



NatureGlenelgTrust 



2017 Winter Edition

Newsletter No. 3

MULLOWAY RESEARCH ANGLER PROGRAM

Welcome to the third edition of the mulloway Research Angler Program Newsletter. The purpose of this newsletter is to provide anglers across Victoria and South East South Australia with feedback on the information we are gaining from the frames you are donating to research. Since the project got under way in August 2014, it has received increasing support from recreational anglers. Thank you to all anglers for their continued involvement in the research.

Over the past 12 months, we've been undertaking genetic analyses to clarify the stock boundaries of mulloway across Victoria and interstate. The results are in, and you can read more about it later in this newsletter.

A reminder that the research project is on-going until the end of 2018 so please keep those frames coming in! If you have any comments or questions, feel free to get in touch by email lauren.veale@ngt.org.au or phone 0439 034 390.

Donations

Last winter and spring we saw significant rainfall across most of the state, creating dirty water in our rivers and less than ideal conditions for fishing. Once the flows eased and the water cleared, donation numbers increased across the western and central part of the state. We are excited to announce that over 120 anglers have now collectively donated over 500 frames to the research project. A mighty effort that deserves a big pat on the back! It's great to see new anglers coming on board and getting involved in the research. Interestingly, almost 90% of all frames donated over the project have been caught and donated over a 6 month period between November and April. While we know there are less anglers targeting mulloway over the cooler months of the year, I suspect it may also relate to the species becoming less active and/or present in our river systems.

Figure 1 shows the number of frames donated to the project by recreational anglers from each region/river between August 2014 and June 2017. The Glenelg and Barwon rivers remain the mulloway ‘hot spots’ where the majority of frames have come from, while good numbers have also come from the Hopkins and Patterson rivers.

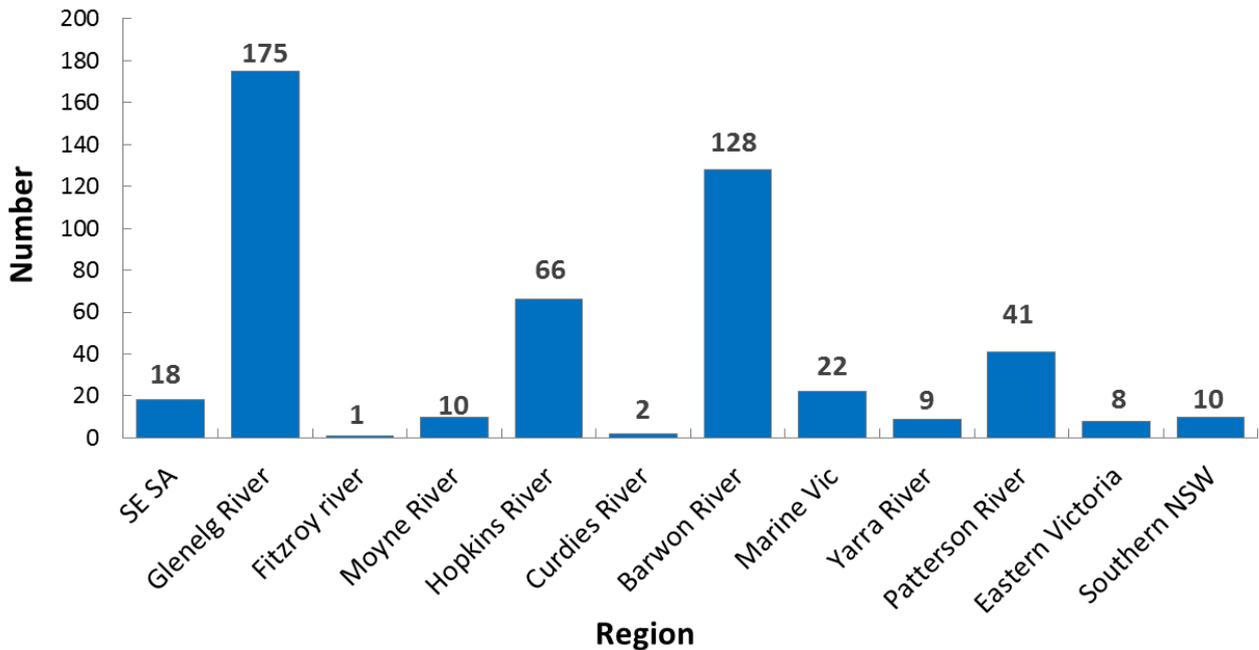


Figure 1. Number of mulloway frames donated by recreational anglers from the various regions between August 2014 and June 2017.

Top overall donators

Fisher	Number of frames
Glenn Mitchell	117
Paul & Buck Ford	42
Daryl Beavis	35
Brad Spiden	26
Michael Gordon	20
Shane Murphy	19

A big thank you to our overall top donators and the 100+ others across the state who continue to be involved in the program.

Collecting a sufficient number of samples from each of the main river systems and coastal marine areas is crucial in developing the age composition data required to assess mulloway stocks. While we know the odds are against us, we are still eager to collect mulloway frames from eastern parts of Victoria (e.g. Yarra River, Western Port Bay, Mallacoota, and

Gippsland Lakes) and from marine waters across the state. Collecting mulloway from marine waters is crucial in learning more about their reproductive behaviour, including their spawning locations and estimated lengths and ages at maturity. If you know of anyone catching mulloway in these eastern waters or in the ocean, please get in contact with us (lauren.veale@natureglenelg.org.au).

A reminder to everyone donating frames! Ideally, we like to receive the whole carcass including the guts and reproductive organs (see below). This allows us to determine the sex of the fish (male/female) and look at whether their reproductively active.



Donated mulloway frame with guts and reproductive organs attached.

What do we do with your frames?

With each frame, we record the total length, sex and reproductive condition of the fish. Ear bones or ‘jewels’ are extracted from their skull and used to determine the age the fish. The length and age data of each fish is perhaps the most crucial as it allows us to carry out length and age-based monitoring of the stock. Age estimates are collated and used to assess how the demographics of a population change over time. The relationship between length and age is also used to look at growth rates (see later). The sex and reproductive condition of each fish is recorded by examining the reproductive organs. More detailed information is provided in Newsletters 1 and 2.

Largest fish donated from each region (as of June 2017)

Region	Fisher	Total length	Estimated age
South East SA (marine)	Aaron Saunderson	137 cm	13 years
Glenelg River	Glenn Fry	123 cm	9 years
Moyne River	Scott Gray	84 cm	6 years
Hopkins River	Graeme Hays	91 cm	4 years
Curdies River	Jodie Baillie	100 cm	5 years
Victorian marine waters	Adrian Lieutier	170 cm	22 years
Barwon River	Jarryd McDowall	102 cm	7 years
Patterson River	Brad Spiden	95 cm	5 years
Mallacoota	Rory Brackley	138 cm	9 years

All donated fish were aged between 3 and 25 years of age, with the oldest being a 142 cm mulloway caught from Western Port Bay. The age frequency plots show that the Victorian mulloway fishery was supported by mainly one year class between 2014 and 2016. In 2014, this cohort was 3+ years, and remained dominant in 2015 (when 4+ years) and 2016 (when 5+ years). In 2017, this cohort, which is now 6+ years has become less abundant, coinciding with the onset of maturity and presumably their movements to the ocean for breeding. This data indicates that there was a significant spawning and recruitment event in summer 2011/2012, a likely response to high freshwater flows. In 2017, we see additional younger age classes (3+, 4+ and 5+) occurring in the estuary which indicates there has been subsequent successful spawning events. We may see another significant year class coming through as result of significant flows over 2016/17.

The length frequency plots highlight that estuaries provide important nursery habitat for mulloway. Over 95% of mulloway caught in Victorian estuaries have been below 85 cm, which is the approximate length of maturity. Mulloway, like a lot of marine species (e.g. mullet, tailor) utilise the high amounts of food, shelter and low predation that estuaries provide in their early stages of life.

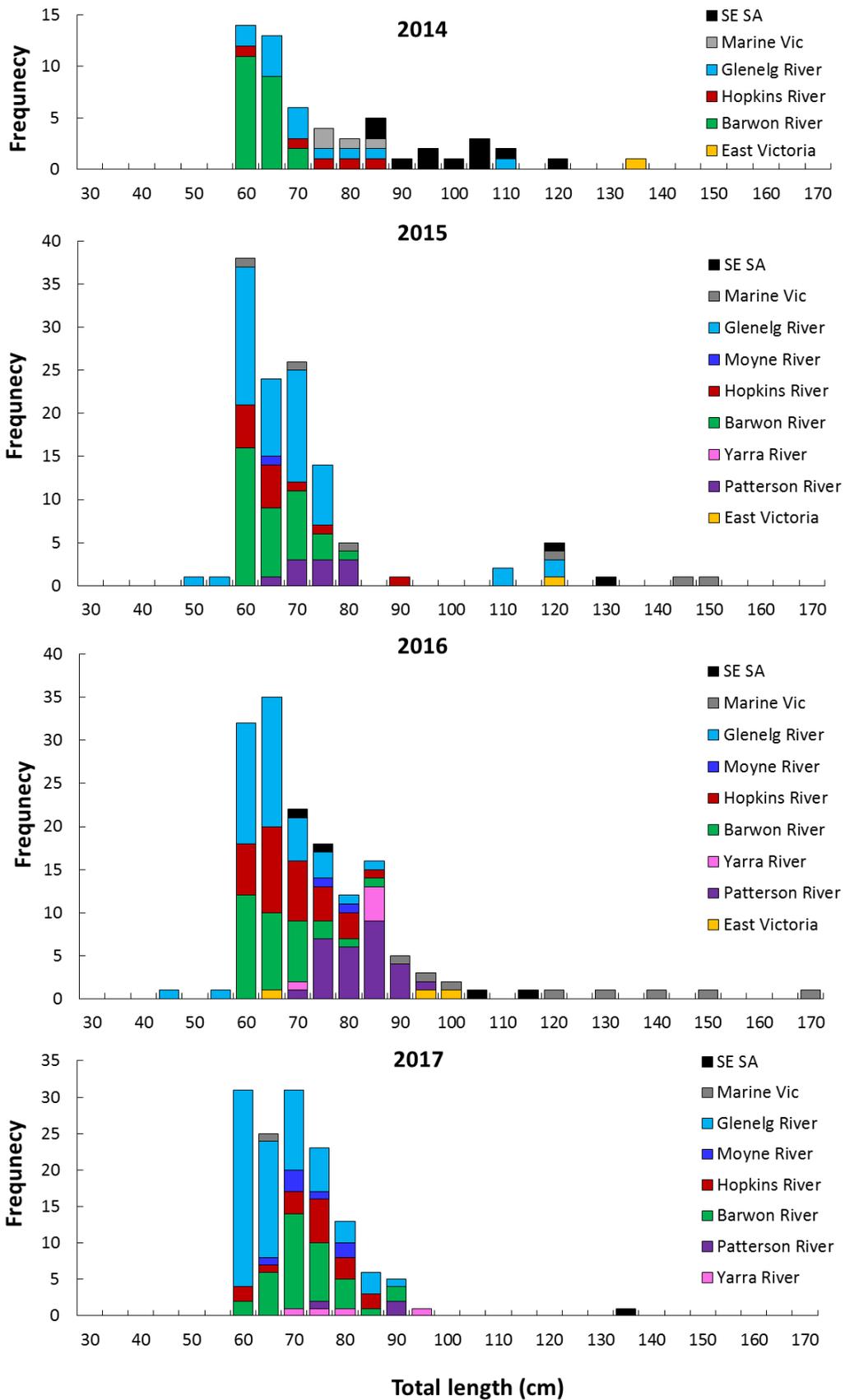


Figure 2. Overall length frequencies of mulloway donated by recreational anglers from the various regions in 2014 (Aug-Dec), 2015 (Jan-Dec), 2016 (Jan-Dec) and 2017 (Jan-Jun), including a small number of fish (<60 cm) caught by research scientists under a Fisheries Exemption Permit.

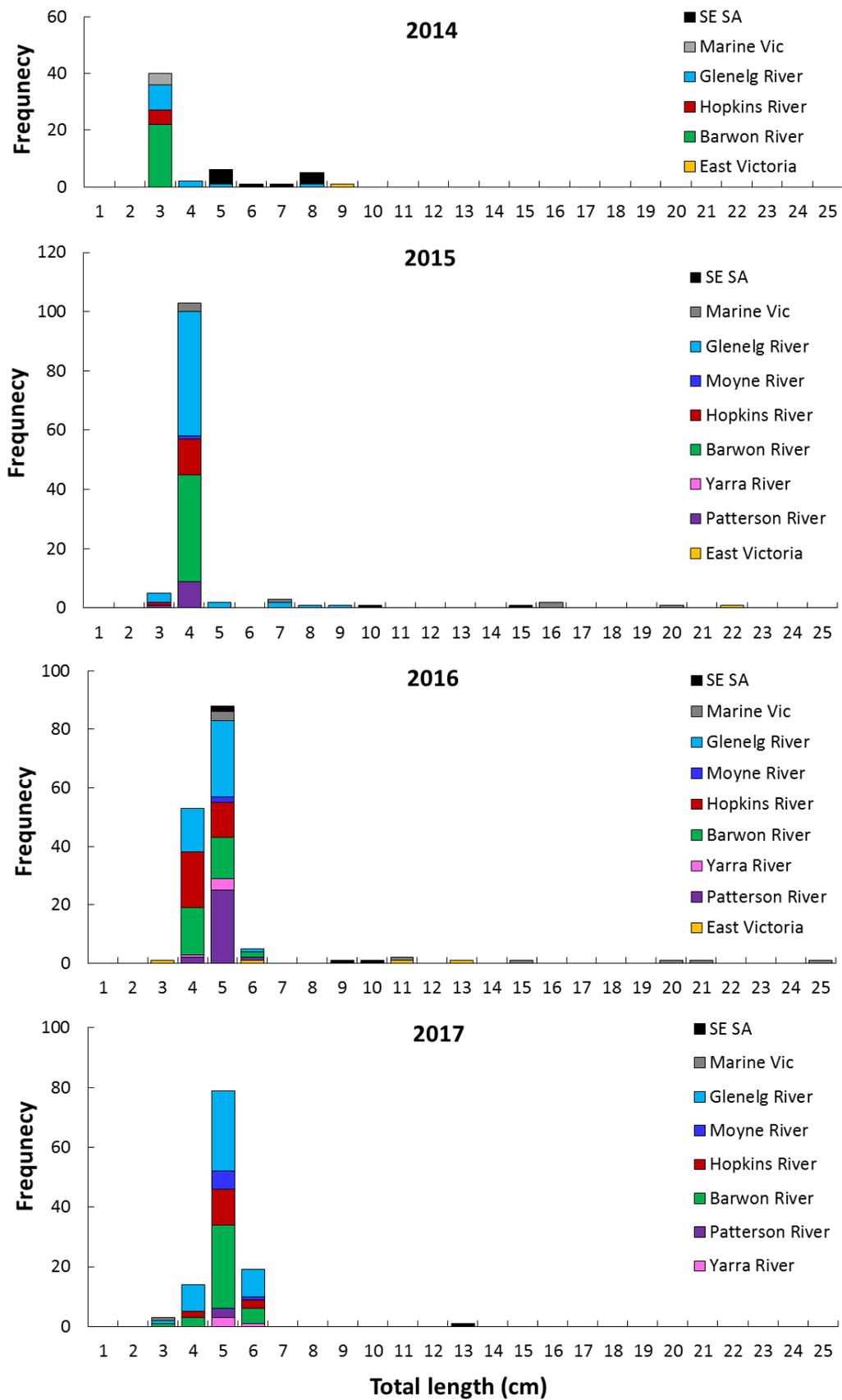


Figure 3. Overall age frequencies of mulloway donated by recreational anglers from the various regions in 2014 (Aug-Dec), 2015 (Jan-Dec), 2016 (Jan-Feb) and 2017 (Jan-Jun), including a small number of fish (<60 cm) caught by research scientists under a Fisheries Exemption Permit.

Growth rates

Figure 4 below shows the total lengths and corresponding ages of mulloway samples donated by anglers from Victoria and South East SA. Further samples collected from the Glenelg River by Fisheries Victoria's Research Anglers have kindly been provided by Simon Conron. This extra data has helped 'fill the gaps' for particularly the younger aged classes. A growth curve (black line) has been developed to describe the change in length at age for mulloway in Victoria and South East SA.

Through calculating the growth curve, an overall value for growth is determined. Based on our Victorian and South East SA samples, the growth rate for mulloway is 0.104 year^{-1} . This is similar to the overall growth coefficient calculated by South Australian scientists for mulloway in South East SA (0.136 year^{-1}). The addition of younger aged fish (<4 years) to our sample collection should see these coefficients become even more similar. This is to be expected, since our genetic analyses revealed that mulloway in Victoria are part of the same subpopulation as those in South East SA (see later). In contrast, the growth coefficient calculated for mulloway in NSW is higher (0.20 yr^{-1}) reflecting their faster growth rates and different genetic status.

The spread of lengths at any given age clearly demonstrate that mulloway growth is highly variable. For example, at 4 years of age, mulloway can be anywhere between 50-91 cm in length, while a 5 year old fish can be between 60-101 cm.

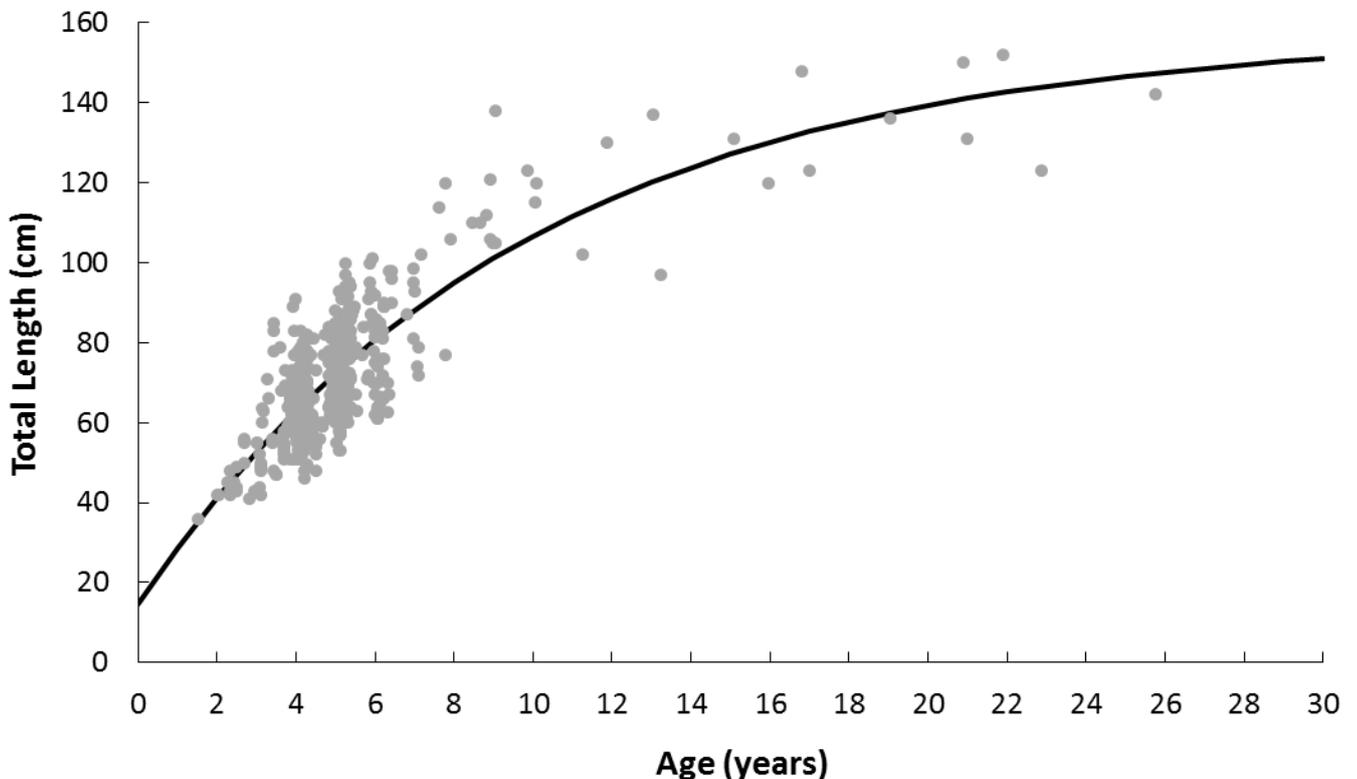


Figure 4. Size-at-age plot and growth curve (black line) for mulloway donated by recreational anglers from Victoria and South East SA since 2014, including some fish below the legal limit caught by research scientists and research anglers under a Fisheries Exemption permit.

Dietary data

While around 50% of stomach samples have been empty (due to mulloway purging themselves when caught), some preliminary dietary data has been collected and reveal some interesting results.

In terms of number of individuals, shrimp were the most important prey item accounting for 58% of the total items, followed by unidentified (digested) fish (14%), then sand crabs (6%). When looking at prey items by weight, mullet was the most abundant, closely followed by unidentified (digested) fish, sand crab, pilchard and salmon. Additional prey items that accounted for <1% of the total items and were therefore not presented in Figure 5, included sandy sprat, black bream, prawns, snails and sea lice. As additional gut samples are processed, this dietary data will be further explored to look at potential trends across regions (estuaries) and length classes to learn more about mulloway diets.

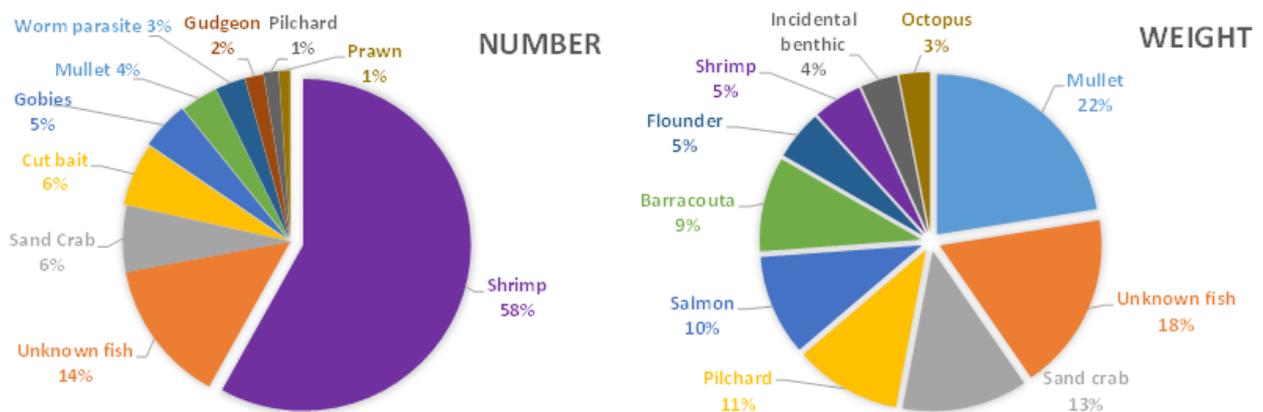


Figure 5. Contributions of different prey items by number of individuals (left) and weight (right).



Figure 6. Stomach content items, including goby species (top left), yelloweye mullet (top right), sand crabs and octopus (bottom left) and unidentified (digested) fish (bottom right).

Genetics

Using powerful genomic sequencing, we have assessed the spatial extent and frequency of gene exchange and the recruitment migration between mulloway stocks in Victoria and interstate. Over 300 tissue samples representing 14 locations (from Victoria, South Australia (SA) and New South Wales (NSW)) were used for genomic analysis.

The analyses revealed that mulloway, occurring between the Coorong in SA and Western Port Bay, form a single randomly mating stock (Figure 7 and 8). This is consistent with acoustic tagging work by the Arthur Rylah Institute that showed connectivity between the Coorong and the Glenelg River.

We detected weak but significant genetic differentiation between far west SA, Victorian/South East SA and NSW mulloway stocks, suggesting that gene flow is limited between these regions (see Figure 8). The potential genetic isolation of Victorian/South East SA and NSW populations is possibly due to their separation by the well-recognised biogeographic divide in eastern Victoria. Here, the contemporary physical conditions of Bass Strait, associated with the Bassian Isthmus, present a continuing barrier to the dispersal for many marine species, including fish and invertebrates. However, further intermediate geographic sampling of mulloway stocks between Western Port Bay and Eden is required to determine if the stocks either side of Bass Strait are truly isolated. While some samples were collected from eastern Victoria (Mallacoota, Gippsland lakes), these were insufficient to include into the genetic analyses.

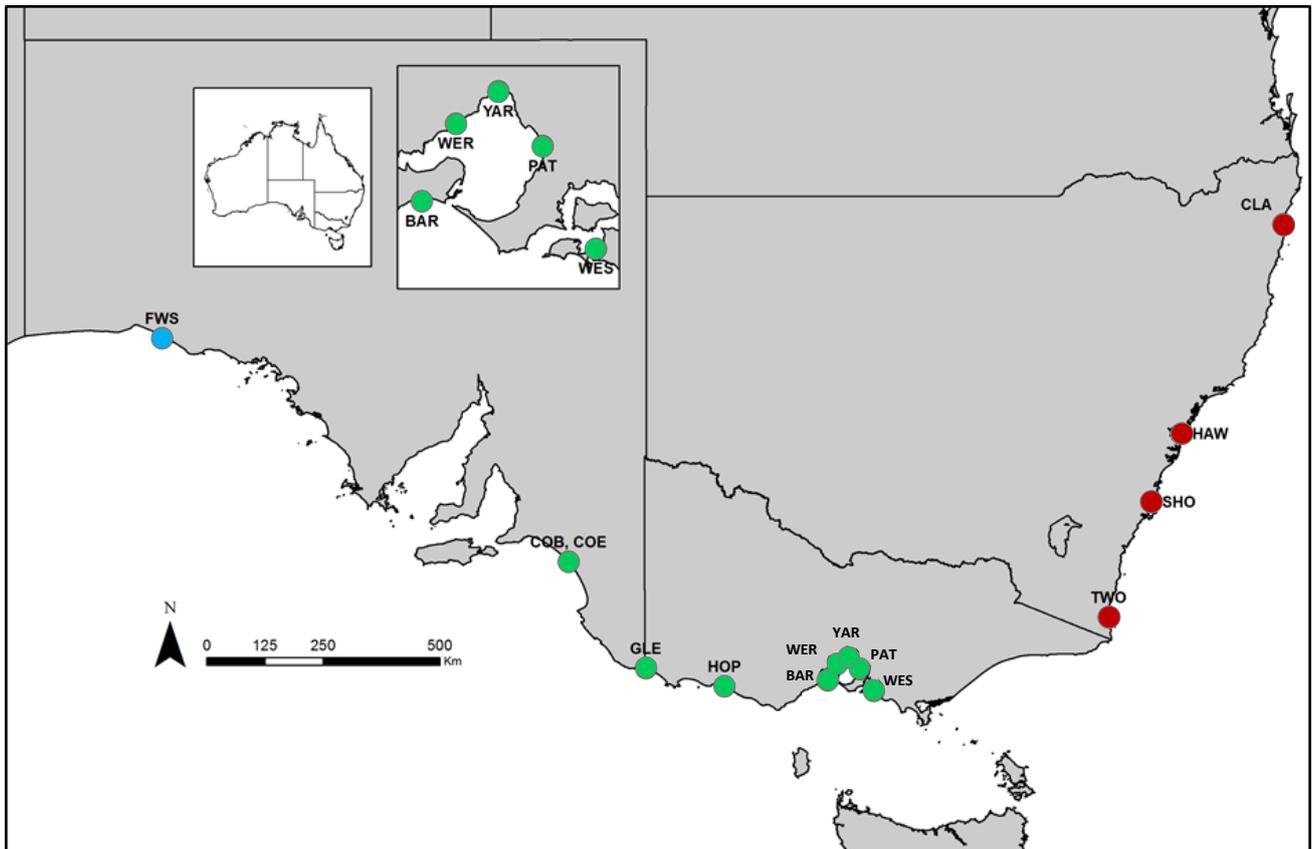


Figure 7. Map of sampling locations for genetic analyses, colour coded to represent the three distinct subpopulations: western South Australia, South East South Australia- Victoria and NSW.

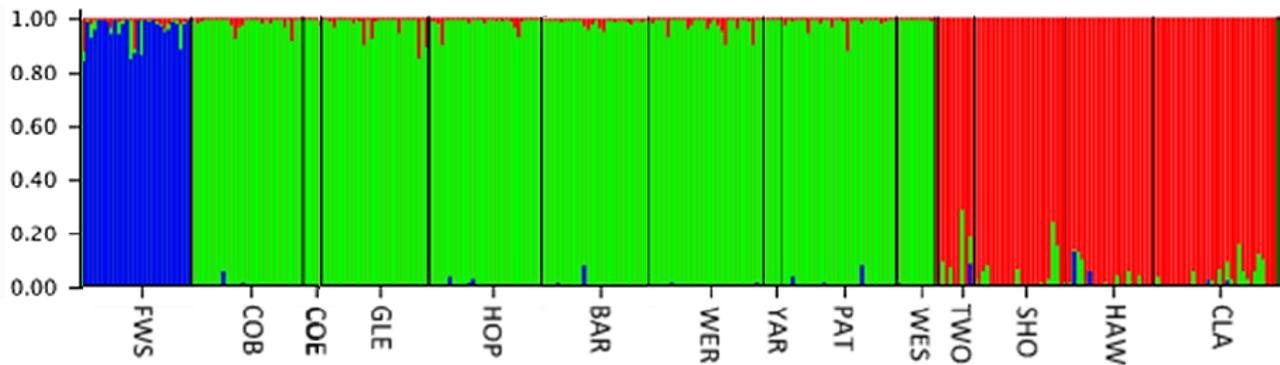


Figure 8. Summary bar plot where each individual is represented by a single vertical line broken into segments, where segments are proportional to the ‘membership coefficient’ for each population cluster. Individuals are arranged into sites and follow geographical order from west to east, where FWS= Far West Coast (SA); COB= Coorong Beach (SA); COE= Coorong estuary (SA); GLE= Glenelg River (Vic); HOP= Hopkins River (Vic); BAR= Barwon River (Vic); WER= Werribee River (Vic); YAR= Yarra River (Vic); PAT= Patterson River (Vic); WES= Western Port Bay (Vic); TWO=Twofold Bay (NSW), SHO=Shoalhaven Bay (NSW); HAW= Hawkesbury River (NSW); CLA= Clarence River (NSW).

How to donate samples?

Place each individual frame (ideally with organs attached) in a bag and attach a label to it with the following information:

1. Total length & total weight of the fish
2. Date and location of capture
3. Name and contacts of fisher

If you can't donate the whole frame you can simply donate the 1) head (try and leave organs still attached), 2) an otolith or 3) a small tissue sample. Make sure you include all the above information.

Please drop off at your nearest drop-off point or call Lauren (0439 034 390) to arrange collection.



Drop-off locations

A huge thanks to all our participating drop-off points. You guys are a crucial part of this research. For a full list of drop-off points and more information about the program, please go to:

<https://www.facebook.com/groups/mulloywaycitizenscience/>

New tagging project

For those that haven't heard, Nature Glenelg Trust has been successful in securing another three year grant to develop a recreational tagging program for mulloway. The project, funded by the Victorian State Government using Recreational Fishing License Fees, will investigate broad-scale movement patterns of mulloway across Victoria and potentially interstate. This project will complement the current RFL funded project and aim to address some of the knowledge gaps surrounding mulloway movement and the older life stages. While we now have an understanding of the early life stages of mulloway, few larger fish are caught in Victoria, leading us to question where mulloway go once they leave our estuaries. We're very excited about this tagging program and look forward to working with anglers to continue to learn more about the species.

The program will be similar to the tagging program in South Australia (SAFTAG), which has already seen mulloway tagged in the Glenelg River. There have been several recaptures which reveal incredible growth rates. In the tag and recapture certificate below, a 55 cm mulloway tagged by Michael Gordon was recaptured 39 days later by Mark Gercovich, and measured 58 cm!

TAG AND RECAPTURE CERTIFICATE

AWARDED FOR THE CONTRIBUTION TO OUR KNOWLEDGE OF FISH IN AUSTRALIA TO

Michael Gordon

	Tag #	Species	Angler	Date	Length	Location
TAG DETAILS	SA24450	Mulloway	Michael Gordon	03 Mar 17	550	Nelson 1k d/s
RECAPTURE DETAILS			Mark Gercovich	13 Apr 17	580	Nelson 1k d/s
				Days Out	Growth	Distance
				39	30	< 1k

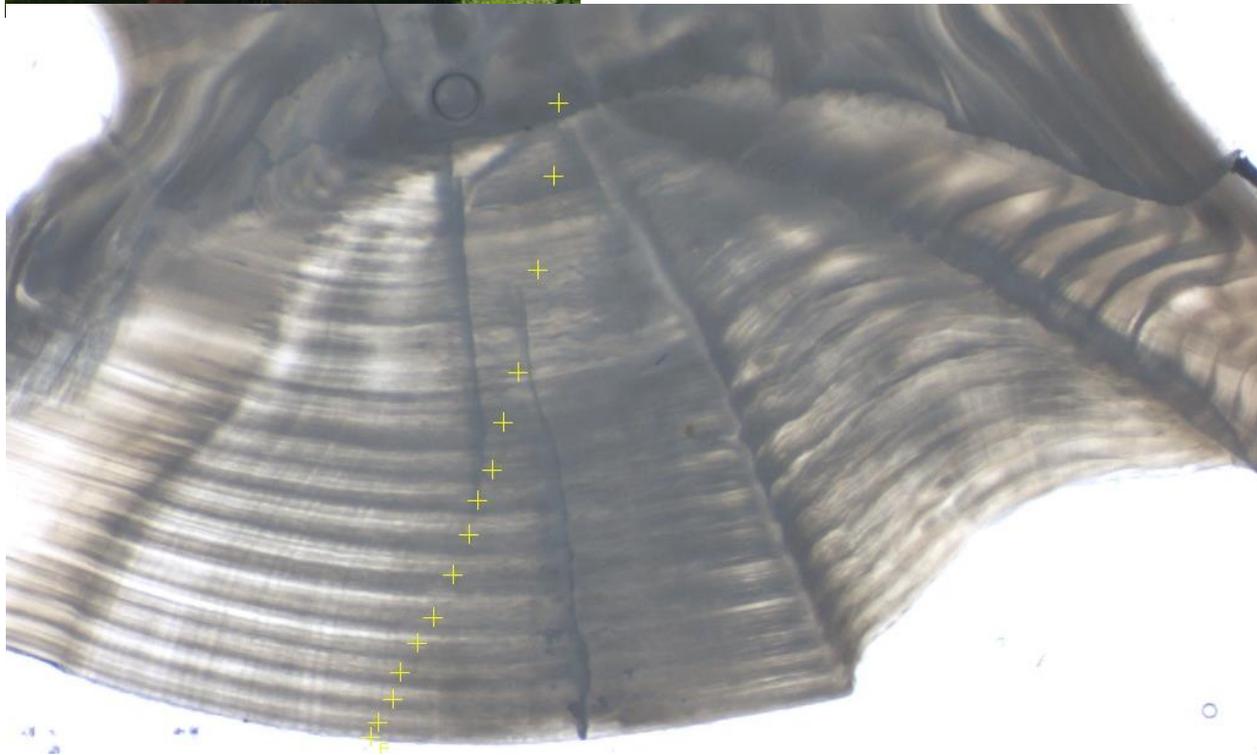
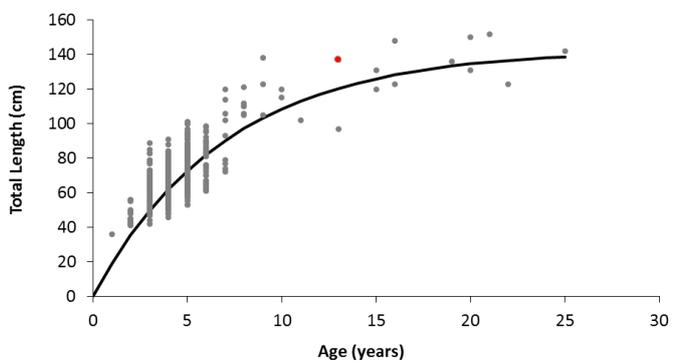
The aim is to establish a small and dedicated group of taggers in each major region of Victoria. If you'd like to be involved in this tagging program, please get in touch with Lauren (lauren.veale@ngt.org.au). We anticipate that tags will be available later in the year. Stay up to date with this new project through our Facebook page: <https://www.facebook.com/groups/mullowaycitizenscience/>.

Fishy Files!



Aaron Sauderson caught this 137 cm mulloway from the Coorong earlier this year, winning him a prize in the annual Kingston Surf Fishing Contest. Well done Aaron! This fish is the largest to be donated from South East SA.

This female fish was aged at 13 years, showing relatively fast growth.

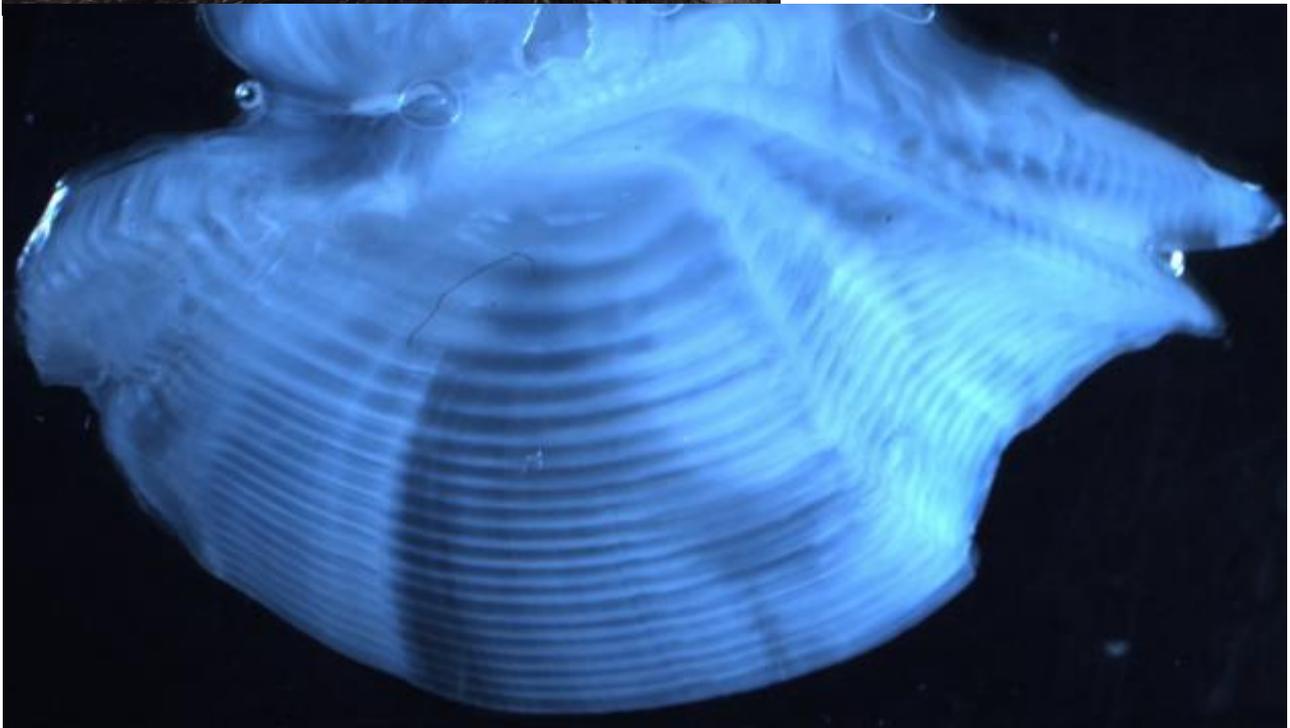


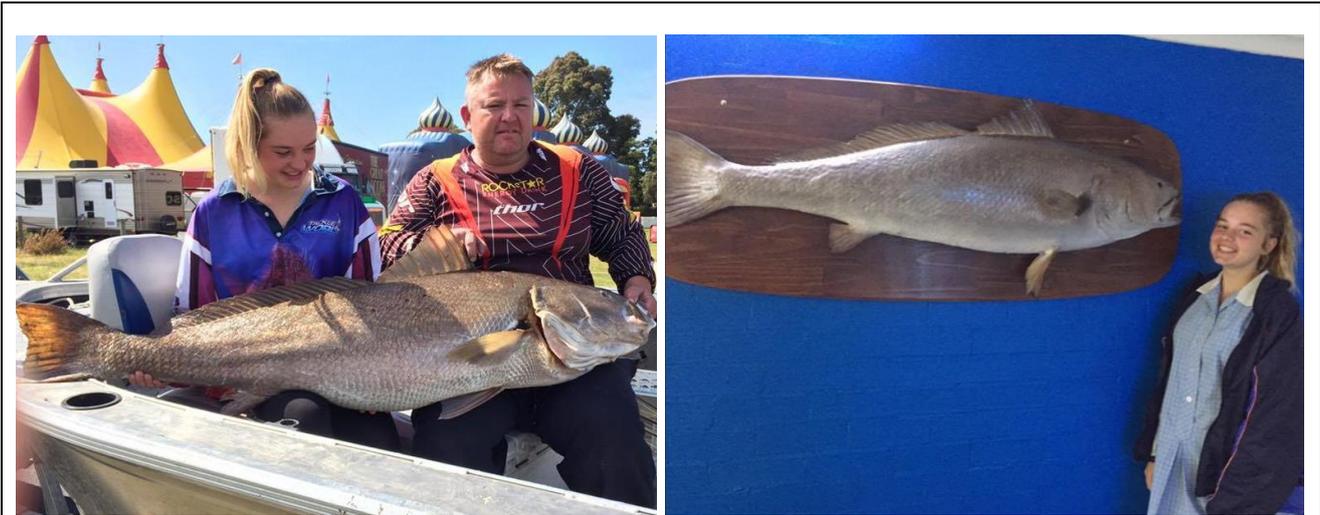


At 170 cm, this mulloway caught by **Adrian Lieutier**, is one of the biggest to be recorded in south-east Australia! Definitely a once in a life time mulloway.

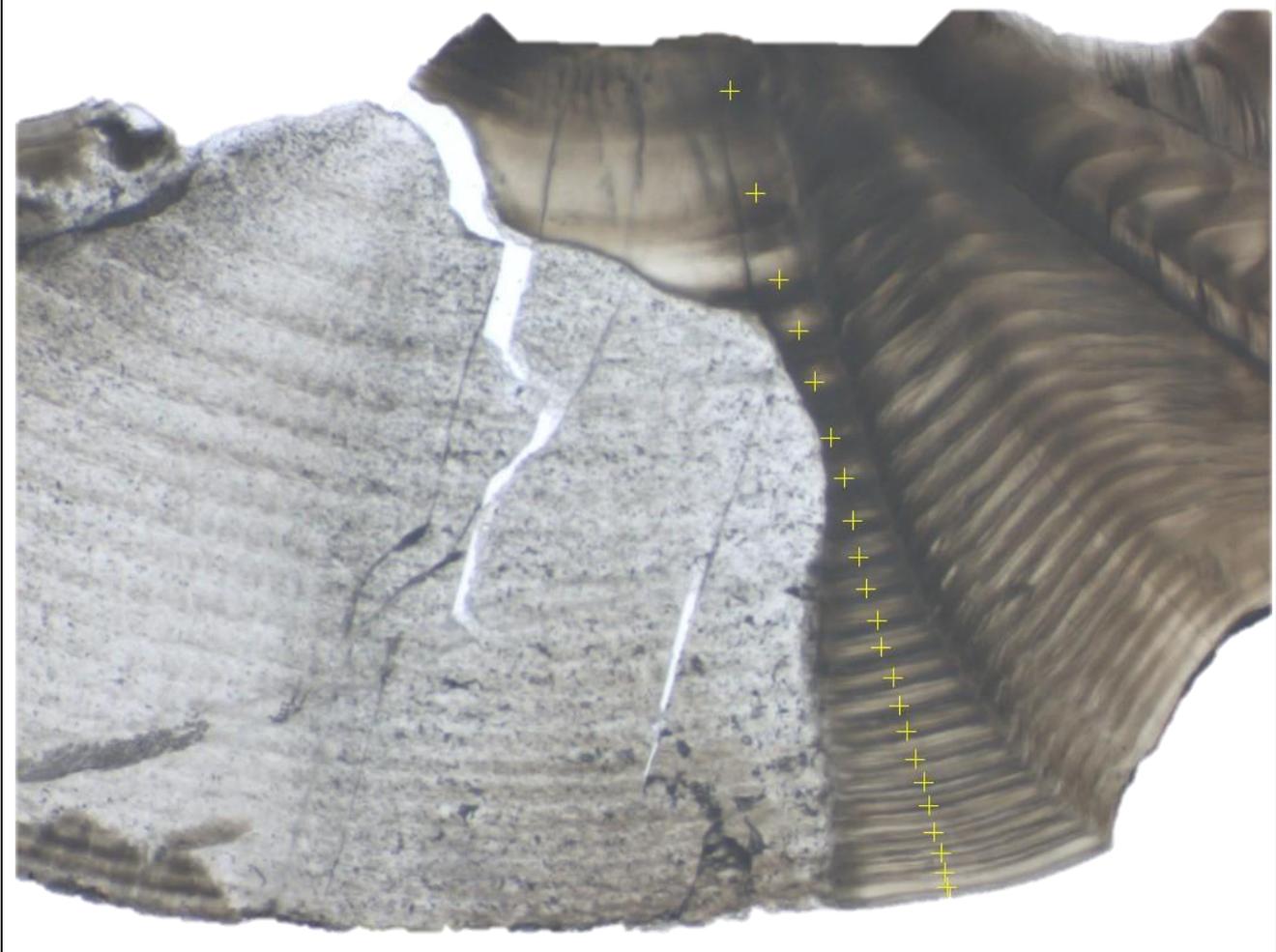
This fish was aged by NSW Fisheries Scientists at 22 years.

While this is the largest fish to be donated to the program, it is a few years younger than the oldest fish- a 142 cm mulloway, also from Western Port Bay.





Ebony Phipps, and her father Wayne, were fishing in Western Port Bay late last year when Ebony realised she had a serious fish on the end of her line! Catching a 152 cm mulloway, weighing just over 30 kg, is something most mulloway anglers only dream about. The mulloway was aged at 21 years, a few years older than Ebony! What a memorable days fishing!





Michael Gordon has been one of our top contributors to the research, donating 20 frames from the Glenelg River. This 75 cm fish was caught in March this year and aged at only 4 years. Thanks for your valued support and involvement Michael!

