



Department of  
Primary Industries

# NSW Aquaculture Research Advisory Committee

**RD&E Strategic Plan**

**2017-2022**

## NSW Aquaculture Research Advisory Committee (ARAC)

- ARAC was established in October 2006.
- ARAC is a statutory committee that advises the NSW Minister on the amount of contributions payable by the NSW aquaculture sectors into trust accounts for aquaculture research, development and extension (RD&E) and the expenditure of those trust funds.

### ARAC shares the NSW DPI vision:

*‘Innovative primary industries in strong regional communities’*

### About this Plan

- This plan provides guidance for the development and implementation of RD&E in support of the NSW aquaculture industry.
- This RD&E plan was developed at an ARAC workshop on the 3<sup>rd</sup> May 2017 taking into account:
  - advice from aquaculture permit holders and other stakeholders, NSW DPI staff and Mr Peter Dundas-Smith AM;
  - the need for evidence based aquaculture policy development in NSW;
  - NSW Department of Primary Industries (NSW DPI) Corporate Plan;
  - Fisheries Research Strategic Plan 2014-2018;
  - National RD&E Strategy for Fishing and Aquaculture 2015-20;
  - Fisheries Research and Development Corporation RD&E Plan 2015-20;
  - other relevant plans or RD&E reviews; and
  - completed, current and planned RD&E and related activities
- At the workshop a number of topics were raised that did not require the creation of new knowledge, processes or technology but rather the extension of same to end-users. These topics have been included under the Adoption program.
- Highlighted in the plan are the RD&E priorities for each aquaculture sector.
- The plan will be used collaboratively by industry sectors and enterprises, research organisations, relevant government agencies and others working in support of the aquaculture industry.
- The plan recognises the competitive advantages held by NSW.
- The ARAC will review the plan each year (latest revision May 2017).
- Copies of this plan are available from NSW DPI, Port Stephens Fisheries Institute, ☎: 02 4916 3901, email: [jo.pickles@dpi.nsw.gov.au](mailto:jo.pickles@dpi.nsw.gov.au) or the website [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au).
- During the consultative and development processes a number of priorities were identified that were not RD&E by nature, but rather related to activities that would nevertheless enhance the resilience and performance of the aquaculture industry, and importantly, better enable it to participate in the planning and execution of RD&E and the adoption of results. These ‘enabling’ priorities have, therefore, been included in this plan.



## Plan framework

The framework is based on the ‘input – output - outcome’ model of investment. In this context:

- Inputs are the resources – in the form of people, expertise, materials, energy, facilities and funds – that research organisations and their partners use in activities to produce outputs.
- Outputs are the goods and services – mainly knowledge, processes and technology – that research organisations and their partners produce for end-users.
- Outcomes are the results, impacts or consequences flowing from the adoption of outputs by end-users.

## RD&E investment performance

The ability to measure RD&E investment performance depends on the quantity and quality of available data. Further, it depends on the nature of the activity. For example, the performance of an activity with a strong public good component would be more difficult to measure (usually qualitative) than one with a strong private benefit component (usually quantitative). The key performance indicators (KPI) described below are a guide only to how performance could be measured. Ideally, such indicators with targets should be detailed in individual projects.

As indicated in the program framework below, the balance between the public good and private benefit components of RD&E varies between programs and priorities. As a general rule public good RD&E attracts a higher government investment than private benefit. Therefore, for RD&E with strong private benefit components to attract government investment, there needs to be evidence of market, institutional, technical, policy or political failure.

## NSW competitive advantages

NSW is well placed to further develop an aquaculture industry that is domestically and internationally competitive. Its competitive advantages are:

- a subtropical-temperate climate that enables the selection from a wide range of species those that can compete in the marketplace;
- world class research capabilities including those that can be drawn from other states and territories and from overseas;
- Australia’s highest seafood consumption that enables near-to-market production;
- coastal infrastructure to support aquaculture;
- a Government policy platform that supports the sustainable development of aquaculture; and
- the foremost Australian state for seafood sales and transport infrastructure.



## Primary Production

Program outcome: Substantial increase in the sustainable production and value of selected aquaculture species.

Outputs Knowledge, processes and technology relating to:	Sectoral Priorities			
	Molluscs (edible oysters, pearls, clams, abalone)	Freshwater Finfish (Murray Cod, Silver Perch and salmonids)	Marine Finfish (Yellowtail Kingfish and Mulloway)	Other (crustaceans, echinoderms, polychaetes, algae)
Aquaculture sites	1. Increase utilisation and protection of existing sites 2. Develop new sites (including for hatcheries)			
Production efficiency	1. Develop innovative production technology 2. Reduce production input costs			
	1. Develop lease and estuary management tools 2. Improve grading technology 3. Develop new site specific growing techniques 4. Promote concept trials of improved stock.	1. Optimise cage production systems 2. Improve husbandry and harvesting techniques	Optimise carrying capacities	Optimise yabby production
Seed/fingerling supply	Increase hatchery capacity and efficiency	Increase hatchery capacity and efficiency		
Breeding	Encourage breeding technology development			
	Improve genetics for disease resistance, faster growth, marketability and other traits	Improve genetics for disease resistance, faster growth, marketability and other traits		
Feed	Improve broodstock feed	Improve cost-effective feeds		
Biosecurity	Further develop stock movement protocols	Further develop stock movement protocols		
Aquatic animal health and welfare	Improve aquatic animal health incident reporting and facilitate emergency preparedness			
	Improve the process for ensuring APVMA approval for aquaculture chemicals			
	Improve the management of threats to shellfish health including Winter Mortality, POMS and QX.	Improve the management of threats to finfish including nodavirus and megalocytivirus		Improve the management of threats to crustacea including whitespot virus and APHND-like virus



Outputs Knowledge, processes and technology relating to:	Sectoral Priorities			
	Molluscs (edible oysters, pearls, clams, abalone)	Freshwater Finfish (Murray Cod, Silver Perch and salmonids)	Marine Finfish (Yellowtail Kingfish and Mulloway)	Other (crustaceans, echinoderms, polychaetes, algae)
Environment	1. Reduce adverse impacts of aquaculture on the environment 2. Mitigate adverse impacts of external influences (including climate change) on aquaculture 3. Further develop Environmental Management Systems for all sectors			
	1. <b>Improve water quality surveillance and facilitate use of that data</b> 2. Determine the impacts of oyster farming on seagrasses 3. Develop techniques for reporting the impacts (both positive and negative) of oyster production on the environment	Determine the quality of discharge water from cage production and recirculation aquaculture systems	1. Determine the environmental impacts of cage culture on surrounding environment 2. Determine the impacts of cage culture on other wild populations (sharks, etc)	
Emerging species	1. Investigate and develop polyculture opportunities 2. Assess alternate species (risk management strategy)		<b>Further develop offshore cage culture</b>	Develop seaweed culture systems technology (including offshore systems)

high priority

RD&E under this program would be expected to have a strong public good component.

Investment target: 45 %

Key performance indicators:

- Production. This relates to the level of increase in sustainable aquaculture production.
- Value. This relates to the level of increase in the gross value of aquaculture production.



## Post-harvest and Market Development

Program outcome: Increased demand and access to premium markets for Australian aquaculture seafood; fulfilment of consumer demands for safe, high-quality, nutritious seafood products; and increased profitability throughout the value chain.

Outputs Knowledge, processes and technology relating to:	Sectoral Priorities			
	Molluscs (edible oysters, pearls, clams, abalone)	Freshwater Finfish	Marine Finfish	Other (crustaceans, echinoderms, polychaetes, algae)
Product development	<ol style="list-style-type: none"> <li>1. Develop market opportunities for low grade/value products</li> <li>2. Develop uses for production and processing waste</li> <li>3. Develop value added ready to use products that meet consumer demand</li> <li>4. Improve product handling throughout the supply chain</li> </ol>			
Market development	<ol style="list-style-type: none"> <li>1. Improve consumer knowledge and expectations</li> <li>2. Develop market opportunities</li> </ol>			
	Develop a toolbox of oyster provenance marketing			
Retailer and food services sector knowledge and skills	Improve retailer and food services knowledge and skills			
Supply chain efficiency (and profitability)	<p style="color: red;">Improve supply chain processes and technology</p> <p style="color: red;">Improve equitable value sharing throughout the supply chain</p>			

high priority



RD&E under this program would be expected to have a strong private benefit component.

Investment target: 20 %

Key performance indicators:

- Consumption. This relates to the level of increase in consumption of aquaculture products.
- Consumer knowledge. This relates to the level of consumer knowledge of aquaculture products.
- Consumer satisfaction. This relates to the level of consumer satisfaction with aquaculture products.
- Market access. This relates to the level and effectiveness of access to domestic and international markets.
- Retailer knowledge. This relates to the level of retailer knowledge of aquaculture products.
- Profitability. This relates to the level of profitability throughout the value chain.



## Communities

Program outcome: The community is knowledgeable and supportive of the aquaculture industry, the natural resources on which it depends and its economic and social benefits to Australia.

Outputs Knowledge, processes and technology relating to:	Sectoral Priorities			
	Molluscs (edible oysters, pearls, clams, abalone)	Freshwater Finfish	Marine Finfish	Other (crustaceans, echinoderms, polychaetes, algae)
Increasing community knowledge of the aquaculture industry and related natural resources	1. Utilise the results of study on the social and economic benefits of aquaculture to NSW 2. Continue to build-on the evaluation of the social and economic benefits of aquaculture to NSW 3. Enhance techniques for regional community engagement initiatives 4. Inform the community about the stewardship role that the aquaculture industry plays in protecting the environment 5. Improve public perception of aquaculture farmed products			
	Inform the community of the positive role that oysters play in local ecology		Inform the community on the research results from the Marine Aquaculture Research Lease	
Community involvement in ways that will benefit the aquaculture industry and related natural resources	Develop opportunities for the community to participate in a stewardship role with respect to the natural resources on which the industry depends			





RD&E under this program would be expected to have a balance of public good and private benefit.

Investment target: 15 %

Key performance indicators:

- Community Support. This relates to the level and effectiveness of community support for the aquaculture industry and the natural resources on which it depends.
- Community Involvement. This relates to the level and effectiveness of community involvement in the aquaculture industry and in protecting and rehabilitating the natural resources on which it depends.



## People

Program outcome: The knowledge and skills of people in and supporting the aquaculture industry are developed and used to derive maximum economic, environmental, and social benefits for the industry and Australia.

Outputs Knowledge, processes and technology relating to:	Sectoral Priorities			
	Molluscs (edible oysters, pearls, clams, abalone)	Freshwater Finfish	Marine Finfish	Other (crustaceans, echinoderms, polychaetes, algae)
Leadership development among people in and supporting the aquaculture industry	<ol style="list-style-type: none"> <li>1. Identify and support potential leaders and promote training opportunities eg. the Seafood Industry Leadership Program and afford them opportunities to become members of industry related entities and participate in industry meetings, forums, etc</li> <li>2. Encourage industry enterprises to undertake business management, media and other relevant training</li> <li>3. Encourage succession planning within industry enterprises</li> </ol>			
Vocational competence of people in and supporting the aquaculture industry	<ol style="list-style-type: none"> <li>1. Encourage industry enterprises to ensure an appropriately trained and qualified workforce</li> <li>2. Encourage industry people to attend relevant conferences and to undertake study tours</li> </ol>			
Enhancing Academic Skills	Encourage education institution interest in aquaculture and foster educational opportunities for industry participants			



RD&E under this program would be expected to have a balance of public good and private benefit.

Investment target: 10 %

Key performance indicators:

- People Development. This relates to the number and quality of people whose capabilities have been improved.
- People Advancement. This relates to the number of people who have succeeded in gaining leadership and other important positions in and supporting the aquaculture industry.



## Adoption

Program outcome: RD&E outputs are used in a way to derive maximum benefit from RD&E investment.

Outputs Knowledge, processes and technology relating to:	Sectoral Priorities			
	Molluscs (edible oysters, pearls, clams, abalone)	Freshwater Finfish	Marine Finfish	Other (crustaceans, echinoderms, polychaetes, algae)
Extension of RD&E outputs	<ol style="list-style-type: none"> <li>1. Provide advice on all relevant research outputs</li> <li>2. Provide advice on where to obtain information on completed, current and planned RD&amp;E</li> <li>3. Provide advice on where to obtain advice of a non RD&amp;E nature</li> <li>4. Undertake field days (Q&amp;A) for aquaculture</li> <li>5. Develop a 'one-stop-shop' for knowledge brokering</li> </ol>			
Facilitation of the adoption and (if appropriate) commercialisation of RD&E outputs	Continue the role of the OceanWatch oyster industry extension officer	Investigate the need for sectoral extension officers		



RD&E under this program would be expected to have a balance of public good and private benefit.

Investment target: 10 %

Key performance indicators:

- Extension. This relates to the level and effectiveness of the extension of R&D outputs.
- Adoption. This relates to the level and effectiveness of influence over the adoption of R&D outputs.



## Total production over past 12 years

Grouping	Common Name	Production (tonne)											
		2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
<b>Crustaceans</b>	black tiger prawn	294	241	199	202	164	165	148	270	223	287	331	326
	yabby	23	19	7	6	4	3	5	5	4	6	4	3
	yabby (bait)										11	10	4
<b>Freshwater fish</b>	barramundi	121	104	114	111	111	86	75	50	50	59	62	68
	golden perch	3	2	1									
	Murray cod	26	13	16	9	8	3	5	14	19	85	177	205
	rainbow trout	218	196	217	130	144	149	168	165	198	253	277	195
	silver perch	270	301	232	203	180	194	240	190	149	195	246	254
<b>Marine fish</b>	eel-long finned	8	8	5	5	4	22	12			34		
	mulloway	8	13	10	9	31	32	72	49	59	93	81	
<b>Hatchery*</b>	Fish & crustaceans												
<b>Mollusc - oysters</b>	Sydney rock oyster	7,186,420 doz	6,567,493 doz	6,524,467 doz	6,350,078 doz	6,539,286 doz	5,812,934 doz	5,243,234 doz	4,558,873 doz	4,675,770 doz	4,786,802 doz	5,152,964 doz	5,273,919 doz
	Pacific oyster	384,409 doz	285,043 doz	192,827 doz	215,675 doz	201,328 doz	250,467 doz	178,443 doz	283,854 doz	208,646 doz	101,514 doz	372,935 doz	468,294 doz
	Triploid Pacific oyster					264,794 doz	362,086 doz	352,549 doz	333,545 doz	262,398 doz	153,699 doz		
<b>Mollusc - other</b>	blue mussel	36	34										

\*Quantity not recorded here due to the range of lifecycles ie. fish fry, fish fingerlings, juveniles etc.



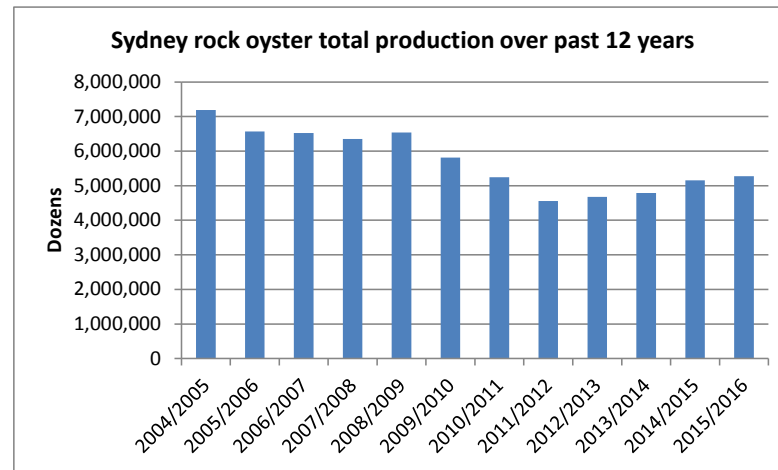
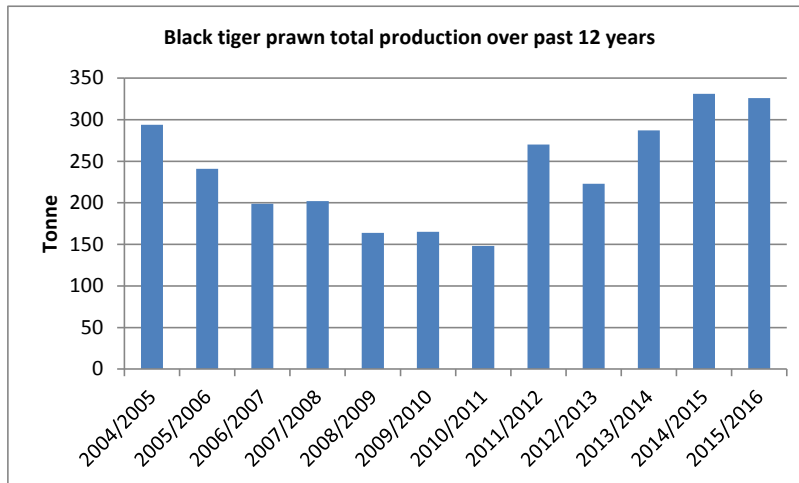
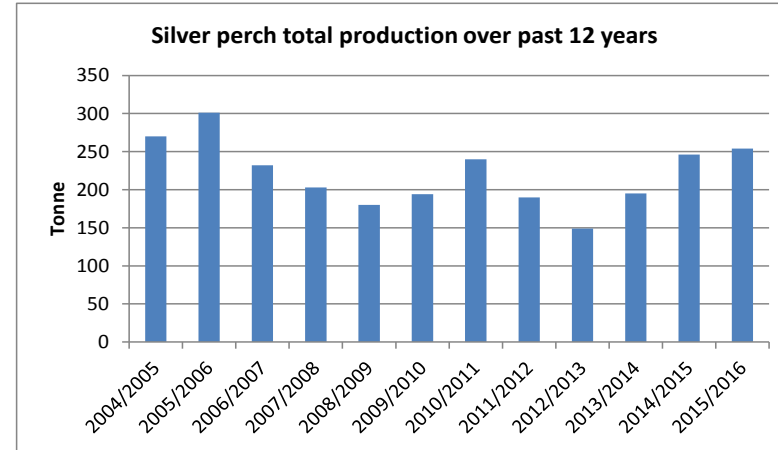
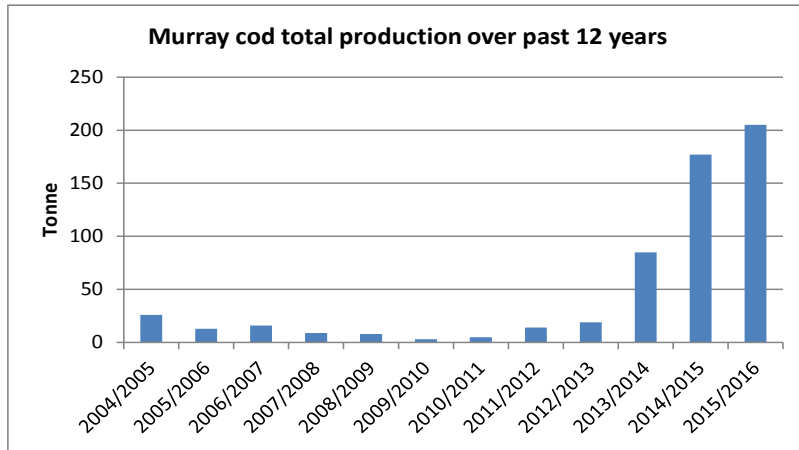
## Total value over past 12 years

Grouping	Common Name	Total Value (\$1,000)											
		2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Crustaceans	black tiger prawn	4,464	3,387	2,580	2,785	2,279	2,427	1,732	3,644	3,484	4,495	5,110	5,985
	yabby	362	214	133	130	74	57	104	98	77	65	93	99
	yabby (bait)			124	151	102	119	112	172	198	220	245	237
Freshwater fish	barramundi	1,360	1,237	1,207	1,318	1,304	1,046	938	700	601	938	941	982
	golden perch	55	33	15	7	5	3	1		2	5	12	4
	Murray cod	374	236	331	173	142	61	92	291	426	1,438	2,662	2,991
	rainbow trout	1,780	1,739	1,668	1,407	1,536	1,602	1,957	1,839	2,189	2,739	2,838	2,287
	silver perch	2,431	2,770	2,393	2,254	1,870	2,336	2,814	2,695	1,879	2,717	3,010	2,968
Marine fish	eel-long finned	95	92	55	52	31	333	124			351		
	mulloway	68	103	93	71	149	293	684	488	624	1,022	915	
Hatchery	Fish & crustaceans	2,093	1,518	1,538	2,274	2,357	2,643	2,843	3,142	2,943	2,782	3,608	3,580
Mollusc - oysters	Sydney rock oyster	33,868	32,590	34,593	36,065	37,217	34,972	31,516	28,254	29,883	31,845	34,771	36,873
	Pacific oyster	1,920	1,403	1,005	1,299	1,264	1,597	1,219	1,996	1,507	707	4,060	5,798
	Triploid Pacific oyster			572	942	2,033	2,921	2,950	2,662	2,191	1,407		
	flat oysters	98	101	277	273	159	125	318	160	263	103	78	102
	oyster spat	1,871	2,352	2,166	1,897	1,974	2,748	2,309	2,109	2,063	1,823	1,733	1,547
*Other		669	437	552	465	622	697	779	1,335	1,805	590	585	1,429

\* Not available for confidentiality reasons ( $\leq 5$  farms authorised to cultivate species). Species include: Australian Paratya (*Paratya australiensis*), Blue Mussel (*Mytilus galloprovincialis*), Brook Trout (*Salvelinus fontinalis*), Floodplain Mussel (*Vesunio ambiguus*), Moreton Bay Bug (*Thenus australiensis*), Mulloway (*Argyrosomus japonicus*), Pearl Oyster (*Pinctada imbricata*), Sea Lettuce (*Ulva lactuca*), Sydney Rock Oyster (*Saccostrea glomerata*; nursery cultivated) & Tube Worm (*Diopatra aciculata*).

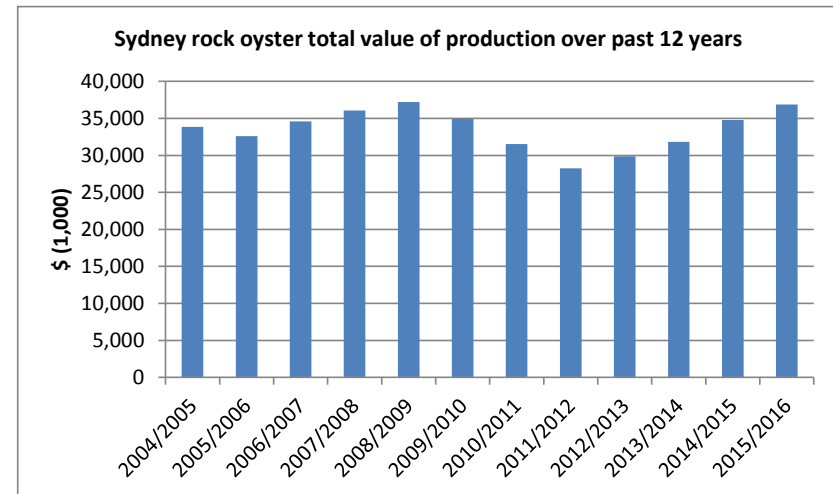
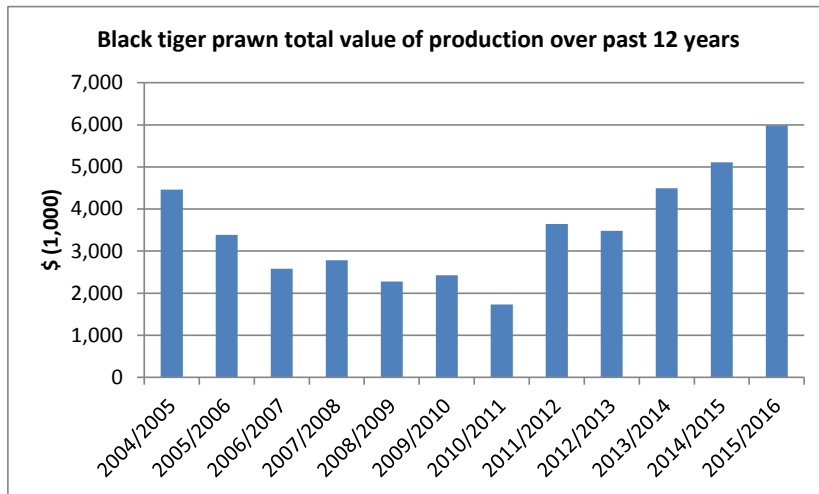
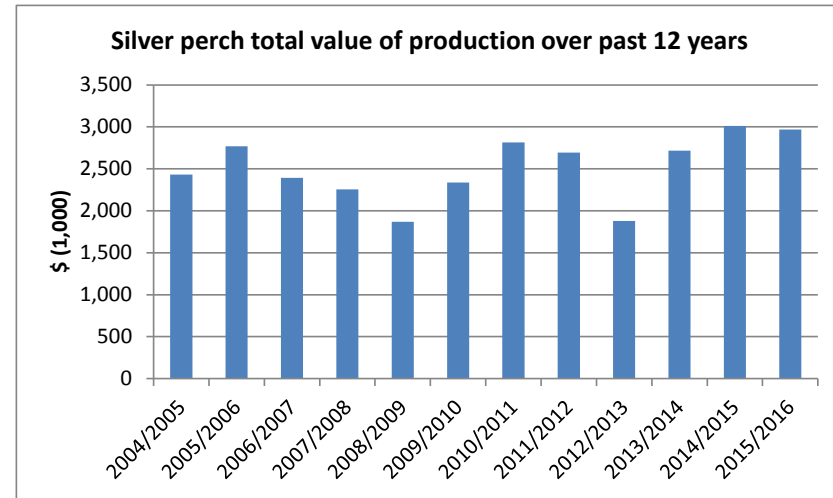
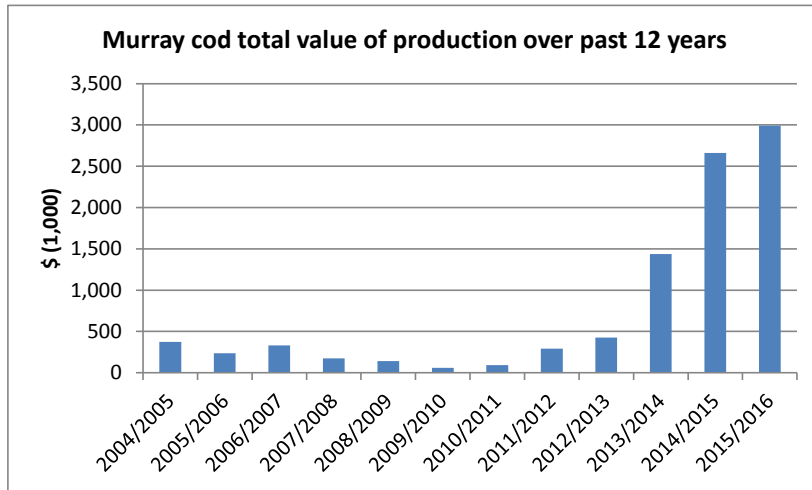


### Four leading species in total production over past 12 years





### Four leading species in total value of production over past 12 years





## Submit an RD&E idea to ARAC

Below is the one-page form giving you an opportunity to advise ARAC of the constraints on the growth of your business, sector or whole of industry and to convey your ideas on how these constraints may be addressed through RD&E. You can detach this page and email your submission to [jo.pickles@dpi.nsw.gov.au](mailto:jo.pickles@dpi.nsw.gov.au) or post to Jo Pickles, C/- ARAC, NSW Department of Primary Industries, Locked Bag 1, Nelson Bay, NSW, 2315.

<b>Proponent:</b> Provide your name and permit number (if applicable).
<b>Need:</b> Describe the constraint(s) on the growth of your business, sector or the whole industry.
<b>Description:</b> Describe how your RD&E idea would address the constraint(s).
<b>Outcome:</b> Describe the outcome you are seeking and, if possible, provide estimates of the potential difference it could make in terms of value or production.
<b>Scope of Impact:</b> Does your RD&E idea have enterprise, sector, regional (eg. estuary), state or national significance?
<b>Level of Support:</b> Describe the level of support you have for your RD&E idea.

