



ICES approach for Data Limited Stocks (progress after June 2012)

Mixed fisheries and Multispecies approaches

Carmen Fernández, ACOM vice-chair
North Western Waters RAC (July 23, 2013, Dublin)



ICES
CIEM

International Council for
the Exploration of the Sea
Conseil International pour
l'Exploration de la Mer

Data limited stocks (DLS):

All stocks for which a “full assessment” and table with catch options can not be provided

- around half of the approx 200 stocks for which ICES gives advice are DLS – *wide range of situations*
- In past: only qualitative advice provided (“Do not increase” or “Reduce” catch)

Since 2012, ICES provides quantitative advice

Work until June 2012:

WKFRAME 3 (Jan 2012); WKLIFE (Feb); RGLIFE (May);
Further development by ICES Secretariat and ACOM

Data limited stocks (DLS):

Principles:

- * Available information should be used
- * Advice for DLS should, to extent possible, follow same principles as for data-rich stocks
- * Precautionary approach: advice more cautious when knowledge about stock status decreases
- Categorisation of stocks (6 categories) from data rich towards situations of decreasing information
- Methods proposed for different categories

See:

www.ices.dk → Community → Advisory process → Latest advice

“General context of ICES advice” and
“ICES implementation of advice for Data-limited stocks in 2012”

Data limited stocks (DLS):

Stock Categories:

1. Quantitative assessments and forecast
2. Assessment and forecast treated only qualitatively
3. Trends-based assessments
4. Only reliable catch data
5. Only landings
6. Very small landings, or caught in minor amounts as bycatch

Common DLS situations:

- Category 3: stock abundance index available (anglerfish, plaice 7fg)
- Category 5/6: only a time series of landings available (sole 7bc)

Advice generally starts from recent catch or landings, and modifies it based on available information. Followed by:

1. Uncertainty window (20% change limit, to dampen noise)
2. Precautionary margin (20% reduction if status in relation to reference points unknown --- with some exceptions, if significant increases in stock size or reductions in exploitation)

- Less frequent updating of this advice

Data limited stocks (DLS):

Work after June 2012:

- Target categories are being established, setting reasonable expectations for each stock

WKLIFE2 (Nov 2012):

- Reviewed DLS methods used during 2012
- Identified methods needing additional simulation testing. Results to be presented at WKLIFE3 (Oct 2013)
- Provided guidance for updating DLS advice in 2013

- Explored methods to infer stock status in relation to reference points based only on limited length information and biological knowledge

Data limited stocks (DLS):

Methods WG (Oct 2013):

- Investigate the robustness of the 6-category advice framework

WKLIFE3 (Oct 2013):

- Proxies for F_{MSY} using life-history traits and exploitation characteristics
- Key methods for estimating current exploitation based on limited information
- Methods to determine relationship between life-history traits and variance of stock development indices
- Review simulation work identified at WKLIFE2
- Investigate application of PSA to inform the advice for sustainable fisheries for data-limited and data-rich stocks
 - ➔ can help prioritise stocks for further development
- Make proposal for updating DLS advice in the future.

Updating/frequency of advice

Newly developing advisory strands require freeing up time from other routinely performed tasks in connection with single-stock advice

- ICES is discussing possibilities for updating advice less frequently, only when significant changes in stock status
- The fact that exploitation is now getting closer to the F_{MSY} objective helps making this a feasible approach
- Idea would be to set criteria for updating advice
- Under discussion...

Cooperation ICES/NWWRAC on data deficiencies

- WKDDRAC3 (Jan 2013) had to be cancelled due to lack of availability from scientists
- Everyone remains committed to improve cooperation, but work pressure very high
- Objective is NOT to have all stocks in category 1
- Stocks of interest to NWWRAC to be benchmarked in early 2014 (*note that some changes may still occur*):

BENCHMARK WK	WG	Stock	
WKSOUTH	WGHMM	Hke-nrth	Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d.
WKHAD	WGCSE	Had-scow	Haddock in Division VIa (West of Scotland)
WKCELT	WGCSE	Sol-celt	Sole in Divisions VIIf, g (Celtic Sea) (?)
	WGCSE	Whg-7e-k	Whiting in Division VIIe-k
	WGCSE	Nep-20-21	Nephrops in the FU 20 (Labadie, Baltimore and Galley), FU 21 (Jones and Cockburn)
	WGCSE	Nep-19	Nephrops off the southeastern and southwestern coasts of Ireland (FU 19)
IBPIRIS – correspondence	WGCSE	ple-iris	Plaice in Division VIIa (Irish Sea)
WKDEEP	WGDEEP	Several deep-sea stocks <i>UNDER DISCUSSION (benchmark may not go ahead in 2014)</i>	

- Data compilation workshops to be held in autumn 2013 (no dates yet)

Mixed fisheries & Multispecies approach

Mixed fisheries (technical interactions):

fisheries catch several species at the same time

➔ fishing pressure linked for several species

If ignored in management, this can:

- lead to under- or over-utilization of fishing opportunities
- discarding
- jeopardize recovery of weak stocks

In 2012, ICES North Sea advice presented an analysis of mixed fishery implications under current TAC and effort regimes:

➤ highlights main points of friction between single-species objectives

Mixed fisheries analysis for North Sea:

North Sea analysis updated in 2013, including also plaice and sole in VIId
Exploratory investigations for hake in IV and plaice in IIIa

Analysis assumes:

- fleets are given quota shares for each stock in line with single-species advice for 2014
- same fleet behaviour in 2013 and 2014 as in 2012 (same fishing pattern and catchability)

Five example mixed fisheries scenarios:

min: fleets stop fishing when their **first** quota exhausted

max: fleets stop fishing when their **last** quota exhausted

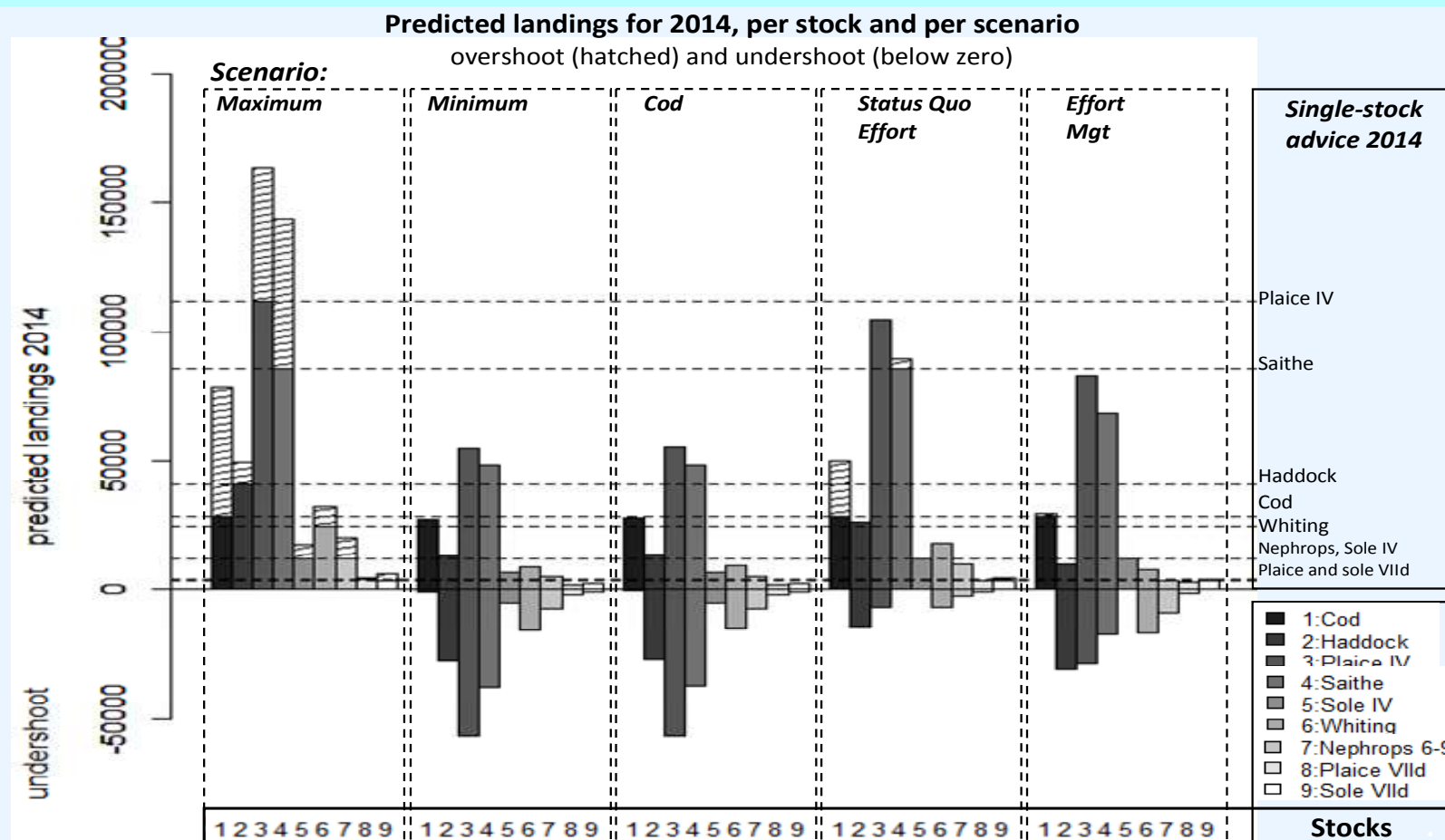
cod: fleets stop fishing when their **cod** quota exhausted

Status quo effort: effort equal to most recent year

Effort management: effort reduced according to regulations

“min” and “max” not realistic, but provide boundaries

Mixed fisheries analysis for North Sea:



- * Individual stock objectives can not all be achieved simultaneously
- * In 2014, the TAC (single-species advice) for cod is the most limiting
- * “Max” scenario leads to $F(2014) > F_{pa}$ for cod, saithe and sole in VIIId (not precautionary)

Mixed fisheries analysis for North Sea:

Evaluating the probability of reaching F_{MSY} by 2015 for all stocks

- Preliminary work in 2012 (WGMIXFISH-August) was a “proof of concept”:
 - same 5 mixed fisheries scenarios were applied for several years in succession and results examined for 2015-17
 - Preliminary results indicate:
 - “min” and “cod” very similar, leading to F at or below F_{MSY} for all species by 2015
 - None of the 5 scenarios is designed for achieving F_{MSY} for all stocks in 2015
 - Finding the optimal scenario to achieve this would require prioritization of management objectives and redesigning HCRs for integrated management at regional level

Mixed fisheries analyses for other ecoregions:

WGMIXFISH is developing a similar mixed fisheries analysis for West of Scotland

- started in 2012, progress expected this year (August meeting)

➤ Process starting for Iberian waters this year

Mixed fisheries advice will continue to develop by considering wider technical interaction, taking into account spatial and technical effects across a species assemblage

This requires interactive process with managers and stakeholders

Celtic Sea, Biscay and Iberia are developing this via RACs and GEPETO project

Multispecies (biological interactions):

Biological interactions occur within populations, between populations and with other ecosystem components:

- responses of stocks to changes in fishing pressure affected by these interactions

“Density-dependent” effects (predation, competition, growth...) imply that expected increases in stock abundance based on an MSY approach on an individual stock basis are unlikely to occur simultaneously

Some aspects incorporated in ICES single-stock advice (e.g. natural mortality values reflecting history of predator populations) – but more progress required

Knowledge must be gained on biological interactions, in order to incorporate them in the advice, where relevant:

requires data (stomach contents) and models

This is a developing process:

- framework and format is being developed

Advice will present precautionary boundaries and highlight main trade-offs

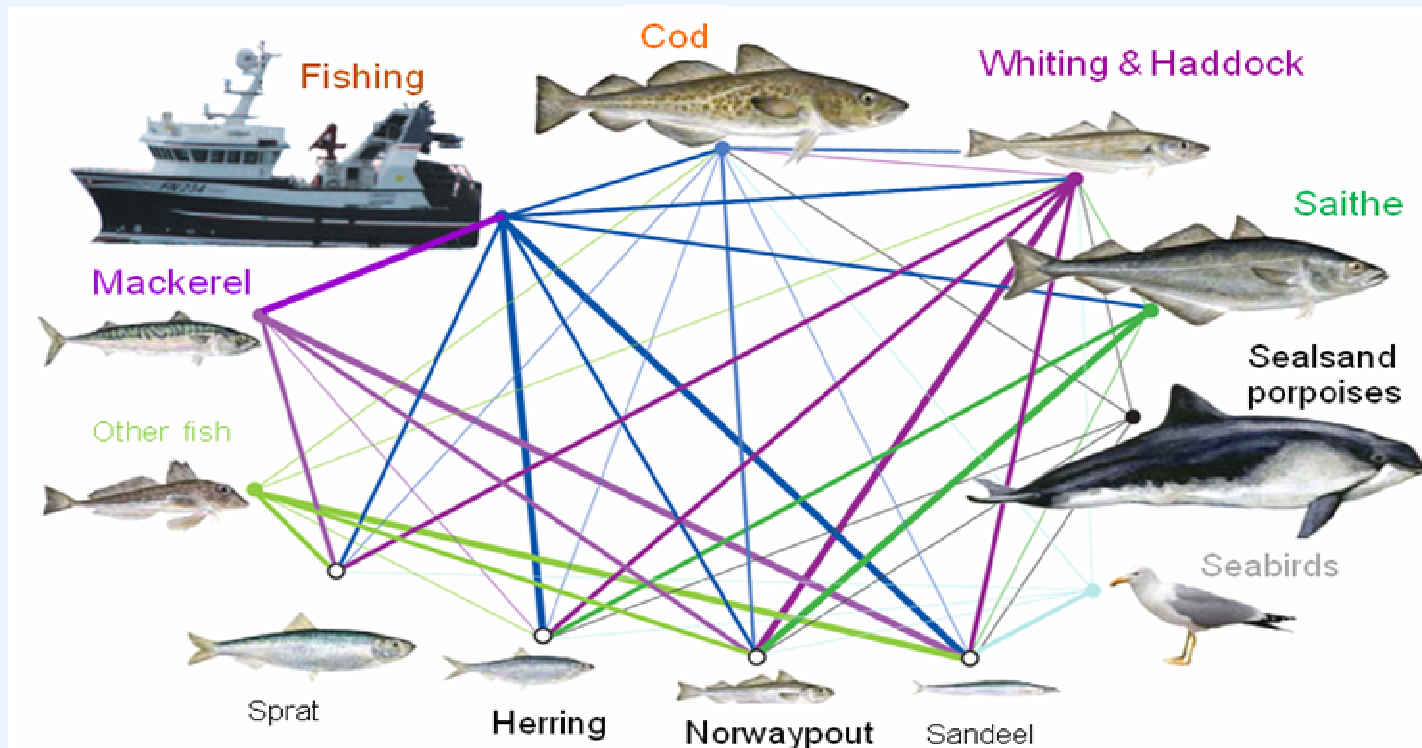
- Started with Baltic Sea in 2012 (& follow-up in 2013)
- North Sea has started process in 2013
- Iberian waters, Biscay and Celtic Seas areas will come later
- Adaptive improvements to advice for each region will occur yearly
- Process assisted by benchmarking process: to take place by ecoregion, aiming to develop ecosystem benchmarks

Multispecies considerations for North Sea:

- Idea is to start dialogue, to foster further development
- Management objectives and risk tolerance need discussion/validation (extends beyond science)
- Work illustrative and results should be interpreted qualitatively:
 - highlights main trade-offs between species
 - provides first indication of how multispecies MSY reference points might be:
 - no multispecies F_{MSY} can be considered precautionary until a formal evaluation has been done

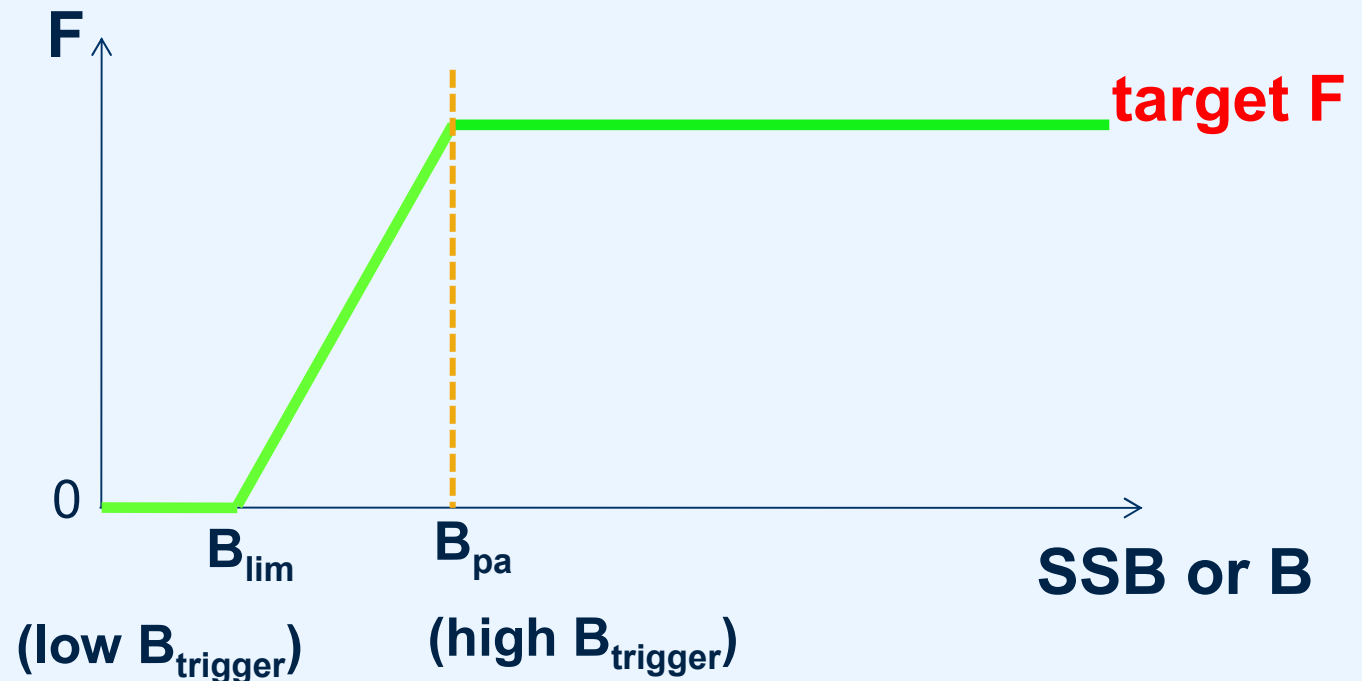
Multispecies considerations for North Sea:

- Results based on a multispecies assessment model (SMS) fit to most commercially exploited fish stocks:
 - cod, haddock, whiting, saithe, herring, sandeel, Norway pout, sprat
 - “external predators”: seabirds, marine mammals, other fishes
 - model accounts for predation
 - not a full foodweb model



- Simulations conducted to investigate long-term yield and SSB under a range of “target F” for all species in model
- Interactions (predation) between species taken into account
- Biomass of “external predators” kept constant (has impact on results)
- Use HCR, and explore a range of “target F” values for each species

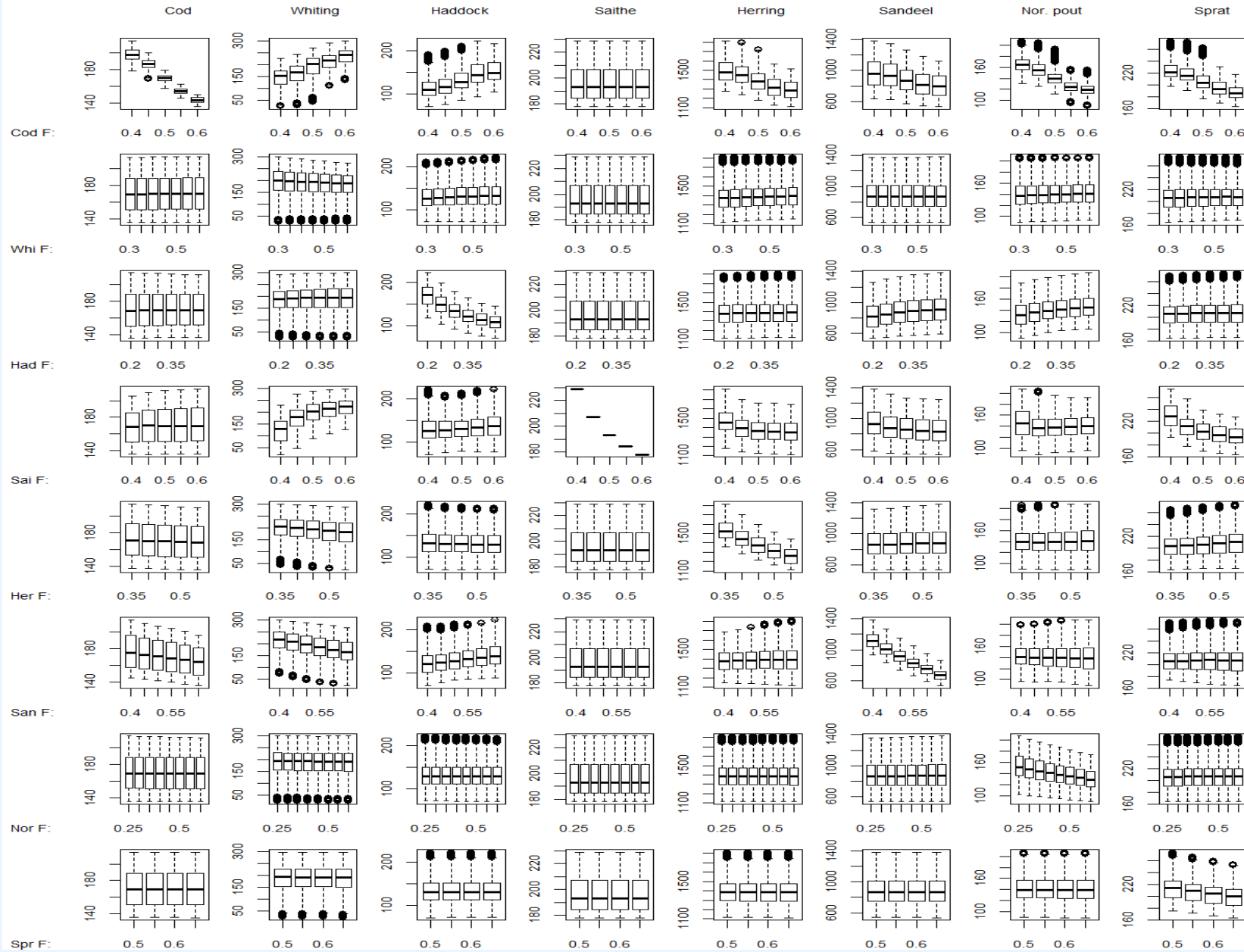
F_{MSY} from analysis refers to “target F” above B_{pa}



Multispecies considerations for North Sea: Results

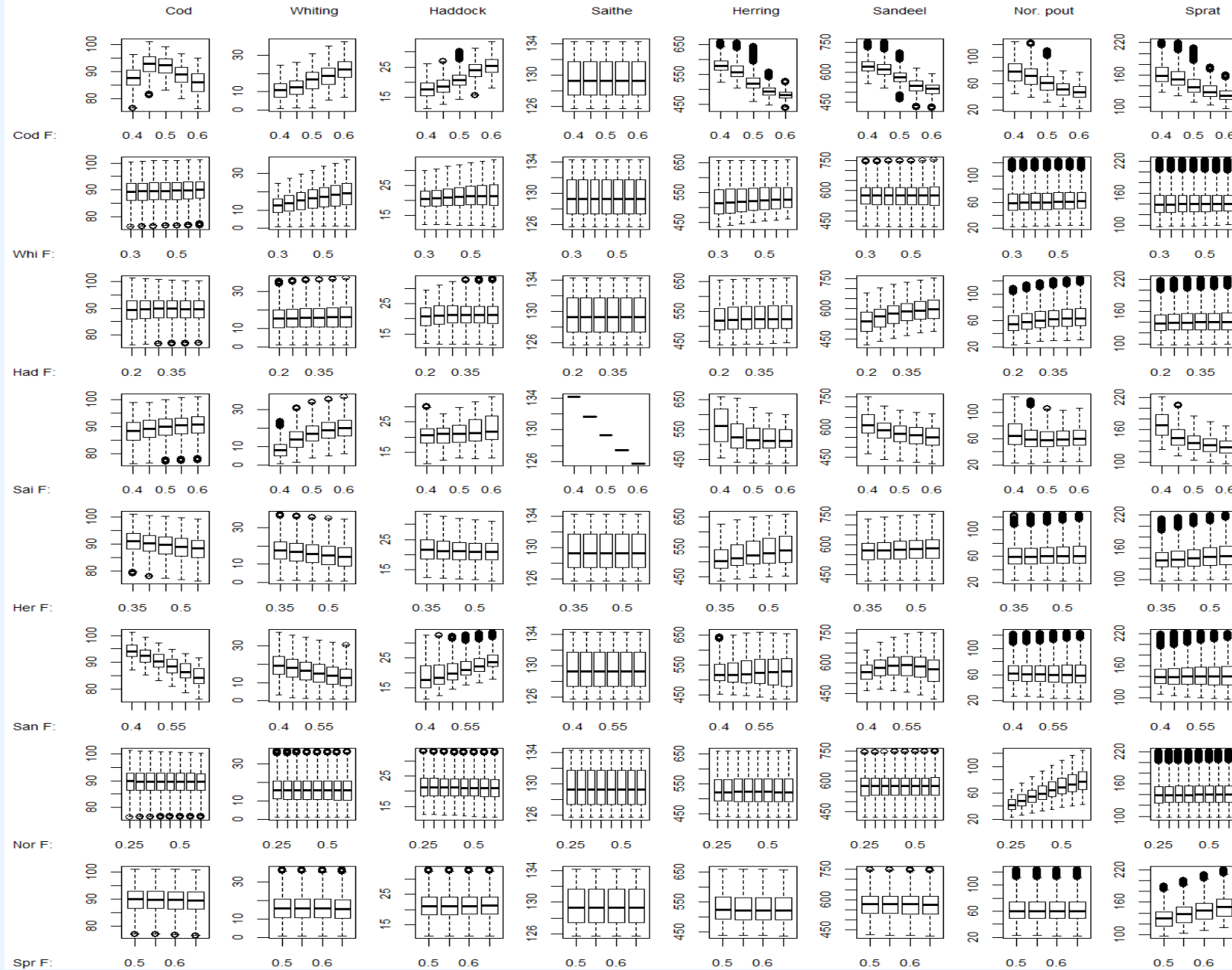
- Cod and saithe (main fish predators in model) stock size has large influence on biomass and yield of other species
 - ➔ choice of “target F” for cod and saithe affects other species considerably
- Direct and indirect predation effects
 - e.g. higher “target F” on cod ➔ smaller cod stock ➔
 - larger haddock and whiting stocks [*direct predation effects*]
 - &
 - smaller herring, sandeel, Norway pout and sprat stocks [*indirect predation effects*]
- It can be difficult to maintain biomass of all species simultaneously above single-species precautionary reference points (whiting)

Average long-term SSB with different “target F”



Fishing Mortality “target F”

Average long-term yield with different “target F”



Fishing Mortality “target F”

Multispecies considerations for North Sea: Conclusions

- Potential target multispecies F_{MSY} depends on management objectives and SSB constraints
No single MSY solution: simulations inform about trade-offs
- Yield and stock size of all species strongly affected by “target F” of cod and saithe. Indirect predation effects also important.
- Due to predation, unlikely that all stocks can be maintained above single-species biomass precautionary reference points simultaneously
- F_{MSY} (“target F”) values found in this analysis generally higher than single-species F_{MSY}
- F has decreased substantially in North Sea, and stock dynamics are increasingly more influenced by natural processes
- Improving estimates of consumption of fish by top predators (seals, cetaceans) also very important

Thank you for your attention!
Comments and questions?