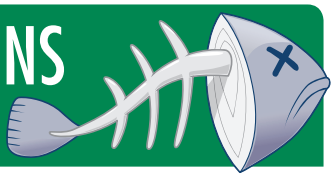
Department of
Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

RESEARCH ANGLER PROGRAM

Newsletter No. 37
December 2017

Welcome to the RAP Newsletter, providing feedback on the data you are collecting and keeping you informed about what is happening at the Department of Primary Industries and Regional Development.

SEND US YOUR SKELETONS 2016/17 REVIEW



The Send Us Your Skeletons (SUYS) initiative is now into its eighth year and remains an integral part of the monitoring program that the Department of Primary Industries and Regional Development (the Department of Fisheries was amalgamated into this new agency in late 2017) uses to determine the stock status of key fish species.

In particular, SUYS is critical to our monitoring of the recovery of key demersal and nearshore species, such as West Australian dhufish and Australian herring.

Hundreds of recreational fishers have donated their fish frames (skeletons with the head and guts intact) to the SUYS program each year since it began in 2010/11, with 5,258 frames donated in 2016/17 by over 600 fishers between Kalbarri and Esperance (Figures 1-3). It's great to see the donations of frames of demersal species from the south-west area rise over recent years, particularly for pink snapper (Fig. 2).

The high number of fishers who donate fish frames to SUYS and the wide range of capture locations helps to ensure that the total sample of each of the key species is representative of their whole stock. This contributes to rigorous stock assessments.

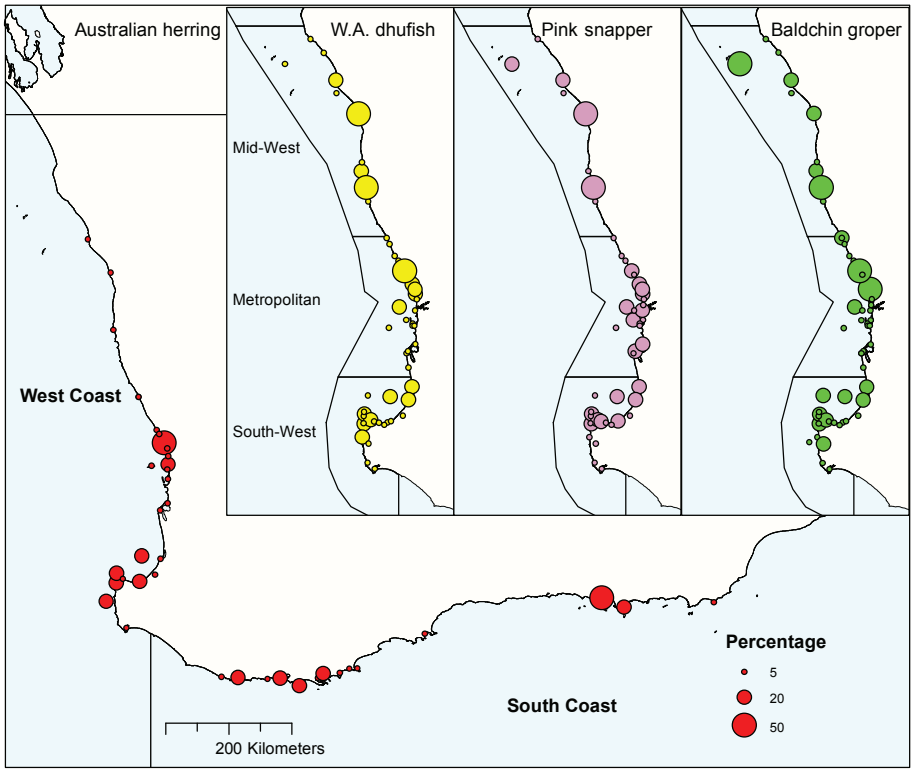


Figure 1. The percentage of frames of Australian herring donated by recreational fishers in 2016/17 from general locations of the West and South Coast Bioregions; and of WA dhufish, pink snapper and baldchin groper from locations in each management area of the West Coast Bioregion. The size of each circle shows the percentage of samples from a location in each area.

Over the years, it has been great to see the ongoing enthusiasm of the many fishers involved, which makes the SUYS program what it is today. This also reflects a strong sense of ownership of WA's unique natural resources and the understanding of the need for good management.

The next assessment of the West Coast Demersal Scalefish Resource will be released in the near future. This assessment incorporates data collected through SUYS from 2012/13 to 2014/15, which has been used to estimate the stock status of key species, WA dhufish and pink snapper. These species are used as indicators of the status of the entire suite of over 100 demersal scalefish species on the west coast. The results will be used to provide scientific evidence of whether their stocks are recovering.

Unfortunately there has been a decline in the number of nearshore fish frames received in 2016/17 from donors for all three nearshore target species – Australian herring, tailor and King George whiting. However, looking at the long-term trend, the total number of herring received from recreational fishers has been stable since collections began.

There has been a marked decrease in the number of King George whiting received and this perhaps reflects a particularly strong recruitment pulse of this species in recent years that is now coming to an end. We have had anecdotal reports from recreational fishers that King George were much harder to locate in 2016/17 than previous years.

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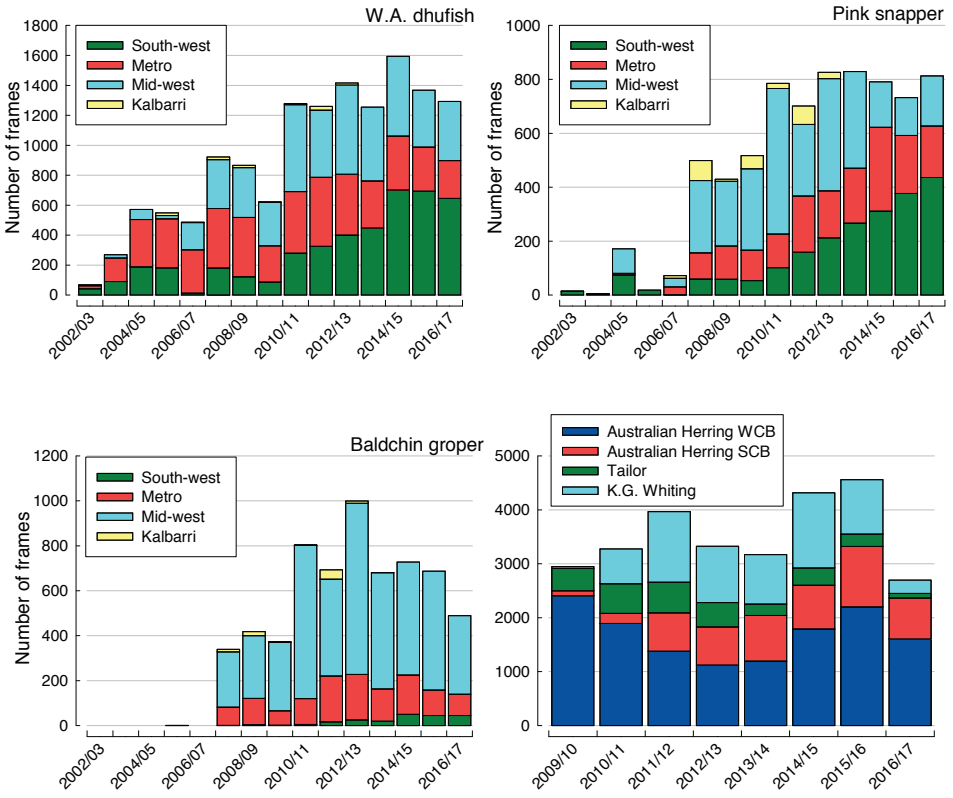

Figure 2. The number of WA dhufish, pink snapper, baldchin groper and Australian herring donated by recreational fishers between 2002/03 and 2016/17

We would love to see the number of nearshore fish, particularly herring, increase in 2017/18. If you would like to play a part in monitoring the recovery of herring and donate herring frames please visit **www.fish.wa.gov.au/frames** for your nearest drop-off location.

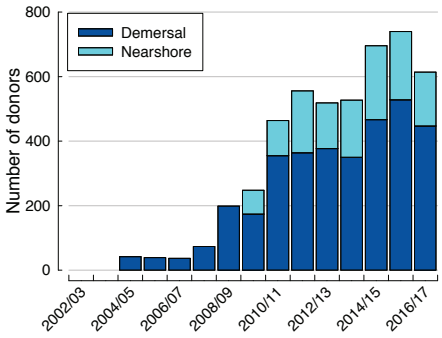

Figure 3. The number of recreational fishers who donated frames of demersal and nearshore species between 2002/03 and 2016/17

From egg to edible

Reproduction in fishes is a broad topic, as they are not only the most speciose (rich in species) group of vertebrates, they are also the most diverse in terms of their morphologies (form and structure) and the habitats they occupy.

Mating strategies range from spawning in large aggregations (gatherings) to monogamy, while parental styles range from internal bearing of young (e.g. many cartilaginous fish like sharks and rays) to open-water broadcast spawning with no parenting whatsoever.

Many fish such as WA dhufish and Australian herring are gonochoristic, meaning that individuals only reproduce as a male or female. In contrast, other species are hermaphroditic, having the ability to change sex as either juveniles or adults or even be both sexes simultaneously.

Baldchin groper is an example of a protogynous hermaphrodite. They begin life as females ('proto' meaning first and 'gynous' meaning female). After reaching sexual maturity at around three years old, individuals reproduce as females, before changing to male at around 8 to 12 years.

The timing of reproductive activity, or spawning, varies amongst fish species. For some temperate species such as WA dhufish and pink snapper, spawning peaks during summer and spring, respectively, on the lower west coast. In contrast, peak spawning in some nearshore species like Australian herring occurs during autumn.

Other species, like tailor, spawn at different times of the year, depending on their location.

Reproduction in fishes consists of several stages, including development, maturation/spawning and resorption (absorption of cells/tissue) phases.

In the months leading up to spawning, the reproductive organs of mature females and males begin to develop in response to annual, lunar, diel and oceanographic factors, including water temperatures and day length.

After initial formation of egg cells or 'oocytes' in the ovaries of females, oocytes enter their first growth phase, developing into the Chromatin nucleolar and then Perinucleolar stages, which are up to around 1/10th of a millimetre in diameter. These can be seen in the cross-section of the ovary of a WA dhufish in Fig. 4.

In these oocytes, DNA replicates and nucleoli form. Cortical alveolar oocytes develop during the secondary growth stage, with carbohydrates and proteins deposited. Following this stage, vitellogenesis occurs, where the nutrient-bearing yolk globules form (Fig. 4).

The primary function of this yolk is to nourish the future embryo. Vitellogenesis significantly increases the size of the oocytes up towards a millimetre in diameter. With this, the ovaries also enlarge, giving a granular appearance, colloquially referred to as 'roed up' (see also Fig. 5).

The final stage of development prior to release during spawning involves hydration of the oocyte to make them both neutrally buoyant and osmotically stable in seawater. After an oocyte (Fig. 5) has been released or ovulated during spawning, it leaves behind a visible follicle (Fig. 4).

In many fish species, not every oocyte develops simultaneously, with multiple stages visible within sections of preserved ovaries, as can be seen in the ovary of a WA dhufish shown in Fig. 4. This is referred to as asynchronous development and is

typically associated with individuals spawning on many occasions during a spawning period. Such species are referred to as multiple spawners.

Upon reaching optimal environmental conditions, spawning will commence. This can occur when certain water temperatures are reached (e.g. 19 – 21°C for pink snapper in WA), or during a particular lunar phase, interaction with potential mates etc.

Responding to such triggers allows fish to synchronise their spawning activity, increasing the probability of reproductive success. Very obvious examples of this are the spawning aggregations of pink snapper in Cockburn Sound during spring (see **www.fish.wa.gov.au/snapper-schooling**) and the large schools of Australian herring around the south-west in late autumn.

Species like WA dhufish, pink snapper and Australian herring are broadcast spawners, meaning that eggs and sperm are synchronously released into the water to allow fertilisation. Like humans, life begins for a fish inside an egg which has been fertilised by a sperm cell. However, unlike humans this all happens externally to the adults.

Throughout the spawning period, hundreds of thousands of hydrated eggs can be released into the water by a single individual, the vast majority of which don't survive into adulthood. For example, an 80 cm WA dhufish can release upwards of 300,000 eggs in one spawning event.

During this embryonic time, the fertilised egg will develop into larvae while being nourished by the yolk content of the egg. Fertilised eggs of fish hatch after different lengths of time, with WA dhufish hatching after roughly 32 hours.

The larval period is a transitionary phase that commences when the larvae begins to externally feed. Pelagic larval periods also vary substantially, allowing the often passive larvae to drift according to currents. However, larvae can also actively swim, seeking out suitable nursery habitats using olfactory senses.

For the first few years of life, the fish uses the majority of its energy for body growth before reaching sexual maturity. Reductions in growth rates then occur, as energy is put towards reproduction. The body size or length is then rarely indicative of a fish's age (hence why we need to collect otoliths to determine age).

The same thing happens to humans as they reach sexual maturity, except we don't have to pull out a human's ear bones in order to determine their age!

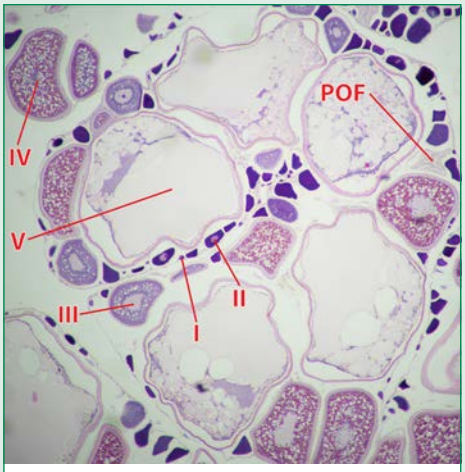

Figure 4. Preserved section of a spawning WA dhufish ovary showing stages of oocyte development. I = Chromatin nucleolus oocyte, II = Perinucleolus oocyte, III = Cortical alveolar oocyte, IV = Yolk granule oocyte, V = Hydrated oocyte, POF = Post ovulatory follicle.

Figure 5. Ovary of a mature 'roed up' WA dhufish containing yolk granule and hydrated oocytes

South Coast demersal assessment results

In 2016, the first stock assessment of inshore demersal scalefish stocks in the South Coast Bioregion of WA was published, funded by the Natural Resource Management Office of Western Australia. This report contains assessments of key inshore demersal species (i.e. pink snapper, Bight redfish, blue morwong and western blue groper.

This resource is important to both commercial and recreational fishers of the Bioregion, which extends from about 40 kilometres east of Cape Leeuwin to the South Australian border (see Figure 1).

In 2013 and 2014, representative samples (fish frames) were collected from both commercial and recreational sectors to determine the age profile of catches of the four

species. Ages were determined for 2,683 pink snapper, 5,672 Bight redfish, 2,621 blue morwong and 682 western blue groper.

The resulting demographic analyses were combined with other lines of evidence including biology and inherent vulnerability, temporal changes in catches, catch rates, length distributions and temporal changes in the geographic distribution of the catch to conduct what is known as a weight of evidence assessment. From this, the level of risk to the stocks from fishing can be determined.

The good news from this study is that after considering all lines of evidence, the stock of each species was considered to be at an acceptable level. These assessments form a baseline for comparison with future assessments to monitor stock trajectories. Age sampling of the commercial line catch is scheduled to commence again in 2019 for a second assessment as part of a planned monitoring schedule.

Send Us Your Skeletons – frequently asked questions

See our website for all the relevant information **www.fish.wa.gov.au/frames**

What exactly are you seeking and why?

The department continues to seek the 'frames' (filleted skeletons, with the heads and guts intact; you can keep the wings) of key demersal and nearshore species from the west and south coast of W.A. to help monitor their stock status and ensure that stocks remain sustainable. The assessments for these species rely heavily on age composition data for the population, so a fish's age, which we obtain from the ear bone or 'otolith', is a key piece of information.

What details do I need to provide and will they be kept private?

Please label your frames, giving the following details, which remain confidential:

Who caught the fish (name, phone number and email address – if you have one).

When the fish was caught (date).

Where the fish was caught (for shore catches: the general location; for boat catches: latitude/longitude or distance and bearing from port and the name of the port).

How do I donate?

You can drop your frames (with the heads and guts intact – remember you can keep the wings) along with the necessary details at our offices or participating stores listed at **www.fish.wa.gov.au/frames**. Bags for frames and waterproof labels are available at these locations.

Can the frames be frozen?

Yes, the information we require from the fish isn't damaged by freezing. Fish can be folded in half to save space if required.

Do you look at gut contents?

Although diets of some of these species have already been studied, they are not used directly in stock assessments. However, the diet of a fish species can inform us of whether they are herbivores, carnivores, omnivores or planktivores; and where they fit into the food chain and broader ecosystem. This type of information can be used in building ecosystem models that can help understand the flow-on effects of fishing, either up or down the food chain.

Do frames count toward bag/possession limits?

No, since 2015 fish frames have been excluded from possession limits (see: **http://www.fish.wa.gov.au/About-Us/Media-releases/Pages/_archive/Fish-frames-now-excluded-from-possession-limit.aspx**

What kind of feedback do I receive?

We are able to provide details of any fish you have donated periodically on request, as long as it has been labelled correctly with your contact details. However, determining the age of each fish can take over a year, with close to 20,000 otoliths processed by the fish ageing laboratories annually.

Are there still prizes to be won?

Yes! Thanks to our sponsors, those who donate frames to SUYS will go into a series of draws to win a range of prizes. Congratulations to last year's prize winners (see Table 1). Kallaroo recreational fisher Ryan Satinover won a charter fishing trip to the Montebello Islands, donated by **Monte Bello Island Safaris**. Ryan won the 2016/17 Send Us Your Skeletons grand prize by donating the skeletons of two King George whiting that he caught off Hillarys one afternoon last October. We would like to thank the organisations that support SUYS each year, including those who provide the drop-off locations and the prize donors.

Table 1. Major and quarterly prize winners for 2016/17

MAJOR PRIZES
R. Satinover
D. Clark
T. Spratt

QUARTERLY PRIZES		
Jul 16 - Sep 16	R. Morphett	J. Hindle
Oct 16 - Dec 16	J. Rodda	H. Heslewood
Jan 17 - Mar 17	P. Mattaboni	P. Michael
Apr 17 - Jun 17	J. Rodda	B. Gardiner

Thank you for your ongoing support and happy fishing!

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Telephone: +61 (08) 9203 0111
Deliveries: 39 Northside Drive, Hillarys, Western Australia 6025

ABN: 18 951 343 745

www.fish.wa.gov.au/frames