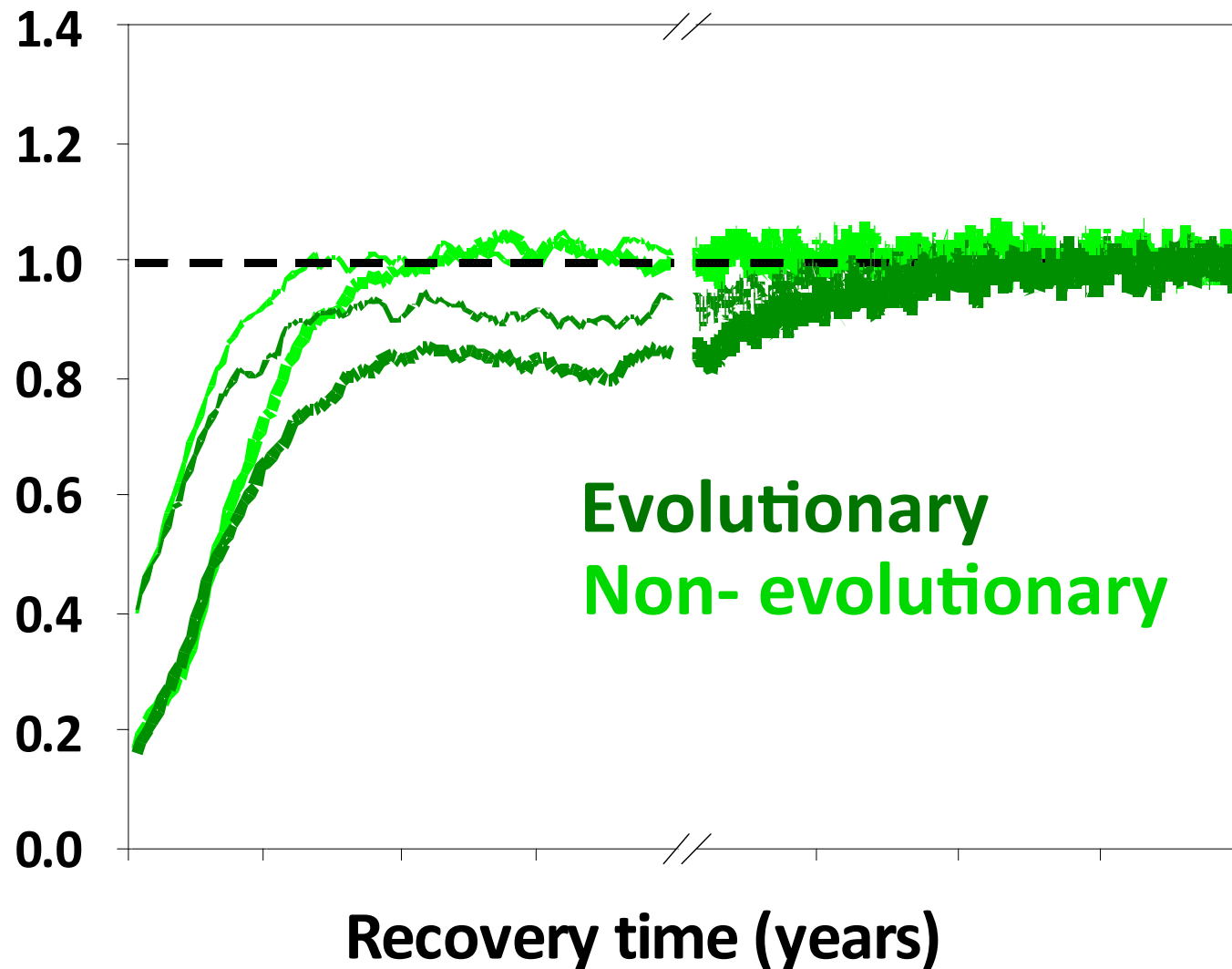
## Impact of Fisheries and Environmental Impacts on Stock Structure, Reproductive Potential and Recruitment Dynamics

	<b>Fisheries effects</b>	<b>Environmental effects</b>
<b>Stock structure</b> (age, size and gender composition, spatial distribution)	<i>Rijnsdorp</i> (plaice) <i>Brunel</i> (meta-analysis)	<i>Dingsør</i> (cod and herring) <i>Pettigas</i> (sardines & others)
<b>Reproduction</b>	<i>Rijnsdorp</i> (plaice) <i>Heino</i> (cod-like)	<i>Lambert</i> (cod) <i>Voss</i> (sprat)
<b>Recruitment</b>	<i>Vikebø</i> (cod) <i>Pettigas</i> (sardines & others) <i>Brunel</i> (meta-analysis)	<i>Horii</i> (sardines & chub mackerel) <i>Mantzouni</i> (cod haddock & herring) <i>Payne</i> (herring) <i>Vikebø</i> (cod) <i>Krysov</i> (herring) <i>Huret</i> (anchovy)
<b>Abundance</b> (landings & biomass)	<i>Horii</i> (chub mackerel & abalone) <i>Heino</i> (cod-like)	<i>Horii</i> (sardines, anchovy, chub mackerel & abalone)

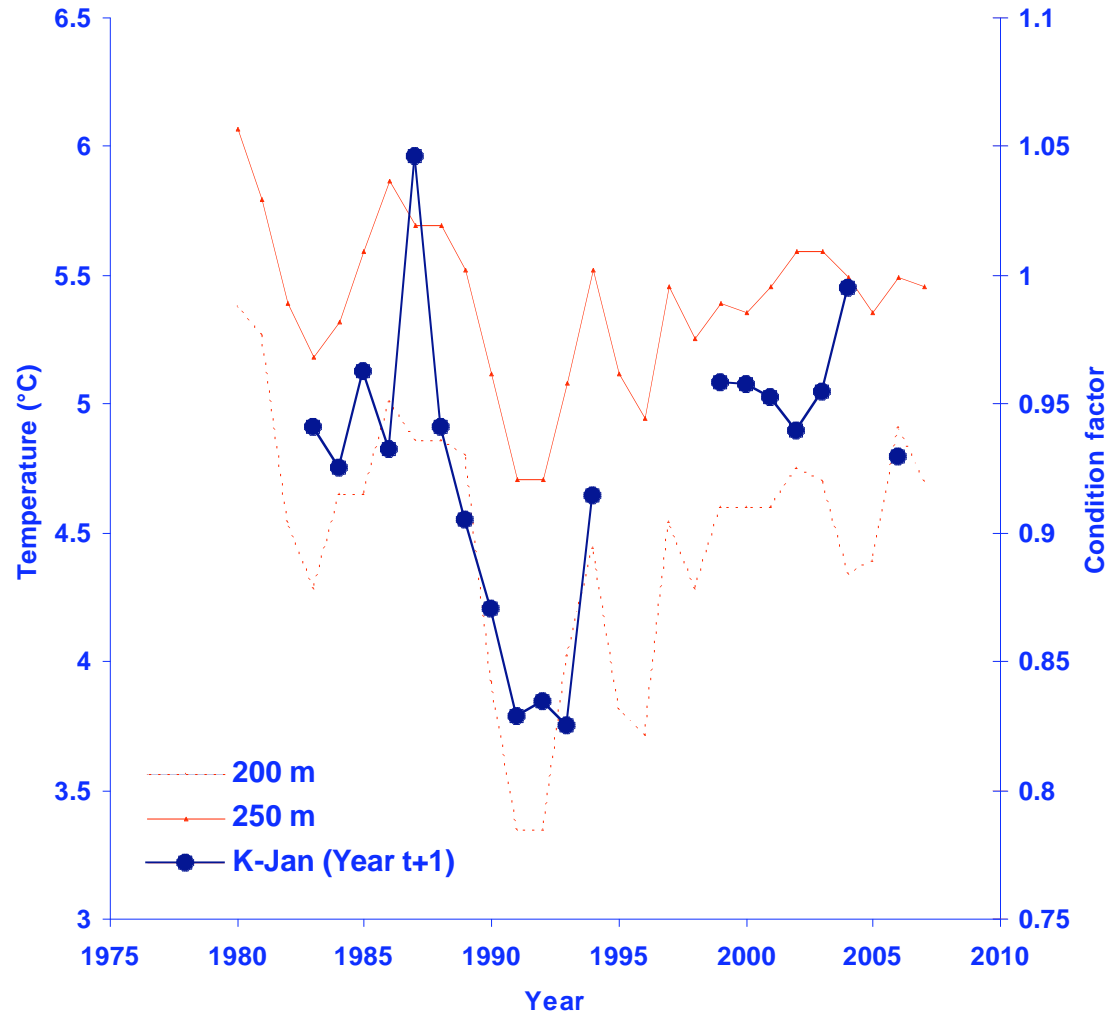
# Fishing impacts demographic structure → reproduction and stock recovery rates



# Fishing impacts genetic structure → life history traits and stock recovery rates

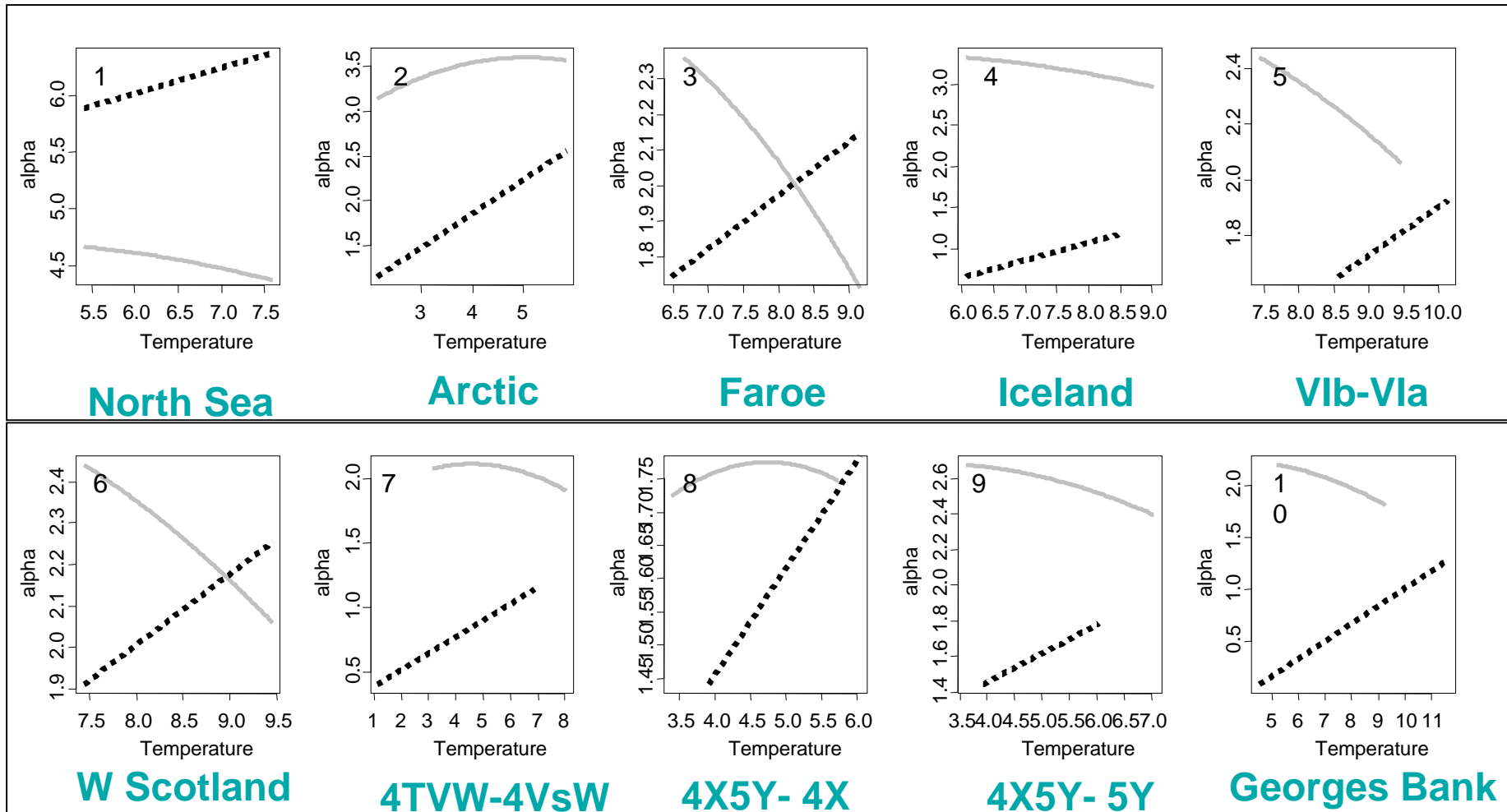


# Environment impacts growth of individuals → reproduction and stock recovery rates



Y. Lambert

# Environment impacts recruitment → mortality and stock recovery rates



# Theme 1: Conclusions about recovery

- “Yes we can”

... BUT

- Evidence of rebuilding in some stocks but others have remained collapsed despite long periods of low fishing mortality
- Stocks can decline even in the absence of fishing; fishing only makes it worse
- Process-based understanding is essential for estimating rates of recovery
- Uncertainty can be reduced by comparing long-term datasets for many species and regions
- Understanding individual spawning components is important to understanding the whole
- The recovered stock may have different structure and life histories
- Fisheries-induced evolutionary changes can influence the recovery process

# Gaps in knowledge about the processes underlying recovery

- We don't understand why some collapsed stocks have failed to recover despite implementation of recovery plans
- Data poor stocks were not represented here
- Modelling provides useful insights but predictive ability should be examined more rigorously
- New biological data (e.g., data storage tags, genetic markers, fecundity) has potential to challenge conventional assumptions
  - spatial structure remains poorly understood
  - reproduction is more variable than assessments assume (skipped spawning, condition, indeterminate or determinate)
- More research into effect of temperature on growth, distribution and reproduction is required

# Possible points for discussion

- Can management protocols accommodate large changes in biological productivity and ecosystem functioning? (*no more biology*)
- Is the recovery problem the responsibility of industry, managers and politicians facilitated by social scientists? (*no more biology*)
- Has our focus on recovery diverted attention from identifying stocks that are not yet recognised to be at risk of imminent collapse? (*more biology required*)
- Is evolutionary change relevant to recovery?  
(*more biology required*)

