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STATUS AND MANAGEMENT OF THE SOUTH AFRICAN SQUID AND WEST COAST ROCK LOBSTER – 2017

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West Coast rock lobster: Status, TAC, Prospects

The global TAC for the West Coast rock lobster resource is managed by an Operational Management Procedure (OMP) approach, similar to the management approach used for the hake, pelagic and South Coast rock lobster resources.

The global TAC is divided amongst different sectors of the fishery (nearshore, offshore, interim relief (to change), recreational), each of which is further divided and allocated to the following super-areas:

Areas 1 and 2 (Port Nolloth and Hondeklipbaai);
Areas 3 and 4 (Lamberts Bay and Elandsbaai);
Areas 5 and 6 (Saldanha Bay Area);
Area 7 (Dassen Island); and
Area 8+ (Cape Point, and east to Gansbaai).

The trend in the WCRL global TAC since 1991/1992 is shown in Figure 1.

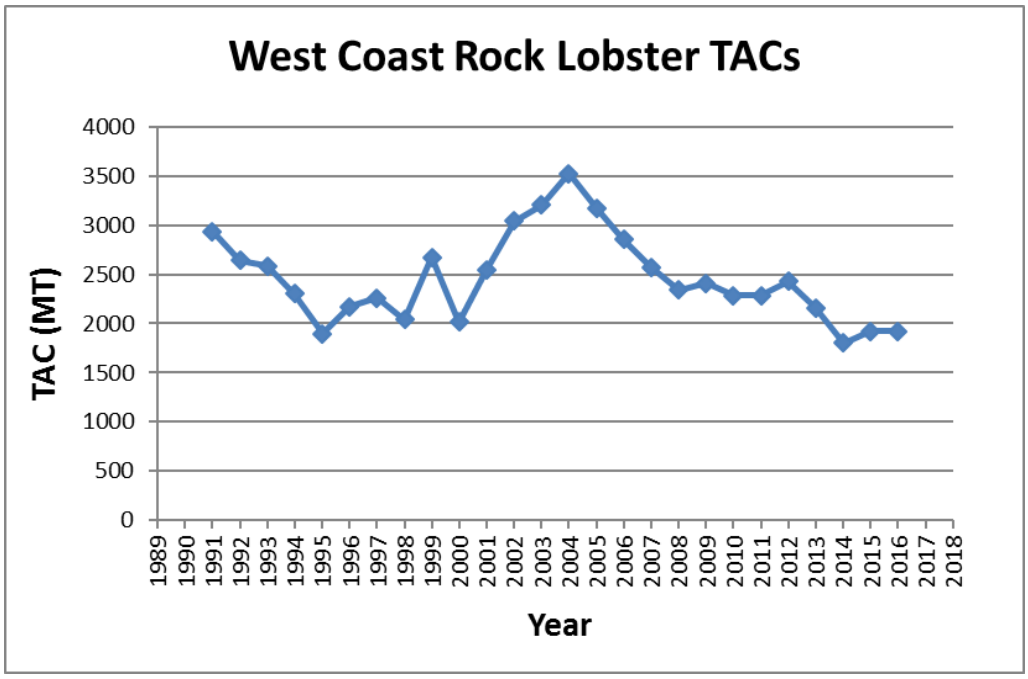


Figure 1. TACs for the West Coast rock lobster resource, 1991/1992 to 2016/2017 fishing seasons. In this plot 1991 refers to the 1991/92 fishing season.

Background to the 2016/2017 TAC

Because of negative resource abundance indices for many areas of the WCRL resource in recent years, and indications that IUU fishing may have reached excessive levels, the TAC recommendations by the scientific working group (SWG) for WCRL were set under exceptional circumstances for the 2016/2017 fishing season, i.e. the OMP formula was not used because the resource had strayed outside the range of options explored during the OMP development process.

As a result of revised assessments for the resource, the following headline points emerged during 2016:

1. The previous resource assessment had been carried out in 2015. At that time the resource biomass was estimated at about 2.5% of the pristine level. The 2016 assessment, using revised poaching scenarios, and new data, suggested the resource was 20% worse off than was estimated in 2015, at approximately 2.0% of pristine.
2. The 2015 assessment estimated that the resource was 7.8% larger in 2014 than in 2006, on track for the 35% rebuilding target. The 2016 assessment suggested that the resource in 2014 was 15% less than it was in 2006, missing the rebuilding pathway by a substantial margin.

3. Projections show that if the TAC is set to zero then the resource does not quite achieve 35% rebuilding by 2021. If the TAC is kept at current levels than the resource biomass will remain at about 15% below the 2006 level, never achieving the 35% rebuilding target.

Some of the important results by super area were:

1. Area 8+, where catches make up the bulk of the annual TAC, is the main problem. The 2016 assessment suggested that the Area 8+ resource biomass declined over the last 5 years from about 8000 MT to 4000 MT. The reason for the decline was partly the elevated levels of poaching which are now assumed in the model, and revised model parameters, mainly recruitment, due to the new data (two more years of CPUE data showing continued declines in this area).
2. Area 5+6 shows strong growth with potential for a good TAC for hoopnets, but caution is needed in interpreting this result because the strong growth referred to is from a low base.

Despite all indications of the need for a sharp and substantial reduction in the TAC for 2016/2017, DAFF surprised everyone and implemented a status quo TAC of 1924.5 MT for 2016/2017.

Background to the 2017/2018 TAC

The key inputs for management each year are

- The commercial catch-per-unit-of-effort (CPUE) data (for hoop nets and traps),
- The Fisheries Independent Monitoring Survey (FIMS) index, and
- The somatic growth rates, derived from mark-recapture information.

In recent years assumptions about and estimates of poaching levels have however begun to dominate the management process and the underlying model calculations.

CPUE

The broad indications for CPUE from data available in mid-2017 are as follows:

- Standardised CPUE indices for hoopnet fishing in Areas 3&4, 5&6 and 8, show, respectively, a 30% increase, no change and a 15% increase, when comparing 2016/2017 to 2015/2016.
- Standardised CPUE indices for trap fishing in Areas 3&4, 7 and 8, show a 35% decrease, a 22% decrease, and a 28% increase, comparing 2016/2017 to 2015/2016.
- Standardised CPUE indices for hoopnet fishing in Areas 1&2 show a 10% increase, comparing 2016/2017 to 2015/2016.

Somatic growth rates

WCRL somatic growth rates are slightly down for the West coast other than Dassen Island and Area 1&2, there is a slight increase at Dassen Island, and no new growth rate data was available for Area 1&2.

Fisheries Independent Monitoring Survey (FIMS)

There were no results available for the Fisheries Independent Monitoring Survey (FIMS).

The main positive opportunity in these data seems to be a possible increase in the allocation for Area 8, although this seems unlikely when the increase over the last two years is viewed as part of a longer declining CPUE series, as shown in Figure 2 below:

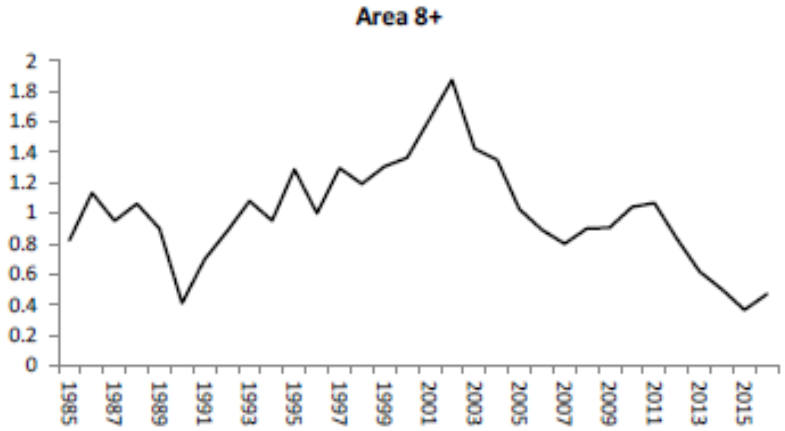


Figure 2. Standardized CPUE index values for Area 8+ of the WCRL resource.

IUU fishing levels (poaching)

The main driver of the 2017/2018 scientific TAC recommendation by the WCRL SWG is the level of poaching of 1475 MT assumed for the period 2012 to 2017, and for the future. This large value of poaching dominates the future performance of the resource as predicted using mathematical models.

The estimates and assumptions about the level of poaching, and trends since 1990, for input into the mathematical models were decided in 2016 by breaking the problem of estimating past and future poaching levels by management area into the following sub-sections:

1. North/South split: An assumption of how poaching is split between Areas 3-7 and Area 8+ (i.e. North vs South)
2. 1990-2008 trend: The trend in poaching from 1990 to 2008
3. 2008 to 2015 trend: The trend in poaching from 2008 to 2015
4. 2015 to 2016 trend: The trend in poaching from 2015 to 2016
5. 2017+ trend: The trend in poaching from 2017 onward
6. Absolute level 2008: The absolute level of poaching in 2008.

The methods and data used in mid-2016 to set the values related to 1-6 above were:

- 1 – 5 were based on trends in the ratio of confiscations to policing effort levels.
- 6 was based on the difference between South African exports and South African landings of lobsters.

Some of these assumptions and the updated data sources were revisited in mid-2017. The WCRL SWG decided that the new data did not provide sufficient grounds to depart from the assumptions and decisions made in 2016 w.r.t. poaching levels.

Management considerations for 2017/2018

TAC

Based on all of the information available at the time that the final scientific deliberations took place, it seems clear that

- The 35% rebuilding strategy for the resource cannot be achieved in the face of a poaching level of 1475 MT. Even were the legal global TAC to be set to zero, the maximum rebuilding level that is possible is 27%.
- That should a status quo TAC of 1924.5 MT remain in place, then the resource will suffer a 15% decline in resource biomass over the planning horizon, which ends in 2021.
- A catch of somewhat less than 1200 MT is estimated as the level that will hold the resource biomass steady without any rebuilding taking place.

It seems therefore that if there is going to be any prospect for resource rebuilding (for the 2016/2017 TAC the WCRL SWG opted for a 7% rebuilding target), then a TAC recommendation substantially less than 1924.5 MT, and even less than the resource biomass stabilising catch of 1200 MT, will be required and is likely to be recommended by DAFF scientists.

This means in effect that the scientific process is likely to implement, for the first time in the history of the fishing, a legal TAC which is smaller than the level of poaching in the fishery. This is a sobering assessment of the state of the fishery, and the capability or lack thereof of the management authorities, who have until now taken a reactive stance to the massive problem with IUU fishing, choosing to reduce the TAC in response to escalating levels of poaching estimates. We have seen the consequences of this process for the commercial sector in the abalone fishery – it is staggering how quickly a similar situation has become the reality for the WCRL resource and fishery.

EFFORT CONTROLS.

For some time now both the industry and DAFF have been interested in the use of effort controls in the fishery. These initiatives have been spurred on by calculations that show that given the number of vessels in the fishery, and given the available fishing days, the TAC could theoretically be harvested many times over. A particularly striking example would be a bakkie in Area 8+ with an allocation of a few hundred kilograms which could be caught in a few days, yet the bakkie has full season access to the resource of more than 6 months.

In response to this, a major sector in the industry developed sea-day limitation proposals, as a voluntary measure, and as a contribution to limiting IUU fishing in the resource. The WCRL SWG on the other hand has proposed shortened seasons which are staggered in time along the coast. These shortened seasons are intended to assist compliance by focussing their efforts spatio-temporally. It is likely that the WCRL SWG will resubmit these proposals for approval by DAFF management, proposals that were put forward for the 2016/2017 season but were not implemented by DAFF.

South Coast rock lobster: Status, TAC, Prospects

Although both based on the exploitation of a spiny rock lobster resource, the economics of the South Coast rock lobster fishery is closer to that of the local hake trawl fishery than it is to the West Coast rock lobster fishery, viewed from the point of view of the capital and cost intensive nature of the fishing. The SCRL fishery is exploited from 9 vessels which range in length from 30 to 40 metres and deploy between 3500 and 6000 plastic traps per vessel. These plastic traps are deployed along a main line roughly 2 km in length and spaced such that each line carries between 150 and 200 traps. A typical set involves the deployment of 20 such lines and the usual configuration is to deploy two sets of 20 lines which are hauled on alternative days with an average soak time of 48 hours. Fishing depth ranges from 100 to 250 metres. Traps are winched collectively by line. Catch rates of in the order of 1 lobster per every three traps per set are typical in this fishery, yielding catch rates in the order of 0.1 kg / trap / pull on a tail weight basis. Crew complements per vessel vary between 25 and 40. The SCRL fishery is therefore a complex and high cost operation where running a vessel above its breakeven point requires careful management of vessel schedules, the selection of fishing locations, and capital financing options.

The South Coast rock lobster (SCRL) fishery is managed by a combination of input and output controls. The output control is a Total Allowable Catch (TAC) and IQs (Individual Quotas), and the input control is a Total Allowable Effort (TAE) which is a limitation on the number of fishing days. The TAC is the primary control measure. The TAE, based on a fishing day allocation, is a secondary measure. Up until the 2015/2016 fishing season, the TAE was designed to be an active constraint on the fishery roughly 1 in 20 years. An important development during 2015 was a revision of the effort controls (TAE) used in the management of the fishery. Up to 2014 the TAE was set on the basis of a 1:40, pool out basis. This means that the effort control, expressed as fishing days, was at a level of "tightness" that only in one year out of 40 would the industry have difficulty landing their TAC, because effort levels were too low. The pool out aspect means that a 10% buffer of fishing days

would be held in reserve to assist worthy applicants with additional extra-ordinary effort. This pool amount is added on to the basic 1:40 years calculated number of fishing days. During 2015 as a result of an initiative by DAFF and an agreement between DAFF and the South Coast Rock Lobster Industry Association, the basis for the TAE was tightened to a level of 1:20 "Pool-In", where the pool of 10% is subtracted from the basic number of fishing days calculated.

The TAC for the fishery is being managed by means of an OMP in which the TAC is capped at 450 MT, and with an objective to rebuild the spawning biomass by 30% over the period 2006/07 to 2025/26, an increase in the rebuilding amount of 20% used in the previous OMP.

The following data are used in the management of the resource:

- Catch-per-unit-effort – measured as kg tails per trap set
- Catch-at-length data
- Tagging data

Figure 2 shows the TACs since the 1989/1990 fishing season, and up to the 2016/2017 fishing season.

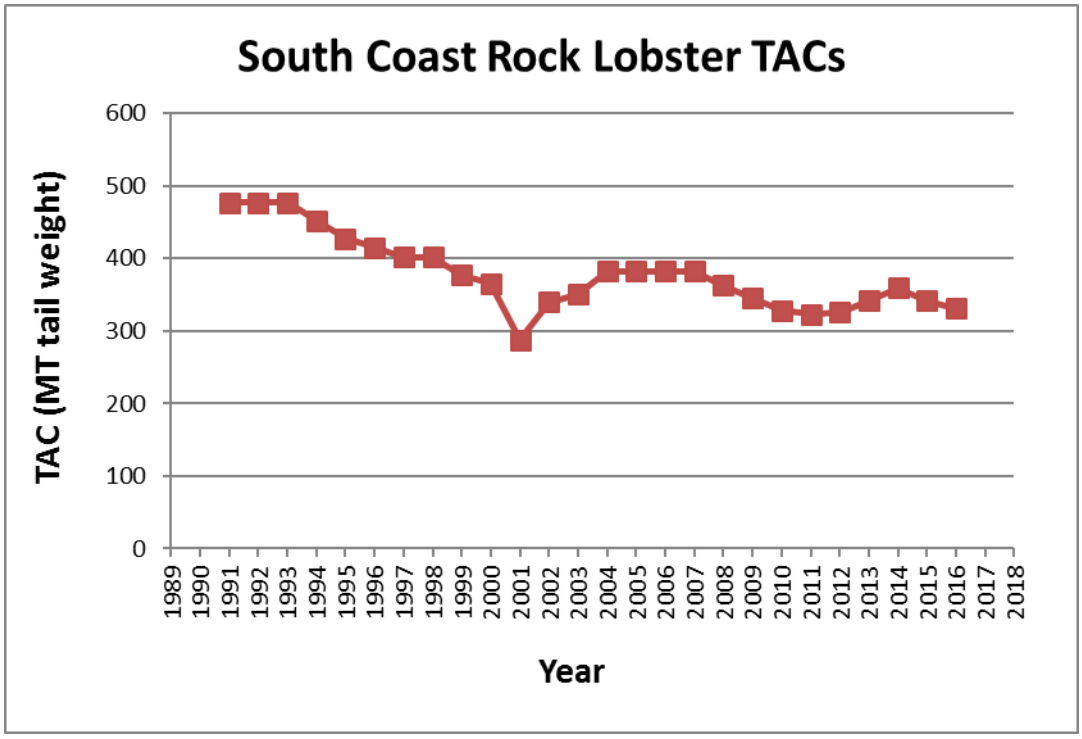


Figure 2. TACs in the South Coast rock lobster fishery 1989/90 – 2016/17.

Summary of recent TAC decisions

2014/2015: Based on its fishing experience during the 2013/2014 fishing season, in July 2014 an automatic 5% increase in the TAC for the 2014/2015 fishing season was considered as an option in the revised OMP formula. This measure was agreed to at the relevant SWG SCRL meeting in 2014, and resulted in a TAC for 2014/2015 of 359 MT.

2015/2016: Given the increase in 2014/2015, a 5% TAC reduction became very likely for the 2015/2016 season, and this was the final outcome of the scientific deliberations during 2015. The TAC for 2015/2016 was 342 MT tail weight.

2016/2017: The TAC for the 2016 / 2017 fishing season was reliant on recent trends in CPUE in the three statistical areas that are used for collating data on the performance of the resource, Areas 1E, 1W and 2+3. The data showed that in Areas 1E and 1W the CPUE in 2014/2015 was slightly better than in 2013/2014. However, in Area 2+3 the CPUE in 2014/2015 suffered an 8% reduction. Area 2+3 is the most important CPUE in the overall TAC calculation since it is estimated to contain the

overwhelming bulk of the resource biomass. Due as well to the selection of the 359 MT TAC for the 2014/2015 fishing season, there was a negative adjustment in the TAC for 2016/2017 to 331 MT.

TAC for the forthcoming season: 2017/2018

The standardised CPUE indices up to 2015/16, as split into the three statistical area 1E, 1W and 2+3 show that the CPUE has decreased by less in 1E and 1W than was anticipated based on early intelligence of CPUE trends, and the decrease in 2+3 was more than expected. Since 2+3 dominates the OMP formula, the dominant feature is the larger than expected decline in CPUE in that area. This has implications for the 2017/2018 TAC. Calculations suggest that a small increase of a few percentage points (less than 3%) will occur for the TAC for 2017/2018 compared to 2016/2017. The reason that the TAC will increase despite a decline in the CPUE is because the OMP is based on the three-year running mean CPUE. The value for 2012/2013, which has a low CPUE value, falls out of the average, which for the 2017/2018 season is based on results for 2013/2014, 2014/2015 and 2015/2016. This leads to an increase in the running mean CPUE in 2017 compared to 2016.

Revision of the OMP for the South Coast rock lobster resource

The OMP for the SCRL resource is due to be revised so that a new formula will be used to set the 2018/2019 TAC. The revision of the OMP is normally an 18 month process so that in reality the revision process is already under way, given that the a TAC decision will be required in August 2018.

Some new features may appear in this revised OMP. For example, during 2016, proposals were tabled to introduce a so-called exceptional circumstances rule for the TAC in which under certain circumstances the TAC can be reduced by more than 5%. The proposal is that a reduction from a sliding scale of between 5% and 20% will be implemented whenever the mean CPUE over the last three years falls between two limit values, values it should be noted which are considerably lower than current levels. The main issue for consideration under this item is the role that the tightened effort control proposal plays, and whether and to what extent the nature of the sliding scale can be ameliorated when this aspect is factored into the simulation studies used to test the exceptional circumstances rule.

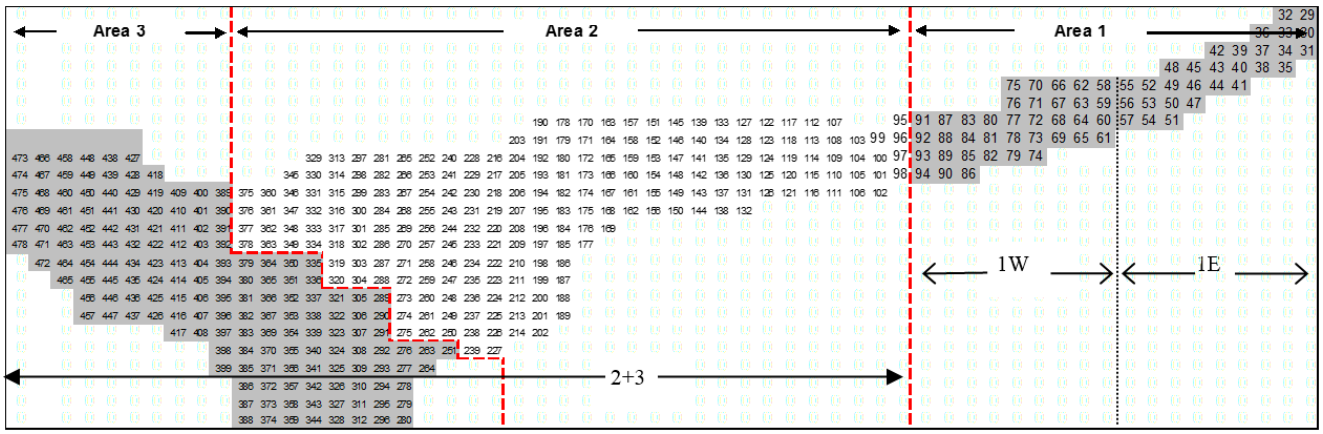


Figure 3. The fishing grounds showing the statistical areas that are used in the formulation of scientific advice for resource management, South Coast rock lobster resource.

Squid jigging industry

The fishery is an effort controlled fishery, where effort is managed by a combination of vessel and crew allocation permits and closed seasons. A safe effort level is estimated for the resource on the basis of mathematical models which make use of the following data:

- jig catch data
- trawl catch data
- jig CPUE data
- trawl CPUE data

- spring survey biomass index from demersal trawl surveys
- autumn survey biomass index from demersal trawl surveys

The management of the resource was reviewed at an international workshop held at the University of Cape Town in 2012. Some of the scenarios submitted to this meeting suggested that there was very limited scope for increasing effort in the fishery. Since that time the catch rates in the fishery have declined, particularly in 2012 and 2013, and given the constant effort nature of the fishery, catches in 2012 and 2013 were substantially reduced compared to the period 2002 to 2011. As a result additional closed seasons were recommended for the 2014 fishing season.

The following is a summary of important milestones in the fishery:

- Total effort in the fishery rose between the period 1995 to 2010, even though the number of crew permits in the fishery remained essentially unchanged and the number of vessels was reduced. The catch rates peaked in the period 2008 and 2009 as did effort levels despite the existence of an additional closed season of 6 weeks duration in 2008, 2009 and 2010.
- Thereafter, from 2010 to 2013, catch rates declined to a low point, it seems likely that the recorded CPUE understates the extent of the overall decline in resource abundance. It does seem based on this sequence of events that the level that the effort reached reduced the recruitment reproductive capacity of the resource and that this caused the reduction in CPUE levels. The mathematical models do, for example, interpret the sequence of events as being due to a reduction in recruitment.
- Similarly low recruitment levels have been experienced in the fishery before, according to the mathematical models, but coincident with such high effort levels. The combination of the two caused the beginning year biomass in 2012 to be the lowest on record, and 2013 was only slightly larger. This led to very poor economic performance in the fishery.

The mathematical models of the resource suggest that the effort level in 2010 was 15%-20% higher than would produce an acceptable biological risk in the 2022 resource biomass - acceptable biological risk is defined as a 5% chance that the 2022 resource biomass will be less than 20% of the pristine resource biomass. The advisability of this measure of biological risk is of course debateable, any appraisal needs to recognise the semi-arbitrary nature of this risk measure. Nevertheless this has been used to drive the various proposals tabled at the squid SWG for effort reductions in the fishery. Two approaches to reduce effort were considered:

- **Reduce crew permits only:** One was to eliminate vessels which had previously underutlilised their opportunities (i.e. days at sea) in the fishery. Under this approach the required 15 - 20% reduction in effort (to 250 000 man days) is achieved when the total number of crew permits are reduced by 57%. This calculation assumes that the vessels which remain in the fishery utilise an average number of fishing days as typical for each vessel in recent years.
- **Introduce an additional 4 month closed season, reduce crew permits slightly:** Another approach considered to achieve the 250 000 man days was to declare an additional 4 month long closed season, coupled with eliminating vessels which previously underutilised the time available for fishing. Under this approach the number of crew permits are reduced by about 7.6% from 2422 to 2238 crew permits by eliminating vessels that have underutilised seadays in the past. This calculation assumes that the remaining vessel do not increase their seaday usage per month beyond what was typical in recent years for the remaining open period of fishing.

Managers have for many years been concerned about the management of effort in the fishery, since data suggests that a large number of the 136 vessels in the fishery utilise far fewer than the available seadays. The effort that these vessels could use is known as latent effort. Without any additional closed seasons the full utilisation of this latent effort could theoretically double the amount of effort used, although the reality of trip turnaround times puts constraints on the maximum the effort can reach at less than double, but nevertheless above a safe effort level. As a result the proponents of the effort reduction options in the previous paragraph also proposed that effort permitted per vessel be capped at each vessel's historic effort level, suggesting that this could be monitored by VMS. The reality of latent effort is however strongly contested by industry representatives, they suggest that the data are either incorrect and/or that the majority of vessels are already turning trips around at close to the maximum level. In contradiction to this view, there were no significant reductions in fishing effort levels when additional closed seasons were declared in the past. Note that the actual catch and effort records for the 2014 and 2015 seasons provide an opportunity to verify or refute these positions. At the time of writing the 2014 effort data were not available and/or their acquisition fell outside the scope of this document.

The final management recommendations for 2014 and 2015 retained crew permits at 2422 and instituted an additional three month closed season instead of four months. No vessel specific effort caps were imposed. On paper, this amounts to far less than the desired reduction in effort. Calculations presented in this document indicate that the net effect of this measure is very little, if any, reduction in effort. The best available science predicts that as a consequence of these watered-down measures there will be a larger than 5% frequency of resource biomass falling below 20% of pristine.

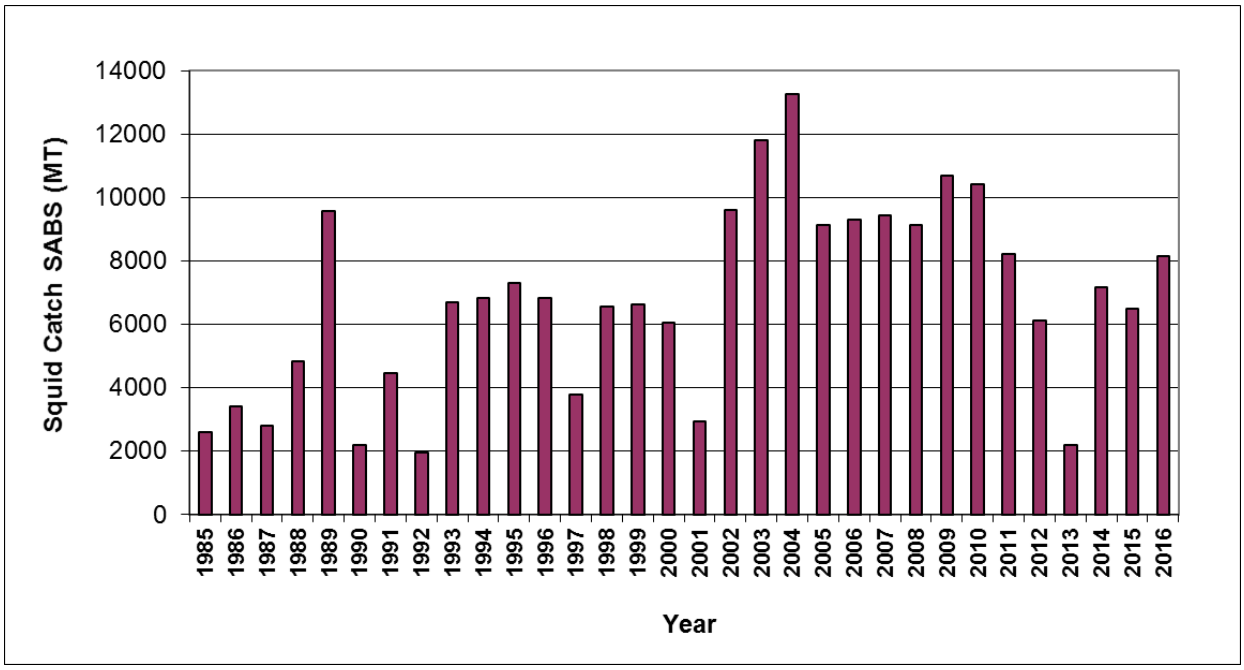


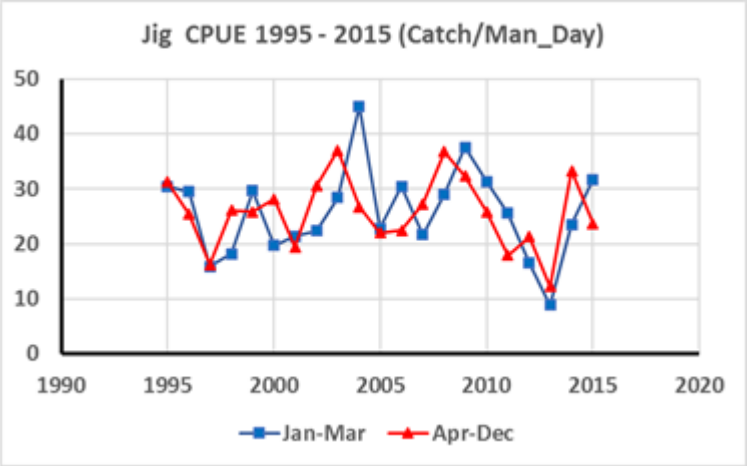
Figure 5. Catches in the squid jigging fishery 1985 to 2015.

Table 1. Table of effort controls and closed seasons for the squid jigging fishery.

Year	Effort Controls	Closed Season
2005	2423 unrestricted crew, 22 restricted crew	5 weeks Oct / Nov
2006	2423 crew or 138 vessels	5 weeks Oct / Nov
2007	2422 crew or 138 vessels	5 weeks Oct / Nov
2008	2422 crew or 136 vessels	5 weeks Oct / Nov + 6 weeks
2009	2422 crew or 136 vessels	5 weeks Oct / Nov + 6 weeks
2010	2422 crew or 136 vessels	5 weeks Oct / Nov + 6 weeks
2011	2422 crew or 136 vessels	5 weeks Oct / Nov
2012	2422 crew or 136 vessels	5 weeks Oct / Nov
2013	2422 crew or 136 vessels	5 weeks Oct / Nov
2014	2422 crew or 136 vessels	April, May, June + 5 weeks Oct / Nov
2015	2422 crew or 136 vessels	April, May, June + 5 weeks Oct / Nov
2016		April, May, June + 5 weeks Oct / Nov
2017		April, May, June + 5 weeks Oct / Nov

Updated assessment results, 2016

In 2016, for the first time since 2013 updated stock assessment results were produced for squid (FISHERIES/2016/OCT/SWG-SQ/25). The main conclusion from this work was that effort in the fishery be maintained at 250 000 man-days. This work also reported jig CPUE indices for a core set of vessels that are used in the scientific process. These are shown below, and they indicate a period of reduced CPUE levels since 2010 compared to the decade prior to 2010.



Abundance levels for 2014 and 2015 derived from demersal research cruises are also reduced compared to the average for the period 2000 – 2010.