9.3.2.3 **Special request, Advice April 2012**

ECOREGION **Widely distributed and migratory stocks**
SUBJECT **EC request on update of 2012 forecast of hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d (Northern hake stock)**

Advice summary

ICES reviewed the paper identified in the request which suggests a new proxy for F_{MSY} for Northern hake. The paper does not provide a careful consideration of the suitability of the stock and recruitment model estimates as a basis for setting reference points, and the analysis does not follow the ICES guidelines as specified in the "General context of ICES advice" (Section 1.2).

The F_{MSY} target fishing mortality for Northern hake was set in 2010 ($F_{MSY} = F_{30\%SPR} = 0.24$; ICES, 2010) using a new assessment methodology and a higher estimate of natural mortality. In 2010, the trends from the assessment were used to formulate advice, but in 2011 the new time-series of F, recruitment, and SSB were accepted. ICES will review the reference points for Northern hake, trying to take into account multispecies interactions and mixed fisheries effects.

Regarding the results of the survey conducted in the 4th quarter of 2011, ICES considers that updating the forecast for 2012 should include both the survey information and the catch information for 2011. ICES advises that this could be completed by the second half of May.

Request

ICES is requested to review

a) *the document "Fisheries Regulation at F_{msy} level: an example on the Northern hake stock for the adoption of an alternative adaptive approach" by E. de Cárdenas and E.C. Lopez-Veiga.*

b) *any new information from surveys concerning the abundance of the stock of Northern hake, in particular surveys effected in autumn 2011.*

On the basis of the conclusions of these reviews, ICES is requested to update its advice for fishing opportunities in 2012 if it considers it appropriate to do so.

Elaboration on the advice

ICES response to item a)

No elaboration on the summary above.

ICES response to item b)

ICES has reviewed the information available at this point in time and considers that updating the forecast for 2012 on the basis of the survey conducted in the 4th quarter of 2011 should include both the survey information and the catch information for 2011. The complete set of data will only be available prior to the meeting of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), which will take place 10–16 May, and the full review will be conducted at that time. ICES will therefore provide a review of ICES advice for 2012, based on a forecast update incorporating both the surveys and catch information, by the second half of May.

Basis of advice

Background

The request text states: "*The TAC 2012 for the stock of Northern hake was adopted with the proviso that the Commission would ensure the evaluation of additional information concerning the latest autumn surveys and concerning methodological issues raised by Spain.*"

Methods

ICES advice on the revision of the document "Fisheries Regulation at F_{msy} Level: an example on the Northern Hake Stock for the adoption of an alternative Adaptive Approach", by E. de Cárdenas and E. C. Lopez-Veiga, was elaborated by the ICES Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), where the Northern stock of hake is assessed.

Sources

ICES. 2010. Report of the ICES Advisory Committee, 2010. ICES Advice 2010, Book 9. 299 pp.
ICES. 2011. Report of the ICES Advisory Committee, 2011. ICES Advice 2011, Book 9. 148 pp.

Annex 1 – Review by the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM) of E. de Cárdenas and E. C. Lopez-Veiga (2011)

The paper includes both biological and socio-economic considerations. WGHMM has no expertise in socio-economic aspects and can only comment on the biological aspects of the paper.

The paper proposes, based on the latest assessment of the stock (ICES, 2011), an alternative value to the one advised by ICES in 2010 (ICES Advice 2010, book 9) for the target fishing mortality rate consistent with the ICES MSY framework. In 2010, considering that the time-series of spawning biomass and recruitment estimated in the stock assessment did not have sufficient contrast to allow direct estimation of F_{MSY}, ICES advised a fishing mortality rate of 0.24 corresponding to $F_{30\%SPR}$ as a proxy for F_{MSY}.

In the present paper, the authors consider that there is enough contrast in the time-series of spawning biomass and recruitment estimated by the assessment model to fit a stock recruitment relationship. They first estimate visually the level of SSB susceptible to produce a maximum recruitment (43,000 t). Then, they fit a Ricker stock-recruitment model to the spawning stock biomass and recruitment data in which the maximum recruitment level is produced at spawning biomass levels between 40,000 t and 80,000 t. From that, they conclude that maintaining the fishing mortality rate at its current level would keep the spawning biomass well above the levels necessary to produce high recruitment and therefore suggest to use F_{sq}=0.42 as a proxy for MSY.

WGHMM notes that, since its 2010 advice, the assessment has been updated with a longer data series starting in 1978 instead of 1990. As a consequence, the time series of spawning biomass and recruitment is different from the one used for the 2010 advice. However, WGHMM still considers that there is not enough contrast in the data to fit a stock recruitment relationship to allow direct estimation of F_{MSY} and that $F_{30\%SPR}$ can still be considered as a proxy for $F_{MSY,}$ as recommended by WKFRAME.

WGHMM notes that the paper underlines the importance of accounting for the multispecies nature of the hake fishery for the development of management objectives. WGHMM agrees with these considerations however, ICES is currently requested to provide catch advice on a stock-by-stock basis. Thus, the ICES framework for fisheries advice needs to be applicable to individual stocks.

WGHMM does not consider a revision of the reference points to be appropriate in this instance. Any future revision of the reference points should be based on careful consideration of the suitability of the model estimates for such an analysis and should be in accordance with ICES guidelines as specified in the “General context of ICES advice” (Section 1.2).

Finally, WGHMM notes that the paper stresses the need to move towards the development of a long term management plan. WGHMM encourages this approach and notes the importance of including both the wider fisheries and, where possible and appropriate, multispecies considerations into such an evaluation.

Annex 2 - Fisheries Regulation at F_{MSY} Level: an example on the Northern Hake Stock for the adoption of an alternative Adaptive Approach

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Abstract

In the present paper an analysis is carried out that leads to the conclusion that adopting a long term management approach based on F_{sq} as a departing point, is as good a F_{MSY} proxy as any other. Fishing that stock at F_{sq} is both sustainable, as allows to reach a SSB level enought, to ensure that recruitment is not harmed, and ensures high long-term yields (proxi to MSY). This is sustained on the fact that the stock reach full reproductive capacity around 43.000 t. and taking into account that average recruitment produced (geometric mean) by SSB > 43.000 t. is around 300 million individuals and fishing the stock at Fsq, each new recruit produces on average 270 g of capture and adds 480 g to SSB, wich multiplied by the 300 millions, produce a longterm average SSB of around 144.000 t.

Moreover, if stock /recruitment relationship for this stock is of the Ricker type (at it seems) the maximum recruitment values could be obtained with SSB levels between 40.000 and 80.000 t. The present level for this stock being around 154.000 t.

Based on this example an ***alternative Adaptive Approach*** *to the ones used at present is proposed which would consist in several steps. The first and most important step would be to lead individual stocks to "Safe Biological Limits" using reasonable and acceptable yearly reductions of fishing effort.*

Once that objective has been reached, there is no more rush: being at safe biological levels means that the stocks are out of risk and the recruitment is not jeopardized due to low spawning stock biomass levels.

From that point the question of reaching an overall MSY level for the fisheries is ***more of an economic nature choice than one of conservation****. It's reasonable to try to reach MSY for many reasons, but that point should be reached by* ***trial and result*** *analysis. Once a restrictive approach has been adopted in that direction it is wise and safe to give time for the stocks to react, the study such reaction and proceed then to the next measure if necessary.*

Introduction

At the ***World Summit on Sustainable Development*** **(*2002*)** a declaration was adopted: the ***Johannesburg Declaration on Sustainable Development*** of which we reproduce here two relevant paragraphs:

> *13. The global environment continues to suffer. Loss of biodiversity continues,* ***fish stocks continue to be depleted****, desertification claims more and more fertile land, the adverse effects of climate change are already evident, natural disasters are more frequent and more devastating, and developing countries more vulnerable, and air, water and marine pollution continue to rob millions of a decent life.*

And

> *36. We* ***commit ourselves to the Plan of Implementation of the World Summit on Sustainable Development*** *and to expediting the achievement of the time-bound, socio-economic and environmental targets contained therein.*

The Implementation Plan is the one which specifically refers to managing at MSY level and the date of 2015; it says in paragraph 31:

> *31. To achieve sustainable fisheries, the following actions are required at all levels:*
>
> *(a) Maintain or restore stocks to levels that can produce the maximum sustainable yield with the aim of achieving these goals for depleted stocks on an urgent basis and* ***where possible not later than 2015****;*

Since then managers have considered that such an approach should be adopted as a general rule for any fisheries management. The question is that the MSY concept derives form a specific type of models -the general production models- which are based on the logistic curve philosophy, that is to say on the concept that there is a limit to the natural growth of populations determined by the environment carrying capacity. These models assume that the maximum population growth rate in a steady state fishery is attained when the biomass is reduced to a half, in the case of the logistic or even less if for example a Gompertz type curve is used, so If we remove all of that increase, the population will remain stable at that level producing the maximum yield.

Typically, *ICES* uses Analytical Models to evaluate stocks. These models do not provide a direct estimate of *MSY* and therefore it must resort to proxy for this value

Another problem when trying to apply this Johannesburg approach is that fisheries are mostly multi-specific and the question is what *MSY* to select. Logic would dictate that this management approach should be applied to all species combined, present in the fishery.

In 2010 the European Commission requested *ICES* to provide with *MSY* reference levels for each one of the stocks in order to adopt a management approach in line with the Implementation Plan.

In the case of the Northern Hake stock those reference points were derived from the 2010 assessment carried out with *SS3*. Since this model does not provide a direct F_{MSY} estimate several proxies of this value were considered, from values provided by the yield per recruit curve and finally 0.24 value was selected as a proxy for F_{MSY} (*ICES Advice 2010, book 9*).

During this process, *ICES* considered that F_{MSY} could be located between values ranging from $F_{0.1}= 0.24$ to $F_{MAX}= 0.29$. Finally $F_{30\%} = 0.24$ was selected (The fishing rate that would reduce the spawning biomass per recruit to 30% of its un-fished level): values exceeding 0.24 were not considered a prudent approach since they could reduce too much the *SSB* and could therefore affect future recruitments.

In 2011 *ICES* estimated that *SSB* level was at its historical maximum since 1978 (*154,000 MT*) and that F was very close to the *M* value ($F_{sq} = 0.42$). Despite of this fact a TAC reduction of 6% was recommended. This reduction corresponds to a catch projection as a result of the application of a $F = (0.78)F_{sq}$, which is considered to be a transitory measure in order to be able to gradually attain the recommended F value of 0.24, before 2015 as contemplated in the implementation plan (*ICES Advice 2011, Book 9*).

Purpose of this work

The purpose of this paper is to compare, using *ICES* published data, the results of different management approaches on sustainability and mean yield of the Northern Hake stock in order to ascertain if by adopting a different approach to the current one, sustainability on the exploitation of this stock is put at risk.

One of the approaches is the one currently adopted by *ICES* and the alternative one would be to keep the present rate of exploitation in order to propose a different way of approaching on a more realistic and economically safe the general objective. Also it will allow to discus whether the recommended approach constitutes a better proxy for *MSY* level than the status quo one.

Stock/recruitment relationships in the Northern Hake stock

In this first step we try to identify what level of *SSB* is necessary for the stock to reach full reproductive capacity. In order to do that, we will analyze the figure which relates recruitments (R), with the Spawning Biomass (*SSB*) which generated them (*Fig. 1*).

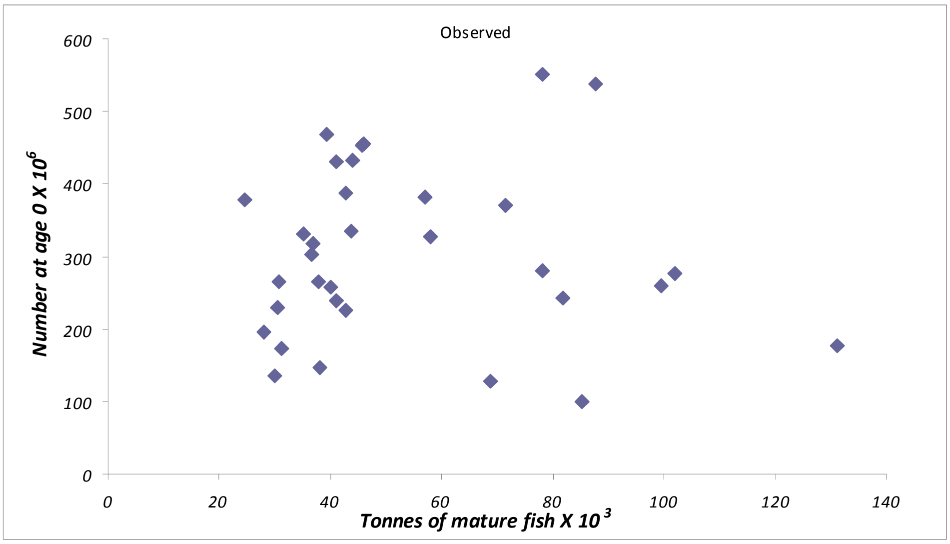

Fig. 1.- Relationship SSB-R for the Northern Hake Stock, since 1978 (Observations for SSB and R taken from WGHMM,ICES 2011).

As usual, the plot does not show any clear or evident relationship, but in order to carry out an orderly analysis we will procede to do it by taking several steps. If we decompose that plot in two sections, the first one containig *SSB* values less than *43.000 t*, and another one with all those above that level, two trends seem to show up. In the first section recruitment values would seem to increase as *SSB* increase, but in the second section the opposite seems to take place, that is to say recruitment would tend to decrease as *SSB* increases. Recruitments associated with the highest *SSB* values (> *100.000 t*) are all below average. (*Fig. 2*).

SSB < de 43.000 t ***SSB > de 43.000 t***

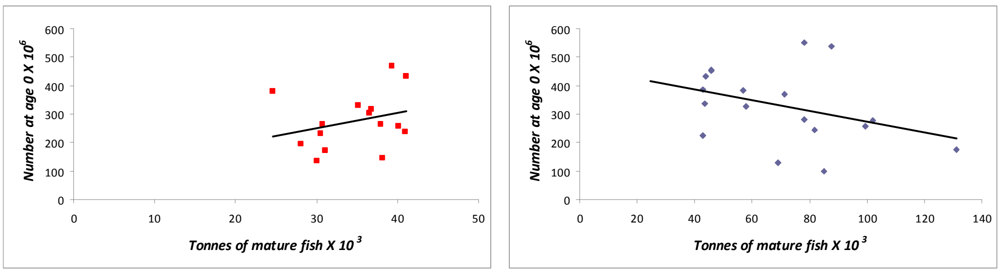

Fig. 2.- Trends of values in the SSB-R relationship, above and below 43.000 t SSB.

With those data we could reasonably conclude that a *SSB ≈ 43.000 t,* would be able to generate maximum recruitment values and, therefore, from that SSB level the stock would have reached **full reproductive capacity**. ICES estimates that the present SSB for this stock is around *150.000* t., and we may reasonably conclude that at present moment the Northern Hake stock has full reproduction capacity. The geometric mean of all recruitmentes produced by SSB levels of more than *43.000 t* is around *300* million individuals.

Let's go now one step further; we will fit directly three different models to all those data: Ricker, Beverton and Holt and, finally, to a segmented regression. As usual the results are that those statistical fits are not too good (*Fig. 3*) but the one giving the "best" adjustment (smallest *SS*) is the *Ricker* model (*Table 1*).

Table 1.- Summary of different regressions.

Parameters	*Ricker*	*B & H*	*Seg. Reg.*
a	*15,412*	*75,825*	*328,772*
b	*-0,017*	*0,227*	*7,882*
SS	*397775*	*440744*	*413721*

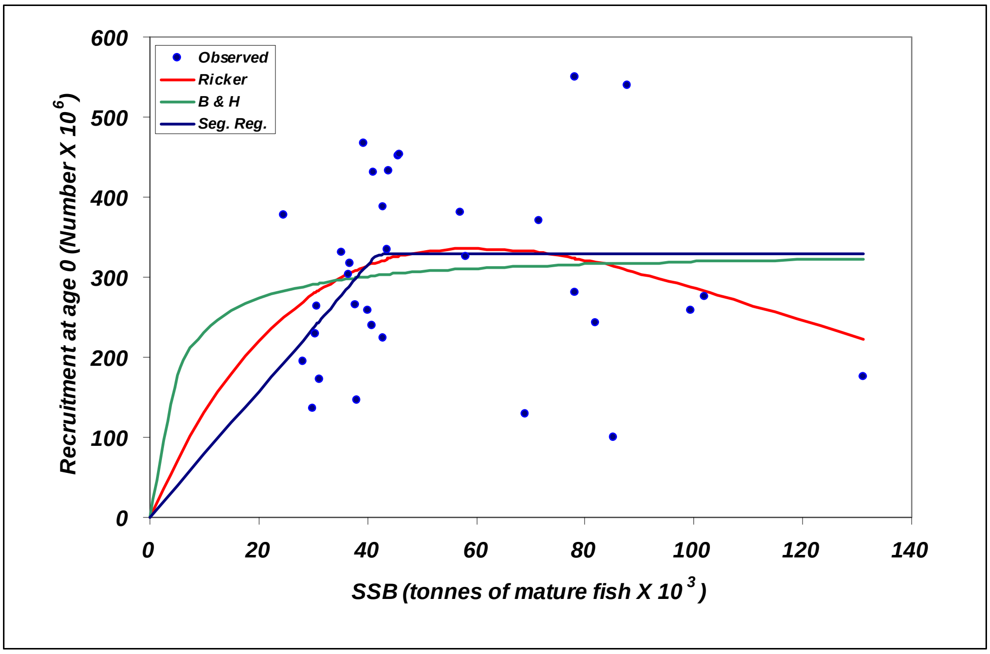

Fig. 3.- Adjustment results of fitting SSB-R pair values to the Segmented Regression, Ricker, and Beverton and Holt models.

Ricker's model is characterized by producing the maximum recruitment at intermediate levels of *SSB*. This is due to the fact that larval and pre-recruit mortality increases as *SSB* levels that originated them increases, mainly due to the fact that phenomena such as cannibalism intensify, and this has been specifically pointed out for this species, (see *Section A.3 of Annex C and Secction 7.5* of *WGHMM, ICES 2011*) but also due to competition with the stock biomass.

We may then reasonably conclude that the Northern Hake Stock has attained at present full reproduction capacity and most probably the *SSB/R* relationship is one of *Ricker's* type with a máximum located between *40.000 t* y *80.000 t SSB.*

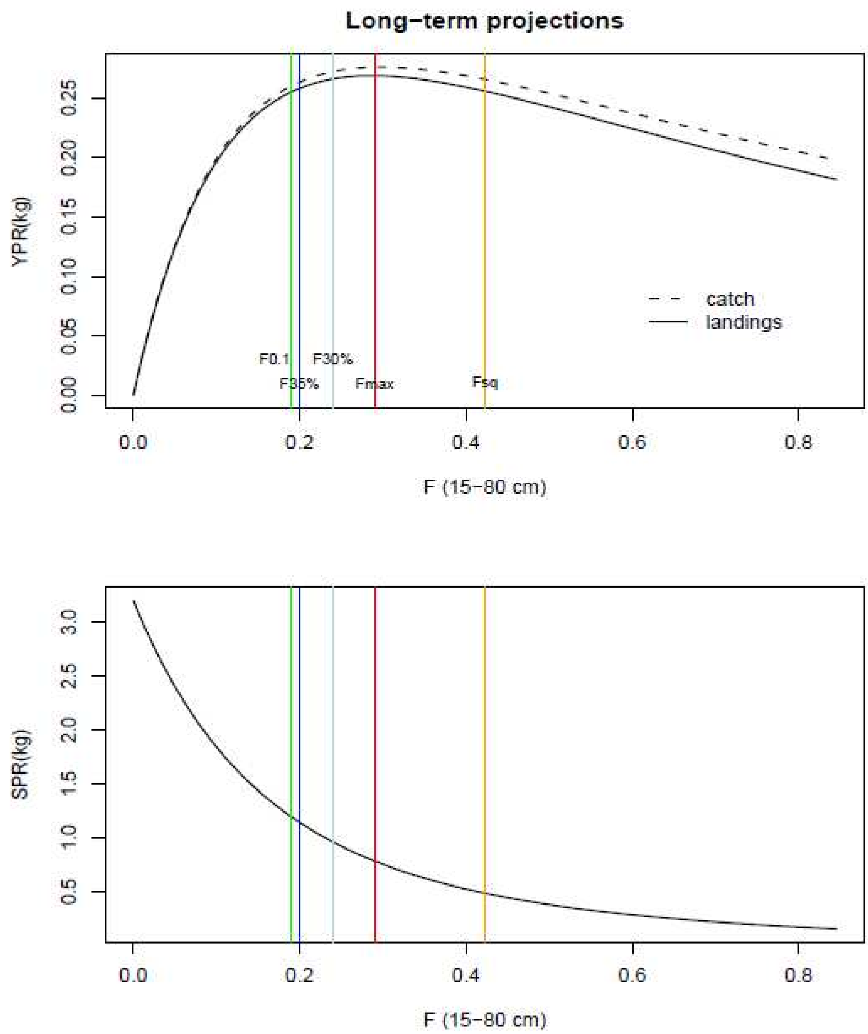

Fig. 4- Yield (above) and SSB (below) per recruit curves for the Northern Hake stock (WGHMM ICES, 2011).

A comparison between the results of keeping the present ICES' long term scenario and an alternative one of maintaining the *Status quo* scenario.

Should we select to maintain the status quo scenario ($F = 0{,}42 = F_{15\%}$), each new incorporated recruit to the fishery would yield an average catch of *270* g (of which *260* g would be landed) and would also add *480* g of spawning biomass to the stock.

On the other side the proxy *F* recommended by *ICES* is *0,24*. To adjust this value from F_{sq} would imply a *43*% from presents' *F* value, and most probably would have an analogous impact on current employment level. With this mortality level of 0.24 each new recruit would yield an average of *270* g. of catches, which would probably all be landed since the average size of individuals fished would probably be greater , and would add *960* g. per recruit to the *SSB*.

Table 2: Long term projections: Yield per recruit (landed Kg per recruit) and SSB per recruit (added SSB per recruit) (WGHMM ICES, 2011)

	SPR level	***Fmul***	***F(15-80 cm)***	***Y/R(catch)***	***Y/R(landings)***	***SSB/R***
	1,00	0,0	0,00	0,00	0,00	3,20
	0,78	0,1	0,04	0,11	0,11	2,51
	0,62	0,2	0,08	0,18	0,18	1,99
	0,50	0,3	0,13	0,23	0,22	1,61
	0,41	0,4	0,17	0,25	0,25	1,31
	0,34	0,5	0,21	0,27	0,26	1,08
	0,28	0,6	0,25	0,27	0,27	0,91
	0,24	0,7	0,30	0,28	0,27	0,76
	0,20	0,8	0,34	0,28	0,27	0,65
	0,17	0,9	0,38	0,27	0,26	0,56
F_{sq} →	**0,15**	**1,0**	**0,42**	**0,27**	**0,26**	**0,48**
	0,13	1,1	0,46	0,26	0,25	0,42
	0,12	1,2	0,51	0,25	0,24	0,37
	0,10	1,3	0,55	0,25	0,23	0,33
	0,09	1,4	0,59	0,24	0,23	0,29
	0,08	1,5	0,63	0,23	0,22	0,26
	0,07	1,6	0,68	0,20	0,21	0,23
	0,07	1,7	0,72	0,22	0,20	0,21
	0,06	1,8	0,76	0,21	0,20	0,19
	0,05	1,9	0,80	0,20	0,19	0,17
	0,05	2,0	0,85	0,20	0,18	0,15

		SPR level	***Fmul***	***F(15-80 cm)***	***Y/R(catch)***	***Y/R(landings)***	***SSB/R***
	F_{max}	0,25	0,68	0,29	0,28	0,27	0,79
	$F_{0.1}$	0,37	0,46	0,19	0,26	0,26	1,18
	$F_{35\%}$	0,35	0,48	0,20	0,26	0,26	1,12
F_{MSY} →	$\boldsymbol{F_{30\%}}$	**0,30**	**0,57**	**0,24**	**0,27**	**0,27**	**0,96**

As it can be seen, in terms of yield per recruit, both scenarios give a very similar results and in fact the ICES' Experts Group states in its report the following:

> "*Considering the yield and SSB per recruit curves, Fmax, F0.1, F35% and F30% are respectively estimated to be 68%, 46%, 48% and 57% of status quo F. The maximum equilibrium yield per recruit is less than 4% above the equilibrium yield at F_{sq}.*" (*Sección 3.4.2 del Report* del *WGHMM ICES, 2011)*.

For the above facts and taking into consideration that Fsq maintains the SSB of the Northern Stock at its full reproductive capacity it may, withouth any fear and in general terms, be stated that **fishing at Fsq level in the present conditions may be considered as a "*proxy*" of F_{MSY}.**

This should not be surprising since when *F = M,* as it happens with this stock (remember that *M = 0,4*), such F value could also considered as a Proxy for F_{MSY} (see for example: *Gulland, J.A. and L.K. Boerema* (*1973*). Scientific advice on catch levels. *Fish. Bull.* 71(2): 325-335*.)*.

The real difference between both scenarios resides in the SSB per recruit level, where ICES' recommended F level doubles the value obtained with Fsq. It may sound alarming the fact that *F* statu quo, corresponds with $F_{15\%}$. However it would be a mistake to contemplate that value in isolation. It can not be extrapolated that the SSB at that level would be reduced to 15% of the virgin *SSB* since $F_{15\%}$ is calculated from a *SSB PER RECRUIT* curve: if the stock/recruitment relationship is of a Ricker's type, the stock would never attain a maximum recruitment level with high *SSB* values, and the average *SSB* generated by the stock in the long run would result from the multiplication of *SSB* per recruit by the mean recruitment produced by that level of *SSB*.

If we want to test if this stock, when exploited at F_{sq} level, would be able to sustain its long term full reproductive capacity, we only have to multiply the corresponding SSB/recruit generated at that level (*480* g) by the average recruitment and we can see that it would be well above *43.000 t* which would in principle correspond to the full reproduction capacity of the stock.

If we would also consider that recruitments above *43.000 t SSB* may be of a random nature and that the stock at full reproductive capacity generates an average of *300 million* recruits, then we may see that the corrresponding *SSB* would be around *144.000 t*, more than three times the SSB level attained when the stock is at its full reproductive capacity.

Should the stock/recruitment relationship be a *Ricker*'s type one (as it seems to be the case) the situation would be even more favourable to keep the present situation, since the average recruitment would be very much affected by the stock's size , which would imply readjustments that would stabilize the population at lower SSB levels, and would imply the revision of F_{MSY} level to higher value.

Some multi-specific considerations on Hake populations

The Group of Experts says in point *A.3.* of *Annex C* of its report *(WGHMM ICES, 2011)* the following:

> *"Hake belongs to a very extended and diverse community of commercial species including megrim, anglerfish, Nephrops, sole, sea bass, ling, blue ling, greater forkbeard, tusk, whiting, blue whiting, Trachurus spp, conger, pout, cephalopods (octopus, Loligidae, Ommastrephidae and cuttlefish), and rays. The relative importance of these species in the hake fishery varies largely in relation to the different gears, sea areas, and countries involved.*
>
> *Hake is preyed upon by sharks and other fish. Cannibalism on juveniles by adults is also quoted. Adults feed on fish (mainly on blue whiting and other gadoids, sardine, anchovy, and other small pelagic fish); juvenile hake prey mainly upon planktonic crustaceans (above all euphausids, copepods, and amphipods).*
>
> *Ecological factors or environmental conditions impacting on hake population dynamics are not taken into account at present in the assessment or in the management."*

In view of this should the status quo exploitation level be able to ensure a *SSB* level enough to maintain its full reproductive capacity, then doubling the *SSB* as the *ICES* approach recommends, which implies more than doubling the total biomass of the stock, would produce a trophic impact in the described preys, including cannibalism.

Metiers directed to hake, catch simultaneusly other species as monks or megrims and that normally it is not possible to arrange the activity of these fleets in such a way that only hake be caught, while allowing the others to escape alive from fishing gears. Thus, actions taken on these gears, necessarily involve related species. In these cases it is impossible to achieve F_{MSY} simultaneously in all these species.

Conclusions: an "Adaptive Approach" to management as alternative for the Northern Hake stock and others.

Management is not an scientific exercise, although it needs a strong scientific advice, but not only biological but also needs an economic and sociological input, and based on all those inputs the administrator would have to make up his mind as to what approach is more acceptable. Real life is mostly economics although it is true that economic maximization cannot be made at the expense of the sustainability of natural resources, but in any case reasonable trade offs are always necessary.

Bodies such as *ICES* may, to some extent, disregard economic and sociological considerations but others like *STEFC* may not. The use of mega-models that would incorporate all economic and biological factors may not yield the best solution. From a pure economic point of view it may be advisable to separate those analysis and use for each of them the appropriate techniques: it does not have to be surprising since Physical Sciences use relativity and quantic theories separatedly and that has not impaired the progress of that Science.

Normally all such values as the ones proposed for F_{max} and F_{msy} are subject to a degree of uncertainty and because the choice of one or another value as regulation points may have important socioeconomic effects, one should exert a maximum of prudence avoiding dogmatic approaches as to the value to be selected: **an Adaptive Approach is recommended** and this certainly applies to any F_{msy} chosen as a management objective.

To the problems related to the lack of precision of the models and calculations, we want to add another consideration: that **most of the fisheries, with the exception of some pelagic ones, are composed of mixed species, fished by several metiers** and that normally it is not possible to arrange the activity of a particular fleet in such a way that only one species caught while allowing the others to escape alive from fishing gears. On the other hand, there are other legal aspects, as the relative stability between countries and metiers, that difficult even more to reach the objective. This is especially true in the traditional demersal fisheries.

Thus the only way of applying the article 31 of the Implementation Plan of Johannesburg on a pragmatic way would be to pool together all species and try to find a Maximum Sustainable Yield for the whole of the species in the fishery. This would imply in a two species example (let them be A and B) to choose a level of effort between f_{MSY-A} and f_{MSY-B}, in which none of the species would be exploited at MSY level: one would probably be slightly overfished and the other under fished. **The important and relevant thing for real conservation purposes, would be to ensure that both would be exploited WHITHIN SAFE BIOLOGICAL LIMITS.**

Therefore management at *MSY* level may be a reasonable option IF applied on a realistic way but:

- It has to be recognized that the estimated reference points F_{MAX} , F_{MSY} or any other are subject to error and for that reason one cannot be dogmatic on the adoption of those levels and therefore

- It must also be recognized the need of applying any restrictive measure on a prudent way in such a manner that they do not cause unnecessary socioeconomic distortions to the fishing communities

- It must be avoided the formulation of measures in fisheries regulation that lead to excessive revenue falls for the stakeholders.

- Measures should be proportionate to the expected results: in other words if there is a possibility of reaching the objectives on a short or a long deadline, choose always the one more socially acceptable.

In the case of the Northern Stock of Hake we have seen that the Status quo approach is capable of producing a sufficient *SSB* level that may keep the stock at full reproductive level: on the other side doubling the *SSB* size (which implies more than doubling the total stock biomass) may produce a trophic impact on the described preys, including cannibalism.

As we have seen F_{MSY} in the Northern Stock could be located inside of a wide range of values for the fishing mortality (and among them F_{sq} would be included) all of them sustainable. The fact that hake is fished in a mixed fishery should be taken into account when choosing the F_{MSY} target for hake, since the effects of a reduction of the effort targeted to hake would reflect on all other stocks associated to this species moreover taking into account that each one has its own F_{MSY} value. As we have said before it would be impossible to attain F_{MSY} simultaneously for all species involved.

In our opinion management of this type of fisheries should start by assuring the full reproductive capacity for each one of the associated stocks, that would guarantee the sustainability in time for that fishery. Once the “biological” target for the group of species assured, the socioeconomic target (F_{MSY}) could be sought. This objective does not have to be a maximization of the whole biomass for the species fished; for example a maximization of revenue may be preferable. It could even be possible to seek maximization of employment, whithin sustainable limits, specially in economically depressed areas or any other objective that may be defined by the Public Administration and stakeholders.

However this objective may be elusive, since a lot of different factors enter into play, such as different gears, different species and in the case of the EU the relative stability would also interfere.

For all those reasons and once attained the biological objectives we propose to adopt an “***Adaptative Approach***” which would consist in proposing and adopting small and gradual changes of effort in specific fleets and assess in subsequent years the reaction of the stocks involved in that fishery, approaching in such a way the “socioeconomic” selected target.

The first and most important step would be to lead individual stocks to “Safe Biological Limits” using reasonable and acceptable yearly reductions of fishing effort. Once that objective has been reached, there is no more rush: being at safe biological levels means that the stocks are out of risk and the recruitment is not jeopardized due to low spawning stock biomass levels.

From that point the choice of reaching an overall *MSY* level for the fisheries has **more of an economic nature than one of conservation**. It’s reasonable to try to reach *MSY* for many reasons, but that target should be reached by **trial and result** analysis. Once a restrictive approach has been adopted in that direction it is wise and safe to give time for the stocks to react, the study such reaction and proceed then to the next measure if necessary.

Although such process may be slow there would not exist any urgency in attaining in a short period of time the target, since in the second part of the process the fished species would remain whithin safe biological limits. In the case of the selected example, the Northern Hake stock it has been shown that F_{sq} is a very acceptable proxy for F_{MSY} which may be a departing point for the adaptative approach proposed.