Cooperative management in the Queensland Finfish (Stout Whiting) Trawl Fishery

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1. INTRODUCTION

The Queensland finfish (stout whiting) trawl fishery is a demersal otter-trawl fishery. The fishery harvests stout whiting (*Sillago robusta*) (Photo 1) and permitted byproduct species off southern Queensland, from Sandy Cape on Fraser Island south to the city of Caloundra. The fishery is the only fishery in Queensland, and one of few in Australia, that is managed under cooperative management arrangements. Management of the fishery is undertaken via a combination of voluntary agreements, permits and legislation.

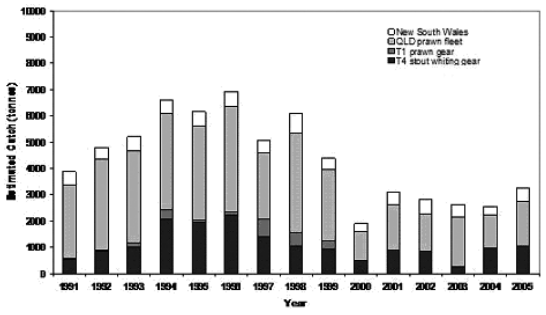
Stout whiting is an offshore whiting found on sandy bottoms across the northern states and territories of Australia from New South Wales on the east coast, through Queensland, around the Northern Territory and along the whole Western Australian west coast. It is a deepwater species and rarely exceeds 230 mm in length (generally about 170 mm). The fishery also takes small amounts of a similar species, red spot whiting (*Sillago flindersi*) (QFMA, 2000). Table 1 summarizes the major features of this fishery.

PHOTO 1
*Stout whiting (*Sillago robusta*)*

TABLE 1
Fishery profile

Total harvest of all species: approximately 1 167 t (in 2005)
Queensland stout whiting fishery harvest: 1 130 t (in 2005)
Recreational harvest: no estimate available but considered negligible.
Indigenous harvest: no estimate available but considered negligible.
Commercial Gross Value of Production (GVP): approximately A$2.5 million
Number of licences: five
Commercial boats accessing the fishery: five
Fishery season: 1 April – 31 December (excluding 20 September – 1 November)

FIGURE 1
Estimated total commercial catch of stout whiting



Stout whiting form fairly dense feeding schools on sandy bottoms but can also scatter more loosely. There is some evidence that juveniles congregate in inshore waters and move into deeper water as they mature. Most females reach sexual maturity at about 145 mm or at one year of age. The major spawning events occur during the spring and summer months between September and March.

The total estimated commercial catch of stout whiting from this stock in 2005 was around 3 000 tonnes (Figure 1). This figure is based on total stout whiting landings from logbook data in the fishery, an estimated total weight of stout whiting bycatch by the Queensland prawn fleet, and an estimated stout whiting harvest by the New South Wales prawn trawl fleet. Of this, 1 130 tonnes were caught and retained by the stout whiting fleet.

2. HISTORY OF THE FISHERY

The fishery was established in 1981 on the south coast of Queensland. One operator fished for red spot whiting (*Sillago flindersi)* and progressively moved to target stout whiting (*Sillago robusta)* as exploration of new grounds provided evidence that a commercial fishery existed for this species. The fish were marketed at a relatively stable price of A$1.80/kg when the fishery commenced. Two more boats entered the fishery to satisfy demand. The product was sorted in a land-based factory and sold in 10 kg layered, frozen packs (QFMA, 2000).

At the same time, significant catch was taken as bycatch in the east coast otter-trawl fishery (ECOTF), which targets prawns and scallops. By 1984, up to 1 000 kg a day of stout whiting were being taken by prawn trawlers. The quality of this product did not satisfy market standards and with the entry of Thailand as a supplier into the market with a lower-priced product, the participation in this fishery shrank to the one original operator. This single operator continued in the fishery and up-graded equipment and fishing practices. This included using a large freezer with "snap" freezing capability and specialised hopper and conveyor equipment for at-sea sorting of the catch, which is a feature of the fishery today (Photo 2).

PHOTO 2
Catch after removal from hopper

The fishery underwent rapid expansion between 1989 and 1990 with more than ten boats reported being involved and landings of 1 789 tonnes of stout whiting in 1990. The market collapsed in 1991, which resulted in significant volumes of unsold catch and led to a consequent reduction in fishing effort. Since that time, the market has recovered and catches today average around 1 000 tonnes a year.

FIGURE 2
Area of the Fishery

3. HISTORICAL MANAGEMENT OF THE FISHERY

The fishery originated as a developmental fishery in the 1980s, when there was essentially open access to all of Queensland's commercial fisheries. The fishery was restructured in 1991 as a limited entry, developmental, fish-trawling fishery in the area between 20 and 50 fathoms between Caloundra and Sandy Cape. This fishery area continues today (Figure 2).

The licensing structure was refined under Queensland law with the introduction of the *Fisheries Act 1994* and the *Fisheries Regulation 1995*. The fishery moved from a developmental status to an established fishery with a specific finfish (T4) fishery symbol. Five commercial fishing licences received a T4 fishery symbol. Two of the licences were originally owned by one operator, which meant that there were four licence holders in the fishery (including two brothers). In late 2006 an existing licence holder bought one of the licences that came up for sale. For the 2007 season there are now two operators who own two licences; the two brothers own three of the five licences in the fishery. A fishing licence costs approximately $A5 000.

The new regulations prescribed the gear that can be used, the area and time of operation, and the two species that could be taken (stout and red spot whiting). At this same time, the original four participants in the fishery entered into a memorandum of understanding (MOU) with the Queensland Government. The agreement included a commitment to work together to monitor and assess that fishery and to develop new management arrangements where necessary. The MOU was used as a basis for cooperative management, particularly in the setting of a total allowable catch (TAC) (QFMA, 2000). Licences have changed hands three times since that original agreement. Each time the new licence holder has agreed with the spirit of the MOU and abided by agreements reached between government and other licence holders.

4. CURRENT MANAGEMENT ARRANGEMENTS

4.1 Limited entry

Queensland now has limited entry rules for all commercial fisheries in acknowledgment that existing Queensland commercial fisheries are considered to be fully exploited. Participation in the fishery is only possible by purchasing one of the five T4 fishery symbols and attaching that symbol to a primary commercial fishing boat licence.

4.2 Seasonal closures

The T4 fishing season is restricted (Sch. 14, Sec. 5, *Fisheries Regulation 1995*) to nine months between April and December by law. This four-month summer closure was implemented in the early stages of the fishery's development, when it was thought that January to April represented the major spawning season for stout whiting. Since that time, fisheries biologists have identified that the gonado-somatic index for both male and female stout whiting peaks between August and October, which indicates greater spawning activity during those months (O'Neill *et al.*, 2003). The current closure does, however, continue to have benefits for spawning, even though the ECOTF continues to operate over the stout whiting grounds during the closure.

In 1999, a new southern closure was introduced in the ECOTF for all waters south of latitude 22 °S between 20 September and 1 November each year (Sec. 11, *Fisheries [East Coast Trawl] Management Plan 1999)*. This covers the entire area of the stout whiting fishery. While this closure does not apply in law to the stout whiting fishery, the stout whiting licence holders have agreed not to work during the ECOTF closure to minimize conflict with the ECOTF licence holders. It is likely that as a result of stout whiting fishers voluntarily 'sitting out' the ECOTF southern closure, stout whiting are provided with a significant benefit in terms of spawning protection.

4.3 Fishery area

Operators are restricted to fishing only in the stout whiting fishery area. This area is defined in legislation as the area between the 20 and 50 fathom depth contours from Sandy Cape (northern tip of Fraser Island) to Caloundra (Sch. 14, Sec. 2, *Fisheries Regulation 1995)* (See Figure 2.) The stock is afforded protection insofar that juvenile stout whiting inhabit shallower waters outside of the permitted fishery area, which therefore reduces the level of fishing mortality on juvenile stout whiting.

In addition to the protection that the inshore boundary of the fishing area provides, adult stout whiting are also found in large quantities both north and south of the fishery area. Genetic analysis has shown that stout whiting from Bustard Head (near Gladstone) to the north and the northern waters of the state of New South Wales to the south are likely to be a single stock (Ovenden and Butcher, 1999).

There is only one spatial closure within the T4 fishery area. This closure was introduced in late 2003 for the protection of a key aggregation site for grey nurse sharks (*Carcharias taurus*) (Sch. 2, Sec. 40F, *Fisheries Regulation 1995).*

4.4 Gear restrictions

While the voluntary TAC (an output control) is the major form of management, there are also a number of input controls relevant to the T4 fishery in the form of gear restrictions. Total net length (combined head rope and foot rope) is restricted to a length of 88 m (Sch. 14, Sec. 4[2], *Fisheries Regulation 1995)*. This is the same overall size as is permitted in the ECOTF. In contrast to the ECOTF, the stout whiting licence holders are allowed to employ long sweeps to herd the target species into the net. Sweeps are restricted to a maximum length of 128 m each (Sch. 14, Sec. 4[4], *Fisheries Regulation 1995)*. Mesh size is also regulated, with a minimum requirement of 38 mm and a maximum mesh size of 60 mm (Sch. 14, Sec. 4[2], *Fisheries Regulation 1995)*. This mesh size also matches that applicable to most of the prawn fishery.

In late 2006, one licence holder was issued a permit to test modified Danish seine gear (see AFMA, 2007), using the existing trawl net and sweeps without otter boards. Under the permit, each warp of the seine was limited to a maximum of 2 500 m. The trial proved a success. Initial results showed greater selectivity for the target species, which led to greater productivity during sorting and increased product quality as a result of reduced bycatch. Some cost savings from reduced fuel use were also observed.

TABLE 2
Permitted byproduct species

Common name	Species name	Quantity
Pinkies	Family Nemipteridae	41 box* trip limit
Octopus	*Octopus* sp.	20 boxes* trip limit
Cuttlefish	*Metasepia* sp. and *Sepia* spp.	52 boxes* trip limit
Squid	*Loliolus* sp., *Notodarus* spp., *Photololigo* spp. and *Sepioteuthis* spp.	52 boxes* trip limit
Balmain bugs	*Ibacus* spp.	No limit, but 10 cm minimum carapace width
Moreton Bay bugs	*Thenus* spp.	No limit, but 7.5 cm minimum carapace width

* Refers to the standard '5 kg' box, which may hold more than 5 kg of product.

The permit has been extended for the whole 2007 fishing season in order to assess its performance throughout the year.

Turtle excluder devices (TEDs) have been introduced incrementally throughout the various trawl fisheries of Queensland since 1999. Initial concerns were raised over logistical difficulties in installing and using TEDs when targeting stout whiting. However, TED trials have been undertaken during recent years, allowing some initial issues with gear modification to be resolved. Commercial fishers operating in the fishery are now required as part of their licence condition to have a TED fitted to their nets when operating in the fishery.

4.5 Permitted species

Under the *Fisheries Regulation 1995*, stout whiting fishers are permitted to retain stout whiting and red spot whiting. The vast majority of catch is made up of stout whiting and this forms the basis of the fishery assessment. However, since 2002, T4 licence holders have been granted permits to enable them to be able to retain additional species that are taken incidentally while targeting stout whiting. These permits allow trip limits for a number of species (see Table 2). Permits are issued annually and only vary slightly from year-to-year, as operators generally seek standard species and trip limits.

When the fishery first commenced operators would routinely retain any species they caught for which they had a market. With increasing pressures to demonstrate sustainable fishing practices, and with a government desire to stop the fishery from becoming a multi-species target fishery, operators were asked to restrict their catch to those species prescribed under law (i.e. stout and red spot whiting) in 1999.

The introduction in 2002 of the permit to retain other species that are part of the genuine bycatch from targeting stout whiting came about through discussions between managers, scientists and operators. Operators successfully argued that some species were a genuine incidental catch and that their return to the water was a waste of what could be a valuable resource.

4.6 Bycatch of stout whiting in other fisheries

Stout whiting is also taken by a number of prawn trawl operators from New South Wales where they fish part of the same stock. Prior to 2000, these fish were also retained in the ECOTF. However, since 2000, participants in the ECOTF have not been permitted to retain stout whiting as by-product to their prawn trawl operations and it now makes up part of the discarded bycatch in that fishery. Bycatch of stout whiting has been declining in the ECOTF in recent years as a result of fewer participants in the fishery (down from approximately 850 licences in 1999 to approximately 450 in 2006) and the introduction of bycatch reduction devices. Both appear to have had a positive impact on the stout whiting biomass.

5. VOLUNTARY TOTAL ALLOWABLE CATCH

5.1 Stock assessment

The harvest is managed via a voluntary TAC for the coming season. In previous years, the TAC was determined after completion of an annual stock assessment. In January 2007, fisheries managers, researchers, and operators agreed to use a new, simplified framework for setting the 2007 T4 stout whiting quota. Under the new arrangements, a full stock assessment will be undertaken every five years.

The methods used in the stock assessments have varied as the knowledge of the stock and modelling expertise has developed. In years prior to 2003, assessments relied upon time dynamic models, such as a virtual population analysis (VPA) and the surplus production model (SPM). In 2003, a statistical catch-at-age model was employed. While this model is not dissimilar to the VPA, it uses a far greater range of fishery parameters. It also analysed the stock status on a monthly basis, which provided a more robust assessment of the exploitable population. The model and fishery parameters are described more fully in O'Neill *et al.* (2003). This dynamic catch-at-age model fed into a Management Strategy Evaluation (MSE) that helped set the TAC.

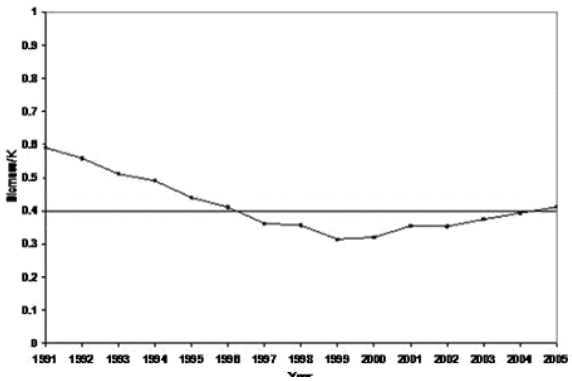
The stock assessment models infer stock status by using the age of fish that are being exploited from year to year. The age structure of the fished population is estimated using length-at-age information that is collected from samples of stout whiting supplied by the licence holders. Catch-per-unit effort is recorded for each of the five boats on an hourly basis and standardised according to the individual boat, skipper, the type and size of net employed, lunar phase, region, and other factors that can influence the catching ability of a boat. Licence holders have agreed to provide this level of detail to ensure that the stock assessments are as robust as possible.

Licence holders play a vital role in the provision of this data. The collection, processing, and analysis of the fish samples are also funded through the licence fees paid by fishers. This licence fee (A$5 000) was originally stipulated through the MOU and was designed to fully fund the annual stock assessment work. This fee has been formalised more recently through a review of the all Queensland licences and fees to ensure fees are based on property rights and it is now contained within the *Fisheries Regulation 1995*.

The Queensland Government has also introduced independent fisheries observers into the fishery to help collect more detailed information and to validate the information that operators supply through logbooks. Licence holders voluntarily provide random catch samples to the Department's Long Term Monitoring Program for age analysis.

The last stock assessment in 2006, based on 2005 data, showed the fishery biomass continuing to recover from a low in 1999 (Figure 3). Current estimates place the stock at greater that 40 percent of virgin biomass, which is the limit reference point for the fishery. While there has been no timeframe set, the objective is to maintain this fishery at a level allowing maximum sustainable yield (MSY).

FIGURE 3
Stout whiting estimated biomass ratio for 1991–2005 (K= estimated virgin biomass)



5.2 Setting the TAC

The TAC for the fishery is a voluntary management arrangement. This is a reflection of the professional relationship that exists between licence holders and managers and research staff from the Queensland Department of Primary Industries and Fisheries (DPI&F).

The new framework, the Total Allowable Catch Table (TACT), is a system that specifies

annually adjustments to the quota based on the changes in standardised catch-rates and fish catch-at-age frequencies (catch curves). The TACT has a matrix of these two variables that triggers an adjustment to the previous year's TAC. When CPUE rates are in the upper 25 percent of the historic distribution of these rates, the TACT recommends adjusting the TAC upward. When the CPUE is in the lower 25 percent of the historic distribution of catch rates, the TACT recommends adjusting the TAC downwardsWhen fishing mortality is low, the population age distribution is skewed toward older fish and the TAC is adjusted upward as indicated by the TCAT. When fishing mortality is high, the population distribution is skewed toward younger fish and the management recommendation is to reduce the TAC. The TACT will recommended an adjustment to either (a) keep the TAC the same, (b) increase the TAC by 50 or 100 t or (c), decrease the TAC by 50 or 100 t. Table 3 shows the exact interaction of the two parameters.

TABLE 3
Total allowable catch table (TACT)

Age structure Z (slope)[1]	Standardized catch rate (percentile) > 75 percentile	25–-75 percentile	<25 percentile
Low[2]	+100T	50T	0
Between	+50T	0	-50T
High[3]	0	-50T	-100T

[1] The low and high thresholds for Z are based on relationship 1.5*M
[2] $M = 0.55$
[3] M=0.7; low threshold = 0.825, high threshold = 1.05.

The TAC for each season is discussed in or around March each year via a joint industry and DPI&F meeting. Licence holders play an active role in providing information for the stock assessment and anecdotal information on the fishery performance. At this meeting, stock assessment modellers and fisheries biologists explain the data and the recommendations of the TACT to the fishers and fishery managers. This is followed by open discussion about the applicability of the TACT results, which includes discussion of real and perceived weaknesses in the data upon which it relied. The sometimes-difficult discussion has always resulted in an agreement regarding the TAC to be adopted for the coming season. Negotiations regarding the TAC do not follow any particular or pre-defined format, but vary according to the results of the stock assessment, the TACT, and the data that was obtained during the preceding season. Through ongoing involvement in this process, the licence holders have had significant exposure to stock assessment results and are now able to adopt an informed, precautionary attitude towards the setting of the annual TAC.

Once agreed, the TAC is evenly divided among the five licences. An equal division of the quota was a feature of the original agreement between operators in the mid-1990s. The agreed allocation was in recognition of equal licence fees paid by each licence holder and the similar catch levels between each operation at the time.

For 2007, the agreed TAC was 1 250 tonnes or 250 tonnes a boat, which was a 50-tonne increase recommended by the TACT over the previous season's 1 200 tonnes. The DPI&F monitors the total catch throughout the fishing year. Most years there is some underfishing or overfishing of quota by individuals, but this, to date, has not resulted in the TAC being exceeded. Total catches are reported to the public in an annual status report each year and operators are aware of other participants' catch totals through the season by sharing information with each other. If the TAC were to be exceeded in a given year, all operators are aware that the flexibility afforded through cooperative management arrangements would be put at risk and that the DPI&F may need to take a more prescriptive approach to ensure sustainable fishing practices.

In the past, quota has only been traded on a limited basis in private agreements between two licence holders without the DPI&F knowledge. In late 2006 one of the existing licence holders bought another of the five licences in the fishery and requested that the catch quota from that licence be amalgamated into their existing licence effectively resulting in 4 boats working in the fishery. This prompted calls from all licence holders to have more transparent arrangements for quota trading. From 2007, licence holders agreed that quota would be included as a licence condition to allow for

the tracking of quota as it is traded privately between the five licence holders. The initial 2007 quota for each licence will be written as a licence condition by the DPI&F and those conditions could then be amended through an agreement between the operators who trade quota. Only a minimal transaction fee is charged for each amendment of a licence to reflect the quota trading. Operators agreed to this approach in an attempt to use the whole TAC in the 2007 year. Operators believed this was important, as in previous years each boat would start fishing but inevitably some boats failed to catch their quota within the prescribed season due to weather, breakdowns or opportunities presenting themselves in other fisheries.

6. OTHER INDUSTRY SELF-GOVERNANCE STEPS

For this fishery, the DPI&F has used a regulatory approach to implement a basic management framework for fishery management measures. In recognition of the small size of the fishery and the cooperative relationships forged by licence holders, researchers and fishery managers, a more flexible approach has been taken with some finer scale management arrangements. An industry meeting is held a few weeks before the start of each season with all licence holders, scientists and managers present. A review of the previous season occurs and views are expressed and debated about stock status and management arrangements. Agreements are made at this meeting and a record of those agreements maintained by the DPI&F fisheries managers.

Consequently, management of this fishery is split between a basic regulatory framework and a range of voluntary arrangements that are agreed to by managers, industry participants and researchers. Table 4 lists those management controls and their nature.

The fishery was granted a wildlife trade operation (WTO) approval in November 2004 under Australian Government environmental legislation on the basis of existing management arrangements and cooperative agreements. This accreditation acknowledges that the fishery is being managed in an ecologically sustainable manner and allows the export of the catch. Under Australian law, all fisheries require WTO approval in order to export product. Upon approval, the DPI&F produced a sticker (Photo 3) to help fishery participants to market their product. In some instances, operators cooperate in marketing their catch to meet the needs of specific buyers or markets. But each operator has developed different markets and processing varies between vessels from frozen blocks of fish to individually quick frozen (IQF) whiting.

The cooperative approach to management by industry enables it to experiment with adjustments to the regulatory framework. At the annual meeting of industry and the DPI&F in February 2007, three new initiatives (i.e. quota trading, Danish seine gear and access to new fishing grounds) were agreed to be tested and evaluated. One of these, the new quota-trading system was described above.

The trial of Danish seine fishing gear will continue in 2007 after the initial trial in 2006. The gear, which uses the same basic net and sweeps but a warp line of up to 2500 m to shoot the net, appears to have many environmental and economic benefits

TABLE 4
Summary of management arrangements

Regulatory	Voluntary, through permit or as a licence condition
Fishery area	Annual TAC
Season closure (December - March)	Quota sharing
Gear restrictions	Voluntary seasonal closure (September – October) to mirror the East Coast Otter Trawl Fishery southern closure.
Limited entry	By-product species and trip limits
Spatial closure for grey nurse shark	Turtle Excluder Devices (TEDs)
Licence fees	

PHOTO 3
Sticker produced by DPI&F

over the otter-trawl fishing method. These include reduced benthic impacts, reduced bycatch, reduced fuel usage and improved product quality.

Stout whiting licence holders are also seeking access to areas south of the prescribed fishery area, where they believe a large biomass may be available. In the past, this area has been restricted to stout whiting operators as a result of conflict with the ECOTF and because of sustainability concerns about the possible bycatch of snapper (*Pagrus auratus*) by stout whiting operators. However, licence holders have been flexible with the types of conditions they would apply to their operations to minimise any risks to snapper and to reduce the potential for conflict with the prawn fleet off the Gold Coast. These concessions will assist licence holders in negotiating with other users of the area and in gaining approval for access.

7. EVALUATION

The co-management approach ensures a sustainable fishery, while also giving operators greater flexibility than would be available in similar trawl fisheries in Queensland or elsewhere. This flexibility allows for more rapid change over time, which has resulted in a more adaptive system. The parties involved have expressed their desire to continue the flexible arrangements and have acknowledged the important role they all play in the management of the fishery. The introduction of the new TACT system in 2007 has received support from licence holders, who have recognized its potential to stabilise catch in the fishery and to provide to greater certainty in the annual TAC.

All fishermen involved in the fishery have said in the past that they want to keep the flexibility that exists with the current management arrangements. Their relationship with Government has varied depending on the issues being negotiated and the personalities of those involved. For now, the relationship between the industry and management is considered to be constructive.

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