“Bio-economic modelling using the métier-fleet based approach and the IFREMER Fisheries Observatory Database: application to the Northern Hake long-term management plan”

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Context : The Northern Hake Management Plan development

- Concerns over the State of the stock in the early 2000
- 2000-2004 : Technical measures to improve selection pattern and protect juveniles (Hake Box)
- 2004 : The recovery plan (increase SSB above Bpa)
- 2007 : The long-term management plan.
- 2007 a: WG 1 / Level of F to exploit the stock at MSY, Biological impact of several management scenarios to achieve Fmsy.
- 2007 b : WG 2 / Economic and Social impacts of the selected scenarios from the WG1

Phase 1 : Biological assesment of several scenarios for the HMP - Methods and results

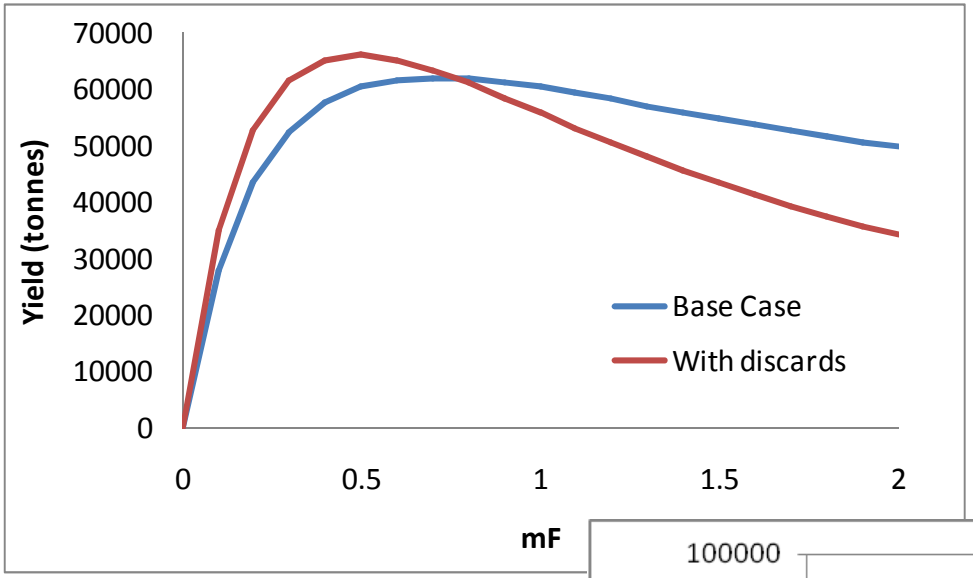
- Fmsy = F max = 0.17 (70% of F statuquo)
- Biological modeling (using FLR with 2 algorithms: simple projection and Management Strategy Evaluation (MSE))
- Base Case without discards as data incomplete (ICES assessment).
- Sensitivity analysis with ad-hoc rebuilding of historical discards
- Changes in the exploitation patterns (F reduced on young ages), 2 scenarios tested (H1 and H2 = no discard)

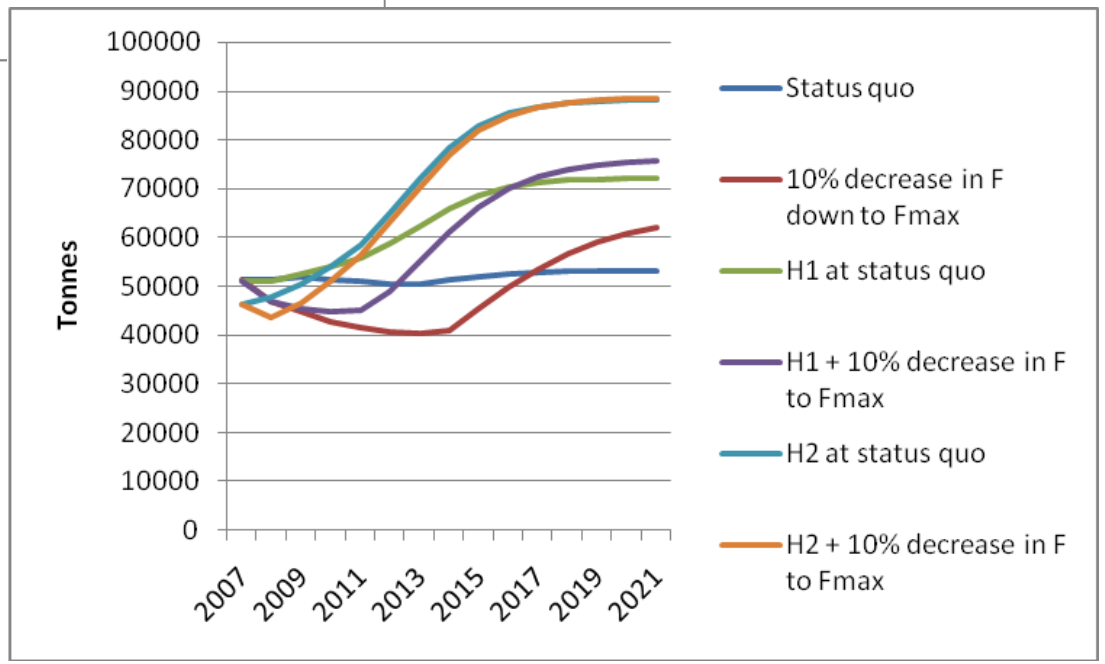
Phase 1 : Biological assesment of several scenarios for the HMP - Methods and results

- Little difference, in terms of long-term yields, between Fmax and Fsq scenarios. However reducing F to Fmax as opposed to Fsq would lead to higher SSB and thus give the stock more stability, reducing the risk of getting back to an unsafe situation.

- Inclusion of discard estimates in the analysis creates a stronger positive effect on yield and SSB when F is reduced. Furthermore, inclusion of discards in simulations where the selection pattern is changed to reduce F on younger ages produces positive benefits of similar magnitude to reductions in overall F

Phase 1 : Biological assesment of several scenarios for the HMP - Methods and results





Phase 2: Basic economic impact assesment of selected scenarios from the phase 1

Description of main fleets catching hake

	Number of vessels catching hake				Hake catches in volume (tonnes)				Hake dependency (%Hake in total value of landings)			
	Spain	**France**	**UK**	**Irland**	**Spain**	**France**	**UK**	**Irland**	**Spain**	**France**	**UK**	**Irland**
Demersal Trawl Segment - Targeted Nephrops 12-24m		204	*	*		952				10%		
Demersal Trawl Segment - Targeted Fish 12-24m		106	*	*		420				5%		
Demersal Trawl Segment 24-40m	93	55		*	12 793	1 111			20%	11%		
Pair Demersal Trawl 24-40m	20				2 190				6%			
Hook 24-40m	84	5			14 056	728			74%	7%		
Netters 12-24m		60				1 747				19%		
Netters 24-40m		18				3 775				38%		
Other		210				1 063				12%		
Total		**658**			**29 039**	**9 797**	**3 600**					

Source : SEC, 2007, Northern Hake long-term management plan (SGBRE-07-05)

Phase 2: Basic economic impact assesment of selected scenarios from the phase 1

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Common economic indicators per fleet segment

Economic indicators
Value of landings
Fuel costs
Other running costs
Vessel costs
Crew share
Gross cash flow
Depreciation
Interest
Net profit
Gross value added
Invested capital
Other economic indicators
Employment on board (FTE)
Invested capital (mEUR)
Effort (1000 days at sea)
Capacity indicators
Volume of landings (1000t)
Fleet - number of vessels
Fleet - total GRT (1000)
Fleet - total GT (1000)
Fleet - total kW (1000)
Composition of landings (value and volume)
per major species

Phase 2: Basic economic assesment of selected scenarios from the phase 1

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- The EIAA (Economic Interpetation of ACFM Advice) model developped in 1999 with extensions till 2007. *Frost, H., J. L. Andersen, A. Hoff and T. Thogersen 2009. The EIAA Model: Methodology, Definitions and Model Outline. Institute of Food and Resource Economics, Copenhagen. 75p.*

- Fleet based model; Inputs=landings and SSB per year (outputs of phase 1); costs and earnings statistics (average of 3 years data).

- Variable costs vary with effort which is a function of prices (constant here), landings (proportionnaly exponent 1) and SSB (less prop, exponent 0.6)

- EIAA model is an output based approach: Stock and yield are used in the Production function to calculate the number of Days at sea to catch the yield (the number of vessels keep constant).

Phase 2: Basic economic and social impact assesment of selected scenarios from the phase 1

- **Selected scenarios:**

One set of simulations is based on the “base-case” assessment (i.e., without accounting for discards) conducted by ICES (2007) and includes:

- A status-quo or Fpa scenario in which F is kept constant at 0.25.
- 5, 10 and 15% decrease on a yearly basis towards Fmax (0.17).
- same scenario with decrease of F towards 0.8*Fmax and 1.2*Fmax

Another set is based on an alternative assessment conducted with an ad-hoc rebuilding of historical discards. In this set, improvement in selection patterns have also been investigated. It thus includes.

- A status-quo F simulation
- A 10% decrease in F towards Fmax
- A drastic improvement in selection pattern (H2) at constant F
- A drastic improvement in selection pattern with a 10% decrease in F towards Fmax.

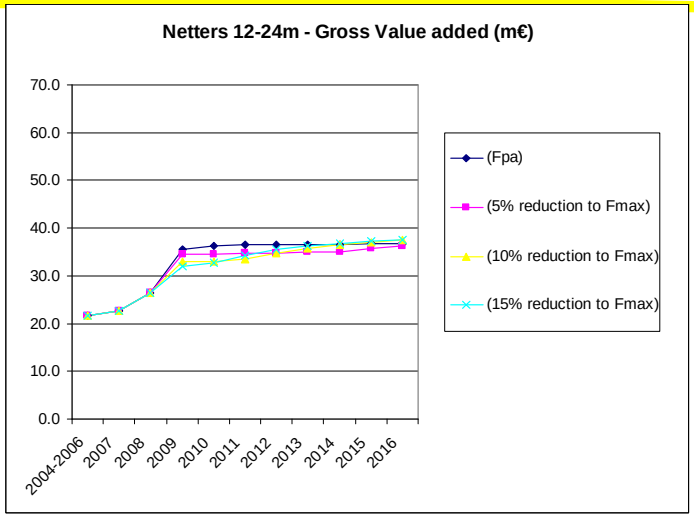
- Period of projection : 9 years
- 2 Discount rates: 5% and 10%

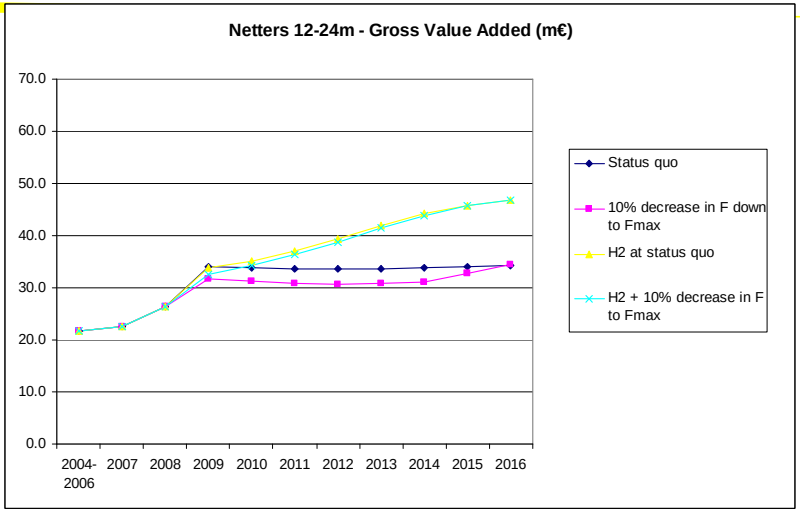
Results of the Phase 2: Basic economic impact assesment of selected scenarios from the phase 1

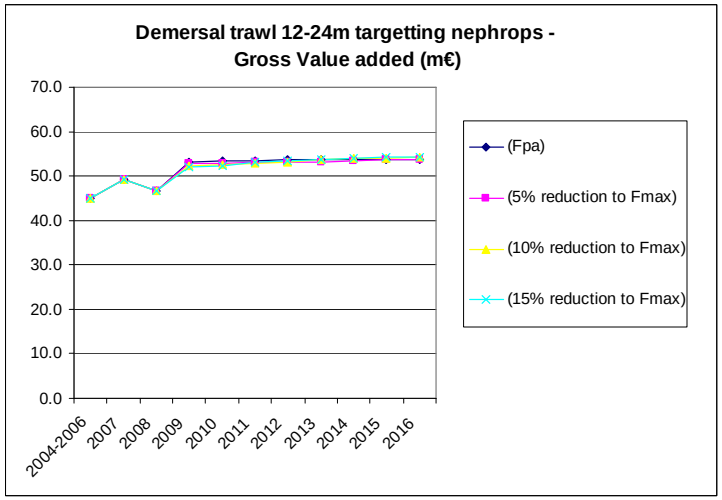
- Fpa and Fmax scenarios without taking account of discards and improvement of selection pattern : Slight improvement in economic performance, slightly better for passive gears; no significant differences between the scenarios.

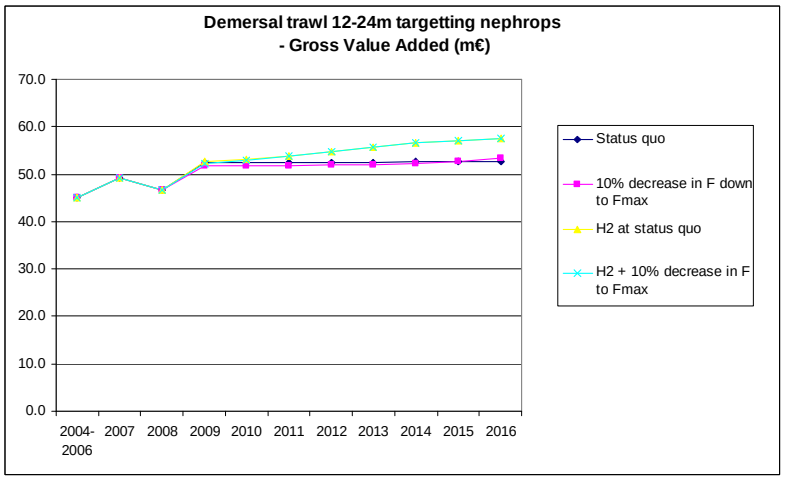
- Fmax with improvement of selection pattern (H1 et H2) : better impact on eco performance (losses in the short term for fleets targeting young age hakes; high benefits in long term for all fleets particularly passive gears)

Results of the Phase 2: Basic economic impact assesment of selected scenarios from the phase 1









Towards an improve bio economic impact assesment of the Hake MP

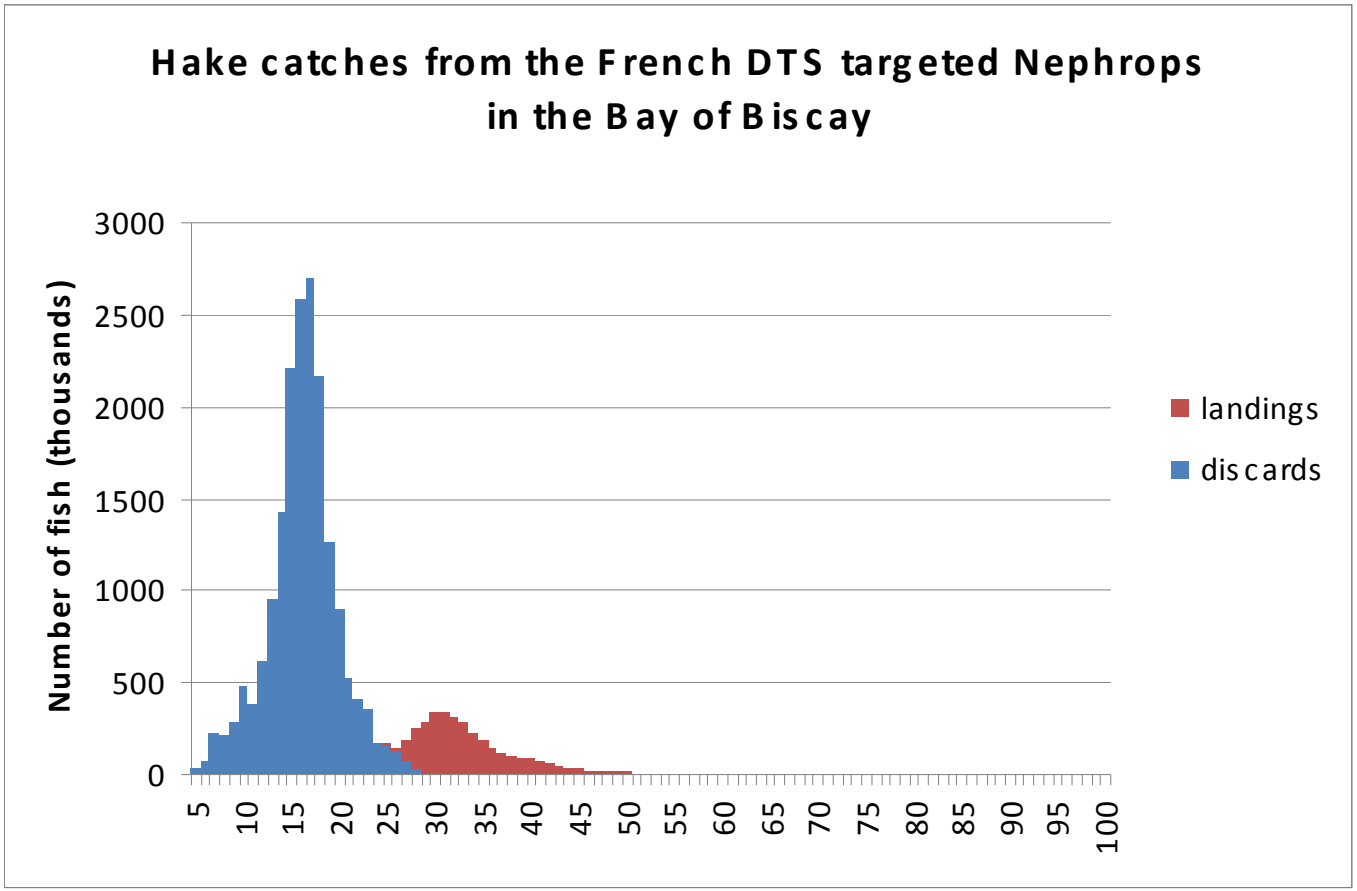
F by metier (called Fishery Units in ICES) or gear can be computed from total F at age estimated by the stock-assessment model. This was done using the proportions of landings at age by category (métier or gear)

Allow for projection accounting for different selection patterns by métier/gear.

As an example, proportion at age by gear:

Gear	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8+
Trawl	0.9990	0.9790	0.9232	0.8535	0.7028	0.4510	0.2856	0.2050	0.1215
Gill.	0.0000	0.0108	0.0491	0.0727	0.0854	0.1666	0.2795	0.3490	0.4211
Long.	0.0000	0.0000	0.0003	0.0083	0.0763	0.2314	0.2812	0.2914	0.2884
Others	0.0010	0.0102	0.0274	0.0655	0.1356	0.1510	0.1537	0.1546	0.1690

Towards an improve bio economic impact assesment of the Hake MP



Towards an improve bio economic impact assesment of the Hake MP

To link the métier to the fleet, it is necessary to built the métier/fleet matrix (the French example).

		Nets	Hooks	Nephrops Trawl	Fish Trawl	Other	
DCR Segment Fleet	**Length Class**	**FU 3 + FU 13**	**FU 2 + FU 12**	**FU 8 + FU 9**	**FU 4 + FU 5 + FU 10 + FU 14**	**FU 16 + FU 00**	**Total Métier (FU)**
DTS - Targeting Nephrops	12-24m			952 (10%)			**952 (10%)**
DTS - Targeting Fish	12-24m				420 (4%)		**420 (4%)**
DTS	24-40m				1 111 (11%)		**1 111 (11%)**
Hook	24-40m		728 (7%)				**728 (7%)**
Netters	12-24m	1 747 (18%)					**1 747 (18%)**
Netters	24-40m	3 775 (39%)					**3 775 (39%)**
Other	-					1 063 (11%)	**1 063 (11%)**
Total Segment Fleet		**5 523 (56%)**	**728 (7%)**	**952 (10%)**	**1 531 (16%)**	**1 063 (11%)**	**9 797 (100%)**

Towards an improve bio economic impact assesment of the Hake MP

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Official fishing national registers of vessels and owners
Census

Activity of the fleet
(métiers, characteristics of the gears, fishing effort…)
Census

Statistics of landings
(logbooks, auction data…)
Declarative

Biological sampling of landings

Surveys aboard scientific vessels

Typologies of fleets / Identification of significant gears, métiers or species…

Collection of catches data aboard fishing vessels or at land
(landings / discards / effort)
sampling

Collection of economic data
(costs and earnings)
sampling

Multidisciplinary analysis of the fishing system :

- Extrapolation (economic situation, catches, fishing effort…)
- Stock assessments
- Bio economic diagnostics of fisheries and analysis of the impacts of management measures…

Flyers and reports for fishermen, stakeholders, administration, general public…

The Fishery Observatory database of Ifremer : a Multidisciplinary and statistical approach

Towards an improve bio economic impact assesment of the Hake MP

Problems of Data availability at European level:

- Building the métier/fleet matrix for British and Irish fleets

- No detailed data on netters for the Spanish fleets

Conclusion

- Further developments need on bioeco modelling :
  - Genuine integrated approach (FLR…)
  - Different Exploitation Pattern between fleets and/or métiers need to be taken into account
  - Fleet dynamic modelling (entry/exit, effort allocation by métier)

- Further developments for bioeconomic modelling using the FOS database:
  - Assumptions on effort/catches allocation per metier within a fleet using logbooks and fishing calendars
  - Analysis on cost per metier per fleet