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Helmholtz-Zentrum für Ozeanforschung Kiel

Science-led Mismanagement of EU Fisheries: The Case of the Baltic Sea

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Event organized by Low Impact Fishers of Europe (LIFE)

Mundo Matongé, Brussels, 26 June 2024

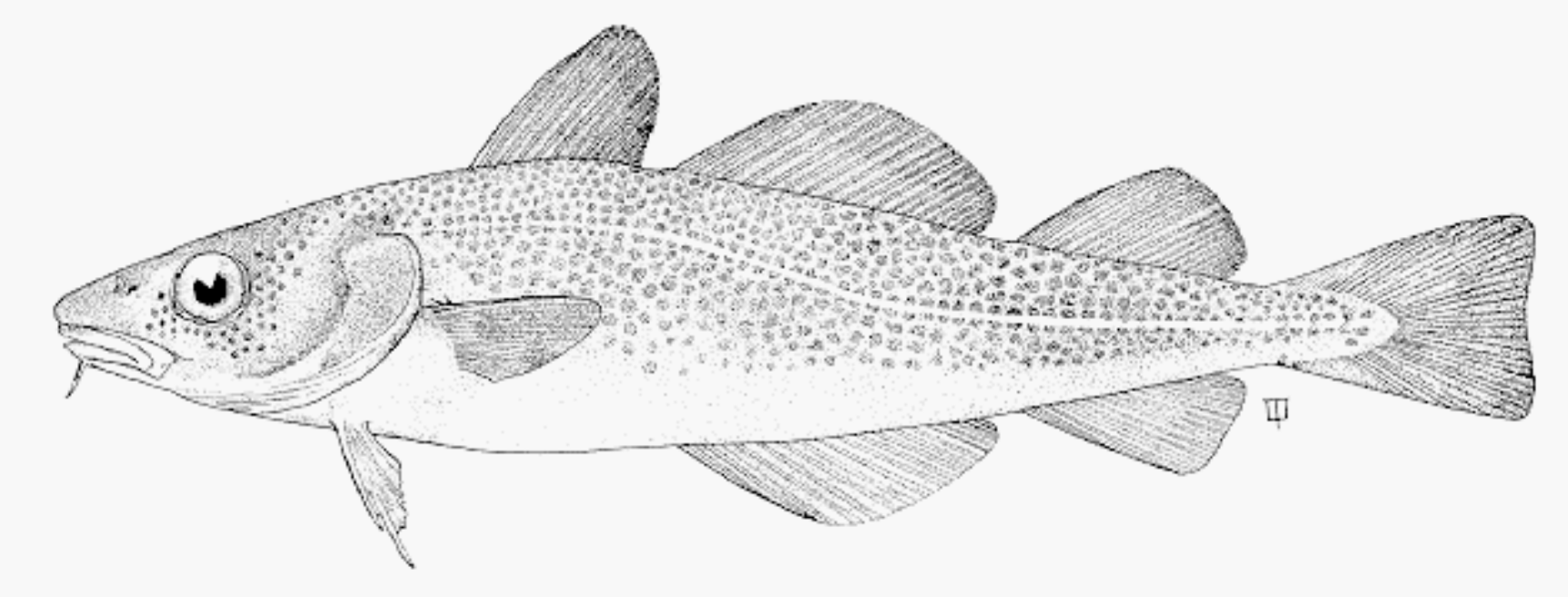
Overview

- Current fisheries management in the EU
- Management and status of eastern Baltic cod
- Status of the western Baltic ecosystem and fisheries
- Management examples of other stocks
- New fisheries management in the EU is needed
- Questions

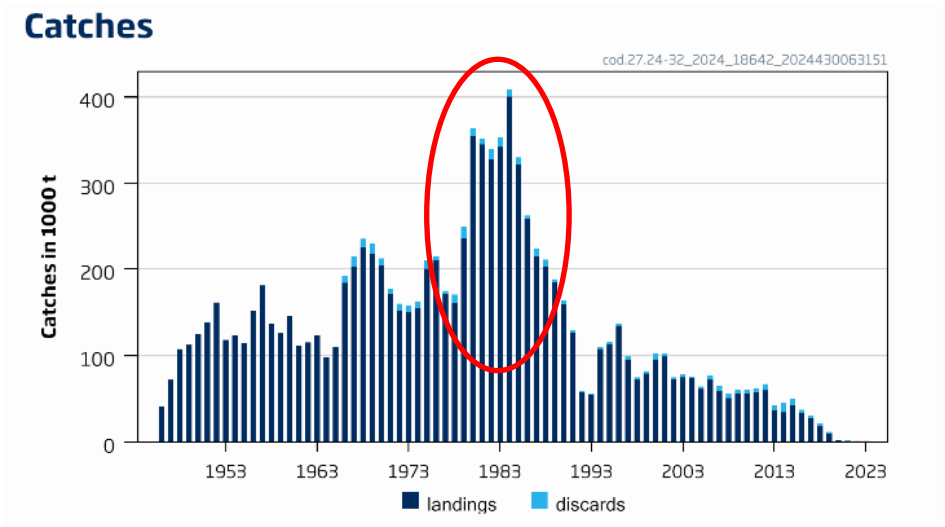
Current fisheries management in the EU

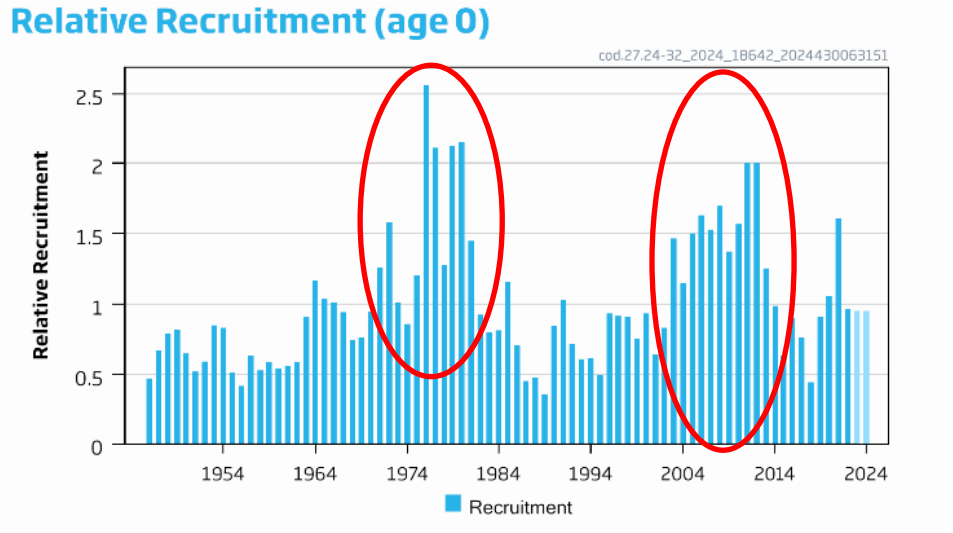
TAC-based Fisheries Management in the EU

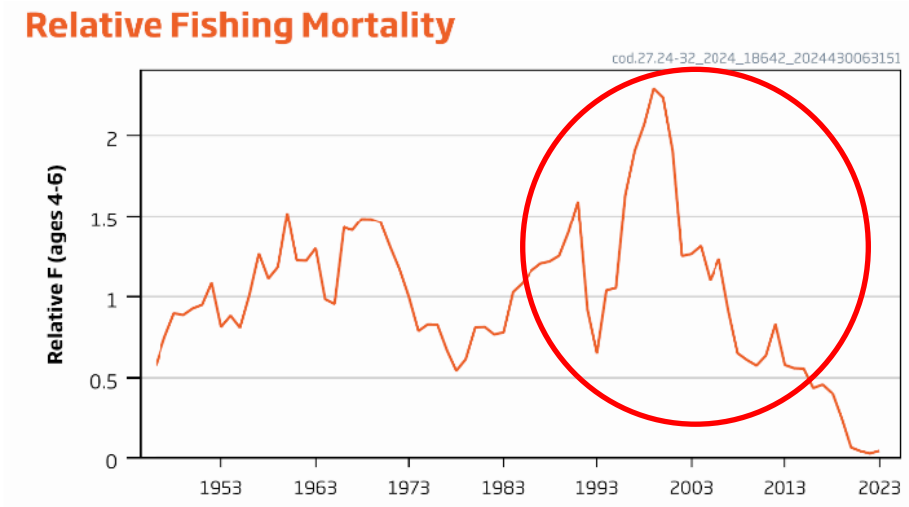
Management and Status of Eastern Baltic Cod



Eastern Baltic Cod according to ICES 2024 https://ices-library.figshare.com/ndownloader/files/46676650







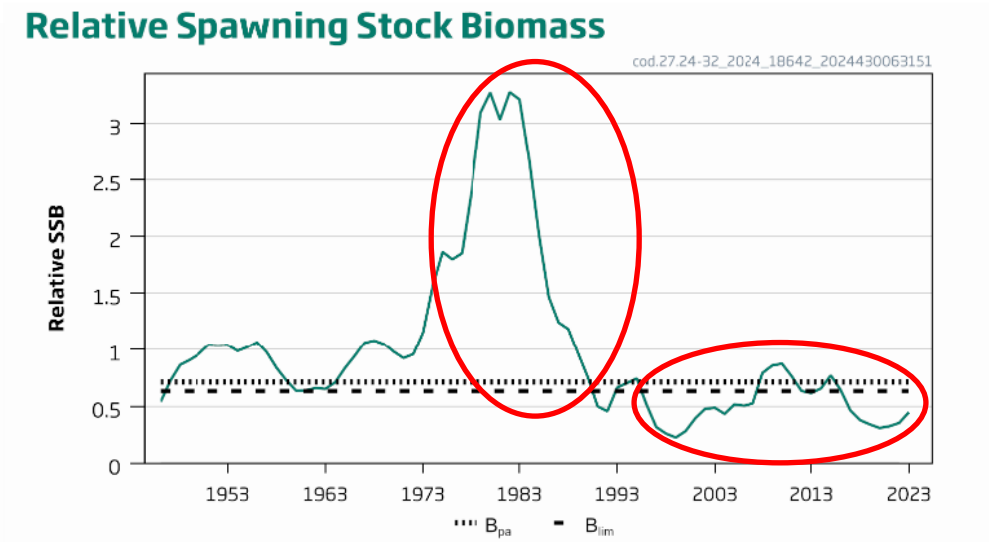
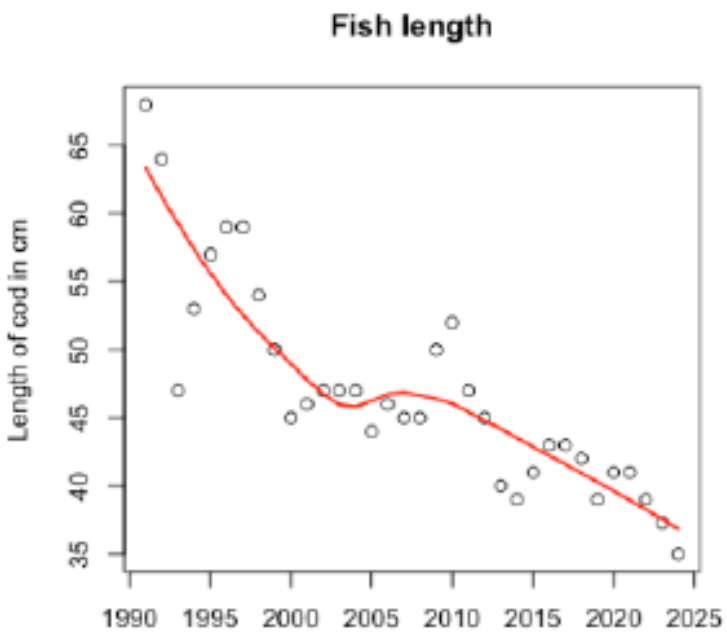
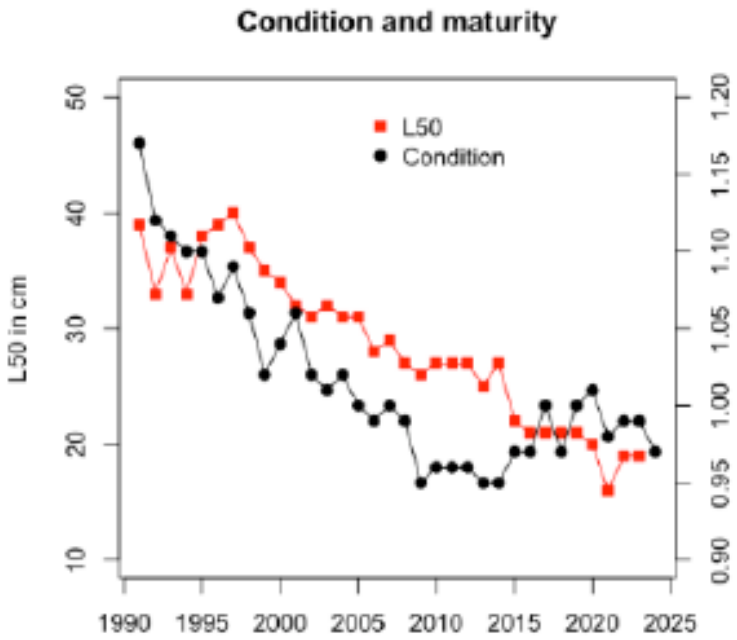


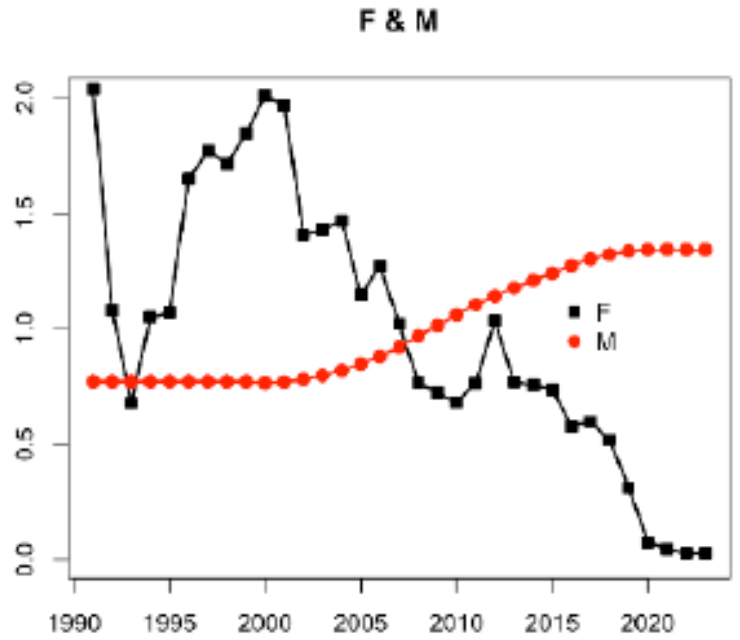
Figure 1 Cod in subdivisions 24–32, eastern Baltic stock. Summary of the stock assessment. Recruitment, fishing mortality, and SSB are relative to the average of the time-series. Landings since 2017 include landings below minimum size (BMS). The assumed recruitment value for 2023 and 2024 is shaded in a lighter colour.

Good recruitment in the 70s led to high biomass which was quickly fished out with annual catches above 300 KT. Even with strongly declining biomass much too high fishing pressure was applied, leading to a deep collapse 1999. Subsequently good recruitment was not used to rebuild the stock to healthy levels but instead fished out. In parallel, central sprat and herring as important cod food was also fished out and bottom oxygen levels declined, thus further limiting food. Currently, the stock is so small and so deprived of food and oxygen that no recovery happens even without fishing

Eastern Baltic Cod https://ices-library.figshare.com/ndownloader/files/46676650, Figure 2



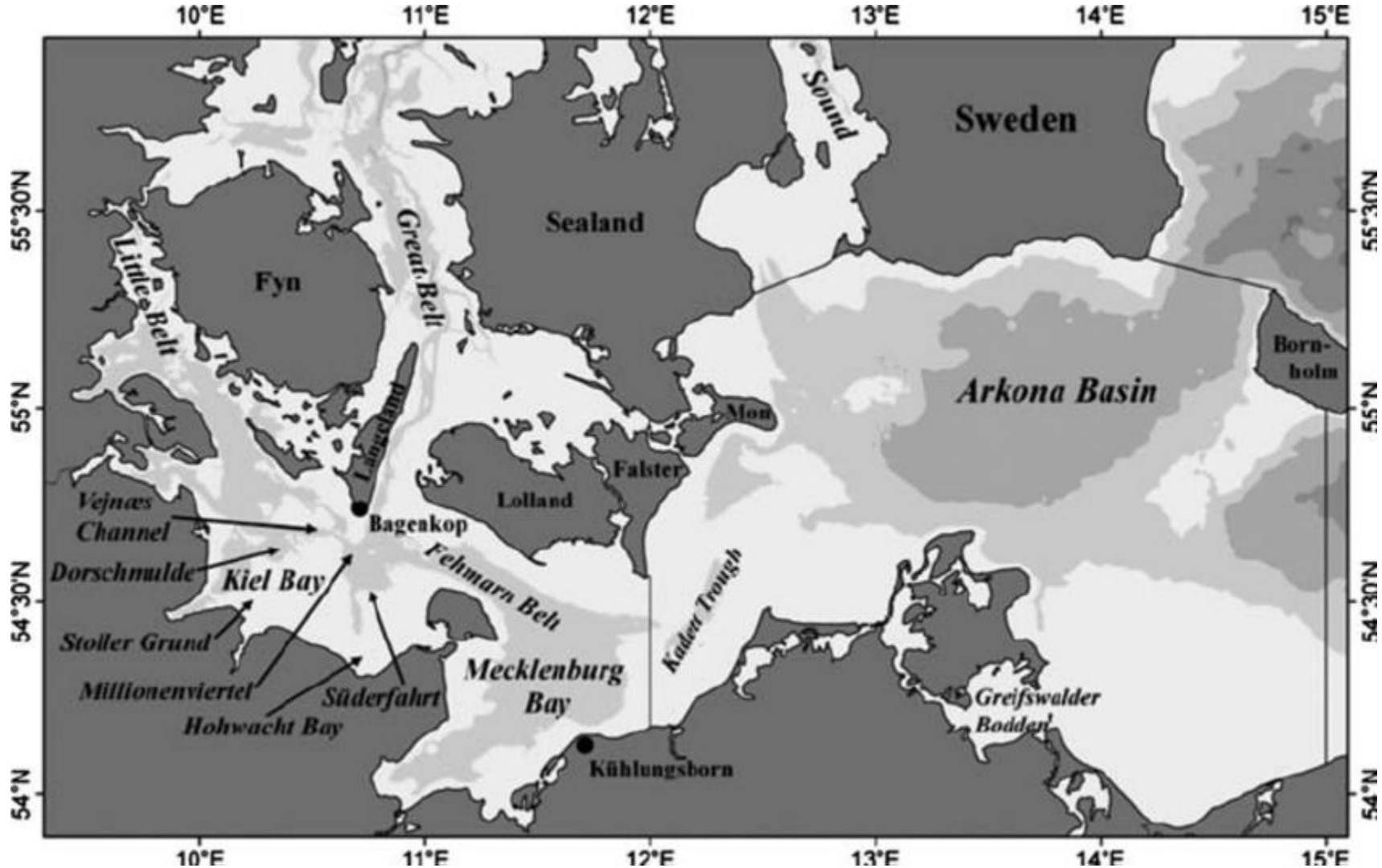




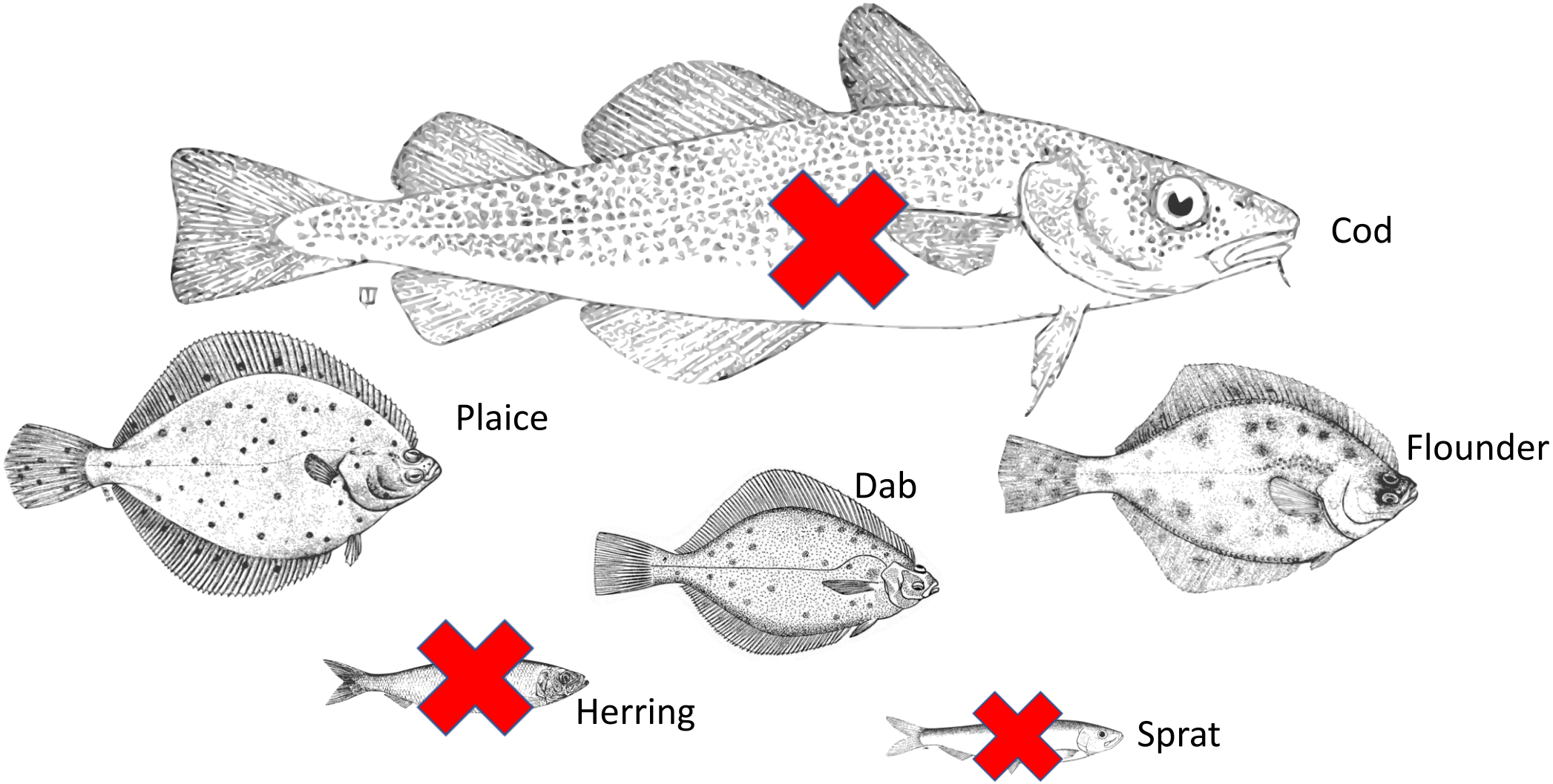
Body length (95th perc), condition (body weight at length) and length at maturation (and thus fecundity) are declining not recently but since 1990. Stock size and body size are now so small that impact of natural predators--which was negligible with healthy stock sizes--has nearly doubled. Combined with limited food and oxygen, the stock is unable to recover, even without fishing.

Measures to (hopefully) rebuild the stock are as follows: (1) Minimize remaining catches and angling; (2) minimize catches of herring and sprat to provide food for juvenile and young adult cod; (3) strongly reduce inflow of fertilizers; (4) stop bottom trawling which re-suspends fertilizers from the sediment; (5) fishers need to be compensated for their financial loss caused by EU and national mismanagement, instead they can participate in research to monitor recovery

Status of the Western Baltic Ecosystem and Fisheries

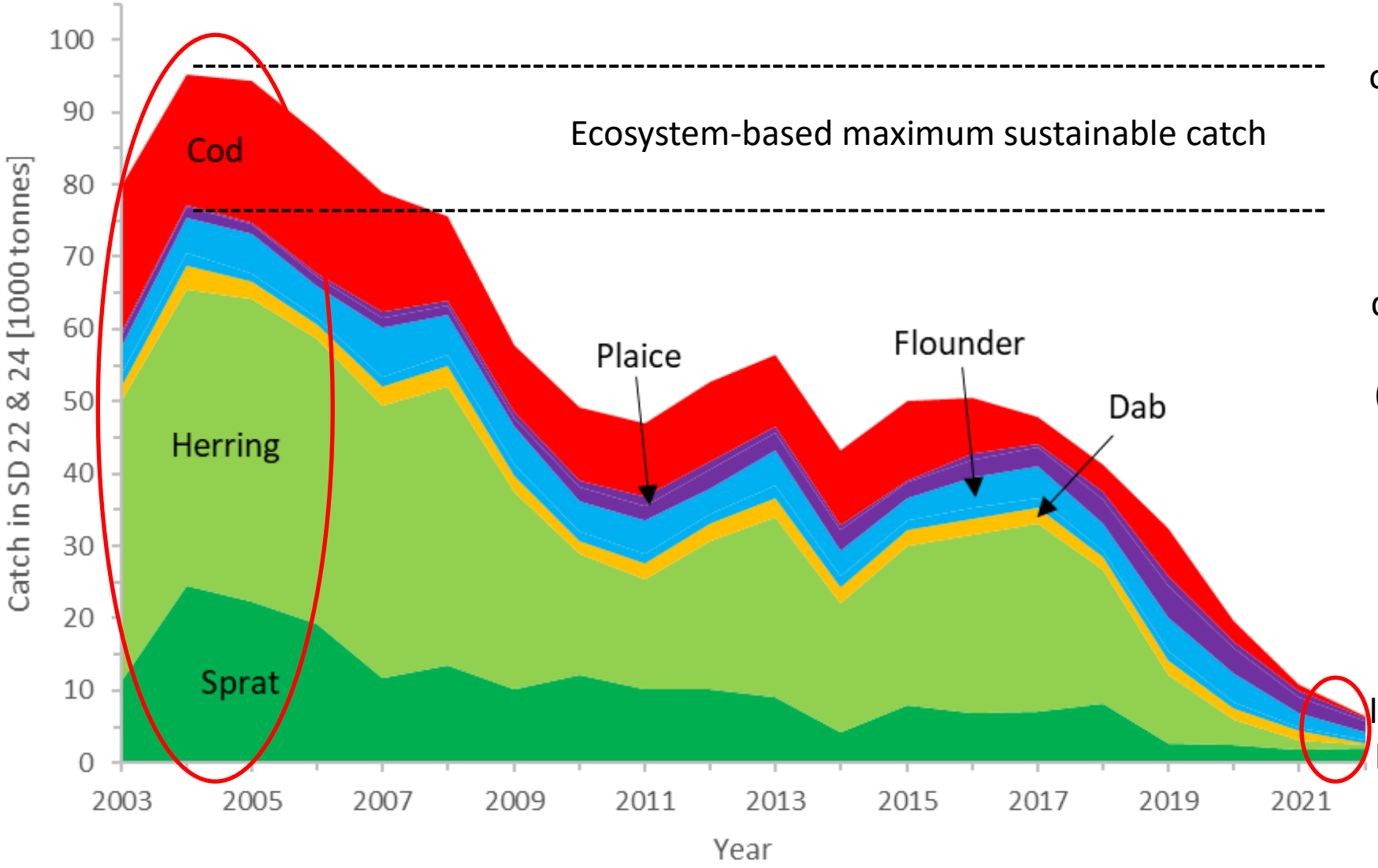


Status of Western Baltic Fisheries



Sources: All data shown are from ICES: WGBFAS 2023, HAWG 2023, historic assessments,

Catch of Commercial Fish in the Western Baltic in the last 20 years



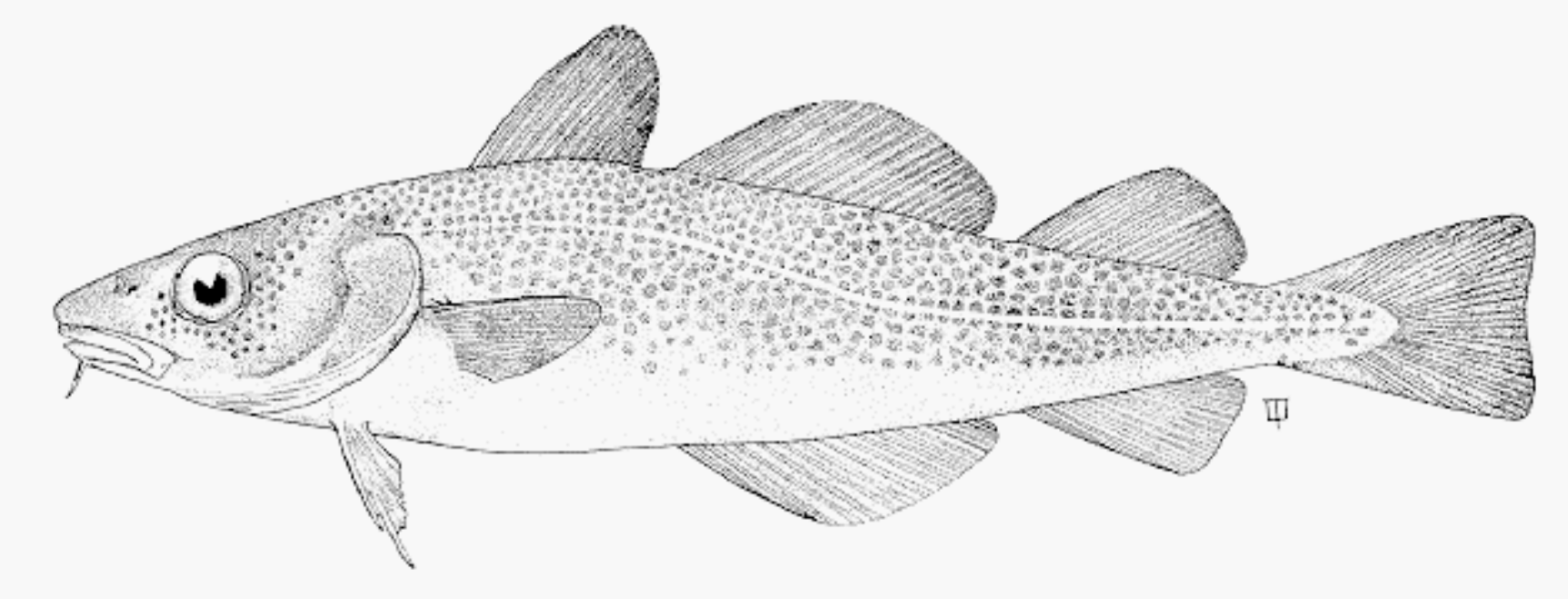
Sources: WGBFAS 2023, HAWG 2023 [WBS_Catch_6.xlsx]

Over the past 20 years, legal catches of cod, herring and sprat far exceeded productivity and collapsed the stocks and the fisheries.

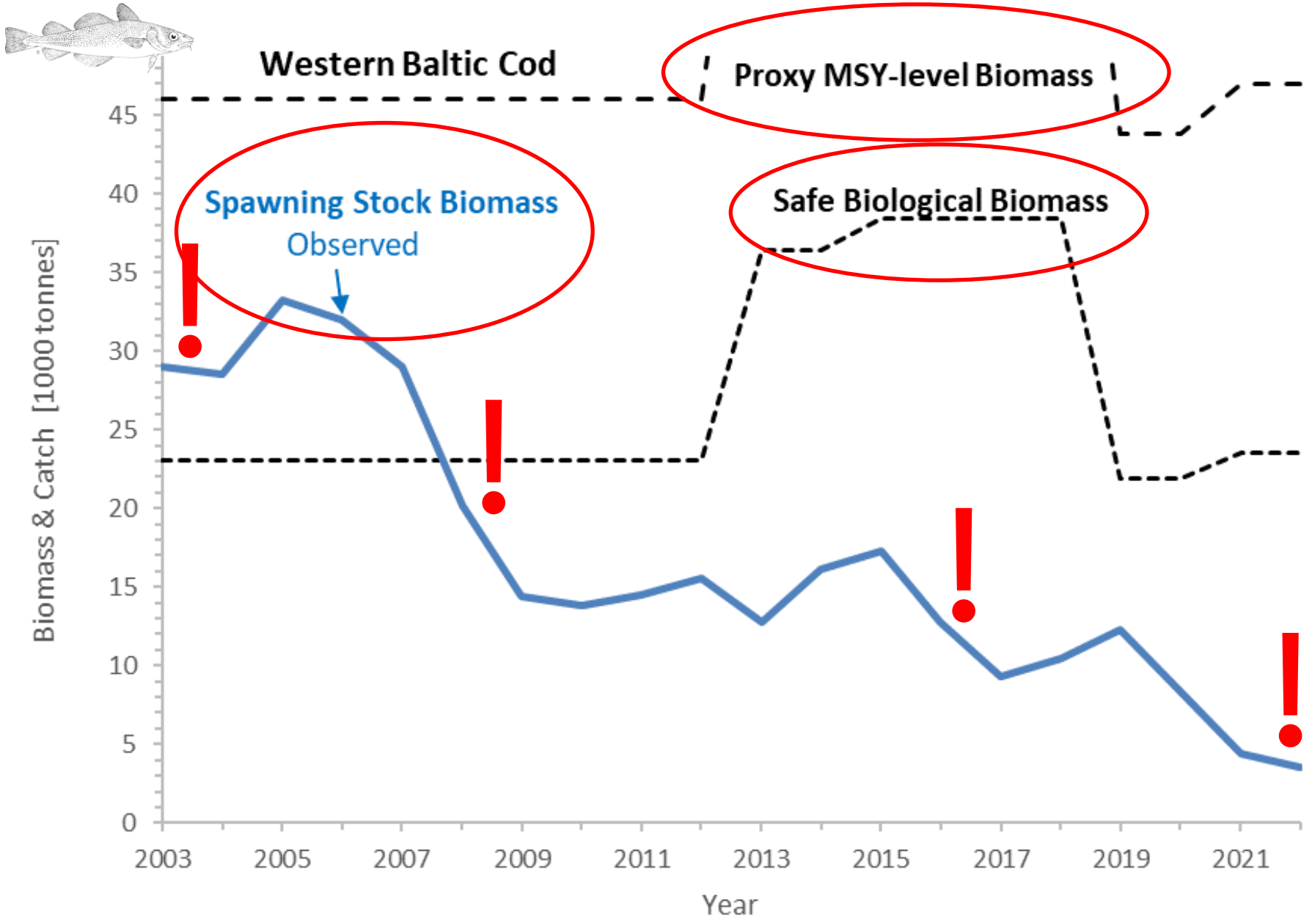
Commercial flatfish (plaice, flounder, dab) were less strongly fished and are doing fine, despite warmer winters (climate change) and reduced oxygen (over-fertilization).
But flatfish cannot replace cod, sprat and herring in the ecosystem and in the fishery.

Ecosystem-based maximum catch levels were realized in the early 2000s but could not be maintained because previous overfishing had reduced stock sizes below MSY-levels.

Western Baltic Cod



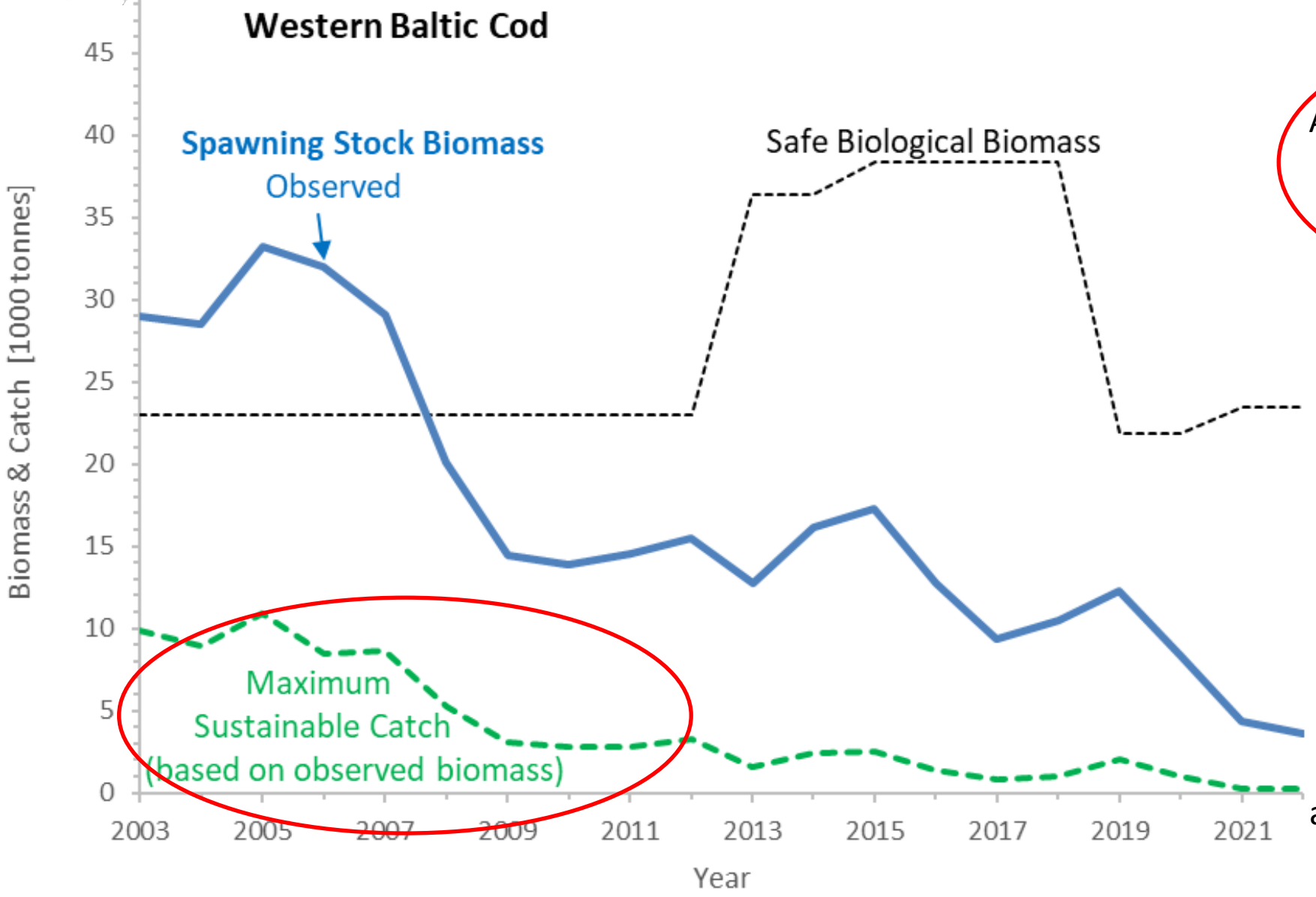
Sources: ICES WGBFAS 2023 [cod_graph_14_ppt.xlsx]



The spawning stock biomass (**blue curve**) is shown together with the border of safe biological biomass (lower dashed curve) below which reproduction is impaired, and the minimum biomass required to produce maximum sustainable catches (MSY) (upper dashed curve).

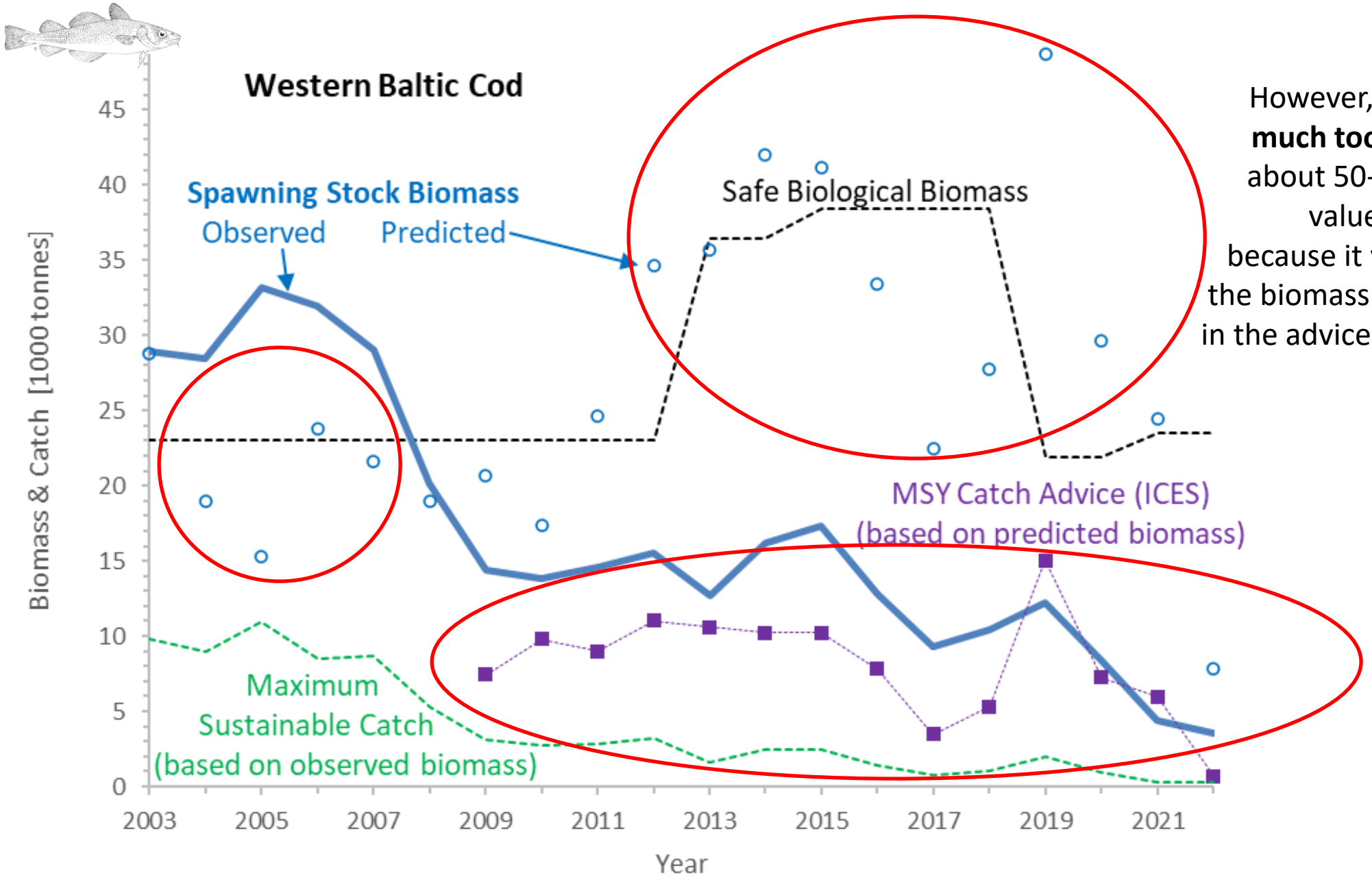
Note that spawning stock biomass is called ‘observed’ to indicate that it is based on all currently available data and thus represents the ‘best’ estimate which may differ from previous ‘historic’ estimates or predictions.

There were numerous warning signs and opportunities to rebuild the stock, all of which where ignored.

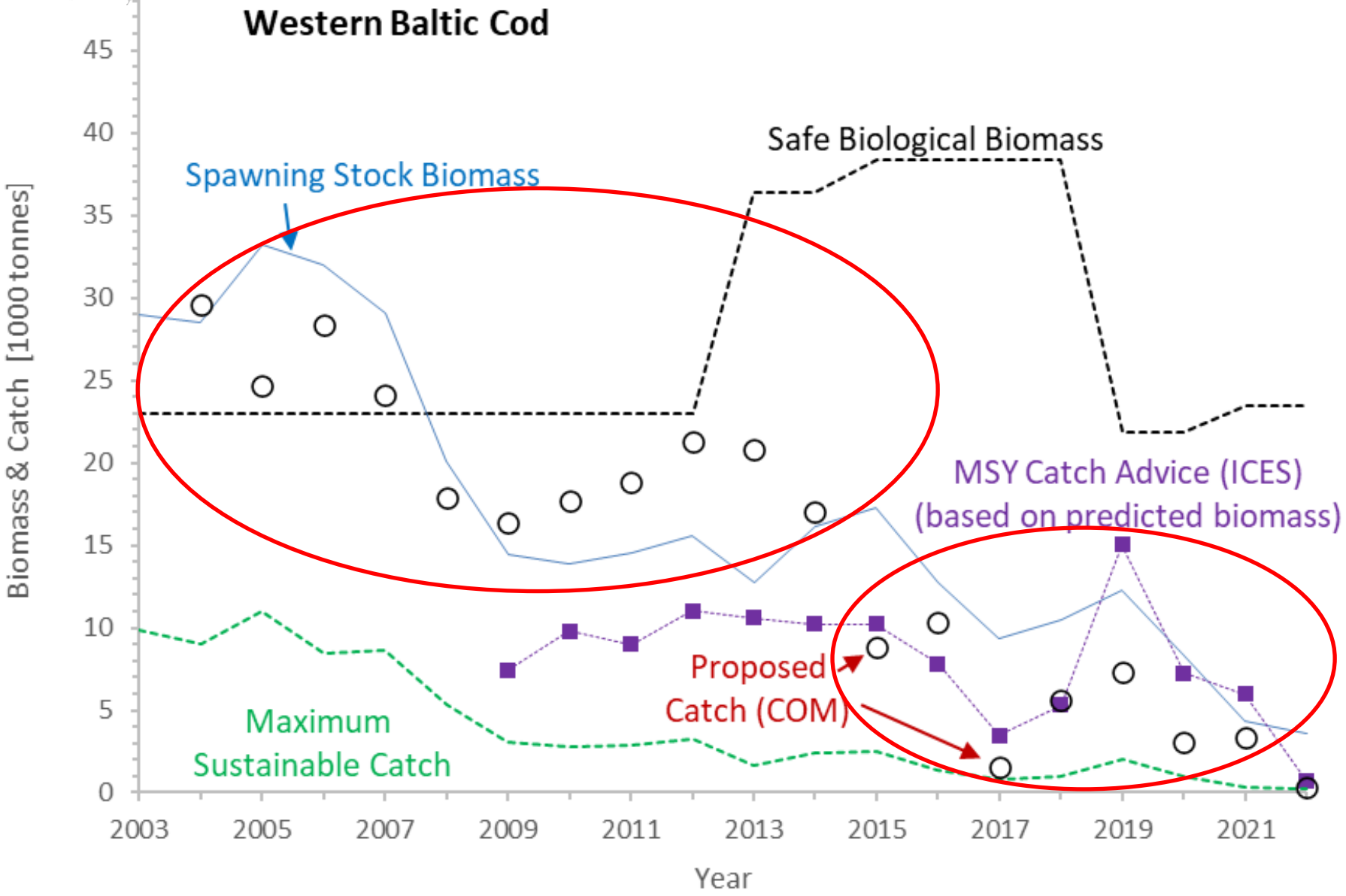


According to the ICES *Fmsy* estimate, a maximum of 21–24% of the fish in the water could be **sustainably fished** per year if spawning stock biomass was above safe biological limits.

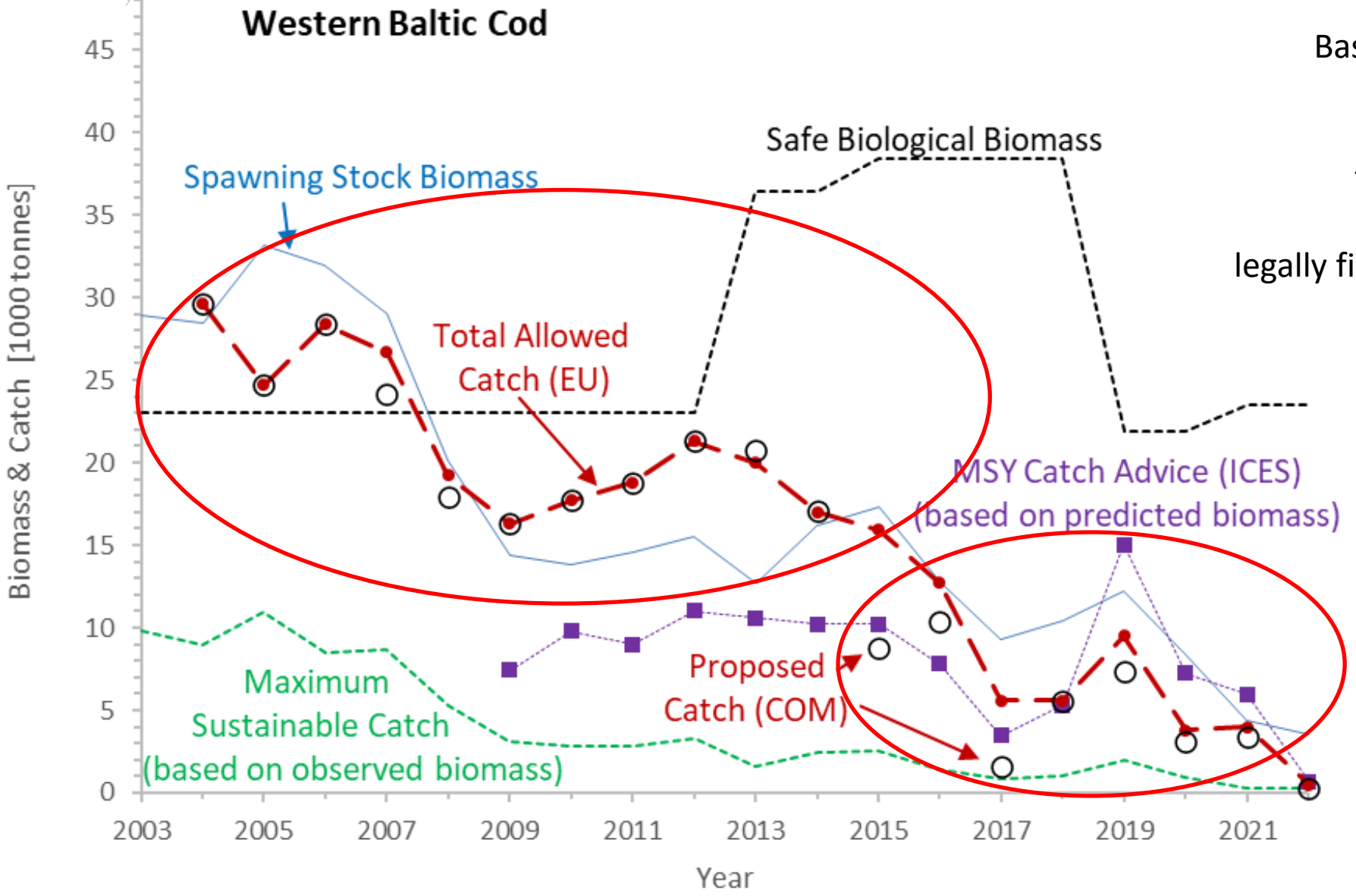
The green dashed line indicates the maximum catch that the stock could support at its actual size in the given year.



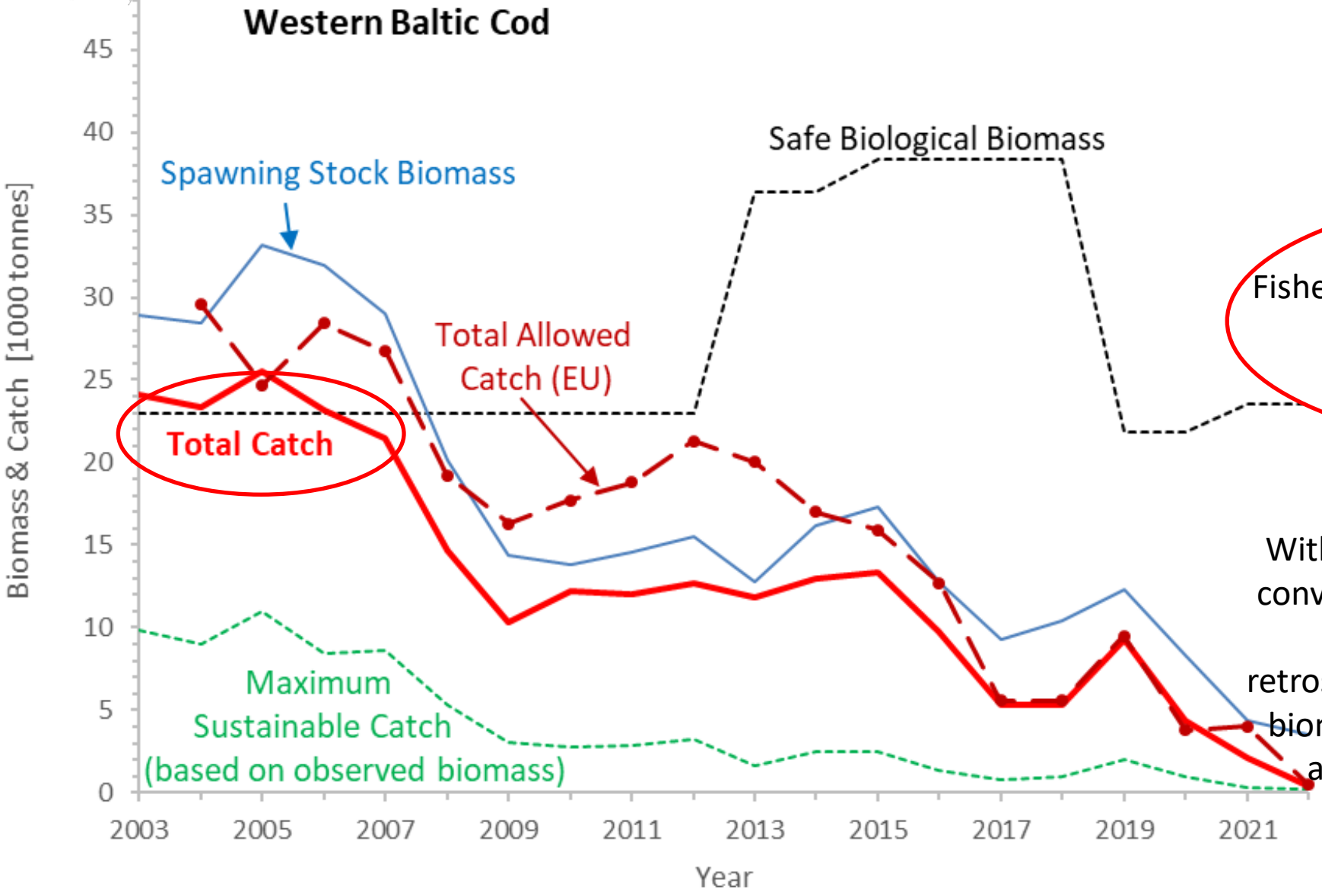
However, ICES regularly gave **much too high catch advice**, about 50-200% above correct values in hindsight, because it vastly overestimated the biomass that would be present in the advice year (light blue circles)



Based on input from ICES and stakeholders, the European Commission **proposed TAC catch** (o), until 2014 about twice as high as the ICES advice



Based on their national advisors,
ICES advice,
and the COM proposal,
the EU Council of Ministers
in charge of fisheries
legally fixed the **total allowed catches** (TACs)

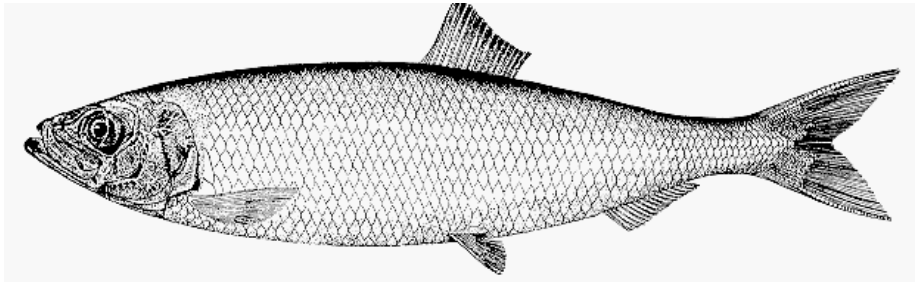


The fishers typically were not able to **catch**
-- as much as was advised by ICES,
-- proposed by EU COM, and
-- legally allowed by the EU Council

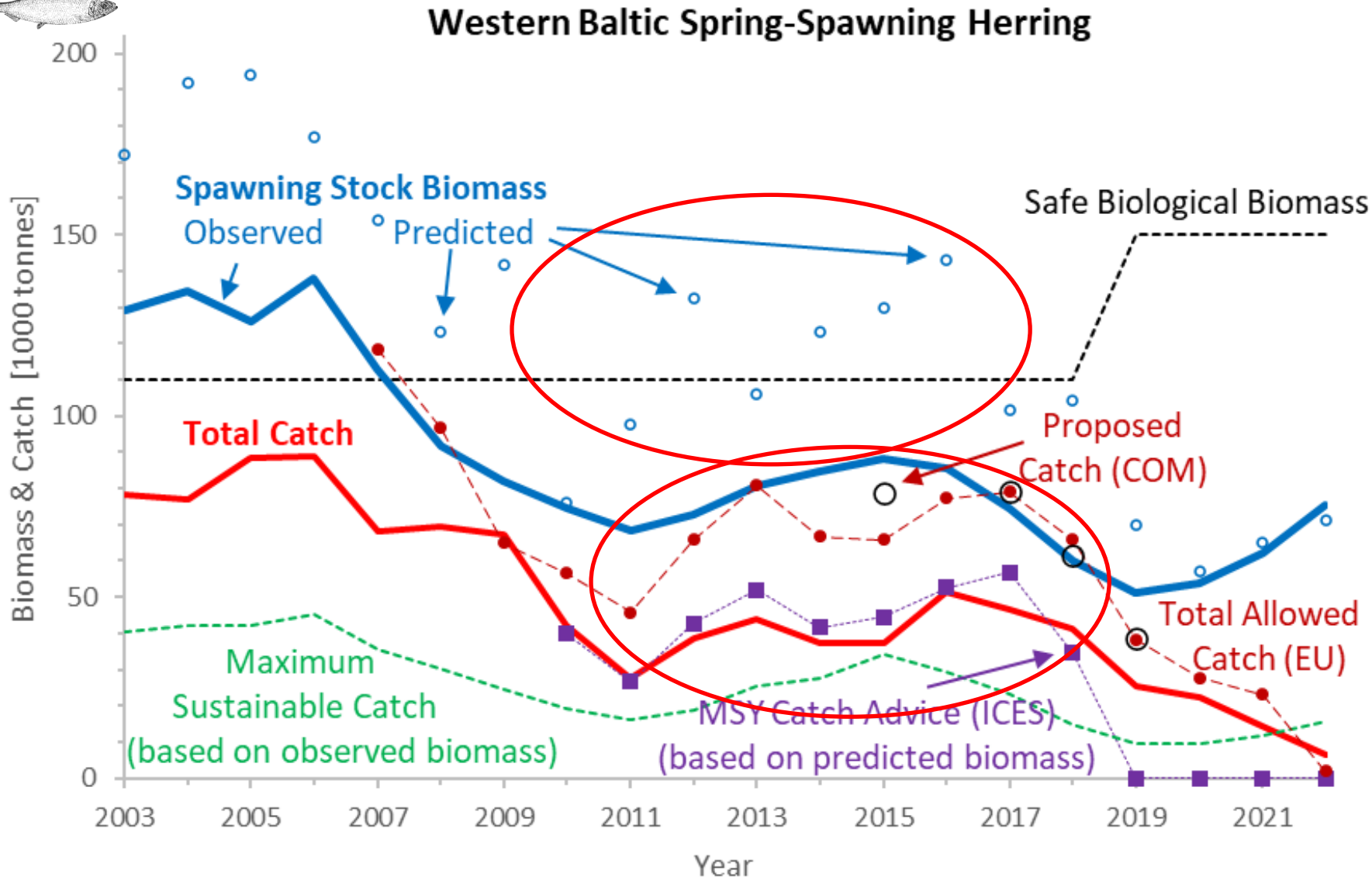
Fishers could not catch more than 80-90% of the adult biomass. Thus, de-facto, **there was no regulation of catch!**

Within 2-3 years ICES estimates of biomass converged near the long-term values shown here (blue curve). Thus, a simple retrospective comparison of past catches and biomass would have shown managers that allowed catches were much too high.

Western Baltic Spring Spawning Herring



Sources: ICES HAWG 2023, [her_graph_11.xlsx]



Data for the spring spawning herring in the western Baltic show the same overall pattern as for cod:

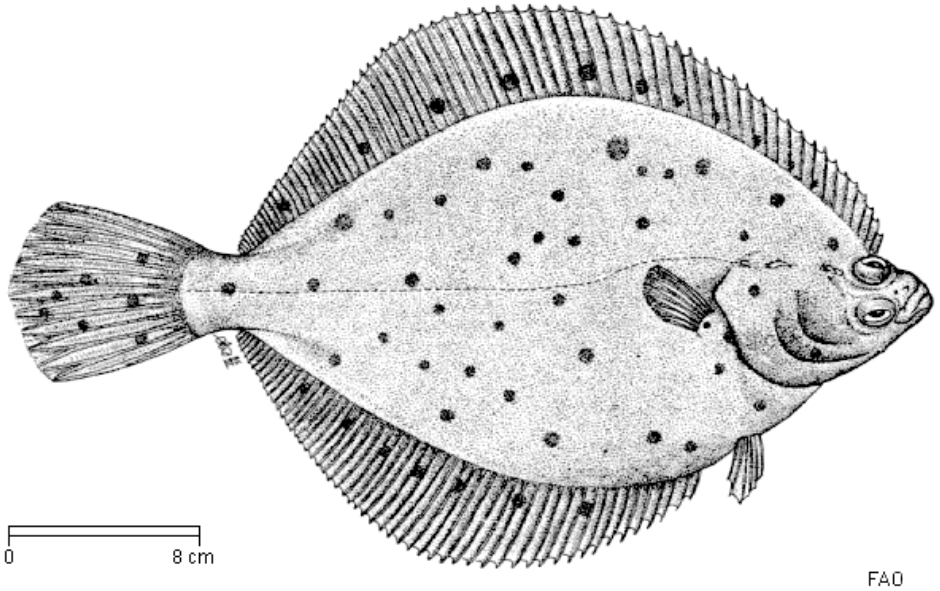
-- much too high biomass prediction and catch advice by ICES

-- COM proposal and COUNCIL TAC exceeding ICES advice

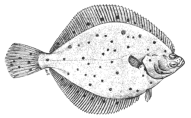
-- Fishers being unable to catch as much as is allowed

-- numerous warning signs and opportunities to rebuild the stock were ignored

Western Baltic Plaice



Sources: ICES WGBFAS 2023 [ple_2123_graph_5.xlsx]



Data for plaice in the Belt Sea and western Baltic show the same overall pattern as for cod and herring:

-- much too high biomass prediction and catch advice by ICES

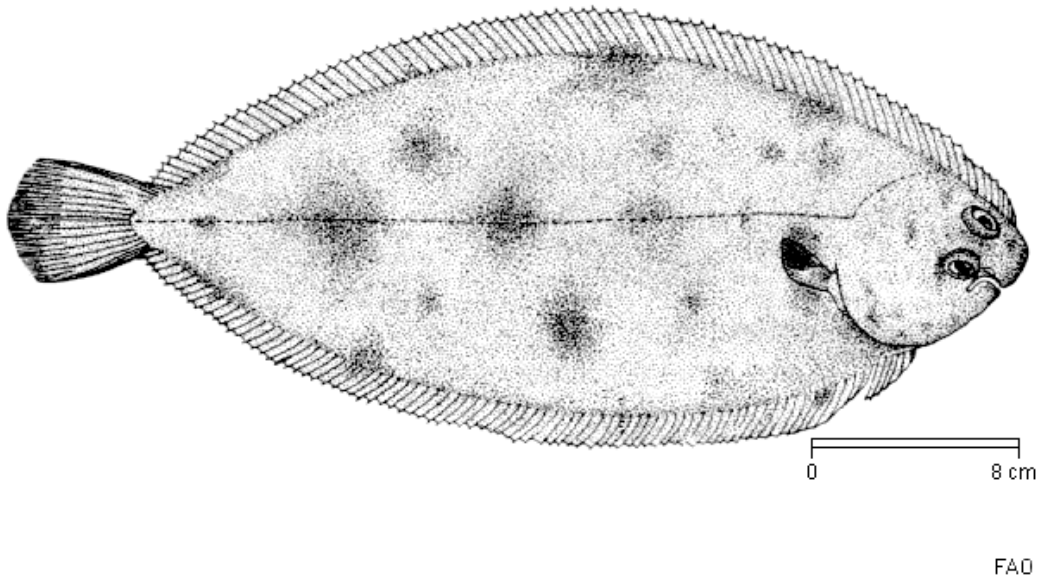
-- COUNCIL TAC exceeding ICES advice

-- Fishers being unable or unwilling (no market) to catch as much as is allowed

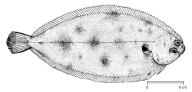
-- recent recovery to MSY-level stock size is mostly due to reduced by-catch in the collapsed fishery for cod

Management Examples of Other Stocks

North Sea Sole



Sources: ICES WGNSSK 2023 [sol_graph_3.xlsx]



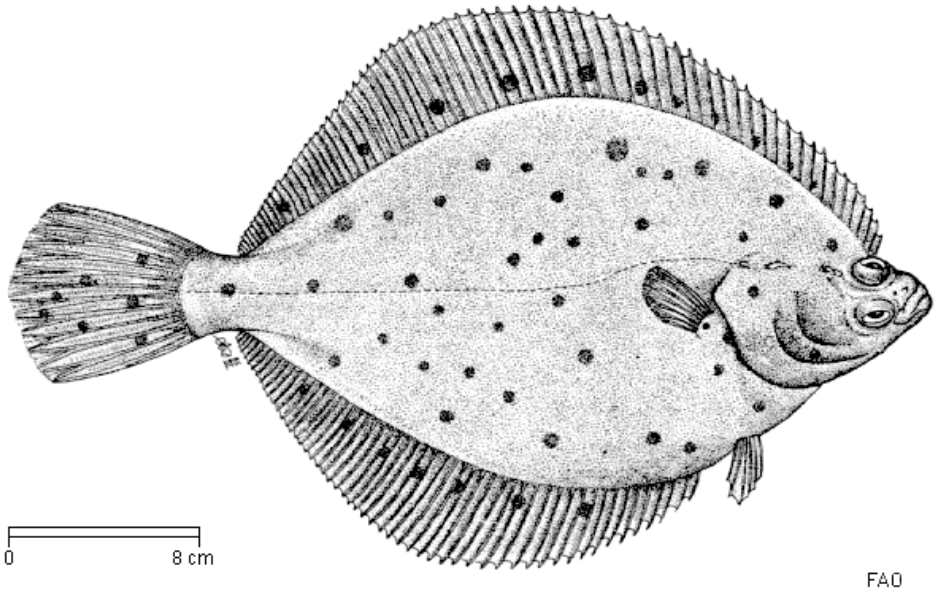
The problem is not restricted to the Baltic but rather systemic: Data for sole in the North Sea show the same overall pattern as for Baltic cod, herring and plaice:

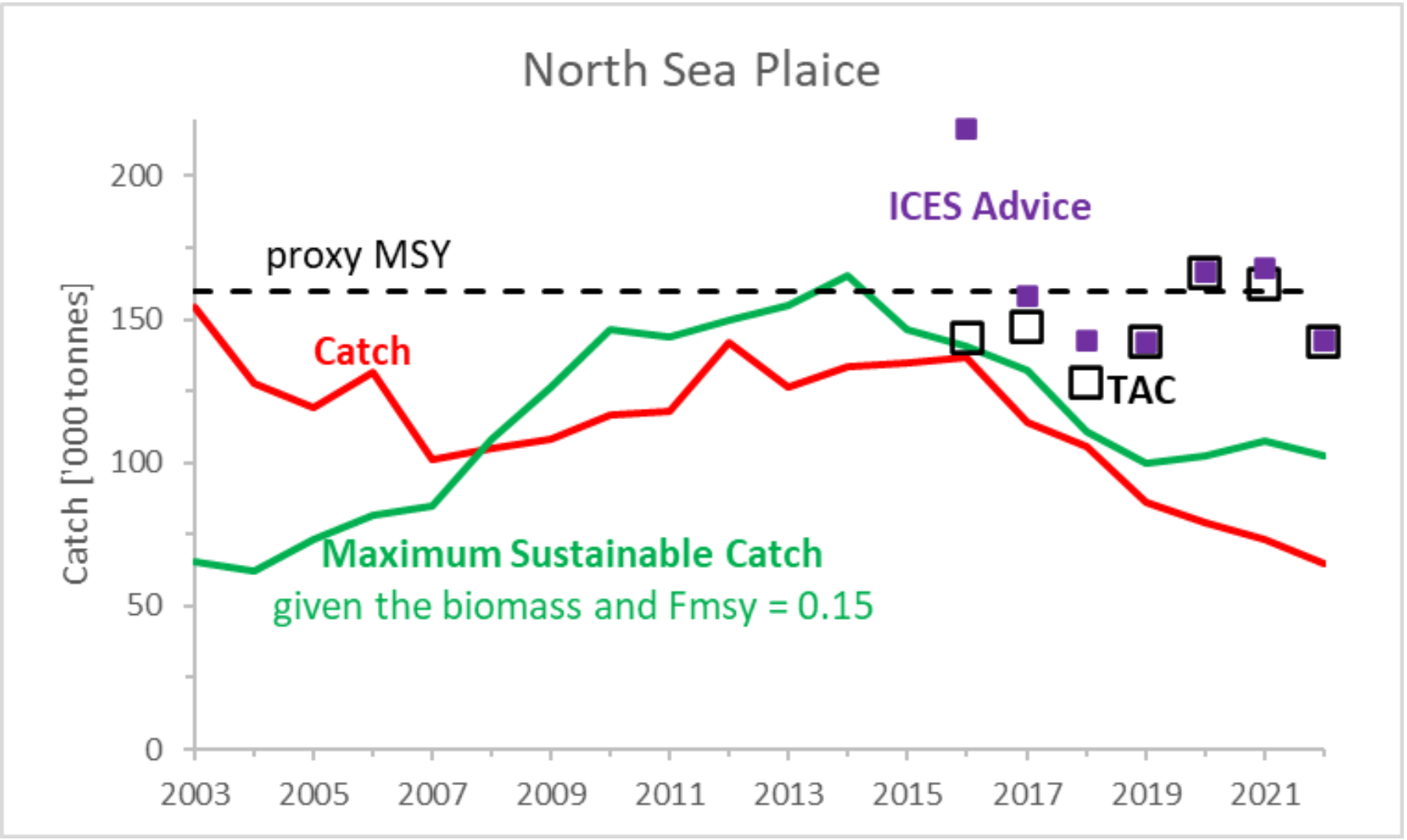
-- much too high biomass prediction and catch advice by ICES

-- COUNCIL TAC exceeding ICES advice, although aligned recently as overprediction by ICES increased

-- since 2017, Fishers being unable to catch as much as is allowed

North Sea Plaice





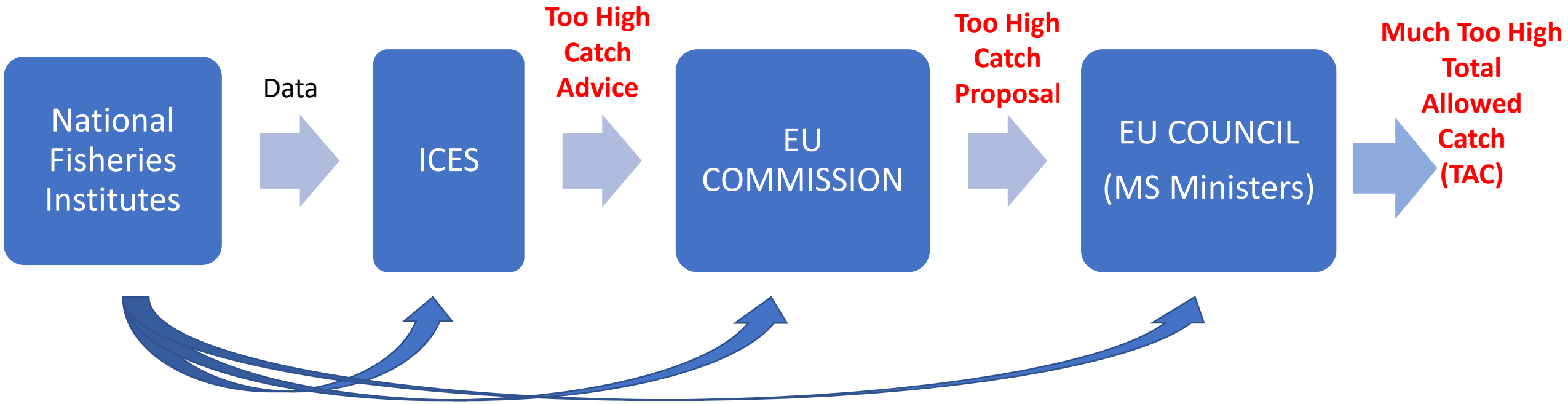
Source of data: ICES advice 2023. File: ple.27.420_graph.xlsx

The good status of NS plaice in the past two decades is due to catches (red curve) since 2007 remaining below the maximum catch that the available biomass can sustain (green curve).

Note that this is **not** caused by good management: ICES advice (purple) and EU TAC (black rectangles) were mostly well above the maximum sustainable catch (green curve). Instead, the de-facto sustainable catches were mostly caused by limited demand and low ex-vessel price of plaice, as evidenced in part by the high (>50% in 2020/21) discards or BMS (landed for fish meal) of NS plaice.

New Fisheries Management in the EU Is Needed

Why Did It Go Wrong?
Fisheries Management in the EU



National Experts/Representatives Push for Short-term National Interests: Highest Possible Catch Now

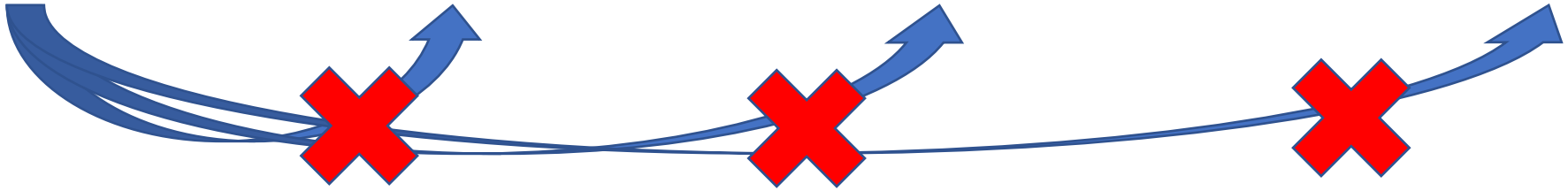
Proposed Fisheries Management in the EU

National Fisheries Institutes

Data

New Independent EU Fisheries Agency

Ecosystem-based sustainable Total Allowable Catch (esTAC)



Only four simple rules:
(1) let all fish spawn before capture; (2) keep all stocks above the MSY-level;
(3) take less than MSY; (4) take even less from low-trophic-level species

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Thank You
Questions?

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(1) Optimum Size for Capture (L_{opt}, W_{opt})

- Fish (including squid, crustaceans, bivalves,...) grow all their lives
- The add-on body weight (gain) reaches a maximum at about **L_{opt} = 2/3 of maximum length** corresponding to **W_{opt} = 30% of maximum weight**
- At this size most species have reproduced 1-3 times
- For a given fishing effort, catch and profit are highest if most fish are >= L_{opt}
- For a given catch, much fewer fish have to be killed if length at first capture is >= L_{opt}

Source: Froese et al. 2016, https://fishbase.de/rfroese/MinimizingImpactfaf.pdf

(2) Optimum Harvest Rate

- In most commercial species, about 20% of the adult individuals die each year from natural causes (predation, accidents, disease, ..)
- If fishing kills the same amount, the total rate of mortality is doubled leading to a decrease in population size by about half
- At about half of unexploited population size production of new biomass (through growth and reproduction) is maximum
- A catch of about 20% of the fish in the water is replenished within one year in most commercial species. Such catch is therefore the maximum sustainable yield (MSY)

Source: Froese et al. 2016, https://fishbase.de/rfroese/MinimizingImpactfaf.pdf

(3) Optimum Economic Yield

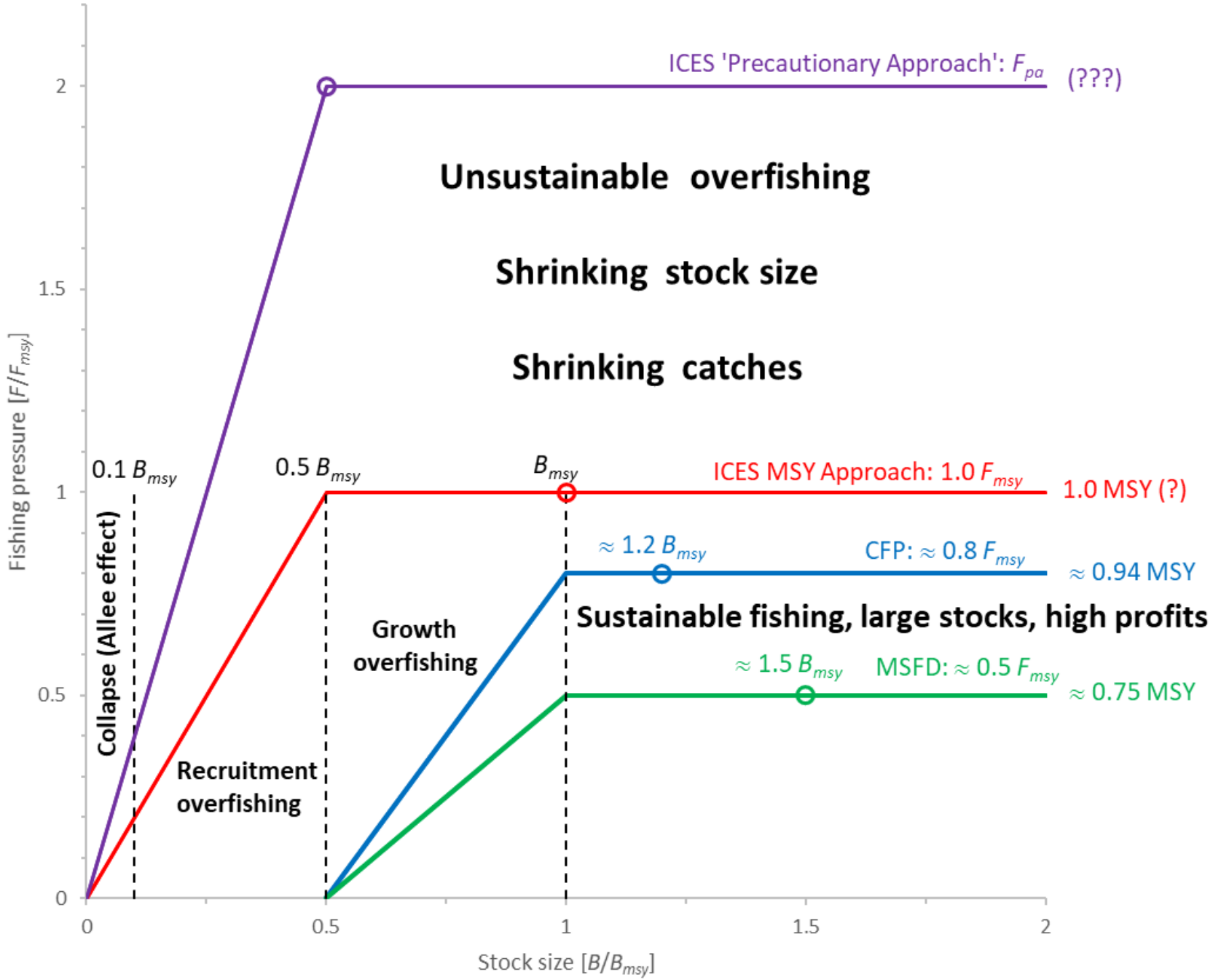
- The more fish there are in the water, the more are caught per hour of gear deployment
- If catches are reduced a bit such that exploited stock size is not half but rather 60% of the unexploited size, then the higher number of fish in the water leads to higher catch per hour and thus to highest sustainable profits or maximum economic yield (MEY)
- Larger stock size is also the best insurance against detrimental environmental impacts such as caused by climate change

Source: Froese et al. 2016, https://fishbase.de/rfroese/MinimizingImpactfaf.pdf

(4) Ecosystem-based Management

- Large fish (cod, halibut, tuna, hake, ..) typically eat small pelagic fish (anchovy, sardine, sprat, herring, ..)
- Small pelagic fish (anchovy, sardine, sprat, herring, ..) eat zooplankton, which is too small to be eaten by large fish, birds or most marine mammals
- Small pelagic fish therefore are a very important ecological conveyor belt, transporting food energy from lower to higher trophic levels
- Ecosystem-based fisheries management therefore ensures that small pelagic fish (anchovy, sardine, sprat, herring, ..) are caught at about half the harvest rate of large fish to ensure proper ecosystem function

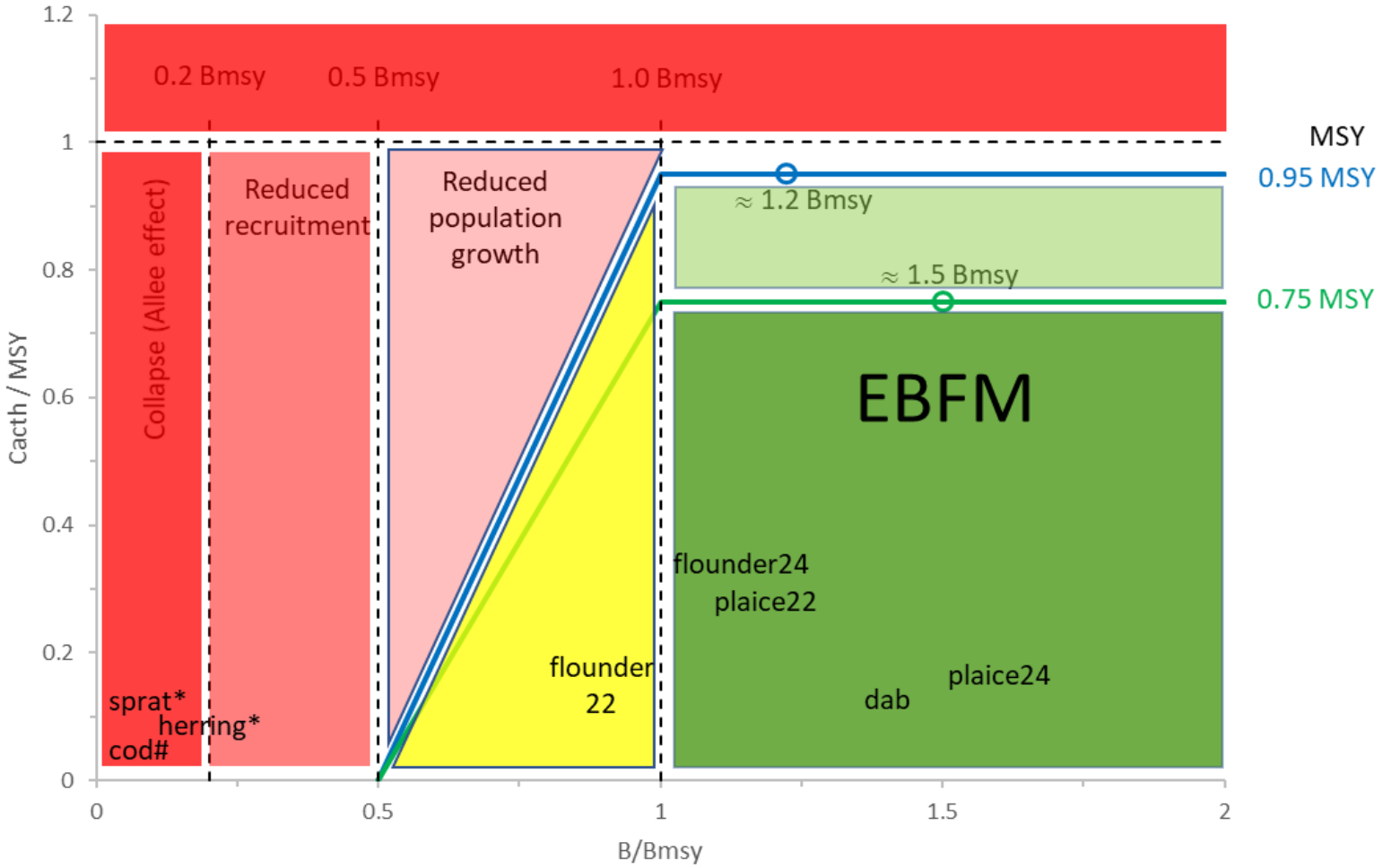
Scotti et al. 2022 https://fishbase.de/rfroese/WBS_Frontiers2022.pdf



The European Union has adopted the principles of sustainable fishing as goals in their Common Fisheries Policy of 2013. The amount of allowed fishing can be derived from Harvest Control Rules, where the blue and green lines depict fishing pressure for regular (blue) and for low-trophic-level (green) species.

Unfortunately, instead the purple curve is applied to minor commercial and bycatch species, and the red line to highly commercial target species.

As a result, many stocks in EU waters are depleted.



A conceptual representation of an EBFM-compatible harvest control rule, *ensuring that (1) catches never exceed MSY (upper dashed horizontal line), (2) catches are quickly reduced if the stock size is too small to produce MSY (area of reduced population growth, B < B_{msy}), (3) no fishing occurs if successful reproduction may be impaired (area of reduced recruitment, B < 0.5 B_{msy}), (4) there is a very low probability of stock collapse (area of depensation or Allee effects). Catches of about 0.95 MSY ensure that predatory fish stocks remain large enough (about 1.2 B_{msy}, blue curve) to fulfill their stabilizing ecosystem roles and catches of about 0.75 MSY ensure that forage fish stocks remain large enough (about 1.5 B_{msy}, green curve) to transport energy from the plankton level to the upper trophic levels. The common names of the WBS stocks indicate their position in this EBFM plot in 2022, with numbers indicating subdivisions of the WBS. The asterisk (*) of cod underlines its role as top predator and the hash (#) of sprat and herring underlines their importance as forage fish.* [HCR_6.xlsx]