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Strategic plan for ACIAR engagement in capture fisheries research and capacity development in Indonesia, 2015–25

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Research that works for developing countries and Australia

Strategic plan for ACIAR engagement in capture fisheries research and capacity development in Indonesia, 2015–25

P4KSI and ACIAR

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(Centre for Fisheries Research and Development)
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Cover: Unloadings of large yellowfin tuna on the beach at Kedonganan, in southern Bali. The tuna are caught by handline using fish aggregating devices (FADs) south of Lombok. The 'jukung' shown, full of tuna, acts as the carrier vessel to bring the fish to shore from the handline catcher boat that remains anchored, among the vessels that can be seen in the background. These tuna will go by truck to processing plants in Benoa. The colourful, viking-style vessels are 'slerek' which fish sardines by purse-seine in the Bali Strait. (Photo: Craig Proctor)

Foreword

The key to success of the Australian Centre for International Agricultural Research (ACIAR) has always been the strength of its partner-country collaborations. Indeed, from its inception, the basic strategy for developing projects and programs has remained the same: initiating consultations that address high-priority problems in developing countries, with participants from the partner countries' research organisations together with those Australian institutions that have relevant expertise.

The ACIAR Fisheries Program in Indonesia is a perfect example of how well this model has worked. Interestingly, the first ever ACIAR projects were two fisheries projects in Indonesia, started in 1983 (on fish drying and managing spoilage). Fast-forward to today, and at least 60 projects in the Fisheries Program have involved Indonesia as a partner country. Research has covered a range of marine and freshwater species, including finfish such as tunas, snappers and terubuk (shad); sharks and rays; and crustaceans such as shrimps and mud crabs. It has focused on a wide range of aspects, including wild-caught and cultured production methods; hatchery and grow-out technology; disease control; productivity and profitability; sustainability and best management practices; postharvest handling and product preservation; stock monitoring; and economics and marketing. All projects in the Fisheries Program have embodied ACIAR's overarching aim of reducing poverty and improving livelihoods in local communities.Devised through extensive collaboration and consultation on Indonesian priorities, this strategic plan for ACIAR capture fisheries research and capacity building continues and expands the strong Indonesian and Australian partnerships forged in this area. It sets an ambitious schedule for capture fisheries research in Indonesia over the next 10 years, with distinct goals and milestones, but also with flexibility to evolve as progress is made.

In considering the future, the plan focuses on managing both inland and marine fisheries, including policy development; building capacity in fishers as well as research institutions, researchers and decision-makers; and increasing the involvement of women, recognising their pivotal role in smallholder fisheries enterprises.

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Small pelagic fish for sale at the Kedonganan fish market in Bali. Photo: William White

Unloading fish at Jepara Port in Central Java. Photo: Tony Bartlett

Background

Indonesia is the fifth most populous country in the world. Home to nearly 254 million people, 65% of the population live in coastal areas (Dahuri 2007; CIA 2013). While the country has achieved strong progress in poverty reduction in recent years, 49% of the population still live on less than US$2.00 a day (AusAID 2008). In addition, most of the extreme poverty tends to occur in communities that depend on agriculture, fisheries and forestry for their livelihoods (AusAID 2008). Strengthening the fisheries and aquaculture sectors is therefore critical for poverty reduction and equitable development across Indonesia.

As the world's largest archipelago, stretching between the Pacific and Indian Oceans (see Figure 1), Indonesia has some of the most diverse aquatic and fisheries resources. In many cases, these resources are shared with neighbouring countries and high seas areas. Indonesia is the world's second largest producer of wild-capture fisheries yield, generating 6.1 million tonnes (Mt) in 2013 or 6.5% of the global production (FAO 2015; see Box 1). Most of this production—5.7 Mt—comes from Indonesian marine capture fisheries (FAO 2015). Indonesia's inland water fisheries, in reservoirs, lakes, floodplains and rivers, while small in comparison to marine systems in production terms (413,000 t in 2013; FAO 2015), are important to local communities as a source of food and income.

Indonesia is one of the world's leading exporting countries of fisheries products (both aquaculture and wild-caught), generating US$2.9 billion of exports in 2013, and contributing 2.9% of the total value of global fish exports (UN 2015). In contrast, Indonesia imports much less fisheries production, US$216 million in 2013 (UN 2015).

To deliver this wild-capture fisheries production, Indonesia has one of the largest fishing fleets in the world, with over 620,000 fishing vessels in the marine capture fisheries (FAO 2013), most of which are small coastal vessels (<5 gross registered tonnage) (DAFF 2011b). These small vessels usually operate within 7.4 km (4 nautical miles) of the coast and are managed at the district level. Larger vessels, licensed at the provincial level (<30 gross registered tonnage) or central government level (>30 gross registered tonnage), are not permitted to fish as close to the coast and instead fish the waters of Indonesia's exclusive economic zone (EEZ) or on the high seas.

An estimated 2.7 million Indonesians are employed directly in capture fisheries (FAO 2014), mostly in small-scale fisheries. In poor rural and coastal areas, wild-capture fisheries provide employment and cash income to resource-poor households (Béné et al. 2010). While the Indonesian fishing sector is often perceived as a male domain, there is increasing recognition of the participation of women, particularly in small-scale fisheries and postharvest activities (Fitriana and Stacey 2012; Kleiber et al. 2015). Consideration of women's involvement is particularly important in understanding the role of fisheries in the context of food security and livelihoods (Kleiber et al. 2015).

In addition to the economic benefits of marine fisheries, Indonesia has one of the highest rates of seafood consumption in the world, estimated at 29 kg/person/year (2011) and contributing 55% of animal protein consumed (FAO 2012). Seafood consumption increases with income; however, lower-income households spend a greater proportion of their food expenditure on seafood than higher-income households (Dey et al. 2007). Due to its large population, Indonesia is the greatest consumer of fisheries products in the Association of South-East Asian Nations (ASEAN) region (estimated at 7 Mt/year, 2011; FAO 2012), with an estimated 80% of Indonesia's marine capture fisheries production consumed domestically. With a growing population (currently estimated at around 1% per year; CIA 2013) and increasing affluence, the demand for seafood is expected to continue to grow.

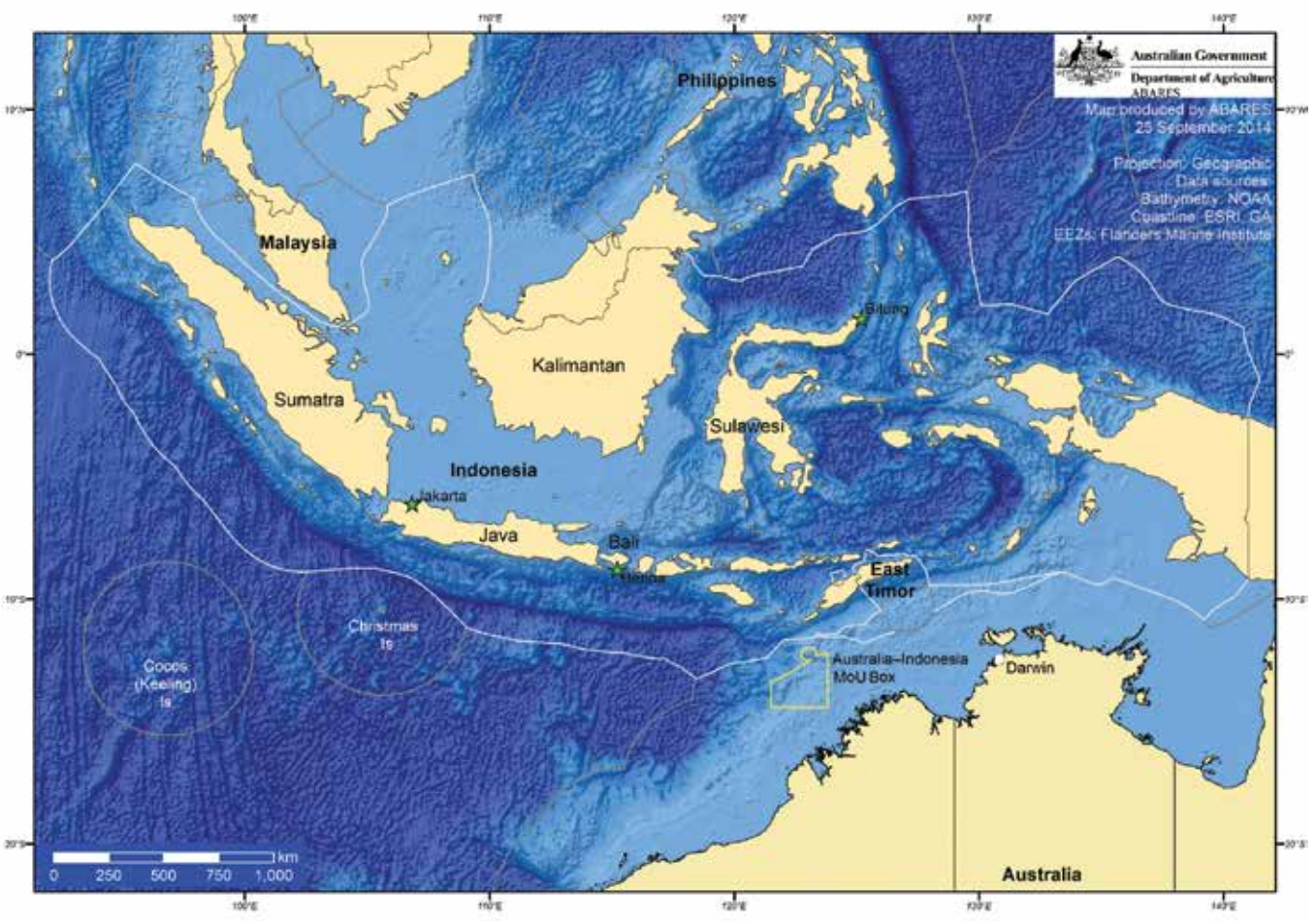

Figure 1. Map of the Indonesian region. Note: MoU area = Australian waters covered by a memorandum of understanding (MoU) allowing use by Indonesian traditional fisheries (see text for more detail).

Box 1. Indonesia's capture fisheries in numbers

	Indonesia	Global
Capture fisheries		
Capture fisheries production, 2013 (FAO 2015)	6.1 million tonnes (Mt) 2nd highest production globally 6.5% of total global production Composed of: • 5.7 Mt marine • 413,000 t freshwater	Total production 93.8 million tonnes
Marine fishing fleet, 2012 (FAO 2013)	621,000 vessels (28% non-powered, 39% out-board engine)	
Inland waters fishing fleet, 2012 (FAO 2013)	185,000 (78% non-powered)	
Capture fisheries direct employment, 2012 (FAO 2014)	2.7 million fishers	Total estimate 39.4 million fishers
Seafood consumption (FAO 2012)		
Total seafood consumption, 2011	7 Mt/year	Total seafood consumption 132.1 billion tonnes
Seafood consumption, apparent, 2011	28.9 kg/person/year	Apparent consumption 18.9 kg/person/year
Seafood as a proportion of animal protein consumption, 2011	54.8%	Average 16.7%
Trade in fisheries commodities (both wild-capture and aquaculture) (UN 2015)		
Exports, 2013	US$2.9 billion 2.9% of global exports	Fisheries commodities exports US$100.2 billion
Imports, 2013	US$216 million 0.2% of global imports	Fisheries commodities imports US$99.7 billion

Partnership with ACIAR

Indonesia and Australia are close neighbours, sharing a long maritime boundary (Figure 1) and a history of cultural and trade links. Many fish stocks straddle the exclusive economic zones (EEZs) of both countries and may be fished by both Australian and Indonesian fishers. Both countries participate in regional fisheries management organisations for highly migratory fish stocks, such as tuna and billfish, which straddle their maritime boundaries and are also fished on the high seas. One of the most valuable fish stocks shared by Australia and Indonesia is southern bluefin tuna, with the only known spawning ground for this species occurring in the waters off Indonesia and Australia (Farley and Davis 1998).

There is a memorandum of understanding (MoU – 1974[1]) between the governments of Australia and Indonesia that covers an area of Australian waters in the Timor Sea (see MoU Box, Figure 1) where Indonesian traditional fisheries, using traditional fishing methods only, are permitted to operate (Department of Agriculture 2015). This access was granted in recognition of the long history of traditional Indonesian fishing in the area. The MoU provides Australia with a tool to manage access to its waters; while for Indonesia, it enables traditional fishers to continue their customary practices.

Indonesia is the Australian Centre for International Agricultural Research's (ACIAR's) largest partner-country program, due to its proximity and strategic importance to Australia, and to the imperative of reducing the large proportion of its population living in poverty (ACIAR 2015). ACIAR has worked with Indonesian and Australian partners on capture fisheries research and capacity building since 1995. In 2008, ACIAR undertook a review and impact assessment of its Indonesian capture fisheries projects (Martin 2008), which identified that the projects had succeeded in delivering research outputs that have the potential to deliver significant economic, social and environmental benefits. The review concluded that the projects improved the understanding of fisheries and delivered proposed management plans for some major fisheries that crossed national boundaries. The projects also enhanced the capacity of Indonesian researchers and research agencies, and developed partnerships between Australian and Indonesian researchers and agencies.

[1] Australia–Indonesia Memorandum of Understanding regarding the Operations of Indonesian Traditional Fishermen in Areas of the Australian Fishing Zone and Continental Shelf – 1974

Previous capture fisheries research and capacity building

The ACIAR program of capture fisheries research and capacity building in Indonesia has responded to priorities at a range of levels, as summarised below.

Fisheries and species

Projects have focused on three key types of species or capture fisheries:

- species or fisheries that are important at the local or province level, particularly when knowledge can be transferred from studies elsewhere, such as projects on terubuk (toli shad, a herring species) (ACIAR projects FIS/1996/082 and FIS/2000/128), fish species used for bait in tuna fisheries (FIS/1994/024) and capture fisheries in freshwater reservoirs (FIS/2002/111). ACIAR fisheries projects were part of the international response to the 2009 tsunami by contributing to rebuilding strategies, primarily in Aceh province (FIS/2005/025)
- fish stocks that may be shared across national boundaries and important to fisheries in both northern Australia and Indonesia, such as the tropical snappers (FIS/1997/165) and sharks and rays (FIS/2000/062 and FIS/2003/037)
- highly migratory stocks of regional and national importance; in particular, tunas and other pelagic species (FIS/2001/079, FIS/2002/074 and FIS/2009/059).

Multidisciplinary approaches

The ACIAR capture fisheries program in Indonesia has been characterised by multidisciplinary projects and approaches. This has reflected the need to provide the fundamental data and science around the fisheries and stocks, improve understanding of the social and economic characteristics of the fishers and associated communities, and build management and policymaking capacity. Previous ACIAR projects have covered many aspects of the information required to inform an ecosystem approach to fisheries management (EAFM) (FAO 2012). This multidisciplinary focus has contributed to strengthening the evidence base for management, policy and decision-making and the translation of ACIAR project results into draft policy and management plans.

Consideration of shared management and policy challenges

The shared nature of some of the fish stocks and common participation in regional and international fisheries forums result in management and policy challenges that are shared by Australia and Indonesia. ACIAR's program has included work to assist in filling gaps in Indonesia's national fisheries policy and regulatory frameworks to meet international or regional requirements. One area of focus has been increasing Indonesia's capacity to manage illegal, unreported and unregulated (IUU) fishing. In March 2001, the Food and Agriculture Organization of the United Nations (FAO) introduced the *International Plan of Action to Prevent, Deter and Eliminate IUU Fishing*. Both Indonesia and Australia are signatories to the *Regional Plan of Action to Promote Responsible Fishing Practices Including Combating IUU Fishing in the Region* (RPOA IUU 2007). ACIAR projects (FIS/2000/163, FIS/2002/019 and FIS/2006/142) contributed to the development of a draft *National Plan of Action to Prevent, Deter and Eliminate IUU* (NPOA IUU) for Indonesia. ACIAR projects (FIS/2000/062 and FIS/2003/037) also contributed to the development of Indonesia's draft *National Plan of Action for the Conservation and Management of Sharks* (NPOA Sharks), in line with the FAO *International Plan of Action for the Conservation and Management of Sharks* (2000).

Strong partnerships

The ACIAR capture fisheries projects have involved strong partnerships with central government research agencies, primarily within the Indonesian Ministry of Marine Affairs and Fisheries, including the Centre for Agro-Socio Economic Research and Development, as well as universities and district and provincial governments. In addition, projects have engaged directly with communities and industry, involving them in sampling or research, communication of project results and the development and discussion of potential management approaches.

In addition, ACIAR projects in Indonesian capture fisheries have been aligned with other research and capacity-building activities in Indonesia and Australia. The ACIAR shark and ray projects built on research in northern Australia, supported by the Fisheries Research and Development Corporation and Environment Australia. The ACIAR tuna and pelagic species projects (see Box 2) have complemented work supported by the Australian Agency for International Development (AusAID) and the Global Environment Fund (GEF) in collaboration with the Western and Central Pacific Fisheries Commission (WCPFC) and the Indian Ocean Tuna Commission (IOTC).

Capacity building

Capacity building has been a central part of ACIAR's mandate and a critical outcome for projects. ACIAR's engagement in Indonesian capture fisheries has included a range of capacity-building activities focused at various levels, from individual to institutional level capacity development, including:

- *direct research training*, as Indonesian research partners work with Australian researchers, undertaking joint sampling, analysis and publication of the research—at times, this has been complemented with specific training workshops held in Indonesia, and has covered technical areas (such as fish ageing, data management) as well as research planning, database development and management
- *study trips* by Indonesian partners to work and undertake training in Australia, including in laboratory-based techniques in fields such as genetics, histology and ageing, as well as stock assessment and data analysis

- *on-the-ground capacity development* through the design and implementation of enumerator and observer programs and training in regional areas
- *postgraduate research* being undertaken by Indonesian scientists, associated with the research projects and supported by ACIAR fellowships
- *policy development*—ACIAR projects have supported the development of the Indonesian NPOA Sharks and NPOA IUU, as well as a framework for bilateral cooperation (Indonesia–Philippines) to address IUU fishing in the Sulawesi Sea
- *institutional capacity building*, such as the Research Institute for Tuna Fisheries in Bali (see Box 2). The ACIAR tuna projects, along with other initiatives, have contributed to the development and formalisation of the research station and its associated monitoring capacity. Other examples include the provision of equipment to enable ageing studies and the development of a centralised database for tuna catch and effort. The ACIAR projects have also increased the capacity of Indonesian agencies to meet reporting and data-submission requirements of relevant regional fisheries management organisations.

Fishers unloading catch at Tanjung, northern Lombok. Photo: William White

Box 2. Case study: success of Indonesia–Australia collaborations on tuna fisheries in Bali

In 1992, Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Fisheries joined with the Central Research Institute for Fisheries Indonesia (CRIFI) and the Research Institute for Marine Fisheries (RIMF) to establish a monitoring and sampling program at Benoa Fishing Port in Bali. This was in recognition of a lack of information on the scale of catch of southern bluefin tuna (SBT) by the Indonesian tuna longline fleet on the SBT spawning ground, south of Java and Bali, and the need for research to better understand the reproductive dynamics of the spawning population. Benoa was, and still is, the main base and catch landing port for the tuna longline fleet operating in the Indian Ocean. The early focus was on obtaining estimates of the number of SBT landed and processed, fish lengths and weights, and sampling of otoliths for ageing and gonads for reproductive biology research.

In 1992–1993, the enumeration and sampling was done by two staff: one contracted to CRIFI and one from the largest fishing company, PT Perikanan Samudera Besar. Key scientists from CSIRO, CRIFI and RIMF provided regular supervision. Through the remainder of the 1990s, the number of enumerators involved in the monitoring activities increased to four. Sampling and associated histological analysis of SBT gonads included a Fisheries Research and Development Corporation project during 1998–2001, and collaboration with the Research Institute for Mariculture at Gondol (northern Bali).

In 2002, Indonesia's Research Centre for Capture Fisheries (RCCF) joined with the Indian Ocean Tuna Commission (IOTC), Overseas Fishery Cooperation Foundation of Japan (OFCF) and CSIRO to expand the focus of the port-based monitoring program to include all species (tunas, billfish, tuna-like species, and bycatch species) and to extend the enumeration to two other key tuna landing ports: Muara Baru in northern Jakarta, and Cilacap on southern coast of Central Java.

Australia's contributions to this new phase of fisheries monitoring were done through activities of ACIAR Project FIS/2001/079, with additional funding from the Department of Agriculture, Fisheries and Forestry (DAFF). At this time, the base of operations in Benoa was a small office rented from one of the fishing companies, PT Sari Segara, and the enumerator team included seven full-time staff. At conclusion of the ACIAR project, the monitoring and biological sampling continued with funding support from DAFF and OFCF, and supervision from CSIRO, IOTC and Indonesian partner agencies. In 2004, the operations moved to a significantly larger rented office adjacent to the former office, and in 2005 also became the base for a trial observer program for the longline fishery—an activity of ACIAR Project FIS/2002/074. Staff numbers increased to 13 (7 enumerators and 6 observers).

In late 2008, RCCF began renovating a rented building within the Benoa Fishing Port precinct, to provide more office space and a laboratory area for the Benoa-based monitoring and observer activities. This facility became operational in February 2009, achieving new status as a formal research institute within the Agency for Marine Affairs and Fisheries Research and Development (AMAFRAD) and named the Research Institute for Tuna Fisheries (RITF). During the next 5 years, staff numbers increased to around 25.

From 1993 to now, the Benoa monitoring and sampling program has provided important information and biological samples for the annual assessment of the SBT spawning population as part of the Scientific Committee process of the Commission for Conservation of Southern Bluefin Tuna (CCSBT) and assisting Indonesia to meet its international reporting requirements to CCSBT and IOTC.

A recent, exciting development has seen RITF move to a new location, a few kilometres outside the Benoa Fishing Port, into a newly constructed building with three levels of extensive office, laboratory and meeting-room facilities. During the coming years, staff numbers are hoped to increase to 60–70. There is an expectation of continued Indonesia–Australia collaborations in tuna fisheries research, to capitalise on the expanded research facilities and build on the more than 20 years of collaborations to date.

Development of the strategic plan

This strategic plan was developed in response to a request from the Centre for Fisheries Research and Development (formerly the Research Centre for Fisheries Management and Conservation—RCFMC) within the Indonesian Ministry of Marine Affairs and Fisheries. The process was led by the Centre and the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) in collaboration with the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The priorities were identified through workshops in Indonesia that included participation from: the Centre, across its research institutes and research and operational divisions; the Indonesian Directorate of Fisheries Resources, within the Directorate General of Capture Fisheries; and the Directorate of Conservation and National Parks, within the Directorate General of Marine, Coastal and Small Islands Affairs. The draft priorities were circulated to key Australian researchers for input and comment, prior to further consultation and finalisation in Indonesia.

The plan builds on the capacity development framework *Net Returns: A Human Capacity Development Framework for Marine Capture Fisheries Management in South East Asia* (DAFF 2011a). This framework was developed under the RPOA IUU (2007) through a participatory approach involving the RPOA members. The RPOA IUU (2007) was a joint initiative of the Indonesian and Australian governments that 11 South-East Asian countries signed in 2007. The overall goal of the framework is to increase the capacity of people and institutions involved in marine capture fisheries within RPOA participating countries to develop their abilities, to ensure the sustainable development of the region's marine capture fisheries. This strategic plan used the framework and applied it across marine and freshwater capture fisheries in Indonesia.

Catches being unloaded at the Muara Angke fishing port in Jakarta. Photo: William White

Drivers and challenges

Global context

The global context for wild-capture fisheries has changed, and continues to change, rapidly and this has implications for future research and capacity-building requirements in Indonesia. Over the past three decades, universal seafood consumption has increased by 50% and seafood now accounts for 16% of all animal protein consumed worldwide (FAO 2015). Looking forward, increased demand for seafood, population growth, efforts to reduce poverty, issues relating to food security and increasing emphasis on market-based processes are all likely to drive and challenge capture fisheries research and capacity building in Indonesia.

Internal challenges

For Indonesian capture fisheries to capitalise on the increased global and local demand for seafood in a way that is sustainable and equitable, there is a need to take into account some internal challenges. Key challenges identified during the workshops to develop this plan include:

- increasing the effectiveness of decentralised fisheries management, including enhancing governance and implementation of regulations with the associated monitoring, control and surveillance; improving research capacity within all levels of government, including data collection and reporting; and implementing international commitments
- the complex nature of Indonesian fisheries, which are often multi-species, multi-gear fisheries that may span the levels of governance—this complexity also reflects a large number of stakeholders, within industry and the associated communities, that may have differing objectives for engagement in the fisheries
- the overexploited state of many fish stocks and the effectively open-access nature of most fisheries, resulting in overcapacity in the associated fisheries
- the impacted and degraded nature of many Indonesian aquatic habitats and ecosystems. Given the high reliance on coastal areas and increasing development, the high level of loss and degradation of marine habitats is of major concern. Some of this has been caused by destructive fishing practices, but coastal development, pollution and other anthropogenic impacts have also contributed. Inland waters are also affected by similar problems, as well as the introduction of alien species. These combine to reduce the ecosystems' ability to support productive fisheries.

Strategic plan 2015–25

This strategic plan identifies high priorities for potential research and capacity-building activities across fisheries, regions and technical areas (Table 1). Because resources are finite, it is important that these activities build on previous partnerships and existing programs supported by other partners and donors. Implementing research to address these priorities should continue to pursue a multidisciplinary approach and support capacity building from the individual to institutional levels. The priorities are divided into six key results areas that are described below. The first four priority areas focus on fisheries or aquatic ecosystem issues. The last two priorities are cross-cutting and could be incorporated within projects that are focused on the first four priorities, or could be targeted through separate projects.

i) Productive and sustainable tuna fisheries

Indonesia is a significant tuna-producing nation and previous Australian Centre for International Agricultural Research (ACIAR) partnerships have been founded on the shared importance of tuna fisheries and the need to engage effectively in international decision-making forums. This strategic plan continues to build on these relationships and previous achievements, contributing to expansion to include the neritic tunas that are locally important in coastal areas.

Research and capacity building are needed to support the national tuna management plans and related policy, management and decision-making at the national, province and district levels. They are also needed to support effective engagement in regional fisheries management organisations and bilateral discussions, as well as the implementation of agreed international management measures. This builds on the effective partnerships centred on Indian Ocean and Pacific tunas, relating to engagement in the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), the Indian Ocean Tuna Commission (IOTC) and the Western and Central Pacific Fisheries Commission (WCPFC). The priorities also reflect the requirement to understand the neritic tuna fisheries and support the implementation of fisheries management plans and an ecosystem approach to fisheries management (EAFM) for these fisheries. There is also a need to focus on the 'ecologically related species' in these fisheries, particularly sharks and bycatch of threatened species such as turtles and seabirds.

The potential high-priority activities include continued support and further development of the research capacity at the Research Institute for Tuna Fisheries in Bali, and the long-term goal of developing similar capacity in Bitung (North Sulawesi), for Pacific and neritic tunas. There is a need for research to improve the understanding of the social and economic characteristics of the Pacific and neritic tuna fisheries and associated communities.

ii) Productive, sustainable and coordinated management of inland waters

While inland waters in Indonesia are much smaller than the marine areas and their associated capture fisheries production less, they remain locally important. The strategy builds on the previous ACIAR research on inland fisheries and the interaction with other uses for inland waters. There is a need for research and capacity building to support floodplains, reservoirs and river capture fisheries management, policy and decision-making. At present, data on the extent and current uses of inland waters are lacking, which makes it difficult to argue, in economic and livelihood terms, the significance and potential of these waters. This area of research will also continue to focus on the interactions between competing uses

in the freshwaters, including freshwater cage culture, to inform local management decision-making. This high priority builds on previous ACIAR work with the aim of strengthening ongoing local government implementation of management. In this area, the need for water quality monitoring systems and early warning systems to enable fishers and farmers to respond was also identified. The recently established Southeast Asian Fisheries Development Center (SEAFDEC) Regional Center for Inland Fisheries Development (in Palembang, South Sumatra) provides an opportunity for collaboration and capacity building. Understanding the social and economic aspects of these fisheries and associated communities is a high priority, including gender-related research to understand the role of women and increase their engagement in decision-making and management.

iii) Evidence-based policymaking and management of marine protected areas

There is significant engagement in Indonesia by donors and researchers focused on marine protected areas (MPAs) and, in particular, their development and implementation. There is a need to support MPA policy and decision-making, particularly in terms of the potential role and interaction with fisheries management. The priorities recognise the requirement to support the scientific basis for the design of MPAs, including improved understanding of connectivity among areas and systems, as well as monitoring the effectiveness of MPAs. Potential activities in this area include research and capacity building that increase the capacity to contribute to the design and establishment of fisheries refugia and other management measures. There is a clear need for improved understanding of the social and economic aspects of the fisheries and associated communities, including gender-specific research, to inform decision-making and management. Activities in this area could link to the undertakings of the Coral Triangle Initiative (CTI-CFF 2015) and other new pursuits in this area.

iv) Ecologically sustainable and healthy aquatic environments (marine and inland)

There is a need for research and capacity building that focus on aquatic environments, particularly in terms of degradation mitigation, rehabilitation and enhancement of aquatic habitats that support marine and inland water fisheries. There is also a need to increase research capacity related to the conservation of endangered aquatic species, such as the freshwater Irrawaddy dolphin (*pesut mahakam*). This is an area where research advice to support policy, management and decision-making at all levels of government is required.

v) Highly capable research institutions and researchers that contribute to evidence-based fisheries management and policy development

Building capacity in research management and leadership was identified as a high priority. This includes the capacity to formulate and implement research plans that are aligned with management and policy objectives. This integration with policy and management objectives would contribute to strengthening evidence-based policy, management and decision-making. A key element of this is the need for capacity building to ensure effective communication and dissemination of research results to decision-makers and stakeholders. Activities in this area could assist in identifying and establishing processes and relationships that increase uptake of research outputs to inform decision-making. This could include elements such as fishery status reporting, which would build on the work of the national stock assessment committee. This was seen as an area that could contribute to long-term, institutional capacity building.

vi) Effective engagement with women in stakeholder discussions, management and policy development

There are limited data and information on the role of women in Indonesian fisheries. However, gender-related research is providing increasing evidence that women have important roles in fishing, processing and marketing, particularly in small-scale fisheries (Fitriana and Stacey 2012). This is highlighting that women are potentially important stakeholders in local fisheries management and decision-making. The limited engagement of women in stakeholder discussions, management efforts or policy development can result in lost opportunities to improve conservation practices and ensure secure, viable livelihoods. There was a clearly identified gap in understanding the role of women in fisheries and associated communities and also the need for capacity building to improve engagement with this stakeholder group. This is seen as a high priority to support improved policy, management and decision-making at national, provincial and district levels and in support of pursuing the Millennium Development Goals.

Women selling fish in the town of Jepara in Central Java. Photo: Tony Bartlett

Table 1. Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
i) Productive and sustainable tuna fisheries	1. Effective engagement and cooperation on tuna fisheries management with neighbouring countries and regional fisheries management organisations (RFMOs) (long term)	1.1 Increase scientific capacity to support bilateral and RFMO engagement 1.2 Increase capacity to meet RFMO data and reporting requirements	Research papers submitted to RFMO meetings and in support of bilateral discussions RFMO data and reporting requirements met Research plans for RFMO and bilateral engagement developed and implemented
	2. National tuna management plans for neritic tunas are based on sound research and support implementation of the ecosystem approach to fisheries management (EAFM) (long term)	2.1 Increase research capacity and understanding of neritic tunas and the associated fisheries to inform management (see 3.1) 2.2 Conduct research and capacity building to support the implementation of EAFM	Research projects undertaken to increase the understanding of neritic tunas and the associated fisheries Capacity-building activities undertaken to support EAFM implementation with respect to neritic tunas Communication activities undertaken to extend the research results to managers and policymakers Management decisions and policy development processes explicitly consider research outcomes
	3. Improved knowledge and understanding to support evidence-based management of tuna fisheries, including neritic tunas, at national, province and district levels (medium term)	3.1 Conduct research and capacity building in the areas of: • catch and effort data collection (including scientific observer programs where appropriate), data management and analysis • fisheries status reporting and stock assessment, including approaches for data-poor stocks or fisheries • biology and population dynamics • characterisation of habitats, including feeding and spawning areas and understanding the oceanographic and environmental variables that influence distribution and abundance • stock structure (genetics) • impact of climate change on tunas and the associated fisheries	Research plan to support tuna fishery management plans developed and implemented Research projects undertaken address key areas Capacity-building activities undertaken and researchers trained in key areas Communication activities undertaken to extend the research results to managers and policymakers Tuna management decisions and policy development processes, at national, province and district levels, explicitly consider research outcomes

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Table 1 (cont'd). Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
i) Productive and sustainable tuna fisheries (cont'd)	4. Improved understanding of the social and economic characteristics of tuna fisheries and associated communities to support evidence-based management of tuna fisheries (medium term)	4.1 Conduct research into the social and economic characteristics of tuna fisheries (industrial and small-scale) and their associated communities. This could include: • understanding the dependence of fisheries and communities on different species • understanding supply chains and markets • evaluation of the social and economic implications of different management options	Research plan to support tuna fishery management plans developed and implemented, including social and economic components Research projects undertaken address key areas Capacity-building activities undertaken and researchers trained in key areas Communication activities undertaken extend the research results to managers and policymakers Tuna management decisions and policy development processes, at national, province and district levels, explicitly consider research outcomes
	5. High-quality research being conducted at the Research Institute for Tuna Fisheries (RITF) in Bali (medium term)	5.1 Conduct research and capacity-building activities at RITF, including collaborations with RFMOs and other initiatives. This work could cover elements identified under 3.1 and 4.1	Research projects undertaken at RITF Capacity-building activities undertaken at RITF Collaboration with RFMOs and other initiatives in research and capacity building
	6. High-quality research and capacity building contributing to building institutional capacity and the potential establishment of a research facility in Bitung, North Sulawesi (long term)	6.1 Conduct research and capacity-building activities in Bitung—this should continue collaborations, such as with the Western and Central Pacific Fisheries Commission (WCPFC). This work could cover elements identified under 3.1 and 4.1	Research projects undertaken in Bitung Capacity-building activities undertaken in Bitung Collaboration with RFMOs and other initiatives in research and capacity building Australian Centre for International Agricultural Research (ACIAR) support recognised as contributing to the institutional capacity and potential establishment of a research facility

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Table 1 (cont'd). Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
i) Productive and sustainable tuna fisheries (cont'd)	7. Improved understanding of ecologically related species (in particular, bycatch) in tuna fisheries to support the implementation of the EAFM and RFMO conservation and management measures (long term)	7.1 Collect data and analyse to characterise and monitor ecologically related species by gear/fishery and region 7.2 Conduct research and capacity building in approaches for risk assessment, stock assessment and management strategies for data-poor fisheries and species 7.3 Conduct research to characterise the social and economic importance of ecologically related species in these fisheries 7.4 Conduct research and capacity building to support the implementation of EAFM	Data collection and analysis processes in place for fisheries/regions Research projects undertaken on ecologically related species in tuna fisheries Capacity-building activities undertaken and researchers trained in risk assessment, stock assessment and management strategies for data-poor fisheries and species Research projects undertaken on the social and economic importance of ecologically related species in these fisheries Research and capacity-building activities undertaken to support EAFM implementation Communication activities undertaken to extend the research results to managers and policymakers Tuna management decisions and policy development processes, at national, province and district levels, explicitly consider research outcomes Capacity-building activities undertaken to support the implementation of RFMO conservation and management measures.

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Table 1 (cont'd). Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
ii) Productive, sustainable and coordinated management of inland waters	8. Local management decisions are informed by research on the interactions between competing freshwater uses (including cage culture) (medium term)	8.1 Continue the research and capacity-building activities for capture fisheries in reservoirs, investigating the interactions with other activities and co-management approaches. This will include: • capture fisheries data collection and analysis • habitat modification, including sedimentation • monitoring of invasive alien species • support for the implementation of EAFM 8.2 Extend the work in Citarum River reservoirs (ACIAR Project FIS/2002/111) to associated rivers and floodplains 8.3 Collaborate and facilitate capacity building with the Southeast Asian Fisheries Development Center's (SEAFDEC's) Regional Center for Inland Fisheries Development	Research projects undertaken to increase the understanding of inland fisheries Capacity-building activities undertaken in inland water fisheries research Communication activities undertaken to extend the research results to managers and policymakers Management decisions and policy development processes explicitly consider research outcomes Research project undertaken to extend previous work in Citarum River reservoirs to associated rivers and floodplains Collaboration and capacity-building activities undertaken with the Regional Center for Inland Fisheries Development
	9. Social and economic aspects of inland fisheries and associated communities (including the role of women) are understood and inform management decisions (medium term)	9.1 Research the social and economic characteristics of inland waters capture fisheries (including the role of women)	Research projects undertaken to document the social and economic characteristics of inland waters capture fisheries (including the role of women) Communication activities undertaken to extend the research results to managers and policymakers Management decisions and policy development processes explicitly consider research outcomes
	10. Water quality monitoring and early warning systems in place so farmers and fishers can respond rapidly to potential threats (long term)	10.1 Research water quality monitoring and management, including impacts of eutrophication and water quality 10.2 Develop and trial water quality monitoring systems and early warning systems	Research projects undertaken on water quality monitoring and management Water quality monitoring and early warning system trialled in inland waters

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Table 1 (cont'd). Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
ii) Productive, sustainable and coordinated management of inland waters (cont'd)	11. National-level inland waters policy is underpinned by robust data on the extent of inland waters (medium term)	11.1 Collect data on the area of inland waters	Survey of the extent of inland waters undertaken
iii) Evidence-based policymaking and management of marine protected areas	12. The design of marine protected areas (MPAs) is guided by research findings (medium term)	12.1 Collect data and analyse to underpin advice on MPA development, zonation and the interaction with fisheries management and the implementation of EAFM	Research projects undertaken to inform MPA design and its role in the implementation of EAFM MPA development and zonation decisions are informed by research outcomes
	13. The effectiveness of MPAs is monitored regularly (long term)	13.1 Conduct research and capacity building on approaches to measure and monitor the effectiveness of MPAs	Capacity-building activities undertaken on measuring and monitoring the effectiveness of MPAs Research projects undertaken on MPA monitoring
	14. Fisheries refugia and other management measures are established when appropriate (medium term)	14.1 Conduct research to identify important habitats/ areas for species and contribute to the design of fish refugia and other related management measures (such as open and closed seasons)	Research projects undertaken to identify habitat use by species Management decisions are informed by research in this area
	15. Social (including gender) and economic aspects of MPAs are understood (medium term)	15.1 Research social and economic aspects of MPAs and the associated fisheries and communities, including gender factors	Research projects undertaken to document the social and economic aspects (including gender factors) of MPAs and the associated fisheries and communities

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Table 1 (cont'd). Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
iv) Ecologically sustainable and healthy aquatic environments (marine and inland)	16. Evidence-based management plans are implemented for the conservation of species, habitats and ecosystems (long term)	16.1 Conduct research and capacity building on inland water habitat changes, including sedimentation rates, wetlands improvements to reduce sedimentation, pollution types and approaches to habitat rehabilitation 16.2 Conduct research and capacity building in marine waters conservation, including coastal, mangrove, sea grass and coral reef habitat monitoring and environmental engineering strategies (e.g. artificial reefs) 16.3 Build capacity to provide status reports on at-risk species that include stock structure, risk assessment, trajectories and rehabilitation strategies 16.4 Collect social and economic data to inform management plan development and decision-making	Capacity-building activities undertaken on inland water habitats Research projects undertaken on changes to inland water habitats Capacity-building activities undertaken on marine waters conservation Research projects undertaken on marine waters conservation Status reports completed on at-risk species Data on social and economic aspects of habitat change collected and considered in decision-making
	17. Effective conservation of endangered aquatic species (long term)	17.1 Conduct studies that provide improved information on conservation approaches to endangered aquatic species	Management plans developed for endangered species
v) Highly capable research institutions and researchers that contribute to evidence-based fisheries management and policy development	18. Institutional integration of scientific outputs into management plans and policy development (medium term)	18.1 Establish institutional processes and relationships that strengthen the links to, and consideration of, research outcomes by policy and decision-makers and managers	Formal and informal institutional processes established to strengthen links between research agency and policy and management agencies Management plans and policy development processes explicitly consider research outcomes
	19. Research programs, projects and activities are explicitly linked to fishery management plans and policy priorities (medium term)	19.1 Build capacity in strategic research planning processes that include researchers and end users of the research (policy and decision-makers and managers)	Capacity-building activities undertaken with staff members who have research management roles to develop strategic research plans Capacity-building activities undertaken with policy and management staff on the role of research in evidence-based policy development and management

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Table 1 (cont'd). Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
v) Highly capable research institutions and researchers that contribute to evidence-based fisheries management and policy development (cont'd)	20. Research results and implications are disseminated more effectively to key stakeholders (medium term)	20.1 Build capacity of researchers in effective communication with key stakeholders 20.2 Establish processes that formalise research dissemination, such as: • fishery status reporting • harvest strategy development 20.3 Assist appropriate researchers to apply for ACIAR John Allwright Fellowships (postgraduate studies) and John Dillon Fellowships (career development)	Capacity-building activities undertaken within ACIAR projects on effective communication for research staff Researchers participate in capacity-building activities on communication Formal and informal processes established to disseminate research results among government agencies Fishery status reporting commenced, building on national stock assessment reports Capacity-building activities undertaken on harvest strategy development for technical staff, research management and policymakers ACIAR fellowships associated with ACIAR projects awarded to appropriate researchers
	21. Integrated information management systems for data collection, exchange and analysis at national and provincial levels. These would facilitate reliable information availability within institutions on aspects such as: stock abundance, catch rate, species composition, size composition, gear selectivity, production value, trade statistics and market intelligence (long term)	21.1 Develop data-sharing systems and processes 21.2 Train enumerators and observers 21.3 Identify other institutions that hold related data and then develop metadata 21.4 Establish electronic databases that link traceability and trade	Data-sharing systems further developed (noting work underway in current pelagic fisheries project FIS/2009/059) Enumerators and observers trained Metadata available for related data held by other institutions Database and sharing system established for traceability and trade data

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Table 1 (cont'd). Key results areas, outcomes, strategies and measures of success

Key results area	Outcomes (time frame for achieving outcomes)	Strategies	Measures of success
v) Highly capable research institutions and researchers that contribute to evidence-based fisheries management and policy development (cont'd)	22. Improved institutional capacity to undertake research to inform fisheries management, policy development and decision-making (long term)	22.1 Build capacity in key fisheries-related research, including biological, ecosystem, social and economic areas 22.2 Build capacity towards increased publications in international journals 22.3 Build capacity in research program management 22.3 Increase number of researchers undertaking postgraduate degrees and further training	Researchers trained, within projects or capacity-building activities, across biological, ecosystem, social and economic areas Researchers trained, within projects or capacity-building activities, to increase their ability to publish in international journals Staff with research management roles trained, within projects or capacity-building activities, in research program management Researchers gain postgraduate qualifications in association with ACIAR projects.
vi) Effective engagement with women in stakeholder discussions, management and policy development	23. Key stakeholders are aware of the role of women in fisheries and associated communities (medium term)	23.1 Collect data and information to understand the role of women in fisheries, pre-production and postharvest activities and associated communities 23.2 Incorporate gender-specific research into social and economic research activities, considering livelihoods and food security 23.3 Evaluate the social and economic impacts of policy and management, including consideration of gender factors	Projects explicitly collect data and information on the role of women Projects undertake social and economic research that explicitly considers gender factors Management and policy decisions are informed by research on the role of women
	24. Women are engaged at every level of fisheries management, from community consultation to government policy planning (long term)	24.1 Build capacity to improve engagement with women in fisheries	Capacity-building activities undertaken within ACIAR projects Staff participate in capacity-building activities Fisheries-related engagement activities explicitly and effectively engage women

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FIS/1994/024: Studies on live baitfish for the tuna industry in eastern Indonesian waters

FIS/1996/082: Management and conservation of the terubuk (*Tenualosa macrura*) fishery in Riau province, Sumatra, Indonesia

FIS/1997/165: Biology, fishery assessment and management of shared snapper fisheries in northern Australia and eastern Indonesia

FIS/2000/062: Artisanal shark and ray fisheries in eastern Indonesia: their socio-economic and fisheries characteristics and relationship to Australian resources

FIS/2000/128: Community-based management of the terubuk fishery in Riau, Indonesia

FIS/2000/163: The identification of researchable options for the development of policy and management frameworks to combat illegal, unreported and unregulated (IUU) fishing activities in Indonesian and Philippine waters

FIS/2001/079: A review of Indonesia's Indian Ocean tuna fisheries and extension of catch monitoring at the key off-loading ports

FIS/2002/019: Management and policy frameworks for illegal, unreported and unregulated (IUU) fishing in Indonesian and Philippine waters

FIS/2002/074: Capacity development to monitor, analyse and report on Indonesian tuna fisheries

FIS/2002/111: Culture, capture conflicts: sustaining fish production and livelihoods in Indonesian reservoirs

FIS/2003/037: Artisanal shark and ray fisheries in eastern Indonesia and their relationships with Australian resources

FIS/2005/025: Fisheries rehabilitation in tsunami-affected Indonesia: community needs assessment and resource status

FIS/2006/142: Developing new assessment and policy frameworks for Indonesia's marine fisheries, including the control and management of illegal, unregulated and unreported (IUU) fishing

FIS/2009/059: Developing research capacity for management of Indonesia's pelagic fisheries resources

Unloading ray and shark catch at Tanjung Luar in eastern Lombok. Photo: William White

Fishing boats moored at the river in Pacitan, East Java. Photo: William White