GEOMAR
Helmholtz-Zentrum für Ozeanforschung Kiel

How We Can Get Real About Restoring Fish Stocks

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Presentation at the

‘Baltic Sea Bankruptcy – a changed climate, broken economy and ecosystem’

EU Parliament Brussels, 3rd September 2025, 13:30-16:00

The Many Laws Decreeing Sustainable & Ecosystem-Based Fisheries Management

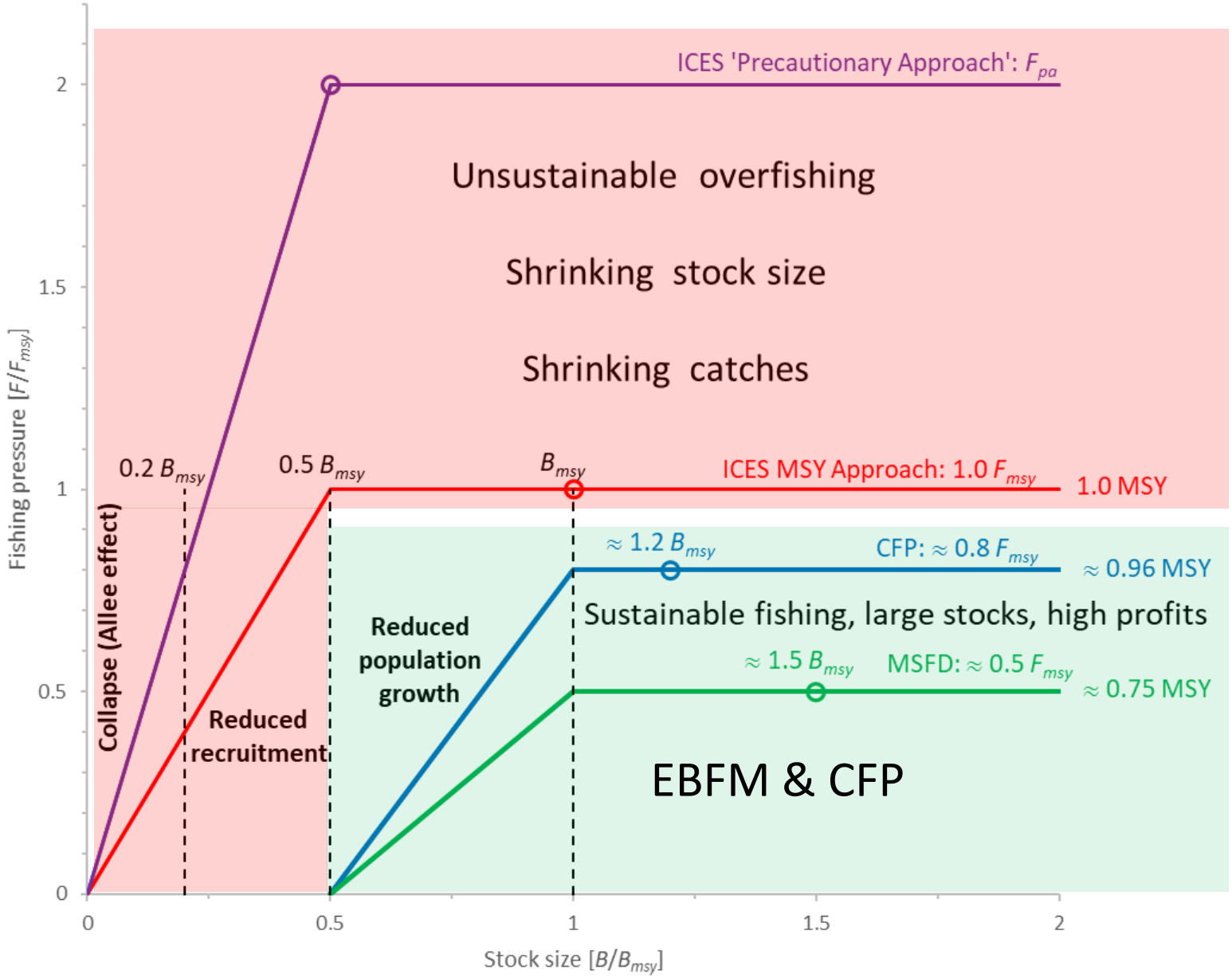
Law/Directive	Article	Quote
UNCLOS 1982	61(3)	"[…] maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield […]"
UNFSA 1995	Annex II (7)	"The fishing mortality rate which generates maximum sustainable yield should be regarded as a minimum standard for limit reference points. […] For overfished stocks, the biomass which would produce maximum sustainable yield can serve as a rebuilding target."
CFP 2013	2(2)	"[…] shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield."
CFP 2013	2(3)	"The CFP shall implement the ecosystem-based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine environment are minimized."
MSFD 2008	Annex I (3)	"Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock."
MSFD 2017	Annex D3C1	"The Fishing mortality rate of populations of commercially-exploited species is at or below levels which can produce the maximum sustainable yield (MSY)."
	D3C2	"The Spawning Stock Biomass of populations of commercially-exploited species are above biomass levels capable of producing maximum sustainable yield."
	D3C3	"The age and size distribution of individuals in the populations of commercially-exploited species is indicative of a healthy population. This shall include a high proportion of old/large individuals and limited adverse effects of exploitation on genetic diversity."
MAP 2016	3(1)	The plan […] shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce MSY."
	3(3)	The plan shall implement the ecosystem-based approach to fisheries management in order to ensure that negative impacts of fishing activities on the marine ecosystem are minimised. It shall be coherent with Union environmental legislation, in particular with the objective of achieving good environmental status by 2020 as set out in Article 1(1) of Directive 2008/56/EC [= MSFD 2008]. In particular the plan shall aim to: (a) ensure that the conditions described in descriptor 3 contained in Annex I to Directive 2008/56/EC are fulfilled; and (b) contribute to the fulfilment of other relevant descriptors contained in Annex I to that Directive in proportion to the role played by fisheries in their fulfilment.
UN SDG 2015	Target 14.4	By 2020, […] restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics."

Measures in Support of EBFM Principles

(1) Maintain structure and function of the ecosystem by rebuilding and keeping the abundance and biomass of all species above levels required for e.g. primary production, ecosystem engineering, energy provisioning, or predation	Fish only for direct human consumption; no extraction of primary producers and ecosystem engineers such as seagrasses; no fishing of zooplankton; maintain forage species representing bottlenecks to energy-transfer such as sprat, or herring above 75% (with 75% of MSY) of their natural abundance; maintain predator species such as cod above 60% (with 95% of MSY) of their natural abundance.
(2) Rebuild and preserve age and size distributions indicative of healthy populations	Do not fish juveniles or spawners; do not fish in nursery or spawning areas; no fishing of zooplankton/larvae. Start selective fishing above sizes where 90% of the larger sex has reproduced and where mean length in the catch is close to 2/3 of maximum length.
(3) Minimize impact on habitats and non-target species, limit carbon footprint, and help—rather than hinder—natural carbon sequestration	Do not employ gears that damage the sea floor or re-suspend carbon such as dredges or bottom trawls; avoid fuel-intensive fishing such as trawling; avoid by-catch of non-target species; discourage influx of fertilizers, pesticides, heavy metals and other chemicals or plastics; discourage habitat-destroying activities such as mining for minerals, oil, gas, gravel, sand, stones, or corals.
(4) Provide no-take areas for conservation and undisturbed evolution of genetic diversity for resilience and adaptation against environmental change.	Designate sufficiently large no-take areas with suitable habitat, sufficient food and oxygen, including deeper areas with cooler waters.

Froese et al. 2025, Science 388: 826-828 https://doi.org/10.1126/science.adv4341

EU Fishing Mortality-Based Harvest Control Rules



The legal requirements for sustainable fishing and for EBFM can be expressed in Harvest Control Rules. Fmsy is the maximum fishing pressure a stock can sustain long-term.

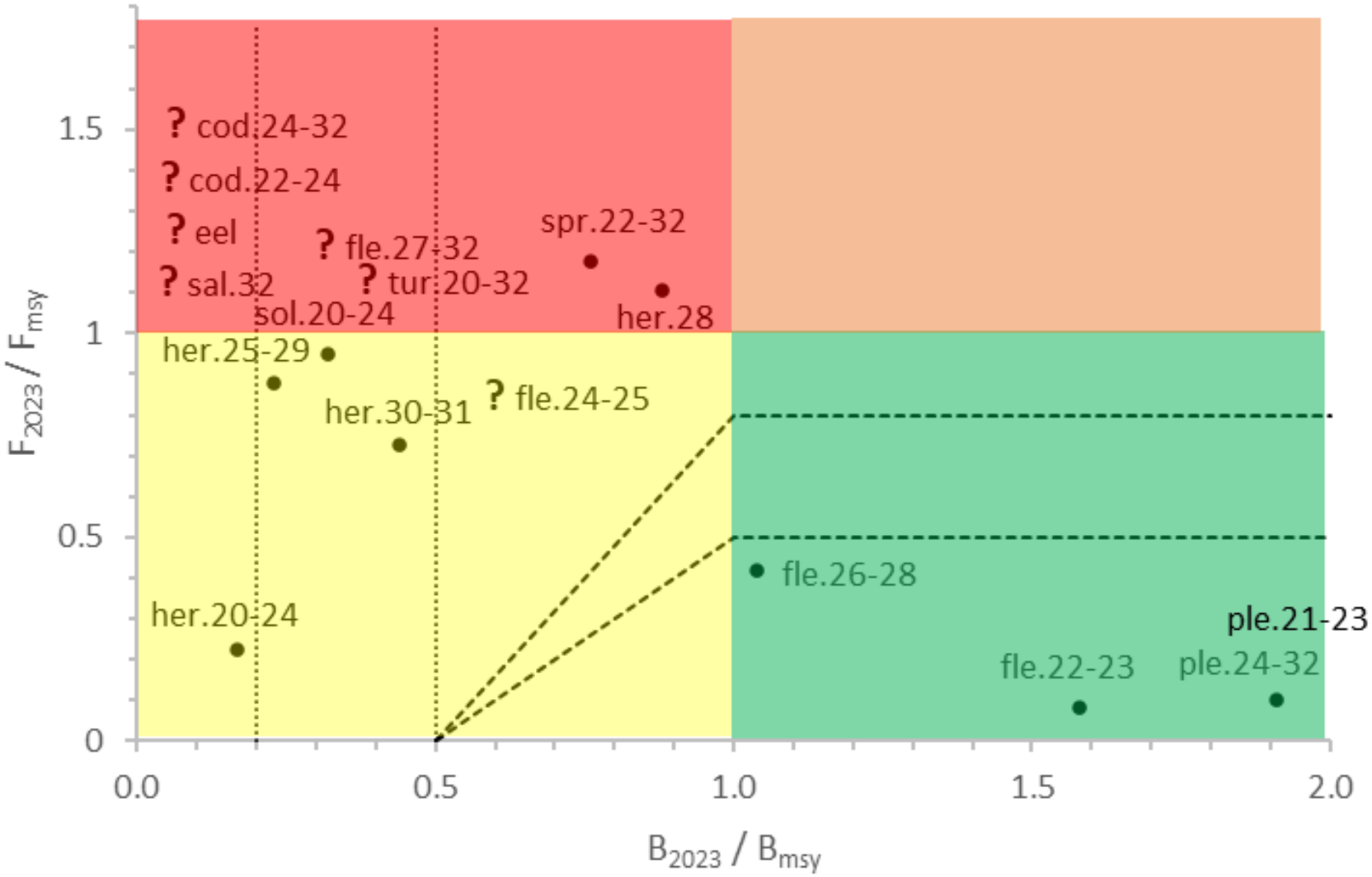
Starting from the bottom, EBFM prescribes that forage fish (green) should be fished with about half of Fmsy while predatory fish (blue) can be fished with about 0.8 Fmsy.

Instead, the ICES HCR applies Fmsy as simultaneous target for all fish, targeting 30% of unexploited biomass (e.g. central Baltic Herring).

Even worse, the ICES 'precautionary approach' allows bycatch species (purple) to be fished with up to twice Fmsy, targeting about 20% of natural stock size.

Also, according to the ICES HCR, fishing never stops even if the stock is collapsing.

Reality Check: Exploitation and Status of Baltic Fish Stocks

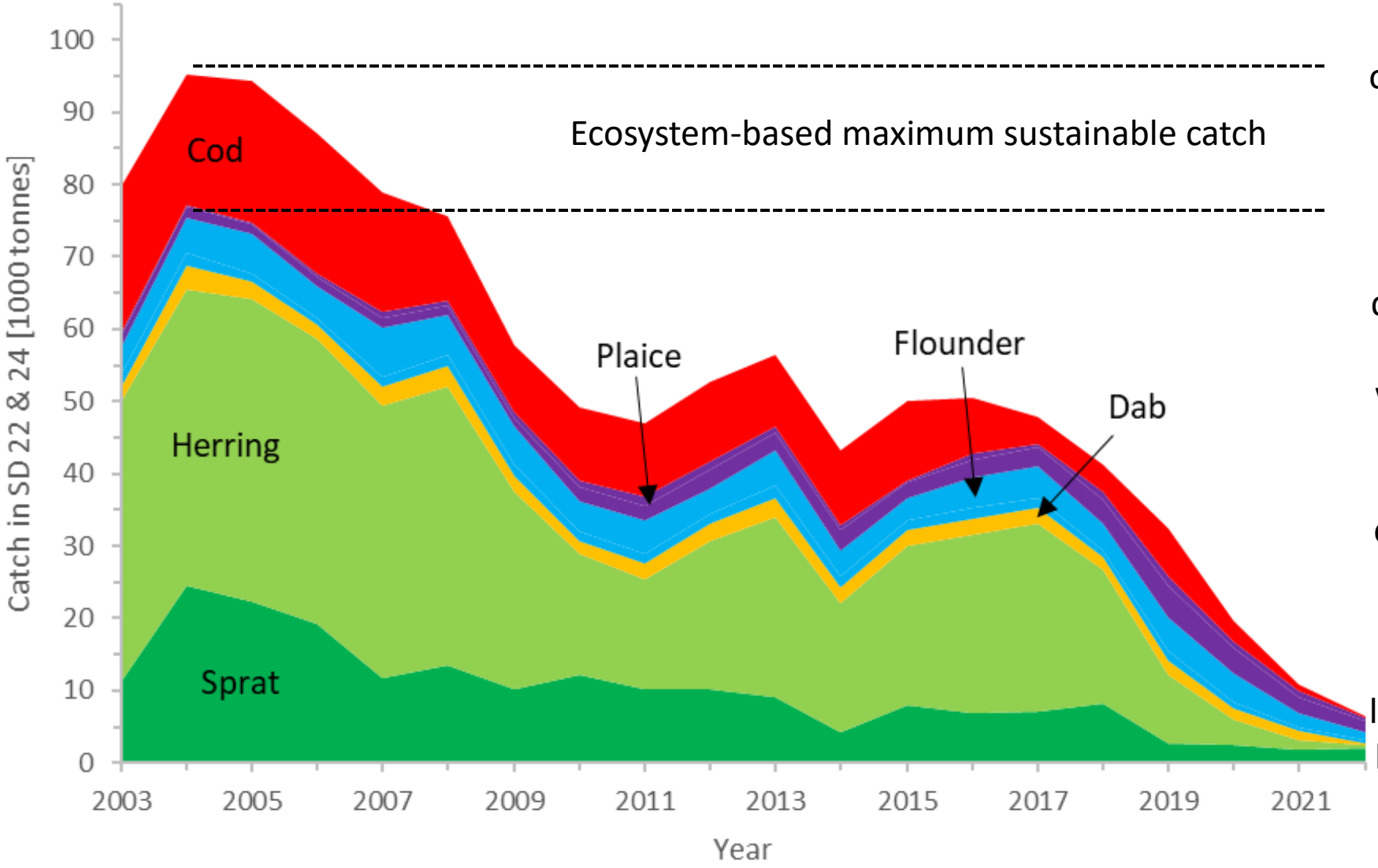


Stock	Biomass 2013-23
Cod 22-24	-73 %
Cod 24-32	-27 %
Eel	-58 %
Flounder 22-23	-27 %
Flounder 24-25	35 %
Flounder 26-28	-31 %
Flounder 27-32	-75 %
Herring 20-24	-37 %
Herring 25-29	-10 %
Herring 28	22 %
Herring 30-31	-32 %
Plaice 21-23	271 %
Plaice 24-32	121 %
Salmon 32	??
Sole 20-24	-18 %
Sprat 22-32	-6 %
Turbot 22-32	-41 %

ICES_Stocks_6.xlsx

Stock	2013-23	MSC year of certification	Current status	Source
Cod 24-32	-27 %	**2011** (DE, DK, LT, PL, SW)	2015: Entered re-certification - suspended **2017**: withdrawn (following 2015 ICES Advice)	Assessments DFPO Denmark Eastern Baltic cod - MSC Fisheries
Flounder 24-25	35 %	**2021** (PL)	**2024:** withdrawn (due to Russia invasion – „international cooperation“)	Assessments Poland flatfish trawl - MSC Fisheries
Flounder 26-28	-31 %	**2021** (PL)	**2024:** withdrawn (due to Russia invasion – „international cooperation“ issues)	Assessments Poland flatfish trawl - MSC Fisheries
Herring 20-24	-37 %	**2015** (DE, DK)	**2018:** suspended; **2020:** withdrawn	Assessments Western Baltic spring spawning herring - MSC Fisheries
Herring 25-29	-10 %	**2020** (DE, DK, EST, SW)	**2024:** suspended	Assessments Denmark, Estonia, Germany, Sweden Baltic herring and sprat - MSC Fisheries
Herring 28	22 %	**2018**	Certification valid (GoR) / Reassessment ongoing	Assessments NZRO Gulf of Riga herring and sprat trawl fishery - MSC Fisheries
Herring 30-31	-32 %	**2018** (SW, FIN)	Certification valid (GoB) / Reassessment ongoing	View FFA Finland and SPFPO Sweden Gulf of Bothnia herring fishery - MSC Fisheries
Plaice 21-23	271 %	**2015** (DK)	Certification valid (Now part of Joint demersal fisheries in the N. Sea and adjacent waters)	View Joint demersal fisheries in the North Sea and adjacent waters - MSC Fisheries
Plaice 24-32	121 %	**2021** (PL)	**2024:** withdrawn (due to Russia invasion – „international cooperation“ issues)	Assessments Poland flatfish trawl - MSC Fisheries
Sole 20-24	-18 %	**2019** (DK)	Certification valid – 2025 expiration? (3a - Kattegat, Skagerrak, 22-24)	View Joint demersal fisheries in the North Sea and adjacent waters - MSC Fisheries
Sprat 22-32	-6 %	**2020** (DE, DK, EST, SW)	**2024**: suspended	Assessments Denmark, Estonia, Germany, Sweden Baltic herring and sprat - MSC Fisheries
Turbot 22-32	-41 %	**2021** (PL)	**2024:** withdrawn (due to Russia invasion – „international cooperation“ issues)	Assessments Poland flatfish trawl - MSC Fisheries

Reality Check: Catch of Commercial Fish in the Western Baltic 2003 - 2022



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 increasing in numbers, despite warmer winters (climate change) and reduced oxygen (over-fertilization). But flatfish are often skinny and they cannot replace cod, sprat and herring in the ecosystem and in the fishery.

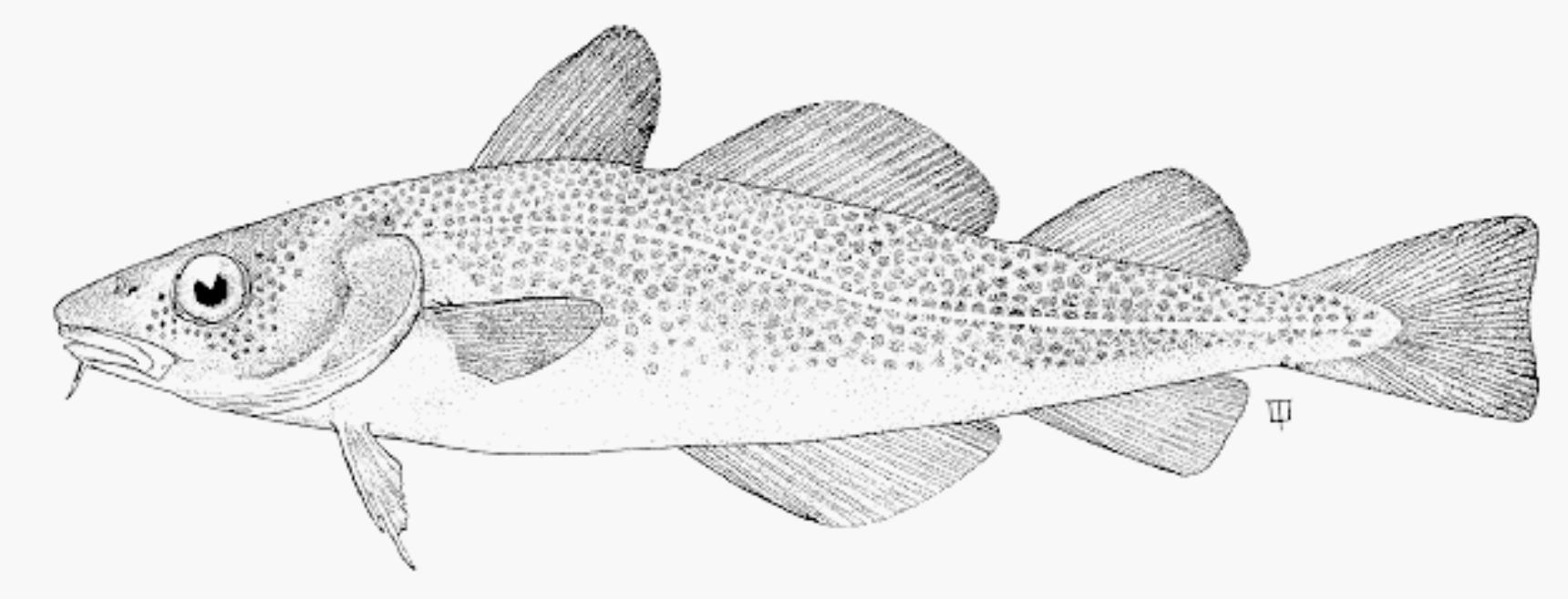
Ecosystem-based maximum catch levels were realized in the early 2000s but could not be maintained because previous overfishing had reduced stock sizes below MSY-levels.

TAC-based Fisheries Management in the EU

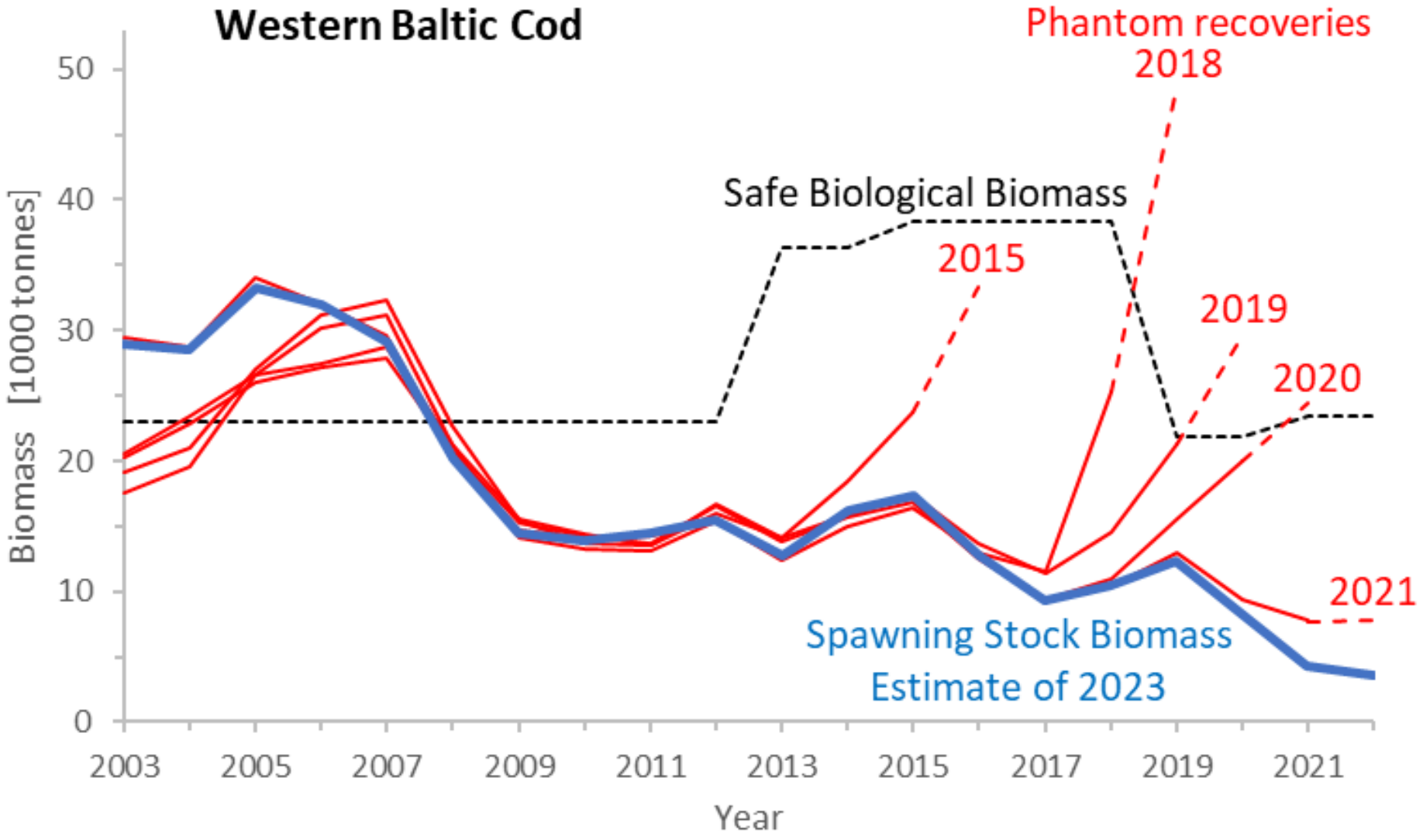
Shortsighted national pressure for 'higher catches now' has compromised all levels of EU fisheries management

Froese et al. 2025, Science 388: 826-828 https://doi.org/10.1126/science.adv4341

What Went Wrong in Baltic Fisheries Management? Example of Western Baltic Cod



Sources: ICES WGBFAS 2023 [cod_graph_14_ppt.xlsx]



'Phantom recoveries' reported by ICES for western Baltic cod.

These wrong predictions representing supposedly 'best available science' led to inaction and increased ICES advice, TAC decisions and catches although the stock was in continuous decline.

The subsequent slides document the mismanagement in detail.

Source: WGBFAS 2023. Baltic Fisheries Assessment Working Group (WGBFAS). ICES Scientific Reports. 5:58. 606 pp. https://doi.org/10.17895/ices.pub.23123768

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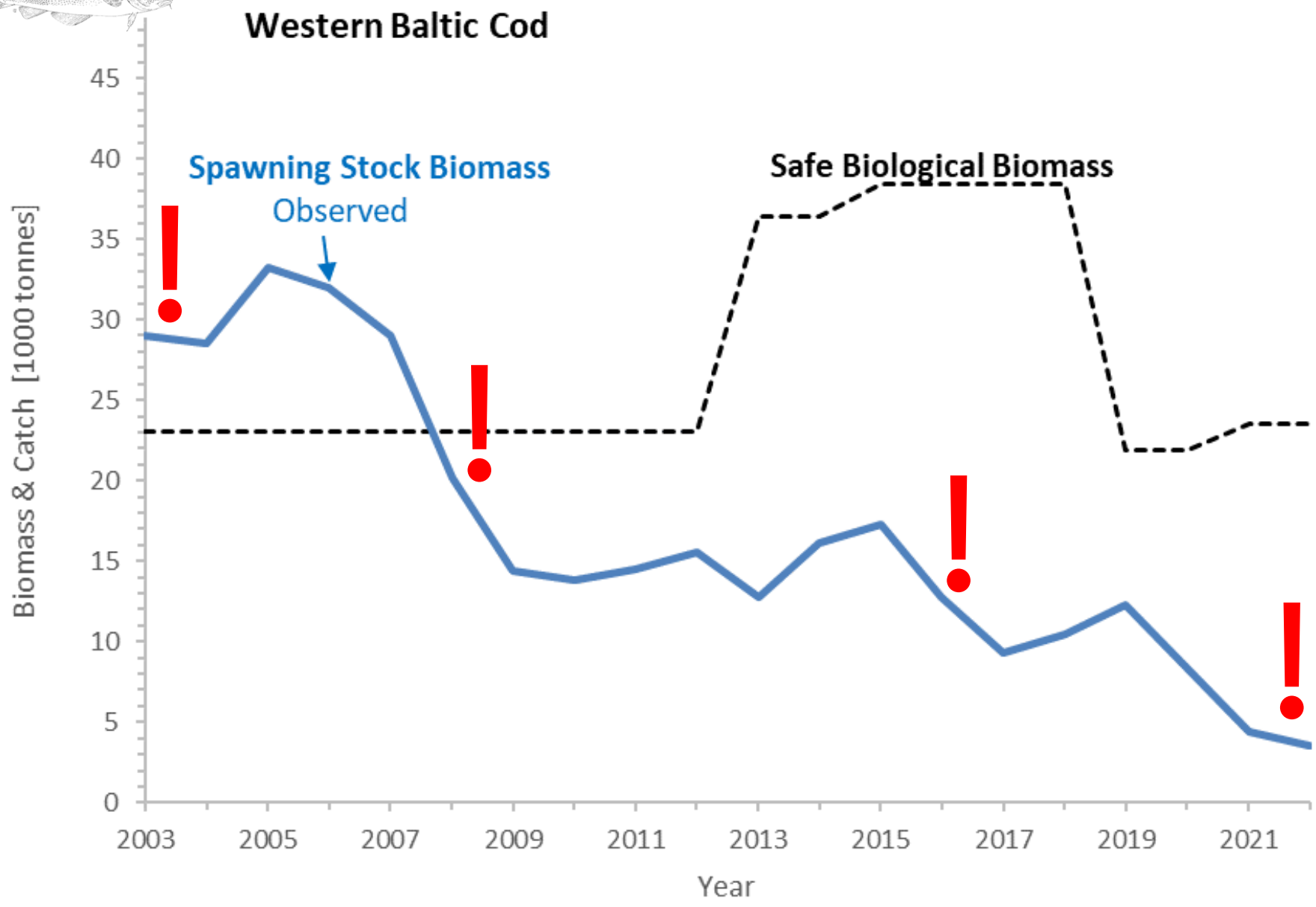
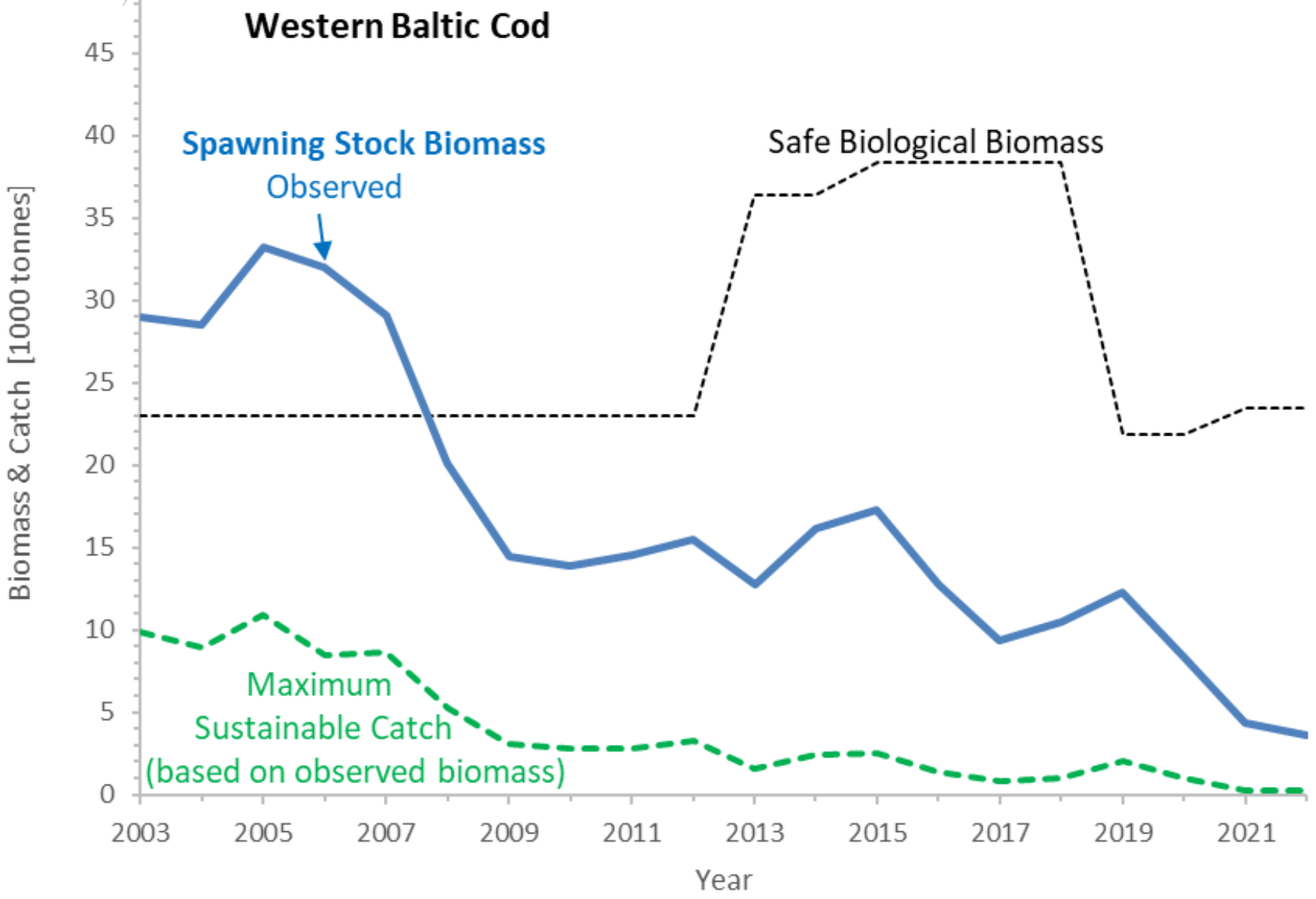


The spawning stock biomass (**blue curve**) is shown together with the border of safe biological biomass as estimated by ICES (dashed curve) below which reproduction is likely to be impaired.

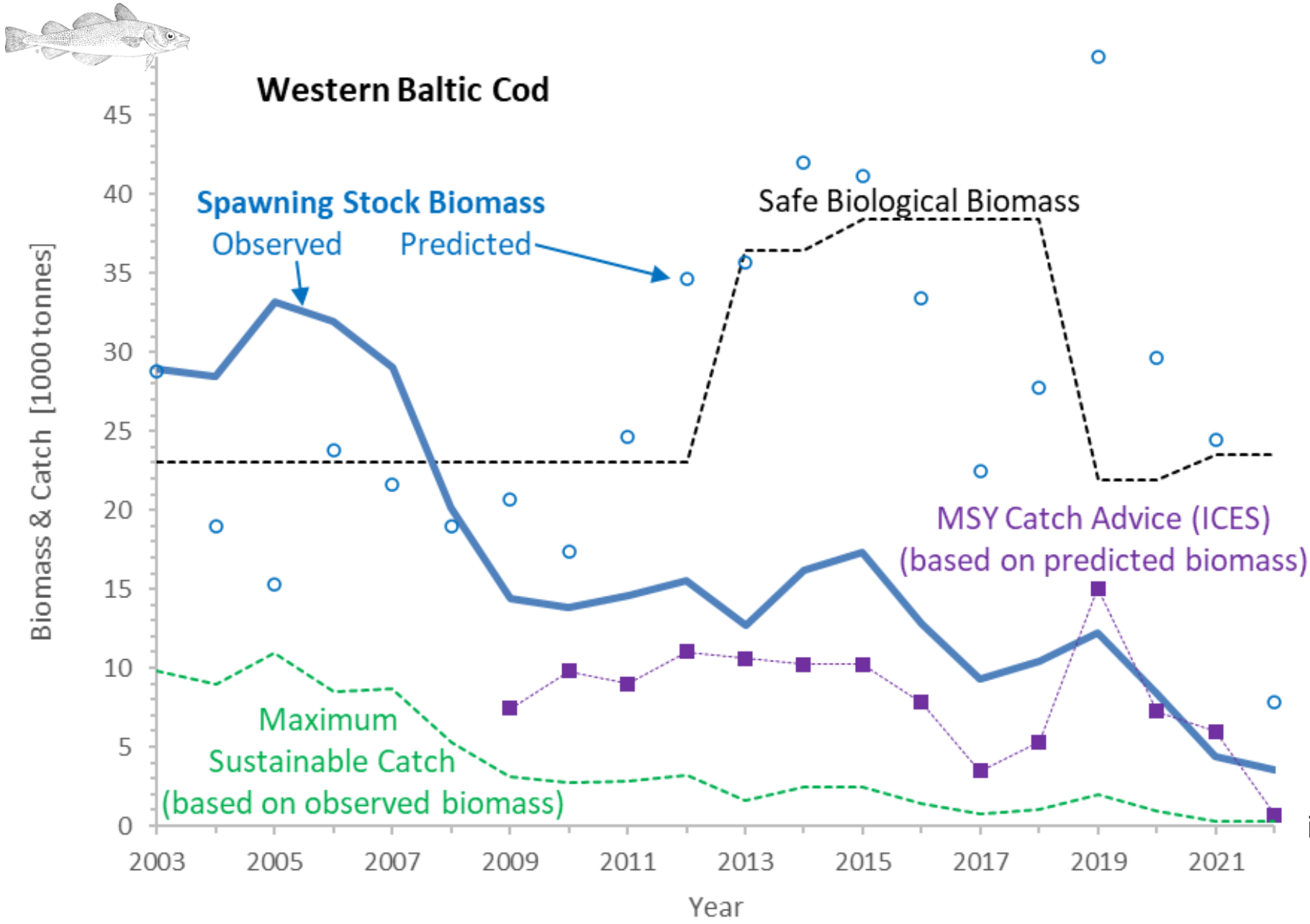
Note that spawning stock biomass is called ‘observed’ to indicate that it is based on all currently available data and thus represents the ‘best’ estimate which may differ from previous ‘historic’ estimates or predictions.

There were numerous warning signs and opportunities to rebuild the stock and keep it within safe biological limits with a one-year reduction in catch. Due to the wrong biomass predictions, that was never done.

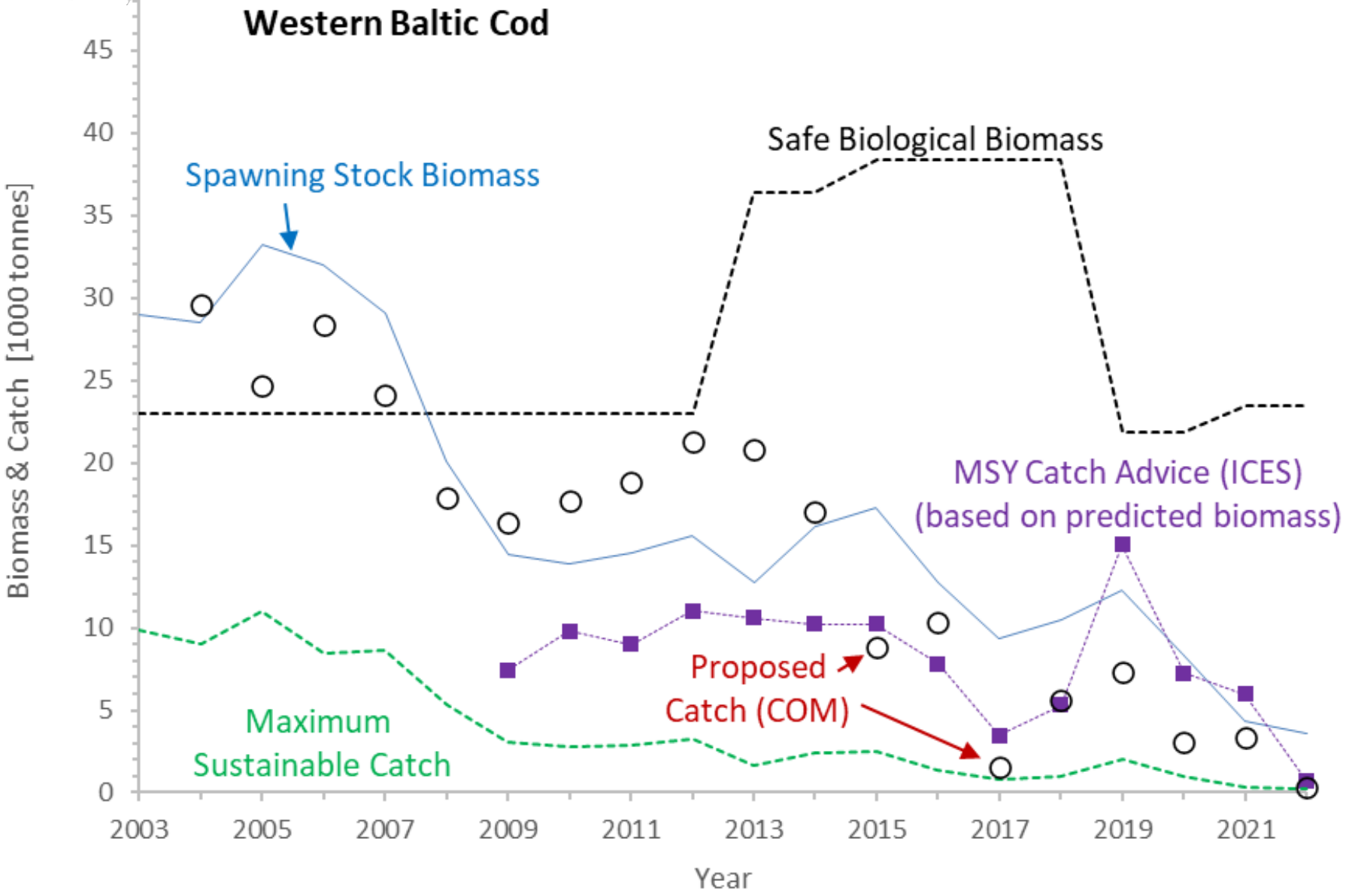


According to the ICES *Fmsy* estimate, a maximum of 21–24% of the fish in the water could be **sustainably fished** per year if spawning stock biomass was above safe biological limits.

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

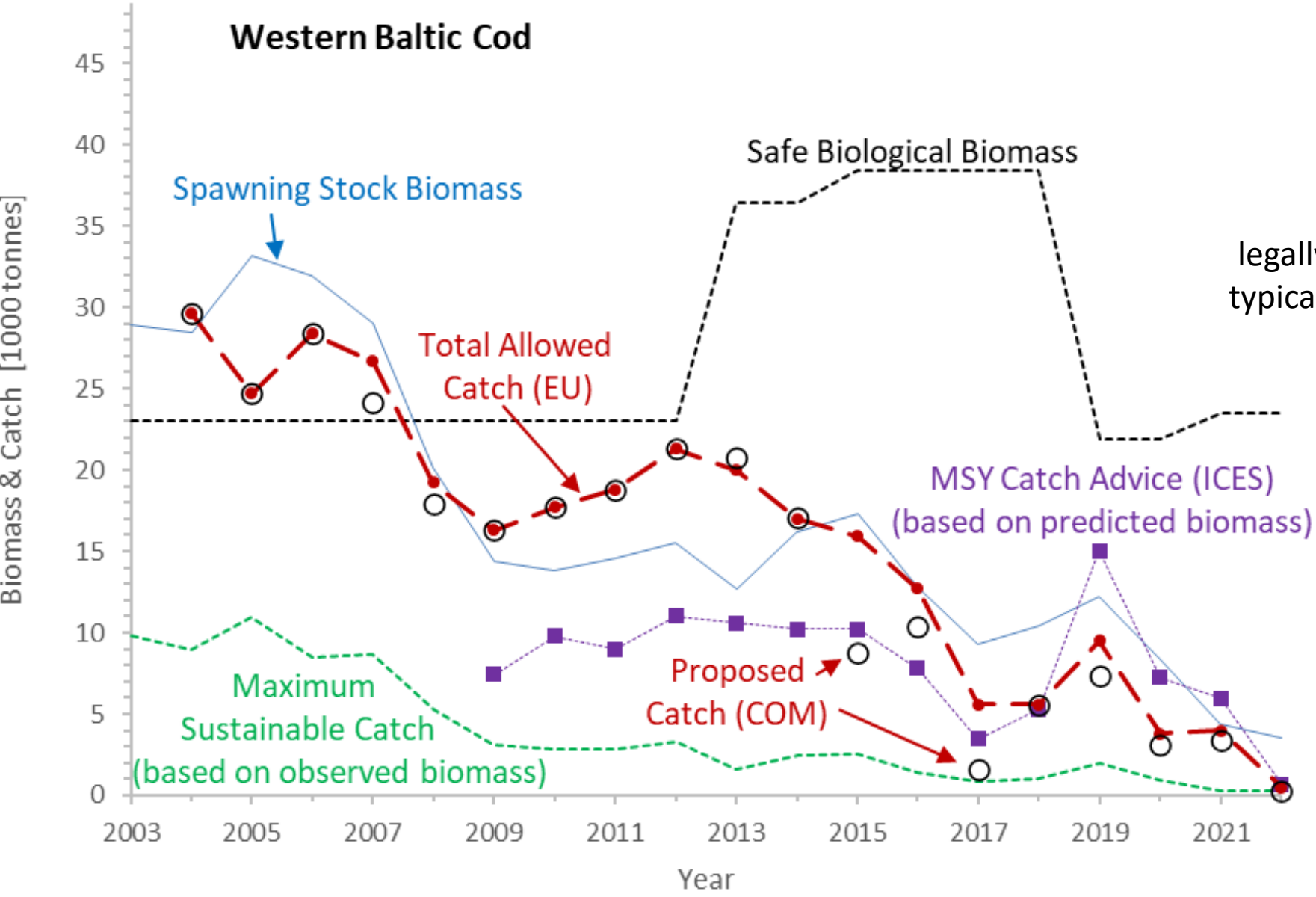


However, ICES regularly gave **much too high catch advice**, about 50-200% above correct values in hindsight, because it vastly overestimated the biomass that would be present in the advice year (light blue circles)

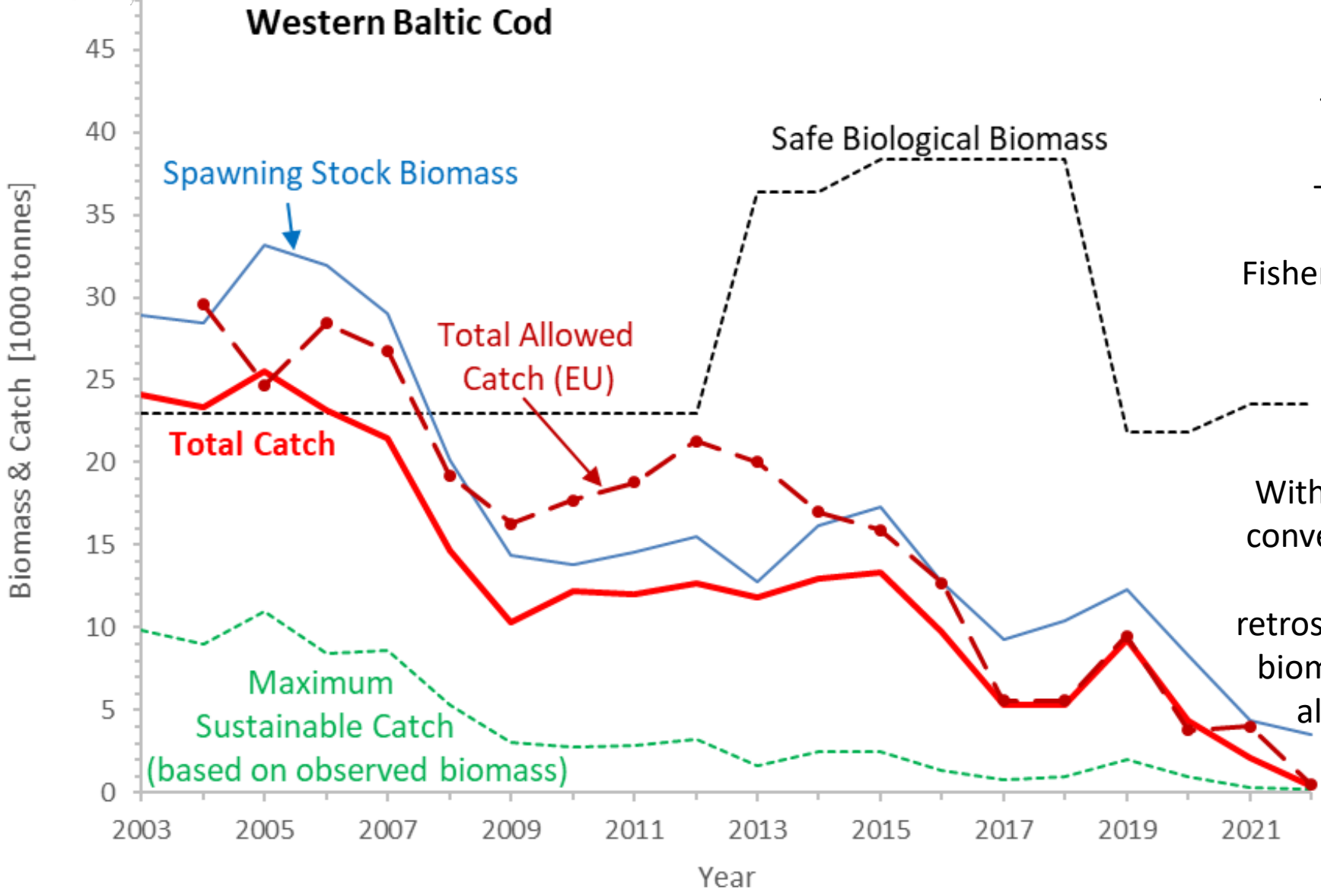


Based on input from ICES and stakeholders, the European Commission **proposed TACs** (o), until 2014 about twice as high as the ICES advice, thereafter mostly below ICES advice, presumably because of the absurd ICES advice on the declining stock.

In all cases ICES advice and EU proposal were far above the maximum catch that the declining stock could support.



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),
typically slightly exceeding the COM proposal.



The fishers were mostly 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.

What Can Be Done?

- Due to massive overfishing, Baltic cod and western & central herring stocks are in the so-called ‘Predator Pit’, where natural predators eat up most of the surplus production that allows stocks to grow
- The little surplus production that remains is taken by fishers and anglers, basically putting the lid on the predator pit
- Therefore, the first needed action is to stop all remaining fishing of cod and western & central herring; the fishers are victims of mismanagement and need to be paid to NOT fish the few remaining cod and herring
- If, by chance, one or more reasonable recruitments occur, current ICES & EU rules for immediately fishing out these recruits need to be **suspended** to allow them to grow and reproduce and rebuild the stocks
- Afterwards, truly sustainable ecosystem-based fishing has to be implemented
- Under ‘Business as usual’, no recovery is likely to happen or can be sustained

EU Fisheries Management Needs Change

- In a recent *Science* paper we analyzed the systemic failure of EU fisheries management and found ignorant political influence at all levels as the main culprit
- We therefore proposed the creation of a new, politically independent institution to propose scientifically sound sustainable ecosystem-based TACs
- In order to stay within current EU-laws, we suggested that the Commission would formally restrain itself to not propose TACs above the new independent advice and that the Council would similarly formally restrain itself to never legally fix TACs above the new scientific advice

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Thank You

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