WG Document No.

MANAGEMENT OF HAKE LONGLINE EFFORT IN SOUTH AFRICA

Submission For : *The Hake Longline Association*

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(In Consultation with the Hake Longline Association and Members)

TERMS OF REFERENCE

This work was commissioned by the Hake Longline Association of South Africa.

"To evaluate the hake longline fishery with a view to developing an appropriate mechanism for the management of hake longline effort in South Africa"

EXECUTIVE SUMMARY

This study was conducted on behalf of the *Hake Longline Association of South Africa* with the objective of determining the most practical means by which hake longline effort can be managed as an alternative to the effort management proposals for the hake trawl sectors.

Using the best available data provided by Marine and Coastal Management and Observer data from 2002 to present it is concluded :

1. Hake longline effort is best managed by controlling the number of pots used on a vessel;
2. Hake longline operators will be required to declare the number of pots utilised on each vessel;
3. Based on historical effort in the hake longline sector, the average number of hooks per pot is 114;
4. Based on historical performance in the hake longline sector, current catch rates per pot assuming 114 hooks per pot, approximate 15.7 kg per pot;
5. The expected maximum number of hake longline fishing days per annum is 196.6 giving a sea day to calendar day conversion factor of 0.5385;
6. There has been a significant decline in hake longline catch rates since 1995 and it is believed this trend correlates with a similar trend experienced across the hake sector, particularly amongst wetfish trawl vessels targeting PQ hake;
7. It is recommended that the hake longline parameters determined in this study be used to test the operational practicality of hake longline effort management using pots. However the restriction of hake longline effort is extremely sensitive to catch rate and should this change significantly up or down, the hake longline effort management regime could seriously compromise the viability of the hake longline fishery. It is therefore recommended that the parameters used to calculate hake longline effort be reassessed early in 2008 once the 2007 catch and effort data have been submitted and verified by MCM.
8. It is also suggested that a comparative catch rate assessment be made using directed wetfish trawl data to confirm if similar patterns (to longline) in the selective targeting on large hake (PQ) corroborates the apparent trends in the hake longline sector.
9. Management of effort in the hake sector, if it is to be effective, requires real-time management in order to accurately track compliance of any imposed effort regime. It is therefore suggested that alternative methods by which real-time effort management of not only the hake longline, but also the overall effort management of hake sectors, be considered.

INTRODUCTION and BACKGROUND

Proposals have been submitted to the Demersal Working Group (MCM) for the management of hake-directed effort in the hake trawl fisheries (Deepsea and Inshore trawls sectors). The primary objective of this submission is to provide a mechanism to manage hake longline effort that as far as possible is compatible with the trawl sector proposals (OLRAC, 2007 and MCM, 2007).

Hake longlining is an established sector of the South African hake fishery exploiting a portion of the hake Total Allowable Catch[1]. Although hake-directed longlining was first proposed in 1982 (the longline methods used were observed in North Atlantic Portuguese and Spanish fisheries). The fishery was first introduced to South Africa in 1983 as a hake longline fishery, but very quickly shifted to a kingklip-directed fishery between 1983 – 1989 (Japp, 1995). With the decline in the kingklip catch rates effort shifted back to hake in 1989 and at the same time the boats in the kingklip fishery began targeting hake. The subsequent closure of the kingklip-directed longline fishery resulted in fishers lobbying for a hake-directed longline fishery. This resulted in an experimental hake-longline fishery between 1994-1995 aimed at evaluating the scientific and socio-economic feasibility of hake longlining in South Africa.

A hake-directed fishery was subsequently introduced amidst much controversy and litigation over rights allocations. Stability in the sector was finally accomplished with the introduction of medium-term fishing rights from 2002 and long-term rights in 2006. The introduction of hake longlining increased the effective number of operators targeting hake significantly[2] with 65 rights issued in 2006 and between 50-70 boats operating each with allocations varying from 40 – 100 t per rights holder. From an effort management point of view this is the most challenging characteristic of the fishery as many boats operate with relatively small allocations, the boats carry multiple permits, fish for shorter periods than trawlers and also have specific market requirements.

Because of the unique nature of the fishery, hake longlining requires a high level of management and operational flexibility that should as far as possible not be compromised through the introduction of an inappropriate Effort Control mechanism. The longline fishery should also be seen in the context of the whole of the South African hake fishery. The trawl sector exploits a significantly larger proportion of the hake stock than longline. Further, although the selectivity of longlines for large fish (not only hake) is a characteristic of the longline method, other fisheries such as trawl are less selective and can target hake of all sizes. Significant volumes of large hake are targeted by the wet-fish trawl fleet for the Prime Quality (PQ) hake market and, combined with longline hake, competes with the hake longline sector. Although it is recognised that this study is aimed at determining the best means of managing hake longline effort, the selective effort on PQ fish exploited by both the trawl and longline sectors and any perceived impact this may have on the hake stock should be kept in mind. In the course of this study longline operators repeatedly raised this concern as there was a perceived bias regarding the impact of the selectivity of longlines on large hake whereas trawling effort was also selectively directed on large fish, and due to significantly larger allocations of this sector (trawl), caught higher volumes of adult fish than the longline method.

In summary, the principle objectives of introducing effort (input control) management as well as quota (output control) of the hake fishery applies equally to all hake fishing sectors and should include:

1. Long-term sustainability of the hake resource
2. Maintain control of fishing effort and prevent effort creep
3. Maintain economic viability of the fisheries
4. Facilitate monitoring and compliance in the fishery

[1] "Line-caught" hake includes both handline and longline and that proportion of the global TAC is < 10%
[2] Noting that hake rights holders had also increased significantly in the trawl and handline sectors as well.

METHODS APPLIED AND DATA UTILISED

Very little analysis of the hake longline fishery has been done since the completion of the experimental period in 1995. This assessment has been based on three primary data sets :

1. Historical (experimental) data (Japp, 1995)
2. Commercial logbook and landing returns from 2002-2007
3. Observer reports from mid 2002 to March 2007

With respect to the historical data the research of Japp, (1995) is referenced. The commercial data set (provided by Phoebie Mullins, MCM) comprised 19 500 line sets. These data required considerable review and correction or removal of sets where there were clear errors or inconsistencies. These included obvious errors in the declared number of hooks and pots deployed, positional errors, sailing and arrival times and dates etc. The subsequent refinement and correction of the data resulted in 19 153 usable line sets which were considered adequate for the purposes of this analysis and consistent with the authors historical experimental data. The Observer data was a smaller subset of the commercial data and comprised some 59 boats and 2 422 line sets. These data have a higher level of reliability than the commercial data and were used where possible to verify or cross-reference outputs from the commercial data set.

The analytical procedure followed was as follows :

(a) The data were split into three groupings – Total sample (all areas), all data north of 33°S (i.e. longline grounds north of Cape Town towards the Namibian border), an "Intermediate" area extending from 33°S to 20°E and then the area East of 20°E[3];

(b) Establish average trip lengths – this required some descriptive analysis based on the areas and ports fished. It included estimating the average trip length assuming vessels leave from different bases. It also required the apportionment of effort between fishing days, time spent steaming to grounds, port turnaround times and lay-up periods expected. This apportionment is essential for the conversion of fishing days to calendar days;

(c) Identify appropriate effort units and determine if there is a relationship between these units and vessel size / capacity.

(d) Determine the historical, seasonal and current catch rates so that appropriate catch volumes could be allocated to effort units;

(e) Consolidate trip length estimates, fishing and calendar days, effort units and catch rates into a practical effort management regime.

RESULTS

A) Trip Lengths

Understanding the *modus operandi* of the hake longline fleet is essential to <u>firstly</u> derive fair estimates of operational requirements and <u>secondly</u>, any effort limitation must be practical and as far as possible not interfere with the normal operations and logistics of the fleet (Figure 1 refers)

[3] The logic in separating these areas was to consider the effects of distance from the main ports as well as seasonality and variability in resource and operational characteristics such as trip length and catch rates.

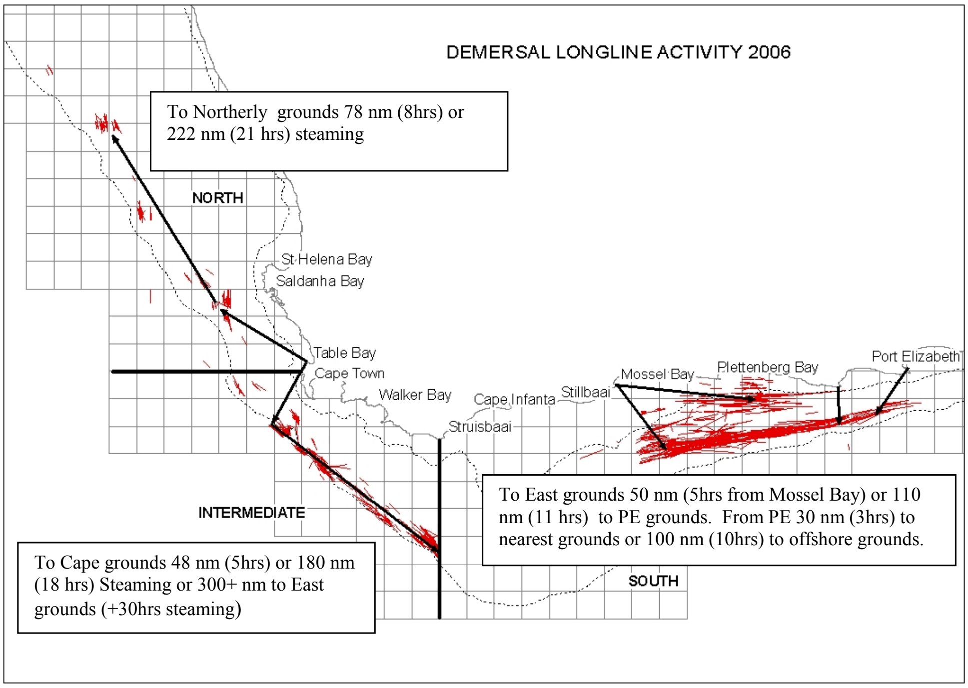


Figure 1. Main hake longline fishing grounds for 2006. Note the areas shown do not differ significantly between years.

Hake longline operations can be divided in to three main operational areas (Figure 1) :

i. Vessels sailing from the West Coast (Saldanha, Cape Town, Hout Bay) and targeting grounds off Cape Town and Cape Point. This is the most heavily targeted longline area and extends from west of Cape Town to due south of Cape Agulhas. Steaming time is relatively short for the 1st line set with boats mostly sailing from port in the afternoon and preparing and setting lines from late evening to early morning the next day. Lines are set between 2-3 am and hauling commences between 8 and 9 am and ends on average at 17h00 in the afternoon. Returning vessels from the same grounds haul during the day and return to port in the evening, so both fishing and steaming to or from grounds may occur on the same day or overlap into the following day. As mostly FOUR line sets are completed, four fishing days are accumulated with a combination of 3 days for steaming to and from grounds, discharge, re-provisioning and return to grounds (Note: this assumes vessels fish optimally).

ii. Vessels sailing for the northern West Coast grounds – these vessels sail from Cape Town, Hout Bay, Saldanha or St Helena Bay and fish west of Saldanha and north towards the Namibian border (never going that far north). Operational characteristics are similar to (i) but with slightly longer steaming times – logistically the trip lengths are similar to the Cape Point grounds.

iii. Vessels fishing the East Coast grounds sailing from either Mossel Bay, Port St Francis or Port Elizabeth (Note: some smaller vessels fish from Plettenberg Bay). The steaming time to these grounds are shorter than for the West Coast but the operational characteristics are similar with four fishing days on average and three-days steaming, discharge and provisioning.

iv. In some cases boats may sail from the West to the East and vice versa – the occurrence of this strategy is however minimal as most rights holders are required by permit condition to fish East or West.

Log Book returns show that average trip lengths (reported sailing and landing dates) have increased since 2002[4]. End to end trips are shown in the Figure 2. Longest trips occur when steaming to the Northerly grounds, shortest from the East. Most vessels leave port mid-day to get to grounds so that they can prepare lines and shoot in the early morning between 2-3 am. Hauling starts on average between 8-9 am and continues for on average 8-9 hours ending at about 17h00.

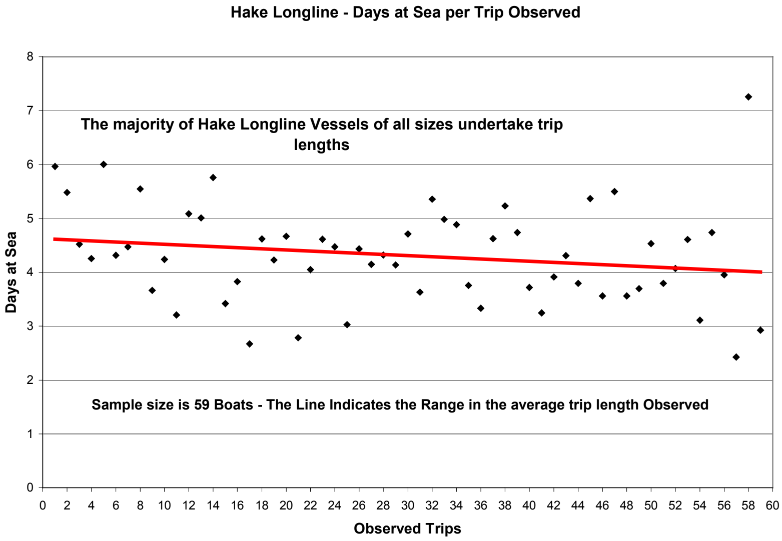
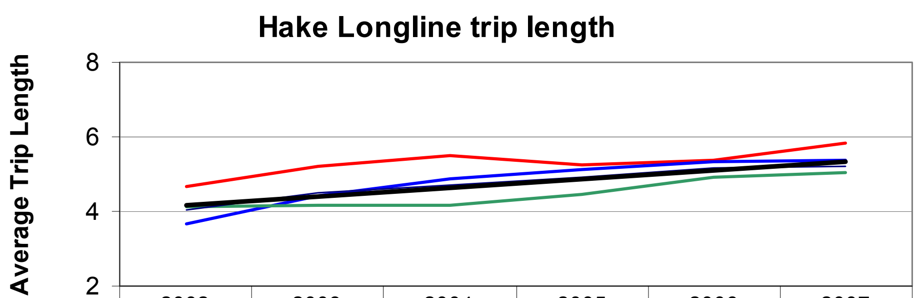


Figure 2. Mean trip lengths per annum as declared on trip logs (Source MCM data)

Using <u>Observer data boat-specific trip lengths</u> confirm that since 2002 the average number of days **<u>FISHED</u>** per trip per vessel is between 4-5 days. Figure 3 shows the relationship between these vessel and their gross registered tonnage (GRT) – the regression suggests bigger vessels have slightly shorter trips but not significantly so.

Figure 3. Relationship between boat size and trip lengths (source Observer data)



	2002	2003	2004	2005	2006	2007
North	4.65	5.20	5.52	5.24	5.37	5.85
Mid	3.68	4.42	4.86	5.14	5.35	5.37
East	4.11	4.17	4.16	4.48	4.92	5.06
All	4.03	4.49	4.71	4.93	5.15	5.22

For the purposes of the effort calculations it is therefore suggested that the following parameters be used with respect to hake longline trip lengths :

- Average hake <u>fishing days</u> per trip is 4 days.
- Steaming time, discharge and provisioning approximates <u>3 days combined</u>.
- <u>A trip per week is therefore the norm in the hake longline industry – this implies a seven-day round trip from sailing time and date to completion of discharge, provisioning and preparation for next departure</u>[5]

[4] Note that these are reported sailing and landing dates and include fishing and steaming days
[5] Note that vessels do not always do continuous trips and that many factors influence operations including market demand, price of products, weather etc.

B) INTERANNUAL AND MONTHLY EFFORT LEVELS

Hake longline effort fluctuates monthly – this effort fluctuation is determined by a host of factors <u>including weather and sea conditions</u>, fish availability market conditions and not least of all pressure to complete allocations towards the end of the quota years. In the Figure 4 the accumulated monthly effort levels is shown (top figure), the time series of monthly effort since 2002 (middle) and the mean effort levels by month between the three areas (bottom).

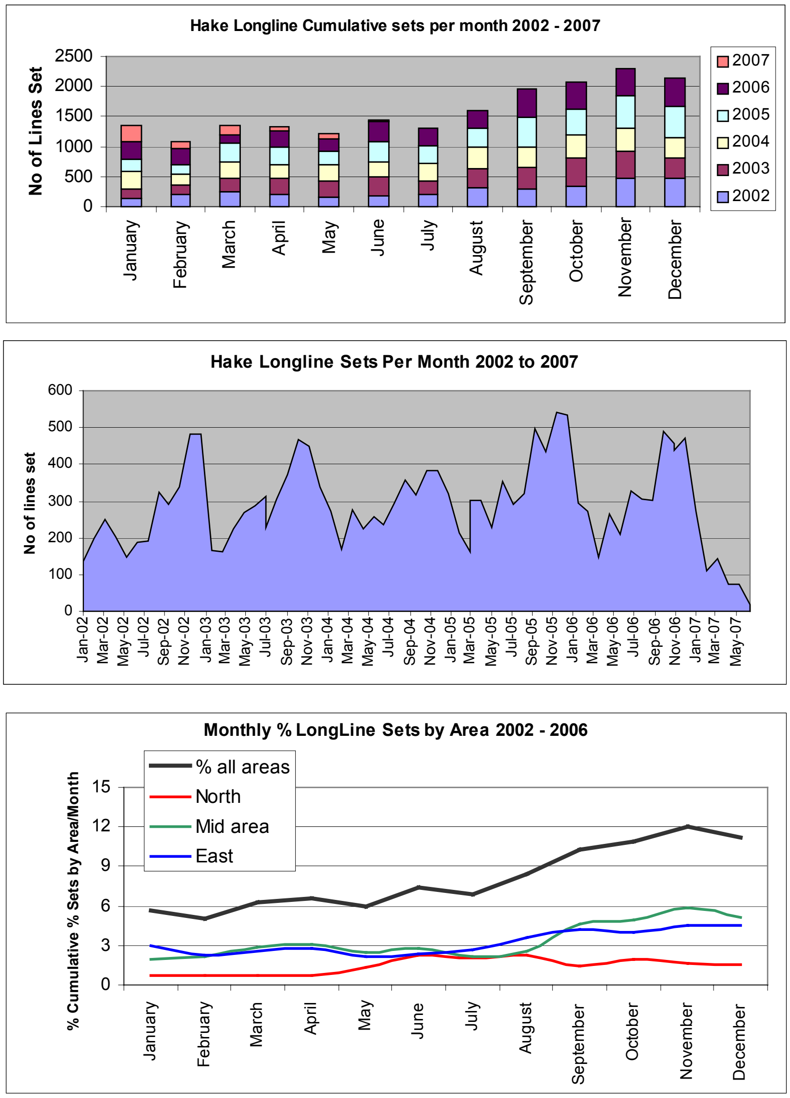


Figure 4. Hake longline effort levels monthly and inter-annually from 2002-2007.

From these figures we can conclude that :

1. Peaks in effort occur consistently from September through to December
2. The least effort is deployed in the Northern grounds on the West Coast – effort peaks there in mid winter.
3. The Intermediate and East Coast grounds deploy similar levels of effort but also have seasonal signals. Peaks in effort on the West Coast occur mostly in late spring to early summer while on the East Coast the peaks are about 1-2 months later – this is probably associated with both fish availability and preferred weather and sea conditions.

Theoretically therefore, if effort were to be allocated on the basis of <u>monthly</u> historical effort, the proportions indicated in Table 1 would give a fair indication of the effort levels expected.

Table 1. The % sets on average per month (2002 – 2007)

Average No of Longline sets	% all areas
January	5.7
February	5.0
March	6.3
April	6.6
May	5.9
June	7.4
July	6.8
August	8.4
September	10.3
October	10.9
November	12.0
December	11.2

C) THE RELATIONSHIP BETWEEN HOOKS, POTS AND BOATS

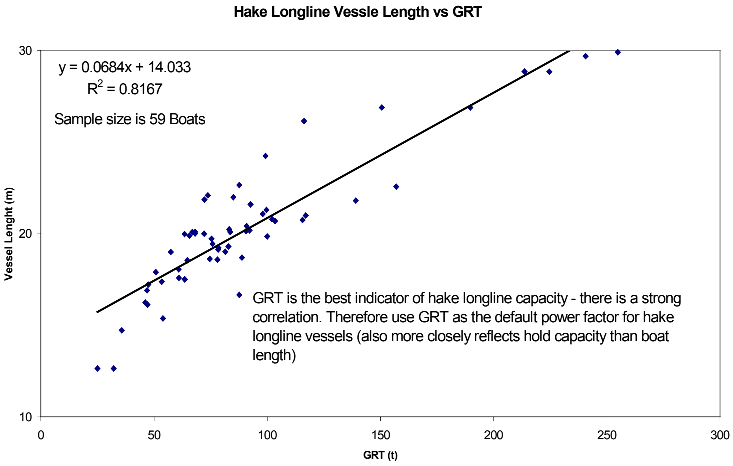


Figure 5. Correlation between vessel displacement (hake longlines) and vessel length

Gross tonnage of vessels and Vessel Total length (Figure 5) are closely correlated. If a vessel parameter is to be used to designate longline effort then Gross Tonnage is probably the best as it will be the best indicator of hold capacity.

Figure 6. Correlation between vessel displacement (hake longlines) and pots deployed per vessel (source : Observer data)

The relationship between boat size (GRT) and the number of pots deployed on a boat (Figure 6) suggests larger boats do generally carry more pots, although most of the data are clustered around the smaller vessels up to 120 GRT. In this group there is a wide range of pots deployed suggesting that GRT and the relationship with pot numbers is probably a poor management tool for effort control of longlines.

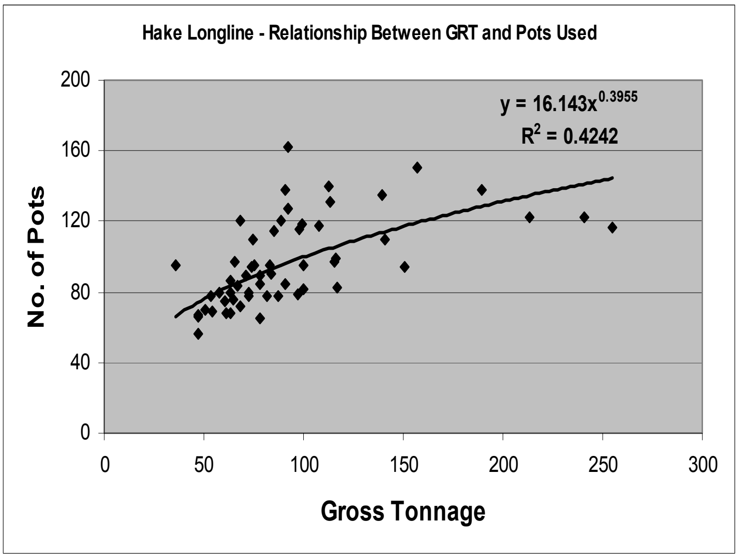


Figure 7. Standard hake longline pot as prepared prior to shooting of the line. Pots comprise normally of four lines of 25-30 hooks per line (source : CapFish)

If hake longline effort is to be managed on the basis of the number of pots then the number of hooks per pot and pot size would have to be standardised.

Figure 7 shows a standard pot commonly deployed by the majority of hake longliners in South Africa. Logbook data indicate quite a high variation in hooks per pot (SE gives a max of 143 and min of about 91)**. The average however is 114** with most skippers declaring 120 hooks per pot on a standard longline. Observer data confirms this variability, but that it mostly relates to skipper error noting that repaired lines on a day to day basis will result in a variable number of hooks (Figure 8). Although there has been a slight progressive increase since 2002 in the average number of hooks set per line (Figure 8) the average number of hooks per pot has remained steady at about 114.

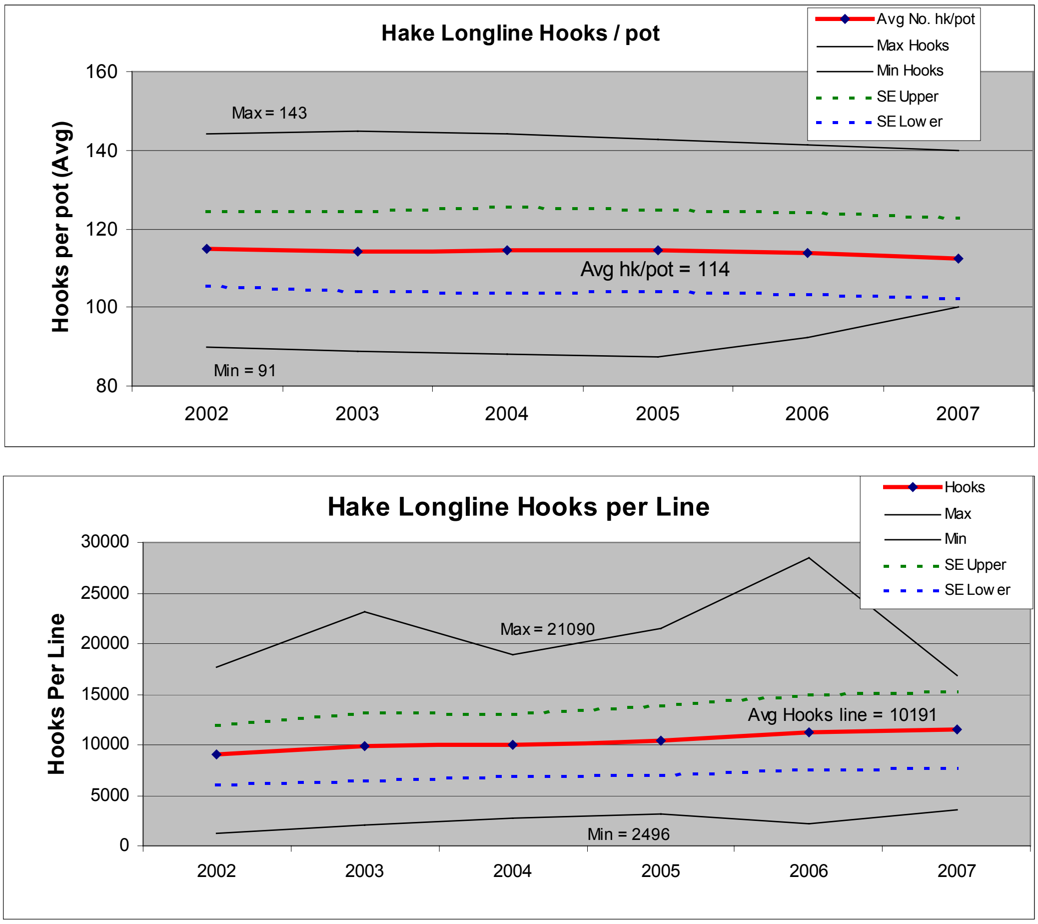


Figure 8. Declared number of hooks per pot and hooks per set (line) (Source : MCM longline data)

Management of hake longline effort is therefore not recommended on the basis of pots and vessel displacement (GRT). Historically hake longliners in South Africa have deployed vessel-specific numbers of pots. Effort management of the longline fleet is therefore probably best done on a **"declaration per rights holder/vessel basis"** and should not be associated with vessel size. For the purposes of Hake Longline effort management the recommended average number of hooks per pot should be set at 114. Boats that shoot higher than that amount will require adjustments to their allocated number of pots.

HAKE LONGLINE CATCH RATES

Determination of a longline-specific catch rate is essential if a practical limit is to be set for the management of fishing days. The hake longline CPUE trends are shown in two sets of consolidated figures showing annual and monthly CPUE trends (Figure 9) by area for the MCM commercial longline data. Note that for the annual figures the 1995 CPUE has been added to the 2002-2007 data points. There is a significantly correlated decrease in hake longline catch rates (catch in kg per 1000 hooks)[6]. Further the monthly trend shows a distinct increase in catch rate in the late Spring to mid Summer period with some displacement of these peaks depending on the area targeted.

[6] Note the CPUE calculation has converted landed products (PQ fish and broken hake) to whole (nominal mass)

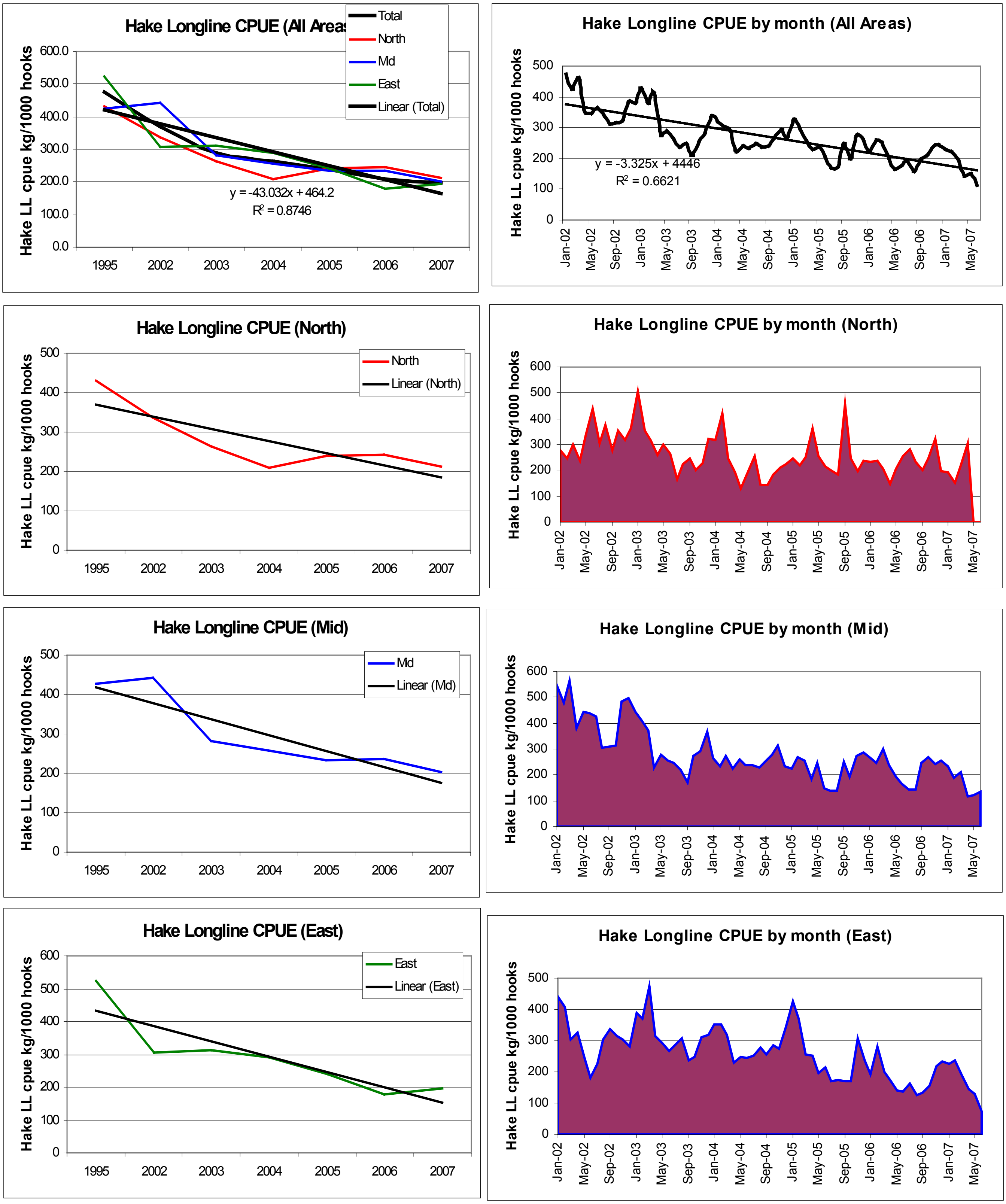


Figure 9. Catch rate trends for hake longline in South Africa by year, area and month(Source : MCM longline data)

CATCH RATE (CPUE) BY SELECTED VESSELS

To further verify the CPUE trends and to check for the variability amongst boats a group of boats were selected to test for individual CPUE trends[7] – these included vessels that had historically performed consistently in the fishery, a fair size range of vessels as well as vessels operating on both the West and South Coasts (Figure 10 and Table 2 refers).

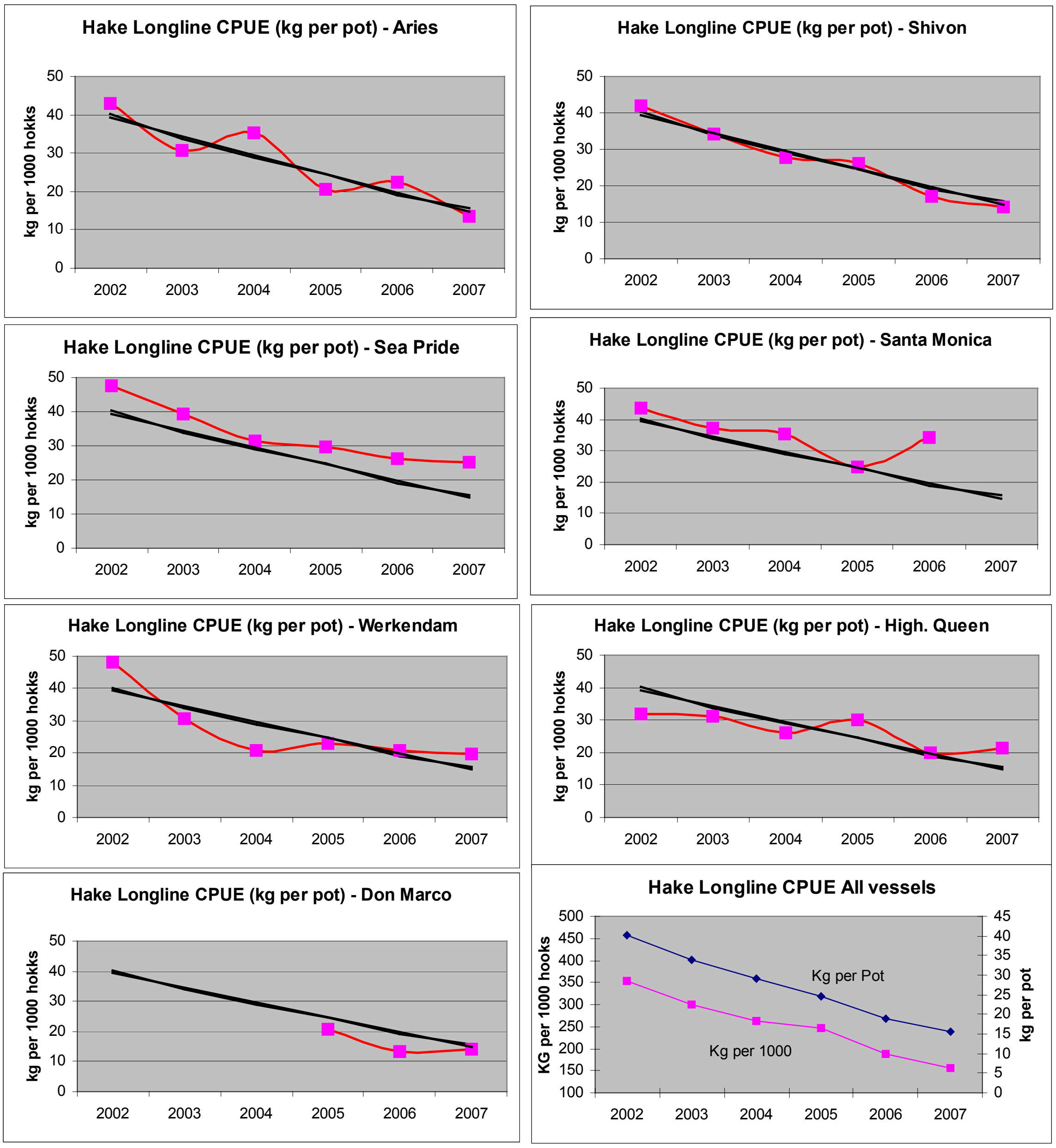


Figure 10. Hake longline catch rate trends from selected vessels. Note that data extending into 2007 has been used and that the CPUE index with respect to pots is shown - this is compared to the index kg per 1000 hooks (bottom right graph)

[7] There was sensitivity expressed regarding the use of operator-specific catch rates – therefore only a small subset of vessels were used with the approval of those vessel owners. Note also that some of the vessels used are known to be top performing vessels in the longline sector so their catch rates may not necessarily reflect the whole hake longline fleet.

Table 2. Estimation of catch rates for <u>selected vessels</u> in the hake longline fleet. Note these data are shown only as **"performance indicators"** to verify the output from the full data set provided by MCM

Year	Vessel	Pots	Hooks	Hake est	Hake CPUE kg/1000 hooks	Hake CPUE per Pot
2002	Aries	5680	636160	244763.2	384.8	43.1
2003	Aries	8455	912385	259192.7	284.1	30.7
2004	Aries	6065	602470	213246.7	354.0	35.2
2005	Aries	15995	1744650	326590	187.2	20.4
2006	Aries	13890	1409430	311409.7	220.9	22.4
2007	Aries	7960	878150	106296.3	121.0	13.4
2002	Sea Pride	3745	449400	178576.8	397.4	47.7
2003	Sea Pride	7815	904960	306867.9	339.1	39.3
2004	Sea Pride	3152	342944	98431.8	287.0	31.2
2005	Sea Pride	10576	1166928	313989.8	269.1	29.7
2006	Sea Pride	8868	881440	233154	264.5	26.3
2007	Sea Pride	1500	168000	37608.7	223.9	25.1
2002	Werkendam	1471	171630	70787.9	412.4	48.1
2003	Werkendam	1715	237680	52735.18	221.9	30.7
2004	Werkendam	2425	404528	50547.9	125.0	20.8
2005	Werkendam	2205	231700	50943.76	219.9	23.1
2006	Werkendam	1615	181000	33866.36	187.1	21.0
2007	Werkendam	210	27000	4146.8	153.6	19.7
2002	Santa Monica	6811	814920	298299.1	366.0	43.8
2003	Santa Monica	7200	864040	267440.4	309.5	37.1
2004	Santa Monica	2760	331200	97812.9	295.3	35.4
2005	Santa Monica	8355	721960	207510.6	287.4	24.8
2006	Santa Monica	3580	429600	121922.1	283.8	34.1
2007	Santa Monica					
2002	Shivon	9840	976800	411272.2	421.0	41.8
2003	Shivon	10600	1054100	361265.4	342.7	34.1
2004	Shivon	12000	1168400	333419.6	285.4	27.8
2005	Shivon	15656	1465600	411072.4	280.5	26.3
2006	Shivon	22270	2116130	379627.7	179.4	17.0
2007	Shivon	1820	182000	26023.8	143.0	14.3
2002	Highland Queen	11880	1425600	380593.2	267.0	32.0
2003	Highland Queen	13193	1575360	409723.8	260.1	31.1
2004	Highland Queen	9820	1143840	256421.3	224.2	26.1
2005	Highland Queen	11554	1283646	349273.9	272.1	30.2
2006	Highland Queen	10365	1187140	204859.6	172.6	19.8
2007	Highland Queen	3676	256200	78991.9	308.3	21.5
2002	Don marco					
2003	Don marco					
2004	Don marco					
2005	Don marco	17890	1581880	369585.8	233.6	20.7
2006	Don marco	23010	2188570	301624.2	137.8	13.1
2007	Don marco	9310	931000	130021.3	139.7	14.0
2002	All Vessels	39427	4474510	1584292	354.1	40.2
2003	All Vessels	48978	5548525	1657225	298.7	33.8
2004	All Vessels	36222	3993382	1049880	262.9	29.0
2005	All Vessels	82231	8196364	2028966	247.5	24.7
2006	All Vessels	83598	8393310	1586464	189.0	19.0
2007	All Vessels	24476	2442350	383088.8	156.9	15.7

It is concluded from the hake longline CPUE data that :

- The hake longline CPUE has declined by more than 50% since 1995 from about 460 kg per 1000 hooks to less than 198.5 kg per 1000 hooks **up to the end of 2006** (note 2007 data not complete)
- Monthly CPUE data show a similar downward trend – these data are useful as they show clearly seasonal peaks in catch rates – the peaks occur mostly from Spring to January. This increased availability at these times probably relates to seasonal migrations and spawning.
- Selected boat data show that in some areas the decline in CPUE has persisted into 2007, particularly for vessels on the East Coast where the catch rate is now estimated to **approximate 15.7 kg per pot**
- For the purpose of the hake longline effort management and estimation of expected catch it is recommended that the current 2007 CPUE of 15.7 kg per pot be applied – this will need updating once the 2007 fishing season has ended[8].

CONSOLIDATION OF RESULTS FOR EFFORT MANAGEMENT

Table 3 shows the consolidation of trips, estimated lay-up periods and steaming times for the conversion of Fishing days into Calendar days.

Table 3. Parameters used for the conversion of fishing to calendar days for hake longliners

	Days per Annum	Comments
Assume 21-Day lay up (3 weeks)	21	Note HLL vessels generally do not fish all year
Days available (Fishing)	344	No of days available for fishing
Max trips PA (7-day turnaround)	49.1	Assumes 7 day start of trip, to sailing again = 4 days fishing, 3 days steaming and turnaround
Max days setting lines (fishing)	196.6	
Max steaming and turnaround days	147.4	49.1 trips x 2 days steaming
Ratio Fishing : Calendar days	**0.5385**	Gives an index for converting sea days to calendar days = 196.6 / 365

The estimated conversion ratio for fishing days to Calendar days that is applied to the effort matrix is therefore **0.5385**. An illustration of the application of this matrix is shown in Table 4. By way of example a rights holder must declare pots deployed and then, based on hake allocation calculate Calendar days such as shown in the Figure 11.

As an example we have applied conversion to a rights holder with a boat that fishes 100 – 120 pots on a line set at 15.7 kg per pot. To maintain activity throughout the year the vessel will require between 300 and 360 t. If the vessel only has a 60 t allocation it will be allocated between 71 (100 pots) and 59 (120 pots) calendar days.

[8] The CPUE per pot is also adjusted for the average number of hooks per pot determined by MCM data (114 hooks per pot) giving an expected catch per pot of 15.7 kg per pot (nominal mass)

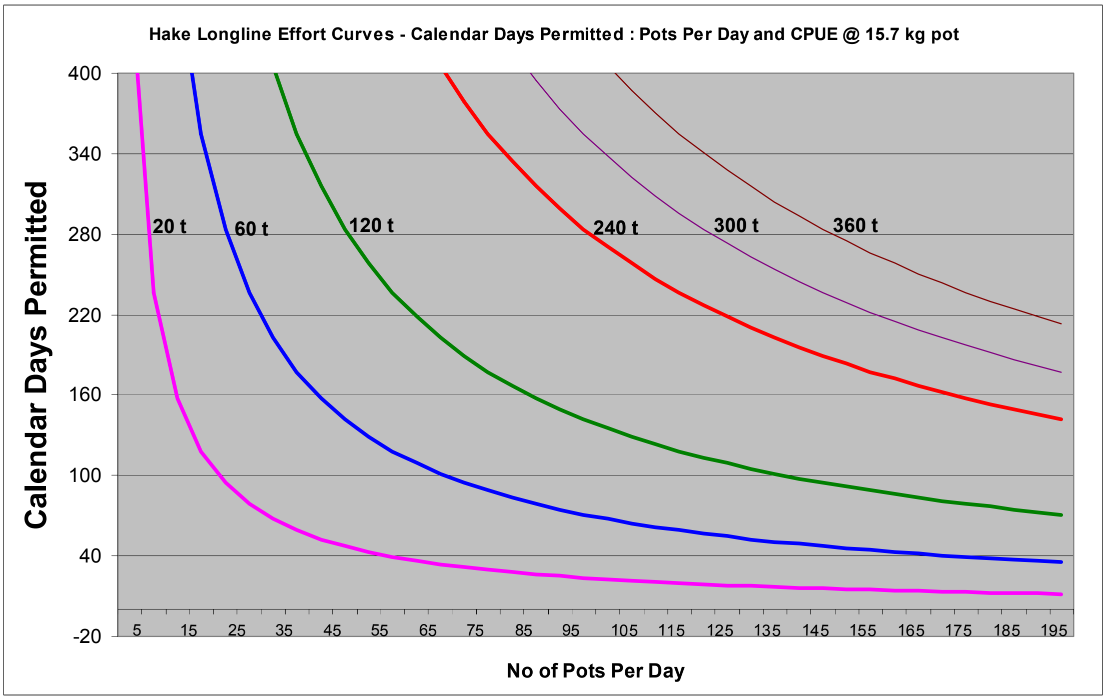


Figure 11. Conversion of hake longline sea days to calendar days based on hake allocation and number of pots deployed and a CPUE per pot of 15.7 kg nominal mass

MANAGEMENT OF THE EFFORT REGIME – APPLICATION OF A REAL-TIME DATA CAPTURE SYSTEM AND WEB-BASED OPTIONS

Management of the hake longline effort system will require real-time monitoring and trip-by-trip consolidation of effort. A possible Industry-Based solution to this problem that will support Marine and Coastal Management is appended (Appendix 1) for consideration. The intention here is to demonstrate conceptually a practical means by which effort in the hake fishery can be managed on a day to day basis.

REFERENCES

Japp, D.W. 1995 – The hake-directed longline pilot study conducted from 23 May 1994 to 31 may 1995 (WG/09/95/D:H:16)

MCM, 2007 – Rules for calculating the net horse power for effort limitation purposes on deep-sea trawlers

MCM, 2007 – Users guide to the development of fishing plans (Effort limitation for the deep-sea trawl fishery)

OLRAC, 2007 – Derivation of a base catch-rate for application to effort controls in the deep-sea hake trawl fishery. Demersal Working Group Document No. 4 – August 2007.

OLRAC, 2007 – Users guide for the capacity management software

Table 4 : Hake Longline Conversion Sea Day to Calendar Day Matrix

Sea Days Matrix Pots --->

Allocation	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	**120**	125
20 t	254.8	127.4	84.9	63.7	51.0	42.5	36.4	31.8	28.3	25.5	23.2	21.2	19.6	18.2	17.0	15.9	15.0	14.2	13.4	12.7	12.1	11.6	11.1	**10.6**	10.2
40 t	509.6	254.8	169.9	127.4	101.9	84.9	72.8	63.7	56.6	51.0	46.3	42.5	39.2	36.4	34.0	31.8	30.0	28.3	26.8	25.5	24.3	23.2	22.2	**21.2**	20.4
60 t	764.3	382.2	254.8	191.1	152.9	127.4	109.2	95.5	84.9	76.4	69.5	63.7	58.8	54.6	51.0	47.8	45.0	42.5	40.2	38.2	36.4	34.7	33.2	**31.8**	30.6
80 t		509.6	339.7	254.8	203.8	169.9	145.6	127.4	113.2	101.9	92.6	84.9	78.4	72.8	67.9	63.7	59.9	56.6	53.6	51.0	48.5	46.3	44.3	**42.5**	40.8
100 t		636.9	424.6	318.5	254.8	212.3	182.0	159.2	141.5	127.4	115.8	106.2	98.0	91.0	84.9	79.6	74.9	70.8	67.0	63.7	60.7	57.9	55.4	**53.1**	51.0
120 t			509.6	382.2	305.7	254.8	218.4	191.1	169.9	152.9	139.0	127.4	117.6	109.2	101.9	95.5	89.9	84.9	80.5	76.4	72.8	69.5	66.5	**63.7**	61.1
140 t			594.5	445.9	356.7	297.2	254.8	222.9	198.2	178.3	162.1	148.6	137.2	127.4	118.9	111.5	104.9	99.1	93.9	89.2	84.9	81.1	77.5	**74.3**	71.3
160 t				509.6	407.6	339.7	291.2	254.8	226.5	203.8	185.3	169.9	156.8	145.6	135.9	127.4	119.9	113.2	107.3	101.9	97.1	92.6	88.6	**84.9**	81.5
180 t				573.2	458.6	382.2	327.6	286.6	254.8	229.3	208.5	191.1	176.4	163.8	152.9	143.3	134.9	127.4	120.7	114.6	109.2	104.2	99.7	**95.5**	91.7
200 t					509.6	424.6	364.0	318.5	283.1	254.8	231.6	212.3	196.0	182.0	169.9	159.2	149.9	141.5	134.1	127.4	121.3	115.8	110.8	**106.2**	101.9
220 t					560.5	467.1	400.4	350.3	311.4	280.3	254.8	233.5	215.6	200.2	186.8	175.2	164.9	155.7	147.5	140.1	133.5	127.4	121.8	**116.8**	112.1
240 t						509.6	436.8	382.2	339.7	305.7	277.9	254.8	235.2	218.4	203.8	191.1	179.8	169.9	160.9	152.9	145.6	139.0	132.9	**127.4**	122.3
260 t						552.0	473.2	414.0	368.0	331.2	301.1	276.0	254.8	236.6	220.8	207.0	194.8	184.0	174.3	165.6	157.7	150.6	144.0	**138.0**	132.5
280 t							509.6	445.9	396.3	356.7	324.3	297.2	274.4	254.8	237.8	222.9	209.8	198.2	187.7	178.3	169.9	162.1	155.1	**148.6**	142.7
300 t								477.7	424.6	382.2	347.4	318.5	294.0	273.0	254.8	238.9	224.8	212.3	201.1	191.1	182.0	173.7	166.2	**159.2**	152.9
320 t									452.9	407.6	370.6	339.7	313.6	291.2	271.8	254.8	239.8	226.5	214.5	203.8	194.1	185.3	177.2	**169.9**	163.1
340 t										433.1	393.7	360.9	333.2	309.4	288.7	270.7	254.8	240.6	228.0	216.6	206.2	196.9	188.3	**180.5**	173.2
360 t											416.9	382.2	352.8	327.6	305.7	286.6	269.8	254.8	241.4	229.3	218.4	208.5	199.4	**191.1**	183.4

Calendar Days Pots --->

Allocation	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	**120**	125
20 t	473.1	236.5	157.7	118.3	94.6	78.8	67.6	59.1	52.6	47.3	43.0	39.4	36.4	33.8	31.5	29.6	27.8	26.3	24.9	23.7	22.5	21.5	20.6	**19.7**	18.9
40 t	946.2	473.1	315.4	236.5	189.2	157.7	135.2	118.3	105.1	94.6	86.0	78.8	72.8	67.6	63.1	59.1	55.7	52.6	49.8	47.3	45.1	43.0	41.1	**39.4**	37.8
60 t		709.6	473.1	354.8	283.8	236.5	202.7	177.4	157.7	141.9	129.0	118.3	109.2	101.4	94.6	88.7	83.5	78.8	74.7	71.0	67.6	64.5	61.7	**59.1**	56.8
80 t			630.8	473.1	378.5	315.4	270.3	236.5	210.3	189.2	172.0	157.7	145.6	135.2	126.2	118.3	111.3	105.1	99.6	94.6	90.1	86.0	82.3	**78.8**	75.7
100 t				591.3	473.1	394.2	337.9	295.7	262.8	236.5	215.0	197.1	182.0	169.0	157.7	147.8	139.1	131.4	124.5	118.3	112.6	107.5	102.8	**98.6**	94.6
120 t				709.6	567.7	473.1	405.5	354.8	315.4	283.8	258.0	236.5	218.3	202.7	189.2	177.4	167.0	157.7	149.4	141.9	135.2	129.0	123.4	**118.3**	113.5
140 t					662.3	551.9	473.1	413.9	367.9	331.2	301.0	276.0	254.7	236.5	220.8	207.0	194.8	184.0	174.3	165.6	157.7	150.5	144.0	**138.0**	132.5
160 t						630.8	540.7	473.1	420.5	378.5	344.1	315.4	291.1	270.3	252.3	236.5	222.6	210.3	199.2	189.2	180.2	172.0	164.5	**157.7**	151.4
180 t							608.2	532.2	473.1	425.8	387.1	354.8	327.5	304.1	283.8	266.1	250.5	236.5	224.1	212.9	202.7	193.5	185.1	**177.4**	170.3
200 t							675.8	591.3	525.6	473.1	430.1	394.2	363.9	337.9	315.4	295.7	278.3	262.8	249.0	236.5	225.3	215.0	205.7	**197.1**	189.2
220 t								650.5	578.2	520.4	473.1	433.7	400.3	371.7	346.9	325.2	306.1	289.1	273.9	260.2	247.8	236.5	226.3	**216.8**	208.2
240 t									630.8	567.7	516.1	473.1	436.7	405.5	378.5	354.8	333.9	315.4	298.8	283.8	270.3	258.0	246.8	**236.5**	227.1
260 t										615.0	559.1	512.5	473.1	439.3	410.0	384.4	361.8	341.7	323.7	307.5	292.9	279.5	267.4	**256.3**	246.0
280											602.1	551.9	509.5	473.1	441.5	413.9	389.6	367.9	348.6	331.2	315.4	301.0	288.0	**276.0**	264.9
300												591.3	545.9	506.9	473.1	443.5	417.4	394.2	373.5	354.8	337.9	322.6	308.5	**295.7**	283.8
320													582.2	540.7	504.6	473.1	445.2	420.5	398.4	378.5	360.4	344.1	329.1	**315.4**	302.8
340														574.5	536.2	502.6	473.1	446.8	423.3	402.1	383.0	365.6	349.7	**335.1**	321.7
360															**567.7**	**532.2**	**500.9**	**473.1**	**448.2**	**425.8**	**405.5**	**387.1**	**370.2**	**354.8**	340.6

APPENDIX 1

PLEASE NOTE THAT THE FOLLOWING TEXT IS NOT AN ENDORSEMENT OF A PARTICULAR PRODUCT OR COMPANY – ITS PURPOSE IS TO SUGGEST A METHOD BY WHICH THE HAKE EFFORT REGIME CAN BE MANAGED

Fishing Effort
Data Management System

TABLE OF CONTENTS

Version	Date	Author	Notes
0.1	22/09/2007	Kris Mortensen	Initial draft
0.2	25/09/2007	Kris Mortensen	2nd draft

Purpose

The purpose of Fishing Effort Data Management system (FEDM) is to manage the data provide by fishing vessels landing their catch and which are required for both permit condition compliance and effort management.

Overview

This document briefly describes concepts, principles and basic functionality of the FEDM. These are also applicable to areas of the fishing industry other than Fishing Effort that also require effective, pragmatic and secure data management. FEDM comprises of both an Information Technology (IT) component and the processes and resources required to ensure an effective operation. The IT component is developed and supported by an IT company specialized in data management systems and independent of the fishing industry and related government bodies.

Fishing Effort data

Capture

A record of a fishing trip needs to be recorded within 12 hours of a vessel landing. It is important that the recording of the data is easy and simple to do and yet is reliable and accurate. This caters for the realities of the conditions that exist in the fishing operations environment as well as a standard, auditable interface to the regulatory body.
Upon landing, a vessel needs to provide the pertinent information of its trip. This is done by sending the data to the Data Centre (DC) by SMS or fax. The information received by the data centre will be captured and checked for basic data compliance. An acknowledgement in the form of a reference number will then be sent from the DC to the originator of the landing data, also by SMS or fax. The captured data will then be viewable on the website for verification.
The basic data to be captured comprises of:

- Vessel name and code;
- Permit number;
- Sailing and landing dates;
- Number of sailing days
- Number of fishing days
- Number of pots

Storage

All Fishing Effort data will be stored on a central database. The database will reside in a secure facility with full backup and recovery facilities as well as disaster recovery.

Output

Access to a vessel's data is provided through a Web interface. All data captured, both recent and historical may be viewed.
The effect of FEDM is to provide a real-time management of fishing effort with online status reporting of effort days, warnings (flags) when effort levels are approaching completion of the individual permit holder.
Reports will be made available through the web with simple output and excel graphics showing, for example, performance of individuals related to sector totals

System administration

Access control
Participating fishing companies must register to gain access to the system and will be issued with a user id and initial password. The password must then be changed by the company to prevent unauthorized access to the Fishing Effort data of the company's vessels. At the time of registration a service level agreement (SLA) will be signed between the fishing company and the IT company. The SLA will stipulate, amongst other things, the additional people / organisations that the fishing company will allow access to its data, e.g. industrial body, CMC, Data Centre administrator.

System up time
The system is housed in a secure facility that provides an un-interrupted power supply. The original Fishing Effort notification will remain available at the DC until the data is confirmed captured correctly and backed up. The capture of data is managed by a data capture clerk at the DC and therefore submission of Fishing Effort data will not be adversely affected by any temporary unavailability of the computer system, should that ever happen.

Backup and Disaster recovery
The central database will be backed up on a daily basis in case of system failure. An alternate site will be provisioned in order to continue operation of the system should the main facility befall a disaster.

System overview