

## SECONDARY EFFORT CONTROL: TRAWLERS

### PROPOSALS ON SECONDARY EFFORT CONTROL IN HAKE TRAWL FISHERIES

#### Motivation

The Director: Offshore & High Seas Fisheries Management recorded the Department's determination to introduce strong and effective effort constraints in the hake fishery at a meeting with industry in June 2006 and enlisted the South African Deep-Sea Trawling Industry Association to recommend a coherent system of effort control for immediate implementation.

The completion of the allocation of long term hake fishing rights creates an ideal opportunity to re-address the question of effort control. The fact that the fishery is presently undergoing a secular downtrend only reinforces the need for action.

#### Rationale

Fisheries managers generally acknowledge that ideally both input and output controls play a necessary role in regulation.<sup>[i]</sup> There is however some debate about the real effectiveness of pure output controls in bottom trawl fisheries but hardly any about the usefulness of input control as a supplementary measure. Input controls always come down to some form of fishing effort restraint which, if properly gauged, should prevent a wide range of undesirable fishing practices on the principle that "the devil is apt to find work for idle ships" especially when they are idle at sea.<sup>[iii]</sup>

The basic case for re-asserting effort control in the hake fishery arises from the conception that, while a constant effort policy implicitly underlay the hake TAC regulatory framework, the fishing power actually deployed has been allowed to grow by more than 28% over the last ten years. Adjusting this figure for the emergence of line fishing for hake takes the figure up to a startling 40%.<sup>[iii]</sup> There is no gainsaying that fishing capacity and the hake fishing rights of certain operators have become mismatched over the last ten years, due in some part to slackness in the licensing of additional hulls.

It is commonly held against conventional boat licensing that boats are infrangible and consequently licensing is a flawed management tool and too crude a medium for effective effort control. The difficulty is that it is not readily envisaged in most regulatory frameworks that vessels ought to fish for less than a whole season. Our proposed form of control would avert complaints by being based on seadays. The time allowed for vessels to deploy at sea would, for practical purposes, be highly flexible in that it could be broken down into portions as small as a day.

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#### [i] PURE EFFORT CONTROL

The idea that a well-tuned effort constraint is all that is needed to regulate less highly aggregative species such as hake is widely held amongst fisheries management theorists. Despite its theoretical attraction, various practical problems in the measurement of effort and the traditional ease with which such controls are usually avoided (effort creep) have meant that effort is largely seen to be an unsuitable primary measure for effecting comprehensive legal and economic control in modern commercial fisheries.

#### [ii] QUOTAS AND HIGH GRADING

Worldwide, the possibility of high grading raises the ire of pure environmental interests. The risk is perceived to be the most important shortcoming of pure fishing quotas unsupported by other measures. High grading is today widely recognized as the most likely cause for the disappointing revival of many stocks that have been depleted for overlong.

#### [iii] ADDITIONS TO HAKE EFFORT BY WAY OF LINING

The re-emergence of hake lining through the nineties created a large amount of new hake effort — possibly a great deal more than the 10% of trawling effort that it nominally displaced. The question of trawling effort was not addressed during the critical period, at least not in any cogent way.

#### [iv] ENTREPRENEURSHIP

An evident virtue of these proposals is that they would achieve the desired level of control while affording trawling operators the greatest amount of freedom to invest.

Another argument against boat licensing as a refined management instrument is that it distorts the business philosophy of investors by restricting their choice of scale — stringent trawler size restriction is said to stifle vessel entrepreneurship.<sup>[iv]</sup> Our proposals allow fishing operators to use any size of vessel they wish. They will just be prohibited from oversubscribing the time they take to catch their share of the hake TAC. It bears repeating that a coherent effort limitation scheme that makes provision for large quotas down to small fractions will be very practical for local hake fisheries as they are presently structured.

A great advantage of effort controls is that they have direct self-correcting properties. A fall in abundance should immediately be reflected in a proportional fall in CPUE and therefore a proportionate fall in the catch. The resource will stand to benefit directly and immediately if operators are unable to compensate by increasing their effort albeit that they already operate within bounds of the quota system.

## History

Notwithstanding the ascendancy of output control (quotas) since 1980, the South African hake trawl fishery has had a long history of effort controls of one kind or another. A statutory Boat Limitation Committee presided over effort control for over 20 years. It pre-dated, and later co-existed with hake quotas. Boat Limitation was finally abolished around 1984, largely to facilitate more long line entrants. Around 1990 the Department instituted a system that limited trawling participants to one horsepower per ton of hake quota. That system was rendered practically defunct by 1996 because of the uneven way in which it came to be administered. A Fishing Effort Advisory Committee was introduced around 2001. Inconsistent policy and the turbulence of fisheries reconstruction probably contributed to the Committee's effective demise by 2004.<sup>[v]</sup>

In the meanwhile the inshore trawl fishery had all along been subject to its own particular form of (constitutional) effort control — from the very inception of SECIFA in 1978. Although the initial hake long lining episode (1983-1989) was effort delimited no apparent attempt has ever been made to apply effort control in the present day long line fishery.<sup>[vi]</sup>

## Status of Rights

Participants in the longline, inshore trawl and deep-sea trawl sectors of the South African hake fishery are primarily regulated by output control in the form of rights to harvest a proportion of the TAC. These proportions converted to nominal mass are referred to as quotas. In a given year quotas designate the Access Right in terms of the Marine Living Resources Act in the sectors that operate under a TAC. They set the defining legal and economic measure for fishing rights in the period. As such they constitute the fulcrum of the regulatory system.

It needs to be stated at the outset that any regulatory proposals made in regard to effort controls would not be aimed at impacting the existing status of quotas. Additional effort controls would be complementary to the quota — not meant to prescribe the right in a way that raises operational costs significantly, only to militate against aberrations such as have occurred in the last ten years running up to the implementation of long term rights.

## Effort Measurement

It is universally acknowledged that the best measure of a bottom trawler's ability to perform work is its shaft horse power.<sup>[vii]</sup> On the face of it a straightforward power constraint matched to quota should provide the basis for the desired level of control. We propose that a single main engine power factor adjusted for the use of shaft alternators and propeller nozzles be used as the underpinning of a formal effort control system.<sup>[viii]</sup> The methodology for reckoning the **adjusted shaft horsepower** of a trawler was settled by consensus of experts who concurred that their assessment might well benefit from further refinement. SADSTIA will continue to research the question with a view to recommending revision, should it prove necessary, before the start of the 2008 season.

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[v] FEAC

The Effort Limitation Advisory Committee recommended the approval of many of the hake trawling applications that it reviewed notwithstanding that cumulative effort steadily got out of control. MCM's determination to use another method of regulation apparently stems from negative experiences with the FEAC. The main shortcoming was quite possibly that FEAC did not operate on published rules and criteria.

[vi] HANDLINING HAKE

The hake handline fishery is already effort delimited.

[vii] HORSEPOWER

The ability of a machine of any kind to do work is conventionally measured in kilowatts but the trawling tradition has been to use horsepower. (one horsepower = 0.746 kilowatts).

Statistical analysis of vessel catches for the period 1998 – 2002 reveals that on average freezer trawlers would require one horsepower for every **4.07 kg** of hake caught per seaday in 2006.<sup>[ix]</sup> Similarly freshers achieve **3.94 kg**. It being desirable to apply a unitary control factor for all vessels it is proposed that the value for freshers be used as the baseline factor for calculating the potential fishing power of deep-sea trawlers and their allotted fishing time.

This basic power unit needs to be modified by a formula that allows for loss of efficiency on the propeller and for power-take-off modes of trawler operation. Allowing for shaft efficiency factors yields engine to shaft power attrition of 18.2%. In other words **4.81 kg** hake/day/adjusted shaft horsepower should be seen as the 2006 power/quota exchange rate. Using such a “currency” it is then possible to generate a comprehensive control system by fairly straightforward calculation assuming a standard trawler utilization of 265 seadays per year.

It is reiterated that no fine-tuning for size or mode of operation be allowed. A unitary basic power unit would be applied to all ships engaged in the fishery. Fortunately the potential unsuitability of a “one size fits” all arrangement would be thrice ameliorated. Firstly, effort control will always play a secondary role in the hake trawl fishery, secondly the base factor is set on (less efficient) fresher performance and thirdly the standard for seadays are not overly constrictive. The system will be sufficiently tight to stabilize the situation but not so tight that it should choke ordinary trawling operations.

### **Annual Adjustment of the Base Rate**

The underlying idea is that horsepower days deployed in the fishery should be constant irrespective of the change in TAC. It would thus be necessary to adjust the base factor as the actual TAC diverges from the base TAC of 150000 tons. Given that the TAC will approximate to a fixed proportion of the biomass at least for the time being and that predicted CPUE will be a density dependant function of the assessed biomass, practicality suggests that with constant effort the predicted CPUE should change in line with the TAC. <sup>[x]</sup> For the time being the base factor would have to change accordingly. If the TAC changes from the 150000 tons available in base year 2006 to 135000 tons in 2007 the base factor of 4.81 kg would have to be adjusted by -10% for effort control purposes. In effect each adjusted shaft horsepower deployed would equate then to 4.33 kg of hake per seaday at the expected CPUE in 2007.

One objection to adjusting the base factor in the above way can be attributed to lead and lag — it has been said that the predicted CPUE is quite likely to be incongruent with the CPUE actually experienced because the theoretical CPUE will probably under- or overshoot the outturn trend thus implying that the annual adjustment should be even greater with a moving TAC. It is a moot point whether the system should take this risk into account. The Association will continue to research this issue with the prospect that the method for arriving at an annual adjustment may need to be revised before the start of the 2009 season.

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#### [viii] MEASURING FISHING EFFORT

The actual measurement of the potential fishing power of trawlers is a serious challenge. There are many technicalities such as scale (dis)economies, degree of power-take-off from the propulsion unit(s), use of auxiliaries, propeller conformation, winch design, deck layout, hull characteristics, kort nozzles, pack-down rate or even mode of operation that effect the fitness of using main engine power as a proxy for fishing power. Trawlermen nonetheless generally recognize that power on the propeller provides far the best fit of any one factor. Inasmuch as propeller power cannot be operationally determined from first principles, bollard pull is the single best determinant. Little of the relevant information is on public record, which is good reason for selecting main engine power in the first instance. Shaft alternators constitute the main power reduction factors whereas the kort nozzle represents the most important power augmentation device. Fortunately the presence of both can be fairly easily certified and they have consequently been incorporated into the formula for reckoning adjusted shaft horsepower (ASHP)

Propulsive fuel consumption is also acknowledged as a close proxy for trawling power but it has never been used successfully in any fishery. It should be borne in mind that the proposals are not meant to be overly precise or restrictive — the quota after all is the really precise control. It is more important to have a single unitary standard that can apply over a wide range of business models and still prevent aberrations and abuse.

#### [ix] DERIVATION OF THE BASE FACTOR

The original statistics derive from 1998 through to 2002 and were adjusted to 2005 catching conditions. Strictly they apply to 2005 but the leap to 2006 has been made on the assumption that catching conditions were similar.

#### [x] CONSTANT EFFORT

The argument about the consistency between biomass, CPUE and effort does assume that the biological adjustments are instantaneous in order to ensure that total effort is fixed for the time being. This is quite practical considering that it is only a secondary form of control that is being mooted. The proportion of the biomass permitted to be taken in the form of the TAC will change when the present “increasing CPUE yield” policies adopted by the Scientific Demersal Working Group change. In the meantime effort should remain constant.

Annual revision of the base factor does not imply tampering with the level of effort — just the opposite — the only way to hold effort constant under the proposed administrative arrangement is to adjust the power unit commensurate with the TAC.

## Administration

Effective effort control will mean that the permit system has to be managed at two levels. Initially quotas and ships have to be brought into equilibrium. Potential deployment of horsepower-days through the fishing season cannot be permitted to surpass the quota available to a specific group of trawlers in that season. The number of days that a ship or fleet of ships will be permitted to fish will be initially ascertained from a fishing plan submitted by each operator. The fishing plan will state the vessels to be used and rights intended to be fished within an operational unit (cluster). It could also include time preferences for partially deployed vessels. Reconciling vessel horsepower and quotas and issuing permits accordingly would follow as a standard administrative procedure. The time preferences of the operator could be taken into account on the fishing permit.

*[See Appendix A for proposed rules and procedures for fishing plans]*

An annual effort control foundation document based on the collective fishing plan will prove a most useful information resource in that it would actually constitute an inventory of standby effort. It thus has the potential to steer parties that have a horsepower deficit to realize their unsubscribed rights in the most cost effective and resource friendly direction. In much the same way it would indicate the degree to which these same parties could add horsepower (trawlers) to exercise their own rights if that is what they wish. <sup>[xi]</sup>

Naturally the system will also have to be monitored. Ideally the industry would like to administer the effort limitation system by way of up-to-date information technology based on the existing Vessel Monitoring System. The idea would be that industry could maintain an accounting system whereby every day spent at sea by each licensed vessel fishing a given quota would be recorded and debited against the quotas of the relevant rights holder. Fishing would cease for any given vessel when either the sea days allotment or the quota is exhausted. Although the idea is technically feasible there is unfortunately no prospect of the necessary hardware and software resources being deployed in time for the 2008 season. Nor would there be time for the all important process of robustness testing. The potential information flow and flexibility advantages of an electronic system warrant it being given a trial. Industry would like to attempt a dry run in the course of 2007.

It will be necessary to introduce a stopgap. The alternative would be a fully paper based system of time delimited permits. All vessels would fit into one of three categories:-

- A. trawlers or groups of trawlers that deploy less than the horsepower allowance needed to match their quotas
- B. trawlers with excessive engine power for the available quota
- C. trawlers that would otherwise be in category A or B but have the potential to exercise additional rights such as midwater horse mackerel and inshore trawling.

It will not be difficult to place a vessel appropriately in categories A or B. For example: a 1500 adjusted shaft horsepower trawler should catch (4.81 kg x 1500 x 265 days =) 1912 tons p.a. or 7.22 tons per seaday in 2006. Assuming the vessel had at its disposal, say, 1700 tons of quota it would have sufficient hake to maintain that vessel for 235 seadays or 324 calendar days. <sup>[xii]</sup> Such a ship will obviously be in category B as it would have to tie up before December. It is proposed that a vessel in Category B would have to carry a compliance monitor and it would be subject to active supervision by way of the Department's vessel monitoring system.

Alternatively the ship could be licensed by way of permit to fish on another (unutilized) quota for the remnant of the year. The 29 seadays available translates to 209 tons of quota in 2006. If the ship in question succeeded in accessing more than that amount of quota from an "outside" source it would move to Category A.

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[xi] UTILISING DOMESTIC EFFORT

It should not be thought that these proposals actually support a laissez-faire attitude to the recruiting of underemployed foreign ships to the fishery simply because they do not explicitly prohibit it. It will always be sound policy to first employ the elements of fleets belonging to existing access rights holders fully. It is recommended that it be one of the principle tasks of the proposed management committee to encourage and effect the catching of domestic quotas by domestic enterprises.

[xii] CALENDAR PERIODS

A seaday translates to 1.38 calendar days in a 265 seaday year. It is thus possible to simplify calculation for administrative purposes by adjusting the base factor from 4.81 kg to 3.49 kg thus thereby bypassing seadays and yielding the outputs of the cluster model directly into calendar days.

If the disposable quota of a similar ship amounted to 2000 tons the trawler would be able to fish all year. With this much hake quota it automatically falls into Category A. The permit would be issued for a full year and it would be able to operate unhindered by effort constraints. <sup>[xiii]</sup>

Vessels or groups of vessels overmatching the power standard will consequently fall into the controlled category B (or possibly C) and will be referred to the Chief Directorate Compliance so that MCM can keep special watch on them. The Hake Management Working Group may well apply supplementary rules to ships in Category B.

Category C consists intrinsically of category A or B vessels plus complication. Fortunately such trawlers will be a distinct minority and they can be addressed by active administration. Operators of Category C trawlers will have to nominate their hake intentions in their plans and each vessel will receive permits to cover the targeted multi-species operation. It will be necessary to refer to logbooks in case of midwater trawling. <sup>[xiv]</sup> If the logbooks and catch comply with hake trawling conditions the operator would be debited with seadays and hake trawling would have to cease on exhaustion of the hake allotment. That ship would be confined to targeting maasbanker thereafter.

The Deep-Sea Trawling Industry Association would be prepared to set up a mechanism to assist the Department in the administration of Category C vessels. <sup>[xv]</sup> The same entity could also assist with administering what might well be called Category C situations. Namely conventional quota transfers and vessel incidents which would excuse strict adherence to the system by their nature but which were unforeseen in the fishing plan — such as major breakdown, fire or sea losses. <sup>[xvi]</sup>

## Clustering

Few trawling rights holders conduct business as one ship one quota entities. A variety of operating arrangements of a joint venture and multiple ship nature are actually in place. <sup>[xvii]</sup> Whether the control system should be based on single quotas or on operational clusters is moot but it would be eminently practical to take into account the structural and organizational realities of the industry in administering any system of effort limitation. Company clusters deploying less horsepower days than would be needed to match the cluster quota would obviously be able to use their fleet without restriction if they so wished. It is likely that not all the ships in a fleet will be fully covered by quota in which case remnants will be placed in category B taking time preferences into account. *[see Appendix B – an Excel spreadsheet that details the working of Clusters].*

### [xiii] OVERSUBSCRIPTION OF QUOTA

Two thousand tons of quota actually equates to 382 calendar days signifying that the operator of that ship might even move quota to another ship by way of the permit system. But that is a complication that the Authorities might want to treat with great caution.

### [xiv] MIDWATER TRAWLING

It has been suggested that a baseline power factor for midwater trawling would be exactly double that for hake.

### [xv] EFFORT ADMINISTRATION

There are at least two well established precedents for the proposal that MCM and Industry should co-operate in effort administration. Both rock lobster fisheries rely heavily on a Recognized Industrial Body to administer fishing rules. In the South Coast Fishery the Association performs a function fully analogous to that here proposed. The West Coast Fishery relies on the Sea Management Committee to run a system which essentially amounts to a form of effort control by area delimitation.

### [xvi] QUOTA TRANSFERS

Permits covering voluntary quota transfers and *force majeure* would need to take account of effort opening and closing balances. It will be fairly simple to implement an accounting system that reconciles elapsed power units (4.77 kg hake per horsepower per day in 2006) with the unused allotment and quotas and ships

### [xvii] CLUSTERS

Essentially a cluster is a vessel or a fleet of vessels under unitary management. Ostensibly, the 52 deep-sea trawling rights holders were effectively organized into 15 different operational units or clusters in 2006 more or less as set out below.

		RIGHTS HOLDERS	
		SINGLE	MULTIPLE
SHIPS	SINGLE	2 (2%)	1 (1%)
	FLEET	3 (38%)	9 (58%)

The table oversimplifies the different modes of organization in deep-sea trawling. The nine clusters in the fourth quadrant actually represent almost as many different kinds of group entity. Members of the industry will of course be free to define and size their vessels into clusters as they wish and it would be naturally advantageous to have fewer and bigger clusters.

## **Conclusion**

The South African Deep-Sea Trawling Industry Association recognizes that some of the issues not fully canvassed in this report, such as differentiation of freshers / freezers, the use of seadays instead of fishing days, the standardisation of factors (such as seadays) and possibly most importantly, the fixing of the Base Factor to a given TAC, could benefit from deeper investigation. Another set of issues that may need more thought relates to meshing these proposals with established administrative procedures such as the maintenance of the scientific data base. The Association undertakes to conduct the requisite research and investigation in the next year.

Notwithstanding possible minor shortfalls the Association believes that the arrangement outlined in this report can be implemented in good time for the 2007 season and it will meet all Marine and Coastal Management criteria for effort control in the deep-sea trawling sector. The Association undertakes to co-operate to the utmost with the Department and to deploy all resources to ensure a practical effort control system is implemented immediately.

## **Other Hake Sectors**

Finally it is imperative that effort limitation measures of an equal degree of restrictiveness be introduced to other sectors of the hake fishery as soon as possible. For instance a similar mechanism could be employed in the inshore trawl fishery even though it operates under dual quotas. In the hake long line fishery (clustered) time delimited permits could be issued on the basis of the 2006 catch rates and number of hooks or baskets deployed. It is strongly recommended in other words that an essentially similar system, but using appropriate parameters, be used for other hake fisheries.