

The landings obligation in view of different management regimes

Hans Frost and Ayo Hoff

Department of Food and
Resource Economics



UNIVERSITY OF COPENHAGEN



What?

Using a simple two-fleet two-species bio-economic model (ToyFish) to illustrate relative economic trade-offs of introducing the landings obligation in fisheries managed with ITQs.

Why?

- The results of this simple generic model will point :
- (i) towards possible trends in economic outcomes of fisheries under the landings obligation and
 - (ii) detail the understanding of the results of more complex case specific models.

Context: Discardless

Discardless (Horizon 2020 grant agreement No. 633680) has the aims:

- To develop **practical, achievable, acceptable and cost-effective Discard Mitigation Strategies (DMS)**.
- To integrate **knowledge, tools and technologies at local, national, EU and international level** to provide and promote the solutions needed to implement DMS through the seafood supply chain.
- To assess the **effects** of discard reduction policies **on the ecosystem, economic and social sustainability**.
- To provide **feedback on improved fisheries management**.

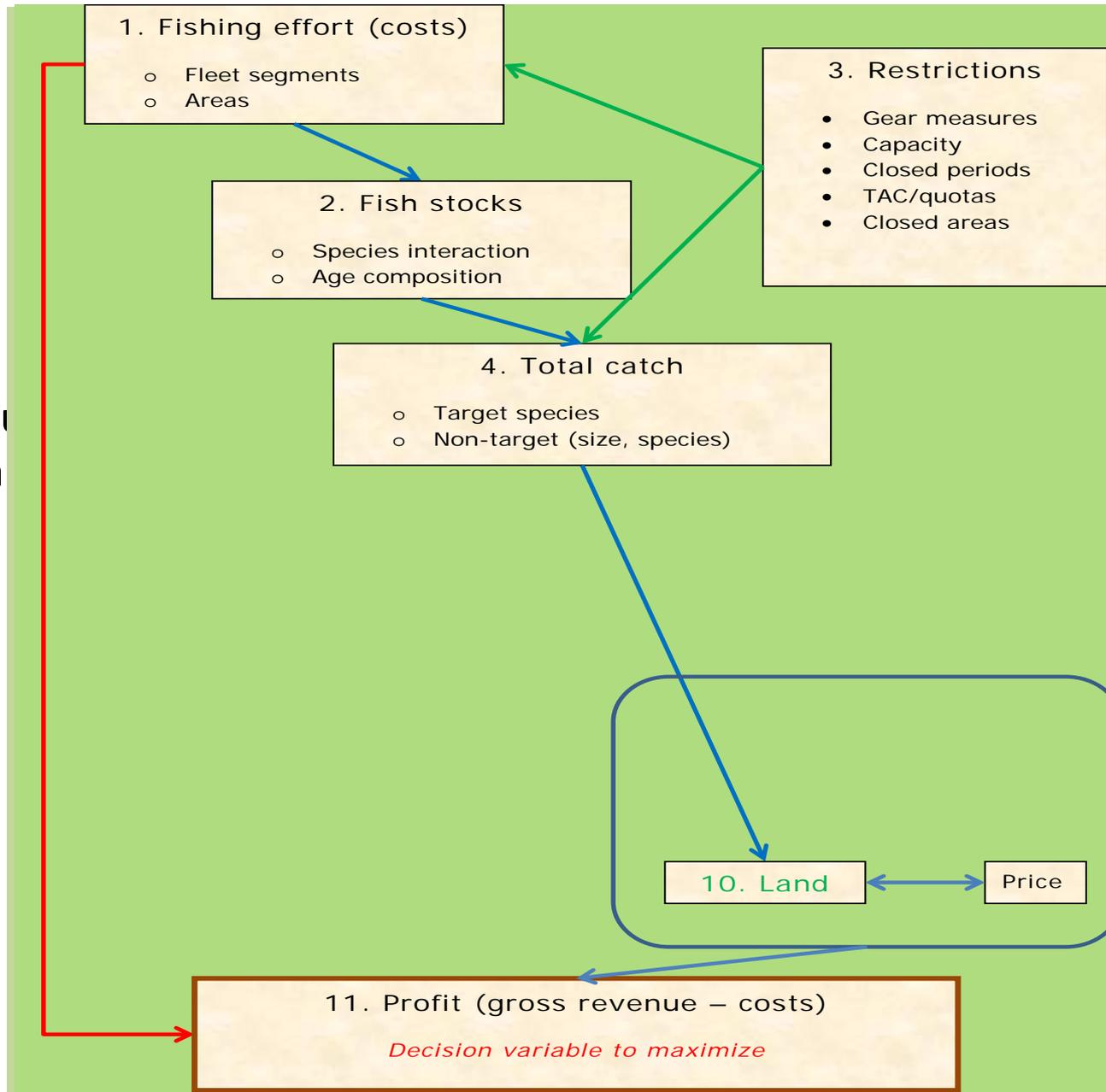


Discardless WP2: Fishery Scale Assessment

Provide best estimates of likely economic and social effects of implementation of the landings obligation of the fishery scale (individual and fleet).

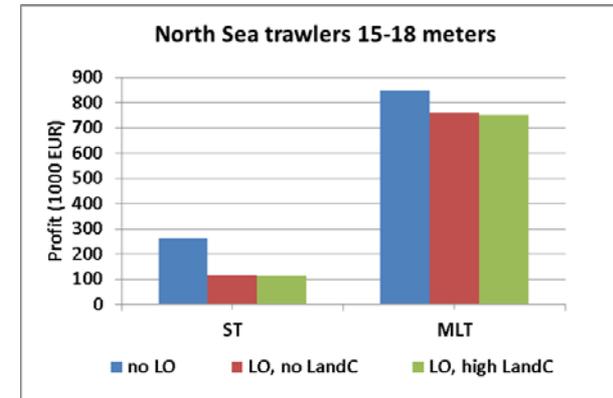
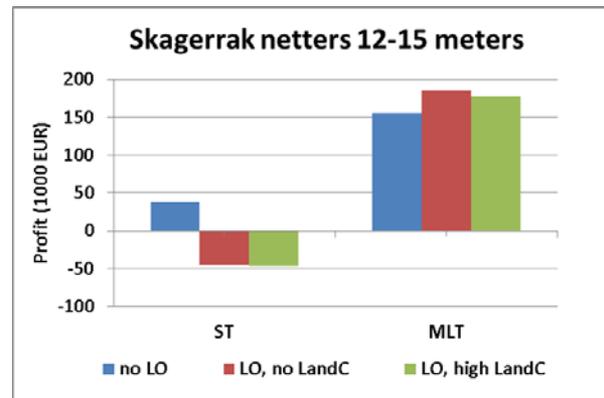
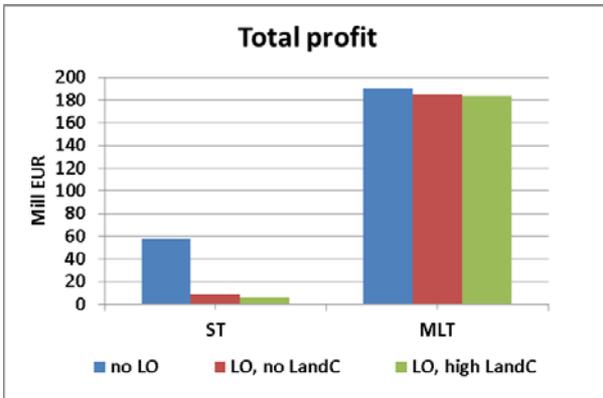
-  **2.1 Foundation:** Summarising available socioeconomic data and knowledge on discard, and identification of knowledge gaps.
-  **2.2 Evaluation basis:** Developing standard economic and social criteria for contrasting socioeconomic effects of DMSs.
-  **2.3 Setting the scene:** Model selection and setup based on DMS scenarios defined throughout the project.
-  **2.4 Evaluating:** Estimating and contrasting socioeconomic effects of DMSs.
-  **2.5 Monitoring:** Real time mapping of economic and social factors before, under and after implementation of the landings obligation for selected fleets.

 **2.1 Fisheries**
discards



nowledge on

Long term effects of the LO in the Danish fishery



- Results obtained using the bioeconomic 'NJORD' model covering the total Danish fishery (35 fleet segments) and 20 species.
- ST: Short Term effects of the LO before effort and capacity have adjusted to new levels (~fixed quota shares).
- MLT: Medium Long Term effects of the LO after effort and capacity have adjusted to new levels (~ITQ), but stocks are unchanged.

ToyFish

$$\text{Total Profit} = \sum_{\text{Fleet segments}} \{(R_{TO} + R_{TU} + R_{BC}) - (c \cdot D + f) \cdot V\}$$

R_{TO} = Revenue of target species above minimum size

R_{TU} = Revenue of (landed) target species below minimum size

R_{BC} = Revenue of (landed) bycatch species

c = Variable costs per days at sea

f = Fixed costs

D = Days at sea per vessel

V = Number of vessels



ST:

- Harvest of target above min size given by CD function.
- Harvest of unwanted fish proportional to harvest of target.
- Quota limitations, set by estimations of stock growth and discards.

ToyFish setup

	Fleet 1 (‘trawl’)	Fleet 2 (‘gillnet’)
Variable costs (1000 €/day at sea)	1.38	0.80
Fixed costs (1000 €/vessel)	120	70
Initial number of vessels	20	40
Maximum number of days per vessel per year	250	180
Price of species 1 (‘cod’) above minimum size (€/kg)	2	3
Price of species 2 (‘plaice’) above minimum size (€/kg)	1.5	2
Price of species 1 (‘cod’) below minimum size (€/kg)	0.2	0.2
Price of species 2 (‘plaice’) below minimum size (€/kg)	0.2	0.2

	Initial biomass	Initial Growth	a	b
Species 1	8000	4800	1	0.00005
Species 2	4000	2720	1	0.00008

Scenarios: From race to fish to long term ITQ without and with LO

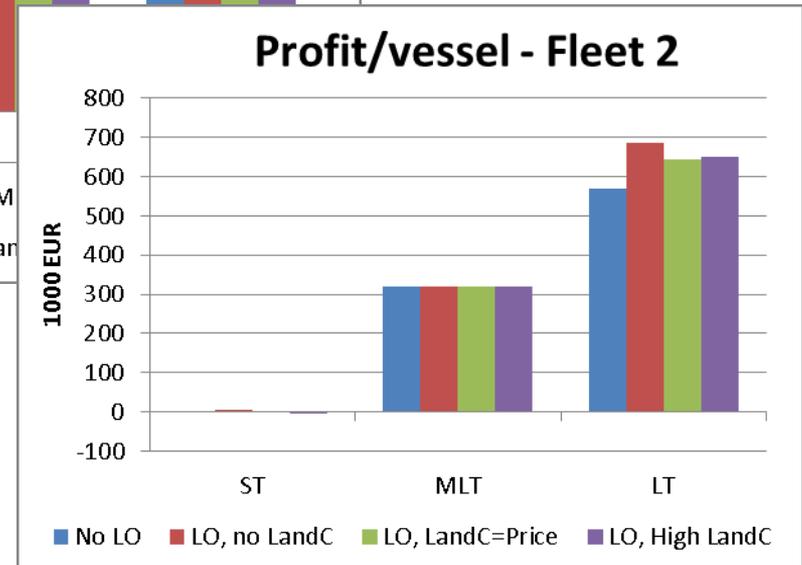
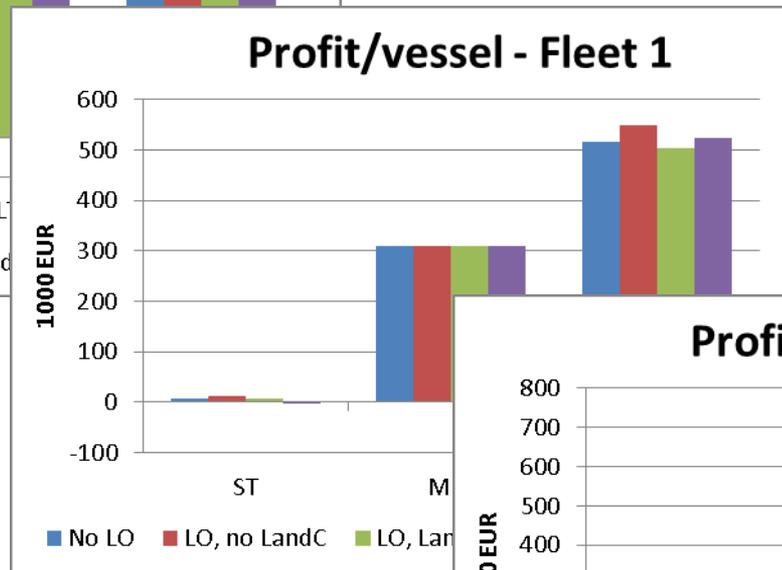
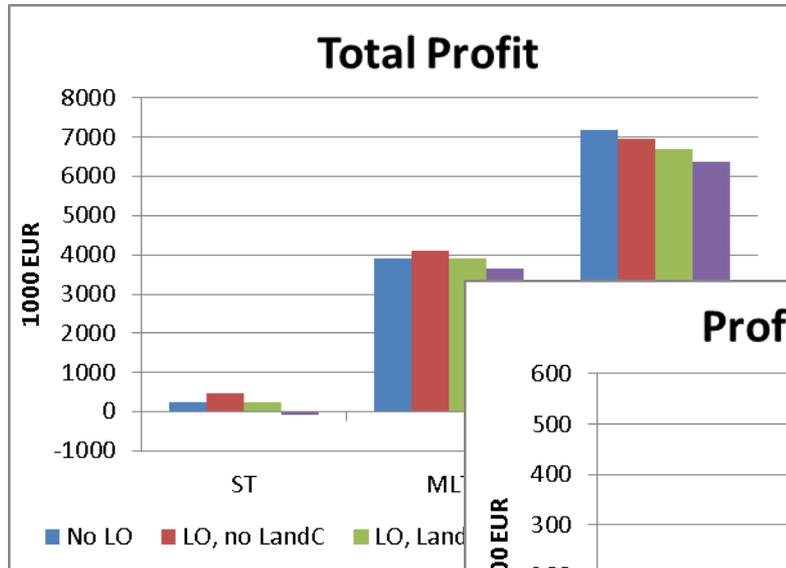
	Scenario	Description	Time Frame
Before LO	ST1	No Landings obligation (LO)	Short Term
	MLT1		Medium long term
	LT1		Long term
After LO	ST2	LO: No cost of landing unwanted catch	Short Term
	MLT2		Medium long term
	LT2		Long term
	ST3	LO: Cost of landing unwanted catch = price of unwanted catch	Short Term
	MLT3		Medium long term
	LT3		Long term
	ST4	LO: High price of landing unwanted catch	Short Term
	MLT4		Medium long term
	LT4		Long term

- **Short term (ST):** Fixed quota shares. TACs=natural growth less expected discards.
- **Medium Long Term (MLT):** ITQ, seadays and number of vessels adjusted to optimal level (maximum total profit). Stocks and quotas equal to ST case.
- **Long term (LT):** ITQ, seadays, number of vessels and *stocks* adjusted to optimal levels ⇒ Quotas adjusted accordingly.

Results: Profitability

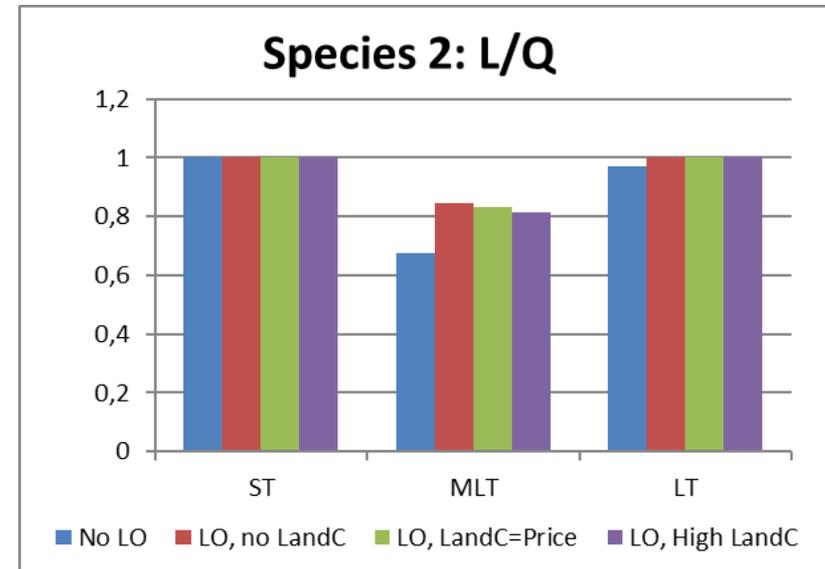
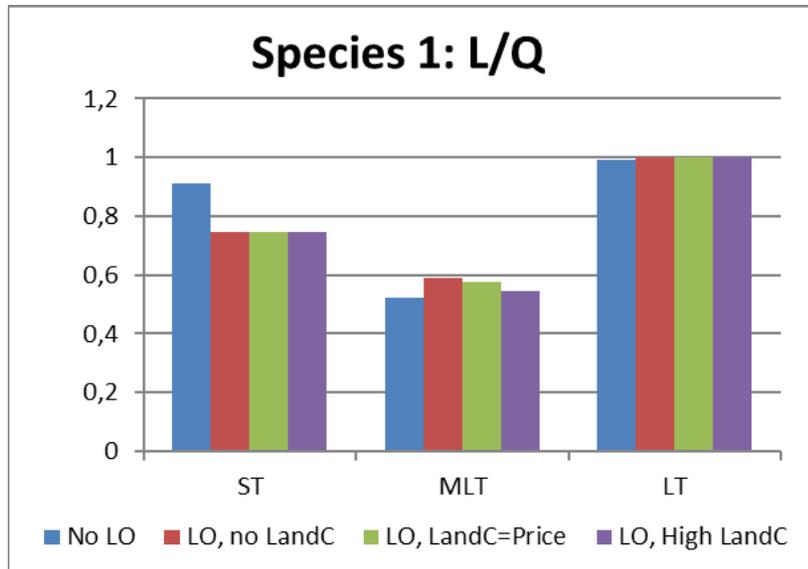
Introduction of the LO may increase overall profitability given reduction in effort related costs.

Introduction of ITQs, as expected, has larger effect on the total profit of the fishery than introduction of the LO.



For the individual vessels the profitability is not changed significantly by introduction of the LO. However, this at the expense of reduction in number of vessels.

Results: quota utilisation



- Species 2 chokes when quotas are shared (ST) \Rightarrow reduced effort when LO is introduced.
- Under MLT (ITQ), before the stocks have adjusted, none of the species are fully utilised \Rightarrow reduced effect of LO.
- Under LT (ITQ), quotas are fully utilised. But since the fishery will adjust to the cost structure through adjustment of capacity (number of vessels), the effect of the LO on overall and individual profitability is still low.

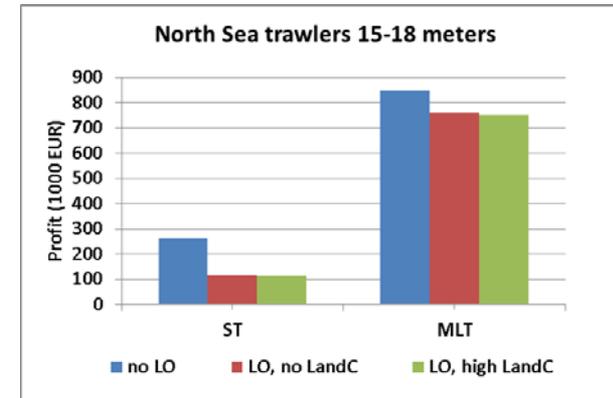
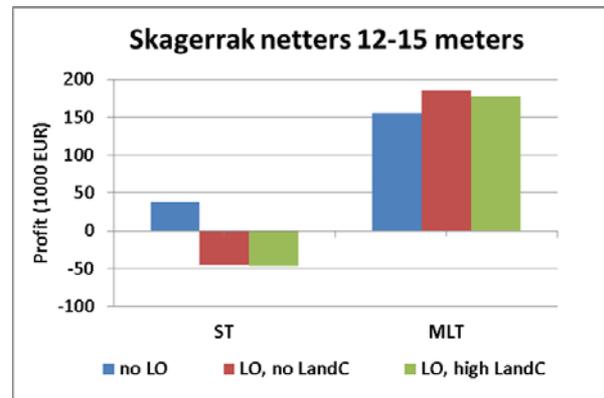
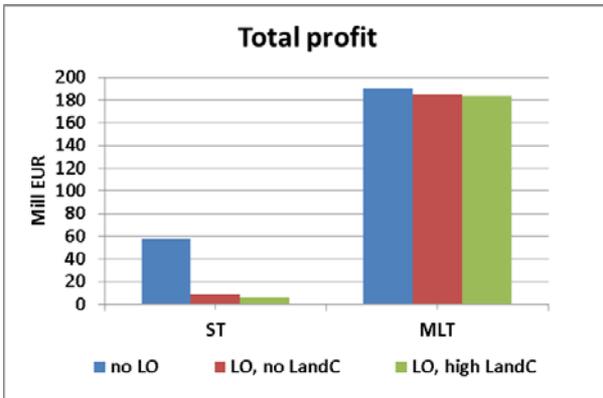
Danish quota utilisations 2012-2014

Denmark has had ITQ management in place since 2007.

Today few Danish quotas are fully utilised.

Species	2012	2013	2014
Blue whiting	31 %	64 %	89 %
Sprat	53 %	47 %	97 %
Monkfish	73 %	70 %	79 %
Horse mackerel	31 %	48 %	33 %
Whiting	22 %	14 %	20 %
Norway lobster	51 %	48 %	58 %
Haddock	89 %	77 %	92 %
Hake	47 %	50 %	33 %
Ling	55 %	64 %	48 %
Mackerel	97 %	101 %	84 %
Saithe	96 %	97 %	91 %
Plaice	83 %	75 %	65 %
Herring	95 %	91 %	98 %
Norway pout	33 %	21 %	25 %
Sand eel	105 %	95 %	93 %
Cod	83 %	62 %	68 %
Sole	62 %	61 %	85 %

The Danish results revisited



- The long run effects of the introduction of the LO in the Danish fishery may be less severe than may be expected.
- Underutilised quotas makes room for increase in catches and thus earnings, that may counteract additional costs of application of the LO.
- This however at the expense of reduction in fleet size.

Summary

In a fishery managed with ITQs possible negative economic effects of the landings obligation may be counteracted by unutilised quotas and thus increase in/reallocation of catches.

Individual vessels operating optimally may not experience any loss given the LO, depending on the price less costs of landing unwanted species.

Extra costs incurred by landing of unwanted species will be reflected in decreased capacity (number of vessels) rather than in significant loss of overall profitability.

Thank you

