Long Term Management of Area 7 *Nephrops*

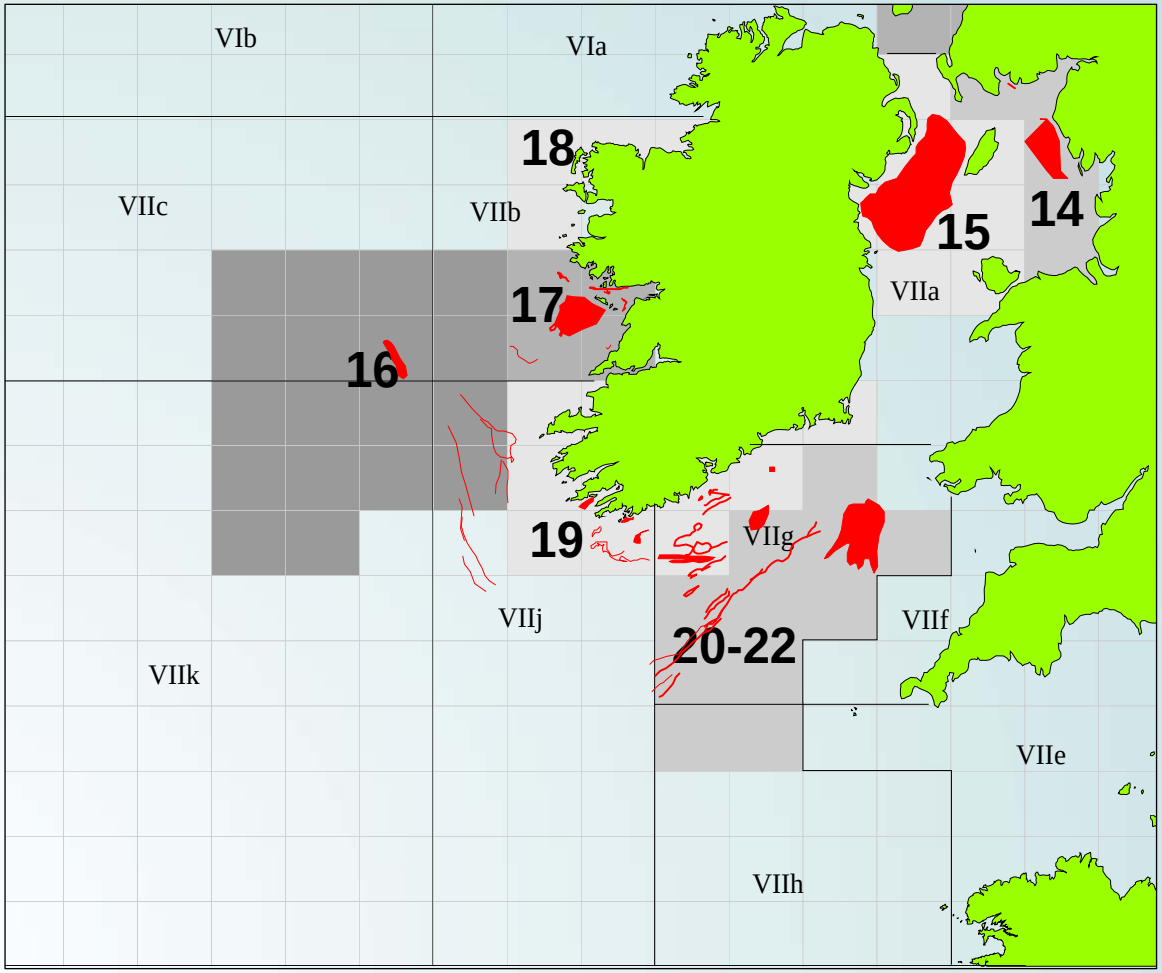
Pieter-Jan Schön

Fisheries and Aquatic Ecosystems Branch

Belfast Northern Ireland

Area overview

TAC area



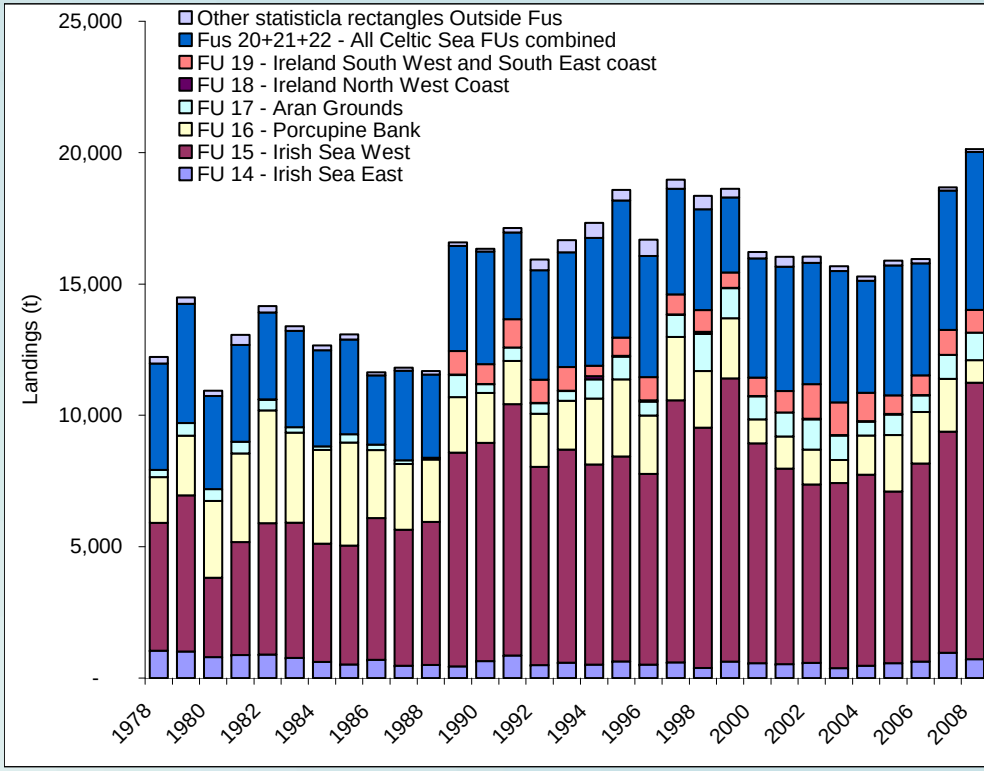
Nephrops are limited to a muddy habitat and the distribution of suitable sediment defines the species distribution

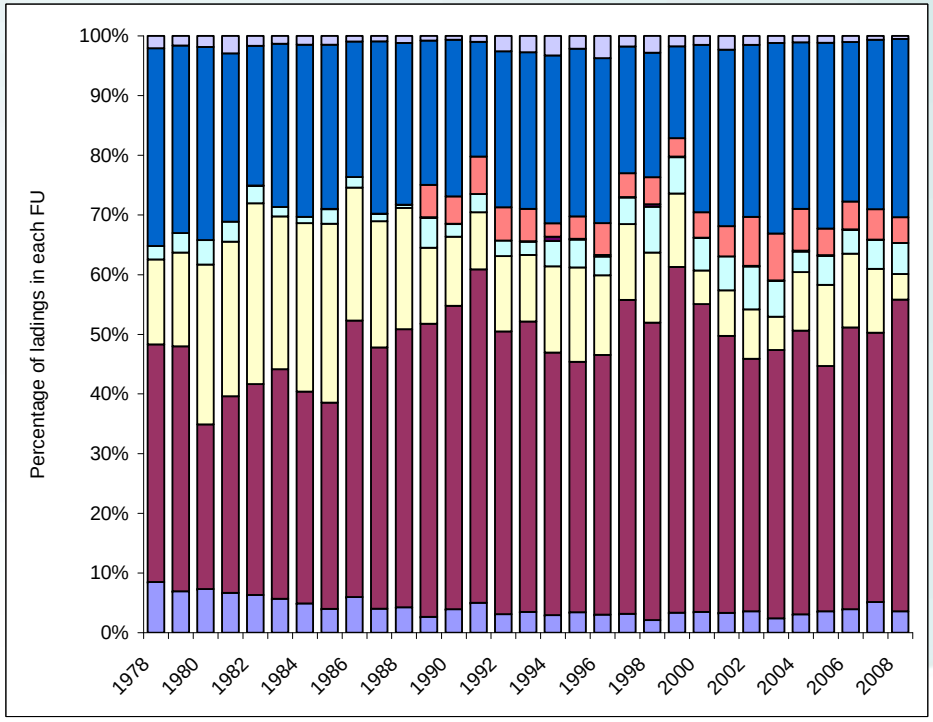
The stocks are assessed as 6 separate Functional Units (FU)

Area overview

Landings

Total reported annual landings
= 11,000 to 20,000 t





Largest percentage landings
from FU15 and FU 20+21+22

Assessment overview

Historic development of assessment methods and advice

Year	Advice basis	Advice	Developments
2001	Indicators / trends Inc XSA &ICA	Average landings	
2003	Indicators / trends Inc XSA &ICA	Average landings	
2005	Indicators/trends including XSA	Average landings	Mixed Fisheries MTAC - Age based VPAs were called into question
2006	STECF 0.1/TV harvest ratio (20%) Indicators / trends Inc XSA (for FUs without TV surveys)	No increase in effort	
2007	Where UWTV surveys existed a 15% harvest rate was applied by ICES for most stocks	Predicted Landings -no increasing effort	Simulation of exploitation. Uncertainty tables in the context of using the survey as relative or absolute
2008	UWTV * Harvest Ratio Indicators / trends for FUs without TV surveys	Predicted Landings -no increasing effort	Survey evaluation Training, reference material

* Historically also used Larval Production method - using fecundity data to back calculate the number of females required to produce the amount of larvae observed in surveys

Assessment overview

Key developments in 2009

FU specific bias correction factors estimated - surveys to be used as absolute indices of abundance

Prior to 2009, TV surveys assumed to have the same selectivity as the fishery.

Fishery dependent vs independent observations demonstrated mismatch – suggesting that the TV surveys detect burrow of *Nephrops* considerably smaller than the fishery selects.

Revision of TV survey selectivity required a revision of the sustainable harvest rate.

Harvest rates revised from 15-20% to 8-12%

Scaling issue - not a change in exploitation rate

Advice for *Nephrops 2010*

No PA but proxies for MSY

Low risk of depleting stock & high long-term yield

MSY proxies: [$F_{0.1}$, F_{max}]

F relative to $F_{0.1}$ and F_{max}	**SSB Stable or Increasing**	**SSB Decreasing**
$F > F_{max}$	Reduce F to F_{max}	Reduce F to $F_{0.1}$
$F_{max} > F > F_{0.1}$	Maintain current F	Reduce F to $F_{0.1}$
$F < F_{0.1}$	Increase F to $F_{0.1}$	Maintain current F

Advice 2010

2009 decision making framework had large implications on catch advice for 2010

			Implied fishery	
	Harvest rate	Survey Index (Millions)	Retained number (Millions)	Landings (tonnes)
	0%	4,288	0	0
	2%	"	68	896
	4%	"	136	1792
	6%	"	203	2688
	8%	"	271	3583
	10%	"	339	4479
	12%	"	407	5375
F0.1	**12.2%**	**"**	**413**	**5465**
	14%	"	474	6271
	16%	"	542	7167
	18%	"	610	8063
	20%	"	678	8959
Fmax	**20.4%**	**"**	**691**	**9138**
	22%	"	746	9854
F Current	**23.5%**		**795**	**10 514**
	24%	"	813	10 750

Advice 2010

2009 decision making framework had large implications on catch advice for 2010

	Landings	ICES Advice	
Ground	**2008**	**2009**	**2010**
Irish Sea East (FU14)	0.7	<1.0	<1.0
Irish Sea West (FU15)	10.5	< 8.5	< 5.5
Porcupine Bank (FU16)	0.9	< 1.0	0
Aran Grounds (FU17)	1.1	< 0.9	< 0.5
Ireland SW and SE Coast (FU19)	0.9	< 0.8	< 0.8
Celtic Sea (FU20-22)	6.0	< 5.3	< 5.3
Other rectangles	0.1	< 0.2	< 0.2
Total	20.1		13.3
Agreed TAC	25.153	24.65	

Long term management

Sustainable harvest rate???

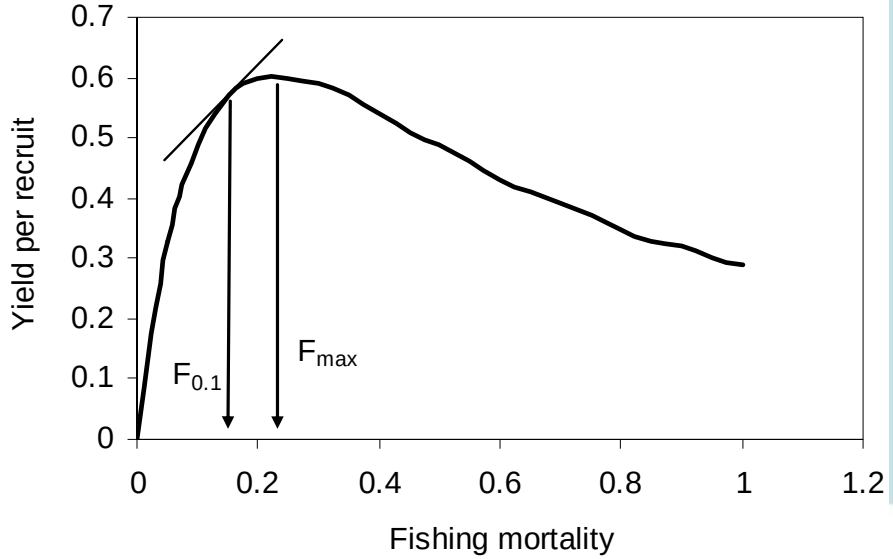
For many stocks ICES considers that exploitation rates between $F_{0.1}$ and F_{max} are an appropriate range of exploitation rates to maximise long term average yield.

Further work is required to ascertain whether fishing at $F_{0.1}$ is consistent with the management objective of maximising yield of *Nephrops*.

F_{max} is often considered too high an exploitation rate, leading to increasing risk to deplete SSB without any substantial increases in yield.

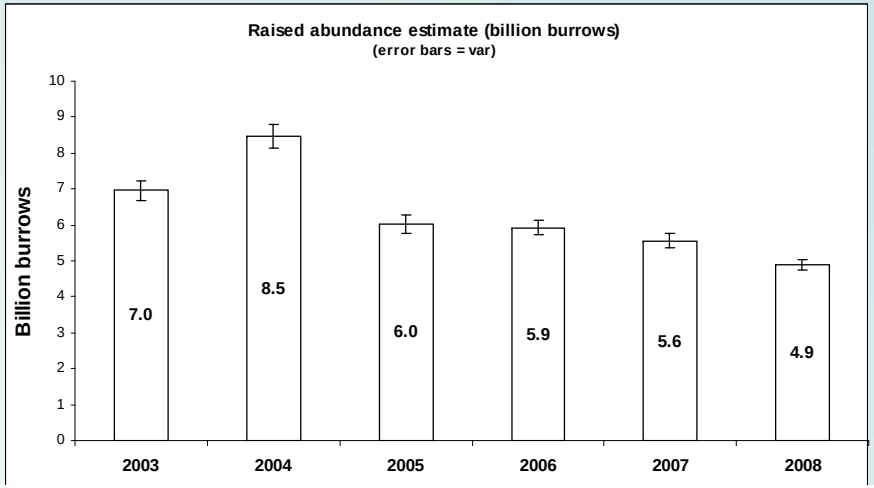
Need to identify scientifically defensible long term fishing mortality target rather than assuming $F_{0.1}$ is appropriate

Level of risk?



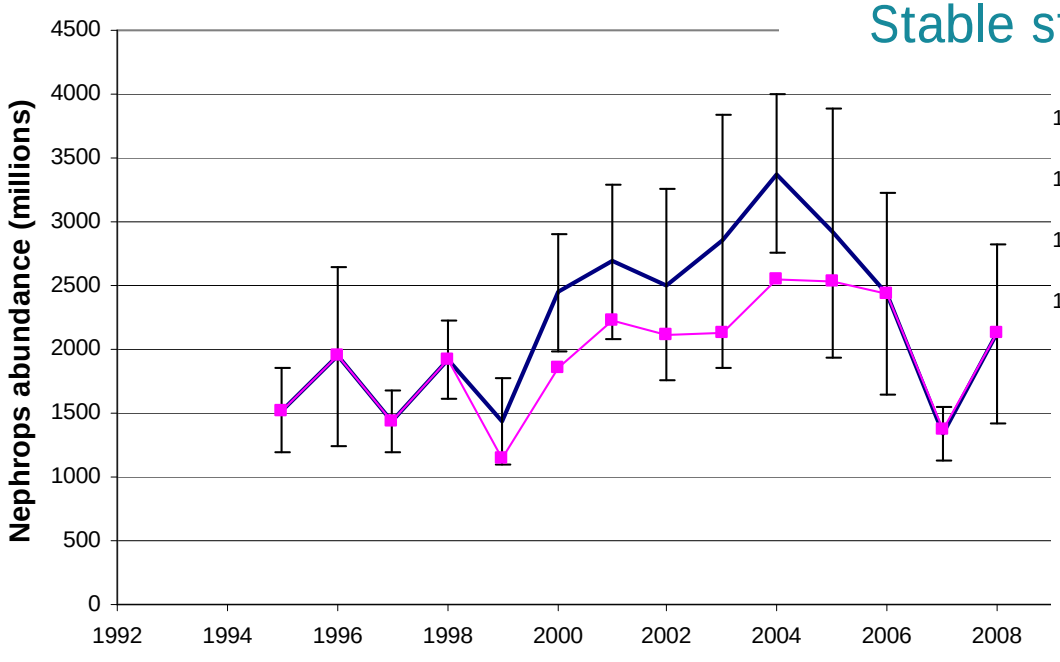
Long term management

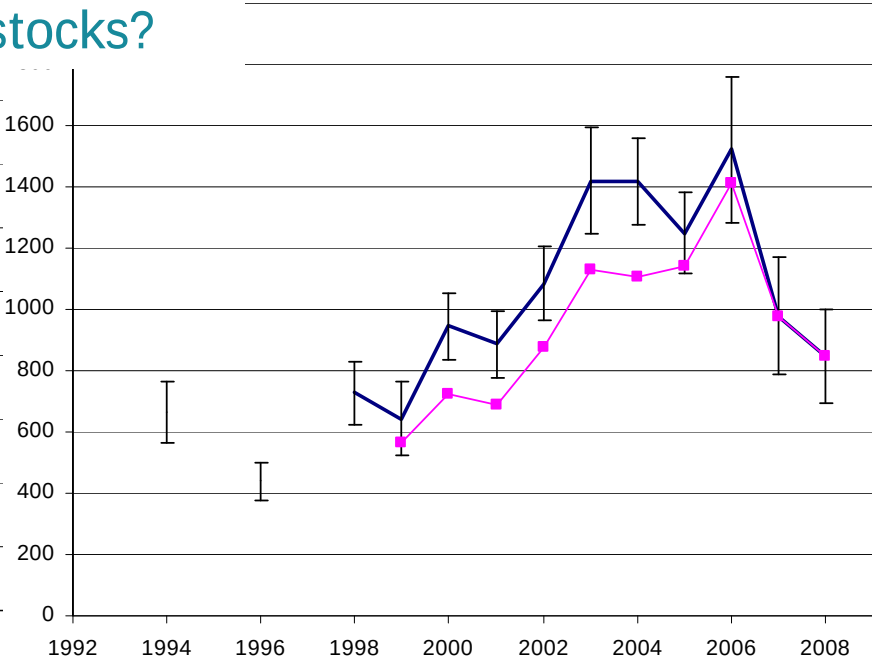
Sustainable harvest rate???



Process used for setting catch advice relative to a sustainable harvest rate, should take account of interannual variability and trend in survey estimated abundance, in order to mitigate risks of exceeding the intended harvest rate during the period for which catch advice is provided.

Stable stocks?

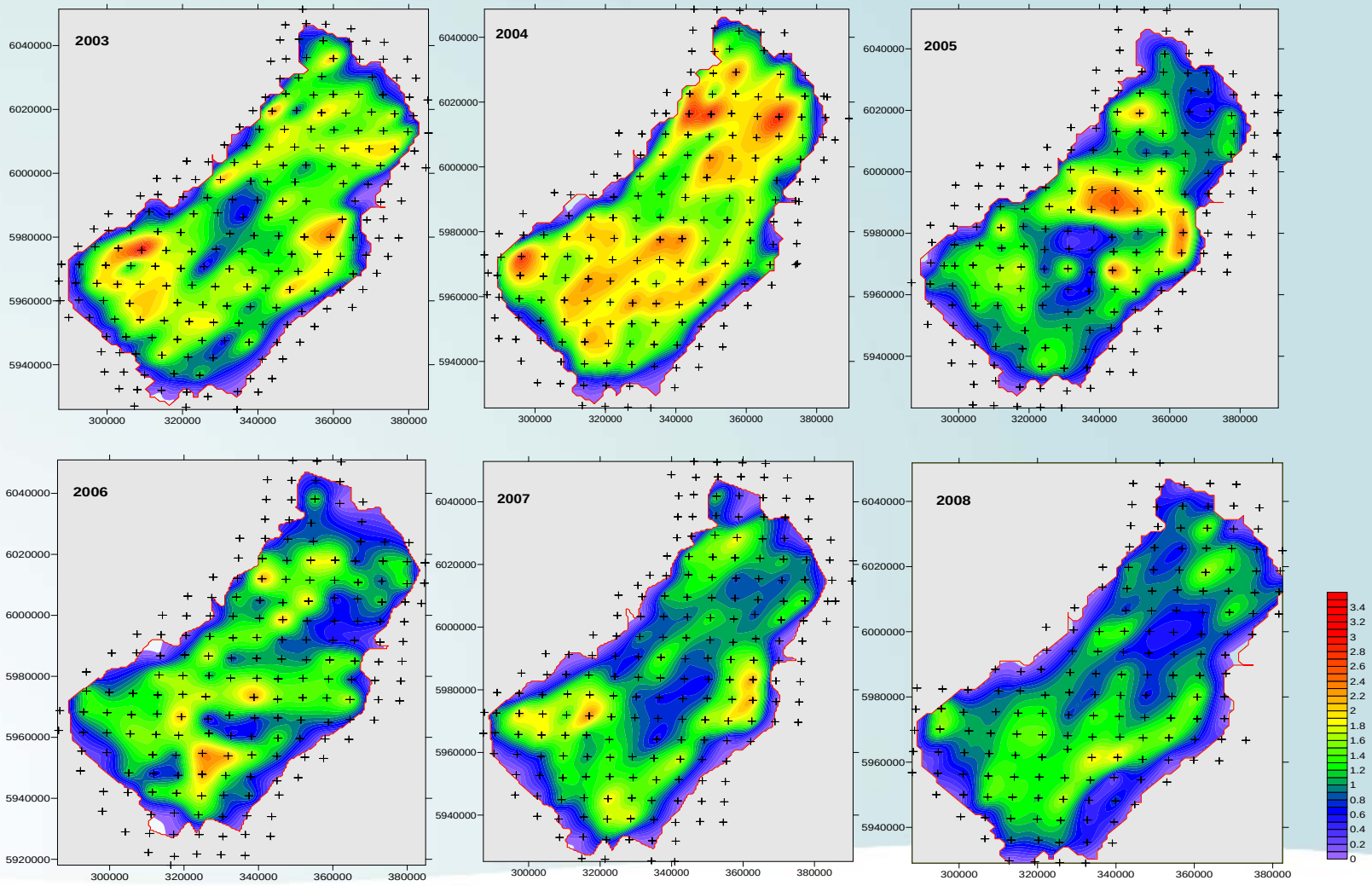




Long term management

Sustainable harvest rate???

Stable stocks?



Long term management

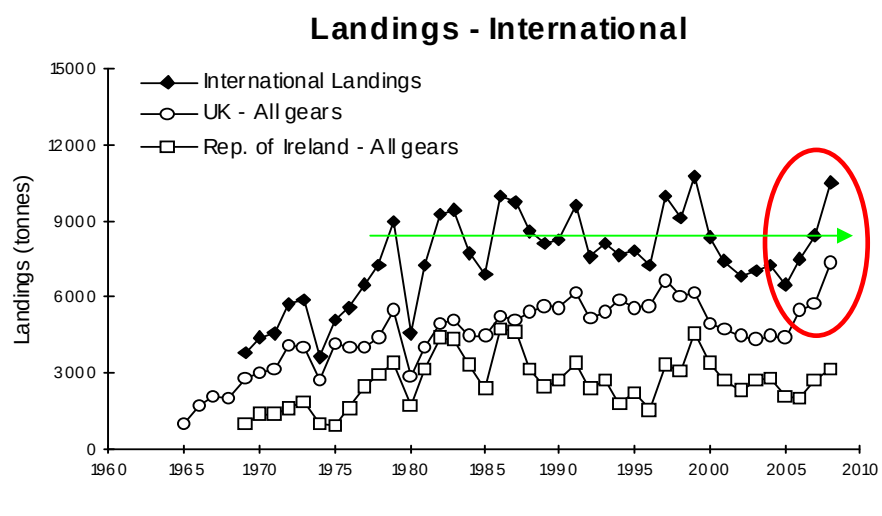
Sustainable harvest rate???

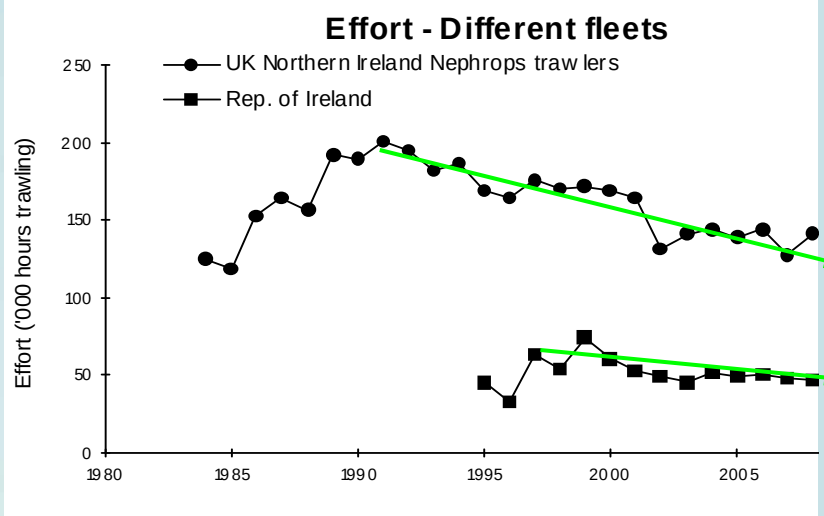
Stable stocks?

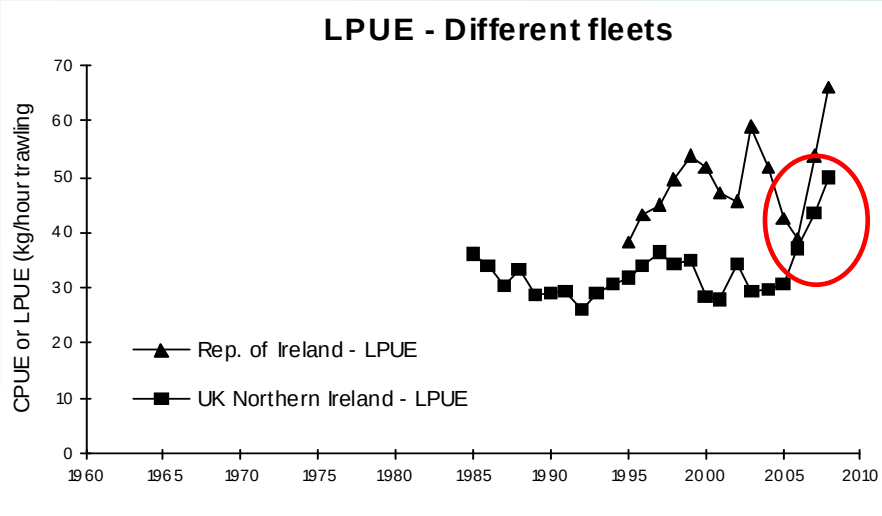
- Gap of 18 months between the survey and the start of the year for which the assessment is used to set management levels
- Calculations of Harvest Ratio and reference points $F_{0.1}$ and F_{max} are based on yield-per-recruit analyses and therefore apply to stocks in equilibrium - unlikely due to variable recruitment
- In addition, important assumptions are made on growth, natural morality and discard rates in the derivation of reference points

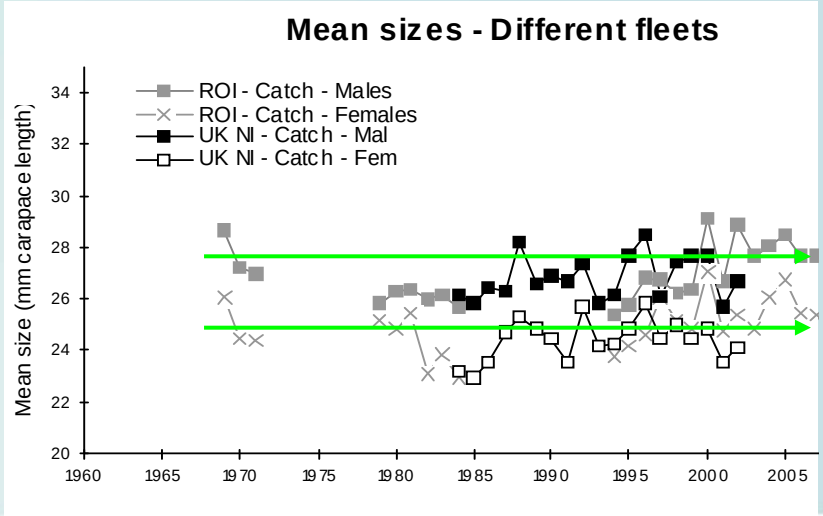
Long term management

Sustainable harvest rate? – other indicators



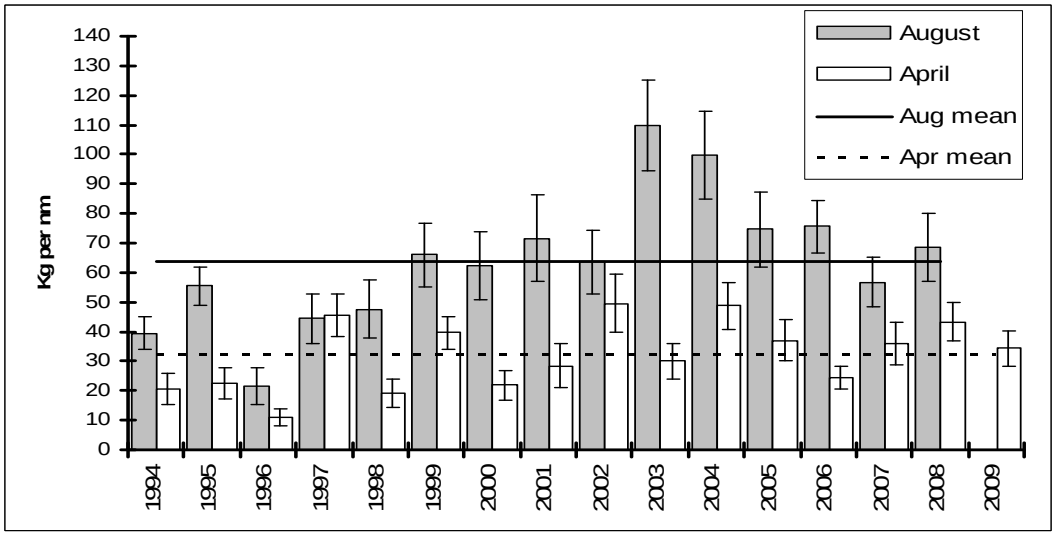


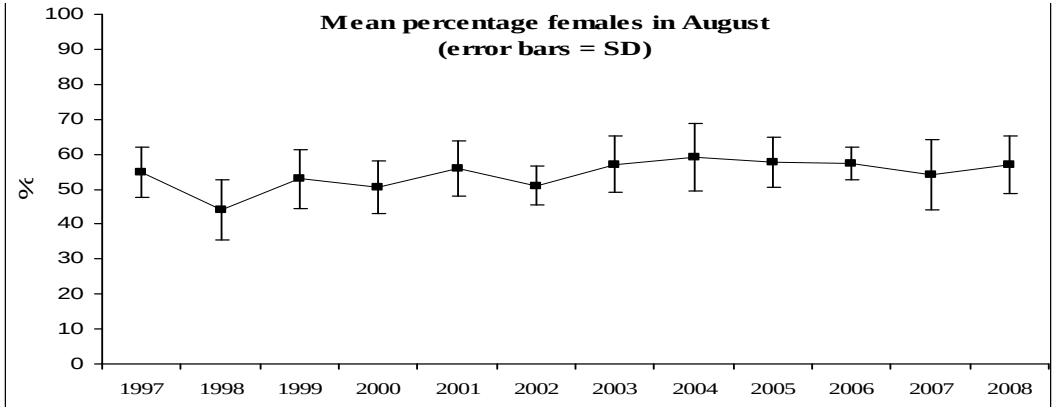


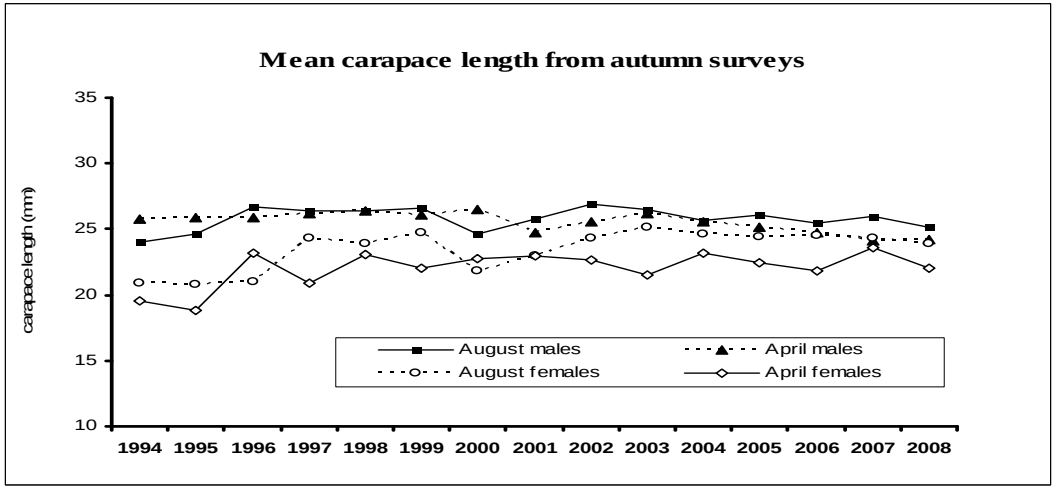


Long term management

Sustainable harvest rate? – other indicators







Long term management

Sustainable harvest rate???

”The *Nephrops* trawl fisheries take bycatches of other species, especially juvenile whiting but also cod. Catches of these species should be reduced to as low as possible because of the poor status of these stocks.”

In terms of mixed fisheries yield and reference points: -

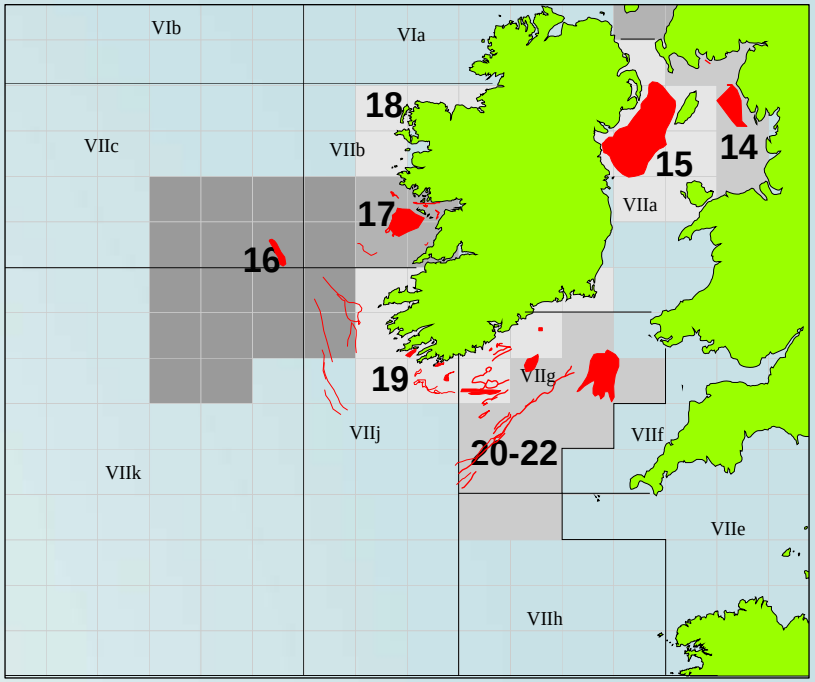
- **In multi-species fisheries the individual stocks have different productivities – effort required to maximise yield in the mixed stock will overexploit less productive species**
- **Total mixed stock yield < estimated yield from each stock separately**

Long term management

Management area???

ICES advice..

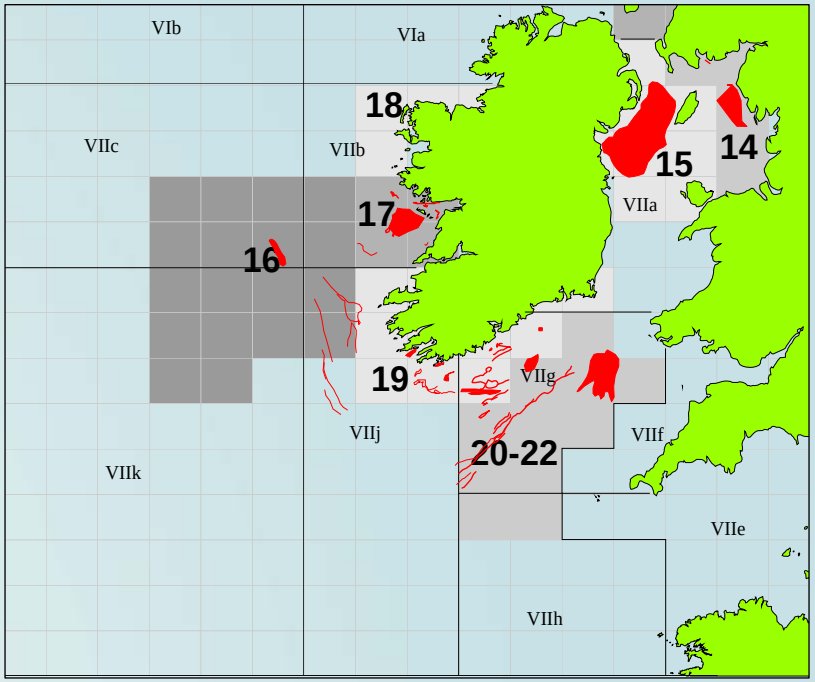
"*The overriding management consideration for these stocks is that management should be at the Functional Unit rather than the ICES Subarea/Division level. Management at the Functional Unit level should provide the controls to ensure that catch opportunities and effort are compatible and in line with the scale of the resources in each of the stocks defined by the Functional Units*."



Long term management

Management area???

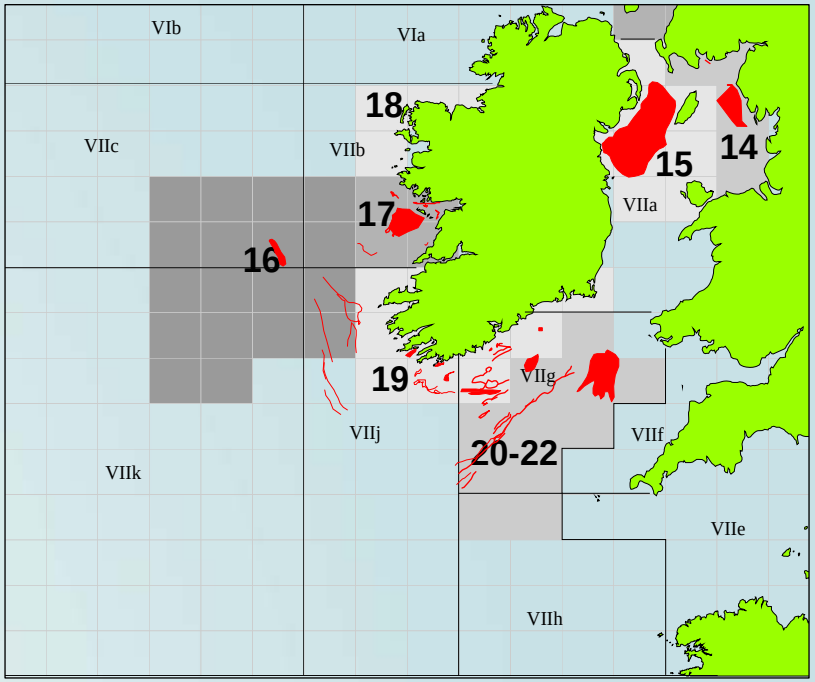
- Harvest rate can vary depending on fishery selectivity, growth characteristics, the age-range represented by the survey, and other features, many of which are different for the different *Nephrops* functional units.
- Harvest rate corresponding to $F_{0.1}$ or F_{max} FU specific
- Appropriate sustainable harvest rate FU specific?



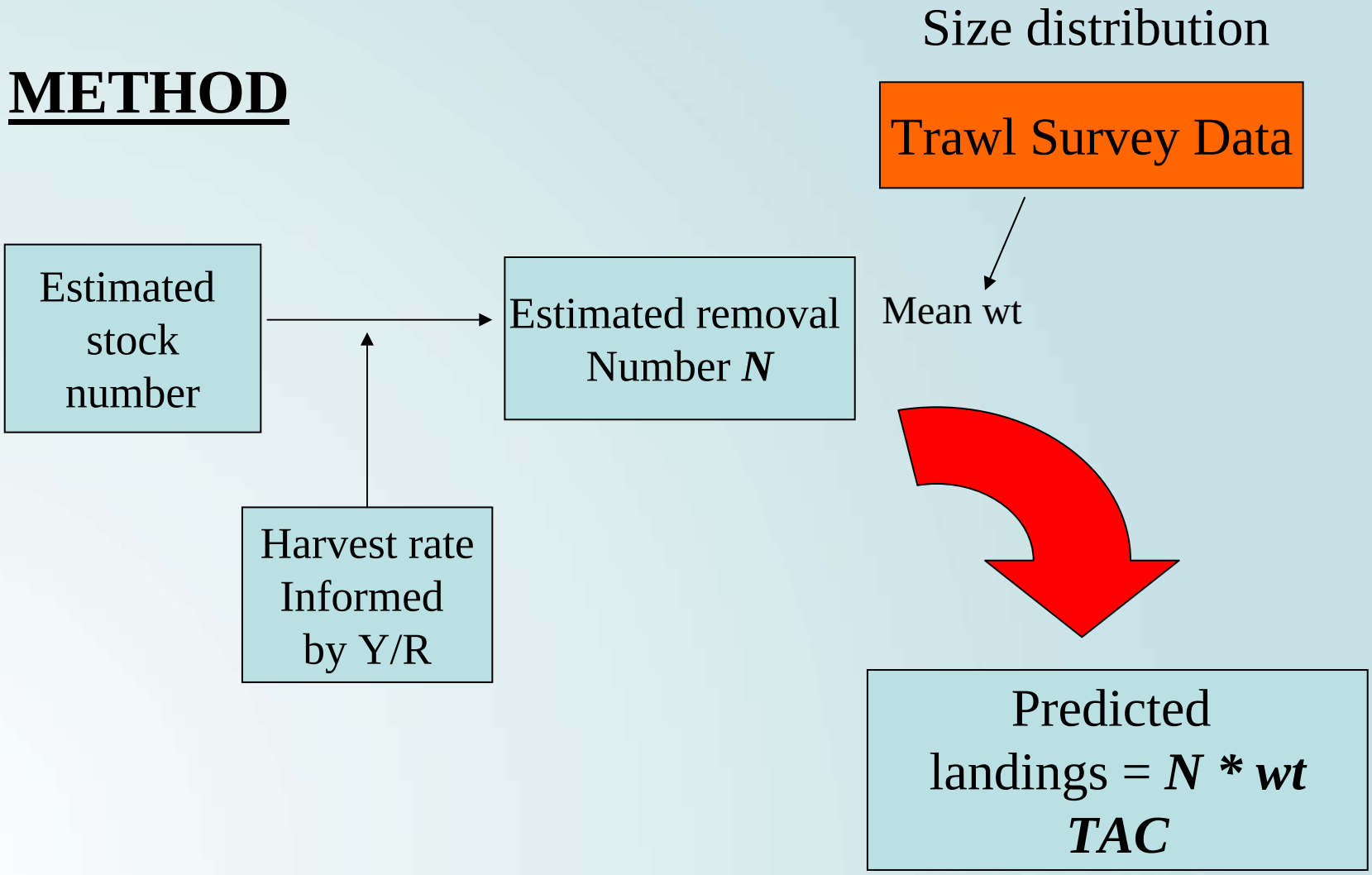
Long term management

Management area???

- Controlling effort by FU?
- How to apply FU specific conservation measures if required, e.g., FU 16 Porcupine Bank
- How do determine appropriate catch options for FUs with no TV survey?



METHOD


Size distribution
Trawl Survey Data
Estimated stock number
Estimated removal Number *N*
Mean wt
Harvest rate Informed by Y/R
Predicted landings = *N* * *wt*
TAC