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Safer and more fuel-efficient fishing vessels, emancipated from dimensional constraints

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As requested by Mr. Michel Barnier, the French minister for agriculture and fisheries, we gathered a working group, acting respectively as its leader and its reporter, in order to elaborate recommendations aimed at sustainably reducing sea fishermen's professional risks. This document sums up the diagnosis we put forward and the courses of action we suggest. The same are further developed in the report we presented to the Minister.

Fleet ageing and consequences

The average age of the fishing fleet steadily increased in France, from 15.4 years in 1991 to 24 years in 2008, which is an ageing rate of more than 6 months each year. The same trend can be observed in all Europe, sometimes at a slightly lesser degree, but this is everywhere a matte rof concern. The incidence of such ageing on safety and working conditions, as well as on operating costs, including primarily the energy consumption, is straightforward and proved.

Failing new vessels to be built, existing ones are transformed, without taking benefit from the improvements in occupational safety and working conditions that should result from the technological evolution achieved since the time of their construction. The vessels thus kept in operation are subject to repeated transformations, changes in their operating modes, installation of more voluminous fishing gear, with the effect that the working spaces are more and more restricted. Ships get heavier (usually at a rate of a 10 to 15% increase in displacement for a ship of a 15 years age), even in the absence of any significant transformation. This increased heaviness modifies the initial stability and load lines data, and results in a proportional increase in fuel consumption when the ship is *en route*.

The important observation that has to be noted is that, despite the reduced number of ships, the related decrease in the number of fishermen, and their reduced overall time at risk, the occupational accident rates remain excessively high, and there is no hope for a change if the working tool remains globally obsolete.

The uncertainty as to the future evolution of marine resources, which prompted the European Union and its member States in their active policy of fleet capacity reduction, explains to a large extent that investing in a new fishing vessel is not so attractive as it used to be. As a result, the necessary fleet renewal did not occur, despite the repeated ship withdrawal campaigns and the few new constructions.

However, the view is widely supported that sea fishing should be continued in Europe, with a fishing capacity in accordance with the future marine resources, and should carry on offering sea products to a demand that is ready to pay the price for them. There is as well an important potential for improving fishermen's working conditions and reduce energy related costs, provided that the vessels to be built are not constrained and hampered in their

characteristics and performance, due to regulatory provisions the effectiveness of which is far from being proved.

New built ships are subject to too much constraints

New vessels are scarce. Due to the numerous and complex constraints they are subject to, they cannot take full advantage from the potential improvements that could be expected with recent and modern constructions. According to all statements from fishing vessel designers or builders, and from their customers ship owners and fishermen, it has become extremely difficult to build a ship in accordance with all ship safety and occupational safety & health requirements, because the design and construction of adequate vessels are burdened with quite a set of constraints, and particularly with the gross tonnage limitation.

The gross tonnage is a parameter that reflects the total volume of enclosed spaces on board the vessel. Its limitation strongly incites to indistinctively restrict the volumes of all spaces: those having some connection with the potential amount of catches, such as the volume of fish holds; but also those that have no such connection, including spaces for handling the fishing gear or to process the catches, engine rooms, accommodation spaces, bunker tanks, buoyancy volumes, steering bridge, ballasts, bow bulbs, which all contribute in nautical performance, safety or comfort, without having an obvious incidence on the fishing capacity.

Further to gross tonnage limitations, length limitations are superimposed : the tonnage calculation mode generates a major threshold effect at the value of 15 m, and in France national provisions generate another threshold effect at a 12 m overall length. The combined effects of both these limitation factors result in the fact that the fishing vessels built during the past few years generally display major design defects and inadequate characteristics.

During the design process of a new vessel, its promoter, as well as the shipyard that receives the order, are obsessively concerned for containing their project within the tonnage limit, and in many instances the length limit, they have to comply with. As they are obliged to constrain any non directly productive space, they design a ship with too compact and too short shapes, with the following serious detrimental effects:

- strictly minimal freeboard and stability characteristics of the newly built ship, with a strong likelihood that they will drop below the minimal values after a few years life;
- poor hydrodynamic characteristics, resulting in excessive fuel consumption when processing *en route*;
- damaged working and living conditions on board, due to the lack of space, and to the fact that many working spaces are left open in order not to be taken in account in the tonnage calculation;
- limited potential for future adaptation to future changes in resource situation, economical conditions or regulatory requirements.

Is tonnage limitation an effective way for controlling the fishing effort ?

Inevitably, for a given tonnage value, the fishing capacity of a new ship is much higher than for an older one. The progress areas are diverse, including improvement of fish detection and location capacity, increased autonomy, better preservation ability, quicker fishing gear deployment and operation. As a result, despite a dramatic decrease in the nominal fishing

capacity of the fleet, its actual capacity did not decrease at all since the different control plans were implemented.

We are therefore obliged to conclude that the tonnage is unfit to reflect the fishing capacity of the present ships. The fishing effort control that the confinement of national fishing fleets within a limited overall envelope is supposed to achieve is illusive, and purely formalistic. This tonnage limitation, together with the hardly controllable engine power limitations that supplement it in the European policies, does not prevent the fleet fishing capacities from remaining by far higher than the fishing possibilities as determined within the framework of the CFP. The gross tonnage constraints that hamper the quality and safety of the new ships appear to have no relevance with regard to their object.

Would building better fishing vessels be feasible?

Professional ship designers and ship builders we consulted during our mission are convinced that it is quite feasible to design and build fishing vessels with equivalent fishing capacities, in comparison with recently built reference ships, but safer and more effective in terms of ship safety, ergonomics and occupational safety, living conditions on board, costs (particularly energy costs), versatility and potential adaptation to changes, provided they are emancipated from the dimensional constraints that are imposed through the different regulations and policies. Such feasibility was verified in a simulation exercise, which consisted in designing "emancipated" ships with fishing capacities equivalent to several recent constructions; the examples were selected as representative of significant segments of the French fishing fleet.

	1. Trawler-dredger 12m		**2. Trawler 15m**		**3. Trawler 100 GT**		**4. Trawler 24m**	
	A	**B**	A	**B**	A	**B**	A	**B**
Length L ht (m)	11,3	**14,0**	14,9	**17,0**	17,5	**21,5**	24,9	**30,0**
Breadth B (m)	5,25	**5,25**	5,65	**6,20**	6,60	**6,76**	7,80	**8,50**
Ratio L/B	2,17	**2,69**	2,66	**2,74**	2,65	**3,15**	3,19	**3,53**
Gross tonnage T	23	**31**	40	**80**	100	**139**	190	**280**
Power (kW)	260	**205**	330	**250**	440	**320**	660	**660**
Speed (kn)	8	**8**	10	**10**	10	**10**	10,5	**10,5**
Drag (kN)	31	**24**	39,2	**29,2**	30,2	**20,5**	36,1	**32,4**

In this table, the columns identified A describe recently built reference ships, while columns B describe ships with equivalent fishing capacities, designed and calculated free

from tonnage and length constraints ; they have therefore tonnage and length values that are much higher than for A ships, but they do not benefit from specific technological innovation, other than a reasonably optimized hull design. Ships B are by far more effective :

- drag at nominal speed is reduced, between A and B ships, by 30 to 50% for ships 1 to 3, and by 11% for the 24 m ship, with proportional reductions in fuel consumption;
- engine power is significantly reduced for ships 1B, 2B and 3B ; in these three examples, the determining factor for the engine power was the power need *en route* for ships A, while for ships B the power need in fishing action becomes the determining factor;
- more space available makes it possible to improve ship safety in terms of stability, freeboard and floatability, to design ergonomically sound working positions for fish catching, handling and processing, to have living spaces less restricted, better located, less noisy;
- enclosed working spaces provide better safety and comfort conditions;
- versatility and adaptability to future changes that will certainly occur is made possible through sufficient space reserves; the most likely future changes are the switch from trawling to alternative fishing techniques, the capacity to land the totality of catches, and even more important the possibility to use different fuels as alternatives to diesel oil.

A few recommendations

The ageing of fishing fleets generates very serious and hardly surmountable problems in the fields of occupational health & safety, ship stability, maintenance, fuel consumption, and versatility. A structural evolution is needed, which would enable the sector to undertake a real energetic redeployment towards improved operational effectiveness and to reach the safety, comfort and ergonomic state-of-the-art standards, so as to be attractive enough. The "occupational health and safety" and "energetic consumption" aspects are closely linked to each other, inasmuch both depend on the ship design and shape, its length, its inner volumes.

The progressive replacement of a major share of older ships, substituted with new ones offering altogether better working conditions, improved intrinsic safety and reduced fuel consumption, is inescapable. However, the return of a strong move towards new constructions, in a context of chronic overcapacity, is delicate to arouse. The conditions for this renewal will have to be created first, and then the constraints that presently overload the new constructions will have to be modified in depth.

The proposal that could be expressed concerning the gross tonnage would consist in a progressive withdrawal of any reference to it in professional fishing regulations, having regard both to the inconsistencies noted in its calculation and to its lack of actual correlation with the fishing effort. Such a withdrawal could be, as a first step, started with the important and symbolic decision to extend the European present mode for tonnage calculation of ships less than 15 m long up to the ships with lengths between 15 m (overall length) and 24 m (LL66 length).

Following a similar approach, with the aim to eliminate any incentive to build too short ships, it would be appropriate to review and reconsider all national regulations or standards that make reference to the ship's length and that introduce any kind of advantage to the

shorter ships, for instance in terms of stability criteria, tonnage measurement, social contributions, fishing rights.

These proposals do not solve the central issue of how to assess, in the medium and longer terms, the real fishing capacity. It is clear that the ship's dimensions are of little help to that respect. Rigorously speaking, the marine resource protection should be ensured through the control of caught, unloaded and marketed fish only.