Department of
**Primary Industries and Regional Development**

GOVERNMENT OF WESTERN AUSTRALIA

RESEARCH ANGLER PROGRAM

**Newsletter No. 38**
**May 2018**

**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.**

# A study of Western Australia's 2010/11 Marine Heatwave

A recently published scientific paper using data collected by volunteers and DPIRD scientists has revealed some of the extraordinary changes that the 2010/11 "marine heatwave" had on our local fish communities.

In 2010/11, sea surface temperatures during summer were 4-5 °C above average along the west coast of Australia. Warm water persisted for a further two years around the south-west coast.

During this marine heatwave, the flow of the Leeuwin Current was exceptionally strong and transported many larvae of tropical fishes southwards.

This study documents how tropical fish species were transported south, well beyond their normal range, to the south-west coast where above average ocean temperatures enabled them to survive for several years and, in some cases, actually spawn.

Much of the data used in this study came from validated amateur observations and specimens volunteered by recreational and commercial fishers, including data from Redmap, the Department's dive surveys, and several web-based recreational fishing forums. The other source of data was the Department's long-term fish recruitment monitoring program which ran from 2004-2015 and used beach seine netting to survey juvenile fish.

The study confirms the emerging contribution of 'citizen scientists' working with researchers to document climate related impacts in the marine environment.

A copy of the paper, *Potential influence of a marine heatwave on range extensions of tropical fishes in the eastern Indian Ocean - Invaluable contributions from amateur observers*, is available online at **https://dx.doi.org/10.1016/j.rsma.2017.03.005**

## Western butterflyfish *(Chaetodon assarius)*

- **Subtropical**
- **On shallow reefs**
- **Max. length 13 cm**

These fish are endemic to WA, in coastal waters between North West Cape and Recherche Archipelago, but are rare south of Lancelin.

In 2011 there was a large spike in sightings between Perth and Albany, indicating a sudden influx of juvenile recruits. However, numbers dropped dramatically a year later, indicating that most did not survive beyond the first year.

## Black-spotted dart *(Trachinotus baillonii)* and Common dart *(Trachinotus botla)*

- **Tropical/subtropical**
- **Pelagic, often along beaches**
- **Max. length ~75 cm (for both species)**

Both species are widespread across Indo-west Pacific. In WA, black-spotted dart are normally found from Lancelin northwards, while common dart are occasionally seen as far south as Bunbury.

A pulse of small juveniles recruited to southern waters during 2011 and were seen at various locations between Perth and Albany. They survived over consecutive winters and were seen in April 2015 when they had grown to around 35cm. This is approximately the size at which both species attain sexual maturity, however there was no evidence that any fish had yet spawned. Last sighting was in February 2017.

## Northern threadfin *(Polydactylus plebeius)*

- **Tropical**
- **Little known about biology of this species**
- **Max. length 50 cm**

These fish are widespread across the Indo-Pacific. In WA, they rare south of Geraldton.

Juveniles arrived in southern waters in 2011 and survived until at least 2013. They were seen in 2012 and 2013 at various sites from Jurien southwards, including along the south coast as far as Esperance. Initial sightings were small fish (~50 mm), with later sightings of larger fish (up to 280 mm), suggesting the recruits had survived for multiple years.

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## Sand bass *(Psammoperca waigiensis)*

- **Tropical/subtropical**
- **On shallow reefs**
- **Max. length 47 cm**

This species is widespread across Indo-west Pacific. In WA, they are common from Shark Bay northwards, but small breeding populations are believed to occur at Dongara, Jurien and perhaps Houtman-Abrolhos Islands.

Prior to the heatwave, this species was moderately common at Rottnest Island, but numbers increased sharply here in 2011.

Fish were sighted in Perth and Geographe Bay each year from 2011 to 2015. Individuals survived over consecutive winters and grew rapidly, reaching sexual maturity in 3-4 years. Spawning fish were observed in Perth in 2014 and 2015.

## Rabbitfish *(Siganus sp.)*

- **Tropical/subtropical**
- **Herbivorous**
- **On shallow reefs**
- **Max. length 47 cm**

These are common from Shark Bay northwards, but are occasionally seen as a far south as Geographe Bay. The southern sightings have gradually increased in recent years, suggesting this species is slowly creeping south.

Large numbers of juveniles recruited to the Perth-Geographe Bay area in 2011. These fish survived and grew, reaching up to 200mm after two years. Large numbers were caught by commercial and recreational fishers in 2013.

These two year old fish commenced spawning in 2013, and a new batch of small juveniles (their offspring) were soon detected in Perth.

A small amount of breeding occurred in 2014 and 2015, but now appears to have stopped with the return to more typical (cooler) summer water temperatures.

### Rabbits of the sea

Rabbitfish don't appear to have established a permanent breeding population in Perth yet, but it could happen in the future as our ocean waters continue to warm.

If it did happen, it is likely to drastically change the local ecology as rabbitfish are herbivores and consume large quantities of marine plants (algae and seagrass).

The arrival of Rabbitfish and other tropical herbivores have already changed coastal ecosystem further north off the mid-west coast of WA, suppressing the recovery of kelp forests lost during the marine heatwave.

Globally, rabbitfish populations have established in temperate waters of eastern Australia, Japan and the Mediterranean, following rising ocean temperatures. These areas have experienced major ecological changes (substantial loss of algal biomass and species richness) and economic costs as a consequence of rabbitfish grazing.

In addition to the shallow-water species discussed above, there is also evidence of many other tropical finfish species moving into the waters south of Perth after the heatwave.

These include:

- Demersal species (20–250m depth): redthroat emperor (*Lethrinus miniatus*), spangled emperor (L. nebulosus), grass emperor (*L. laticaudus*), bluespot emperor (*L. punctulatus*), rankin cod (*Epinephelus multinotatus*) and Chinaman rockcod (*E. rivulatus*).
- Larger-bodied pelagic species: billfish (*Makaita indica* and *M. mazara*), whale shark (*Rhincodon typus*), manta ray (*Manta birostris*), Japanese devilray (*Mobula japanica*) and Spanish mackerel (*Scomberomorus commerson*).

# Oarfish

DPIRD divers were lucky enough to have a rare encounter with a living oarfish *(Regalecus glesne)* at Bunker Bay in February 2017, when the oarfish visited whilst the team was working underwater on an acoustic receiver.

Oarfish are the world's longest bony fish, with unconfirmed reports of fish up to 17 metres. They feed on plankton and are found worldwide in tropical and temperate marine waters. They have no scales and have a single dorsal fin that extends the length of the body. They normally reside in deep oceanic waters so encountering one is a rare event. People most often see them washed up on beaches.

Photo: Silas Mountford

# The Southwest Recreational Crabbing Project

The Southwest Recreational Crabbing Project (SWRCP) was a three-year study run by The Department of Primary Industries and Regional Development (DPIRD); formerly The Department of Fisheries,

The project worked with local crabbing communities to develop ongoing, cost-effective programs to deliver annual information on recreational crabbing and stock dynamics in the iconic recreational blue swimmer crab fisheries of the Swan-Canning Estuary (SCE); the Leschenault Estuary and wider Bunbury area (LE); and Geographe Bay (GB).

The project ran from 1 June 2013 to 31 May 2016, and was funded through the Recreational Fishing Initiatives Fund (RFIF), administered by RecFishWest.

The specific objectives of the study aimed to:

1. Establish a Research Angler Program (RAP) for crabbing in the SCE, LE and GB;
2. Develop methods for the ongoing assessment of blue swimmer crab recruitment and breeding stocks in the SCE, LE and GB.
3. Determine the effectiveness of tagging methods to provide information on the movement of blue swimmer crabs that occurs between the SCE, LE and GB and their adjacent marine environments, including Cockburn Sound and Koombana Bay.

The project proved very successful, with over 200 enthusiastic crabbers getting involved.

The data generated through the logbook program, along with the information we collected from breeding stock and recruitment surveys in each of the three fisheries, proved invaluable as they provide the Department's only current source of information about the dynamics of the crab stocks in the LE and GB. We also collected some very useful information on methods for tagging blue swimmer crabs, and their movement in the three fisheries, through the tagging surveys.

A total of 208 fishers registered with the RAP, with 103 fishers in the SCE, 43 in LE and 62 in GB. The majority of fishers were male and lived near their specific fishery.

Drop netting accounted for the majority of crabbing trips in each fishery. There was also some scooping in each fishery, and snorkelling/scuba diving in the SCE.

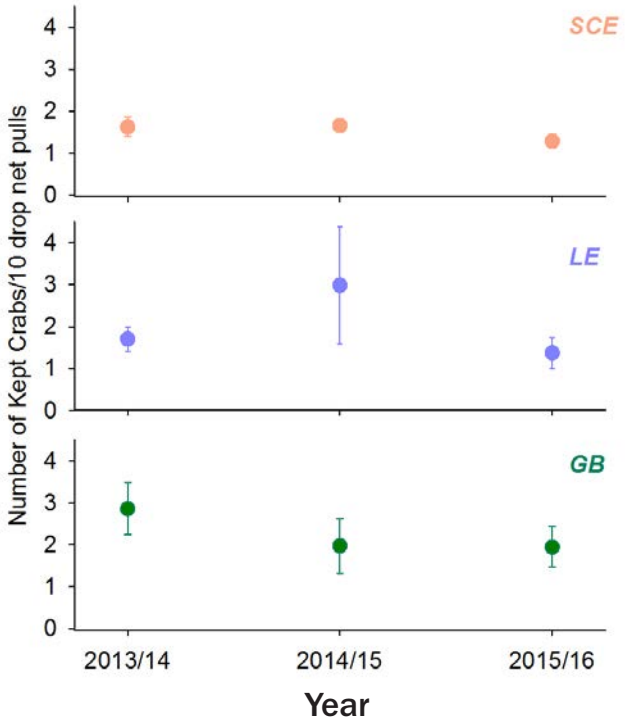


**Figure 1. Mean annual drop net catch rates (kept crabs per10 drop net pulls) for SWRCP fishers in the Swan-Canning Estuary (SCE), Leschenault Estuary and wider Bunbury area (LE) and Geographe Bay (GB) between June 2013 and May 2016 inclusive. 95% confidence intervals are included.]**

The mean annual catch rate (crabs kept for every 10 drop net pulls) for drop net fishers in the SCE was consistent at between 1.3 – 1.7 kept crabs/10 drop net pulls (Figure 1).

Drop net catch rates were generally higher and more variable in the LE and GB than in the SCE. The catch rate in LE almost doubled from 1.7 kept crabs in 2013/14 to 3.0 the next year, before falling to just 1.4 in 2015/16.

The mean annual drop net catch rate in GB was 2.9 crabs in 2013/14, before declining to 2.0 and 1.9 crabs in 2014/15 and 2015/16, respectively (Figure 1).

Most fishing in the SCE occurred over summer and into autumn, with fishing occurring throughout much of the estuary. The catch was almost exclusively male, and distinctive by the large size of crabs (mean carapace width ~153 mm CW).

Fishing focused on the lower reaches of the Swan River during winter and spring with the catch composed mainly of large female and sub-legal (< 127mm CW) male crabs.

The majority of fishing within the Leschenault Estuary occurred over summer, where the catch was almost exclusively male and much smaller than in other southwest WA fisheries (mean carapace width ~123 mm CW).

A small amount of crabbing also occurred in Bunbury Harbour, with the catch a mix of male and female crabs. Fishing continued in the estuary into autumn, before shifting solely to Bunbury Harbour during winter and into spring.

The catch during this period was largely female, with about half the catch over the legal-size limit.

Fishing in Geographe Bay was more evenly spread throughout the year with a peak in activity from September to January. The catch during this peak period was mostly female with many berried. The catch over summer and autumn was composed equally of male and female crabs, with relatively equal numbers of size and undersize female crabs, and predominantly undersize males. Fishing in the region occurred exclusively in the shallow nearshore waters around the bay, with most activity between the Busselton Jetty and Wonnerup Estuary.

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While anecdotal evidence from our crabbers suggests that crabbing has changed over the last 40 years or so, the data we received over the course of the project suggested that the crab stocks in each fishery are currently sustainable.

However, it is important to note that the project only provided a three-year time series, so DPIRD intends to maintain the logbook program and breeding stock surveys on an annual basis to compile the long-term datasets needed to inform harvest strategies for monitoring these fisheries into the future. So it's a great credit to our valued crabbers that because the data they provided was considered so useful, the logbook program has continued despite the specific funding for the project expiring in 2016. We will also continue with breeding stock surveys in each fishery, along with recruitment sampling in the Swan River.

So a BIG thank you to all our valued recreational crabbers! We look forward to continuing to work together to ensure the sustainability of crab stocks in these fisheries for future generations.

And don't forget that we are always keen to have new recreational crabbers join our program, as the more information we can collect from crabbers, the better the picture we can get of the health of the crab stocks. So if you have any family or friends interested in joining our program and supporting our work, they are welcome to contact me via email (david.harris@dpird.wa.gov.au), or phone 9203 0252 to find out how they can become involved.

For detailed information and results from the SWRCP, you can download a copy of the The Fisheries Research Report on the project at:

**http://www.fish.wa.gov.au/Documents/research_reports/frr281.pdf**

# Fishers of the month

The RAP 'fisher of the month' prizes were decided by randomly drawing one log sheet returned in each month.

Congratulations to the following 'fishers of the month':

| | | |
|---|---|---|
| **Dec 15** | **John Kaciuba** | **(West Coast)** |
| **Jan 16** | **Jacintha Page** | **(Gascoyne)** |
| **Feb 16** | **Mal Bernick** | **(West Coast)** |
| **Mar 16** | **Brian Heterick** | **(West Coast)** |
| **Apr 16** | **Neil Beckwith** | **(West Coast)** |
| **May 16** | **Les Nixen** | **(West Coast)** |
| **June 16** | **Don Howe** | **(West Coast)** |
| **July 16** | **Kim Meldrum** | **(West Coast)** |
| **Aug 16** | **David Scott** | **(South Coast)** |
| **Sep 16** | **Andrew Nicholls** | **(West Coast)** |
| **Oct 16** | **Robert Waugh** | **(West Coast)** |
| **Nov 16** | **Daniel Bedo** | **(West Coast)** |
| **Dec 16** | **Sean Johnson** | **(West Coast)** |
| **Jan 17** | **Geoffrey Cocks** | **(West Coast)** |
| **Feb 17** | **Peter Holtfreter** | **(West Coast)** |
| **Mar 17** | **Francis Parker** | **(West Coast)** |
| **Apr 17** | **Ross Bennett** | **(West Coast)** |
| **May 17** | **Dick Shore** | **(West Coast)** |

Each winner received one of our stylish RAP beanies.

## Thank you for your ongoing support and happy fishing!

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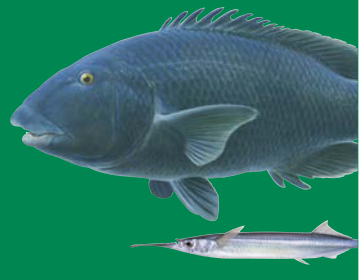



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