

# **Observer study in the Estuary General sea garfish haul net fishery in NSW**

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## NON-TECHNICAL SUMMARY

**FSC2005/53      Observer study in the Estuary General sea garfish haul net fishery in NSW**

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The Estuary General fishery for sea garfish in NSW was closed in August 2003 whilst a recovery program was developed for this overfished species. This closure is to remain in place under the recovery program until either the species is fully recovered or suitable alternative actions are included in the management plan. However, under the recovery program access to part of the Estuary General sea garfish fishery was authorized in 2005 under a section 37 research permit. Access to a part of the fishery in Port Stephens was provided allowing for fishers to assist with sea garfish research currently being done as part of the recovery program for this species. Access depended on fishers co-operating with observer work to assess accurately the composition of this fishery, and also to satisfy the requirement to do an observer study on this method of fishing under the Estuary General Fishery Management Strategy (FMS).

The observer-based assessment concluded that the beach-based estuarine fishery for sea garfish during 2005 and 2006 had only limited by-catch, didn't target juveniles or spawning aggregations, had no record of deleterious interactions with threatened species, was a minor component of the total sea garfish fishery and was unlikely to have had any major ecological impacts. Management arrangements that prohibited the hauling of nets over beds of seagrass, and increased the permissible mesh size in hauling nets from 25 to 28mm, have been successful in limiting the catch of non-target fish and juvenile sea garfish. Major problems with monthly catch record reporting have been identified. These problems relate to the inaccuracy of reporting and the format of the catch record forms that do not allow assessment of effort targeted towards sea garfish.

The detailed information in this report is in two appendices. Appendix 1 is a scientific paper that details the retained and discarded catch characteristics observed in this fishery. Appendix 2 is a summary of an analysis of the accuracy of reporting.

## **OBJECTIVES**

- (1) Quantify the sizes, species composition and rates of discarded catch.
- (2) Quantify the sizes, species composition and rates of retained catch.
- (3) Validate the accuracy of reporting using standard monthly returns and the proposed daily logbook.
- (4) Document any interactions with fish habitats and threatened species.
- (5) Compare the catch composition of sea garfish caught in estuary waters with those caught in the ocean hauling fishery.

**APPENDIX 1:**

**AN OBSERVER-BASED ASSESSMENT OF THE ESTUARINE  
FISHERY FOR EASTERN SEA GARFISH (*HYPORHAMPHUS  
AUSTRALIS*) IN AUSTRALIA**

*This scientific paper addresses the following project study objectives:*

- *Quantify the sizes, species composition and rates of discarded catch.*
- *Quantify the sizes, species composition and rates of retained catch.*
- *Document any interactions with fish habitats and threatened species.*
- *Compare the catch composition of sea garfish caught in estuary waters with those caught in the ocean hauling fishery.*

*Summary*

*A total of 40 taxa were observed to be caught during two fishing seasons, between April 2005 and March 2006. Eight taxa were retained and 39 discarded. The target species, eastern sea garfish, represented more than 89% of the total catch by weight and numbers. The majority of discarded fish were small individuals of non-commercially important species. Overall ratios of retained to discarded catch were 23.1:1 by numbers and 22.8:1 by weight. During the period of assessment this beach-based estuarine fishery had limited by-catch, did not target juvenile or spawning aggregations of conspecifics, had no record of deleterious interactions with threatened species and was unlikely to have had any major ecological impacts. The relatively low levels of by-catch and juvenile-sized eastern sea garfish probably reflect regulations that: (i) prohibit fishing over beds of the seagrass *Posidonia australis*; and (ii) increased the minimum size of mesh in fishing nets.*

## An observer-based assessment of the estuarine fishery for eastern sea garfish (*Hyporhamphus australis*) in Australia

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### Abstract

The estuarine fishery for eastern sea garfish (*Hyporhamphus australis*) in New South Wales (NSW), Australia was assessed using observers to quantify retained and discarded catches and interactions with threatened species. Observers recorded 40 taxa to be caught during two fishing seasons between April 2005 and March 2006. Eight taxa were retained and 39 discarded. The target species, eastern sea garfish, represented ~90% of the total catch by weight and numbers. The majority of discarded fish were small individuals of non-commercially important species. Overall ratios of retained to discarded catch were ~ 23:1 by numbers and weight. During the period of assessment this beach-based estuarine fishery had limited by-catch, did not target juvenile or spawning aggregations of conspecifics, had no record of deleterious interactions with threatened species and was unlikely to have had any major ecological impacts. The relatively low levels of by-catch and juvenile-sized eastern sea garfish probably reflect regulations that: (i) prohibited fishing over beds of the seagrass *Posidonia australis*; and (ii) increased the minimum size of mesh in fishing nets.

### Introduction

The eastern sea garfish *Hyporhamphus australis* (hereafter sea garfish), is a small, pelagic, schooling, inshore marine species which is targeted by commercial and recreational fishers in sheltered bays and in estuaries (Kailola et al., 1993). The fishery for sea garfish operates along the eastern coast of Australia, almost exclusively in coastal waters of New South Wales (NSW). The commercial fishery is divided into two sectors, estuarine and ocean, which require separate endorsements. The garfish are captured using seine nets that have been designed to fish the surface layers. Fishing generally involves 2 to 6 fishers and may be either beach-based, where small boats are used to encircle schools of fish and the nets are retrieved onto the shore, or boat-based, where lampara-style nets are deployed and retrieved to the boat (Stewart et al., 2004).

The estuarine fishery for sea garfish is relatively small averaging, since 1998, ~ 8 tonnes per year which is valued at around AUD\$40K at the point of first sale (NSWDPI catch statistics). It is, however, a lucrative short-term fishery for some fishers. Sea garfish are highly sought for human consumption both domestically and overseas and smaller fish are considered excellent bait. Unfortunately the stock of sea garfish has declined markedly since the mid 1990s and is currently listed as being overfished (Stewart et al, 2005). In response, a recovery program aimed at protecting juveniles and reducing fishing mortality on adults has been implemented by the governing fisheries agency (New South Wales Department of Primary Industries – NSW DPI). As a part of this recovery program, the minimum allowable mesh in garfish seine nets was increased from 25 to 28mm (Stewart et al., 2004) and the estuarine sector of the fishery was completely closed in August 2003.

Following indications of improved recruitment of sea garfish during 2004, and intense lobbying of the government minister by commercial fishers, the fishery was re-opened in 2005 under a permit system. Under the permit system: (i) the length of the net was limited to 300 m; (ii) mesh sizes



could not be smaller than 28 mm nor greater than 36 mm; (iii) hauling of the net had to be done in a continuous manner and could not be towed by any vessel; (iv) fishing was not allowed on weekends or public holidays; (v) fishing was prohibited over beds of the seagrass *Posidonia australis*, and; (vi) fishers were required to complete a daily log of their fishing operations that included information on the numbers of hauls done on the day, the fishing locations, whether it was beach or boat-based and the total weight of sea garfish caught.

Despite the re-opening of the fishery, there remained major concerns that estuary fishing for sea garfish may not be ecologically sustainable. Concerns were: (i) because other species of the family Hemiramphidae spawn in vegetated estuarine habitats (Jones et al. 2002; Jordan et al., 1998; Berkeley & Houde, 1978) that the estuarine fishery would catch too many juveniles and/or spawning adults; (ii) using small mesh nets (28mm) in areas of known high abundance of juveniles of commercially and recreationally important species (Bell & Pollard, 1989), would result in substantial levels of by-catch, and; (iii) the potential for interaction with threatened species such as dolphins and turtles (Ganassin & Gibbs, 2005).

There have been few observer-type studies on fisheries that target hemiramphid fishes and any previous findings may not be applicable to this estuarine seine fishery. McBride & Styer (2002) used onboard observers to document the catch in the South Florida lampara net fishery for Hemiramphidae, and they concluded that the fishery was highly selective and that by-catch was insignificant because of the surface-oriented behaviour of the fish and the design of the net. The fishery in Florida is, however, a coastal boat-based fishery that uses using much larger nets than the fishery for sea garfish in Australia (McBride et al., 1996). Observer studies that have documented the discarded and retained catches of estuarine seine-fisheries in NSW have targeted different species that are caught using larger nets (1000m headline length), larger meshes (>50mm in the bunt) and in different estuaries (Gray et al., 2001; Gray & Kennelly, 2003). Given the concerns outlined above, the aim of this study was to assess the estuarine fishery for sea garfish in terms of its retained and discarded catch and its potential impact on habitats and threatened species.

## Materials and Methods

The observer study was done in the Port Stephens estuary (32°43'S, 152°09'E), where more than 95% of the estuarine catch of sea garfish has been reported since 2002 (NSWDPI catch statistics). After the fishery was re-opened in 2005, all of the 13 permits issued to allow fishing for sea garfish were allocated to this estuary. The estuarine fishery for sea garfish is seasonal, with 98% of the reported catch being taken between February and June (inclusive) since 1998 (NSWDPI catch statistics). Therefore, the observer study was done during autumn in both 2005 and 2006.

Scientific observers accompanied commercial fishers during their fishing operations throughout the study period. On each sampling occasion, observers recorded information that included: (i) the names of the fishers; (ii) the date and time of hauling; (iii) exact locations; (iv) substrate type; (v) gear specifications; (vi) weather conditions, and; (vii) any interactions of the fishing operations with threatened species. After each haul the catch was sorted into the retained and discarded portions by the observer and commercial fishers. The condition of the by-catch and its probability of survival, if discarded immediately as part of the normal fishing operation, were also recorded. Data were collected on the weights, numbers and lengths (fork lengths – FL – rounded down to the nearest whole cm) of all species caught for both the retained and discarded portions of the catch. Weights of porcupine fish (*Dicotylichthys punctulatus*) were not recorded because of their habit of inflating themselves with water. When the catch of a species was too large to fully sample, sub-sampling was done by measuring approximately half of a standard fish box (~ 10 to 15 kgs) of that species and total numbers estimated using simple proportions of the weight of fish measured and the total weight of the catch. There was one day when the total catches from two hauls were combined prior to sampling owing to logistic difficulties with handling the catch.

Total fishery catch and effort information was obtained from fishers' compulsory daily logbooks. The sizes of sea garfish landed in the ocean fishery were also measured concurrently with this observer study as part of the NSW DPI fisheries monitoring program. The sizes of these ocean caught sea garfish were compared with those retained by estuarine fishers using Kolmogorov-Smirnov tests.

## Results

### *Catch, effort and observer coverage*

Commercial fishers reported a total of 24 hauls using garfish hauling nets during 2005 and 22 during 2006 (Table 1). All commercial fishing effort was reported as being beach-based. Observers sampled seven days and nine hauls in 2005 and five days and six hauls in 2006, which represented 38% and 28% of total hauls done in the fishery during those years respectively. The total observed landed catch was 2,736kg of which 96% were retained and 4% were discarded. The overall ratios of retained to discarded catch were 23.1:1 by numbers and 22.8:1 by weight.

There was no correlation between the weight of fish discarded and the weight retained per haul (Pearson's correlation coefficient  $r = 0.66$ , 9 d.f.,  $P > 0.01$ ), suggesting that the quantity of by-catch per haul was independent of the quantity of target fish captured.

**Table 1.** Commercial fishing effort, sea garfish catch (kgs) and observer coverage during 2005 and 2006.

Year	Commercial effort			Observer coverage			Percent coverage		
	Days	Hauls	Sea garfish	Days	Hauls	Sea garfish	Days	Hauls	Sea garfish
2005	21	24	5,791	7	9	923	33%	38%	16%
2006	18	22	4,463	5	6	1,527	28%	28%	34%
Total	39	46	10,254	12	15	2,450	31%	33%	24%

### *Retained catch composition*

Observers recorded eight species to be retained during the two years of the study. Sea garfish was present in every haul and represented 93% of the retained catch by weight and numbers (Table 2) and approximately 90% of the total landed catch by weight and numbers. No sea garfish were discarded, but some unmarketable individuals of the other retained species were observed to be discarded at various times (Table 3).

**Table 2.** Summary of the total catch of retained species in terms of weight (kg), numbers and percent frequency of occurrence (%FO).

Scientific name	Common name	Kg	Number	%FO
<i>Hyporhamphus australis</i>	Sea garfish	2450	30932	100
<i>Trachurus novaezelandiae</i>	Yellowtail scad	75	968	7
<i>Atherinidae</i> spp.	Hardyheads	13	923	7
<i>Sillago ciliata</i>	Sand whiting	63.5	265	29
<i>Sepioteuthis australis</i>	Southern calamari squid	15.1	51	36
<i>Sphyrnaena novaehollandiae</i>	Striped sea pike	3.7	29	14
<i>Sepia</i> spp.	Cuttlefish	0.6	6	14
<i>Acanthopagrus australis</i>	Yellowfin bream	0.3	1	7
Total	8 species	2621	33174	

**Table 3.** Summary of the total catch of discard species in terms of weight (kg), numbers and percent frequency of occurrence (%FO). \* denotes not weighed.

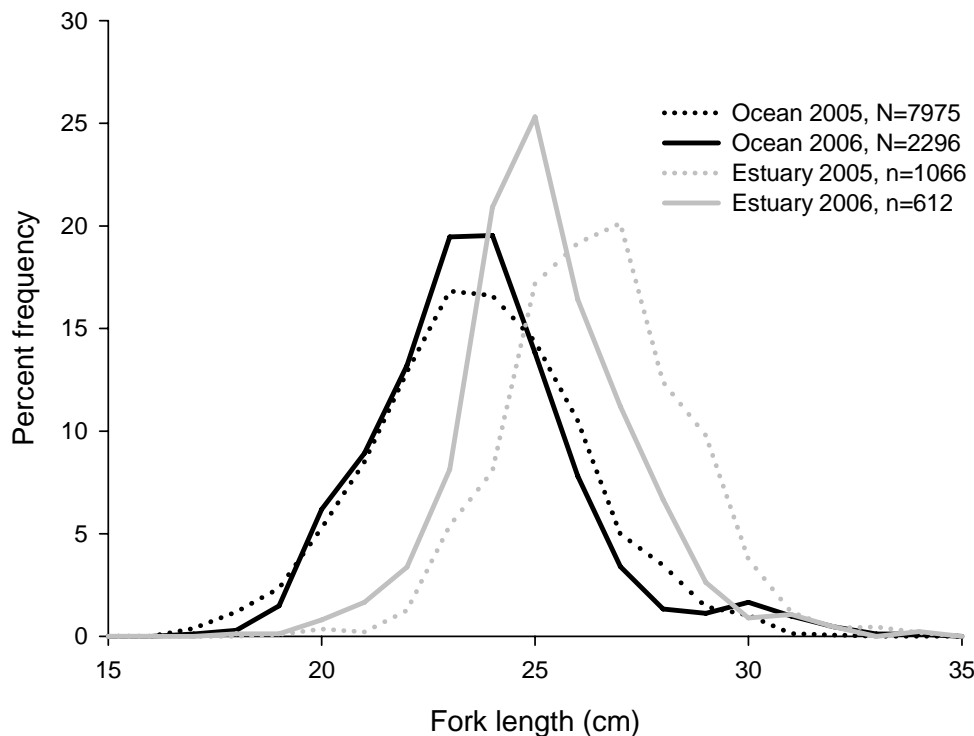
Scientific name	Common name	Kg	Number	%FO
<i>Atherinidae</i> spp.	Hardyheads	2.3	248	29
<i>Liza argentea</i>	Flat-tail mullet	12.8	117	21
<i>Scobinichthys granulatus</i>	Rough leatherjacket	5.75	103	43
<i>Torquigener pleurogramma</i>	Banded toadfish	0.55	96	21
<i>Gerres subfasciatus</i>	Silverbidddy	6.4	90	14
<i>Meuschenia freycineti</i>	Six-spined leatherjacket	5.6	84	29
<i>Enoplosus armatus</i>	Old wife	1.5	75	7
<i>Acanthaluteres spilomelanurus</i>	Bridled leatherjacket	1.15	72	29
<i>Sphyraena novaehollandiae</i>	Striped sea pike	9.5	64	43
<i>Upeneichthys</i> spp.	Red Mullet	1.2	63	21
<i>Monacanthus chinensis</i>	Fanbellied leatherjacket	2.85	60	36
<i>Parupeneus spilurus</i>	Blackspot goatfish	1.2	51	21
<i>Sepia</i> spp.	Cuttlefish	3.25	50	29
<i>Sillago ciliata</i>	Sand whiting	8.2	45	29
<i>Pelates quadrilineatus</i>	Trumpeter	0.81	25	29
<i>Pagrus auratus</i>	Snapper	0.8	22	21
<i>Aldrichetta forsteri</i>	Yelloweye mullet	4.6	19	7
<i>Rhabdosargus sarba</i>	Tarwhine	2.6	18	36
<i>Meuschenia trachylepis</i>	Yellowfinned leatherjacket	0.8	18	14
<i>Siganus fuscescens</i>	Black trevally	0.75	16	21
<i>Trygonorrhina</i> sp.	Eastern fiddler ray	19.1	15	21
<i>Sepioteuthis australis</i>	Southern calamari squid	5.4	15	14
<i>Trachurus novaezelandiae</i>	Yellowtail scad	1.45	14	14
<i>Platycephalus fuscus</i>	Dusky flathead	6.55	9	29
<i>Acanthopagrus australis</i>	Yellowfin bream	2	9	21
<i>Myxus elongatus</i>	Sand mullet	0.4	7	7
<i>Pomatomus saltatrix</i>	Tailor	1.9	5	14
<i>Tylosurus gavioloides</i>	Longtom – Stout	1.1	5	14
<i>Branchaluteres jacksonianus</i>	Pigmy leatherjacket	0.15	5	14
<i>Fistularia petimba</i>	Flutemouth – Rough	0.35	3	14
<i>Dicotylichthys punctulatus</i>	Porcupinefish – three-barred	*	3	7
<i>Pseudorhombus jenynsii</i>	Small-toothed flounder	0.75	2	7
<i>Strongylura leiura</i>	Longtom – slender	0.1	2	7
<i>Trygonoptera testacea</i>	Stingaree – common	1.1	1	7
<i>Myliobatis australis</i>	Eagle Ray	0.8	1	7
<i>Orectolobus ornatus</i>	Banded wobbegong	0.7	1	7
<i>Pseudocaranx dentex</i>	Silver trevally	0.22	1	7
<i>Tetractenos glaber</i>	Smooth toadfish	0.1	1	7
<i>Reicheltia halsteadi</i>	Halsteads toadfish	0.1	1	7
Total	39 species	114.9	1436	

#### Discarded catch composition

Observers recorded thirty-nine species to be captured and discarded (Table 3). The majority were captured infrequently, with the most commonly caught being rough leatherjacket (*Scobinichthys granulatus*) and striped sea pike (*Sphyraena novaehollandiae*), both occurring in 43% of days observed. The two most abundant species observed to be discarded, hardyheads (*Atherinidae* spp.) and flat-tail mullet (*Liza argentea*), are schooling fishes and were observed in 29% and 21% of days respectively.

### Lengths of sea garfish captured

The length distributions of sea garfish caught in the estuaries during 2005 and 2006 were significantly different to those caught in the ocean fishery during the same years (Fig. 1., Kolmogorov-Smirnov tests,  $P < 0.01$ ). There were no differences between the sizes of sea garfish caught in the ocean fishery during 2005 and 2006 ( $P > 0.05$ ), however those caught in the estuary in 2005 were significantly larger than those caught during 2006 ( $P < 0.01$ ).



**Figure 1.** The lengths of sea garfish measured from the ocean and estuarine fisheries during 2005 and 2006.

### Discussion

The findings and conclusions from this study are only relevant to the beach-based estuarine fishery for sea garfish as no boat-based fishing for sea garfish occurred during the study. The estuarine fishery for sea garfish during this study was highly selective; with the target species comprising ~ 90% of the total catch by weight and numbers. The predominance of the target species in catches was largely a result of their pelagic schooling behaviour and fishers only deploying their fishing nets when schools were detected from the beach. Non-target species that were retained in this fishery represented a small component of the total catch by weight (~ 6%) and contributed little to the income from this fishery. In this respect the fishery is somewhat similar to the Hemiramphidae lampara net fishery in Florida where McBride & Styer (2002) reported an incidental by-catch rate of ~ 0.03 by weight (~ 1:30) slightly lower than the 1:23 ratio in the Australian sea garfish estuarine beach fishery. The capture of demersal dwelling species in the Australian beach-based fishery, such as eastern fiddler rays (*Trygonorrhina* sp.), dusky flathead (*Platycephalus fuscus*), common stingaree (*Trygonoptera testacea*) and eagle ray (*Myliobatis australis*), indicates that the net, at times, fishes the sea floor. This is likely to occur in shallow water when the net is being hauled onto the beach, rather than during the entire fishing operation.

Species discarded during the present study were done so for several reasons. Some were non-saleable species (e.g. banded toadfish (*Torquigener pleurogramma*), old wife (*Enoplosus armatus*), bridled leatherjacket (*Acanthaluteres spilomelanurus*)), some were individuals of saleable species below the legal minimum length (e.g. sand whiting (*Sillago ciliata*), snapper (*Pagrus auratus*), yellowfin bream (*Acanthopagrus australis*)), while others were captured in quantities that fishers considered too small to send to market on that day (e.g. sand whiting, hardyheads, southern calamari (*Sepioteuthis australis*)).

The by-catch in the estuarine fishery for sea garfish consisted mainly of small, commercially unimportant species. This is in contrast to the by-catch taken in other estuarine finfish seine fisheries in NSW, where the majority of the by-catch has been reported to be small individuals of commercially important target species (Gray & Kennelly 2003; Gray et al., 2001). Ratios of retained to discarded catch in these demersal estuarine seine fisheries were typically between 1:0.51 and 1:1.5, substantially lower than that observed during the present study.

During normal beach-based sea garfish fishing operations, obviously unwanted catch is sorted and released in shallow water. This practice is likely to promote survival of discards. However during the observer study, all discard fish were retained for sampling, making it impossible to gauge their chance of survival. The majority of by-catch had no obvious physical damage and larger sized species such as the common stingaree, banded wobbegong (*Orectolobus ornatus*) and eagle ray appeared to survive the fishing operation well. Some species however, are likely to suffer from high rates of mortality. Leatherjackets (family Monacanthidae) were almost always caught by their dorsal spines in the netting and in general were badly damaged when removed. Likewise, small pelagic species (e.g. hardyheads) appeared delicate and unlikely to survive being hauled onto the beach prior to possible discarding.

The large number of species (40) and small sizes of many captured individuals indicated that the small mesh (28mm) used in the estuarine sea garfish fishery has the potential to be largely non-selective for non-target species. A similar situation was reported by Cabral et al. (2003) who studied a beach seine fishery in Portugal that targeted small pelagic species. The 20mm mesh used in that fishery resulted in unacceptably high levels of by-catch of juvenile fish because the fishery operated in known nursery areas.

It is well documented that seagrass (*Posidonia australis*) provides nursery habitat for a wide variety of fish (Jenkins et al., 1995; Rotherham & West, 2002). Therefore, it is hypothesized that the banning of hauling nets over *P. australis* in the NSW fishery has removed a potentially significant by-catch problem. However, hauling of nets is still permitted over the seagrass *Zostera capricorni* that is also an important nursery habitat for many species (Worthington et al., 1992; Rotherham & West, 2002). Preventing hauling over beds of *Z. capricorni* may decrease the by-catch in this fishery even further. Other benefits of the management restriction to hauling over *P. australis* is that it provides some protection to sea garfish that may be feeding (Parsons 2002) or using the seagrass as spawning habitat. Spawning over *P. australis* has not been demonstrated for sea garfish; however such habitats are important for the spawning of other species of Hemiramphidae (Jones et al. 2002; Jordan et al., 1998; Berkeley & Houde, 1978).

The estuarine fishery for sea garfish does not currently target spawning aggregations. The fishery operates between February and June, because these are the times during which sea garfish are sufficiently abundant in estuaries to make them a viable commercial fishing target. The spawning season for sea garfish is from June to December inclusive (Hughes & Stewart, 2006), hence sea garfish caught in estuaries between February and June are unlikely to be spawning. This observation lends weight to the model that, unlike many other hemiramphid fishes, sea garfish in NSW may not be reliant on seagrass as spawning habitat. Rather, their observed spatial and

temporal patterns of distribution suggest that near-shore algal habitats may be more important for spawning.

The sizes of sea garfish observed in estuarine catches, and also those in the ocean fishery (Fig. 1) suggest that the regulated change in permissible mesh size has been successful in minimising the catch of juvenile sea garfish (see Stewart et al., 2004). In addition, the estuarine fishery during the 2 years studied caught almost no juvenile-sized sea garfish (< 21 cm FL – Hughes & Stewart, 2006). This observation supports the model that the estuarine sea garfish fishery in NSW targets schools of adult fish that enter the estuaries between February and June, presumably to feed.

Observers recorded no interactions of the fishing operations with threatened species; however only a small number (15) of hauls were observed. There remains the potential for interactions with predators such as dolphins and birds that feed on sea garfish, but the severity and consequences of such interactions cannot be assessed here.

We cannot quantify the ecological impact of the catch taken in the estuarine sea garfish fishery. Nevertheless, the relatively low proportion of by-catch and the fact that it consisted mainly of juveniles, which are likely to suffer from high levels of natural mortality, suggests that the ecological impact may be negligible. Any physical damage to the substrate from hauling is unlikely given the net is designed to fish the surface layers and that hauling over seagrass has been shown not to have any detectable effects (Otway & Macbeth, 1999). It is likely that any significant ecological impacts from this fishery would be related to the removal of large numbers of sea garfish that are known to be important prey for predatory fish, birds and dolphins (Kailola et al., 1993).

It is not known whether the presence of observers caused any change in the fisher's normal behaviour. It is possible that fishers did not fish in areas, or at times, where they expected to catch large quantities of by-catch. It is also possible that the quick sorting of discards at the waters edge (in order to demonstrate a high likelihood of survival of discards) was not normal practice. This study, however, observed ~ 33% of all reported hauls during the 2 year study period. Therefore, it is unlikely that fishers altered their operations significantly because of the potential losses in income by doing so.

## Conclusions

This observer-based assessment concludes that the beach-based estuarine fishery for sea garfish during 2005 and 2006: (i) had only limited by-catch; (ii) did not target juveniles or spawning aggregations; (iii) had no record of deleterious interactions with threatened species; (iv) was a minor component of the total sea garfish fishery; and, (v) was unlikely to have had any major ecological impacts. Management regulations that prohibited the hauling of nets over beds of *P. australis*, and increased the permissible size of mesh in fishing gears from 25 to 28mm, appear to have been successful in limiting the catch of non-target fish and juvenile sea garfish. Nevertheless, fisheries managers must assess factors including societal approval of the fishing activity, fishers' compliance to regulations and the accuracy of their reporting before any decisions on the future of this fishery can be made. If the fishery is allowed to continue there should be a commitment to the continued monitoring of catches of sea garfish while this species remains under a recovery program.

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**APPENDIX 2:**

**AN ASSESSMENT OF THE ACCURACY OF REPORTING IN THE  
ESTUARY GENERAL SEA GARFISH FISHERY**

*This assessment addresses the project study objective “To validate the accuracy of reporting using standard monthly returns and the proposed daily logbook”.*

*Information for this analysis was sourced from the daily fishing logbooks completed by fishers as a condition of their permits to take sea garfish, and from fishers compulsory monthly catch records. The latter was supplied by the NSW DPI Fishery Management Branch using the 1<sup>st</sup> December 2006 extraction from the comcatch database.*

### **Summary**

Analyses were done on the reported catch and effort information for sea garfish taken in the Estuary General fishery since 2003. These analyses provided the following observations:

- (i) Information on catch and effort from daily logbooks correlated well with that from observers.
- (ii) There was poor correlation between monthly catch records and the daily logbooks. This was likely due to inaccurate monthly catch return data.
- (iii) It is apparent that some fishers may be falsely reporting small catches of sea garfish on their catch returns.
- (iv) The format of the monthly catch record forms precludes assessment of effort targeted towards catching sea garfish.
- (v) Fishers reported taking sea garfish in estuaries during the closed months of December and January.
- (vi) Fishers reported taking sea garfish in estuaries other than the permitted estuary of Port Stephens.
- (vii) Fishers reported taking sea garfish in estuaries using unauthorized fishing gear.

Two of these issues are of major concern: (a) the format of the Estuary General catch record form; and (b) the apparent inaccuracy of reporting. The status of the sea garfish stock in NSW remains as overfished and the recovery program designed to promote their recovery is ongoing. Justification for re-opening the Estuary General component of this fishery was to assist in research and monitoring the status of the stock. A major tool in the assessment of the status of this fishery is the analysis of catch and catch rates, and the Estuary General component of this fishery does not currently contribute reliable information for this assessment.

### **Accuracy of reporting**

Comparison of reported daily logbook information from fishers with that reported by observers showed reasonable agreement (Table 1). Some of this agreement is certainly due to the very close working relationship that observers had with fishers during 2005, with observers stressing the importance of accurate reporting to fishers. It is also likely that fishers were conscientious in completing their daily logbooks on days when observers were accompanying them. Nevertheless,

during this study the self-reporting by fishers through the daily logbooks provided a reasonably accurate account of their catch and effort as validated by observers.

**Table 1.** Comparison of reported daily logbook information from fishers with that reported by observers.

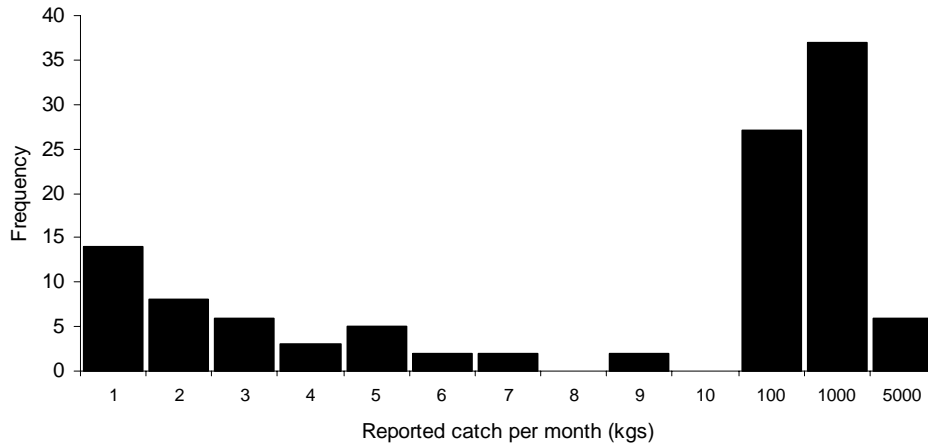
Date	Observed shots	Observed catch (kgs)	Reported shots	Reported catch (kgs)
18-Apr-05	1	51	1	132
19-Apr-05	2	152	2	152
27-Apr-05	2	125	2	125
28-Apr-05	1	300	1	300
29-Apr-05	1	209	1	209
03-May-05	1	73	1	73
12-May-05	1	13	1	13
15-Mar-06	2	215	2	378
21-Mar-06	1	236	1	258
22-Mar-06	1	940	1	963
23-Mar-06	1	72	1	73
24-Mar-06	1	64	1	77
Total	15	2450	15	2753

Comparison of the reported daily logbook catch and effort information with that reported through region 4 fishers monthly returns shows little similarity (Table 2). The reason for this lack of agreement is not known, but the good agreement between observer and daily logbook reports suggests that the monthly returns may be inaccurate.

**Table 2.** Comparison of reported estuarine catch of sea garfish between the daily logbook and monthly catch returns for region 4.

Period	Logbook kgs	Monthly returns kgs
March 2005	553	1435
April 2005	3071	4215
May 2005	2167	754
February 2006	850	1816.2
March 2006	3613	1091.9
Total	10254	9312.1

A further assessment of the monthly catch record data indicates that many fishers are reporting very small quantities of sea garfish in a month (Figure 1). This is highly unlikely in hauling nets given the schooling behaviour of sea garfish and it is likely that many fishers report small quantities each month to demonstrate participation in the fishery. This situation should be rectified because it: (i) is against the law, and; (ii) will bias estimates of catch and effort in the fishery.



**Figure 1.** The distribution of reported sea garfish landings in the Estuary General fishery from monthly catch records since 2003.

Unfortunately, the format of the Estuary General fishery monthly catch record form precludes any realistic assessment of effort targeting sea garfish. The method of hauling for sea garfish in estuarine waters is reported as ‘Hauling net – general purpose, trumpeter whiting or garfish’. This method is used to target a wide range of species and it is not possible to differentiate days of effort targeting each species. This problem could be rectified by continuing the daily logbook (with the associated inconvenience to fishers and added administration costs) or by changing the method name when targeting sea garfish to that used in the Ocean Hauling Fishery (garfish net, hauling (beach) and garfish net, hauling (boat)).

### **Erroneous reporting**

Further analyses of the monthly catch records indicated several areas of concern.

#### *(i) Taking sea garfish in estuaries during the closed season*

There is a prohibition on the taking of garfish in tidal (estuarine) waters, by any net methods, during December and January each year (F92/1894). Despite this closure, some fishers continue to report taking sea garfish in estuarine waters during these months. Ten fishers have reported taking a total of 117 kg of sea garfish in estuarine waters during December and January since 2003. Reported landings were relatively small (<30kg per month), and were taken using the method of hauling with the exception of 1 record that reported using the method bullringing (garfish).

#### *(ii) Taking sea garfish in closed estuarine waters*

Permits were issued to take sea garfish in designated waters of Port Stephens only. Since August 2003 (when the taking of sea garfish in the Estuary General fishery was prohibited) 24 fishers have reported taking sea garfish from other estuaries (Table 3).

**Table 3.** Reported sea garfish catch from fishers other than those operating in the permitted area of port Stephens since august 2003.

Estuary	Number of FL's	Reported kgs
Camden Haven River	1	19
Clarence River	1	559
Hawkesbury River	2	126
Hunter River	1	0.8
Lake Illawarra	1	48
Manning River	1	1
Port Jackson	3	244
Shoalhaven River	1	31
Tuggerah Lakes	4	96.4
Wallis Lake	9	124
Total	24	1249.2

*(iii) Taking sea garfish in estuarine waters using unauthorized fishing gear*

Permits were issued to take sea garfish using hauling nets only, yet large quantities of sea garfish have been reportedly taken in estuarine fishing gears other than these (Table 4). The majority of this 'other' catch has been reported using the method of bullringing (garfish) and may be attributed to either: (i) fishers taking sea garfish using illegal methods, or; (ii) fishers incorrectly referring to garfish hauling as bullringing (a more likely cause). Standardizing terminology amongst fishers and management to describe fishing methods may solve this reporting problem.

**Table 4.** Reported estuarine catch (kg) of sea garfish using methods other than the permitted method of hauling net since August 2003.

Period	Bullringing (garfish)	Eel trap	Mesh net (flathead)	Mesh net, top set bottom set or splashing	Prawn set pocket net
May 2003			67.1		
Aug 2003	104				
Sep 2003	5				
Oct 2003				1	1
Mar 2004	1128.6				
Apr 2004	200.1				
May 2004	290				
Jun 2004	2672				
Oct 2004	20			1	
Dec 2004	5				
Feb 2005	188			20.6	
Mar 2005	700				
May 2005	49				
Jun 2005	97				
Aug 2005	14				
Sep 2005		9			
Oct 2005	2			4	
Feb 2006				17.5	
May 2006		10.5		129.9	
Jul 2006		204			
Aug 2006				1.8	
Total	5474.7	223.5	67.1	175.8	1

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