



NEW SOUTH WALES REPORT CARD

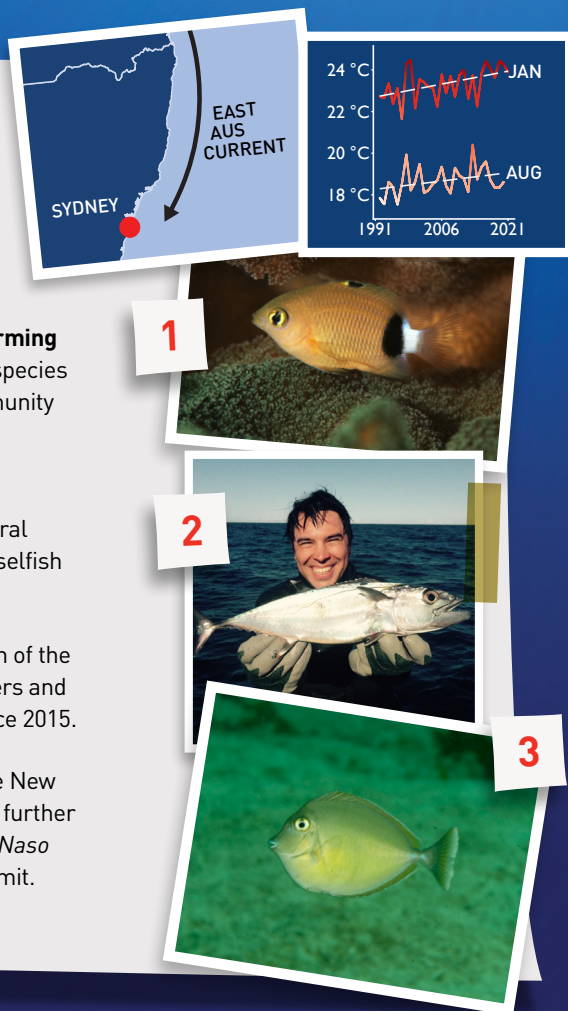
Over the past decade, Redmap (Range Extension Database & Mapping Project) has recorded out-of-range marine species with the help of observant citizen scientists across the state.

Marine species are moving further south

The East Australian Current or **EAC**, which transports warm, tropical water south along the coast of New South Wales, has strengthened over the past several decades. As a result, south-eastern Australia is **one of the fastest warming regions** of the world's oceans. In response to warming waters, some marine species are extending their ranges south. In recent years, the New South Wales community has **spotted many species south of their usual ranges**, for example:

- 1 In 2013 SCUBA divers first spotted a bed of the tropical branching coral (*Pocillopora aliciae*) near Sydney, which has been multiplying since. Several tropical fishes have been spotted in the coral bed, including Dick's Damselfish (*Plectroglyphidodon dickii*).
- 2 Dogtooth Tuna (*Gymnosarda unicolor*) usually live in tropical waters north of the Queensland border, but this highly prized fish has been surprising anglers and spearfishers with several catches along the New South Wales coast since 2015.
- 3 Each spring, tropical juvenile fishes carried by the EAC appear along the New South Wales coast. Now, these tropical recruits are being spotted much further south than previously reported, for example the Bluespine Unicornfish (*Naso unicornis*) near Narooma, about 340 km south of its recognised range limit.

Image credits: (1) J. Sear; (2) D. Cruz; (3) A.Green



CITIZEN SCIENCE HELPS DETECT SPECIES RANGE SHIFTS

Thank you to New South Wales' citizen scientists (beachcombers, boaters, divers, and fishers), who since 2012 have been logging 'out-of-range' species sightings like those above with Redmap. These observations can provide an early indication of how species distributions are changing, improving our ability to predict and prepare for the challenges and opportunities range extending species may deliver. By contributing to citizen science programs like Redmap, anyone with a camera can become an 'ecological detective', helping to uncover which species are on the move and how their local region may be changing in response to ocean warming.

HOW DO WE DETERMINE IF SPECIES ARE SPOTTED OUT-OF-RANGE?

Sightings logged by citizen scientists are reviewed by species experts for verification. Then, the location of sightings are compared to each species' distribution limits (established from scientific sources as of 2012) to identify which species were spotted beyond their known range boundaries over the past decade. Here is a summary of this information across the five marine bioregions of New South Wales.

234

CITIZEN SCIENTISTS
logged unusual or out-of-range species sightings

3

CITIZEN SCIENCE PROGRAMS providing out-of-range species observations
(see final page for more info)

redmap
SPOT. LOG. MAP.

iNaturalist

Australasian
Fishes Project

RLS

REEF LIFE
SURVEY

656

Out-of-range or unusual **SPECIES** REPORTS

93

MARINE SPECIES tracked for out-of-range sightings

54

SCIENTISTS involved in verifying species identifications

11

out-of-range species reported
8 NEW to the bioregion

5

out-of-range species reported
4 NEW to the bioregion

3

out-of-range species reported
1 NEW to the bioregion

11

out-of-range species reported
6 NEW to the bioregion

6

out-of-range species reported

TWOFOLD SHELF

BATEMANS SHELF

HAWKESBURY SHELF

MANNING SHELF

TWEED-MORETON

BANORA POINT

COFFS HARBOUR

PORT MACQUARIE

NEWCASTLE

SYDNEY

ULLADULLA

MERIMBULA

8

3

2

1

4

12

14

19

16

15

13

11

17

18

23

20

22

21




Species' → # ← Species' #
historical southern range limit (as of 2012)
How far south the species was spotted

HOW IS THIS INFORMATION USED?

Out-of-range observations provide important evidence of the possibility that a species' range is extending. Based on factors like whether a species was recorded in more than one year or season, the data helps us assess the strength of evidence for each species using a peer-reviewed (or scientifically supported) analysis.

WHAT SPECIES ARE ON THE MOVE IN NEW SOUTH WALES?

How confident are we that a species' range is shifting?

HIGH		Confidence that a species' range is shifting was assessed as 'High', 'Medium' or 'Low' by combining the strength of evidence provided by citizen scientists' observations with our confidence in each species' known southern range limit.
MEDIUM		
LOW		



Number of sightings by:

			
SNORKELERS/ DIVERS	FISHERS	BEACH- COMBERS	SPEAR- FISHERS

Tweed-Moreton



1



Whitetip Reef Shark
(*Triaenodon obesus*)
 3 

2





Lemon Shark
(*Negaprion acutidens*)
 1 

Hawkesbury Shelf



3



Dogtooth Tuna
(*Gymnosarda unicolor*)
 5  2 



4



Headband Humbug
(*Dascyllus reticulatus*)
 138 



5



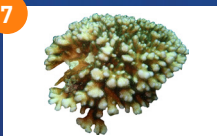
Dick's Damsel
(*Plectroglyphidodon dickii*)
 3 



6



Brown Tang
(*Zebrasoma scopas*)
 10 



7



Branching Coral
(*Pocillopora aliciae*)
 17 



8



Common Coral Trout (*Plectropomus leopardus*)
 3 


9



Spiny Seahorse
(*Hippocampus histrix*)
 3 

10





Stout Moray
(*Gymnothorax eurostus*)
 12 

Batemans Shelf



11



Barred Soapfish
(*Diploprion bifasciatum*)
 2 

12



Paradise Threadfin Bream (*Pentapodus paradiseus*)
 99 


13



Bluebarred Parrotfish
(*Scarus ghobban*)
 29 

14



Green Moon Wrasse
(*Thalassoma lutescens*)
 104 




15



Spangled Emperor
(*Lethrinus nebulosus*)
 4  1 

16



Pearl Perch
(*Glaucosoma scapulare*)
 1  1 



17



Giant Trevally
(*Caranx ignobilis*)
 1 

18



Fiveline Snapper
(*Lutjanus quinquelineatus*)
 2 

Twofold Shelf

19



Bluespine Unicornfish
(*Naso unicornis*)
 189 


20



Crested Hornshark
(*Heterodontus galeatus*)
 9 



21



Hairtail Blenny
(*Xiphias setifer*)
 2  1 

22



Banded Rockcod
(*Hyporthodus ergastularius*)
 3 

23



Striate Anglerfish
(*Antennarius striatus*)
 10  1 

What is Redmap?

Redmap (Range Extension Database and Mapping Project) invites members of the community to spot marine species that are outside of their usual range around Australia and log photos on our website or smartphone app.

GET INVOLVED

— WE'RE RELYING ON YOU!

Even though we have 'High' confidence that some species have been extending their range south along the coast of New South Wales, it is your observations as citizen scientists that are helping to assess how far beyond their known ranges these species are found. Your continued efforts will help to determine if these 'out-of-range' observations represent long-term patterns, and whether 'Medium' or 'Low' confidence species are more likely to undergo a range shift in the future. For more info and how to get involved - visit redmap.org.au

HAVE YOU SPOTTED AND PHOTOGRAPHED THESE SPECIES?



IN NEW SOUTH WALES?



Blacktip Reef Shark
(*Carcharhinus melanopterus*)



Blackspot tuskfish
(*Choerodon schoenleinii*)



Shark Mackerel
(*Grammatocynus bicarinatus*)

SOUTH OF SYDNEY?



Blackback butterflyfish
(*Chaetodon melannotus*)



Diamondscale Goatfish
(*Parupeneus ciliatus*)



Doublesaddle butterflyfish
(*Chaetodon ulietensis*)

Image credits: top row: Doug Finney, David Harasti, CSIRO Australian National Fish Collection CC BY-NC-SA; bottom row: Erik Schlögl, Rick Stuart-Smith, David Harasti; Background (above): John Turnbull

CONTRIBUTORS

Institute for Marine and Antarctic Studies at UTAS: B. Wolfe, G. Pecl, F. Heather, J. Keane, J. Stuart-Smith, R. Stuart-Smith; New South Wales Department of Primary Industries: C. Champion, M. Coleman, N. Moltschanowskyj; University of Newcastle: T. Gaston; Department of Natural Resources and Environment TAS: R. Pearn, S. Frijlink; Department of Primary Industries and Regional Development (WA): J. Brown, G. Jackson; James Cook University: S. Kjeldsen, J. Strugnell; Queensland Museum: S. Watson; Western Australian Museum: G. Moore; Australian Museum: M. McGrouther; GBRMPA: T. Hatley

More ways to be a citizen scientist



iNaturalist is an online social network where people can share, identify, and learn about species sightings (not just out-of-range or marine species), and help generate biodiversity data for scientists along the way. www.inaturalist.org

Reef Life Survey is a citizen science initiative in which trained volunteer SCUBA divers conduct standardised underwater surveys of biodiversity on rocky and coral reefs around Australia (and the world). www.reeflifesurvey.com

WWW.REDMAP.ORG.AU



MADE POSSIBLE WITH
SUPPORT FROM:



This report card was co-funded by the NSW Marine Estate Management Strategy (MEMS). What is MEMS? MEMS was developed by the Marine Estate Management Authority on behalf of the NSW Government and the broader community. It outlines how to protect and enhance our waterways, coastline and estuaries for 2018-2028. Find out more at www.marine.nsw.gov.au



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