

**Ageing work undertaken on key species  
from the South East Fishery**

**Final Report**

**to**

**Australian Fisheries Management Authority**

**Kyne Krusic-Golub, Sonia Talman & John Ackerman**

**Project Number R02/0930**

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**Age estimation work undertaken on key fish species from the South East Fishery**

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**Synopsis**

The Central Ageing Facility (CAF), based at the Marine and Freshwater Resources Institute (MAFRI), Queenscliff was contracted by the Australian Fisheries Management Authority (AFMA) for the year 2002/2003 to estimate the ages of 9,400 otolith samples from 11 priority species caught in the South East Fishery (SEF). By 30<sup>th</sup> June 2003, 12,182 otoliths had been received for the contracted year and 8,719 ages were estimated accordingly. This was comprised of 8,459 collected from the year 2002/2003 and 260 from previous years. Pink ling and blue-eye trevalla specimens received late in the financial year have yet to be aged.

**Introduction**

The Central Ageing Facility (CAF), based at the Marine and Freshwater Resources Institute (MAFRI) in Queenscliff, has been contracted to undertake production ageing work on a range of fish species caught in the South East Fishery (SEF) since 1991. The priority species and the sample sizes to be aged are determined annually by the Australian Fisheries Management Authority (AFMA) through discussions with the South East Fishery Assessment Group (SEFAG) and the SEF Research Committee, the South East Trawl Management Advisory Committee (SETMAC) and the South East Non-Trawl Management Advisory Committee (SENTMAC). The agreed CAF work plan for 2002/03 is shown in Table 1. The CAF is not funded by AFMA to undertake research on ageing methods or validation studies but some of this work on the priority SEF species has been funded from other sources (eg. Fisheries Research and Development Corporation - FRDC).

Results are provided in reports and electronic form to the various fishery assessment groups that operate under the South East Fishery Assessment Group. These data are then incorporated into stock assessment models. Due to increasing time series and number of fish, it has become impractical to include full details of recent and past ageing data for each species so summaries are now provided to AFMA. Full results are provided electronically to those with a requirement for more detailed data.

This report has been prepared to provide AFMA with information on the progress of the SEF collections and results of the contracted ageing component for the 2002/03 financial year. It provides an update on collections and ageing work undertaken since the 2002/03-milestone report was submitted.

## Otolith collections

Each year, otoliths from AFMA's eleven priority SEF species (blue grenadier, gemfish, blue-eye trevalla, blue warehou, spotted warehou, orange roughy, jackass morwong, eastern school whiting, tiger flathead, redfish and ling) are collected for ageing. The orange roughy otoliths are collected by CSIRO. All other otoliths are collected by staff from the Integrated Scientific Monitoring Program (ISMP) from fish sampled onboard SEF vessels, in ports, processing plants, or at markets. There are specified ISMP targets for the collection of otoliths of each species from both the trawl and non-trawl sectors of the fishery, which are collected regardless of whether the current CAF work plan requires ageing of a particular species in that year. In 2002/03, jackass morwong, eastern gemfish and trawl-caught blue eye trevalla were not included in the workplan (Table 2).

Once removed, otoliths are stored dry in envelopes labelled with data on fish length, sex (when available), area of collection, date of collection, and vessel and gear type. These are forwarded to the CAF where they are allocated a unique species and batch number.

## Procedures

The CAF has developed procedures and protocols to ensure quality assurance in the process of production ageing. These include repeat ageing of a 25% sub-sample of otoliths collected and the estimation of age without reference to the size or sex of fish. A detailed description of these procedures and of the CAF ageing system is given in Morison *et al.* (1998). Batches of otoliths collected from a species are generally held for several months and then read together. For some species the entire year's sample will be read together after collection is completed. This is more efficient as it requires fewer calibration checks of readers. It also helps maintain consistency by reducing the likelihood of a change or drift in interpretation of incremental structure over time. The CAF is aware of the requirements of the Stock Assessment Groups (SAGs) and the timing of the workshops drives the timetable for the ageing of the respective species.

## Work undertaken during 2002/03

The ISMP collected over 12,000 otoliths from the eleven SEF priority quota species during July 2002 to June 2003. Except for trap-caught and trawl caught ling, mesh-caught blue warehou, eastern gemfish and trawl-caught blue-eye trevalla all targets were met (Figure 1, Table 3). The otoliths were transferred to the CAF to be processed and aged. All samples are aged using sectioned otoliths, except for western gemfish and school whiting, where whole otoliths are used. The CAF sectioned over 9000 SEF samples during 2002/03. More otoliths are processed than are required for ageing, as it is more efficient to prepare an entire batch rather than specific samples from within a batch.

Under the agreed workplan, the proposed cost for undertaking the SEF ageing work during 2002/03 was \$145,955 (Table 2). Over 8,000 age estimates were made on SEF species collected during 2002/03, meeting most of the species targets in the CAF workplan (Figure 2). Currently, 87.9 percent of ages required on the priority species have been completed and only ling and blue-eye trevalla specimens collected during May and June 2002 have yet to be aged. Due to shortfalls in otolith collections, ageing could not be undertaken on 234 non-trawl blue warehou, 150 non-trawl ling and 151 trawl-caught ling, consequently the cost of the project was reduced by \$8,605 to \$137,350. The audited acquittal statement is amended to reflect this reduction.

It should be noted that the otoliths collected by the ISMP in a particular year may not necessarily be those that are aged by the CAF. The timetable for ageing a particular species is driven by the

timing of the relevant stock assessment workshop but not all of the 2002/03 samples were collected, much less aged, at the time that the stock assessments were held. In these cases, it is the otoliths from the previous year and a preliminary sample from the current year that were aged. In 2001/02, the stock assessments were scheduled late in the financial year and a concerted effort by the CAF to complete ageing requirements by July meant that the majority of otolith ageing targets had been met. Consequently, there were relatively few residual samples from 2001/02 aged during 2002/03. The majority of ageing work undertaken during 2002/03 was from samples collected during this period.

Details of sample collections for each of the priority species are provided below.

### **Species Summaries**

#### *Blue grenadier - *Macruronus novaezelandiae**

Sufficient blue grenadier otolith samples were collected from both the winter-spawning fishery and the summer non-spawning fishery requirement. As in the previous year, Sarah Russell (Australian Maritime College) collected winter-spawning samples as part of her PhD thesis. Bob Stanley also provided additional winter-spawning samples. Sufficient samples of spawning and non-spawning have been aged to meet AFMA targets for 2002/03.

#### *Gemfish - *Rexea solandri**

Collection of western gemfish otoliths proceeded well during 2002/03, exceeding the AFMA target. Collections of eastern gemfish have proved difficult to source as they are generally caught in low numbers and only account for a small part of the eastern trawl fishery by-catch. They are not required for the 2002/03 ageing component and all available eastern gemfish samples have been archived at the CAF for later use.

As stipulated by AFMA, only age estimates of western gemfish were required during 2002/03. Sufficient samples have been aged to meet the AFMA target.

#### *Blue-eye trevalla - *Hyperoglyphe antarctica**

Otolith collection of non-trawl blue-eye trevalla proceeded well during 2002/03. A concerted effort by the ISMP to target any line caught blue-eye trevalla has allowed sufficient collections to be made from this sector. However, as in previous years, difficulties were encountered in the collection of trawl caught blue-eye trevalla. Only 102 of the required 500 samples were able to be collected. This problem is caused by the generally low numbers of blue-eye caught by trawlers at any one time, which makes sampling for otoliths very difficult. The problem is compounded because the fish are sold whole, command a high price and rarely reach the market where otoliths can be extracted.

Currently only 236 of the 738 line-caught blue-eye trevalla samples have been aged. At the time of the 2002/03 blue-eye trevalla stock assessment the CAF had aged 100% of collected samples. The majority of blue-eye trevalla have been collected during May and June 2003. These have been prepared and will be completed during July 2003. As stipulated by AFMA, no age estimates were undertaken for trawl caught blue-eye trevalla during 2002/03 and the samples were archived.

### Blue warehou - *Seriolella brama*

Collection of trawl caught blue warehou samples during 2002/2003 proceeded well, exceeding the AFMA target of 750. However, like the previous two years, samples from the mesh net fishery in the east were extremely difficult to obtain. Currently only 16 of the 500 required have been collected. This reflects the continuing low level of effort and catches in this fishery. For the year 2002/2003, the CAF aged 758 samples of blue warehou from both the trawl and non-trawl fishery; including 335 collected between May and June 2002 and 423 collected between July 2002 and February 2003 (including the 16 from the mesh net fishery).

Additionally, AFMA have contracted the CAF to age additional blue warehou from past years where the sample numbers were relatively low. A further 1052 estimates were made on historical samples held at the CAF from samples collected between 1991 and 1999 from both non-trawl and trawl fisheries. These data were presented to the blue warehou assessment group in April 2003 and are being used in the refinement of the blue warehou 2-stock model.

### Spotted warehou - *Seriolella punctata*

Otolith samples collected by the ISMP exceeded the target of 750 trawl caught spotted warehou. A concerted effort by the ISMP staff has allowed for sufficient numbers of samples to be collected each month throughout 2002/03. The CAF provided 600 spotted warehou age estimates from 2002/03 at the stock assessment group held in April 2003. The residual samples have since been aged to meet the AFMA target.

### Jackass morwong - *Nemadactylus macropterus*

The collection of jackass morwong otoliths proceeded well during 2002/03 and over 1000 samples have been collected from the SEF. As stipulated by AFMA, no age estimates were undertaken during 2002/03 for jackass morwong and the samples have been archived at the CAF.

### Tiger flathead - *Neoplatycephalus richardsoni*

The ISMP collected 1154 tiger flathead otolith pairs during 2002/03 which was well in excess of the workplan target of 800. Of the 1154 otoliths collected, 291 and 560 otoliths were aged from the danish seine fishery and trawl fishery, respectively.

The CAF investigated differences in age estimates between whole and sectioned otoliths during 2000/01 and the results were presented at the 2001 tiger flathead workshop. Subsequently, all age estimates of tiger flathead were carried out using sectioned otoliths.

### Redfish - *Centroberyx affinis*

Collection of redfish otolith samples during 2002/03 proceeded well and the AFMA target of 1000 has been exceeded. From the 1114 otoliths collected, 1019 samples have been aged, meeting the ageing requirement for this species.

### Ling - *Genypterus blacodes*.

A considerable effort by ISMP staff working with the non-trawl fishery has enabled sufficient samples to be collected from this sector during 2002/03. However, collections of trawl-caught ling have not met the AFMA target of 700.

For the last few years, the ISMP has been requested to collect 200 otoliths from mesh-caught ling. This component of the CAF work plan has been reconsidered for 2002/03 and the collection of these otoliths has been transferred to the trap fishery. As with the mesh net fishery, low levels of effort in the trap fishery during 2002/03 has resulted in low availability of samples and the target has not been met. Only 50 samples from the required 200 have been collected

Age estimates were completed on 455 trawl-caught ling and 354 non-trawl caught ling from 2002/03. Additional 245 age estimates were made on the residual 2001/02 line-caught ling. It is expected that the remaining ages from 2002/03 will be aged early 2003/04, combined with 2002/03 requirements and presented at the next assessment group meeting.

#### Orange roughy - *Hoplostethus atlanticus*

Collection of orange roughy otoliths has been undertaken by various organisations, including CSIRO in recent years. However, Cascade Plateau caught orange roughy from the earliest available years of sampling were required for the 2002/03 ageing component. Samples collected by Geoff Diver (Diversity Sustainable Development Consultants) from 1998 and held at the CAF were used for age estimation.

These results of the ageing component were presented at the orange roughy stock assessment group in March 2003.

#### School whiting - *Sillago flindersi*

Otolith collections from trawl caught whiting proceeded well during 2002/03. Over 500 school whiting otoliths were collected by the ISMP. This met the target set by AFMA and the CAF has provided ages on 100% of otoliths collected.

### **Acknowledgments**

MAFRI's Integrated Scientific Monitoring Program staff; Ken Smith, Paul McCoy, Graeme Cottier, Chris Fenner, Jeff Nemecek and Glen Richardson enabled collection of the otoliths. Sarah Russell and Bob Stanley assisted in the collection blue grenadier otoliths from the winter fishery. Sharon Berrie coordinated the collection of otolith samples. We wish to thank AFMA for funding this work and the SEF fishers and processors for supporting this research.

### **References**

Morison, A. K., Robertson, S. G. and Smith, D. C. (1998). An integrated system for production fish ageing: image analysis and quality assurance. *North American Journal of Fisheries Management*. 17:587-598.

Table 1. The Central Ageing Facility work plan for 2002/03 as agreed by SETMAC.

Sector	Species	Component	Sample size	Cost (\$)
Non-trawl	Blue warehou	Mesh net	250	3,899
	Ling	Trap	200	3,292
	Ling	Line	300	4,939
	Blue-eye trevalla	Line	750	12,998
Total non-trawl			1500	\$25,128
Trawl	Blue grenadier	Spawning	1000	14,855
		Non-spawning	800	11,883
	Gemfish	Eastern	600	*
		Western	600	5,199
	Blue warehou		750	11,695
	Spotted warehou		750	11,695
	Redfish		1000	16,463
	Blue-eye trevalla		500	*
	Ling		700	11,525
	Orange roughy		1000	22,510
	School whiting		500	3,466
	Tiger flathead		800	11,536
	Jackass morwong		700	*
Total trawl			9700	\$120,827
Total			11200	\$145,955

\* Not included in ageing work plan but otolith sample will continue to be collected.

Table 2. Ageing work undertaken by the Central Ageing Facility on the 11 priority species from the South East Fishery in the last 10 years 1994-2003. SEF species, for which otoliths were collected and aged by the CAF (A), collections were made but not aged (C), or where no collection was made (X).

Species	Area	Year									
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Blue grenadier	Spawning	A	A	A	A	A	A	A	A	A	A
	Non-spawning	A	A	A	A	A	A	A	A	A	A
Gemfish	Eastern	A	A	A	A	A	A	A	A	C	C
	Western	A	C	A	A	A	C	C	C	C	A
Blue-eye trevalla	Non - Trawl	X	C	A	A	A	A	A	A	A	A
	Trawl	X	C	A	A	A	A	A	C	C	C
Blue warehou	Non-Trawl	A	A	A	A	A	A	A	A	A	A
	Trawl	A	A	A	A	A	A	A	A	A	A
Spotted warehou		A	A	A	A	A	A	A	A	A	A
Jackass morwong		C	C	A	A	A	C	C	C	C	C
School whiting		A	C	A	A	C	A	A	A	A	A
Tiger flathead		A	A	A	A	A	C	C	A	A	A
Redfish		A	A	A	A	A	A	A	A	A	A
Ling	Non-Trawl	A	A	A	A	A	A	A	A	A	A
	Trawl	A	A	A	A	A	A	A	A	A	A
Orange Roughy		A	A	A	A	A	A	A	A	A	A

Table 3. Number of otoliths collected from SEF quota species during 2002/03, summarised by area and the deviation between the collected number of otoliths and the AFMA targets (between 01/07/02 and 30/6/03).

Species	Gear	Eastern Bass Strait	Western Bass Strait	Eastern Tasmania	Western Tasmania	New South Wales	GAB	Total	AFMA Target	Total Deviation
Blue Grenadier	Winter	-	-	-	1094	-	-	1094	1000	94
	Non-Winter	-	581	350	100	53	-	1084	800	284
	All	0	581	350	1194	53	0	2178	1800	378
Blue-eye Trevalla	Trawl	13	58	16	15	-	-	102	500	-398
	Non-Trawl	10	321	184	223	-	-	738	750	-12
	All	23	379	200	238	0	0	840	1250	-410
Blue Warehou	Trawl	134	548	36	40	-	-	758	750	8
	Non-Trawl	16	-	-	-	-	-	16	250	-234
	All	150	548	36	40	0	0	774	1000	-226
Spotted Warehou	All	173	309	101	552	-	-	1135	750	385
Redfish	All	-	-	-	-	1114	-	1114	1000	114
Ling	Trawl	238	150	-	83	78	-	549	700	-151
	Non-Trawl	-	-	7	347	-	-	354	500	-146
	All	238	150	7	430	78	0	903	1200	-297
Gemfish	Eastern	175	-	-	-	55	-	230	600	-370
	Western	-	624	-	-	-	-	624	600	24
	All	175	624	0	0	55	0	854	1200	-346
Tiger Flathead	Seine	291	-	-	-	-	-	291		
	Trawl	50	-	299	170	409	-	928		
	All	341	0	299	170	409	-	1219	800	419
Jackass morwong	Trawl	76	359	167	130	300	-	1032	700	332
School whiting	Seine	253	-	-	-	-	-	253		
	Trawl	-	-	-	-	253	-	253		
	All	253	0	0	0	253	0	506	500	6
Orange Roughy	Trawl	-	542	-	1069	16	-	1627	1000	627
Total								12182	11200	982

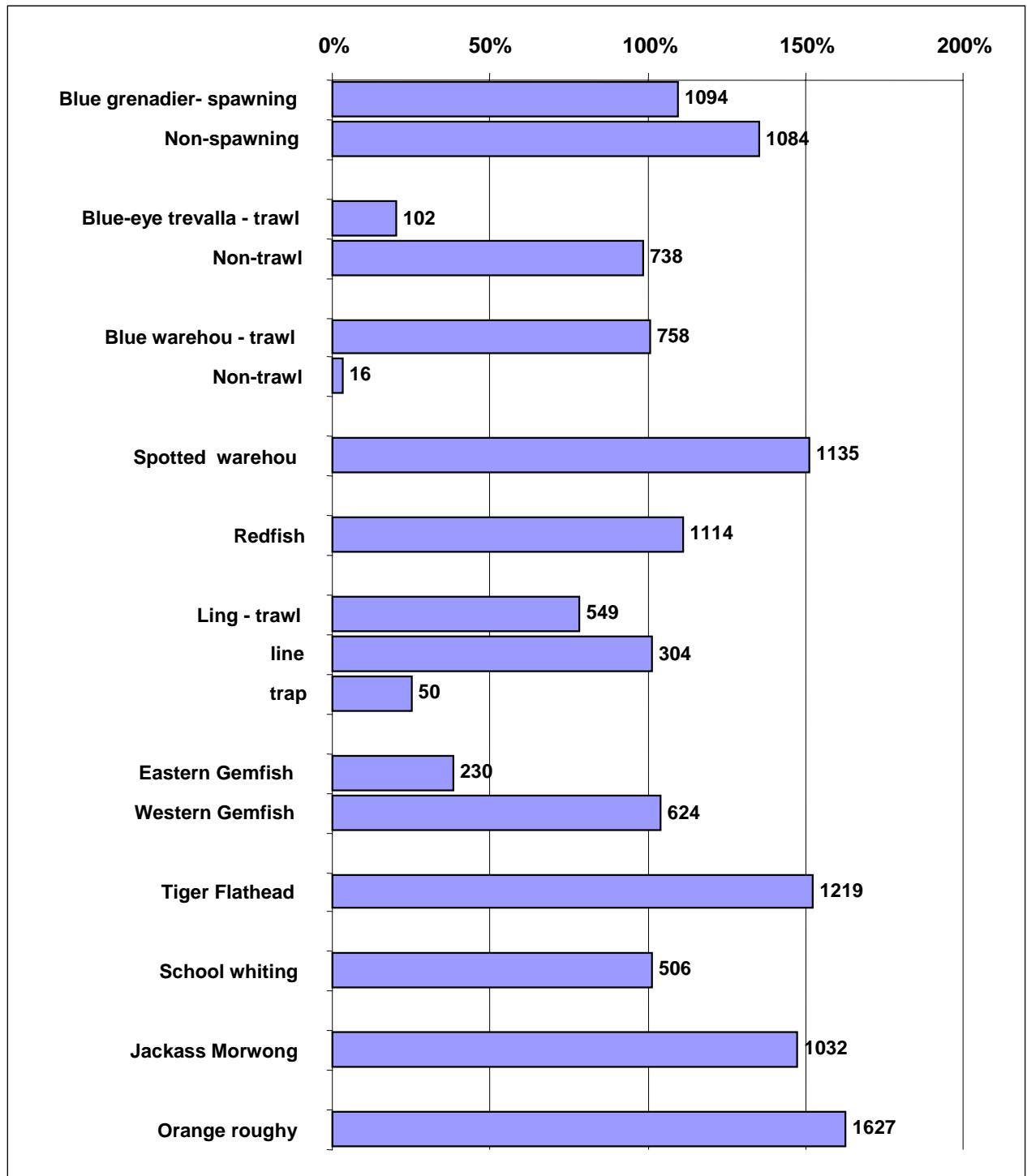


Figure 1. Number of otoliths collected as a percentage of the agreed CAF workplan target for 2002/03 financial year. Total number = 12,182. Labels indicate actual numbers collected.

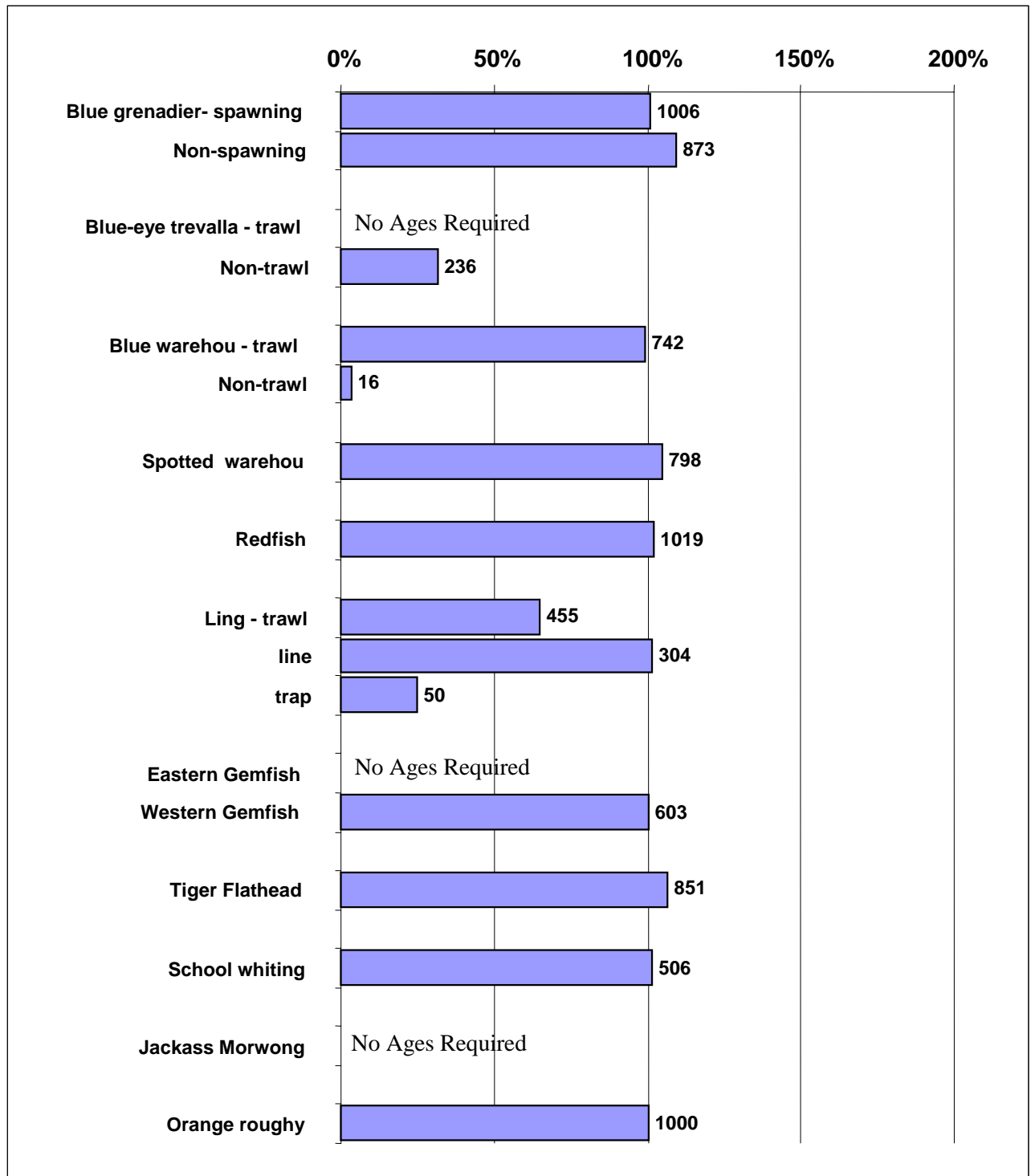


Figure 2. Number of otoliths of each species aged by the CAF as a percentage of the agreed CAF work plan target for 2002/03 for samples from current collection year only. Total number = 8,459. Labels indicate actual numbers read.