



Department of
Primary Industries

Fisheries, Aquaculture and Aquatic Conservation Key Highlights and Statistics 2014-15



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Foreword

This new report series is designed to consolidate information about the work undertaken and outcomes achieved by the NSW Department of Primary Industries' Fisheries branch. In addition to a brief description of each major area of work and a few key highlights from 2014/15, it provides data on important metrics such as:

- Fisheries and aquaculture production
- Status of fish stocks
- Numbers of threatened species
- Condition of fish communities
- Fisheries enhancement work
- Education and compliance activities
- Permits/licenses issued
- Research publications
- Projects underway and completed

Over time, the report series will allow trend analysis of key performance indicators for fisheries in NSW.

The report also refers readers, where appropriate, to sources of more detailed information including published reports and the branch's website (www.dpi.nsw.gov.au/fisheries).

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Introduction

As part of the NSW Department of Industry, Skills, and Regional Development, the Department of Primary Industries (DPI) works to increase the value of primary industries and drive economic growth across NSW.

The Fisheries branch of DPI (DPI Fisheries) fosters sustainable and economically-viable fishing and aquaculture industries through research, policy and regulatory compliance. DPI Fisheries manages the protection of key fish habitats, assesses and manages aquatic resources, regulates commercial and recreational fishing, and manages indigenous fishing and aquaculture. DPI Fisheries is responsible for administering the *Fisheries Management Act 1994* and primarily responsible for administering the *Marine Estate Management Act 2014*.

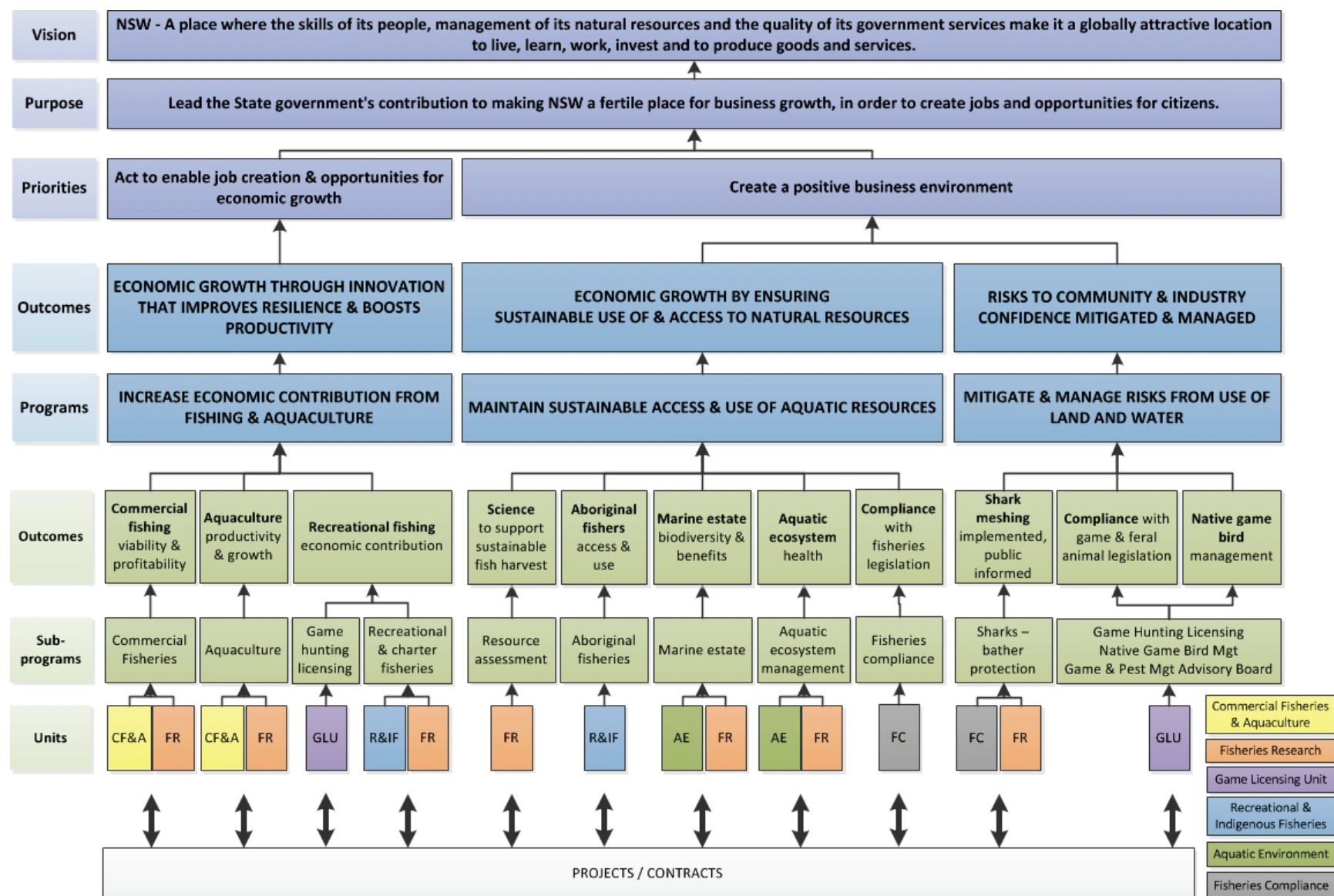
DPI Fisheries contributes to 3 key programs in the new DPI Strategic Plan 2015-18:

- Increase economic contribution from fishing & aquaculture (commercial fisheries, recreational fisheries and aquaculture)
- Maintain sustainable access and use of aquatic resources (resource assessment, Aboriginal fisheries, marine estate, aquatic ecosystems, and fisheries compliance)
- Mitigate and manage risks from use of land and water (the shark (bather protection) program).

Each of the following two parts of this report is divided into chapters which reflect these DPI programs. The first part describes – for each program area – the outcomes that DPI Fisheries is seeking to achieve on behalf of the NSW Government, industry and the community, as well as key measures to indicate success in achieving these outcomes and selected achievements from 2014-15. The second part provides statistical tables, maps and figures which provide detailed information on industry performance, resource status and DPI Fisheries activities, outputs and efficiency.

A list of publications, including internal reports, commissioned reports, reports to external funding agencies, scientific publications, non-technical publications, newsletters etc, appears as Appendix 3. Externally funded projects commenced: and completed during 2014-15 are listed in Appendix 4.

Figure 1: The contribution of DPI Fisheries sub-programs to strategic objectives of NSW DPI and the Department of Industry



1. Outcomes and highlights – by program

1.1. Increase economic contribution from fishing and aquaculture

1.1.1. Commercial fisheries

Outcome sought: Increased viability and profitability of the commercial fishing industry

Key measures	2011-12	2012-13	2013-14
Total NSW wild harvest (tonnes)	13,177	12,443	13,489
Total GVP (\$'000)	82,001	83,637	96,333
Total number of commercial fishing businesses with shares/entitlements	1,304	1,303	1,302
Average GVP per reporting fishing business (\$'000)	78.4	82.0	95.2

The NSW wild harvest commercial fishing industry is worth around \$80-\$90 million per year at first point of sale. Around 1000 commercial fishing businesses work with wholesalers, processors and retailers to supply fresh seafood to communities across the State, as well as to interstate and overseas markets.

There are currently ten managed fisheries in NSW waters, including seven share management fisheries (*Abalone, Lobster, Estuary General, Estuary Prawn Trawl, Ocean Hauling, Ocean Trawl, Ocean Trap & Line*) and three restricted fisheries (*Inland, Sea Urchin & Turban Shell, Southern Fish Trawl*).

DPI Fisheries is responsible for the sustainable management and development of the commercial harvest fisheries of NSW, including fisheries resource planning to ensure appropriate sharing of fisheries resources, and fisheries management through implementation of share management plans and fishery management strategies (including controls on fishing gear, quotas and catch limits).

The Commercial Fishing Trust Fund is constituted under the *Fisheries Management Act*. A range of fees, charges and contributions are paid into the Trust, including management charges for share-managed fisheries, annual contributions for restricted fisheries, fees paid for commercial fishing licences, commercial fishing boat licences and the registration of fishing gear used by commercial fishers, and the proceeds of the sale of tags used on fish taken by commercial fishers. The funds are used to offset the costs of taking measures to enhance and maintain the effective management of commercial fishing, carrying out research into commercial fishing, management and administration of commercial fishing, ensuring compliance with commercial fishing regulatory controls and consulting with commercial fishers (see Appendix 1).

The major focus during 2014-15 was on continuing to implement the NSW Government's Commercial Fisheries Reform Program (see Box 1).

Box 1: Commercial Fisheries Business Adjustment Program

The NSW Commercial Fisheries Business Adjustment Program (formally known as the NSW Commercial Fisheries Reform Program) continued during the 2014-15 year, with a number of key milestones achieved. Submissions were received on linkage options that were released in April/May 2014 for public consultation, and a Summary of Submissions report was developed and released in June 2015 outlining a number of key concerns identified by stakeholders.

The concerns raised resulted in the commissioning of additional analysis for consideration by the Structural Adjustment Review Committee (SARC). The further work undertaken included: (i) a critical review of the proposed structure of the exit grant process (published March 2015); and (ii) an independent economic analysis which examined the current viability of the fisheries subject to reform and the potential impact of the linkage options (published June 2015).

DPI Fisheries also continued to provide administrative and technical support to the SARC as needed, assisting in the development the SARC's draft recommendations prior to a targeted stakeholder consultation phase commencing in July 2015.

Box 2: Economic analysis of NSW commercial fisheries reform package

Economic analysis of the reform package was undertaken to assess the economic performance of NSW fisheries as they operate now, and look at the economic impacts of the various reform linkage options proposed. The analysis included estimates of return on investment (ROI) for the varying commercial fisheries and modelling of the impact of various share linkages in 15 share classes.

Despite some difficulties in sourcing fishing business operational financial information, the analysis was able to provide insight into the viability of the various fisheries and the impact of proposed linkages on fishing businesses. The estimated return on investment across the various NSW fisheries was estimated to range from - 71% to 15% with 4 of the 5 NSW fisheries subject to reform showing a negative ROI (although noting that some individual fishing businesses are viable). The impacts of various linkages were also difficult to determine given the complex nature of fishing businesses (i.e. each business may contain various share classes and operate at varying levels of fishing activity). Therefore, the impacts will vary business by business.

Box 3: Spanner crab quota scheme

The Minister for Primary Industries announced the implementation of an individually transferable quota (ITQ) system for spanner crab northern zone shareholders to commence on 1 July 2015. This follows long-standing support from fishers for quota implementation in this zone and additional consultation through the NSW Commercial Fisheries Business Adjustment Program. An interim total allowable catch is to be set for 2 years with individual quotas allocated in direct proportion to shares held. The total allowable catch will then move to a scientifically based TAC. For the first time fishers will use FisherMobile to report their activity - a mobile App which provides integrity in the management arrangements, while allowing giving fishers more flexibility and efficiency in completing their catch reporting requirements. With this portion of the fishery managed by an output control, the number of dillies able to be used has been increased from 20 to 30 for a single operator. The need to retain other gear controls will continue to be monitored taking into account efficiency needs and sustainability outcomes.

Box 4: Eastern sea garfish recovery

In response to Eastern Sea Garfish being classified as overfished in 2002-03, a recovery program was introduced involving changes to the minimum mesh size and implementation of weekend closures for the commercial fishery. Several research projects were also undertaken to improve the understanding of life history and biology of Eastern Sea Garfish.

Ongoing monitoring has demonstrated improvements in the age composition in landings and improved catch rates over the five most recent consecutive years. These improvements have led to Eastern Sea Garfish being reclassified as from 'overfished' to 'fully fished' in March 2015. DPI Fisheries continues to closely monitor the harvest of Eastern Sea Garfish and to ensure the management arrangements in place continue to support ongoing sustainable harvest.

1.1.2. Aquaculture

Outcome sought: Increased productivity and growth of aquaculture

Key measures	2011-12	2012-13	2013-14
Total NSW aquaculture production (tonnes)	4,289	4,186	4,331
Total value of NSW aquaculture production (\$'000)	49,646	50,135	53,365
Aquaculture productivity (production value per ha, \$)	12,108	12,455	12,386
- Lease-based	8,338	8,264	10,091
- Land-based			

In NSW, aquaculture produces a diverse range of seafood including oysters, prawns, marine and freshwater fish, yabbies and mussels. Aquaculture product contributes over \$50 million to the NSW economy at point of first sale and aquaculture provides over 1500 full and part time jobs in regional areas. Aquaculture is expected to be an increasingly important sector to support the future food security needs of the state.

DPI Fisheries is encouraging the ecologically sustainable development of aquaculture to ensure production of high quality seafood for the Australian public and for export. It develops and transfers technology to industry to support aquaculture and helps to enhance job creation and economic growth in rural NSW by encouraging responsible aquaculture investment. Sustainable Aquaculture Strategies for the oyster and land-based sectors promote industry best practice and environmental protection.

The Aquaculture Research group within the Fisheries Research unit conducts research to underpin the sustainable development of aquaculture, including improvements to mollusc (especially oyster) aquaculture and genetics, marine fish production techniques, and aquaculture nutrition.

The Aquaculture Trust Fund is constituted under the *Fisheries Management Act*. It is funded by fees paid for aquaculture permit applications and renewals, miscellaneous permits (e.g. for scientific collection and aquarium collection) and lease rental. The funds are used to offset costs for administration, database and GIS systems and the Derelict Oyster Lease Clean Up Project (see Appendix 1).

Box 5: Murray Cod cultivation expands in NSW

In 2014-15, five irrigation farmers in the south west of the state came together to develop new Murray Cod fish farms. Murray Cod is an iconic species with an attractive moist, white flesh sought after by local and Asian consumer markets.

Commercial harvest of Murray Cod is no longer permitted and aquaculture is now expanding to meet the increasing demand of this highly sought after species.

These five Murray Cod farmers have the potential to produce over 150 tonne of fish by utilising irrigation water through cage based farming in dams prior to irrigating crops with the water. This results in the water being used twice and nutrients from the fish wastes provide valuable nutrients for plant growth.

The farmers are investigating cooperatively how they can develop their industry along with access to markets both in Australia and overseas. They are working closely with the NSW Government's International Engagement Team and attending international food shows to gauge the interest in developing markets for our iconic Murray Cod overseas.

Box 6: Family breeding program for Sydney Rock Oyster

DPI Fisheries commenced a new approach to the successful Sydney Rock Oyster breeding program in 2014-15. The program will target improvement in growth, shell shape, disease resistance and meat condition. The 25 year old program previously used mass selection where large numbers of selected parents contribute to each generation. The new approach uses family breeding lines and relies on single pair mating. Some of the key benefits of family breeding are that: it enables the estimation of potential gains of desirable heritable traits; selection can be based on more than one trait; and, it prevents inbreeding - something that is very difficult to do using mass selection. To industry, the new program translates into a reduction in time to market and the revitalisation of estuaries affected by oyster diseases - a benefit costing at some \$7 million in extra production per year.

Box 7: Commercial shellfish leases in Jervis Bay

DPI Fisheries was successful this year with its application for 50 hectares of leases for aquaculture of shellfish/algae in the marine embayment of Jervis Bay. This approval comes on the back of over 12 months of community and industry consultation and the preparation of an Environmental Impact Statement, an Environmental Management Plan and a visual amenity study. The aquaculture leases provide an 'investment ready' platform for prospective investors with relevant approvals in place, reducing business risk. Twelve months of environmental monitoring has already been undertaken by DPI Fisheries to support the establishment of a shellfish food safety program. These leases will be offered to the commercial sector through a competitive process. Information collated for the Jervis Bay project, and the related marine finfish research lease off Port Stephens, will support the development of a NSW Marine Waters Sustainable Aquaculture Strategy.

1.1.3. Recreational fisheries

Outcome sought: Increased economic contribution from recreational fishing

Key Measures	2012-13	2013-14	2014-15
Total recreational fishing fee revenue (\$ million)	13.1	15.6 ¹	15.6

An estimated 1 million people – or around 17% of the population – engage in recreational fishing with the participation rate being twice as high in regional compared with metropolitan areas. This figure includes around 500,000 licensed recreational fishers whose license fees contribute to trust funds to improve recreational fishing.

DPI Fisheries is responsible for setting sustainable harvest rules for saltwater and freshwater fishing (including size and bag limits), managing and administering programs funded by the Recreational Fishing Trusts to provide quality recreational fishing in NSW, and administering the recreational fishing fee payment network. Staff within the Fisheries Research unit support this work through research on recreationally important species and development or improvement of techniques for fisheries enhancement.

The two Recreational Fishing Trust Funds (one for freshwater and one for saltwater) are constituted under the *Fisheries Management Act*. All revenue from the recreational fishing fees is placed in these trusts and the funds are used to improve recreational fishing in NSW (see Appendix 1).

Each Trust is overseen by an expenditure committee made up of recreational fishers. Funding decisions are guided by an Investment Plan, which in turn is informed by priorities identified by the broader recreational fishing community. The 2008-09 to 2012-13 Investment Plan identified seven key programs to improve recreational fishing in NSW:

- Recreational fishing enhancement programs
- Recreational fishing education
- Aquatic habitat protection and rehabilitation
- Research on fish and recreational fishing
- Fishing access and facilities
- Enforcement of fishing rules
- Recreational fishing havens (i.e. repayment of a NSW Government loan used to create 30 recreational fishing havens)

These programs were continued in 2014-15 while work continued on a new Investment Plan.

The Charter Fishing Trust Fund is constituted under the *Fisheries Management Act*. It is funded by charter fishing business licence administration fees. The funds are used to offset costs for carrying out research into charter boat fishing; management and administration of charter fishing boat operations; ensuring compliance with charter fishing boat regulatory controls; and consulting with owners and operators of charter fishing boats (see Appendix 1).

Highlights of 2014-15 included:

- Expenditure of nearly \$12 million from the Recreational Fishing Trusts on programs to improve recreational fishing (Figure 3).

¹ Note there was a fee increase in Sep 2013

- Deployment of a second offshore artificial reef for NSW – in the Shoalhaven region – and finalisation of the environment assessment for a third reef to be constructed off Port Macquarie (Box 9).
- Stocking of over 1.7 million native fish and 2.9 million salmonids (Table 22).
- Successful engagement of Education Officers, Schools staff and Fishcare Volunteers with over 65,000 recreational fishers and school children from across NSW (Table 24-26).
- Commencement of an Expressions of Interest process for a new recreational fishing advisory committee, Recreational Fishing NSW.

Box 8: Fish Aggregating Devices

Fish Aggregating Devices (FADs) are designed to aggregate popular pelagic fish for recreational fishers. They consist of a floating buoy (containing a GPS tracking device), mooring line and heavy ground chain and anchor which is moored to the ocean floor at predetermined locations. Currently DPI Fisheries deploys and maintains FADs at 30 locations off the NSW coastline from Tweed Heads to Eden, ranging from 9-29 km offshore. These locations were selected based on accessibility for anglers, likelihood of attracting fish and to minimise interaction with commercial fishers. FADs are deployed between September and June each year to coincide with the warm ocean water delivered to the NSW coast by the East Australian Current and the pelagic fish species such as dolphinfish that come with it. The FADs have proven extremely popular with anglers since the program began off the NSW coast in 2002 and new FAD locations are constantly being investigated.

Box 9: Recreational fishing reefs

Purpose-built offshore artificial reefs are being constructed to increase recreational fishing opportunities in areas where natural reef is limited. The reefs have proven to be very popular with anglers while monitoring has confirmed their ability to support a diverse fish community. During 2014-15 monitoring of the first offshore artificial reef, located off Sydney, was completed. The Sydney reef has been found to attract a wide range of fish species, including the iconic Yellowtail Kingfish. The completion of the monitoring of the Sydney reef was an important milestone as it has provided important information for the construction and deployment of additional reefs.

Construction of a second offshore artificial reef off Shoalhaven Heads on the state's south coast was completed in January 2015. Monitoring has already showed a similar response to that observed off Sydney with large numbers of fish rapidly colonising the new reef structure.

Planning is currently underway for new offshore artificial reefs off Port Macquarie and Port Botany.

Box 10: Eastern King Prawn stockings

The marine stocking program was rolled out in 2014-15 with the release of 4 million prawns across 10 estuaries in NSW to boost recreational fishing tourism opportunities. Catching Eastern King Prawns over summer is one of the great traditional family pastimes and these releases were designed to boost recreational prawn catches. Prawn larvae were sourced from a commercial prawn farm and stocked into seagrass beds within the estuaries. The prawns have quick growth rates and reached harvestable size in about two to three months. Research monitoring of the stockings was undertaken to inform future stocking practices.

Box 11: Angler access - inland

The identification, retention and enhancement of angler access are vital for the maintenance of quality recreational fishing opportunities in NSW. In 2014-15 DPI Fisheries Angler Access staff assessed 6,581 public roads, or around 40% of the total of 16,000 roads considered for disposal. This included desktop assessments of more than 1,300 sites and field inspections of more than 250 sites. A total of 96 roads were considered of importance to anglers. Information from this work is being catalogued and will be included on an angler access website currently under construction.

In addition, DPI Fisheries installed more than 50 angler access signs and additional boundary signage. DPI Fisheries also worked with local councils to improve access to Lake Oberon, Manning River, Billabong Creek, Edward River, Murray River and various other waterways across NSW. DPI Fisheries staff also installed access signage to 20 sites around Thompsons Creek Dam (near Lithgow and Wallerawang) and improved disabled access to the dam. Staff also attended 26 stakeholder meetings to discuss important areas for angler access.

Box 12: Recreational fishing survey of New South Wales and the ACT

A survey of NSW and ACT residents was undertaken in 2013-14 to provide a comprehensive overview of recreational fishing in NSW and ACT waters.

The survey was primarily designed to measure the number of NSW/ACT residents who go recreational fishing, where and how often they fish and what they catch. Similar methodology to the 2000-01 National Recreational and Indigenous Fishing Survey was used, enabling any changes in the recreational fishery since that time to be identified.

The survey is comprised of several modules 1) A Screening Survey; 2) Diary Survey and 3) 'Wash Up' or Attitudinal Survey. Data collection for the first 2 components was completed just prior to the end of 2014-15.

Participating fishers were contacted at the completion of the Diary Survey to collect data on their opinions and attitudes about recreational fishing. This 'Wash Up' survey ran for 4 months from July to October 2014 and canvassed opinions from over 2,000 fishers.

Following collection of all data from the 'wash up' survey, error checking, verification, construction of databases and data analysis continued well into early 2015. Once complete, drafting of a comprehensive final report into all aspects of the survey began. It is anticipated a completed survey report will be available late 2015.

1.2. Maintain sustainable access and use of aquatic resources

1.2.1. Sustainable fish harvest

Outcome sought: Improved knowledge & understanding to support evidence-based management of fisheries resources

Key measures	2011-12	2012-13	2013-14
Species assessed as sustainably harvested ²			
- No.	31	30	36
- As a proportion of all key commercial and recreational species	27.4%	25.9%	31.3%
Sum of differences between current and target Resource Assessment Class for all key commercial and recreational species ³	90	87	84
Overfished species			
- Taken in NSW	6	6	5
- NSW-managed ⁴	3	3	2
- In a recovery plan	2	2	1

Sound scientific knowledge is crucial to underpin the management of the state's aquatic ecosystems and sustainable harvest of fisheries resources. The Fisheries Resource Assessment group within the Fisheries Research unit evaluates the effectiveness of fisheries management initiatives and conducts research to ensure the sustainable harvest of fish.

² 'Sustainably harvested' species include those assessed as lightly, moderately or fully fished. It does not include those assessed as 'Uncertain' or 'Undefined' – see Table 28

³ The current RAC for each species indicates the level of assessment actually performed (which depends in part on available data), whereas the target RAC indicates the 'ideal' level of assessment (based on the species' importance to commercial and recreational fisheries and conservation values). Hence a reduction in this measure indicates that the level of understanding of key fisheries resources is approaching target levels. See Figure 13 for more information.

⁴ For some overfished species, management is led by a different agency (eg. Commonwealth) and NSW provides complementary measures in support; from 2011-12 to 2013-14 Dogfish, Gemfish and School shark were in this category.

1.2.2. Aboriginal fisheries

Outcome sought: Sustainable access and use for Aboriginal fishers

For Aboriginal communities, fishing has always been an integral part of community life, providing a valued source of food and playing an important role in cultural and ceremonial life. Protection and promotion of Aboriginal cultural fishing is one of the important objectives that DPI Fisheries, in consultation with Aboriginal people, is working towards in managing the fisheries resources of NSW. A related consideration involves traditional fishing rights under native title legislation. DPI Fisheries engages with native title claimants to better understand community aspirations in regards to traditional fishing activities, with a view to working towards ongoing management arrangements.

During 2014-15, major areas of focus for DPI Fisheries have been continuing to develop cultural fishing regulations and building positive relationships with Aboriginal communities centred around their involvement in recreational fishing (see Box 13 and Box 14).

The Aboriginal Fishing Advisory Council (AFAC) met once in 2014/15, discussing issues such as the cultural fishing regulation and a communication strategy for AFAC, in particular the Interim Compliance Policy and establishment of a broader sector working group to assist AFAC and DPI Fisheries during the development of a cultural fishing regulation (see Table 33).

In regards to native title interests, the native title rights of the Gumbaynggirr People (far north coast), Barkandji People (far western) and the Yaegl People (far north coast) were formally recognised through Consent Determinations made on 15 August 2014, 16 June 2015 and 25 June 2015 respectively. Other claims continue their passage through relevant processes with the expectation that more matters will be determined in the next financial year. During 2014-15, DPI Fisheries continued to develop understanding of claimant groups' fisheries harvest activities with a view to documenting ongoing fisheries management arrangements and progress Indigenous Land Use Agreements (ILUA) related to both determined claims and those under negotiation.

Box 13: Elders Olympics – Taree

DPI Fisheries (in partnership with Biripi Aboriginal Medical Service) participated in the 2015 Elders Olympics at Taree and presented fishing to over 300 elders, children and seniors attending this event. The Elders Olympics is a cultural event to engage Aboriginal and Torres Strait Islander communities in sporting activities and promotes healthy lifestyles and wellbeing with over 20 Aboriginal groups from the Taree, Wingham, Nambucca, Tinnak, Blue Mountains, Forster, Moree, Tamworth and the Tablelands, Newcastle, the Central Coast and Coffs Harbour participating in the event.

Box 14: Parents and children's camps

In 2014-15 DPI Fisheries (in partnership with KARI Aboriginal Resources Inc) conducted 3 Mothers & Children and Fathers & Sons fishing and cultural workshops for 90 children, mothers, dads, aunties and uncles.

These workshops offered Aboriginal children fishing skills and social interaction skills. They provided a great opportunity for elders, parents, grandparents, aunties and uncles to share their knowledge and teach the participants not only the safety and skills of fishing but also touch on the topic of fishing as a readily available resource for Aboriginal communities.

1.2.3. Marine estate

Outcome sought: Healthy coast and sea, managed for the greatest well-being of the community, now and into the future

Key measures	2012-13	2013-14	2014-15
Community confidence in marine estate management	16%	-	-

The NSW marine estate includes the ocean, estuaries, coastal wetlands (saltmarsh, mangroves and seagrass), coastline including beaches, dunes and headlands, coastal lakes and lagoons connected to the ocean and islands including Lord Howe Island. It extends seaward out to three nautical miles and from the Queensland border to the Victorian border.

In March 2013, in response to the *Report of the Independent Scientific Audit of Marine Parks in NSW*, the NSW Government announced a new approach to managing the marine estate, driven by two new advisory bodies – the Marine Estate Management Authority to oversee management of the marine estate with expert advice from the independent Marine Estate Expert Knowledge Panel.

During 2014-15, DPI Fisheries continued in its role as a lead agency to progress the NSW Government's marine estate reforms, as well as managing the state's system of marine parks and aquatic reserves. Some highlights included:

- Implementation of a new legislative framework for the marine estate reforms via the commencement of the new Marine Estate Management Act 2014
- Finalisation of the Threat and Risk Assessment (TARA) Framework – to guide how threat and risk assessments will be undertaken for the marine estate
- Finalisation of the Ocean Beaches and Headlands TARA (see Box 16)
- Commencement of the Hawkesbury Shelf TARA to identify the priority threats to the environmental assets and social and economic benefits derived from the marine estate within the marine bioregion (which extends from Newcastle to Shellharbour)
- Development of a Marine Park map app for mobile devices (see Box 15)
- Reappointment of the Lord Howe Island and Cape Byron Marine Park Advisory Committees
- Development of the Marine Park Advisory Committee Handbook
- Adoption of a number of Departmental Marine Park policies including Marine Parks Mooring and Anchoring Policy, Marine Parks Permits Policy, Aboriginal Engagement and Cultural Use of Fisheries Resources in NSW Marine Parks Policy, and Artificial reefs and fish attracting devices in NSW Marine Parks Policies
- Development of compliance risk assessment for Marine Parks and integration with Annual District Compliance Plans
- Acceptance and presentation of 2 Marine Park and 1 Community Engagement poster and a facilitated session at the World Parks Congress, Sydney

The Marine Ecosystems group within the Fisheries Research unit works to develop indicators of environmental condition, assess and reduce threats to ecosystem health, and develop and improve techniques to restore damaged aquatic ecosystems. For example, intertidal and shallow rocky reefs are mapped at frequent intervals in order to assess changes in the extent and structure of habitats (see Table 36).

Box 15: Marine park maps on your mobile

Marine park zoning maps for mobile devices were released in June 2015 by the DPI Fisheries Marine Planning team. The maps are free and available for iPhone and Android devices, via the Avenza PDF Maps app. Park visitors can see where they are on a park zoning map, using a smart phone or tablet, and also identify the types of activities they can do in that area.

The Avenza PDF Maps platform was selected for its ease of use, availability across operating systems and ability to operate without mobile coverage. This digital map format complements the traditional fold-out paper user guide and zoning maps, which are still available from marine park offices.

The release was communicated to marine park users by an announcement on the DPI Fisheries Facebook page, flyers at the Sydney Boat Show and marine park offices, and a story in the Newscast email to recreational fishers. By December 2015 approximately 2000 map downloads had been recorded, with Port Stephens-Great Lakes Marine Park leading the way in terms of popularity.

Box 16: Oceans & Headlands TARA

In order to assess the impacts associated with shore-based recreational fishing in ocean beach and headland marine park sanctuary zones, background ecological information was collated, and the stressors associated with the activity detailed. This allowed a threat and risk assessment (TARA) to be conducted on the beach and headland habitats, and threatened and protected species at the level of individual sites. This informed the overall ocean beaches and headland assessment that formed part of the decision on sanctuary zones included in the recreational fishing amnesty.

Box 17: Testing for human impacts on rocky reef habitats

DPI Fisheries is completing the initial stage of the state's first assessment of rocky reef habitats (primarily large seaweeds). This program aims to test for human impacts on these important habitats and provide a baseline against which to assess changes due to other impacts such as climate change. Fisheries researchers developed a new technique for sampling habitats using a helicopter which enables sampling to be done efficiently and accurately at more than 40 sites over 1000 km of coastline. The results from the first 5 years of sampling are due early 2016. The program will be repeated periodically over coming years to test for future changes in some of our most productive marine habitats.

1.2.4. Aquatic ecosystems

Outcome sought: Improved status of aquatic ecosystems, habitats and species

Key measures	2012-13	2013-14	2014-15
Fish assemblage condition ⁵ by catchment			
- Best: North coast (poor)	45.78	45.78	49.75
- Worst: Lachlan (extremely poor)	6.44	7.11	6.17
- Average: all catchments (very poor)	27.06	27.27	27.31

Healthy aquatic ecosystems are vital for the maintenance of aquatic and terrestrial biodiversity. They are also critical for maintaining good water quality and providing ecosystem services that support the beneficial use of water by humans for activities such as agriculture, aquaculture, fishing, recreation, tourism and swimming. However, aquatic ecosystems are subject to a wide range of impacts, from activities such as vegetation clearing, water regulation, dredging, mining and construction, to exotic species and climate change.

DPI Fisheries is responsible for implementing the threatened species provisions of the *Fisheries Management Act* and assessing the potential impacts of development proposals and strategic natural resource use plans on aquatic ecosystems in accordance with the *Fisheries Management Act* and DPI Fisheries' *Policy and guidelines for fish habitat conservation and management*. The types of applications assessed include:

- **Applications for Part 7 permits** (see Table 43) for dredging and reclamation works, harming marine vegetation and obstruction of fish passage under Part 7 of the *Fisheries Management Act*. In 2014-15 the majority of Part 7 permits were issued for dredging and reclamation works to construct waterway crossings.
- **Integrated Development Applications** (see Table 44) for certain activities and developments required (under *Environmental Planning and Assessment Act 1979*) to be assessed via a development approval process generally managed by the relevant local council. IDAs are formally referred to DPI Fisheries for its General Terms of Approval. The majority of valid IDA referrals are triggered by dredging and reclamation provisions of the *Fisheries Management Act* and are generally associated with providing boating infrastructure (boat ramps, pontoons, jetties, marinas etc.).
- **A variety of other proposals and plans referred to DPI Fisheries for assessment/approval**, eg:
 - Proposals for dredging or reclamation by public authorities (referred to the Minister under s.199 of the *Fisheries Management Act*).
 - Proposals for private works (such as boating infrastructure) on public Crown land, referred for assessment prior to the Crown issuing land owner's consent.
 - State Significant Developments and rezoning by local councils, referred for assessment.

DPI Fisheries also leverages external funds and community support to deliver improved natural resource management outcomes, such as improved fish passage, restored wetlands, re-

⁵ Based on the Sustainable Rivers Audit Fish Index – see Figure 14 for more detail. Index is out of a maximum of 100; 0-20 = extremely poor; 20-40 = very poor; 40-60 = poor; 60-80 = moderate; 80-100 = good. 5 year running average, ie. figures are the average of any available results over the last 5 financial years

snagged rivers, improved water quality and riparian vegetation, and increased engagement of recreational fishers.

The Freshwater Ecosystems group within the Fisheries Research unit works to develop indicators of environmental condition, assess and reduce threats to ecosystem health, and develop and improve techniques to restore damaged aquatic ecosystems.

The Fish Conservation Trust Fund is constituted under the *Fisheries Management Act*. It is funded by all relevant permit and assessment fees and charges collected by DPI Fisheries. The funds are used to contribute to the costs of administering the habitat protection provisions of the Act (see Appendix 1).

Box 18: Threatened species listings

During 2014-15 there was one addition to the threatened species schedules of the *Fisheries Management Act* (as recommended by the Independent Fisheries Scientific Committee):

Alpine Redspot Dragonfly (*Austropetalia tonyana*) as a vulnerable species in November 2014.

Box 19: Major Project Biodiversity Offsets – WestConnex Motorway

The WestConnex project will provide a 33 km motorway linking Sydney's west and south-west with Sydney Airport and the Port Botany precinct. The WestConnex M4 Widening Project will directly impact marine vegetation (mangroves). DPI Fisheries' Aquatic Ecosystems Unit negotiated a reduction in the area of mangroves impacted during the detail design phase of the project, with the resulting final offset being calculated on the loss of 0.1818 ha (181m²) of mangrove habitat.

This loss of mangrove habitat is required to be offset under the NSW Biodiversity Offsets Policy for Major Projects. This Policy applies to all biodiversity in NSW, including aquatic biodiversity protected under the *Fisheries Management Act 1994*. The Policy requires any offset to be calculated to achieve a minimum 2:1 habitat replacement within the catchment area affected.

A monetary offset of \$202,000 has been deposited into the Fish Conservation Trust Fund established under the *Fisheries Management Act* and quarantined for habitat offsets and/or other measures, where site-based offsets are not fully achievable within the catchment area. DPI Fisheries will manage the delivery of the site-based offset in partnership with relevant public authorities, such as Crown Lands, or relevant local government authorities.

Box 20: Connecting riverine communities in the Namoi

DPI Fisheries has successfully managed the Connecting Riverine Communities in the Namoi program in north-west NSW, partnering with the Commonwealth government through its Biodiversity Fund to invest over \$3.5 million of funding to improve management of over 800 hectares of riverbank and floodplain habitat. During 2014-15 on-ground activities were undertaken along a 150 km reach of the Namoi River between Gunnedah and Wee Waa to increase connectivity along the waterway and its floodplains, leading to an overall improvement in riparian health, biodiversity, water quality, and fish habitat. During the 3 year program over 460 Ha of native revegetation was completed, 212 Ha of remnant native vegetation along waterways were protected, and 800 Ha of woody weeds were managed. The project formed strong productive partnerships with State agencies, private landholders, local contractors, local Aboriginal Land Councils, local Councils, school groups, employment agencies, and Landcare groups to complete the significant on-ground activities, exceeding project targets and maximising benefits to the environment and local landholders.

Box 21: Long Term Intervention Monitoring in inland waterways

DPI Fisheries recently completed the first year of a five year study funded by the Commonwealth Environmental Water Office under their Long Term Intervention Monitoring program. The program is investigating ecosystem responses to environmental flow delivery in the Lachlan, Gwydir, Darling-Warrego, Murrumbidgee and Edward-Wakool river systems in New South Wales.

One highlight was the detection of golden perch and silver perch spawning in the Murrumbidgee River. Silver perch are listed as Vulnerable in NSW and Critically Endangered under Commonwealth legislation.

In addition, collection of otoliths (ear bones) to determine population demographics and growth has provided opportunities to investigate key nursery areas of Murray-Darling fish species. For example, chemical signatures in the otoliths of golden perch collected from the Edward-Wakool river system indicate the dominant cohort (age group) were spawned in 2009/10 in the Darling River and subsequently migrated >500 km upstream into the Edward-Wakool system as 1 year olds on the back of the 2010/11 floods. The same cohort has also populated the lower Murray River into South Australia.

The program is also investigating fish movement responses to key flow stimuli using acoustic telemetry and long-term changes in native fish community structure associated with recruitment resulting from flow-cued spawning events.

Box 22: Investigating the impacts of river infrastructure on fish

Fish need only a fraction of a second to pass downstream through river infrastructure such as weirs, dams or hydropower turbines structures, however, even this short time can be dangerous, and is sometimes fatal.

DPI Fisheries researchers have been leading research aimed at improving the design and operation of this infrastructure to support native fish population recovery. 'Sensor Fish' technology is being used to determine the hydraulic conditions fish experience during passage through weirs and turbines. The data indicate that fish can be exposed to rapid decompression and elevated fluid shear, causing fatal injuries such as rupturing, haemorrhaging and embolism within internal organs. Using state-of-the-art laboratory facilities, researchers have been able to determine the tolerance of different life stages of fish to such stresses.

As a result, fisheries standards have been produced to assist those designing and operating river infrastructure to reduce the impact on native fish. To date, these standards have been used to improve the design of more than 40 weirs in south-eastern Australia. Internationally, the work has been informing the discussion between fisheries scientists and turbine manufacturers in the Mekong River.

Additional recognition of the research team has come via an award winning global review paper published in 2014, a finalist award in the 2013 Australian Engineering Excellence Awards, and an exhibit on the research being featured at the Powerhouse Museum in Sydney throughout 2014.

1.2.5. Fisheries compliance

Outcome sought: An optimal level of compliance to maintain sustainable use & access of natural resources

Key measures	2012-13	2013-14	2014-15
Target rate of compliance with legislation ($\geq 85\%$) *			
- Commercial fisheries	80%	81%	78%
- Recreational fisheries	90%	90%	89%

Fisheries compliance plays a key role in ensuring the sustainability of NSW fisheries resources. DPI Fisheries delivers compliance services across 28 fishery programs under the four key functional areas of recreational fisheries, commercial fisheries, aquaculture and conservation. Fisheries officers delivering those compliance services are based in 27 coastal and inland locations in or near popular fishing areas. Several specialist units also travel widely across the state focusing on recreational fishing fee, abalone, rock lobster, aquaculture and fish habitat issues.

Patrols of rivers, lakes, estuaries, inshore areas and offshore waters are undertaken by vehicle, vessel, foot and aircraft. Fisheries officers also execute operational plans to tackle larger compliance problems. During these events teams of officers are formed to conduct covert and overt checks on fishers over several days leveraging the efficiency and effectiveness of the combined resources of intelligence, officers, vehicles, vessels and surveillance equipment.

Fisheries officers enforce a range of NSW and Commonwealth fisheries statutes and their subordinate regulations. The primary legislation includes the *Fisheries Management Act 1994*, *Marine Parks Act 1997* (replaced by the *Marine Estate Management Act 2014*), *Fisheries Management Act 1991* (Commonwealth) and *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

Fisheries officers maximise voluntary compliance with fishing laws by educating them about fishing rules and restrictions and conducting compliance checks to detect unintentional, opportunistic and intentional offending. When fishers are found not complying with fishing laws fisheries officers respond by applying a range of sanctions that are proportionate to the seriousness of the offence: minor and moderate offences result in the issue of written warnings and penalty notices whilst serious offences result in prosecution and other administrative sanctions.

The fisheries compliance unit has adopted a risk based approach to compliance and enforcement using annual district compliance planning (ADCP) processes. This approach assists fisheries officers to most effectively allocate resources for localised and regional fisheries compliance problems. The ADCP process allows specific fisheries to be reviewed bi-annually in each location to:

- Identify the potential illegal fishing problems within the fishery
- Understand the causes and sources of those illegal fishing problems
- Assess the loss of fish stocks if they eventuate
- Develop new patrol plans to control the potential illegal fishing
- Monitor and review offences, seizures, information reports and inspections to determine success of the new patrols

Box 23: Significant coastal and inland prosecutions in 2014-15

Coastal: A 40 year-old Port Macquarie man has been ordered to forfeit his boat, outboard motor and boat trailer after pleading guilty to possessing a commercial quantity of mud crabs, in Port Macquarie Local Court in June 2015. Fisheries officers were conducting a surveillance operation of the Hastings River in March 2015 when they apprehended the man. Fisheries officers found 39 priority species mud crabs in the man's vessel, more than eight times the daily possession limit and considered a commercial quantity. The crabs were returned to the water alive and an application was made for the forfeiture of his fishing equipment, including his boat, which was successful.

Inland: A 60 year old man had an expensive day's fishing, with fines and costs totalling \$8435 for illegally trapping and taking 15 Golden Perch in the Murrumbidgee River, NSW. Fisheries officers observed the man check the illegal fish trap in the waters of the Murrumbidgee River in October 2014. The man, from Hay, was observed to illegally take 12 Golden Perch and 2 Carp from the fish trap, before resetting the trap. Fisheries officers apprehended the man and found him to be in possession of a total of 15 Golden Perch taken over two days of fish trapping. A further two fish traps were located. The fish and three traps were seized. The man appeared in Hay Local Court in June 2015 and was charged with using a fish trap, in possession of illegal fishing gear, fish taken illegally from a fish trap, take more than the daily limit of fish and exceed the possession limit of fish being Golden Perch. He was ordered to pay a total of \$8435 including fines, professional and court costs.

1.3. Mitigate and manage risks from use of land and water

1.3.1. Sharks (Bather Protection) Program

Outcome sought: Shark management strategy implemented and community better informed about reducing risk of shark attack

Key measures	2012-13	2013-14	2014-15
Shark Meshing Program Management Plan trigger points tripped (total = 4; see Table 64)	1	2	1

The Shark Meshing (Bather Protection) Program (SMP) is a public safety measure introduced in 1937 to reduce the risk of shark attack at the State's most popular public bathing beaches. Around 2 million people swim at these beaches each year. Under the program, 51 beaches are netted by contractors using specially designed meshing nets to reduce the chances of shark encounters. The program has been effective in helping to provide a safer environment for swimmers, with only one fatality on a meshed beach since the program commenced, and no fatalities on a meshed beach in over 60 years.

Since 2009-10, the SMP has operated in accordance with Joint Management Agreements (JMAs) and an associated Management Plan authorised under the *Fisheries Management Act 1994* and the *Threatened Species Conservation Act 1995*. A review of these JMAs was undertaken in 2014-15, with the review and a proposed new JMA to go on public exhibition early in 2016.

During 2014-15 there were a total of 18 reported shark incidents in NSW, two of which were fatal. The fatalities occurred at unpatrolled beaches at Byron Bay and Ballina and involved a swimmer and a surfer, respectively. Forensic investigation by DPI Fisheries shark scientists indicated that both these fatalities were likely caused by white sharks. Three shark interactions occurred at the meshed beaches of Avoca, Dee Why and Merewether beaches, but these were all assessed as being with Wobbegong Sharks, which is not a target species of the SMP.

Shark-related incidents, including shark bites and close sightings of sharks, can provoke extreme public anxiety. The NSW DPI Shark Incident Response Plan clarifies the lines of responsibility and procedures to be followed to ensure a co-ordinated response from NSW Police, DPI Fisheries and Surf Life Saving NSW in the event of a serious incident. Responsibility for the Shark Meshing (Bather Protection) Program and the Shark Attack Response Plan lies with the DPI Fisheries Compliance unit.

Other bather protection measures managed by DPI Fisheries and linked to the SMP include the annual Observation Tower Grant Program, summer aerial surveillance and the communication of safety tips via the SharkSmart campaign and mobile app.

For more information, refer to the sharks information page on the DPI Fisheries website, www.dpi.nsw.gov.au/fisheries/info/sharks.

Box 24: New approach to shark management in NSW

In early 2015 the NSW government committed \$100,000 for a review and trial of innovative technologies which might complement the existing suite of bather protection measures. An independent review into new and emerging technologies was commissioned and subsequently completed in September 2015. The outcomes from the review were considered at a well-publicised NSW Shark Summit attended by Australian and international shark experts and concerned stakeholder representatives.

In response to an increase in the number of shark incidents on the NSW north coast in 2014-15, including the two fatalities noted above, a targeted north coast response was developed. This included implementation of the North Coast Local Waters Shark Tagging Project, targeted aerial surveillance, and the selection of north coast beaches as priority sites for the trial of some of the technologies identified during the review and Shark Summit.

On 25 October 2015 the NSW government announced a new \$16 million Shark Management Strategy. Under the Strategy, DPI Fisheries will trial all the most promising technologies over the next 5 years as well as facilitate new research into bather protection measures.

Box 25: Improving identification and sample collection by SMP contractors and observers

Pre-season training for observers and contractors focused on improving species identification, re-iterating tagging procedures for nominated shark species and disentanglement procedures for non-target species. DPI Fisheries' shark scientist informally reviewed sampling techniques and conducted a workshop in August 2014 to ensure observers and contractors were trained to collect samples for DNA analysis and other uses. A complete wet lab training session was undertaken and a dissection kit was dispensed for each shark meshing boat. New skate & ray identification aides were also supplied to contractors to assist in correct identification for the catch records.

Box 26: Research into target sharks affected by the SMP

The distribution, abundance, biology and ecology of target shark species affected by the SMP continued to be investigated in 2014-15 through a range of research projects conducted by DPI Fisheries and other organisations in collaboration with DPI Fisheries, in part using data and samples collected as part of the SMP.

For example, DPI Fisheries continued to monitor the movement patterns of Bull, Grey Nurse and White sharks (the latter in collaboration with CSIRO) using acoustic tags surgically implanted in 2014-2015 or in previous years. Data are collected when tagged sharks pass close to any of the over 500 listening stations that DPI Fisheries has established along the NSW coast. Results were displayed at exhibitions at such places as Sydney Aquarium and the National Maritime Museum, presented at various scientific symposia and workshops and in the public arena, and published in the scientific literature.

2. Statistical tables – by program

2.1. Increase economic contribution from fishing and aquaculture

2.1.1. Commercial fisheries

Table 1: Fishing businesses with shares/entitlements (no.) and participation by fishery (%)

Source: Number of FBs based on share extracts from 26-09-2013 (for 2012-13), 31-07-2014 (for 2013-14) and 21-07-2015 (for 2014-15). Participation figures¹ based on NSW DPI FisherAssist 06-11-2015 extract. Ongoing validation may alter these data.

FISHERY	2012-13		2013-14		2014-15	
	FBs (no.)	Participation (%)	FBs (no.)	Participation (%)	FBs (no.)	Participation (%)
Abalone	48	Quota ²	48	Quota ²	48	Quota ²
Lobster	101	Quota ²	99	Quota ²	98	Quota ²
Estuary General	604	77%	595	79%	592	77%
Estuary prawn trawl	167	57%	162	56%	157	59%
Ocean hauling	277	57%	275	53%	264	52%
Ocean trap & line	355	73%	349	72%	346	64%
Ocean trawl (including SFT)	216	57%	209	53%	208	52%
Sea urchin & turban shell (SUTS)	37	Quota ²	37	Quota ²	37	Quota ²
Inland	27	67%	27	59%	27	33%
Total number of FBs with shares/entitlements³	1,304	78%	1,303	78%	1302	74%

1 Participation is calculated as the percentage of Fishing Businesses in a fishery which reported catches in that financial year. Based on records received and entered as at 06-11-2015; ongoing validation may alter these data.

2 Since the Abalone and Lobster fisheries are quota-managed, all Fishing Businesses are “active”, either taking quota themselves or transferring quota to other Fishing Businesses.

3 Total number of Fishing Businesses is smaller than the sum of Fishing Businesses for each fishery as many Fishing Businesses hold shares/entitlements in more than one fishery.

Table 2: Expected catch records received (%)

Source: NSW DPI FisherAssist 06-11-2015 extract. Ongoing validation may alter these data.

	2012-13		2013-14		2014-15	
	FBs (no.)	Expected records received (%)	FBs (no.)	Expected records received (%)	FBs (no.)	Expected records received (%)
All commercial fisheries	1304	97%	1303	96%	1302	89%

Table 3: NSW commercial wild harvest gross reported landings (tonnes) and estimated Gross Value of Product (\$'000) by fishery

Source: NSW DPI FisherAssist 26-11-15 extract. Ongoing validation may alter these data.

	Landings (t) ¹			GVP (\$'000) ²		
FISHERY	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
Abalone	110	120	130	3,372	3,838	3,876
Lobster	142	138	146	8,094	7,501	9,999
Lobster by-product	15	17	12	91	107	77
Estuary general	3,648	3,363	4,109	19,053	20,774	25,347
Estuary prawn trawl	421	436	413	2,781	3,144	3,271
Ocean hauling	3,508	3,422	4,183	8,483	9,164	13,307
Ocean trap & line	1,747	1,443	1,483	12,968	11,425	11,834
Ocean trawl (including Southern Fish Trawl)	3,098	2,939	2,615	20,376	21,870	22,085
Sea urchin & turban shell	84	79	87	119	110	126
Inland	169	262	194	1,285	2,075	1,260
S37 permit (freshwater eels and tuna bait)	156	161	120	410	425	363
Total NSW commercial wild harvest	13,098	12,381	13,491	77,031	80,434	91,547

1 Landings are gross reported landed weight, not whole weight of fish prior to processing. Does not include weight of released fish

2 Based on Sydney Fish Market monthly average price per species. Does not include local price variability, value adding, integrated business structures etc.

Table 4: NSW commercial wild harvest gross reported landings (tonnes) and estimated Gross Value of Product (\$'000) by species or species group

Source: NSW DPI FisherAssist 26-11-15 extract. Ongoing validation may alter these data.

FISHERY	Landings (t) ¹			GVP (\$'000) ²		
	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
Crustaceans						
Rock lobster	142	138	146	8,096	7,507	10,003
King prawn	490	659	582	8,749	11,076	11,076
School prawn	849	909	797	5,351	6,286	6,071
Other prawn (e.g. tiger, royal red, greasyback)	17	16	37	217	157	253
Crab	306	361	519	4,473	5,014	7,501
Other (e.g. Balmain bug, yabby, nippers)	157	213	160	1,919	2,852	2,054
Molluscs						
Blacklip abalone	110	120	130	3,372	3,838	3,876
Cuttlefish	78	49	64	296	225	296
Pipi	18	48	69	327	591	647
Octopus	75	84	175	809	813	1,349
Squid	46	41	36	596	538	520
Other (e.g. cockle, periwinkle, whelk, blue mussel)	13	11	11	110	71	92
Fish						
Sea mullet	3,227	2,448	3,825	7,336	7,632	12,967
Silver trevally	151	168	167	557	692	663
Yellowtail kingfish	244	121	108	2,547	1,466	1,246
Jack mackerel	4	1	2	4	1	3
Black bream and yellowfin	258	290	348	3,083	3,416	3,895
Eastern Australian salmon	939	1,353	1,112	1,248	1,876	1,935
Snapper	307	241	205	3,204	2,547	2,060
Grey morwong	37	34	27	192	183	149

Table 4 Cont'd	Landings (t)¹			GVP (\$'000)²		
FISHERY	2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
Fish						
Mulloway	78	77	56	719	780	589
Sand whiting	107	83	80	1,403	1,214	1,193
Luderick	421	394	366	601	614	584
Eastern school whiting	1,109	906	618	3,859	3,315	2,659
Dusky flathead	173	126	117	1,260	1,186	1,169
Other	3,656	3,414	3,644	16,018	15,902	18,040
Other taxa						
Not included elsewhere (e.g. beachworms, sea urchins)	87	81	90	684	643	658
Total NSW commercial wild harvest	13,098	12,381	13,491	77,031	80,434	91,547

¹ Landings are gross reported landed weight, not estimated whole weight of fish

² Based on Sydney Fish Market monthly species average price

Table 5: Fishery Management Strategy trigger points (no.)

Note: Excludes triggers relating to compliance and research. For more detail see Appendix 2

Trigger points – status 2014-15					
Fishery	Triggered	Not triggered	Not measurable	Not applicable this period	Total
Estuary General	1	4	7	3	15
Estuary Prawn Trawl	1	3	7	1	12
Ocean Hauling	0	4	7	2	13
Ocean Trap & Line	1	3	8	2	14
Ocean Trawl	0	4	7	2	13
Lobster	0	9	8	0	17
Abalone	2	5	4	0	11

Table 6: Commercial fisheries export approvals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Note: Assessments test the sustainability of each fishery against a set of guidelines, including the impacts on marine species protected under Part 13 of the EPBC Act

Fishery	Outcome of assessment ¹	Duration	Expiry
Estuary General Fishery	[No conditions]	Extension ²	24 June 2016
Ocean Hauling Fishery	[No conditions]	Extension ²	24 June 2016
Abalone Fishery	[With conditions]	Extension ²	5 August 2016
Estuary Prawn Trawl Fishery	[With conditions]	Extension ²	5 August 2016
Lobster Fishery	No conditions	5 years	30 March 2017
Ocean Trap & Line Fishery	With conditions	3 years	8 May 2017
Ocean Trawl Fishery	With conditions	3 years	23 June 2017
Sea Urchin & Turban Shell Fishery	With conditions	3 years	25 October 2018

1 Options are (i) refused export approval, (ii) export allowed with controls or conditions (called 'Wildlife Trade Operations' - WTOs), or (iii) export allowed without control or conditions.

2 The maximum export approval timeframe for low risk fisheries is currently under review and the Australian Government is considering a proposed new maximum of ten years (for fisheries that have been assessed as meeting all of the guidelines). In the interim the EG, OH, Ab and EPT fisheries have been granted extensions on their previous approvals.

Table 7: Fishing business services average transaction processing times (days)

Transaction Type	2012-13	2013-14	2014-15
Transfer/Transmittance Fishing Business/Component	28	16	13
Transfer fishing boat licence	20	12	9
Change of boat details	11	10	2
Fisher Nominations/Revocations	2	1	1
Renew commercial fishing licence ¹	20	15	10
Renew fishing boat licence ¹	25	21	12
Issue commercial fishing licence ²	20	10	8
Issue fishing boat licence	14	8	7
Fishing authority replacement	1	1	1
Amend fishing boat licence	14	8	3

¹ Applications with missing information or unsigned forms may take longer than average. Renewal processing averages are high due to the number of applications received in the short time period.

² May take longer to process pending response from interstate conviction checks and missing related paperwork.

Table 8: Whole/partial transfers of fishing businesses approved for each fishing business type (no.)

	2012-13		2013-14		2014-15	
Fishing Business Type	Whole	Components	Whole	Components	Whole	Components
Restricted fishery	5	n/a	2	n/a	6	n/a
Abalone	2	1	4	9	3	4
Lobster	2	1	1	10	2	0
Share managed fishery ¹	55	100	102	210	88	193
Total	64	102	109	229	99	197

¹ See Table 9 for detailed breakdown of transfers by share managed fishery

Table 9: Whole/partial transfers of share managed fishing businesses, categorised by fishery (no.)

	2012-13		2013-14		2014-15	
Fishing Business Type	Whole	Component s	Whole	Component s	Whole	Component s
Estuary General	23	50	46	127	34	125
Ocean Trap and Line	14	23	23	33	24	28
Ocean Haul	7	13	14	26	12	28
Estuary Prawn Trawl	6	4	11	11	9	9
Ocean Trawl	5	10	8	19	9	10
Total¹	55	100	102	216	88	200

¹ Many fishing businesses hold shares in more than one share-managed fishery; thus, transfers of these businesses may impact on more than one share type. Hence these totals may be higher than the 'Share managed fishery' totals in Table 8.

Table 10: Whole/partial transmittances¹ of fishing businesses approved for each fishing business type

	2012-13		2013-14		2014-15	
Fishing Business Type	Whole	Component s	Whole	Component s	Whole	Component s
Restricted fishery	0	n/a	0	n/a	0	n/a
Abalone	0	0	1	0	0	0
Lobster	0	0	0	0	2	0
Share managed fishery	2	1	3	2	2	3
Total	2	1	4	2	4	3

¹ A 'share transmittance' is the transfer of shares in accordance with the provisions of a Will or where a Grant of Probate or Grant of Administration has been approved by a Court.

Table 11: Transactions generated using different FishOnline channels, both in total and for key transaction types¹ (no.)

FisherAssist = completed by DPI Fisheries staff; FisherDirect = self-service (online); FisherMobile = self-service (using smartphone app)

FishOnline Channel	2012-13	2013-14	2014-15
FisherAssist			
Total transactions	23,622	36,566	37,165
- Catch and effort	16,539	22,655	23,239
- Commercial fishing licence renewal	639	1,500	1,400
- Fishing boat licence renewal	1,078	2,418	2,174
FisherDirect			
Total transactions	1,834	4,066	6,817
- Catch and effort	1,834	4,066	6,817
- Commercial fishing licence renewal	n/a	n/a	n/a
- Fishing boat licence renewal	n/a	n/a	n/a
FisherMobile			
Total transactions	n/a	n/a	63
- Catch and effort	n/a	n/a	62

1 The number of self-service transactions is currently small because limited functionality is available to the pilot group of commercial fishers using the system. Once amendments to the *Fisheries Management Act* are passed, additional functions will be 'switched on'.

Table 12: E-business customers¹ as of 30 June each year (no.)

FishOnline Channel	2012-13	2013-14	2014-15
FisherDirect	32	194	267
FisherMobile	n/a	n/a	22

1 Customers may include shareholders, licensed commercial fishers, or nominated agents.

2.1.2. Aquaculture

Table 13: Aquaculture production in NSW¹ (\$)

	2011-12	2012-13	2013-14
Lease-based production	\$35,221,743	\$35,945,432	\$36,128,614
Land-based production	\$14,424,001	\$14,189,076	\$17,236,197
Total	\$49,645,744	\$50,134,508	\$53,364,811

1 More detailed production data are available in the Aquaculture Production Report 2013-14, available on the NSW DPI website (www.dpi.nsw.gov.au)

Table 14: Aquaculture productivity in NSW

	2011-12	2012-13	2013-14
Lease-based			
Number of leases	2,361	2,322	2,291
Total hectares	2,909	2,886	2,917
Production value	\$35,221,743	\$35,945,432	\$36,128,614
Productivity (production value per ha)	\$12,107.85	\$12,455.10	\$12,385.54
Land-based			
Number of farms	151	148	138
Total Water Surface Production Area (WSPA) - hectares	1,730	1,717	1,708
Production value	\$14,424,001	\$14,189,076	\$17,236,197
Productivity (production value per WSPA)	\$8,337.57	\$8,263.88	\$10,091.45

Table 15: NSW total aquaculture production (tonnes) and value (\$'000) by species or species group

	Production (t)			Value (\$'000)		
	2011-12	2012-13	2013-14 ³	2011-12	2012-13	2013-14 ³
Crustaceans						
Black Tiger Prawn	106	223	287	3,645	3,484	4,495
Kuruma Tiger Prawn	0.7	-	-	20	-	-
Yabby	5	4	6	98	77	65
Yabby (bait)			11	172	198	220
Freshwater fish						
Barramundi	50	50	59	700	601	938
Golden Perch	negligible	0.2	0.5	negligible	2	5
Longfinned Eel			34			351
Murray Cod	14	19	85	291	426	1,438
Rainbow Trout	165	198	253	1,839	2,189	2,739
Silver Perch	190	149	195	2,695	1,879	2,718
Marine fish						
Mulloway	49	59	93	488	624	1,022
Hatchery						
Hatchery species				3,142	2,943	2,782
Molluscs						
Sydney Rock Oyster				28,254	29,883	31,845
Pacific Oyster				4,659	3,698	2,115
Native / Flat Oyster				160	263	103
Oyster Spat				2,109	2,063	1,823
Oyster Nursery Species						118
Miscellaneous						
Other species ¹				1,335	1,805	590
Total²				49,605	50,135	53,365

1 Combined for confidentiality reasons. Species include Blue Mussel (*Mytilus galloprovincialis*), Australian Paratya (*Paratya australiensis*), Tube Worm (*Diopatra aciculata*), Freshwater Shrimp (*Atyidae* sp.), Freshwater Prawn (*Macrobrachium* sp), Floodplain Mussel (*Velesunio ambiguus*) and Pearls (*Pinctada imbricata*). Prior to 2013-14 also included Longfin Eel (*Anguilla reinhardtii*)

2 Totals may differ from sum of individual figures due to rounding

Figure 2: Annual reported NSW farm gate oyster price per dozen 1994-95 to 2014-15 (\$)

SRO = Sydney Rock Oyster; PO = Pacific Oyster; TPO = Triploid Pacific Oyster (commenced production in 2008-09)

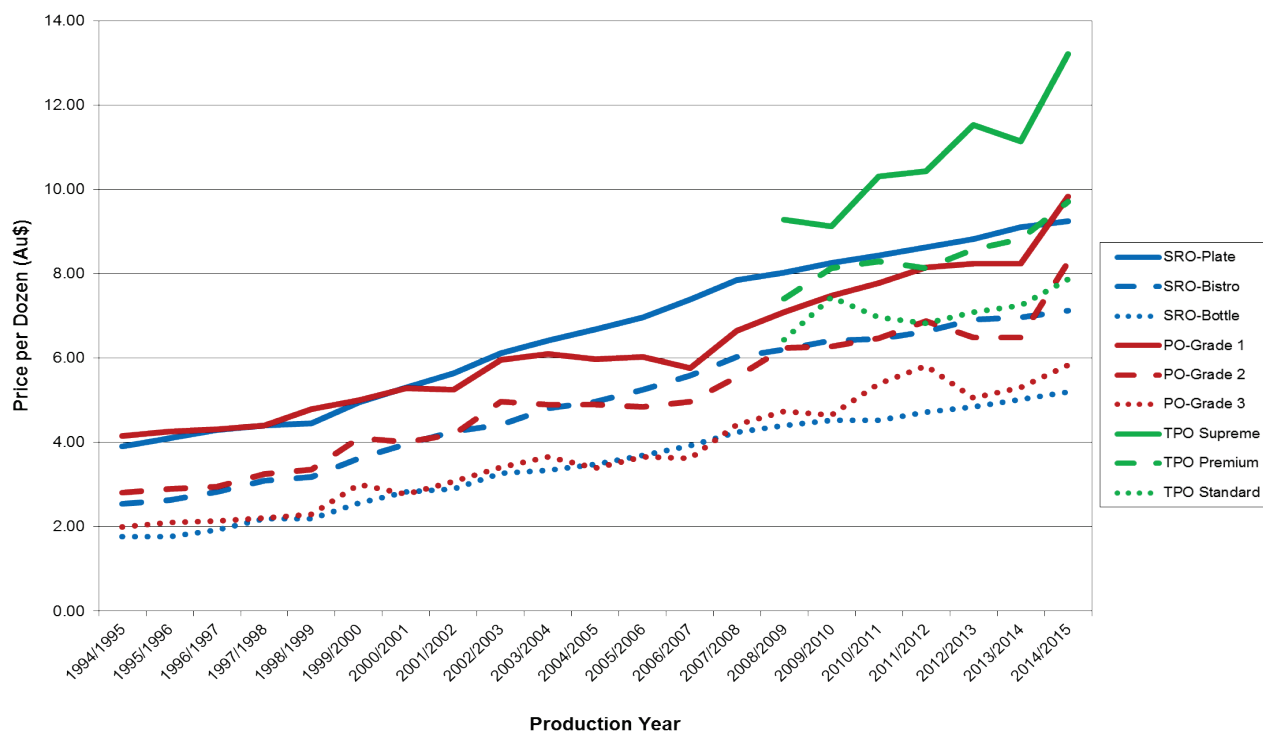


Table 16: The value of total NSW aquaculture production derived from stock selectively bred or produced by DPI Fisheries (\$m)

	2012-13	2013-14	2014-15
Oyster - selectively bred stock (20% of total)	5.98	6.37	6.9
Angasi oyster – stock produced by DPI Fisheries (50% of total)	0.13	0.05	0.07
Mulloway – eggs produced by DPI Fisheries (100% of total)	0.62	1.02	0.9
Total			
- Value - \$m	6.73	7.44	7.87
- % of total NSW production	13%	14%	13%

Table 17: Sustainable aquaculture research projects underway – government / externally funded (no.)

	2014-15
Number of projects	15

Table 18: Derelict oyster leases remediated in NSW under the Derelict Oyster Lease Clean-up Project

	2012-13	2013-14	2014-15
Number of leases	29	30	64
Hectares	24.33	28.52	55.64

Table 19: Aquaculture transactions completed (no.)

Type of application	2012-13	2013-14	2014-15
Land-based			
Permits			
- Granted	3	6	13
- Cancelled	8	19	16
- Amended	3	3	8
- Applications withdrawn / refused	0	0	0
Lease-based			
Permits			
- Granted	21	19	11
- Cancelled	28	30	26
- Amended	36	8	274
- Applications withdrawn / refused	1	0	3
Leases			
- Applications withdrawn / refused	32	20	5
- Granted	21	19	22
- Amended	73	39	14
- Renewed	102	128	190
- Transferred	250	182	88
- Sublet	1	6	14
- Surrendered in full	14	15	1
- Subdivided	0	5	3
- Consolidated	0		2
- Granted from consolidation	0		1
- Granted from subdivision	0	10	6
- Part-surrendered	1	1	1
- Transmitted	19	5	6
- Deeds replaced	20	13	11
- Cancelled	4	32	12
- Expired	79	123	130
Terminated leases			
- Returned to public water land	27	39	61
- To Clean-Up Program – Lessee/State	16	22	12
Total transactions completed	759	744	930

Table 20: Aquaculture transaction processing times (median days to complete)

Type of application	2012-13 ¹	2013-14	2014-15
New permit (lease or land-based)	n/a	35	15
New lease	n/a	300	134
Lease renewal	n/a	50	58
Lease transfer	n/a	26	37

1 Processing times not recorded in 2012-13

Table 21: Miscellaneous permits processed (no.)

Type of permit	2012-13	2013-14	2014-15
Aquarium collection	2	8	3
Aquarium education	6	8	6
Broodstock collection	6	5	2
Miscellaneous collection	21	14	13
Processing live Pacific oysters	8	5	1
Collection of marine vegetation	0	3	1
Scientific collection	67	61	38
Import	2	0	54
Permit amendments	61	48	34
Total permits	173	152	152

2.1.3. Recreational fisheries

Figure 3: Recreational Fishing Trust funded programs by platform 2014-15

Note: Excludes fishing fee coordination and payment network

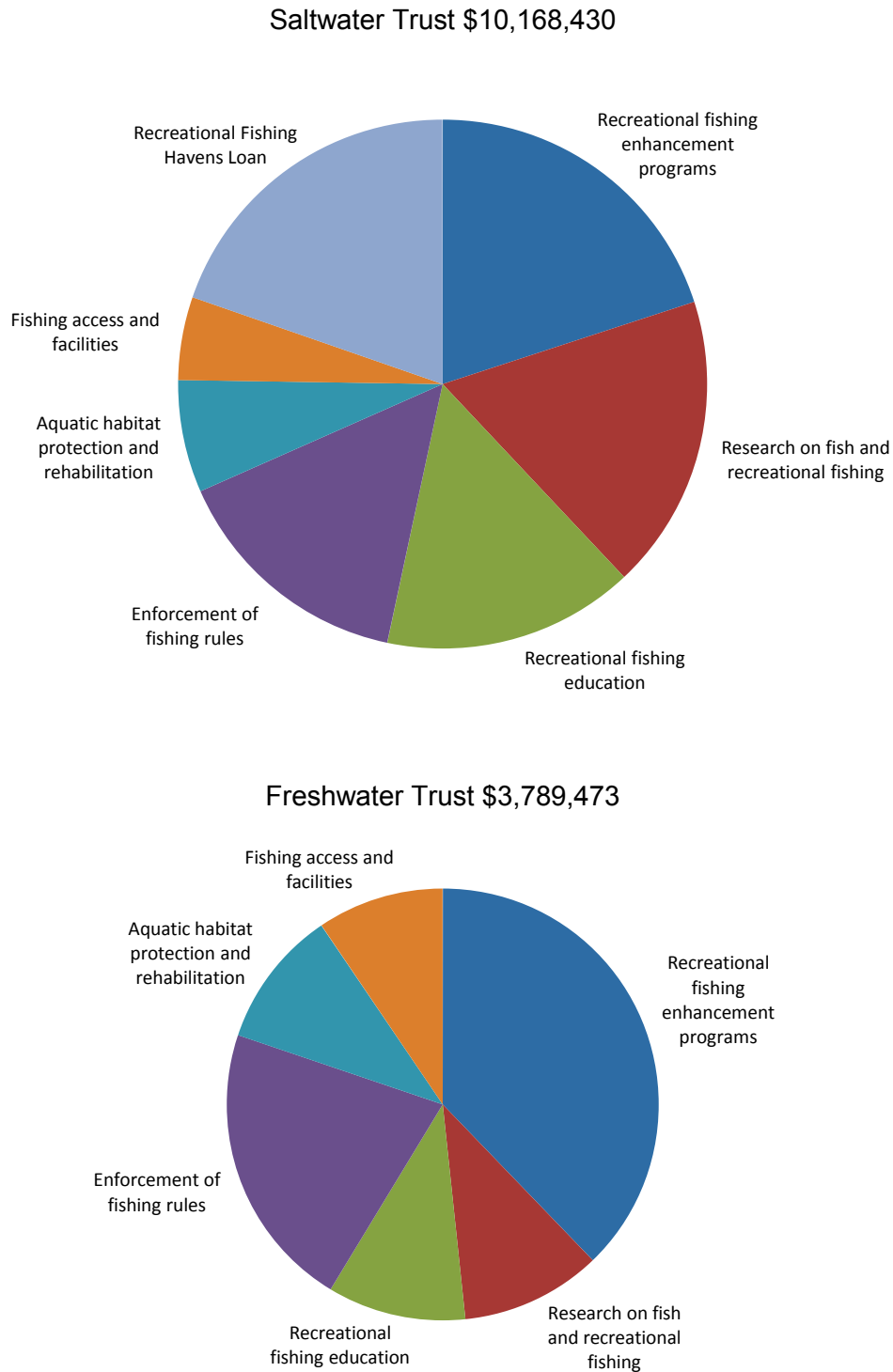


Figure 4: Fisheries enhancement locations

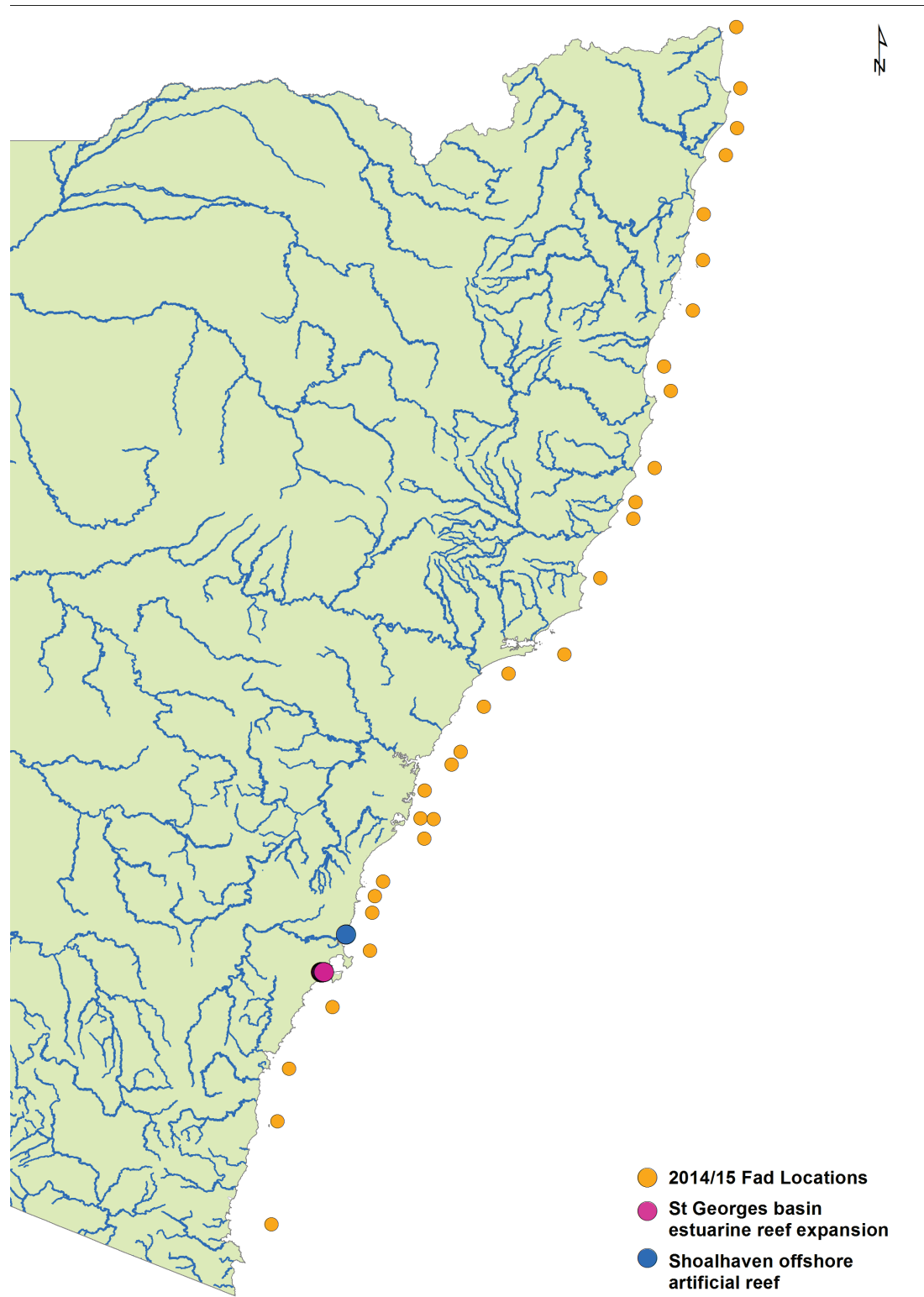


Table 22: Freshwater fish stocked in NSW for recreational fisheries enhancement (no.)**A. Native fish produced at government hatcheries and private hatcheries (the latter under the dollar-for-dollar native fish stocking program or for independent groups)**

Species	2012-13	2013-14	2014-15
Golden perch	343,400	653,000	319,200
- Government	784,797	691,530	724,159
- Private	1,128,197	1,344,530	1,043,359
- Total			
Murray cod			
- Government	287,400	526,500	249,200
- Private	270,161	315,587	257,169
- Total	557,561	842,087	506,369
Aust bass			
- Government	280,000	413,000	57,700
- Private	100,762	108,655	91,809
- Total	380,762	521,655	149,509
Silver perch			
- Government	1,200	5,000	62,000
TOTAL			
- Government	912,000	1,597,500	688,100
- Private	1,155,720	1,115,772	1,073,137
- Grand total	2,067,720	2,713,272	1,761,237

B. Salmonids (produced at government hatcheries and stocked by government and acclimatisation societies)

Species	2012-13	2013-14	2014-15
Rainbow trout	1,883,350	2,007,200	2,052,455
Brown trout	633,150	626,600	624,450
Brook trout	114,150	114,320,	111,134
Atlantic salmon	156,185	156,315	155,335
TOTAL	2,787,560	2,906,435	2,943,374

Figure 5: Fish stocking locations in NSW 2014-15

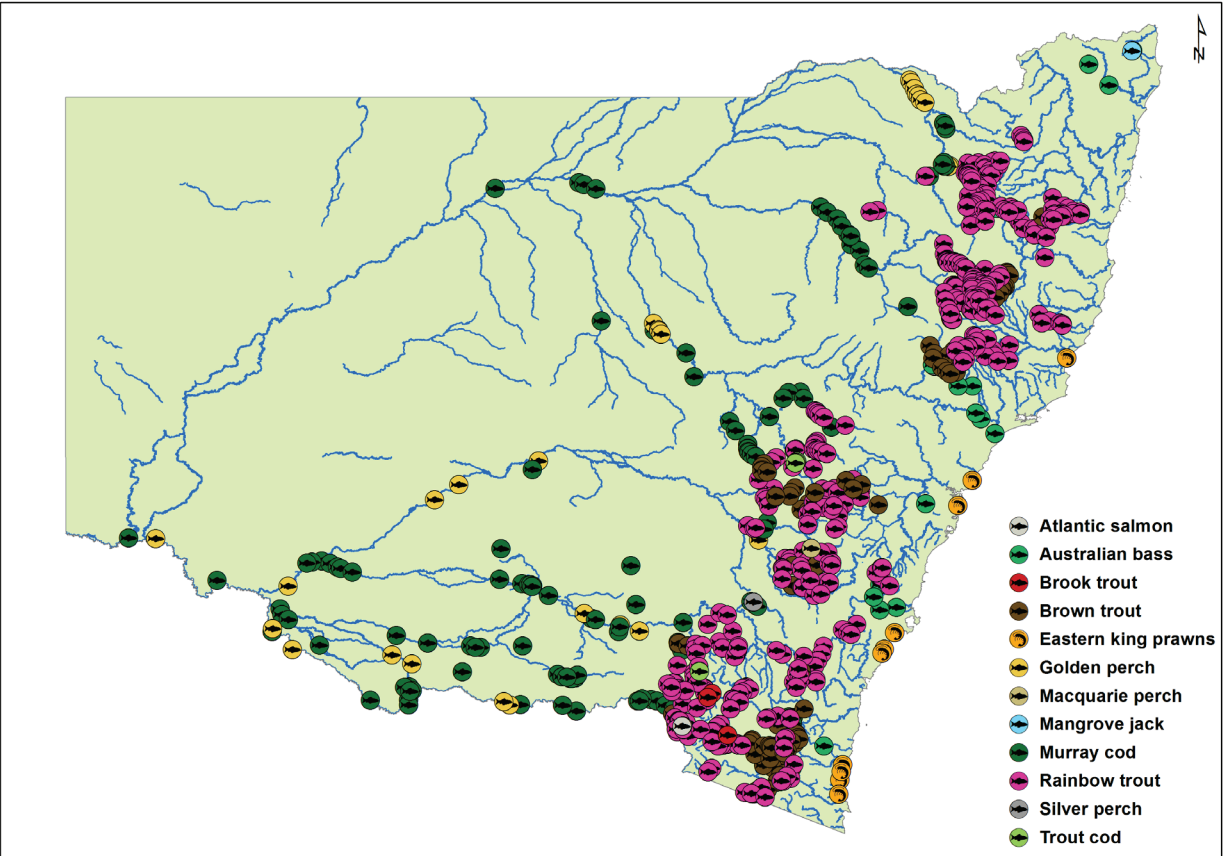


Table 23: Fisheries enhancement research projects underway – government / externally funded (no.)

2014-15	
Number of projects	16

Table 24: Fishcare volunteers, events, contacts and service hours

Measure	2012-13	2013-14	2014-15
Active volunteers (#)			
- Sydney	60	63	35
- Other coastal NSW	140	180	118
- Inland NSW	50	59	61
- Total	250	302	214
Registered events in which volunteers participated	231	202	173
- Sydney	172	179	135
- Other coastal NSW	71	109	86
- Inland NSW	474	490	397
- Total			
Estimated number of contacts made			
- Sydney	16,000	134,500	26,100
- Other coastal NSW	13,400	31,300	16,000
- Inland NSW	13,500	10,000	10,200
- Total	42,900	175,800	52,300
Total service			
- Hours	9,500	15,900	7,200
- Days (approx.)	~1,360	~2,270	1,023
Volunteers from culturally and linguistically diverse (CALD) communities	8%	8%	7%
New volunteers who completed training	20	32	16

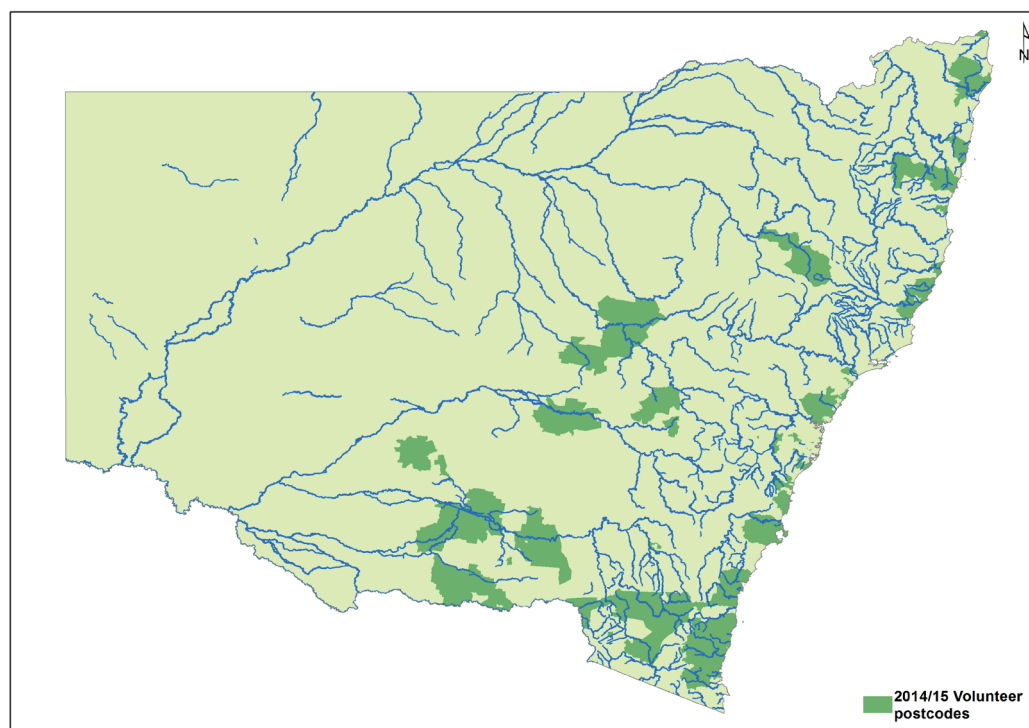
Figure 6: Fishcare volunteer locations (based on postcode) 2014-15

Table 25: Fishing workshops and participants (no.)

	2012-13		2013-14		2014-15	
Workshop type	Workshop s	Participan ts	Workshop s	Participan ts	Workshop s	Participan ts
Paid (15-30 children, \$40 fee pp)	46	926	45	840	43	842
Unpaid (community engagement & special needs)	n/a ¹	n/a ¹	62	2,034	28	990
Unpaid facilitated (in partnership with other groups eg. scouts, fishing for sport, clubs, retirees)	281	7,000	188	4,723	209	7,000

1 Data unavailable

Table 26: “Get hooked ...it’s fun to fish” participation by calendar year (no.)

	2013		2014		2015	
Workshop type	Schools	Students	Schools	Students	Schools	Students
Coastal	66	4880	49	2923	63	3314
Inland	23	1078	49	1946	24	1008
Total	89	5958	98	4869	87	4322

Figure 7: “Get Hooked ...it’s fun to fish” school locations (based on postcode) 2014-15

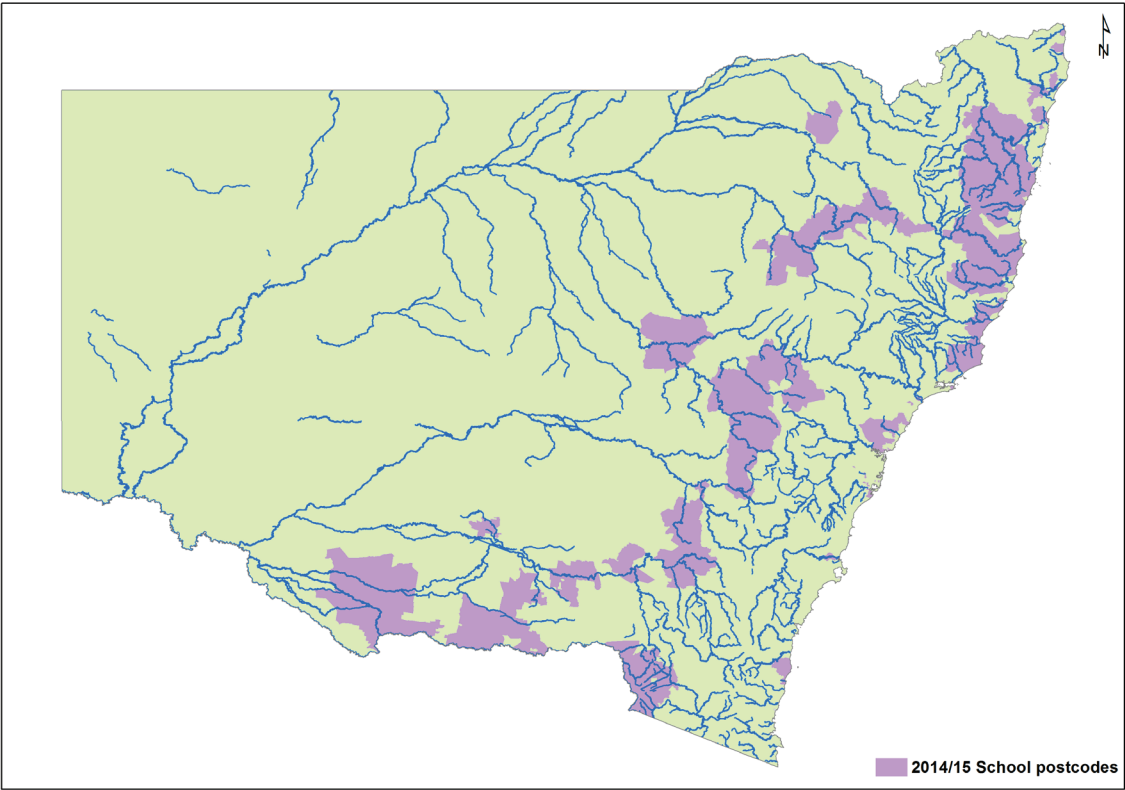


Figure 8: Angling facilities funded and completed in 2014-15

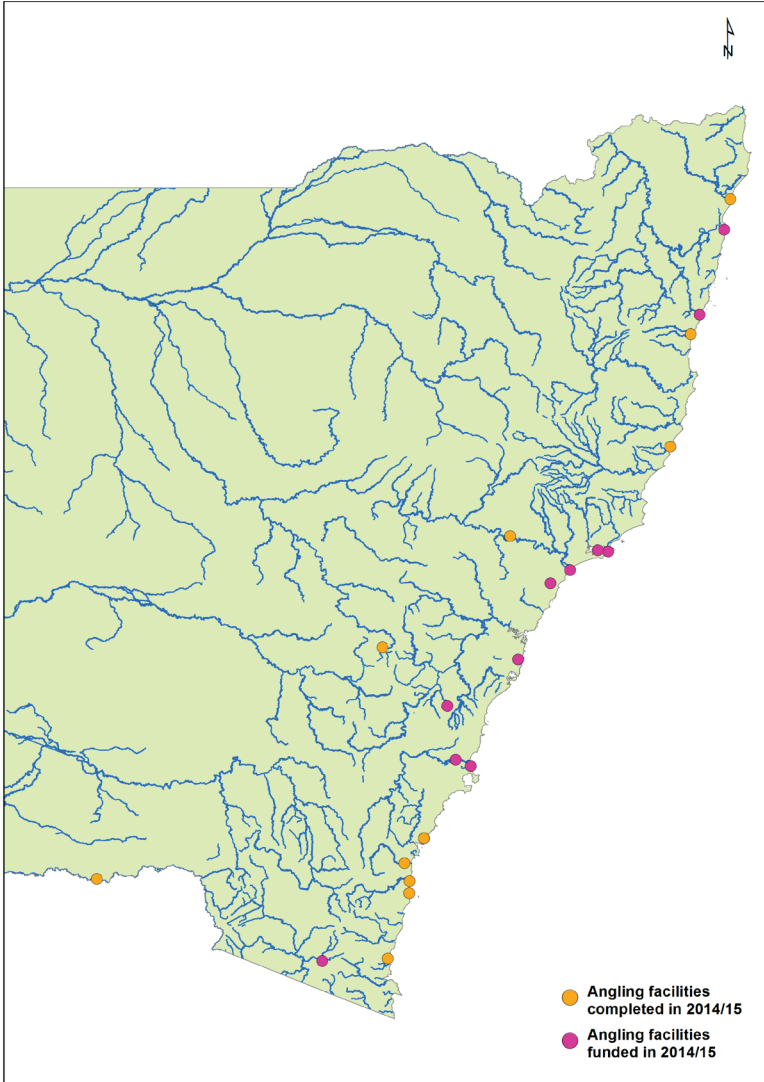


Figure 9: Locations where gamefish were tagged in 2014-15

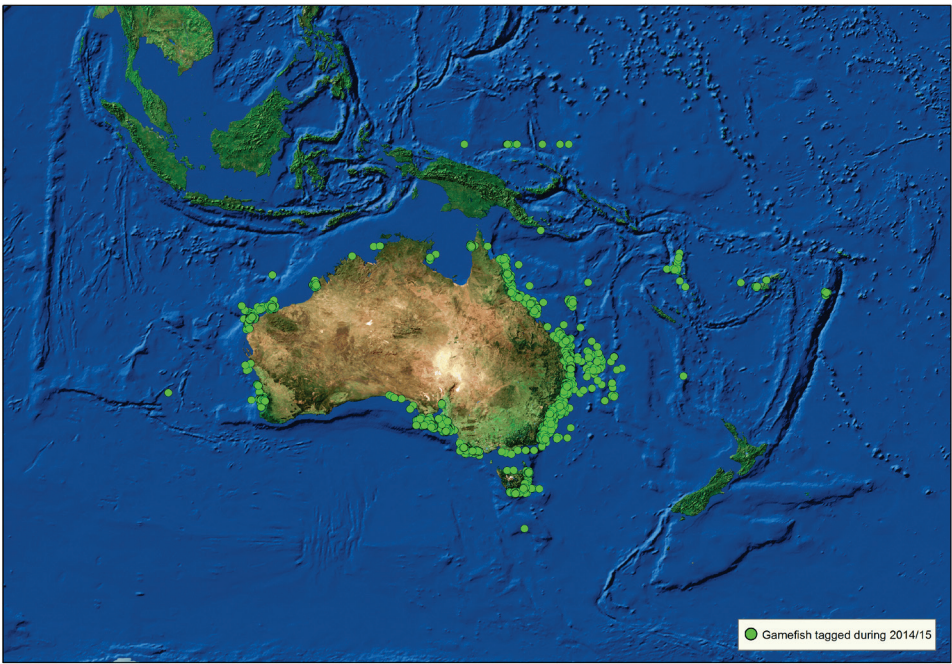


Table 27: Recreational fishing fee licences sold – by duration (no.)

	2012-13	2013-14	2014-15
3 day	224,017	221,643	197,130
1 month	79,677	75,216	70,538
1 year	129,495	130,599	131,247
3 years	108,261	103,602	103,680

Figure 10: Recreational fishing fee sales trends 2009-10 to 2014-15

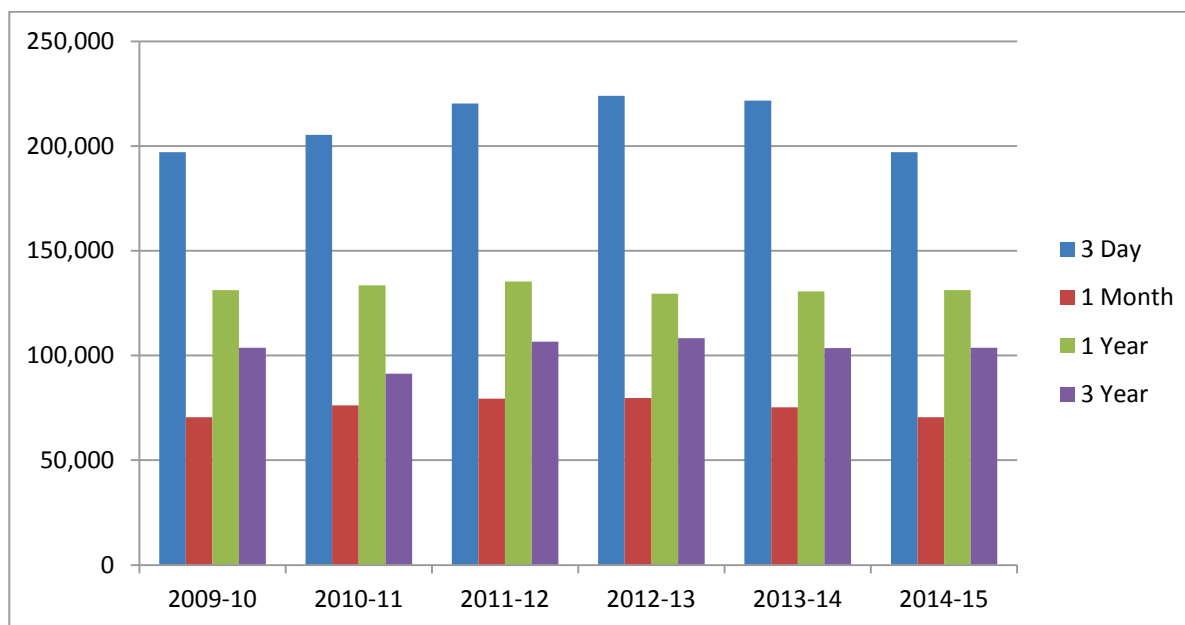
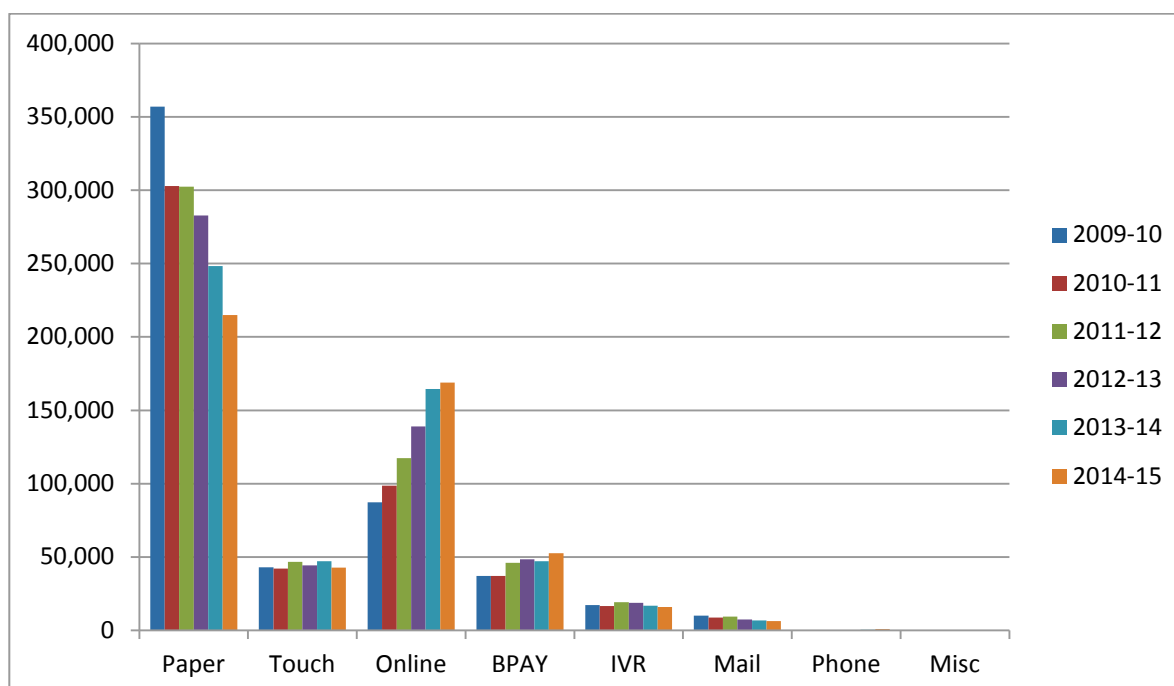


Figure 11: Recreational fishing fee payment channel trends 2009-10 to 2014-15

Paper = fishing fee agent (paper); Touch = fishing fee agent (electronic); Online = via DPI website; IVR = by phone using automated voice recognition technology; Phone = with staff assistance. BPAY available for renewals only



2.2. Maintain sustainable access and use of aquatic resources

2.2.1. Sustainable fish harvest

Table 28: Primary, target, key secondary, byproduct and conditional target species (from all fisheries) in each exploitation category (no.)

Note: Assessments are conducted each year using data from the previous financial year; hence financial year in the following table refers to the source data not the assessment date

Status	Definition	2011-12	2012-13	2013-14
Overfished	Recruitment is being significantly suppressed as a result of a small spawning biomass (as determined by a population model or measured stock-recruitment relationship). Fishing mortality rates are significantly greater than natural mortality rates. Estimates of spawning biomass are less than 20-30% of the estimated unfished spawning stock. The 'Spawning Potential Ratio' is less than 20-40% (depending on life history characteristics). Catch rates are less than 30% of the initial catch rates. Length and age distributions unstable (excessively affected by recruitment, too few age or size classes in the exploitable population given a species' life history). Trends in length/age compositions are evident which indicate increasing (and/or excessive) fishing mortality.	6	6	5
Growth overfished	Yield per recruit would increase if length at first capture was increased or fishing mortality decreased A population model has determined that sustainable yield would increase if fishing mortality was decreased or size at first capture were increased	5	5	5
Fully fished	Fishing mortality is approximately the same as Natural mortality Estimates of the spawning biomass are greater than 30% of the estimated unfished spawning biomass Catch rates have been steady for 5-10 years and/or catch rates are greater than 30% of initial catch rates Length and age distributions are stable Species are fished throughout their entire geographic range	28	28	32
Moderately fished	Fishing mortality is less than half of natural mortality Estimates of the biomass are greater than 70% of the estimated unfished biomass Catch rates are greater than 70% of initial catch rates Species are fished in most of their geographic range but non-fishing areas are known to exist Markets may limit catch and effort	3	2	4
Lightly fished		0	0	0
Uncertain OR Undefined	A significant amount of evidence has been collected and considered, but there are inconsistent or contradictory signals in the data that preclude determination of exploitation status Some data are available but no reasonable attempt has been made to determine exploitation status	72	74	71
TOTAL		114	115	117

Figure 12: History of the exploitation status of key commercially and recreationally harvested species assessed by DPI Fisheries from 2001-02 to 2013-14

Note: some similar exploitation status categories have been combined to simplify presentation

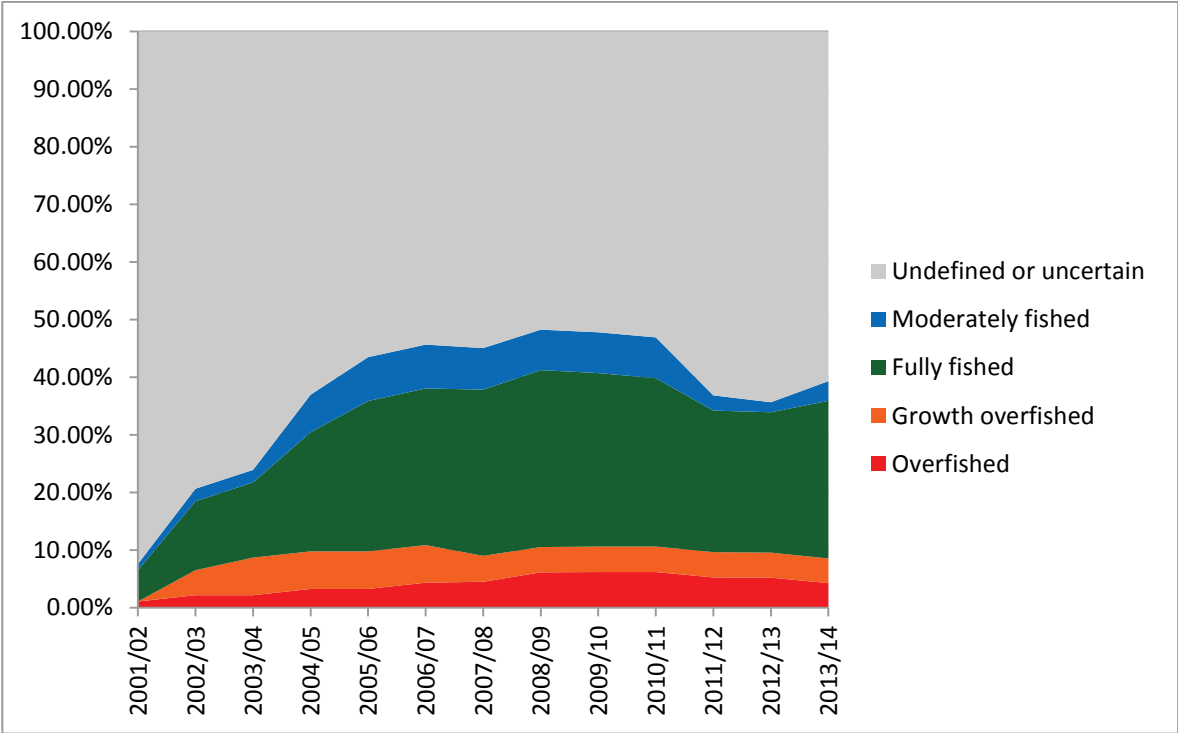


Figure 13: Sum of differences between current and target Resource Assessment Class for all key commercial and recreational species, 2003-04 to 2013-14⁶

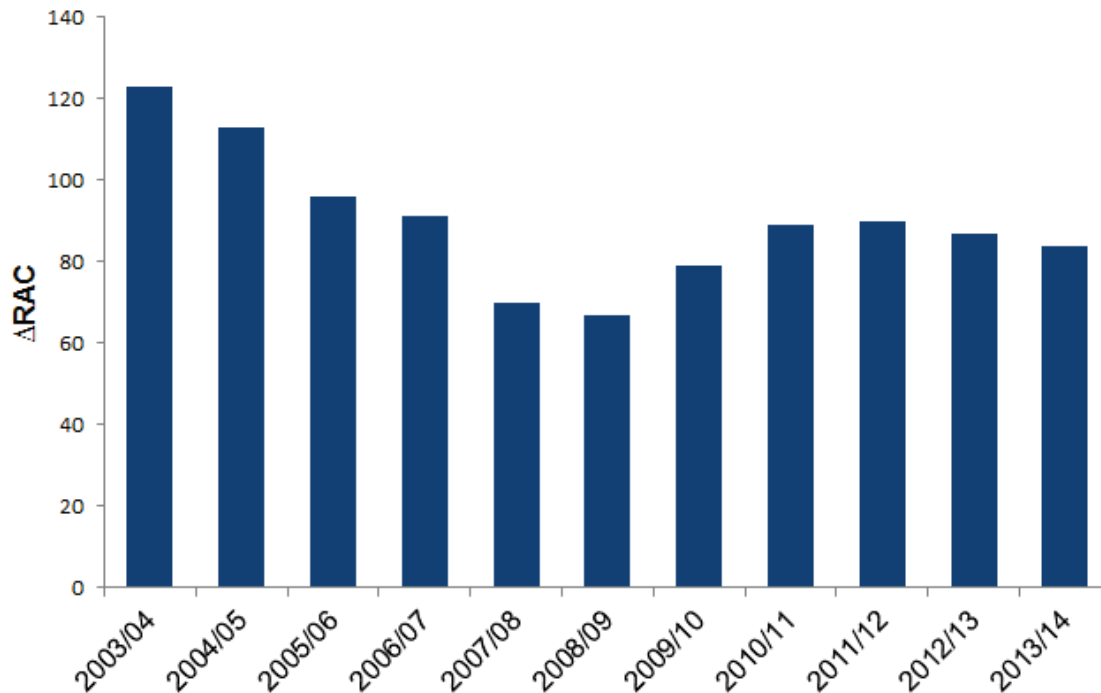


Table 29: Observer days undertaken for NSW commercial fisheries (no.)

Fishery	2012-13	2013-14	2014-15
Southern Fish Trawl	-	-	31
Ocean Trawl Fishery - Northern	-	-	73
Estuary General (hand gathering)	-	48	27
Total	-	48	131

Table 30: Sustainable fish harvest projects underway – government / externally funded (no.)

	2014-15
Number of projects	30

⁶ The current Resource Assessment Class (RAC) indicates the level of assessment actually performed (ranging from Class 1 – the most rigorous/evidence based – through to Class 5), and reflects the quantity, quality and currency of available data. A target was originally nominated for each species based on the species' commercial/recreational importance and conservation values and hence priority for assessment. A reduction in this measure indicates that RACs are approaching their target levels.

2.2.2. Aboriginal fisheries

Table 31: Applications for cultural fishing authorities under s.37(1)(c1) of the *Fisheries Management Act 1994* received and processed (no.)

	2012-13	2013-14	2014-15
Permits approved	5	7	10
Permits not issued ¹	6	0	4
Total applications processed	11	7	14

1 Permits can be 'not issued' for a range of reasons including applications being withdrawn, refused or lacking information to complete the process

Table 32: Indigenous Land Use Agreements

	2012-13	2013-14	2014-15
Bandjalang People #1 (NSD6034/1998) and #2 (NSD6107/1998)	Under negotiation	Under negotiation	Negotiations pending
Yaegl People #1 (NSD6052/1998) and #2 (NSD168/2011)	Under negotiation	Under negotiation	Under negotiation

Table 33: Aboriginal Fishing Advisory Council (AFAC) meetings (no.)

	2012-13	2013-14	2014-15
Meetings held (no.)	2	2	1

Table 34: Engagement with Aboriginal communities

	2013-14	2014-15
Face-to-face meetings		
- to consult on fishing-related matters	n/a ¹	10
- with Aboriginal commercial fishers	n/a ¹	2
- with native title claimants	2	0
Aboriginal fishing clinics / cultural workshops		
- No of workshops	18	48
- Participants	500	800

1 Data unavailable

Table 35: Aboriginal people¹ involved in lawful commercial related fishing activity (no.)

	2014-15
Commercial fishers	24

1 DPI does not ask for nor maintain any record of a person's ethnicity in its databases. This figure represents commercial fishers who have voluntarily identified themselves to DPI Fisheries as of Aboriginal or Torres Strait Islander heritage.

2.2.3. Marine estate

Table 36: State-wide marine habitat research

	2012-13	2013-14	2014-15
Estuarine macrophytes mapping (# estuaries)	5	4	1
Rocky reef habitats sampling (# sites)	42	42	0

Table 37: Marine ecosystem assessment and marine biodiversity research projects underway – government / externally funded (no.)

	2014-15
Number of projects	35

2.2.4. Aquatic ecosystems

Table 38: Threatened species, populations, ecological communities and key threatening processes listed in the schedules of the *Fisheries Management Act* (no.)

	2012-13	2013-14	2014-15
Species presumed extinct	4	4	4
Critically endangered species	6	6	6
Endangered species	11	11	11
Vulnerable species	6	7	8
Endangered populations	9 ¹	10 ¹	10 ¹
Critically endangered ecological communities	-	-	-
Endangered ecological communities	4	4	4
Vulnerable ecological communities	-	-	-
Key threatening processes	8	8	8

¹ These figures include six endangered populations of *Posidonia australis* – in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie

Table 39: Captive-bred threatened fish released into the wild (no.)

Species	2012-13	2013-14	2014-15
Macquarie perch	24	11,700	-
Trout cod	2,000	-	24,000
Olive perchlet	-	-	-
Purple spotted gudgeon	-	-	-
Southern pygmy perch	-	-	-

Figure 14: Fish assemblage condition by catchment (5 year running average)

Based on the Sustainable Rivers Audit (SRA) Fish Index (ndxFS) – a combination of various measures of Fish Recruitment, Fish Nativeness and Fish Expectedness, and an indicator of the overall health of fish communities

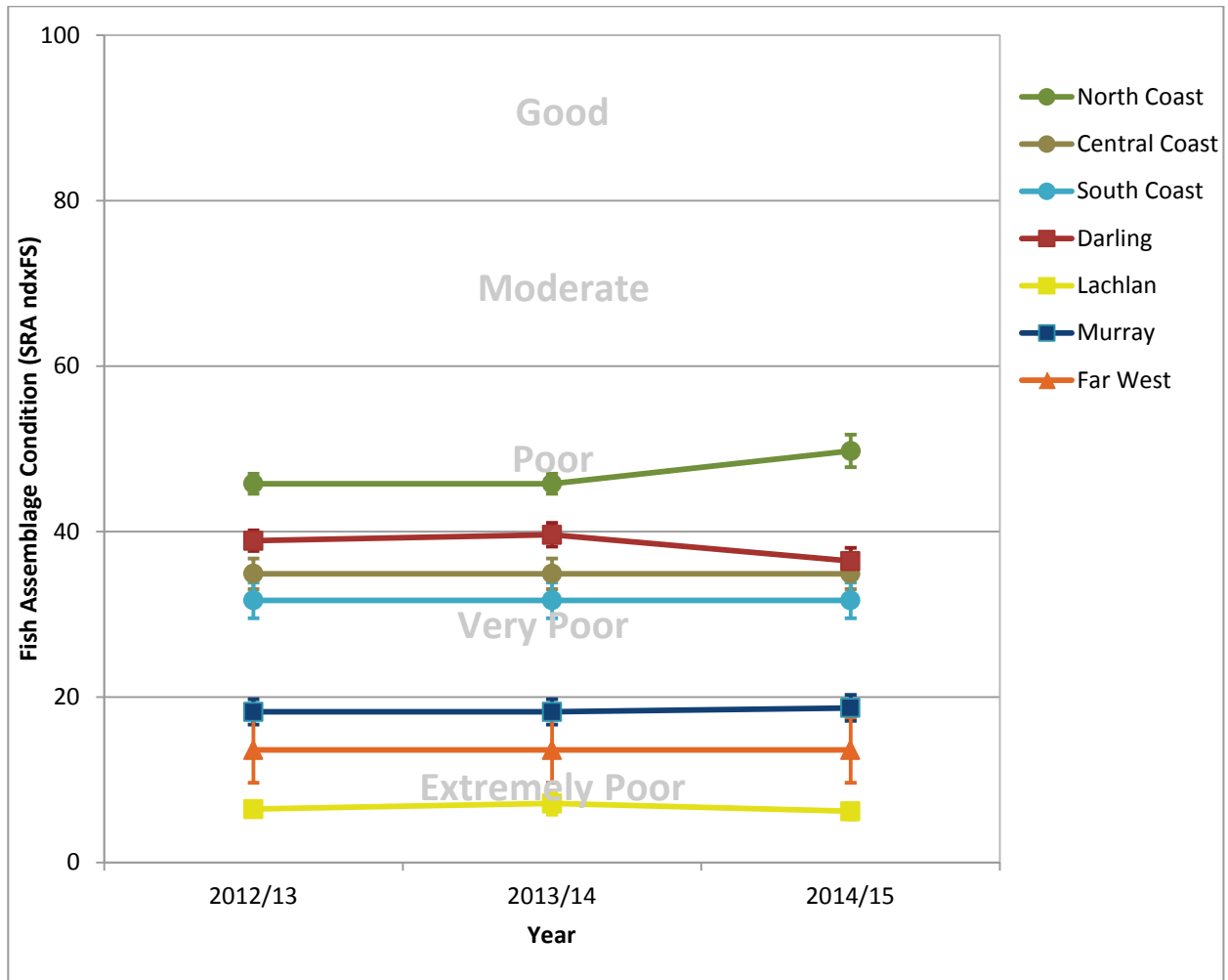


Table 40: DPI Fisheries freshwater fish sampling events (no.)

	2012-13	2013-14	2014-15
Sampling events (trips to a single site)	662	216	436

Table 41: Relevant research projects underway – government / externally funded (no.)

	2014-15
Freshwater ecosystem assessment projects	10
Freshwater biodiversity research projects	6
Threats to fishery resources research	13
Fish habitat improvement research projects	17
Total	46

Table 42: Aquatic habitat protection permits/approvals issued by DPI Fisheries (no.)

Approval Type	2013-14		2014-15	
	Assessed	Issued	Assessed	Issued
Part 7 permits	382	382	346	345 ¹
General Terms of Approval (for Integrated Development Applications)	112	82	127	127
S.199, land owner's consent and other referrals to DPI Fisheries	460	460	369	369
TOTAL	954	924	842	841

1 Additional information sought for one permit had not yet been forwarded

Table 43: Turnaround times for Part 7 permit applications compared to the statutory 28 day assessment and processing timeframe (no. / %)

Approval Type	2013-14		2014-15	
	No.	% of total	No.	% of total
Within 7 days	210	55%	196	57%
8-14 days	95	25%	76	22%
15-21 days	28	7%	35	10%
22-28 days	12	3%	20	6%
>28 days	37	10%	18 ¹	5%
Total	382	100%	345	100%

1 Of these 18 permits that exceeded 28 days, 4 required further information.

Table 44: Turnaround times for Integrated Development Applications referred to DPI Fisheries compared to the statutory 40 day processing timeframe (no. / %)

	2011-12	2012-13	2013-14 ¹
Number of referrals	133	137	127
% processed within 40 days	98%	98%	92%

1 The number of Integrated Development Applications referred to DPI Fisheries and turnaround times are reported each year to Planning NSW. As Planning NSW calculates turnaround times based on additional information from Councils, there is a 1 year lag in reporting of these figures.

Table 45: Habitat Action Grants awarded (no. / \$)

	2012-13	2013-14	2014-15
Number of projects	25	31	31
Total value of grants awarded ¹	\$523,642	\$567,164	\$575,754

1 These figures represent the total funding *announced* for successful grant applications in each funding round, not the actual amount disbursed in that financial year. In some cases (eg. where projects are withdrawn, not completed or underspent), returned funds are reallocated to the next funding round. Also, the funding for some projects is split over multiple years.

Table 46: Habitat rehabilitation on-ground outcomes

	2012-13	2013-14	2014-15
Fencing			
- Km of fencing installed	8.7	31.5	43.2
- Hectares fenced off	54	2,591	202
Fish passage reinstated upstream			
- Km of additional waterways with free fish passage	1,082	1,978	90
- Number of structures removed or remediated	7	10	5
Management plans / reports completed	2	1	5
Offstream water points provided (number)	0	5	19
Riparian / aquatic weed control			
- Km of waterway	32.6	0.7	1,119.4
- Hectares	171.4	2753.8	68.1
Riparian vegetation planted			
- Km of waterway	4.9	0.6	44.6
- Hectares	81.6	135.4	584.4
- Number of plants		899	26,420
Snags placed (number)	56	20	37
Waterway habitat mapped (km)	236	0	1,184
Waterway/bank stabilised (km)	2.65	0.1	1.5
Wetland under improved management (hectares)	39	2	313.3

2.2.5. Fisheries compliance

Table 47: Client contacts (compliance checks) (no.)

	2012-13	2013-14	2014-15
Commercial fisheries	2,800	2,100	2,030
Recreational fisheries	41,000	40,000	40,700
Conservation	2,900	6,300	5,690
Aquaculture (including oyster)	2,000	1,500	920
Other programs	480	370	210
Total¹	49,000	50,000	50,000

1 Due to rounding, individual program figures may not sum to totals.

Table 48: Patrol hours

	2012-13	2013-14	2014-15
Commercial fisheries	13,100	11,000	11,080
Recreational fisheries	22,800	22,500	27,600
Conservation	8,600	11,800	13,400
Aquaculture (including oyster)	2,400	2,200	1820
Other programs	16,600	17,100	14,200
Total¹	63,600	64,900	68,100

1 Due to rounding, individual program figures may not sum to totals.

Table 49: Quality inspections conducted (no.)

	2012-13	2013-14	2014-15
Recreational fisheries	784	1,094	2,232
Post Harvest Program	217	348	252
Commercial fisheries - Abalone	40	21	34
Commercial fisheries - Lobster	63	32	85
Commercial fisheries - Other	850	585	804
Oyster Lease	1,861	1,452	821
Total	3,815	3,532	4,228

Table 50: Fisheries compliance operations conducted (no.)

	2012-13	2013-14	2014-15
No. of operations	39	46	31

Table 51: Contracted services completed satisfactorily (%)

	2012-13	2013-14	2014-15
Cooperative Management of the Temperate East Commonwealth Marine Reserves Network (<i>Annual Business Agreement with Commonwealth Director National Parks</i>)	100%	100%	100%
Memorandum Of Understanding with Australian Fisheries Management Authority (<i>compliance services on a fee-for-service basis</i>)	100%	100%	100%

Table 52: Rate of compliance with fisheries legislation (%)

	2012-13	2013-14	2014-15
Commercial fisheries	80	81	78
Recreational fisheries	90	90	89

Table 53: Fisheries compliance actions (no.)

	2012-13	2013-14	2014-15
Written warnings	3,600	4,180	4240
Penalty notices	2,200	2,120	2510
Prosecutions ¹	330	300	220
TOTAL	6,130	6,600	6,970

1 Matters successfully prosecuted

Table 54: Seizures (no.)

	2012-13	2013-14	2014-15
Fish	52,000	45,000	41,000
Fishing gear	3,100	3,100	3,140

Table 55: Major groups of fish and invertebrates seized

	2012-13	2013-14	2014-15
Invertebrates			
Abalone (Blacklip/Greenlip)	2,220	3120	2,310
Blue swimmer crabs	90	400	730
Cockles	22,380	9,100	19,100
Eastern rock lobsters	610	480	107
Nippers	2,660	8,900	2,320
Oysters (Sydney Rock/Pacific)	240	2,000	360
Pipis	8,150	40	523
Sea urchins	120	400	730
Fish			
Silver trevally	2,640	200	244
Tailor	280	300	460
Snapper	320	420	430
Mullet (Sea/Yelloweye/Flat Tail)	70	160	500
Yellowfin bream	1,000	400	320
Eels	180	470	0d

Table 56: Major items of fishing gear/equipment seized

	2012-13	2013-14	2014-15
Fishing lines	676	1,050	1,054
Crab traps	770	1,098	1,032
Hoop or lift nets	624	454	559
Yabby traps	607	138	114
Meshing nets	52	43	42
Spears	27	40	42
Cast nets	27	36	27
Sets of diving gear	21	19	20
Boats	3	3	3
Cars	2	0	0

Table 57: Most common offences 2014-15

	Offence (legislation)	No.	%
1	Section 34J(1), Recreational fisher fails to pay fishing fee, FMA1994	1,668	22.9
2	Section 34J(2), Fail to have official receipt in immediate possession, FMA1994	1,214	16.7
3	Section 16(1), Possess prohibited size fish – first offence, FMA1994	853	11.7
4	Section 18(2), Possess more than possession limit – first offence, FMA1994	285	3.9
5	Section 41 Harm or attempt to harm any animal in sanctuary zone MEMA2014	206	2.8
6	Section 24(1), Unlawfully use net or trap for taking fish – first offence, FMA1994	182	2.5
7	Section 25(1)(a), Possess prohibited fishing gear – first offence, FMA1994	174	2.4
8	Clause 45(1) Place/set net/fishing gear not identified in accordance with Regulation FM(G)R2010	153	2.1
9	Section 20A(3)(b), Take fish declared waters – recreational fishing – first offence, FMA1994	142	2.0
10	Clause 46(3)(a), Use more than 2 hand held lines in inland waters, FM(G)R2010	136	1.9
	Subtotal of top 10 offences	5,013	68.8%
	Total of all offences	7,286	100%

NOTE:

FMA1994 is the *Fisheries Management Act 1994*

FM(G)R2010 is the *Fisheries Management (General) Regulation 2010*

MEMA2014 is the *Marine Estate Management Act 2014*

Figure 15: Offences detected during 2014-15 by day of week and hour of day

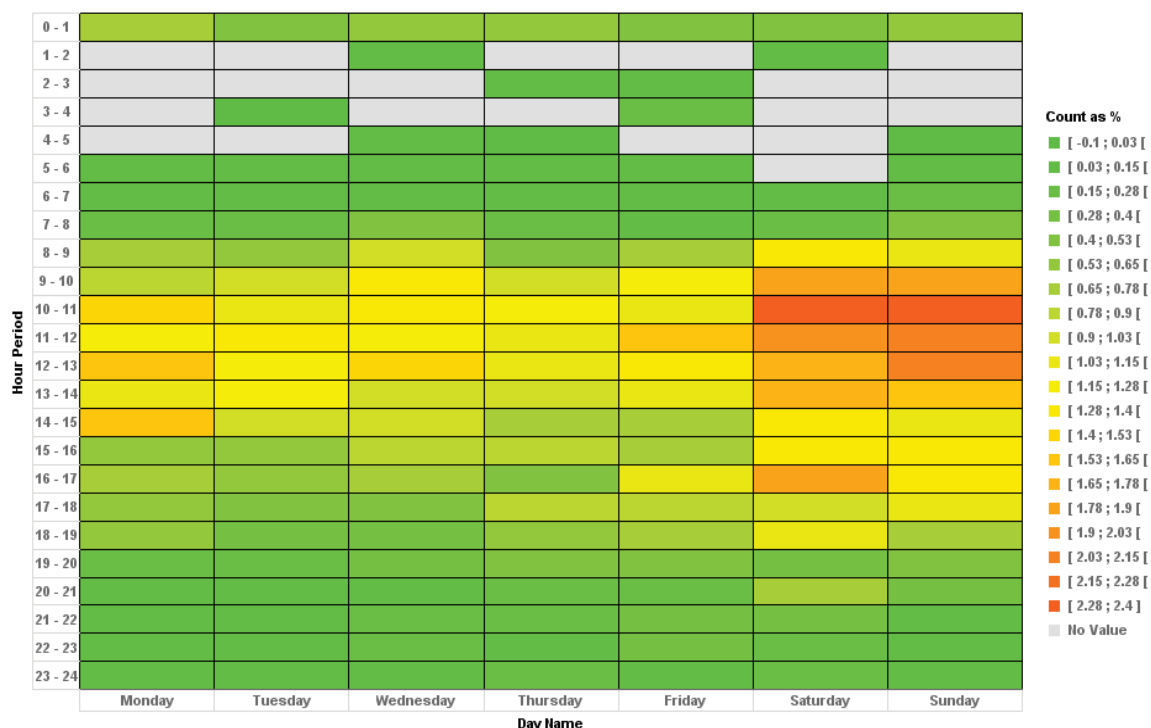


Table 58: Fishers Watch

	2012-13	2013-14	2014-15
Total Fishers Watch calls logged	3,451	3,785	3,588
Top telephone exchanges	Sydney, Gosford, Newcastle and Illawarra	Sydney, Gosford, Newcastle & Nowra	Sydney, Gosford, Newcastle & Nowra
Most popular days	Monday Friday Saturday	Saturday Monday Sunday	Saturday Monday Tuesday
Most popular time	Around 1:00 pm	Around 11:30 am	Around 11:30 am
Most popular connection device	Mobile phone	Mobile phone	Mobile phone
No. of web-based reports	70	150	315

Figure 16: Information reports¹ recorded in 2014-15 by day of week and related fishing activity

Includes reports made using Fishers Watch online form, Fishers Watch 1800 number and entries by fisheries officers

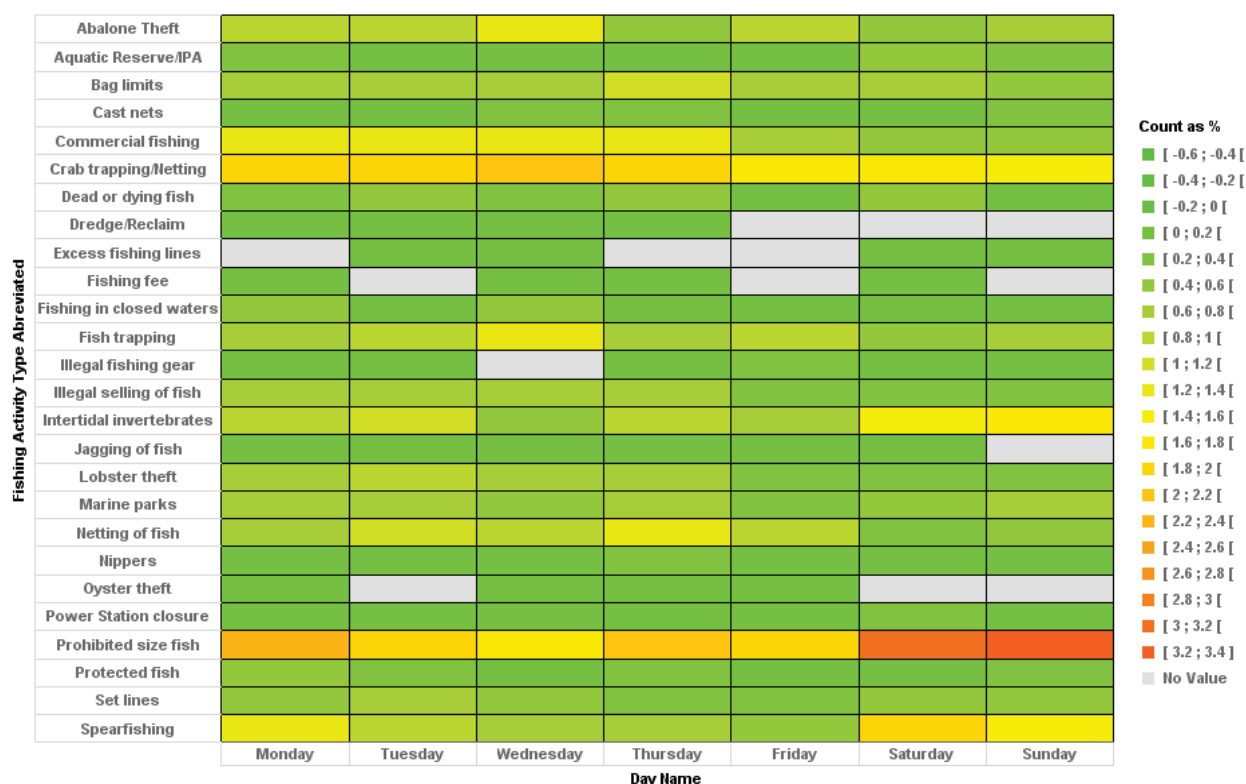
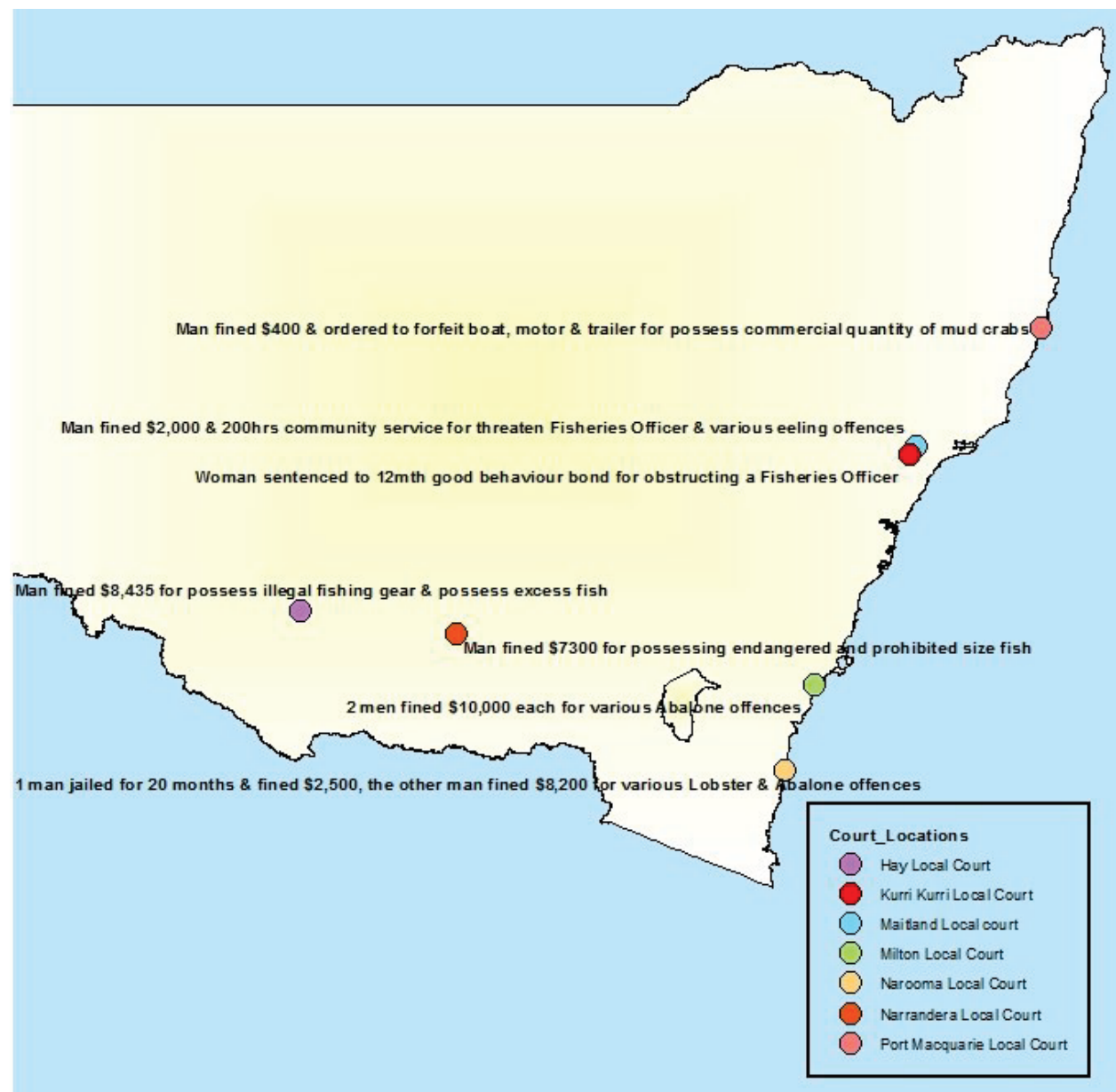


Table 59: Compliance outputs published on social media (no.)

	2012-13	2013-14	2014-15
Facebook	Page did not exist	90	60
Twitter	Page did not exist	46	25
YouTube	2	1	0

Figure 17: Major prosecution results by court location 2014-15



2.3. Mitigate and manage risks from use of land and water

2.3.1. Sharks (Bather Protection) Program

Table 60: Marine life interactions with the Shark Meshing Program (no.)

(Brackets) show the number released alive

	2012-13	2013-14	2014-15
Target sharks			
- White Sharks*	3	6 (1)	10
- Shortfinned Makos	2	5 (1)	8
- Dusky Whalers		10 (1)	6
- Common Blacktip Sharks		9	5
- Bronze Whalers		3	5 (1)
- Broadnose Sevengill Sharks	1	3	5 (1)
- Bull Sharks	1	1	2 (1)
- Tiger Sharks	2 (2)	6 (1)	2
- Unidentified (whalers)	23 (2)	3	1
Subtotal – target species	32 (4)	46 (4)	44 (3)
Non-target sharks			
- Smooth Hammerheads	19	22	42 (1)
- Grey nurse Sharks*	9 (3)	4 (2)	4
- Australian Angelsharks	3 (1)	6	1
- Other species ¹	7 (1)	2 (2)	3
Rays			
- Southern Eagle Rays	29 (21)	58 (39)	47 (33)
- Australian Cownose Rays		19 (14)	27 (25)
- Other species ²	5 (2)	13 (12)	12 (9)
Marine mammals			
- Common Dolphins#		4	3
- IndoPacific Bottlenose Dolphins#		2	
- Bottlenose Dolphin#		1	
- Humpback Whale*	2 (2)	1	
Marine reptiles			
- Green Turtle*		10 (1)	4 (1)
- Hawksbill Turtle*			1
- Leatherback Turtle*		2 (2)	
- Loggerhead Turtle*	1		
- Unidentified Turtle*	1		1 (1)
Fish			
- Longtail tuna		1	
Subtotal – non-target species	76 (30)	145 (72)	145 (70)
TOTAL	108 (34)	191 (76)	189 (73)

1 Including 1 Scalloped Hammerhead*, 3 Port Jackson Sharks and 3 unidentified sharks in 2012-13, 2 Port Jackson Sharks in 2013-14 and 1 Thresher Shark, 1 Silky Shark and 1 unidentified shark in 2014-15

2 Including 5 unidentified rays in 2012-13; 1 White Spotted Eagle Ray, 4 Black Stingrays, 1 Ornate Eagle Ray and 7 unidentified rays in 2013-14; and 4 Blue Spotted Eagle Rays, 3 Smooth Stingrays, 2 Manta Rays and 3 unidentified rays in 2014-15

* Threatened species; # Protected species

Table 61: Total Shark Meshing Program contractor hauling days and percentage observed¹, by region

Meshing region	2012-13		2013-14		2014-15	
	Hauling days	% observed	Hauling days	% observed	Hauling days	% observed
Hunter	117	31%	120	38%	116	31%
Central Coast	117	22%	121	36%	85	32%
Sydney North	115	17%	106	30%	108	18%
Sydney Central	135	15%	111	28%	108	31%
Sydney South	167	11%	172	19%	147	26%
Illawarra	124	17%	123	27%	102	34%
Total	775	19%	753	30%	666	29%

¹ Observers are employed on a temporary basis each season to document any catch (including certifying catches of target and non-target species), provide accurate setting locations of all nets using GPS, and assist with obtaining samples for scientific research

Table 62: Shark Meshing Program compliance checks (no.)

	2012-13	2013-14	2014-15
Nets inspected	138	93	214
Patrol hours	222	186	614

Table 63: Shark Meshing Program compliance with contractual arrangements (%)

	2012-13	2013-14	2014-15
Size, length, marking of nets	100%	100%	100%
Pinger and whale alarms	100%	100%	100%
Operational compliance (eg. setting and inspecting nets, reporting, using VMS)	n/a ¹	n/a ¹	92%

¹ Compliance exceeded 80%. The majority of hauls occurred within 72 hours of nets being set, however there were periods of extended heavy weather which required nets to be left set longer than the required 72 hours

Table 64: Shark Meshing Program Management Plan trigger points tripped

Objective	Trigger point	2012-13	2013-14	2014-15
Reduce the risk to humans from shark attack at beaches of the SMP	One fatality or serious injury per meshing season on a meshed beach	N	N	N
Minimise the impact on non-target and threatened species	Entanglements of non-target species and threatened species over two consecutive meshing seasons exceed twice the annual average catch of the preceding 10 years for those species.	N	Y	Y
Minimise OHS risks associated with implementing the SMP	One major or minor OHS incident ¹	Y	N	N
Transparent monitoring and reporting	Annual performance report submitted to the Minister for Primary Industries, Director-General of NSW DPI, Director-General of Department of Premier and Cabinet, the Scientific Committee and the Fisheries Scientific Committee by 31 July each year	N	Y	N

1 Major = 5+ compensable days off work; Minor = <5 compensable days off work. Tripped in 2012-13 when there were 2 major OHS incidents

2.4. Communication

Table 65: DPI Fisheries website usage

	2012-13	2013-14	2014-15
Website – www.dpi.nsw.gov.au/fisheries			
Unique pageviews ¹			
- Recreational	1,225,980	1,381,625	1,552,706
- Commercial	46,939	81,873	78,522
- Aquaculture	83,507	99,579	112,012
- All fisheries	1,824,270	2,103,468	2,319,544
As a percentage of NSW DPI unique pageviews	33.73%	33.59%	35.85%
Average time on page (min:sec)	1:17	1:28	1:31

1 Number of individual visitors who have viewed pages. Data from Google Analytics.

Table 66: DPI Fisheries social media outputs

	2012-13	2013-14	2014-15
Facebook – https://www.facebook.com/NSWDPIFisheries			
Page likes		3,204 ¹	10,138 ²
Number of posts			
- Compliance		90	60
- Recreational		72	77
- Other		29	65
- All fisheries		191	202
Average reach of posts (all fisheries)		1,998	10,662
Twitter - @nswdpi			
Number of fisheries-related tweets		68	57
Average reach per tweet		~8,000	Not available
YouTube – https://www.youtube.com/user/NSWFIsheries			
Number of uploaded videos	5	10	4
Total views	9,821	39,392	8,156 ³
Average views	1,964	3,939	2,039

1 Snapshot as of 30 June 2014.

2 Snapshot as of 15 December 2015.

3 Total views (of the 4 videos posted in 2014/15) as of Jan 2016.

Table 67: Fisheries research scientific publications by calendar year (no.)

	2012	2013	2014
Conference presentations	21	27	16
Books and journals	59	76	71
Reports	27	18	12

See Appendix 3 for complete list of 2014 publications

2.5. Workforce

As of mid-2015 the Fisheries branch of NSW DPI had 420 executive, permanent, fixed term and casual staff members employed at various locations across the state. Excluding casuals, the number of Full Time Equivalent (FTE) positions was 360. Of these staff, 89% work in regional NSW and 11% in the Sydney metropolitan area.

Figure 18: Offices where DPI Fisheries staff are located, June 2015



Table 68: Number of staff and Full Time Equivalent positions at each office location, June 2015

Office	Individuals	FTEs
Albury	8	7.6
Armidale	1	1.0
Ballina	3	3.0
Batemans Bay	15	11.8
Bathurst	5	4.7
Byron Bay	6	4.0
Coffs Harbour	42	35.4
Dareton	2	2.0
Deniliquin	2	2.0
Dubbo	6	6.0
Dutton	6	5.2
Eden	5	3.4
Grafton	4	3.0
Huskisson	14	9.8
Inverell	2	2.0
Jindabyne	8	7.8

Office	Individuals	FTEs
Lake Illawarra	7	7.0
Lord Howe Is.	2	2.0
Macleay	5	4.8
Merimbula	2	2.0
Narooma	13	12.5
Narrandera	22	15.2
Nelson Bay	4	3.4
Nowra	30	29.1
Ourimbah	17	15.7
Port Macquarie	5	4.5
Port Stephens	88	75.6
Queanbeyan	1	1.0
Sans Souci	4	4.0
Swansea	6	5.0
Sydney ¹	37	26.9
Tamworth	6	6.0
Tumut	2	2.0
Tuncurry	4	3.6
Tweed Heads	2	2.0
Wollongbar	14	12.3
Wollongong	9	7.0
Wollstonecraft	11	10.4
Total	420	360.6

1 Includes Menangle, Mosman and Newington

Table 69: Staff safety and wellbeing key measures

Green text indicates target met; red text target not met

WHS Operational Plan (Fisheries) Primary Measure	Target	2012-13		2013-14		2014-15	
		Measure	Change	Measure	Change	Measure	Change
Incidents reported within 24 hours	80%	44%		58%		59%	
Incidents investigated within 72 business hours	80%	65% ¹		75%		79%	
Near Miss & Hazard Reports	+25% year on year	12	n/a ²	16	+33%	22	+38%
Total recordable injury rate	-35% year on year	22	-27%	11	-50%	20	+82%
Number of Lost Time Injuries (LTI)	-10% year on year	8	-33%	3	-63%	5	+67%
Number of medical treatment only incidents	-10% year on year	14	-22%	8	-43%	15	+88%

1 Data from Oct 12 to June 13 only

2 2011-12 data not available for comparison

Appendix 1: Trust Funds

There are six Fisheries Trust Funds constituted under the *Fisheries Management Act 1994*:

- Aquaculture Trust Fund
- Commercial Trust Fund
- Conservation Trust Fund
- Charter Fishing Trust Fund
- Recreational Fishing Freshwater Trust Fund
- Recreational Fishing Saltwater Trust Fund

The fees, charges and other monies to be paid into each Fund, and the purposes for which funds may be used, are prescribed by the Act (see following sections). The Act also states that the Minister is to consult any relevant advisory council established under section 229 about policies and priorities for expenditure from that Fund.

A. Aquaculture Trust Fund

The Aquaculture Trust Fund is funded by:

- a) Fees paid for aquaculture permits and all payments of rent for aquaculture leases, and
- b) Fees and charges paid under Part 6 and the regulations made under that Part (except annual contributions payable into the trust funds established under section 157), and
- c) Fees and charges for services provided by the Department to persons engaged in aquaculture, and
- d) Any gift or bequest of money for the purposes of that Fund, and
- e) Any other money appropriated by Parliament for the purposes of that Fund or required by law to be paid into that Fund.

The funds may be used for:

- a) The costs of taking measures to enhance, maintain or protect the management of aquaculture, and
- b) The costs of carrying out research into aquaculture, and
- c) The costs of management and administration of Part 6 and the regulations under that Part, and
- d) The costs of ensuring compliance with the regulatory controls on aquaculture under Part 6 and the regulations under that Part, and
- e) The costs of consultative arrangements with persons engaged in aquaculture.

B. Commercial Trust Fund

The Commercial Fishing Trust Fund is funded by:

- a) All fees paid for commercial fishing licences, fishing boat licences and the registration of fishing gear used by commercial fishers, and
- b) All fees and charges paid under Parts 3 and 4 and the regulations made under those Parts (other than community contributions by shareholders under section 77), and
- c) The proceeds of the sale of tags, or other identification, to be used on fish taken by commercial fishers, and
- d) Any gift or bequest of money for the purposes of that Fund, and
- e) Any other money appropriated by Parliament for the purposes of that Fund or required by law to be paid into that Fund.

The funds may be used for:

- a) the costs of taking measures, to enhance, maintain the effective management of commercial fishing, and
- b) the costs of carrying out research into commercial fishing, and
- c) the costs of management and administration of commercial fishing, and
- d) the costs of ensuring compliance with commercial fishing regulatory controls, and
- e) The costs of consultative arrangements with commercial fishers.

C. Conservation Trust Fund

The Fish Conservation Trust Fund is funded by:

- a) all fees and charges paid under Part 7 or 7A and the regulations made under those Parts, and
- b) all fees and charges for inspections and reports by the Department relating to development proposals affecting fish habitat, and
- c) any gift or bequest of money for the purposes of that Fund, and
- d) any other money appropriated by Parliament for the purposes of that Fund or required by law to be paid into that Fund.

The funds may be used for:

- a) the costs of taking measures to enhance, maintain or protect fish habitat, and
- b) the costs of carrying out research into fish habitat, and
- c) the costs of management and administration of Part 7 or 7A and the regulations under those Parts, and
- d) the costs of ensuring compliance with the regulatory controls under Part 7 or 7A and the regulations under those Parts.

D. Charter Fishing Trust Fund

The Charter Fishing Trust Fund is funded by:

- a) All fees and charges paid under Part 4A and the regulations under that Part, and
- b) Any gift or bequest of money for the purposes of that Fund, and
- c) Any other money appropriated by Parliament for the purpose of that Fund or required by law to be paid into that Fund.

The funds may be used for:

- a) The costs of taking measures to enhance, maintain or protect charter fishing, and
- b) The costs of carrying out research into charter boat fishing, and
- c) The costs of management and administration of charter fishing boat operations, and
- d) The costs of ensuring compliance with charter fishing boat regulatory controls, and
- e) The costs of consultative arrangements with owners and operators of charter fishing boats.

E. Recreational Fishing (Freshwater) Trust Fund

The Recreational Fishing (Freshwater) Trust is funded by:

- a) Any amount or proportion of the recreational fishing fees that is allocated to that Fund by the Minister under this section, and
- b) All other payments received in connection with the administration of Part 2 (including fees and charges paid under Part 2 or the regulations made under that Part) that are not required to be paid into any other trust fund, and
- c) The proceeds of the sale of tags, or other identification, to be used on fish taken by recreational freshwater fishers, and
- d) Any gift or bequest of money for the purposes of that Fund, and
- e) Any other money appropriated by Parliament for the purposes of that Fund or required by law to be paid into that Fund.

The funds may be used for:

- a) The costs of stocking freshwater with fish, or taking other measures, to enhance, maintain or protect recreational fishing, and
- b) The costs of carrying out research into freshwater fish and their ecosystems, and
- c) The costs of management and administration of recreational freshwater fishing (including commission for authorised agents collecting recreational freshwater fishing fees), and
- d) The costs of ensuring compliance with recreational freshwater fishing regulatory controls, and
- e) The costs of providing third-party insurance coverage for landowners where recreational fishers use private land (or water over private land) for freshwater fishing, and
- f) The costs of consultative arrangements with freshwater recreational fishers.

The Minister may, from time to time, determine the amount or proportion of the recreational fishing fees to be allocated to that Fund.

F. Recreational Fishing Saltwater Trust Fund

The Recreational Fishing (Saltwater) Trust is funded by:

- a) Fees paid for the registration of fishing gear used for recreational estuarine and marine fishing, and
- b) The proceeds of the sale of tags, or other identification, to be used on fish taken by recreational estuarine and marine fishers, and
- c) All recreational fishing fees, other than any amount or proportion of those fees allocated to the Recreational Fishing (Freshwater) Trust Fund, and
- d) Any gift or bequest of money for the purposes of that Fund, and
- e) Any other money appropriated by Parliament for the purposes of that Fund or required by law to be paid into that Fund.

The funds may be used for:

- a) The costs of taking measures to enhance, maintain or protect recreational estuarine and marine fishing and
- b) The costs of carrying out research into estuarine and marine fish and their ecosystems, and
- c) The costs of management and administration of recreational estuarine and marine fishing, and
- d) The costs of ensuring compliance with recreational estuarine and marine fishing regulatory controls, and
- e) The costs of consultative arrangements with recreational estuarine and marine fishers.

Appendix 2: Fishery Management Strategy trigger points

Trigger points – by issue	Fishery/ies ¹	Triggered 2014-15?	Notes
Conserving biological diversity			
Increase in quantity of discards for any observed method increases between consecutive observer surveys	All except Ab	-	2
Significant shift in species composition detected between consecutive observer surveys for any method	All except Ab	-	2
Guidelines specified in any Marine Pest and Disease Management Program are not adopted by the fishery	All	N	
Areas / estuaries closed to the fishery become open after the commencement of the FMS	All except Ab	N	3
Maintaining harvested fish stocks at sustainable levels			
Exploitation status of a primary or key secondary is changed to 'overfished' or 'recruitment overfished' by NSW DPI	All except Ab / Lob	N	4
Contribution of other secondary species to total Estuary General landings exceeds 15% in any two consecutive years	EG	N	
Total Estuary General landings from any estuary region changes by more than 50% between any two consecutive years	EG	Y	5
Contribution of conditional target and byproduct species for any method exceeds 5% in any two consecutive years	OH	N	6
Ratio of the landings of any by-product species to total landings of target species in each estuary in the Estuary Prawn Trawl Fishery exceeds the limits specified in the FMS in any two consecutive years.	EPT	Y Hawkesbury River only	7
Contribution of secondary species to total trap and line landings exceeds 15% in any two consecutive years.	OTL	Y	8
Contribution of secondary species to total trawl landings exceeds 5% in any one year	OT	N	
Biomass of spawning stock is depleted to less than 25% of pre-exploitation level	Lob	N	
Ratio of annual commercial catch to TACC is below 85% in two consecutive years	Lob	N	
The index of abundance of spawning stock decreases in two consecutive years	Lob	N	
Ratio of total annual landings of all byproduct species to eastern rock lobster taken by the Lobster Fishery – <i>trigger point yet to be determined</i> .	Lob	-	
Commercial landings of hermit crabs exceed 30 tonnes per fishing period.	Lob	N	
Lobster Fishery landings of wobbegong sharks exceeds 8 tonnes	Lob	N	

Trigger points – by issue	Fishery/ies ¹	Triggered 2014-15?	Notes
The biomass of mature or legal sized abalone: (a) falls below the 1994 benchmark by more than 15%, or (b) there is a greater than 50% chance of (a) occurring in the next 5 years if the TACC is unchanged ⁶	Ab	-	9
(a) Industry provides ≥90% of catch and effort data within the time frames required (b) NSW DPI provides ≥90% of available summary data to industry by the 15th day of each month (NB: Triggered if these conditions are NOT met)	Ab	N	
Catches exceed the levels recommended by the TAC Committee or other finer scale limits set by industry	Ab	N	
Conserving threatened and protected species			
Any interactions between the fishery and a threatened species, population or ecological community reported by endorsement holders in the fishery or observed during an observer survey that are likely to threaten the survival of that threatened species, population or ecological community, as determined by the DDG DPI Fisheries on advice from relevant threatened species experts	All except Ab	-	10
A biennial review undertaken by NSW DPI of interactions between the fishery and a protected species reported by endorsement holders in the fishery or observed during an observer survey is likely to threaten the survival of that protected species as determined by the DDG DPI Fisheries on advice from relevant threatened species experts	All except Ab	-	11
Number of grey nurse sharks caught by the Ocean Trap and Line Fishery - <i>trigger point yet to be determined.</i>	OTL	-	12
Resource sharing and minimising negative social impacts			
Maximum absolute difference in the distribution of landings between the commercial and non-commercial sectors is greater than 15 percentage points when compared every five years. Note: Trigger point for the Ocean Trawl, Lobster and Abalone fisheries is 25%.	All	-	13
Among the NSW commercial fisheries for each key species: Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 15 percentage points	All except Lob / Ab	n/a	14
Among estuary general endorsement types for each primary species: Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 20 percentage points	EG	n/a	14
Among estuary general regions for each primary species: Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 25 percentage points	EG	n/a	14

Trigger points – by issue	Fishery/ies ¹	Triggered 2014-15?	Notes
Among ocean hauling regions for each target species: Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 50 percentage points	OH	n/a	14
Among ocean trap and line endorsement types for each primary species: Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 25 percentage points	OTL	n/a	14
Among ocean prawn trawl and ocean fish trawl gear types for each primary species: Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 25 percentage points	OT	n/a	14
Quantity of finfish landings in the Lobster Fishery compared to the Ocean Trap and Line Fishery – <i>trigger yet to be determined</i>	Lob	-	
DDG DPI Fisheries determines that an unacceptable level of breaches of the Abalone Fishery Code of Practice have occurred with respect to interaction with other harvest sectors and items of cultural heritage – <i>trigger yet to be determined</i>	Ab	-	15
Economic viability			
Net economic returns: DDG DPI Fisheries is satisfied that the gross value of production of the fishery has not exceeded the sum of indicative industry operational costs and government management costs relevant to the fishery for three consecutive years - <i>trigger yet to be determined</i>	All except Ab	-	16
Average market of shares when traded – <i>trigger yet to be determined</i>	All except Lob / Ab	-	
Average annual share transfer price increases or decreases by more than 25% over two years	Lob	N	17
Gross value of commercial catch (CPI adjusted) relative to the full TACC if caught, decreases by more than 10% from the previous year	Lob	N	18
Raw catch rate of commercial divers falls below 19.12 kg/hr	Ab	N	19
Beach price falls below \$35.70 per kg (CPI adjusted each year)	Ab	Y	20
Total commercial catch falls below 85% of the TACC in the fishing period	Ab	N	
Management fees increase by more than CPI between any two consecutive years	Ab	Y	21
The number of divers harvesting abalone falls outside a range determined by the DDG DPI Fisheries following consultation with shareholders – <i>appropriate range yet to be determined</i>	Ab	-	
1 EG = Estuary General; EPT = Estuary Prawn Trawl; OH = Ocean Hauling; OT = Ocean Trawl; OTL = Ocean Trap & Line; Lob = Lobster; Ab = Abalone. 2 Consecutive observer survey data not available. The FMSs for all the major commercial fisheries (excluding Lobster and Abalone) require the implementation of a cross-fishery scientific observer program. Ocean line fishing methods were identified as the highest priority and a 3-year scientific observer program commenced in Sep 2007,			

with the final report expected in 2015-16. The Ocean Trawl Fishery was identified as the next highest priority and a 3-year scientific observer program commenced in that fishery in 2014.

- 3 In most fisheries, the area available to the fishery has been reduced through the introduction of new marine parks and other measures.
- 4 Latest resource assessment is based on 2013-14 data.
- 5 Triggered in Region 5 where there was a >50% decrease in total landings between 2013-14 and 2014-15, this may be influenced by changes in annual catches of sea mullet.
- 6 Contribution of conditional target and byproduct species taken by the method garfish net (hauling) exceeded 5% in one year only (2014-15).
- 7 Triggered for the Hawkesbury River EPT where landings of hairtail (*Trichiurus lepturus*), whitebait (*Hyperlophus vittatus*) and black sole (*Brachirus nigra*) exceeded the limit specified in the FMS for two consecutive years.
- 8 Contribution of secondary species to the total OTLF landings was 17% in 2013-14 and 22% in 2014-15.
- 9 Cannot be monitored (since 2008-09) following the reduction in research services and removal of the fishery independent survey) provided by DPI Fisheries. However there has been an increase to the minimum size limit of abalone to 117mm as well as to the south of Wonboyn an increase to 120mm then 123mm and average size data shows a significant increase in abalone above the current size limit.
- 10 Interactions have been reported in the EG (1 endorsement holder), OH (1 endorsement holder), OTL (observer survey + endorsement holders) and OT (1 endorsement holder) fisheries. No determinations made by DDG DPI Fisheries that the interactions were likely to threaten the survival of these threatened species.
- 11 Review not undertaken in 2014-15.
- 12 Baseline data collected through scientific observer programs; trigger point determination pending.
- 13 This performance indicator can only be measured if updated estimates of non-commercial catch become available between comparison years. Final report from a 2013-14 state-wide survey of recreational fishing is due shortly.
- 14 Not applicable to 2014-15. In accordance with the FMS, assessment of these performance indicators / trigger points occurs on a 5 year cycle with the last assessment completed in 2012-13.
- 15 The Code of Practice for the Abalone Industry in NSW was prepared and implemented via training program in February 2008. Although an appropriate level of breaches is yet to be determined, no breaches of the Code of Practice have been reported during 2014-15.
- 16 A process of determining indicative operational costs is yet to be developed.
- 17 Significant variability in reported trading price is evident. Notwithstanding variations in trading, a reasonable estimation of the current expected market price is in the vicinity of \$3,000 to >\$4,000 per share.
- 18 Percentage of TACC caught in 2014-15 – 99.9%. Value of the reported catch in 2014-15 - \$11.03m
- 19 Raw catch rate (CPUE) of commercial divers for the 2014 fishing period was 47.04kg/hr.
- 20 Average weighted beach price of abalone for the 2014 fishing period was \$29.57
- 21 The management charge payable by shareholders increased in 2014 and 2015 but the community contribution was still calculated at zero through the 2014 and 2015 fishing periods. Management charge for 2014 was \$62.81 per share and \$68.37 per share in 2015.

Appendix 3: Publications

A. Scientific outputs for the 2014 calendar year

Includes journal articles, reports, oral presentations at conferences/workshops, books and book chapters. Note: The names listed in **bold** are staff or former staff members of DPI Fisheries.

Aquaculture research

Refereed Journal Articles

Farrell, H., Seebacher, F., **O'Connor, W.**, Zammit, A., Harwood, T. and Murray, S., 2015. Warm

temperature acclimation impacts metabolism of paralytic shellfish toxins from *Alexandrium minutum* in commercial oysters. Global Change Biology, DOI: 10.1111/gcb.12952.

Laczka, O.F., Labbate, M., Seymour, J.R., Bourne, D.G., **Fielder, D.S.**, Doblin, M.A. 2014. Surface Immuno-Functionalisation for the Capture and Detection of *Vibrio* Species in the Marine Environment: A New Management Tool for Industrial Facilities. PLoS ONE 9(10): e108387. DOI:10.1371/journal.pone.0108387.

O'Connor, W., Green, T.J., Robinson, N., Chataway, T., Benkendorff, K. and Speck, P., 2014.

Evidence that the major hemolymph protein of the Pacific Oyster, *Crassostrea gigas*, has antiviral activity against herpesviruses. Antiviral Res.110:168-74. DOI: 10.1016/j.antiviral.2014.08.010.

Parker, L.M., **O'Connor, W.A.**, Raftos, D.A., Pörtner, H-O., Ross, P.M., 2015. Persistence of Positive Carryover Effects in the Oyster, *Saccostrea glomerata*, following Transgenerational Exposure to Ocean Acidification. PLoS ONE 10(7): e0132276. DOI:10.1371/journal.pone.0132276.

Scanes, E., Parker, L.M., **O'Connor, W.A.**, Ross, P.M., 2014. Mixed Effects of Elevated pCO₂ on Fertilisation, Larval and Juvenile Development and Adult Responses in the Mobile Subtidal Scallop *Mimachlamys asperima* (Lamarck, 1819). PLOS One 9(4) e93649.

Spiers, Z., Gabor, M., Fell, S., Carnegie, R., **Dove, M.**, **O'Connor, W.**, Frances, J., Go J, Marsh I, Jenkins C, 2014. A longitudinal study of winter mortality disease in *Saccostrea glomerata* (Sydney rock oysters). Diseases Aq. Org., 110:151-164.

Stewart, M.J., Favrel, P., Rotgans, B.A., Wang, T., Zhao, M., Sohail, M., **O'Connor, W.A.**, Elizur, A., Henry, J., Cummins, S.F., 2014. Neuropeptides encoded by the genomes of the Akoya pearl oyster *Pinctata fucata* and Pacific oyster *Crassostrea gigas*: a bioinformatic and peptidomic survey. BMC Genomics, 15:840.

Wright, J.M., Parker, L.M., **O'Connor, W.A.**, Williams, M., Kube, P., Ross, P.M., 2014. Populations of Pacific oysters *Crassostrea gigas* respond variably to elevated CO₂ and predation by *Morula marginalba*. Biol. Bull., 226: 269-281.

Conference and Workshop Proceedings including oral presentations

Jaramillo, D., P. Hick, **S. Fielder** and R. Whittington, 2014. Observations on age dependency of Viral Nervous Necrosis and implications for disease control. 7th International Symposium on Aquatic Animal Health (ISAAH-7), Portland, Oregon, USA, August 31-September 4, 2014.

Parker, L., Ross, P., **O'Connor, W.**, Raftos, D. and Portner, H., 2014. Multigenerational exposure of the Sydney Rock oysters *Saccostrea glomerata* to ocean acidification creates resilient adults and larvae. Presentation at AMSA Canberra.

Scanes, E., Parker, L., **O'Connor, W.** and Ross, P., 2014. Mixed Effects of elevated pCO₂ on fertilisation, larval and juvenile development and adult responses in the mobile subtidal scallop *Mimachlamys asperrima* (Lamarck, 1819). Presentation at AMSA Conference.

Scanes, E., Ross, P., Johnston, E., **O'Connor, W.** and Parker, L., 2015. Quantifying native and invasive oyster distributions in the iconic urbanised Port Jackson estuary. Conference Abstract. AMSA July 2015 Geelong.

Wilkie, E., Bishop, M. and **O'Connor, W.**, 2014. The density and spatial arrangement of the invasive oyster *Crassostrea gigas* determines its impact on settlement of native oyster larvae. Presentation at AMSA Canberra.

Wright, J., **O'Connor, W.**, Parker, L. and Ross, P., 2014. Predation by *Morula Marginalba* differs among populations of Pacific Oysters *Crassostrea gigas* in response to elevated CO₂. Presentation at AMSA Canberra.

Wright, J., Parker, L., **O'Connor, W.**, Williams, M., Kube, P. and Ross, P., 2014. Populations of Pacific oysters *Crassostrea gigas* respond variably to elevated CO₂ and predation by *Morula marginalba*. Presentation at AMSA Canberra.

Refereed Reports

Elizur, E., Cummins, S., Vu, I., Wang, T., Ntalamagka, Harding, B., **O'Connor, W.**, 2014. Understanding conditioning in Sydney Rock Oysters. Final Report Seafood CRC, 38 pp.

Kube, P., Bennett, G., **Dove, M.**, Cunningham, M., Brown, M., Cochet, M., King, H. and **O'Connor, W.**, 2015. Incorporation of selection for reproductive condition, marketability and survival into a breeding strategy for Sydney Rock Oysters and Pacific Oysters. Seafood CRC Final Report, 102p.

Books

O'Connor, W.A., Dove, M.C., Thompson, E.L., Parker, L.M., Ross, P.M. and Raftos, D.A., 2014. Breeding Sydney rock oysters and its effects on resilience. Breeding Focus 2014 - Improving Resilience. Hermes, S. and Dominik, S. (eds), p. 73-86.

Pierce J, **O'Connor WA** 2014. Impact of Oyster Farming on Rural Community Sustainability in North Vietnam. In Linking Local and Global Sustainability. Sandhu S, Mackenzie S, Harris H (Eds.) 314 pp.

Marine Ecosystems

Refereed Journal Articles

Astles, K.L., 2015. Linking risk factors to risk treatment in ecological risk of assessment of marine diversity. ICES Journal of Marine Science, 72: 1116–1132.

Campbell AH, Marzinelli EM, Vergés A, **Coleman MA**, Steinberg PD, 2014. Towards Restoration of Missing Underwater Forests. PLoS ONE 9(1): e84106. DOI:10.1371/journal.pone.0084106.

Cetina-Heredia, P., M. Roughan, E. van Sebille, and **M. A. Coleman**, 2014. Long-term trends in the East Australian Current separation latitude and eddy driven transport. J. Geophys. Res. Oceans, 119, doi:10.1002/2014JC010071.

Clark, G.F., Kelaher, B.P., Dafforn, K.A., **Coleman, M.A., Knott, N.A.**, Marzinelli, E.M., Johnston, E.L., 2015. What does impacted look like? High diversity and abundance of epibiota in modified estuaries. Environmental Pollution, Volume 196, 12–20 DOI:10.1016/j.envpol.2014.09.017

Coleman, M.A., Bates, A.E., Stuart-Smith, R.D., **Malcolm, H.A., Harasti, D., Jordan, A., Knott, N.A.**, Edgar, G.J., Kelaher, B.P., 2015. Functional traits reveal early responses in marine reserves following protection from fishing. Diversity and Distribution, 1-12, DOI:10.1111/ddi.12309.

Coleman MA, Feng M, Cetina-Heredia P, Roughan M and Connell SD, 2014. Temperate shelf water dispersal of Australian boundary currents and implications for population connectivity. Limnology and Oceanography: Fluids and Environments 3: 295-309. DOI:10.1215/21573689-2409306.

Kelaher, B.P., Page, A., Dasey, M., Maguire, D., Read, A.D. and **Coleman, M.**, 2015. Strengthened enforcement enhances marine sanctuary performance. Global Ecology and Conservation, 503-510.

Kelaher, B.P., Tan, M., Figueira, W.F., Gillanders, B.M., Connell, S.D., Goldsworthy, S.D., Hardy, N., **Coleman, M.A.**, 2015. Relationships among fish communities, marine sanctuaries and fur seal activity associated with rocky reefs. Biological Conservation, 182, 205-214.

Dafforn, K.A., **Glasby, T.M.**, Airoidi, L., Rivero, N.K., Mayer-Pinto, M., Johnston E.L., 2015. Marine urbanization: an ecological framework for designing multifunctional artificial structures. Frontiers Ecology and the Environment, DOI:10.1890/140050.

-
- Davis, T., **Harasti, D.** and Smith, S.D.A., 2014. Compensating for length biases in underwater visual census of fishes using stereo video measurements. *Marine and Freshwater Research*. *Marine and Freshwater Research*, 2014, 65, 1–6.
- Davis, T.R., **Harasti, D.** and Smith, S.D.A., 2015. Developing a habitat classification typology for subtidal habitats in a temperate estuary in New South Wales, Australia. *Marine & Freshwater Research*, <http://dx.doi.org/10.1071/MF15123>.
- Durant H, Burrridge C, Kelaher BP, Barrett, N, Edgar, G and **Coleman MA**, 2014. Implications of macroalgae isolation by distance for networks of Marine Protected Areas. *Conservation Biology* 28: 438-445.
- Durrant, H.M.S., Barrett, N.S., Edgar, G.J., **Coleman, M.A.**, Burrridge, C.P., 2015. Shallow phylogeographic histories of key species in a biodiversity hotspot. *Phycologia* 54 (6), 556-565.
- Ferguson, A.M., Harvey, E.S., Rees, M.J., **Knott, N.A.** 2015. Does the abundance of *girellids* and *kyphosids* correlate with cover of the palatable green algae, *Ulva* spp.? A test on temperate rocky intertidal reefs. *J Fish Biol.*, 86(1):375-84. DOI: 10.1111/jfb.12557.
- Francis, M.P., **Harasti, D.**, **Malcolm, H.A.**, 2015. Surviving under pressure and protection: a review of the biology, ecology and population status of the highly vulnerable grouper, *Epinephelus daemeli*. *Journal of Marine and Freshwater Research*, <http://dx.doi.org/10.1071/MF15099>.
- Garside, C.J., **Coleman, M.A.**, Kelaher, B.P. and Bishop, M.J., 2014. Putative predators of *Carcinus maenas* in eastern Australia. *Estuaries and Coasts*, DOI 10.1007/s12237-014-9895-1.
- Garside, C.J., **Glasby, T.M.**, **Coleman, M.A.**, Kelaher, B.P., and Bishop, M.J., 2014. The frequency of connection of coastal water bodies to the ocean predicts *Carcinus maenas* invasion. *Limnology and Oceanography* 59, 1288-1296.
- Glasby, T.M.**, **Taylor, S.L.** and **Housefield, G.P.**, 2014. Factors influencing the growth of seagrass seedlings: a case study of *Posidonia australis*. *Aquatic Botany*, 120:251-259. DOI: 10.1016/j.aquabot.2014.09.003.
- Harasti, D.**, 2015. Range extension and first occurrence of the thorny seahorse *Hippocampus histrix* in New South Wales, Australia. *Marine Biodiversity Records*, vol 8; e49.
- Harasti, D.**, **Malcolm, H.**, **Gallen, C.**, **Coleman, M.A.**, **Jordan, A.**, and **Knott, N.A.**, 2015. Appropriate set times to represent patterns of rocky reef fishes using baited video. *Journal of Experimental Marine Biology and Ecology* 463:173-180.
- Harasti, D.**, Martin-Smith, K. & Gladstone, W. 2014. Ontogenetic and sex-based differences in habitat preferences and site fidelity of the White's seahorse *Hippocampus whitei*. *Journal of Fish Biology*, 85, 1413–1428, DOI:10.1111/jfb.12492
- Harasti, D.**, Martin-Smith, K. & Gladstone, W., 2014. Does a no-take Marine Protected Area benefit seahorses? *PLOS ONE*, volume 9(8): e105462, DOI10.1371
- Harasti, D.**, **Gallen, C.**, **Malcolm, H.**, Tegart, P. and Hughes, B., 2014. Where are the little ones: distribution and abundance of the threatened serranid *Epinephelus daemeli* (Günther, 1876) in intertidal habitats in New South Wales, Australia. *Journal of Applied Ichthyology* DOI: 10.1111/jai.12446.
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- Kelagher, B.P., **Coleman, M.A.**, Broad, A., Rees, M.J., **Jordan, A.** and Davis, A.R., 2014. Changes in fish assemblages following the establishment of a network of no-take marine reserves and partially-protected areas. *PloS One* 9(1): e85825.
- Malcolm, H.A.**, Schultz, A.L., Sachs, P., Johnstone, N. and **Jordan, A.**, 2015. Decadal changes in the abundance and length of snapper (*Chrysophrys auratus*) in Subtropical Marine Sanctuaries. *PLoS ONE* 10(6): e0127616. DOI:10.1371/journal.pone.0127616.
- Marzinelli, E.M., Williams, S.B., Babcock, R.C., Barrett, N.S., Johnson, C.R., **Jordan, A.**, Kendrick, G.A., Pizarro, O.R., Smale, D.A., Steinberg, P.D., 2015. Large-Scale Geographic Variation in Distribution and Abundance of Australian Deep-Water Kelp Forests. *PLoS ONE* 10(2) DOI: 10.1371/journal.pone.0118390
- Otway, N.M.**, 2014. Serum biochemical reference intervals for free-living sand tiger sharks (*Carcharias taurus*) from east Australian waters. *Veterinary Clinical Pathology*, ISSN 0275-6382, DOI: 10.1111/vcp.12254.
- Parsons, E.C.M., Favaro, B., Alonso Aguirre, A., Bauer, A.L., Blight, L.K., Cigliano, J.A., **Coleman, M.A.**, Cote, I.M., Draheim, M., Fletcher, S., Foley, M.M., Jefferson, R., Jones, M.C., Kelagher, B.P., Lundquist, C.J., McCarthy, J., Nelson, A., Patterson, K., Walsh, L., Wright, J., Sutherland, W.J., 2014. 71 questions of importance for marine conservation. *Conservation Biology*, Volume 28, Issue 5, Article first published online: 29 APR 2014.
- Poulos, D.E., **Gallen, C.**, Davis, T. Booth, D.J. and **Harasti, D.**, 2015. Distribution and spatial modelling of a soft coral habitat in the Port Stephens-Great Lakes Marine Park: implications for management. *Marine and Freshwater Research*, <http://dx.doi.org/10.1071/MF14059>.
- Ricardo, G.F., A.R. Davis, **N.A. Knott**, and T.E. Minchinton., 2014. Diel and Tidal Cycles Regulate Larval Dynamics in Saltmarshes and Mangrove Forests. *Marine Biology* 161:769-784.
- Schultz AL, **Malcolm HA**, Bucher DJ, Linklater M and Smith SDA, 2014. Depth and medium scale processes influence fish assemblages structure of unconsolidated habitats in a subtropical marine park. *PLoS ONE*.9(5): e96798. DOI:10.1371/journal.pone.0096798.
- Schultz, A.L., Malcolm, H.A., Linklater, M., **Jordan, A.R.**, Ingleton, T. and Smith, S.D.A., 2015. Sediment variability affects fish community structure in unconsolidated habitats of a subtropical marine park. *Mar. Ecol. Prog. Ser.*, 532: 213-226, DOI:10.3354/meps11311.
- Scott, A., **Harasti, D.**, Davis, T. and Smith, S.D.A., 2014. Southernmost records of the host sea anemone, *Stichodactyla haddoni*, and associated commensal shrimps in a climate change hotspot. *Marine Biodiversity*.
- Smith, K.R., Scarpaci, C., **Louden, B.M.**, **Otway, N.M.**, 2015. Behaviour of aggregated grey nurse sharks in SE Australia: similarities/differences among life-history stages and sites. *Endangered Species Research*, Vol. 27: 69–85, 2015. DOI: 10.3354/esr00652.
- Smith KR, Scarpaci C, Scarr MJ and **Otway NM.**, 2014. Scuba diving tourism with critically endangered grey nurse sharks (*Carcharias taurus*) off eastern Australia: tourist demographics, shark behaviour and diver compliance. *Tourism Management*, 45:211-225.

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- Verges, A., Steinburg, P.D., Hay, M.E., Poore, A.G.B., Campbell, A.H., Ballesteros, E., Heck Jr, K.L., Booth, D.J., **Coleman, M.A.**, Feary, D.A., Figueira, W., Langlois, T., Marzinelli, E.M., Mizerek, T., Mumby, P.J., Nakamura, Y., Roughan, M., van Sebille, E., Gupta, A.S., Smale, D.A., Tomas, F., Wernberg, T. and Wilson, S.K., 2014. The tropicalisation of temperate marine ecosystems: climate -mediated changes in herbivory and community phase shifts. *Proc. R. Soc. B.*, 281, 20140846.
- Zhang, D., **Glasby, T.M.**, Ralph, P.J., Gribben, P.E., 2014. Mechanisms influencing the spread of a native marine alga. *PLoS ONE* 9(4), e94647.

Refereed Reports

- Glasby, T. and West, G.**, 2015. Estimating losses of *Posidonia australis* due to boat moorings in Lake Macquarie, Port Stephens and Wallis Lake. Fisheries Final Report Series No. 147, 30p.
- Harasti, D. and Gallen, C.**, 2014. Distribution and relative abundance of juvenile black cod *Epinephelus daemeli* in intertidal habitats in the Hunter-Central Rivers region. NSW DPI Report.
- Jordan, A. and Creese, R.**, 2015. Ecological Background to the Assessment of Shore-Based Recreational Fishing on Ocean Beaches and Rocky Headlands in Sanctuary Zones in Mainland NSW Marine Parks. Fisheries Final Report Series No. 146, 114p.

Conference and Workshop Proceedings including oral presentations

- Gallen, C. and Harasti, D.**, 2014. Monitoring movements and threats to marine turtles within a temperate marine park in New South Wales. Oral presentation at AMSA Canberra - 07/07/2014-10/07/2014.
- Harasti, D.**, 2014. How long is enough: Comparison of baited remote underwater video (BRUV) set times to representatively sample rocky reef fish assemblages. ASFB Darwin - 30/06/2014 - 04/07/2014.
- Jordan, A., Malcom, H.**, Smith, S., Schultz, A., Davies, P.L., Ingleton, T., Foulsham, E., Linklater, M., Ferrari, R., Hill, N. and Lucieer, V., 2014. Linking habitat and biotic patterns improves spatial management in a marine park. Oral presentation at GEOHAB 2014- Marine Geological and Biological Habitat Mapping Conference, Lorne, Victoria, Australia 5 to 9 May 2014.

Fisheries Resource Assessment

Referred Journal Articles

- Balash, C., Sterling, D., Lustica, M., **Broadhurst, M.**, 2015. Twist and camber effects on the performance of simple hydro-sails used with an innovative penaeid-trawling otter board. *Ocean Engineering*, 109: 161-168.

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- Broadhurst, M.K., Butcher, P.A.** and Cullis, B.R. 2014. Effect of mesh size and escape gaps on discarding in an Australian giant mud crab (*Scylla serrata*) trap fishery. PLOS ONE 9(9): e106414. DOI: 10.1371/journal.pone.0106414.
- Broadhurst, M.K., Butcher, P.A.,** Millar, R.B., Marshall, J.E. and **Peddemors, V.M.** 2014. Temporal hooking variability among sharks on south-eastern Australian demersal longlines and implications for their management. Glob. Ecol. Cons. 2: 181–189.
- Broadhurst, M.K.,** Sterling, D., Millar, R., 2015. Modifying otter boards to reduce bottom contact: effects on catches and efficiencies of triple-rigged penaeid trawls. Fish. Man. Ecol., 22: 407-418.
- Broadhurst, M.K.,** Sterling, D.J. and Millar, R. B., 2014. Configuring the mesh size, side taper and wing depth of penaeid trawls to reduce environmental impacts. PLOS ONE, 9(6): e99434.
- Broadhurst, M.K.,** Sterling, D.J. and Millar, R.B. 2015. Increasing lateral mesh openings in penaeid trawls to improve selection and reduce drag. Fish. Res. 170: 68-75.
- Broadhurst, M.K.,** Sterling, D.J. and Millar, R.B., 2014. Engineering and catch implications of variable wing-end spread on a penaeid trawl. Fish. Res., 153: 24-30.
- Broadhurst, M.K.,** Sterling, D.J. and Millar, R.B., 2015. Effects of diel period and diurnal cloud cover on the species selection of short and long penaeid trawls. Fisheries Research, 170: 144-151.
- Broadhurst, M.K.,** Sterling, D.J., Millar, R.B., 2015. Traditional vs novel ground gears: maximising the environmental performance of penaeid trawls. Fisheries Research, 167: 199-206.
- Butcher PA,** Boulton AJ, **Macbeth WG** and **Malcolm HA,** 2014. Long-term effects of marine park zoning on giant mud crab (*Scylla serrata*) populations in three Australian estuaries. Mar. Ecol. Prog. Ser., 508: 163-176.
- Butcher, P., Peddemors, V.,** Mandelman, J., McGrath, S., Cullis, B., 2015. At-vessel mortality and blood biochemical status of elasmobranchs caught in an Australian commercial longline fishery. Global Ecology and Conservation, 3: 878–889.
- Chan, J.T., Sherwin, W.B. and **Taylor, M.D.,** 2014. A tool for tracking genetic contributions of wild *Penaeus (Melicertus) plebejus* broodstock to hatchery populations. Animal Genetics, DOI: 10.1111/age.12212.
- Chapman, M.G. and **Smoothey, A.F.,** 2014. Sea urchins provide habitat for rare chitons in intertidal boulder-fields. Journal of Experimental Marine Biology and Ecology 459:31-37.
- Cooke, S. J., Hogan, Z. S., **Butcher, P. A.,** Stokesbury, M. J. W., Raghavan, R., Gallagher, A. J., Hammerschlag, N. and Danylchuk, A. J., 2014. Angling for endangered fish: conservation problem or conservation action? Fish and Fisheries, DOI: 10.1111/faf.12076.
- Gannon R, **Taylor MD,** Suthers IM, **Gray CA, van der Meulen DE,** Smith JA, Payne NL, 2014. Thermal limitation of performance and biogeography in a free-ranging ectotherm: insights from accelerometry. Journal of Experimental Biology, 217:3033-3037. DOI:10.1242/jeb.104455.

Geraghty, P.T., J.E. Williamson, **W.G. Macbeth**, D.C. Blower, J.A.T. Morgan, G. Johnson, J.R. Ovenden and M.R. Gillings. 2014. Genetic structure and diversity of two highly vulnerable *carcharhinids* in Australian waters. *Endangered Species Research* 24: 45-60.

Gilbert, J.M., Reichelt-Brushett, A.J., **Butcher, P.A.**, McGrath, S.P., **Peddemors, V.M.**, Bowling, A.C., Christidis, L., 2015. Metal and metalloid concentration in the tissues of dusky *Carcharharhinus obscurus*, sandbar *C. Plumbeus* and white *Carcharodon carcharias* sharks from south-eastern Australian waters, and the implications for human consumption. *Marine Pollution Bulletin*, v92, issues1-2, 186-194.

Gray C., Barnes L., **van der Meulen D. E.**, Kendall B., **Ochwada-Doyle F. A.** & Robbins W. D., 2014. Depth interactions and reproductive ecology of sympatric Sillaginidae: *Sillago robusta* and *S. flindersii*. *Aquatic Biology*, 21: 127-142 (DOI: 10.3354/ab00578).

Gray CA, Johnson DD, Reynolds D, Rotherham D, 2014. Development of rapid sampling procedures for an exploited bivalve in the swash zone on exposed ocean beaches. *Fisheries Research*, 154, 205-212.

Gray, C., Walsh, C., Stocks, J., Crook, D.A. and Morrongiello, J., 2014. Environmental drivers of recruitment and growth in an estuarine fish: evidence from long-term, otolith-based indices. *Glob Chang Biol*. 2014 Feb 8. DOI: 10.1111/gcb.12545.

Hall, K.C., Broadhurst, M.K. and Butcher, P.A., 2014. Clinical signs of barotrauma in golden perch, *Macquaria ambigua* (Richardson), and associated effects on post-release mortality and health. *J. Fish. Dis.* 37: 251-264.

Hall, K.C., Broadhurst, M.K. and Cullis, B.R., 2015. Deep hooking and post-release mortality of two Australian native freshwater fishes angled from rivers by using natural baits. *Trans. Am. Fish. Soc.*, 144:4, 860-871, DOI: 10.1080/00028487.2015.1042558.

Harcourt, R., Pirodda, V., Heller, G., **Peddemors, V.** and Slip, D., 2014. A whale alarm fails to deter migrating humpback whales: an empirical test. *Endang. Species Res.*, 25: 35-42. DOI: 10.3354/esr00614.

Harris B, Young JW, Revill A, **Taylor MD**, 2014. Understanding diel-vertical feeding migrations in zooplankton using bulk carbon and nitrogen stable isotopes. *Journal of Plankton Research*, DOI: 10.1093/plankt/fbu026.

Hughes, J.M., **Stewart, J.**, Lyle, J.M. and Suthers, I.M., 2014. Top-down pressure on small pelagic fish by eastern Australian salmon *Arripis trutta*; estimation of daily ration and annual prey consumption using multiple techniques. *Journal of Experimental Marine Biology and Ecology*, 459: 190-198.

Kennelly, S.J. and Broadhurst, M.K., 2014. Mitigating the bycatch of giant cuttlefish *Sepia apama* and blue swimmer crabs *Portunus armatus* in an Australian penaeid-trawl fishery. *Endang Species Res*, 26: 161-166. DOI: 10.3354/esr00639

Lee, K.A., Huveneers, C., Gimenez, O., **Peddemors, V.** and Harcourt, R.G., 2014. To catch or to sight? A comparison of demographic parameter estimates obtained from mark-recapture and mark-resight models. *Biodivers. Conserv.*, DOI 10.1007/s10531-014-0748-9.

Lowry, M., Folpp, H., Glasby, T.M., Boys, C. A., Suthers, I., 2014. Response of fish

communities to the deployment of estuarine artificial reefs for fisheries enhancement. *Fisheries Management and Ecology*, 21(1): 42-56.

- Matis P, Kelaher B, Figueira W, Humphries J, Suthers IM, **Taylor MD**, 2014. Cyclonic entrainment? The ichthyoplankton attributes of three major water mass types generated by the separation of the East Australian Current. *ICES Journal of Marine Science*, DOI: 10.1093/icesjms/fsu062.
- McGrath S.P., Reichelt-Brushett A.J. and **Butcher P.A.**, 2014. Sub-lethal effects of ingesting nickel-plated carbon-steel hooks in mulloway (*Argyrosomus japonicus*). *Marine Environmental Research*, 99:188-197.
- McHugh, M. J., **Broadhurst, M. K.**, Sterling, D. J., and Millar, R. B. 2014a. Comparing and modifying penaeid beam- and otter-trawls to improve ecological efficiencies. *Fish. Man. Ecol.* 21: 299-311. DOI: 10.1111/fme.12079
- McHugh, M.J., **Broadhurst, M.K.**, Sterling, D.J. and Millar, R.B., 2015. A 'simple anterior fish excluder' (SAFE) for mitigating penaeid-trawl bycatch. *PLOS One*. 10(4): e0123124. DOI:10.1371/journal.pone.0123124.
- McHugh, M.J., **Broadhurst, M.K.**, Sterling, D.J., Millar, R.B., 2015. Comparing three conventional penaeid-trawl otter boards and the new batwing design. *Fisheries Research*, 167, 180-189.
- McHugh, M.J., **Broadhurst, M.K.**, Sterling, D.J., Millar, R.B., Skilleter, G., **Kennelly, S.J.**, 2015. Relative benthic disturbances of conventional and novel otter boards. *ICES Journal of Marine Science*, 72: 2450-2456.
- Ochwada-Doyle F. A.**, **Stocks J.**, Barnes L. & **Gray C.**, 2014c. Reproduction, growth and mortality of the exploited sillaginid, *Sillago ciliata*. *Journal of Applied Ichthyology* In Print (DOI: 10.1111/jai.12478).
- Payne, NL and **van dDer Meulen, DE** and Gannon, R and Semmens, JM and Suthers, IM and **Gray, CA** and **Taylor, MD.**, 2014. Rain reverses diel activity rhythms in an estuarine teleost. *Proceedings of the Royal Society B Biological Sciences*, 280: 7, (1750) Article 20122363. ISSN 1471-2954.
- Payne NL, **Taylor MD**, Watanabe J, Semmens JM., 2014. From physiology to physics: what can biotelemetry tell us about aquatic animals? *Journal of Experimental Biology*, 217, 317-322.
- Peregrin, L.S., **Butcher, P.A.**, **Broadhurst, M.K.**, Millar, R.B., 2015. Angling-induced barotrauma in Snapper *Chrysophrys auratus*: are there consequences for reproduction. *PLoS ONE*, 10(3): e0119158. DOI:10.1371/journal.pone.0119158.
- Pichler, H.A., Spach, H.L., **Gray, C.A.**, Junior, R.S., de Oliveira Neto, J.F. and **Broadhurst, M.K.**, 2015. Environmental influences on resident and transient fishes across shallow estuarine beaches and tidal flats in a Brazilian World Heritage listed area. *Est. Coast Shelf Sci.*, 164: 482-492.
- Piddocke, T., **Butler, G.**, **Butcher, P.**, **Stewart, J.**, Bucher, D. and Christidis, L., 2015. Age validation in the Lutjanidae: A review. *Fisheries Research*, 167: 48-63.
- Pleizier, N., Gutowsky, L.F.G., **Peddemors, V.M.**, Cooke, S.J., **Butcher, P.A.**, 2015. Variation in whole-, landed- and trimmed-carcass and fin-weight ratios for various sharks captured on demersal set-lines off eastern Australia. *Fisheries Research*, 167: 190-198.

-
- Possatto, F.E., Spach, H.L., Cattani, A.P., Lamour, M.R., Santos, L.O., Cordeiro, N.M.A. and **Broadhurst, M.K.** 2015. Marine debris in a World Heritage Listed Brazilian estuary. *Mar. Poll.* 91: 548–553.
- Pursche AR, Suthers IM, **Taylor MD**, 2014. The effect of targeted stocking on behaviour and space utilisation of a released finfish. *ICES Journal of Marine Science*, DOI:10.1093/icesjms/fst209.
- Pursche, A.R., **Walsh, C.T.** and **Taylor, M.D.**, 2014. Evaluation of a novel external tag-mount for acoustic tracking of small fish. *Fisheries Management and Ecology*, 21(2): 169-172, DOI: 10.1111/fme.12051.
- Robbins, W. D., V. M. **Peddemors, S. J.Kennelly**, and M. C. Ives, 2014. An experimental evaluation of shark detection rates by aerial observers. *PLoS ONE*, 9(2): e83456.
- Scott, M.E., Smith, J.A., **Lowry, M.B., Taylor, M.D.** and Suthers, I.M., 2015. The influence of an offshore artificial reef on the abundance of fish in the surrounding pelagic environment. *Marine and Freshwater Research*, 66: 429-437.
- Smith, J.A., **Lowry, M.B.** and Suthers, I.M., 2015. Fish attraction to artificial reefs not always harmful: a simulation study. *Ecology and Evolution*, 5(20): 4590-4602.
- Smith JA, **Taylor MD**, 2014. A peaked logistic-based selection curve. *Canadian Journal of Fisheries and Aquatic Sciences*, DOI: 10.1139/cjfas-2013-0401.
- Stewart, J.** and Hughes, J.M., 2014. Swim bladder function and buoyancy control in pink snapper (*Pagrus auratus*) and mulloway (*Argyrosomus japonicus*). *Fish Physiology and Biochemistry*: 40(2): 335-346.
- Stocks JR, Gray CA and Taylor MD.**, 2014. Testing the effects of near-shore environmental variables on acoustic detections: implications on telemetry array design and data interpretation. *Marine Technology Society Journal*, 48, 28-35.
- Stocks, J.R., Gray, C.A.** and **Taylor, M.D.**, 2014. Synchrony and variation across latitudinal gradients: The role of climate and oceanographic processes in the growth of a herbivorous fish. *Journal of Sea Research*, 90, 23-32.
- Stocks, J.R.Gray, C.A.** and **Taylor, M.D.**, 2015. Out in the wash: spatial ecology of a temperate marine shallow rocky-reef species derived using acoustic telemetry. *Marine and Freshwater Research*, 559–571, <http://dx.doi.org/10.1071/MF14182>
- Taylor, M.**, 2015. A good year for prawns - Eastern King Prawn stocking program. *Fishing World Magazine online* (27-1-15), 3p.
- Taylor MD, van der Meulen DE**, Ives MC, **Walsh CT**, Reinfelds IV, **Gray CA**, 2014. Shock, Stress or Signal? Implications of Freshwater Flows for a Top-Level Estuarine Predator. *PLoS ONE* 9(4): e95680. DOI:10.1371/journal.pone.0095680.
- Uhlmann, S.S., **Broadhurst, M.K.** and Millar, R.B., 2015. Effects of modified handling on the physiological stress of trawled-and-discarded yellowfin bream (*Acanthopagrus australis*). *PLOS One* 10(6): e0131109. DOI:10.1371/journal.pone.0131109.
- Uhlmann, S.S., **Broadhurst, M.K.**, 2015. Mitigating unaccounted fishing mortality from gillnets and traps. *Fish and Fisheries*. 16, 183-229.

van der Meulen DE, Walsh CT, Gray CA and Taylor MD, 2014. Habitat requirements and spawning strategy of an estuarine-dependent fish, *Percalates colonorum*. Marine and Freshwater Research, 65: 218-227. <http://dx.doi.org/10.1071/MF13060>.

Conference and Workshop Proceedings including oral presentations

Balash, C., Sterling, D., **Broadhurst, M.**, Dubois, A. and Behrel, M., 2015. Hydrodynamic evaluation of a simple sail used in an innovative prawn-trawl otter board. Proceedings of the 34th international conference on ocean, offshore and Arctic engineering (May 31 to June 5, 2015), St John's, Newfoundland, Canada.

Broadhurst, M., McHugh, M., Sterling, D., 2015. An angle to address benthic-trawl impacts. Australian Marine Science Assoc Student Conference, oral presentation.

Cribb, T.H., Bullard, S.A., **Chick, R.C., O'Connor, W., O'Connor, S., Johnson, D.** and Cutmore, S., 2015. Phylogenetic position of a fish blood fluke (*Trematoda: Aporocotylidae*) infecting a bivalve. Conference Abstract. EAFP Symposium of Fish Parasites, Valencia, Spain, 31 Aug - 4 Sept 2015.

Hall, K., 2015. Determining the current status of eastern Australian cephalopod stocks. Mollusc 2015 conference, 29 November to 2 December 2015, Coffs Harbour (Presentation only).

Taylor, M.D., Payne, N.L., **Lowry, M.B.**, 2015. Feels like home: Movement and homing behaviour of mature fish translocated from a power-station canal. Presentation at 3rd International conference on Fish Telemetry. Presented by Matthew D. Taylor.

Taylor, M., van der Meulen, D., Ives, M., **Walsh, C.**, Reinfelds, I. and **Gray, C.**, 2014. Implications of freshwater flows for a top-level estuarine predator. Presentation at ASFB & ASL Congress 30 June & 14 July 2014, Darwin.

Uhlmann, S.S., **Broadhurst, M.K.**, and **Brand, C. P.**, 2014. Catostylus jellyfish: a stinging predictor of discard mortality. ICES CM 2014/A:37. ICES Annual Science Conference, 15-19 September 2014, A Coruña, Spain.

Refereed Reports

Flood, M, Stobutzki, I, Andrews, J, Ashby, C, Begg, G, Fletcher, R, Gardner, C, Georgeson, L,

Hansen, S, Hartmann, K, Hone, P, Horvat, P, Maloney, L, McDonald, B, Moore, A, Roelofs, A, Sainsbury, K, Saunders, T, Smith, T, Stewardson, C, **Stewart, J** & Wise, B (eds) 2014. Status of key Australian fish stocks reports 2014, Fisheries Research and Development Corporation, Canberra.

Ghosn, D., Collins, D.P. and Gould, A., 2015. The NSW Game Fish Tournament Monitoring Program 1994 to 2013: A summary of data and assessment of the role and design. NSW DPI Fisheries Final Report Series No. 144, 162pp.

Gray, C.A., Young, C.L., **Johnson, D.D.**, Rotherham, D., 2015. Integrating fishery-independent

and -dependent data for improved sustainability of fisheries resources and other aspects of biodiversity. FRDC Project No. 2008-004 Final Report, 129p.

Liggins, GW, Miller, ME & Ballinger, G 2014, Resource Assessment - Lobster - Prepared for the Total Allowable Catch Setting and Review Committee process for the determination for the Total Allowable Commercial Catch of NSW Lobster for the 2014/15 season, NSW Department of Primary Industries, Sydney.

Ochwada-Doyle, F.A., McLeod, J., Barrett, G., Clarke, G. and **Gray, C.A.**, 2014. Assessment of recreational fishing in three recreational fishing havens in New South Wales. NSW DPI Fisheries Final Report Series No. 139, 29 p.

Stewart, J., 2015. Status of fisheries resources in NSW 2013-14 (Summary). NSW Department of Primary Industries, 12 p.

Stewart, J., 2015. Status of fisheries resources in NSW 2012-13 Summary.
http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/557763/status-fisheries-resources-NSW-2012-13.pdf.

Extension and Advisory Material

Ghosn, D., 2014. Celebrating 20 years of the NSW Game Fish Tournament Monitoring Program. Gamefish Club Newsletters + Charter Boat Operators.

Taylor, M., 2015. A good year for prawns - Eastern King Prawn stocking program. Fishing World Magazine online (27-1-15), 3p.

van der Meulen, D.E. and **Taylor, M.D.**, 2014. The secret life of fish: resolving the where, when and why of fish movement. Mordern Fishing, p.86.

Freshwater Ecosystems

Referred Journal Articles

Baumgartner, L. J., Conallin, J., **Wooden, I.**, Campbell, B., Gee, R., **Robinson, W. A.** and Mallen-Cooper, M., 2014. Using flow guilds of freshwater fish in an adaptive management framework to simplify environmental flow delivery for semi-arid riverine systems. Fish and Fisheries, 15: 410-427. DOI: 10.1111/faf.12023.

Baumgartner, L. J., Daniel Deng, Z., Thorncraft, G., **Boys, C. A.**, Brown, R. S., Singhanouvong, D. and Phonekhampeng, O., 2014. Perspective: Towards environmentally acceptable criteria for downstream fish passage through mini hydro and irrigation infrastructure in the Lower Mekong River Basin. Journal of Renewable and Sustainable Energy, 6: 012301 (2014).

Baumgartner, L.J., Zampatti, B., Jones, M., Stuart, I., Mallen-Cooper, M., 2014. Fishways and Fish Migration in the Murray-Darling Basin: Not just an upstream battle. Ecological Management and Restoration, 15 (S1): 28-39.

-
- Boys, C. A.**, Lyon, J., Zampatti, B., Norris, A., Butcher, A., **Robinson, W.** and Jackson, P., 2014. Demonstration reaches: Looking back whilst moving forward with river rehabilitation under the Native Fish Strategy. *Ecological Management & Restoration*, 15: 67-74.
- Brown, P. and **Gilligan, D. M.**, 2014. Optimising an integrated pest management strategy for a spatially structured population of common carp (*Cyprinus carpio*) using meta-population modelling. *Marine and Freshwater Research* 65, 538-550.
- Brown, R. S., Colotelo, A. H., **Pflugrath, B. D.**, **Boys, C. A.**, **Baumgartner, L. J.**, Deng, Z., Silva, L. G. M., Brauner, C. J., Mallen-Cooper, M., Phonekhampeng, O., Thorncraft, G. and Singhanouvong, D., 2014. Understanding barotrauma in fish passing hydro structures: a global strategy for sustainable development of water resources. *Fisheries*, 39: 97-122.
- Burden CT, Stow AJ, Hoggard SJ, **Coleman MA** and Bishop MJ, 2014. Genetic structure of *Carcinus maenas* in south-east Australia. *Marine Ecology Progress Series* 500:139-147.
- Butler, G.L.**, Mackay, B., **Gilligan, D.**, St Vincent Welch, J. & Broderick, T., 2014. Relative condition of freshwater fish community in the Clarence Basin: Ecohealth North Coast New South Wales. Report to Northern Rivers Catchment Management Authority. NSW Department of Primary Industries, Grafton, NSW.
- Butler, G.L.**, **Rowland, S.J.**, Baverstock, P.R. and Brooks, L., 2014. Movement patterns and habitat choice of the endangered eastern freshwater cod *Maccullochella ikei* in the Mann River, Australia. *Endangered Species Research*, 23, 35-49.
- Ellis, I., Whiterod, N., Linklater, D., Bogenhuber, D., Brown, P. and **Gilligan, D.**, 2015. Spangled perch (*Leiopotherapon unicolor*) in the southern Murray-Darling Basin: Flood dispersal and short-term persistence outside its core range. *Austral Ecology*, DOI: 10.1111/aec.12226.
- Forbes, J.P.**, Watts, R.J., **Robinson, W.A.**, **Baumgartner, L.J.**, **Steffe, A.S.** and **Murphy, J.J.**, 2015. Recreational fishing effort, catch, and harvest for Murray cod and Golden perch in the Murrumbidgee River, Australia. *North American Journal of Fisheries Management*, 35:4, 649-658, DOI: 10.1080/02755947.2015.1032452.
- Hill, E., Ingram, E., **Duncan, M.**, Strugnell, J. and Mitchell, J., 2015. Genetic diversity and population structure of the threatened freshwater catfish, *Tandanus tandanus*, in Victoria, Australia. *Conserv. Genet.*, 16:317-329. DOI 10.1007/s10592-014-0660-6.
- Miles, N.G., **Walsh C.T.**, **Butler, G.L.**, Ueda, H. & West, R.J., 2014. Australian diadromous fishes-challenges and solutions for understanding migrations in the 21st century. *Marine and Freshwater Research*, 65, 12-24.
- Morrongiello, J. R., **Walsh, C. T.**, **Gray, C. A.**, **Stocks, J. R.** & Crook, D. A. 2014. Environmental change drives long-term recruitment and growth variation in an estuarine fish. *Global Change Biology* 20, 1844-1860.
- Norman, J.A., Blackmore, C.J., **Rourke, M.**, Christidis, L., 2014. Effects of mitochondrial DNA rate variation on reconstruction of Pleistocene demographic history in a social avian species, *Pomatostomus superciliosus*. *PLoS ONE*, 9(9): e106267. DOI:10.1371/journal.pone.0106267.
- Rourke, M.L.**, **Gilligan, D.M.**, 2015. Complex biogeography and historic translocations lead to complicated phylogeographic structure of freshwater eel-tailed catfish (*Tandanus*

spp.) in south-eastern Australia. Conservation Genetics DOI 10.1007/s10592-015-0699-z.

Silva AT, Hatry C, **Thiem JD**, Gutowsky LFG, Hatin D, Zhu DZ, et al., 2015. Behaviour and Locomotor Activity of a Migratory Catostomid during Fishway Passage. PLoS ONE 10(4): e0123051. DOI:10.1371/journal.pone.0123051.

Stocks, J.R., Gray, C.A. and Taylor, M.D., 2015. Intra-population trends in the maturation and reproduction of a temperate marine herbivore *Girella elevata* across latitudinal clines. Journal of Fish Biology 86, 463-483.

Stocks, J.R., Gray, C.A. and Taylor, M.D., 2015. Tuning into the beat of the drummer. Modern Fishing and Spearfishing Downunder article.

Thiem, J.D., Dawson, J.W., Gleiss, A.C., Martins, E.G., Haro, A., Castro-Santos, T., Danylchuk, A.J., Wilson, R.P. and Cooke, S.J., 2015. Accelerometer-derived activity correlates with volitional swimming speed in lake sturgeon (*Acipenser fulvescens*). Canadian Journal of Zoology, 93: 645-654.

Conference and Workshop Proceedings including oral presentations

Bond, N. Baldwin, D. **Butler, G.L.**, Crook, D., **Hohnberg, D.**, Humphries, D., Kennard, M., Kopf, K., Koehn, J., McCasker, N., Morrongiello, J., Nielsen, D., Reich, P., Stoffels, R., Thomson, J. & Yen., J., 2014. Are native fish populations in the Murray River energy limited? (Abstract) Australian Society for Fish Biology Annual Conference, Darwin, Northern Territory.

Boys, C. A., Robinson, W., Navarro, A., 2014. Defining downstreaming fish passage guidelines for the protection of species in the Murray-Darling Basin. Paper presented at the ASFB Conference 28 June 2014 – 4 July 2014, Darwin.

Gilligan, D. and McColl, K., 2014. The hard slog: progress towards a National Carp Biocontrol Program. Oral presentation at 26/05/2014-29/05/2014 - Australian Vertebrate Pest Conference, Brisbane. 29/06/2014 - 04/07/2014 - ASFB & ASL Congress 2014.

Pavlova, A., Amish, S., Beheregaray, L.B., Coleman, R., **Gilligan, D.**, Ingram, B.A., Kearns, J., Lamb, A.M., Lintermans, M., Luikart, G., Lyon, J.P., Narum, S., Sasaki, M., Tonkin, Z. and Sunnucks, P., 2015. Genetic consequences of hybridization of diverged stocks of endangered Australian freshwater fish after translocations early in the 20th century. Conference presentation. Society for Molecular Biology and Evolution 2015. Vienna, Austria, 12-16 July 2015.

Smith, D.M., **Butler, G.**, **Rowland, S.**, Brooks, S. and Kind, P., 2014. Using underwater video to study the breeding behaviour of the Murray cod (*Maccullochella peelii*) in the Border Rivers, New South Wales and Queensland. 29/06/2014 - 05/07/2014 ASFB & ASL Congress.

Thiem, J., Wassen, S., Jenkins, K., Bino, G., Spencer, J., Kobayashi, T., Watts, R., Lenon, E., Thomas, R., **Baumgartner, L.**, Hall, A., Hill, M., 2014. Larval abundance of cod (*Maccullochella spp.*) during targeted environmental watering in the Murrumbidgee River. ASFB 2014 Conference, Darwin.

van der Meulen, D., Payne, N., **Gray, C.**, **Walsh, C.**, Reinsfelds, I., Suthers, I., **Taylor, M.**, 2015. Temperature-mediated spawning migrations of an estuarine dependent sillaginid, 3rd International Conference on Fish Telemetry, 13-17 July 2015, Canada.

Zampatti, B.P., Wilson, P.J., **Baumgartner, L.**, Koster, W., Livore, J.P., McCasker, N., **Thiem, J.**, Tonkin, Z. and Ye, Q., 2015. Reproduction and recruitment of golden perch (*Macquaria ambigua*) in the southern Murray-Darling Basin in 2013-2014: an exploration of river-scale response, connectivity and population dynamics. SARDI Research Report Series No. 820, 61p.

Reports

Boys, C. A., Navarro, A., **Robinson, W.**, **Fowler, T.**, Chilcott, S., Miller, B., **Pflugrath, B.**, **Baumgartner, L. J.**, McPherson, J., Brown, R. and Deng, Z., 2014. Downstream fish passage criteria for hydropower and irrigation infrastructure in the Murray-Darling Basin. NSW DPI Fisheries Final Report Series No. 141, 119pp.

Duncan, M., **Robinson, W.** and Galt, D., 2014. Koondrook-Perricoota Icon Site Fish Condition Monitoring Annual Report. Report to the Forestry Corporation of NSW. 43p.

Butler, G. L., St Vincent Welch, J., Mackay, B., and **Bruce, A.**, 2014. Fish assemblages of Clarrie Hall Dam, north-eastern New South Wales. Report to NSW Recreational Fishing Trust. NSW Department of Primary Industries, Grafton, NSW.

Thorncraft G, Phonekhampheng, O, **Baumgartner, L.**, Martin K, **Pflugrath, B.**, Brown R, Deng Z, **Boys C.**, Navarro A., 2014. Optimising fish-friendly criteria for incorporation into the design of mini-hydro schemes in the Lower Mekong Basin. National University of Laos, Vientiane. 93pp.

Walsh, C., **Rodgers, M.**, **Robinson, W.** and **Gilligan, D.**, 2014. Evaluation of the effectiveness of the Tallowa Dam Fishway. NSW DPI Fisheries Final Report Series No. 143, 89pp.

Wassens, S., Jenkins, K., Spencer, J., **Thiem, J.**, Wolfenden, B., Bino, G., Thomas, R., Ocock, J., Lenon, E., Kobayashi, T., **Baumgartner, L.**, **Bindokas, J.** and Hall, A., 2014. Monitoring the ecological response of Commonwealth environmental water delivered in 2013-14 to the Murrumbidgee River system. Institute for Land, Water and Society, Charles Sturt University, Final Report, 133p.

Watts, R.J., McCasker, N., **Thiem, J.**, Howitt, J.A., Grace, M., Healy, S., Kopf, R.K., Dyer, J.G., Conallin, A., **Wooden, I.**, **Baumgartner, L.** and Bowen, P., 2014. Monitoring the ecosystem responses to Commonwealth environmental water delivered to the Edward-Wakool river system, 2013-14. Institute for Land, Water and Society, Charles Sturt University, Final Report, 168p.

Extension and Advisory Material

Boys, C.A., 2014. Protecting downstream migrating fish. New South Wales Department of Primary Industries Brochure. 4 pp.

B. Sample of publications posted on the NSW DPI (Fisheries) website during 2014-15

Note: Please visit www.dpi.nsw.gov.au for more comprehensive information.

Strategies and reports

- Aquaculture Production Report 2013/2014
- Aquaculture Facts & Figures 2015

Newsletters

- Aquaculture news
 - August 2014
 - December 2014
 - July 2015
- Commercial Fisheries Reform Newsletter
 - Number 4 – 01 Oct 2014
 - Number 5 – 24 Dec 2014
- NEWSCAST - Recreational Fisheries News
 - Newstreams special invitation edition – July 2014
 - September 2014
 - November 2014
 - February 2015
 - May 2015
 - Special Edition - Recreational Fishing NSW reminder - June 2015
- Newstreams - network for fishing clubs and anglers interested in habitat repair
 - No. 49, December 2014
 - No. 50, March 2015
 - No. 51, June 2015

Primefacts

Threatened species

- Alpine Redspot Dragonfly – *Austropetalia tonyana* (Primefact 1356)
- Black Rockcod (Primefact 189)
- Haswells Caprellid (Primefact 1284)
- Murray-Darling population of Eel-Tailed Catfish (Primefact 1321)
- River Blackfish population in the Snowy River Catchment (Primefact 1384)
- *Smeagol hiliaris* (Primefact 1232)
- White shark (Primefact 6)

Recreational fishing

- Trout waters recreational fishing guide (Central)
- Trout waters recreational fishing guide (Northern)
- Trout waters recreational fishing guide (Southern)
- Central Tablelands Recreational Fishing Guide
- Central Coast and Hawkesbury River Recreational Fishing Guide
- Far West District Recreational Fishing Guide
- Hume District Recreational Fishing Guide
- Macquarie Recreational Fishing Guide
- Monaro Recreational Fishing Guide
- New England Recreational Fishing Guide
- Peel Recreational Fishing Guide
- Riverina Recreational Fishing Guide
- South West Slopes Recreational Fishing Guide
- Fishing for yabbies in New South Wales
- Recreational Fishing Trusts funding guidelines October 2014

Other

Sharks

- SharkSmart North Coast poster (PDF, 1.9 MB)
- SharkSmart North Coast brochure (PDF, 1.3 MB)

Appendix 4: Externally funded projects

A. Externally funded projects commenced during 2014-15

PSFI = Port Stephens Fisheries Institute; NFC = Narrandera Fisheries Centre;

FRDC = Fisheries Research & Development Corporation; LLS = Local Land Services; SEWPaC = Dept of Sustainability, Environment, Water, Population and Communities; MDBA = Murray Darling Basin Authority; NPWS = National Parks & Wildlife Service

Project Title	Manager Location	Start	Fund Source	External \$
Recreational fisheries				
People development program: 2014 FRDC International Travel Award	PSFI	1-07-2014	FRDC	6,000
Mulloway stocking	PSFI	1-07-2014	Saltwater Trust	383,500
Fisheries Enhancement Infrastructure	PSFI	1-07-2014	Saltwater Trust	51,635
Inland Education trailer	NFC	31-07-2014	Freshwater Trust	31,635
L126 - Phase three of the Guide to Spearfishing in New South Wales	Nowra	4-08-2014	Saltwater Trust	17,000
L121 - Improving our understanding of the values, beliefs, motivations and attit	Nowra	4-08-2014	Saltwater Trust	106,180
L128 - First implementation of an independent observer program for the Charter B	Nowra	4-08-2014	Saltwater Trust	111,500
Gwydir LTIM Project Phase 2	Grafton	31-08-2014	Collaborative Research	932,300
L122 - Install and Upgrade of Fish Cleaning Tables, Horseshoe Beach and Stockt	Nowra	1-09-2014	Saltwater Trust	20,210
L127 - Safeguarding recreational fishing in NSW from ciguatera fish poisoning	Nowra	4-10-2014	Saltwater Trust	35,000
L123 - Const of Fish Cleaning Table Shoal Bay	Nowra	8-10-2014	Saltwater Trust	11,495
L124 - The Const of shelters, Soldiers Pt, Lemon Tree and Karuah	Nowra	16-10-2014	Saltwater Trust	20,000
L125 - South Durras Fishing Platform	Nowra	16-10-2014	Saltwater Trust	22,000
Designing artificial structures as marine habitats	PSFI	1-11-2014	Universities	0
L129 - How many species of blood worms are there in NSW? and does this matter?	Nowra	23-01-2015	Saltwater Trust	20,578
Port Botany offshore artificial reefs	Coffs Harbour	12-02-2015	Transport NSW	2,400,000
Aquaculture				

Project Title	Manager Location	Start	Fund Source	External \$
Clean up of Derelict Oyster Leases NSW	PSFI	14-04-2015	Crown Lands	227,428
Novartis Master Agreement	PSFI	1-07-2014	Misc. Org.	260,000
Sustainable fish harvest research				
Tailor fishery assessment	Mosman	1-10-2014	Saltwater Trust	164,986
Marine estate				
A Vessel Monitoring System (VMS) pilot for Lord Howe Island	Lord Howe Island	14-05-2015	Alliances	27,273
Barangaroo Fish Monitoring	PSFI	1-07-2014	Worley Parsons Pty Ltd	28,000
Solitary Islands School Awards project	Coffs Harbour	1-07-2014	Coffs Harbour Council	5,265
Juvenile white shark monitoring	PSFI	4-09-2014	Collaborative Research	18,182
Aquatic ecosystems				
Making More Fish Naturally 2014-15	PSFI	1-07-2014	Freshwater Trust	200,000
Connecting Riverine Communities in the Namoi - Future Management Fund	Tamworth	1-07-2014	SEWPaC	271,150
Connecting the Namoi - Namoi River Reserves	Tamworth	1-07-2014	SEWPaC	748,927
Habitat Action Program 14-15	PSFI	1-07-2014	Saltwater Trust	500,000
NSW Implementation of the Murray-Darling Basin Plan	Wollongbar	1-07-2014	DPI Water	3,485,000
Swimming Performance and Road Crossing Design	Wollongbar	1-07-2014	Transport NSW	343,956
Environmental Outcomes NSW Implementation of the Murray-Darling Basin Plan	PSFI	1-07-2014	DPI Water	2,568,243
Edward Wakool LTIM Project Phase 2	NFC	1-07-2014	Universities	883,672
Lachlan LTIM Project Phase 2 2014-2019	NFC	1-07-2014	Universities	431,401
Macquarie River environmental flow monitoring	Batemans Bay	23-07-2014	SEWPaC	196,986
IWRA - Making fish happen in the Macquarie	Dubbo	1-08-2014	Inland Waterways	19,581
Protecting the Purple Patch	Dubbo	31-08-2014	Little River Landcare	24,691
UGLA Bringing Back the Fish on the Horton	Dubbo	1-10-2014	Misc. Org.	13,652
Fish and Flow in the Northern Murray-Darling Basin	Tamworth	1-10-2014	MDBA	159,091

Project Title	Manager Location	Start	Fund Source	External \$
Murray LLS - Freshwater Externally Funded Small Projects	NFC	1-10-2014	LLS Murray	7,727
Richmond River Estuary Project, Stage 2	PSFI	13-10-2014	Misc. Org.	14,000
Murray Darling Basin Plan Survey 2014-2018	Batemans Bay	24-10-2014	MDBA	1,132,504
Murrumbidgee LTIM Project Phase 2	NFC	1-11-2014	Universities	831,715
Fishway Carp Trapping in Edward Wakool System	Wollongbar	20-11-2014	LLS Murray	46,593
L120 - Support for the NSW Fish Habitat Partnership	Nowra	26-11-2014	Saltwater Trust	30,000
Ecohealth - Macleay	Grafton	15-12-2014	LLS North Coast	50,000
Toorale LTIM Project Phase 1 (Warrego-Darling)	Grafton	15-12-2014	Collaborative Research	3,100
Mapping Severn Fish Habitat	PSFI	19-12-2014	LLS Northern Tablelands	48,921
Refining the Clarence River Nordmøre-grid for Spencer Gulf	Coffs Harbour	1-02-2015	Collaborative Research	17,501
Woodberry Swamp - Newcastle Port	PSFI	1-01-2015	Newcastle Port Authority	55,000
Richmond River Estuary Project (Stage 3)	PSFI	9-03-2015	Misc. Org.	10,000
Severn River Ongoing Works	PSFI	18-05-2015	LLS Northern Tablelands	139,156
OEH - Lachlan River Habitat Mapping	Dubbo	1-06-2015	NPWS	30,000
Pudman Creek fish sampling for Southern Pygmy Perch recovery assessment	Albury	4-06-2015	Australian River Restoration Centre	17,203
Edward-Wakool River System Project	NFC	15-06-2015	LLS Murray	10,000
CWLLS Lachlan Habitat Mapping	Dubbo	16-06-2015	LLS Central West	100,000
Fish Friendly Irrigators - CWLLS	Dubbo	16-06-2015	LLS Central West	15,000.00
Woodberry Swamp LLS	PSFI	17-06-2015	LLS Hunter	18,000
Camden Haven School Prawn Project	PSFI	22-06-2015	FRDC	107,078
CTLIS Lachlan River Habitat Mapping	Dubbo	29-06-2015	LLS Central Tablelands	35,400
Fish and Flows in the Southern Murray-Darling Basin	Queanbeyan	30-06-2015	MDBA	76,049

B. Externally funded projects completed during 2014-15

Project Title	Manager Location	Start	Fund Source	External \$
Recreational fisheries				
People development program: 2014 FRDC International Travel Award	PSFI	1-07-2014	FRDC	6,000
Responsible Stocking Practice Mulloway-East. King Prawns	Coffs Harbour	11-11-2009	Saltwater Trust	219,754
2FishTrack; Clarence River; Freshwater Trust	Grafton	1-05-2014	Freshwater Trust	10,000
Inland Education trailer	Coffs Harbour	31-07-2014	Freshwater Trust	31,635
FishTrack 2013-2015 Clarence River	Grafton	1-05-2014	Northern Rivers CMA	120,000
Aquaculture				
Breeding Strategy for Sydney Rock and Pacific Oysters	PSFI	1-01-2010	Seafood CRC	304,850
Propagation of Southern Bluefin Tuna	PSFI	14-09-2013	Seafood CRC	42,357
Sustainable fish harvest research				
Maximise Survival Line Fish	Coffs Harbour	1-07-2005	Saltwater Trust	1,260,972
Profiling the Biology and Fishery of Rock Blackfish in Sydney Region	PSFI	9-11-2009	Saltwater Trust	153,140
PHD Project Movements of Kingfish/Dolphin Fish	PSFI	1-11-2011	Saltwater Trust	105,000
Biota Sampling at RAAF Williamtown environment	PSFI	16-06-2014	Consultancies Research	13,591
Marine estate				
Juvenile white shark monitoring	PSFI	4-09-2014	Collaborative Research	18,182
Solitary Islands School Awards project	Coffs Harbour	1-07-2014	Misc Govt Contributions	5,265
Bruvs Survey Boulder Bay	PSFI	18-05-2012	Hunter Water	19,620
Jervis Bay Catchment Study	Huskisson	22-08-2012	Shoalhaven City Council	18,182
Shoalhaven Beach Nourishment Study	Huskisson	1-05-2013	Local Govt Authorities	40,909
Aquatic ecosystems				
Fishing Club Habitat Liaison Officer (Coast)	Wollongbar	1-07-2012	Saltwater Trust	456,762
Connecting Riverine Communities in the Namoi	Tamworth	1-07-2012	SEWPaC	2,318,750
Western LLS Lower Darling PIT Installation	Wollongbar	17-04-2014	LLS Western	100,000

Project Title	Manager Location	Start	Fund Source	External \$
Urchin Barrens Mapping Stage 2	PSFI	30-04-2014	LLS Hunter	48,000
Success of restocking in blackwater affected reaches of the Edward-Wakool system	NFC	31-05-2014	LLS Murray	38,903
Richmond River Estuary Project, Stage 2	PSFI	13-10-2014	Misc. Org.	14,000
Richmond River Estuary Project (Stage 3)	PSFI	9-03-2015	Misc. Org.	10,000
Northern Basin Flows for Fish workshop	Tamworth	20-05-2014	MDBA	35,000
Go with the flow	Wollongbar	1-06-2012	Environmental Research Trust	100,000
Macquarie Resnagging - Wellington to Dubbo	Dubbo	1-04-2014	LLS Central West	130,000
Mapping Macleay Fish Habitat	PSFI	6-06-2014	LLS North Coast	25,000
FT-Monitoring & Mngt Macquarie Perch	Batemans Bay	1-07-2011	Freshwater Trust	226,922
Mapping Severn Fish Habitat	PSFI	19-12-2014	LLS Northern Tablelands	48,921
Environmental Water delivery in the Murrumbidgee River	NFC	20-08-2012	Universities	378,214
Snowy Flow Response - Fish Sampling 2013 & 2014	Batemans Bay	2-02-2013	Dept of Water & Energy	72,486
E-water monitoring in the Edward Wakool system 2013-14	NFC	18-09-2013	Universities	304,675
Ecological responses to managed & natural flows in Murrumbidgee River Phase 2	NFC	1-11-2013	Universities	177,246
Towards recovery of crayfish in the Edward-Wakool	NFC	1-05-2014	LLS Murray	40,149
Toorale LTIM Project Phase 1 (Warrego-Darling)	Grafton	15-12-2014	Collaborative Research	3,100