Can a discard ban be good for fishers?

Discardless Work package 2: Fishery Scale Assessment

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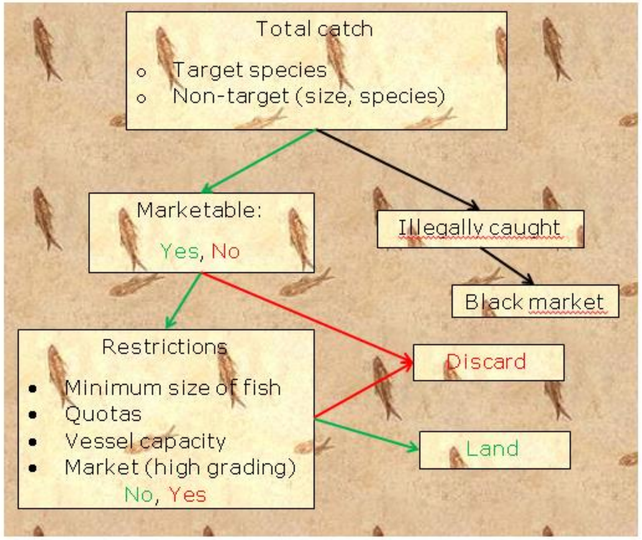
This project has recieved funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under gramt agreement no. 633680

Why Discard: Most mentioned causes to discard in interviews with fishers.



- *Regulatory reasons:*
  - Quotas that do not match with catches (Mixed fisheries).
  - Minimum Landings size.
  - Zero-quota species.
- Economic reasons:
  - High Grading.
  - High handling costs combined with low commercial value.
  - Low- or non-value species with high survival rate.
- Technical and biological reasons:
  - Fishing areas with high concentration of juveniles.
  - By-catch.

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Possible adaptation and mitigation strategies – from interviews with fishermen

- Selectivity.
- Spatial management.
- Quota adjustment.
- De Minimis exemption.
- Year to year quota flexibility.
- National quota allocation.

Can these measures help reduce the economic consequences of the Discard Ban (DB)?

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Regional bioeconomic model studies

Iceland mixed demersal fishery
Focus on quota discount and transferability.

E. Channel Mixed demersal
Focus on TAC adjustment.

Bay of Biscay Hake fishery
Focus on de minimis and quota flexibility.

W. Mediterranean Hake fishery
Focus on selectivity mitigations.

E. Mediterranean Mixed fishery
Focus on implementation of the DB in the complex E. med. fishery.

UK demersal fisheries
Focus on catch allowance on zero-quota stocks, quota adjustment and national quota exchange.

North Sea – Danish dem fleet
Focus on de minimis, costs, prices and quota adjustment

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Bay of Biscay: The Basque trawl fishery targeting hake

1. Benchmark: No DB, hake chokes the fishery. Discard of all other species.

2. Baseline: Full implementation of DB 2018-2025. Hake chokes and stops the fishery.

3. De minimis: 5% of all catches allowed as discards and do not count against the quotas.

4. Year transfer: 10% yearly quota flexibility.

5. Increased selectivity: Minimum Mesh Size increased from 100mm to 120 mm.

Relative to Benchmark	Sc 2. Baseline	Sc 5. Selectivity modifications
Hake F	↓	↓
Hake SSB	Slight ↓	↔
Hake Yield	↔	Slight ↑
Incomes	Slight ↓	↑
Crew wage	Slight ↓	↑
GVA	Slight ↓	↑

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The DB will have short term (2018-2019) negative economic consequences for the Basque fleets (worst case). Exemptions, flexibilities and selectivity measures (Best case) may reduce these effects in the longer run (2018-2025).

Generally the DB will not affect all fleets equally, thus some fleets will gain and others loose from the DB.

Synthesis of model studies

Scenario \ Case study	Iceland Mixed Demersal	Bay of Biscay mixed trawl	W. Med.	E. Med.	North Sea W. of ScotL, UK fisheries	North Sea Danish Demersal fisheries	Eastern channel mixed demersal
	Profit relative to Business As Usual (BAU): No Discard Ban						
Full Implementation							Gross revenue
De Minimis							
Selectivity measures							
Year Transfer							
Increased cost							
Increased landings prices							
Catch allowanc zero TAC stocks							
TAC/Quota adjustment							Gross revenue
Vessel movement betw. metiers							
Quota movement							

- Decrease in profit/Gross Value Added relative to BAU
- No change in Profit/Gross Value Added relative to BAU
- Increase in Profit/Gross Value Added relative to BAU

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Is a discard ban good or bad for the fishers?

Full implementation of the Discard Ban

- *Reduced total economic result*, due to choke, relative to the 'no DB' case, for all cases managed by TACs.
- *A more varied picture at individual fleet segment level*: Results indicate that some fleet segments have increasing and some decreasing economic outcomes.

Full implementation with mitigations and excemptions

- *Selectivity measures may increase the overall economic results* relative to no DB in the medium and long run.
- *De minimis and quota flexibility may to some degree mitigate the negative effects* of full implementation of the DB.

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Thank you

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North Sea: The Danish demersal mixed fishery

1. **Business as usual (BAU):** No DB
2. **Full implementation (FI):** DB implemented for all species, no exemptions.
3. **De minimis:** Discard allowed of species that is less than 5% of total fleet catches.
4. **Increased landings costs:** Extra costs of landing undersized species.
5. **Increased prices:** Cod below Minimum Landings Size sold at lowest human consumption price.
6. **Quota Adjustment:** Danish quotas adjusted with previous discarded amount (monthly model)

Relative to BAU	Sc 2, 3, 4, 5 All Scenarios	Sc 6. Quota Adjustment
Cod SSB – 2025	↑↑	-
DK Cod Yield – 2025	↓↓↓	-
Incomes – 2025	↓	↑
Crew wage – 2025	↓	↑
Profits - 2025	↓	↑
NPV 2015-2025	↓	

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The DB generally have a negative effect over the period (2015-2025) on the Danish demersal NS fishery, which can be mitigated by quota adjustments.

The effect on individual fleet segments however vary – some are winners and some are losers.

The UK demersal fisheries

1. **Business as usual:** 2015 situation, no DB
2. **Full Implementation (FI):** DB implemented, no exemptions.
3. **Catch allowance:** DB+catch allowance for zero-TAC stocks.
4. **Quota adjustment:** Sc3 plus quota adjustments.
5. **Vessel movements:** Sc4 plus vessel movements between metiers.
6. **Full use of UK quota:** Sc5 assuming quota allocation between UK fleets.
7. **B4+end of year quota: Sc 6 with** UK quota after international swaps.

Relative to 2015	Sc 2, 3, 4, 5 FI	Sc 6. Quota movement	Sc 7. Quota end year
Effort	↓↓↓	↓	↓↓↓
Revenues	↓↓↓	↓↓	↓↓↓
Cash Flow	Negative	↓↓	↓↓↓
Net Profit	Negative	↓↓	Negative

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The DB generally have a negative effect over the period (2019-2024) on the UK demersal fishery due to the choke problem.

The effect on individual PO fleet segments however might vary.

Quota trading might reduce negative effect, however it is not enough to fully mitigate choke.

Western Mediterranean: Trawl fishery for Hake around the Balearic Islands

1. Business as Usual (BAU): No DB

2. Full Implementation (FI): DB implemented, 10% increase of variable costs per day and 1 additional crew member per vessel.

3. LO Selectivity scenarios:

3.1. Avoiding catch at age 0: $F_0=0$

3.2. Avoiding catch of undersized species (length<20cm): $F_{MLS}=0$

3.3. Avoiding catch of of immature individuals (length <30cm): $F_{INM}=0$

Relative to BAU	Sc. 2.	Sc. 3.3
	FI	$F_{INM}=0$
F	↔	↓↓
# Recruits	↔	↔
SSB	↔	↑↑↑
Yield	↔	↑↑
Incomes	↔	↑↑
Crew wage	↓	↑↑
Profits	↓	↑↑

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Full implementation of the DB does not result in bio-economic benefits relative to BAU (worst case) in the longer run.

Avoiding catches of immature individuals leads to improvements relative to BAU (best case) in the longer run.

Other selectivity cases between these two.

Icelandic mixed demersal fisheries

1. **Benchmark:** No DB
2. **Full Implementation (FI):** DB implemented for all species, no exemptions.
3. **Current situation (CS):** DB with quota discount for MCRS, VS catches, full ITQ and 5% year transferability.
4. **VS catches (VS):** Landings permitted without deducting from quota if 80% of the landing value is allocated to research.

Relative to Benchmark	Sc 2, 3 FI, CS
Cod SSB – 2015	↔
Cod Yield - 2015	↔
Incomes – 2015	↑
Crew wage – 2015	↑
Profits - 2015	↓

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ITQ system and consolidation in the industry important factor in discard reduction

Eastern Mediterranean: Fishery in the Thermaikos Gulf

1. **Business as Usual (BAU):** No LO.

2. **Full Implementation (FI)**: DB implemented, all discards are landed and sold.

Multiple fleets considered: Trawl, Purse-seine, Beach-seine, Coastal vessels.

Relative to BAU	Sc. 2. FI
F	↔
# Recruits	↔
SSB	↔
Yield	↔
Incomes	↑↑
Variable costs	↑↑
Profits	↑↑

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Given that there are no choke species in the Thermaikos Gulf fishery the extra landings, previously discarded, are now sold, thus increasing the profit.

Eastern Channel Mixed Demersal Fishery

1. **Business as usual (BAU):**
   a) Strict discard below Minimum Landings Size.
   b) Discard based on observed discard rates.
2. **Full Implementation (FI):** DB, no exemptions.
3. **TAC Adjustment:** DB with TAC adjustments for Sole, Plaice, Cod and Whiting.

Relative to BAU – 1a	Sc 2. FI	Sc 3. TAC Adjustment
Sole Biomass 2025	↑↑↑	↑↑↑
Sole Yield 2025	↓↓↓	↓↓↓
Gross Revenue	↓↓↓	↓↓

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Biomass of all species go up when DB is implemented.

When TAC adjustments are implemented the Gross revenue increases with 20% compared to FI with no exemptions,

Outcomes of the bioeconomic analyses

Full implementation of the Discard Ban

- *Reduced total economic result*, due to choke, relative to the 'no DB' case, for all cases managed by TACs.
- *A more varied picture at individual fleet segment level*: Results indicate that some fleet segments have increasing and some decreasing economic outcomes.

Full implementation with mitigations and excemptions

- *Selectivity measures may increase the overall economic results* relative to no DB in the medium and long run.
- *De minimis and quota flexibility may to some degree mitigate the negative effects* of full imple-mentation of the DB.

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Detailed Case Study presentations below!

Western Mediterranean CS – European hake
Bio-economic analysis

Scenarios tested:

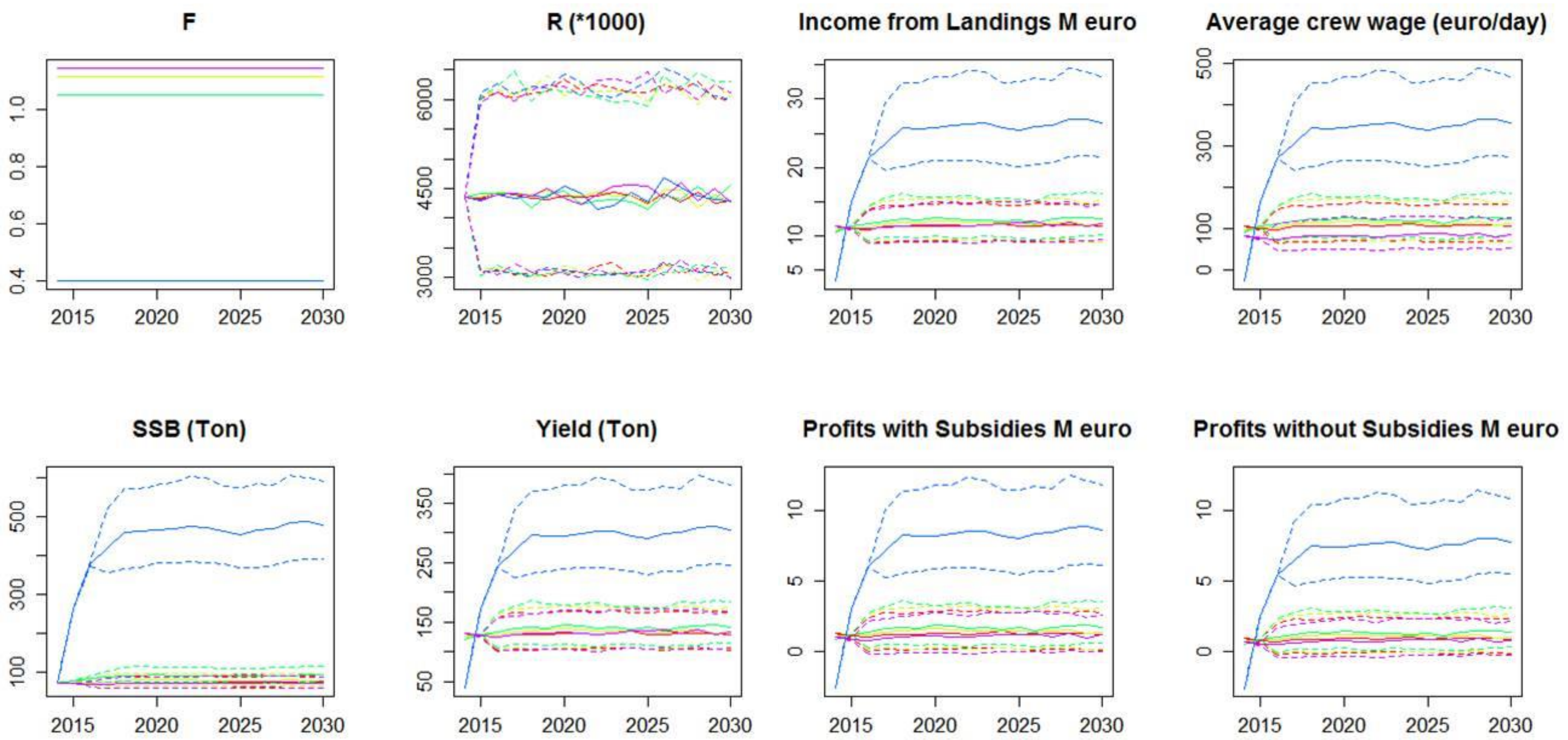
- **1. 'BAU'- Business as usual**: Current fishing mortality levels (F) per age class applied
- **2. 'FI'- Full Implementation**: 10% increase of daily variable costs and 1 more crew member
- **3.1. No Fishing mortality at age**: **0**: $F_0 = 0$
- **3.2. No Fishing mortality in individuals under the MLS**: $F_0 = 0$ &10% decrease in F_1, ($F_1 = 1.96$ to $F_1 = 1.77$) for avoidance of catches of individuals < MLS (TL < 20 cm)
- **3.3. No Fishing mortality in immature individuals**: Modification of current age-selectivity parameters to avoid catches of immature individuals (TL < 30cm)

Western Mediterranean CS – European hake
Bio-economic analysis

	Sce. 2	Sce. 3.1	Sce. 3.2	Sce. 3.3
	FI	$F_0 = 0$	$F_{MLS}=0$	$F_{INM}=0$
F	↔	Slight ↓	↓	↓↓
# Recruits	↔	↔	↔	↔
SSB	↔	Slight ↑	↑	↑↑↑
Yield	↔	Slight ↑	↑	↑↑
Incomes	↔	Slight ↑	Slight ↑	↑↑
Crew wage	↓	Slight ↑	Slight ↑	↑↑
Profits	↓	Slight ↑	Slight ↑	↑↑

From a *single-species* point of view the discard ban does not result in bio-economic benefits but avoiding catches of individuals <MLS and/or recruits provides significantly better results.

Western Mediterranean CS – European hake
Bio-economic analysis



SCE1. 'BAU' SCE2. FI SCE3.1. $F_0=0$ SCE3.2. $F_{MLS}=0$ SCE3.3. $F_{INM}=0$

ECOPATH model in Thermaikos Gulf

To examine the effects of landing obligation on the ecosystem, **two** ECOPATH models with the **same parameterization** were built, except for the exports from the system:

→ one model included **landings and discards** and the other one **only landings** data

The same procedure has been followed for the Ionian Sea (*Moutopoulos et al. 2013 J Mar Sys*)

Initial scenario (model 1): business as usual

The ECOPATH model has been developed for the first time in the area

Alternate scenario (model 2): full implementation (all discards are landed)

The functional group has been removed and the discards have been added to landings

The partial implementation scenario is in progress and expected to finish soon. The approach of "**multiple fleets**" has been selected to deal with the discards issue in ECOSIM.

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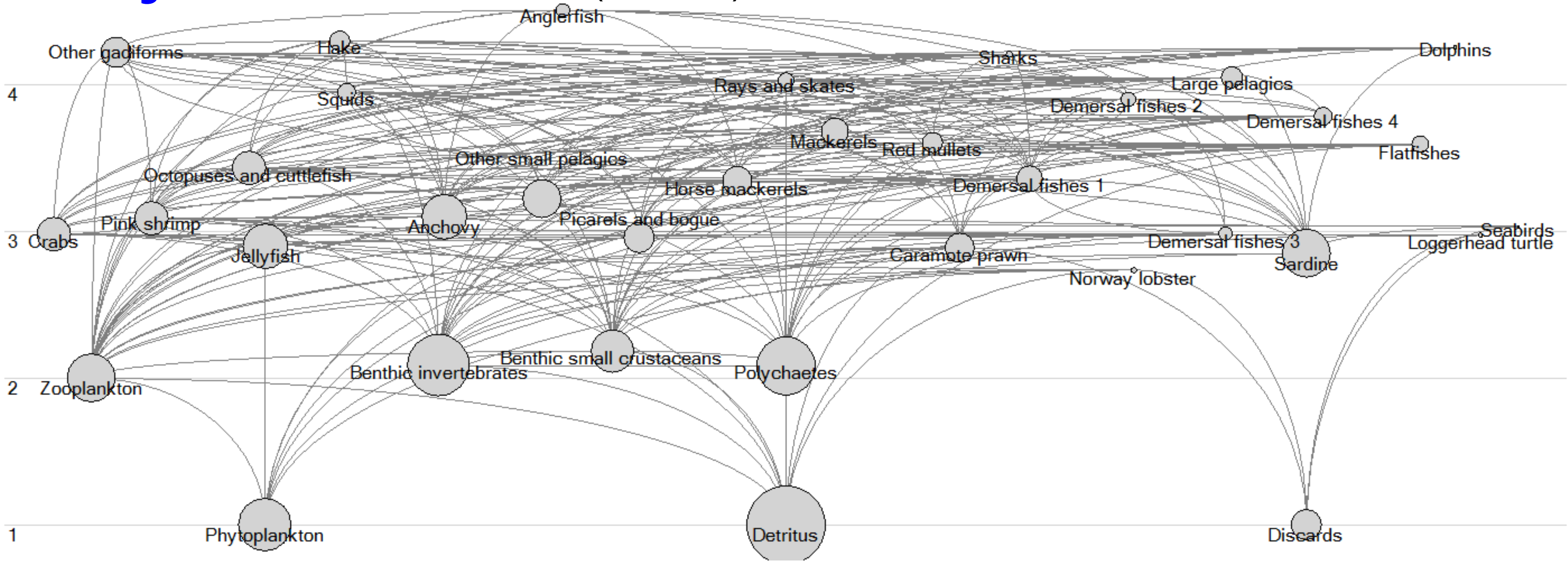
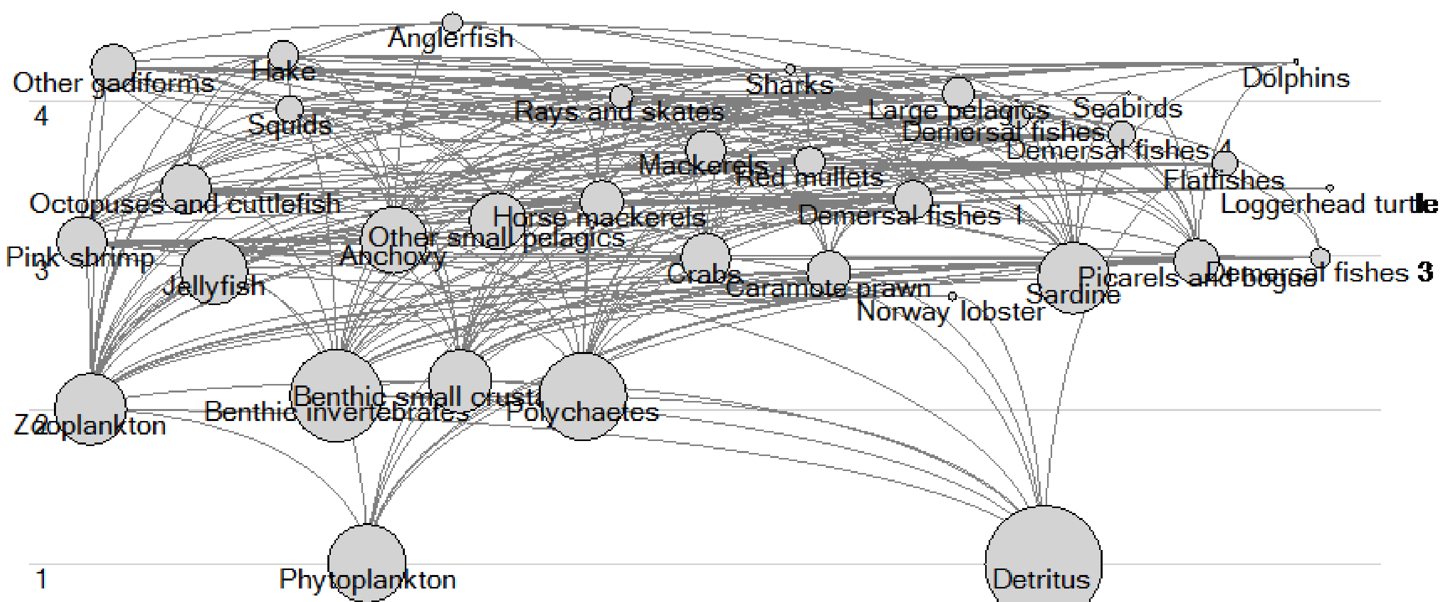
Flow diagram of the **initial scenario** (model 1)



Flow diagram of the **alternate scenario** (model 2)



Ecological indicators related with energy and structure for models **including/excluding** discards.

	MODEL 1	MODEL 2	
Parameter	**Including discards**	**Excluding discards**	**Units**
Sum of all consumption	943.42	943.42	t/km2/yr
Sum of all exports	**74.89**	**65.42**	t/km2/yr
Sum of all respiratory flows	470.13	470.13	t/km2/yr
Sum of all flows into detritus	457.93	456.78	t/km2/yr
Total system throughput	**1946.36**	**1935.74**	t/km2/yr
Sum of all production	820.08	820.08	t/km2/yr
Mean trophic level of the catch	3.31	3.31	
Gross efficiency (catch/net p.p.)	0.01	0.01	
Calculated total net primary production	535.48	535.48	t/km2/yr
Total primary production/total respiration	1.14	1.14	
Net system production	65.35	65.35	t/km2/yr
Total primary production/total biomass	12.07	12.07	
Total biomass/total throughput	0.02	0.02	/year
Total biomass (excluding detritus)	44.35	44.35	t/km2
Total catch	6.64	6.64	t/km2/yr
Connectance Index	0.23	0.23	
System Omnivory Index	0.20	0.20	
Total market value	**5.89**	**6.64**	eur
Total value	**5.89**	**6.64**	eur
Total variable cost	**4.71**	**5.31**	eur
Total cost	**4.71**	**5.31**	eur
Profit	**1.18**	**1.33**	eur

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Conclusions (preliminary)

- Comparable trophic status with the NE Aegean Sea (Tsagarakis et al. 2010), higher compared to the Ionian Sea (Moutopoulos et al. 2013)
- When excluding discards, **flows to exports** and **total system throughput** were decreased
- Total biomass, TE and trophic level were less impacted
- The discard ban will certainly affect the ecosystem but the impact is not as extensive
- Value, cost and profit were all higher when discards were excluded

Bay of Biscay demersal (Spain)

- Modelling the LO for the fleet shows that results are:
- **Bad**: If only the fleets financial results are considered in the short term;

  It depends: if the mid term is considered there will be winners and losers, at least in financial terms (relative redistribution).

  -With an alleviated effect of this redistribution if exemptions and/or flexibilities are considered;

  Bad: In the long term if the flexibilities are used in continuous;

  Good: Regarding the incentives in place.

Description of scenarios and results by stock/fleet/indicator in: https://aztigps.shinyapps.io/stecfbobdem/ (password: Discardless)

Bay of Biscay demersal (Spain)

An analysis of private vs. social incentives was also made:

- A selectivity change has been identified by skippers as a potential tool to reduce the choke species problem.
- However, is a selectivity change worth for reducing choke species problem under the MCRS perspective?
  - Private incentives are weak. Capital owner can be reluctant to increases the mesh size.
  - Social incentives stronger. GVA is increased and human directed consumption supply of hake, as well.

Description of scenarios and results by stock/fleet/indicator in:

https://aztigps.shinyapps.io/ciheam/ (password: ciheam)

Bay of Biscay demersal (Spain)

Scenarios tested:

- **no LO:** A benchmark scenario has been created. In this benchmark scenario the fishery is simulated without the landing obligation constraint. In this case the simulation is based on having the quota of hake as the one that is going to limit the effort level. If any of the others quotas are exceeded, this excess has to be discarded.
- **Baseline:** The baseline scenario assumes full implementation of the LO from 2018 to 2025 without any exemption or flexibility. The implementation of this scenario is based on considering that the effort of this metier cannot be increased once the quota share of the first species is reached.
- **de minimis:** This scenario is based on the implementation of the de minimis exemption on top of the LO scenario. This second scenario implies that there is a 5% of allowable discards that do not count against the quota. It has been implemented in the same way as the LO scenario with the only change that the quota isincreased by a 5%. However, this extra quota cannot be landed (nor sold) and has to be discarded but and it has to be considered when producing the TAC advice.
- **Year transfer:** The third scenario is to allow for inter-year flexibility of quota (with a limit of 10% of the initial quota) on top of the baseline scenario. It has been implemented in the same way as the baseline scenario with the only change that the quota of year t can be increased up to a 10% with the obligation to reduce the catches produced in t in the year t + 1. However, in contrast with the de minimis scenario, this extra quota can be landed and sold.
- **New selectivity PDEF:** A theoretical change in the MMS from 100mm to 120mm MMS (minimum mesh size)

Bay of Biscay demersal (Spain)

Results in comparison with the **no LO Scenario**

	Baseline (full implementation of the LO)	Selectivity modifications (increase in the MMS)	Implementation of the LO (including de minimis)	Implementation of the LO (including flexibilities)	Implementation of the LO (including flexibilities and de minimis)
F	↓	↓	↑	↑	↑↑
SSB	Slight ↓	↔	Slight ↓	Slight ↓	↓
Yield	↔	Slight ↑	Slight ↑	↔	Slight ↑
Incomes	Slight ↓	↑	↓	↔	↔
Crew wage	Slight ↓	↑	↓	↔	↔
Profits	Slight ↓	↑	↓	↔	↔

Results show the simulated trend of the indicators from 2017 to 2021.

Note that the trend has been interpreted using the medians of the results. If the confidence intervals are considered: The uncertainty is higher than the change, so all the results would be ↔ .

SEAFISH model

Data Input Framework

- Individual vessel activity, 2015
- UK quota (FIDES and MMO data), 2015 & 2016
- Discard rates (STECF FDI database), 2015
- Biological data (ICES), most recent
- LO implementation rules
- LO quota adjustment (top-up/uplift)

Bioeconomic Simulations

- B1: LO rules, no mitigation
- B2: LO + catch allowance for zero-TAC stocks
- B3: LO + zero-TAC allowance + quota adjustment
- B4: LO + zero-TAC + quota adj + vessel movement
- S1: B4 + full use UK quota
- S2: B4 + end of year quota (after international trade)

Data Output Framework

- Findings from simulations can be presented in different ways:
- by home-nation fleet segment
- by PO fleet segment
- by métier; and
- by stock

- There are also a multitude of findings that can be presented.

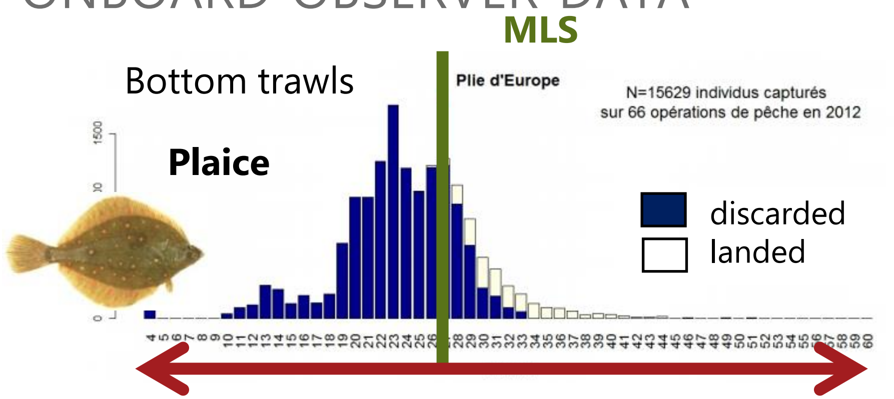
Seafish Bioeconomic Modelling: Preliminary findings for 3 UK Fleet Segments

		Scotland nephrops trawl		Scotland whitefish trawl		Northern Ireland nephrops trawl	
Sea Area		IV	VI	IV	VI	VI	VII
2017	Choke point*	*52%*	*39%*	*74%*	*94%*	*56%*	*93%*
	Choke stock(s) for POs	Sole, haddock, nephrops	Nephrops, haddock 5b6a	Cod	Haddock 5b6a	Haddock 5b6a	Nephrops
	Value of S1	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √
	Value of S2	X	X	√ √ √	X	X	√ √ √
2018	Choke point	*26%*	*39%*	*46%*	*94%*	*56%*	*93%*
	Choke stock(s) for POs	Sole, saithe, whiting, nephrops	Nephrops, haddock 5b6a	Saithe	Haddock 5b6a	Haddock 5b6a	Nephrops
	Value of S1	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √
	Value of S2	√ √ √	X	√ √ √	X	X	√ √ √
2019	Choke point	*10%*	*23%*	*13%*	*46%*	*43%*	*6%*
	Choke stock(s) for POs	Hake, sole, nephrops	Nephrops, ling, anglerfish	Hake	Ling, saithe	Plaice	Whiting 7a
	Value of S1	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √
	Value of S2	√ √ √	√ √ √	√ √ √	√ √ √	X	√ √ √

* Choke point : % of fleet effort in 2015

Eastern Channel
Sigrid Lehuta (WP1 +WP2)

- Re-calibration : after re-estimation of selectivity
- Creation of 2 scenarios of discard behavior: based onboard observer data



Scenario 1: discard < MLS
Scenario 2: observed discard rates per quater, gear, year

Source : Onboard observer data

- Scenarios

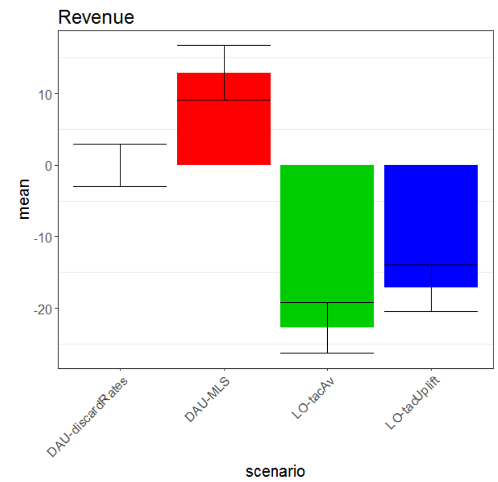
	2010	...	2015	2016	...	2025
Discard TAC Biology Effort	Discard as usual Forced by time series Forced by time series Forced by time series			**Scenarios** Average Average total effort + métier ~ behavior model		

Scenarios		
1	Discard as usual	MLS strict
2		Discard rates
3	Landing obligation	TAC
4		TAC + uplift
	Fleet opportunism	10-20-30%

RESULTS

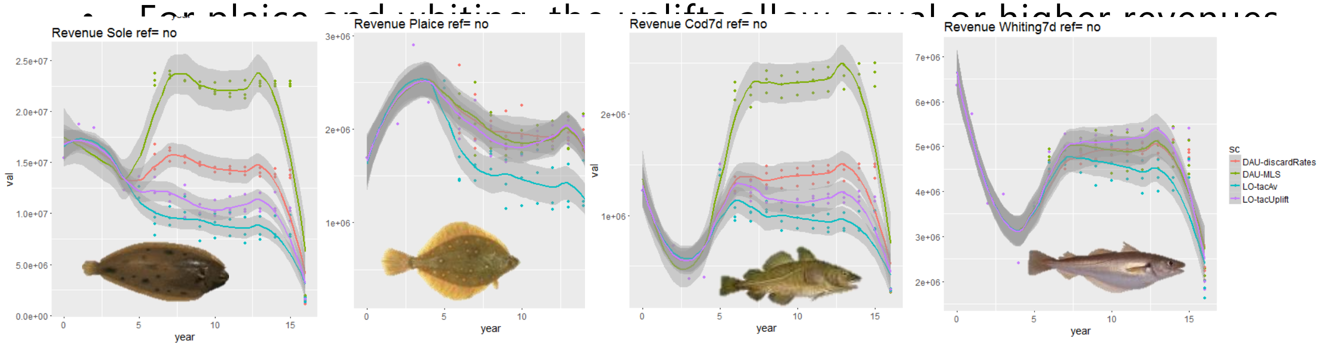
LO effects

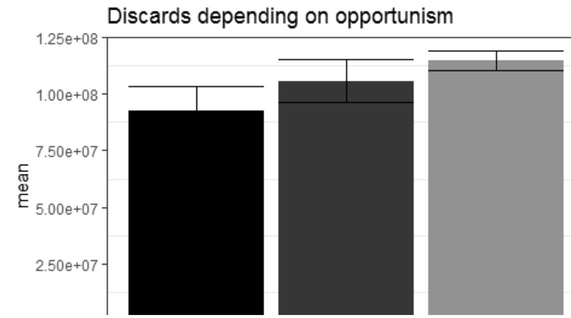
- Positive on the biomass for all regulated species (+ 2-75%)
- Positive on the species jointly targeted (red mullet and cuttlefish)
- Little flexibility to report effort
- Gross revenues of the fishery are about -25%.



TAC uplifts / LO without uplift

- +20% in revenues with < 8%stock biomasses reduction
- For plaice and whiting, the uplifts allow equal or higher revenues





Discarding Behavior (no LO)

- MLS scenario reduces discards as long as TAC is not reached
- TAC for plaice and whiting are reached earlier, causing higher discards
- Discards tend to increase with fleet opportunism -> Fleet dynamics model does not allow to avoid species which TAC is exhausted.
- Revenues decrease with opportunism -> behavior model is designed for short term (one month) optimization of effort distribution, and is inefficient in the long term.