



# Small-scale octopus fisheries, Indonesia

A primer for fisheries stakeholders



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**Front page image:** Octopus arms © Blue Ventures / Garth Cripps

# Summary

## A critical livelihood to traditional fishers

Octopus fisheries take place on coral reef habitats throughout Indonesia and are dominated by traditional, small-scale fishers. The growing demand for octopus – predominantly *Octopus cyanea* – particularly for export to Europe and the USA, has made it a high value product and increased fishing pressure. Traditional fishers catch it using simple gear, and because other valuable nearshore species are depleted, it has become a critical livelihood to many poorer small-scale fishers.

According to export data compiled by the Indonesian National Statistics Agency (Badan Pusat Statistik) octopus fetches a higher price per kilogram than the average price of frozen tuna. However, quality is lost in local collection networks, shrinking the value of catches. Furthermore, though traditional fishers use highly selective fishing methods with no bycatch, there is no market differentiation or branding of the product to reflect this. Despite the considerable socioeconomic importance and export value of octopus, there is no management plan in place for the fishery, which, like most small-scale fisheries in Indonesia, remains essentially unregulated and de facto open access. Given the scale of market demand for octopus for export, without management the fishery is likely to suffer through overexploitation.

## A key opportunity to manage nearshore fisheries

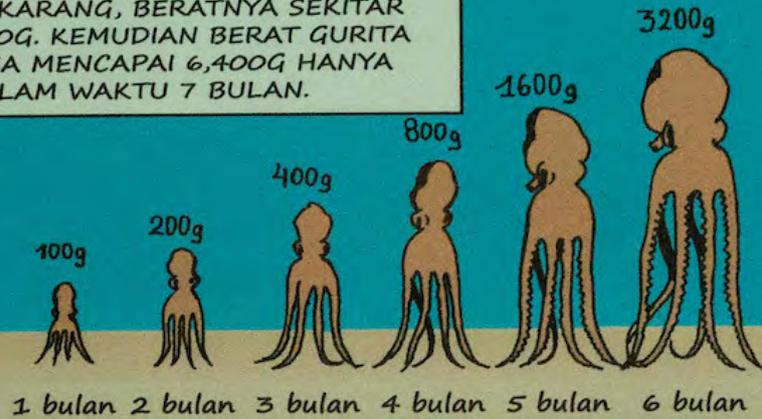
Across a growing number of Indian Ocean coastal states, there is strong precedent of small-scale fishers enacting simple but robust management to rebuild octopus fisheries. As a highly productive fishery that responds rapidly to management, octopus presents an opportunity to diversify fisher livelihoods away from other overfished coastal species, and so reduce pressure on reefs.

Historically traditional systems of local fisheries management were in place in many regions of Indonesia, however these practices are no longer followed in large parts of the archipelago. Nevertheless, current legislation on coastal zoning, as well as decentralisation of environmental decision making to regional and village government, create opportunities for local management.

In the case of octopus, efforts to rebuild the fishery could be mandated through the development of a dedicated national fisheries management plan (RPP) for the species. Such a plan would be one of the first to focus exclusively on a small-scale, traditional fishery. Management of the octopus fishery could also be implemented through Community-Led Fishery Improvements (CLFI) formalised at provincial, district and village levels, and implemented by fishers as a model for future

## GURITA TUMBUH DENGAN C

GURITA BERTAMBAH BERATNYA DUA KALI LIPAT SETIAP BULAN. KETIKA MEREKA HIDUP MENETAP DI KARANG, BERATNYA SEKITAR 100g. KEMUDIAN BERAT GURITA BISA MENCAPAI 6,400g HANYA DALAM WAKTU 7 BULAN.



## SIKLUS HIDUP GURITA (OCTOPUS CYANEA)



① GURITA BETINA BERTELUR SEKITAR 300.000 BUTIR DI LUBANG KARANG DAN MENERAMI TELURNYA SELAMA SATU BULAN SAMPAI MENETAS.

② ARUS LAUT MEMBUAT BAYI GURITA YANG BERUKURAN SANGAT KECIL TERSEBAR

③ SETELAH 3 SAMPAI 4 BULAN GURITA AKAN MENETAP DI KARANG.

④ MEREKA HIDUP DAN TUMBUH DI TERUMBU KARANG YANG DATAR DAN MEMAKAN KEPITING, KERANG KERANG, DAN IKAN KECIL.

⑤ SETELAH 8 SAMPAI 10 BULAN, GURITA BETINA PINDAH KE KARANG YANG LEBIH DALAM UNTUK BERTELUR.



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adoption by other small-scale fisheries.

This high-value, highly selective fishery carries a strong human and conservation story: a fishery in which traditional fishers interact with some of the most biodiverse coral reefs on earth. There are ready opportunities to increase the fishery's value through overcoming inefficiencies in the supply chain, as well as market differentiation of landed products. Where most octopus fishers and traders operate on very thin margins, these commercial opportunities would incentivise the implementation of fishery improvements. In doing so, the full value of octopus as a strategic fishing resource to Indonesia could be fully realised. This would provide a powerful demonstration of the role of traditional fishing communities in safeguarding nearshore fisheries and coral reef ecosystems.

## Marine fisheries are critical to Indonesia, but are in trouble

Indonesia is among the world's most important seafood producers and is second only to China in the production of its marine capture fisheries. Small-scale fishers catch 92% of the nation's fishing production. They are vital to coastal economies and are critical to the food security of 260 million people: Indonesians consume roughly 32 kilograms of seafood *per capita* per year, nearly double the global average of 19 kilograms. In remote islands, seafood forms up to 90 percent of the protein consumed by local people. Indonesia's Ministry of Maritime Affairs and Fisheries (MMAF) estimates that 4.4 million people are directly employed in small-scale fisheries and 25 million in secondary employment.<sup>1</sup>

Yet coastal fisheries within the 12-mile zone are *de facto* open access. Other than restrictions on the use of destructive fishing gear, such as explosives or poison, small-scale fisheries in Indonesia are essentially unregulated. Government data show that many coastal fisheries targeting small pelagic fish, as well as squid and blue swimmer crab, are now fished at or above their full capacity. Ninety percent of Indonesia's 16.42 million coastal and small island population lives below the poverty line. Across the country's population as a whole, nearly 40% of Indonesians live just above the national poverty line (Asian Development Bank 2015) and are vulnerable to shocks that can easily drive them back into poverty.

Given their exceptional responsiveness to management, and high productivity, octopus fisheries are a ready opportunity to revitalise and sustain small-scale fisheries, especially in coastal waters where other high-value species such as sea cucumber, garoupa, lobster and *Trochus* are becoming scarce. They can ultimately catalyse broader improvements in the local management of nearshore, small-scale fisheries. Such improvements are critical to the future welfare of Indonesia's people both in terms of ensuring food security and supporting sustainable development.



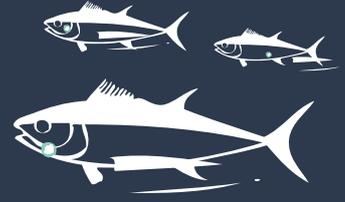
**4.4 million**

people directly employed in small-scale fisheries in Indonesia



**>60%**

of total Indonesian fishery production contributed by small-scale fishers



**54%**

of Indonesia's animal protein supply comes from seafood



# Fishery Profile

## Resource characteristics

Habitat	Coral reefs and nearby rubble
Capacity to rebound	High
Market value	High
Stock health / status	Unknown, but likely to be fully exploited to overfished

No stock assessment exists for *Octopus cyanea*, so it is difficult to assess the sustainability of the commercial fishery. There is no documentation on the subsistence catch (Crespo 2015). However, because of an influx of exporters into the fishery, both fishermen and buyers state that catches have decreased markedly over the last five years, with widespread overfishing.

*Octopus cyanea* has a low vulnerability to fishing pressure because of its high fecundity, low age at maturity, relatively short lifespan and rapid growth rate (Crespo 2015). However, its behavior and spawning spikes can make it vulnerable to overfishing (Crespo 2015).

Because octopus is relatively resilient to fishing pressure, simple but effective management would allow stocks to rebound and safeguard long-term production.

## Management systems

Fishing rights	None
Monitoring & enforcement (MCS)	Low / ineffective
Scientific data quality	Low
Management data quality	Medium
Fishery improvement projects	None

Most small-scale octopus fishers have no formal or secure rights to their fishing grounds. There are currently no regulations specific to octopus fisheries, such as a minimum catch size, annual fishing closures or quotas.

In contrast to commodities such as tuna and blue swimming crab, there is no fishery management plan (Rencana Pengelolaan Perikanan – RPP) for octopus, nor is octopus considered within the official Maximum Sustainable Yield (MSY) calculation by the Ministry of Maritime Affairs and Fisheries (MMAF). Yet, as a strategic development asset, octopus is at least as important as these other fisheries. Octopus feeds a growing export market, fetches a higher price per kilogram than frozen tuna, is entirely fished by small-scale fishers, and requires no specialised equipment.

Though octopus is subject to the overarching regulatory framework governing (among others) fisheries management under Law 31/2004 (as revised by Law 45/2009), there are as yet no regulations specific to octopus fisheries. As mentioned above, they remain *de facto* open access and unregulated.

Destructive fishing techniques are commonly used in nearshore fisheries and undermine the coral reef ecosystem octopus depend on. Some, such as blast or cyanide fishing, are banned, but enforcement of these regulations is low in many areas, as are most fisheries in Indonesia.

## Supply chain

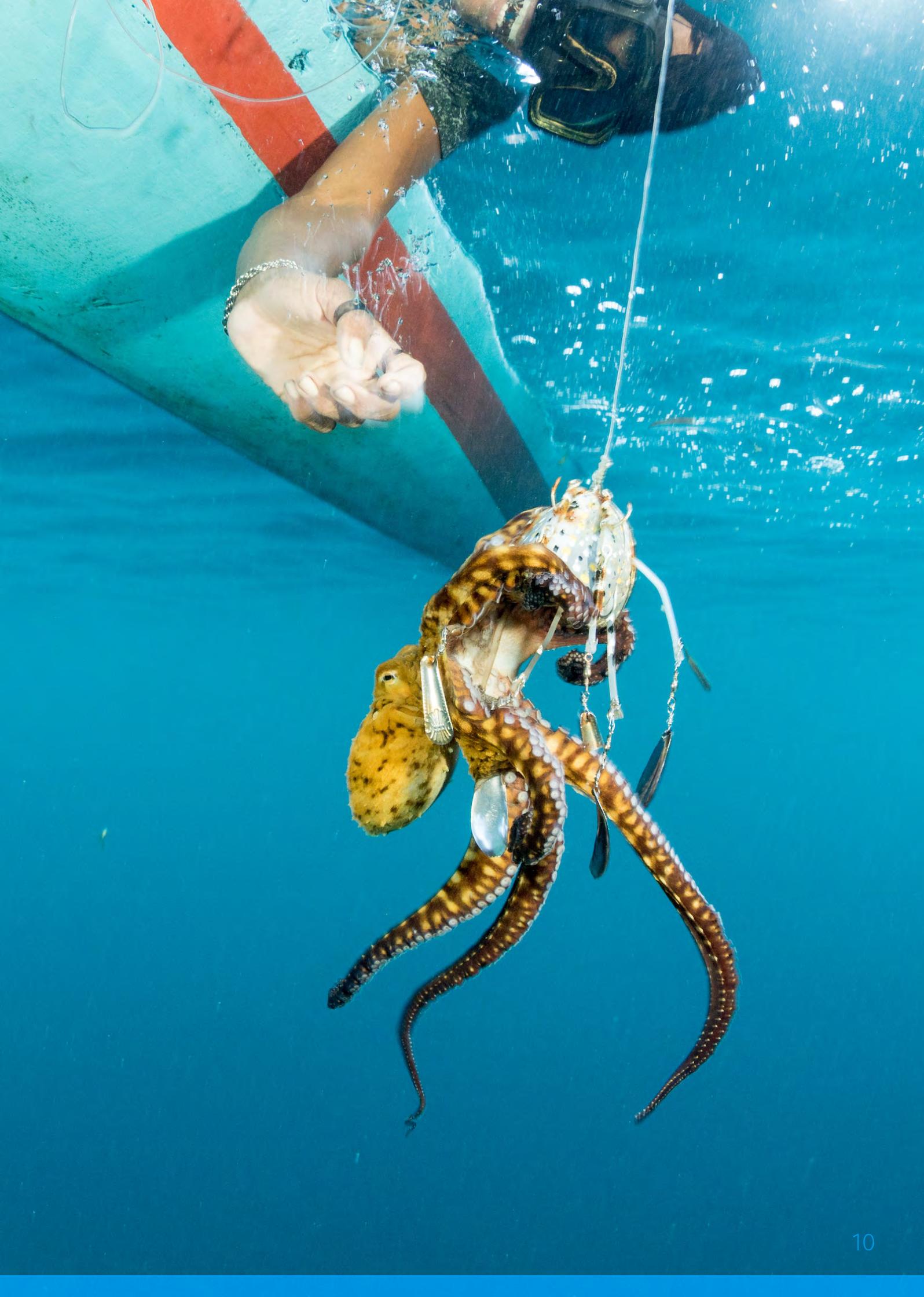
Actors between fishers and consumers	Up to 6 (neighbourhood and village collectors; intermediary traders at district and provincial levels; processors & exporters; foreign distributors / wholesalers)
Price capture	Exporters capture up to 55% of total export value; traders capture around 15%, fishers around 30%
Quality of logistics	Village collectors & intermediary traders (medium); exporters (high)
Processing constraints	None for exporters, well capitalised
Value chain priorities	Presently volume; quality & sustainability are not a focus

Fishers are linked to processors and exporters through a network of highly integrated supply chains involving neighbourhood (dusun) and village collectors, and intermediary traders at district and provincial levels. Through such supply chains, for example, octopus caught by fishers in south, southeast, central and north Sulawesi, as well as regions such as north Maluku (Tidore) and east Kalimantan (Balikpapan), finds its way to processors and exporters in Makassar.

Exporters act as price setters and, together with intermediary traders, they capture most (*approx.* 70%) of the total export value of octopus. Volume takes precedence over sustainability and quality. Some traders, however, recognise that size limits would be a good idea in ensuring that stocks are not depleted.

Most value is lost with collectors, who often store octopus for too long and at insufficiently cold temperatures before selling it on to other traders or exporters in order to reduce transport costs. This, together with a lumpy payment schedule back down the supply chain, depresses the price paid to fishers.

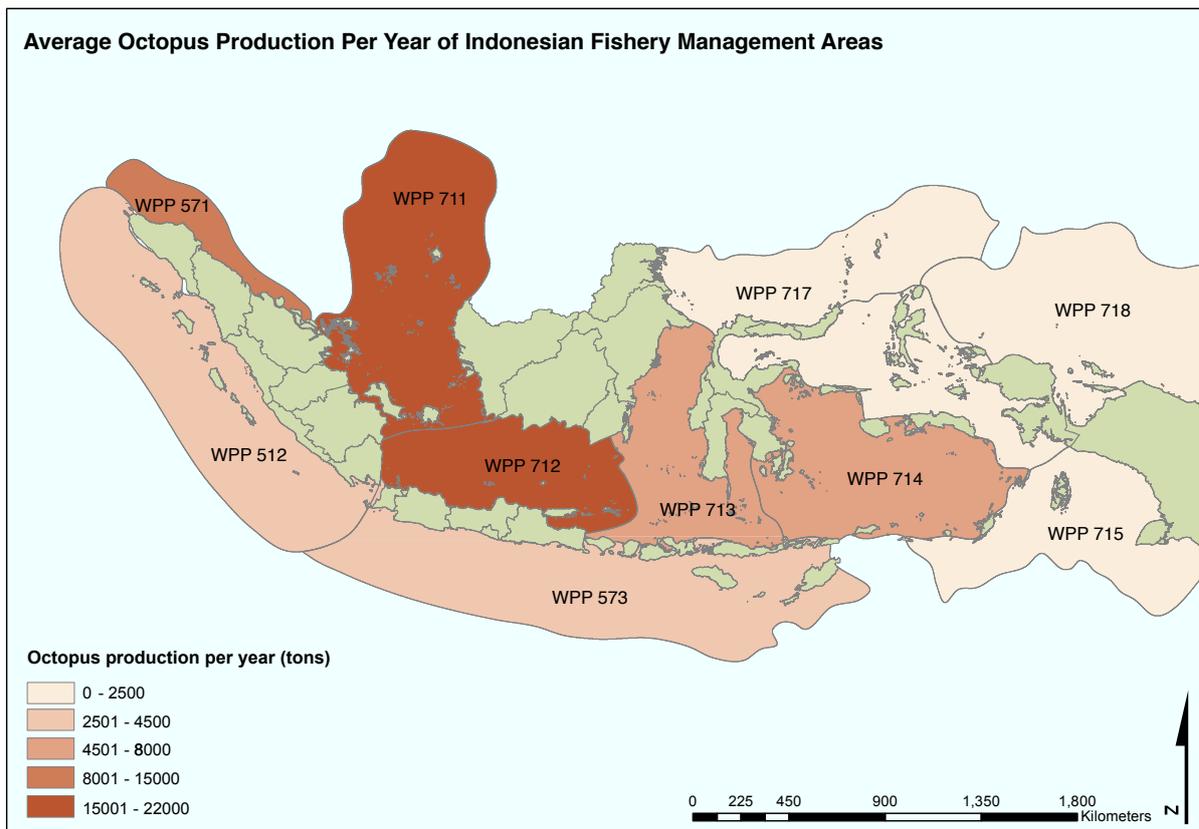
Intermediary traders work to thin margins, and so depend on their ability to maximise turnover and volume. Many lock in supplies by advancing loans to collectors further down the supply chain, who in turn advance loans to individual fishers. Fishers rely on loans to meet basic needs such as the cost of higher education. Loans are rarely ever paid off in full. There is heavy social pressure to honour these relationships, even if fishers are able to secure better prices elsewhere.



## Production

There are major discrepancies between export and production data, indicating that a significant proportion of the octopus harvest goes unreported. Monitoring is difficult as small-scale fishers using vessels below 10 gross tonnes (GT) are not required to obtain fishing licenses<sup>2</sup>.

The figure below shows average octopus production per year, between 2011 - 2015, according to fishery management area:



## At sea

Fishing is dominated by small-scale fishers in shallow waters up to four nautical miles from shore, and who catch octopus in addition to other species. In south Sulawesi, production peaks between October and April, when fishers catch on average 10 - 20 kg per trip. Production is lowest between July and September, when seas are rougher.

Octopus is mainly caught on reef flats by individual artisanal fishers (both men and women) using lures and spears at low tide, by fishermen diving, and by individual fishermen fishing from small wooden boats using lures on handlines in deeper coral reef and coral rubble habitats. Traps and pots are also used in some regions, but not widely because they catch less and can involve complex hauling operations (Crespo 2015). Most fishing methods, especially lures on hand lines, are targeted, have no bycatch and cause little to no damage to habitat.

## Illegal, unreported and unregulated (IUU) fishing

Octopus fishing is dominated by traditional small-scale fishers. As they use only small boats or glean on foot, they fall within the <10GT legal definition of small-scale fishers and do not require a fishing license. So, a proportion of their catch, both for subsistence as well as for sale, goes unreported.

Enforcement of existing fisheries regulations is weak, and in some coastal areas illegal, unreported and unregulated (IUU) fishing is still a significant challenge for inshore fisheries. Since octopus is traded through a complex network of debt and obligation, which also sponsors the use of illegal fishing practices such as cyanide and fish bombs, it is hard to disaggregate from a wider patterns of bonded labour, overexploitation and illegality in the fishing industry, especially in certain areas such as South Sulawesi.

## At market

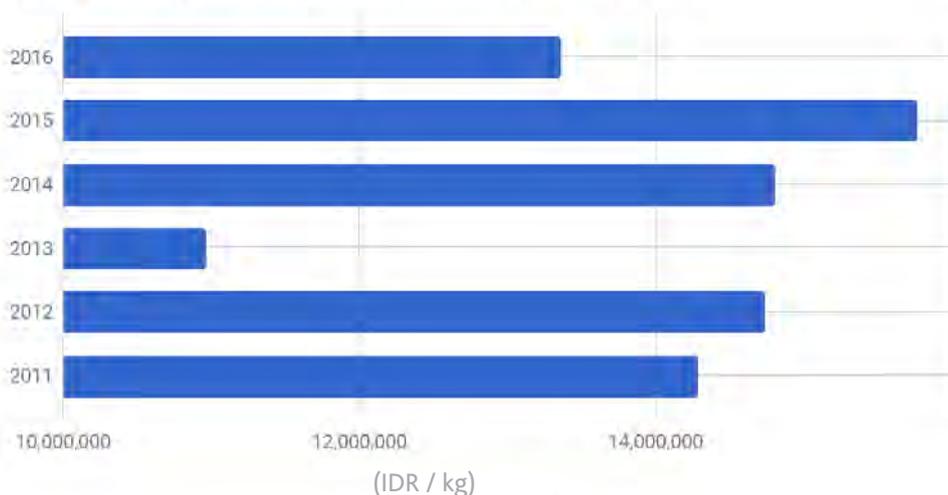
Octopus exports fluctuated significantly over the period 2011 - 2016. Bad weather, including the impacts of the recent El Nino, are possible causes.

### *Frozen octopus exports from Indonesia 2011 - 2017*

	<b>Volume (Kg)</b>	<b>Value (USD)</b>	<b>Price(USD/kg)</b>
2011	14,286,288	71,047,405	4.97
2012	14,738,281	72,343,662	4.91
2013	10,960,650	40,560,121	3.70
2014	14,812,902	57,616,067	3.89
2015	15,772,422	60,413,737	3.83
2016	13,362,691	51,601,840	3.86
2017*	7,531,653	33,469,105	4.44
average			
2011 - 16	13,988,872	58,930,472	

Source: BPS (2017) <sup>3</sup> Note : \* January to June 2017 only

Octopus exports from Indonesia 2011— 2016



While the average export price for octopus fell from 4.97 USD/kg in 2011 to 3.70 in 2013, it has since risen year-on-year because of growing international demand, reaching 4.4 USD/kg in 2017.

The fluctuation in exports and prices between 2011 - 16 meant that the value of exports ranged from a high of 72.3 million USD in 2012 to a low of 40.6 million in 2013.

Presently, Europe is the single biggest importer of Indonesian octopus; in 2015, 32% was exported to Italy alone. The USA is an important growing market, accounting for 23%, followed by Korea and Japan. Other growing markets include Australia.

The growing demand for octopus has made it a high value export commodity. According to government export statistics, frozen octopus is far more valuable than the average price of frozen tuna: the export price of tuna averaged just 1.76 USD/kg in 2017 versus 4.44 for octopus (BPS, 2017). Indonesia has fewer global competitors in the octopus trade compared to tuna. Octopus is also exclusively caught by small-scale fishers and the equipment needed to catch octopus is simple and low cost.

## Constraints

### Key enablers of health stocks

Secure tenure	None, an open fishery
Sustainable harvests	Unknown; no sustainable harvest rule in place
Monitoring & enforcement	Community (low); independent collectors (low); exporters (strong)

### Key drivers of fishery value

Stock health	Unknown
Operational efficiency	Possible to improve
Market value	Possible to improve



# Opportunities

As noted before, octopus is a highly productive fishery that responds rapidly to management improvements. Moreover, well-managed octopus fishing presents an opportunity to diversify fisher livelihoods away from other overfished coastal species, and so reduce pressure on reefs. It also presents an entry point through which to test and institutionalise improvements in small-scale fisheries management overall.

## Fisher-led management

Octopus fisheries in Indonesia are well suited to the [fisheries management models](#) that communities have successfully enacted with other small-scale octopus fisheries in a growing number of east African and western Indian Ocean coastal states. These experiences have demonstrated that fishers can take effective management steps, beginning with [temporary octopus fishing closures](#), which can in turn catalyse a groundswell of local support for broader fisheries management and marine conservation interventions, including through [Locally Managed Marine Areas \(LMMAs\)](#). Published research showed that the temporary octopus fishing closures pioneered Madagascar in 2004 brought about an [87% increase in the average weight of octopus caught and a 137% increase in fisher income](#) in the month following their opening. Exporters also benefited as larger octopus fetched a higher price on export markets. Better management of fisheries increases stocks and sustainable yields, helping increase fisher earnings.

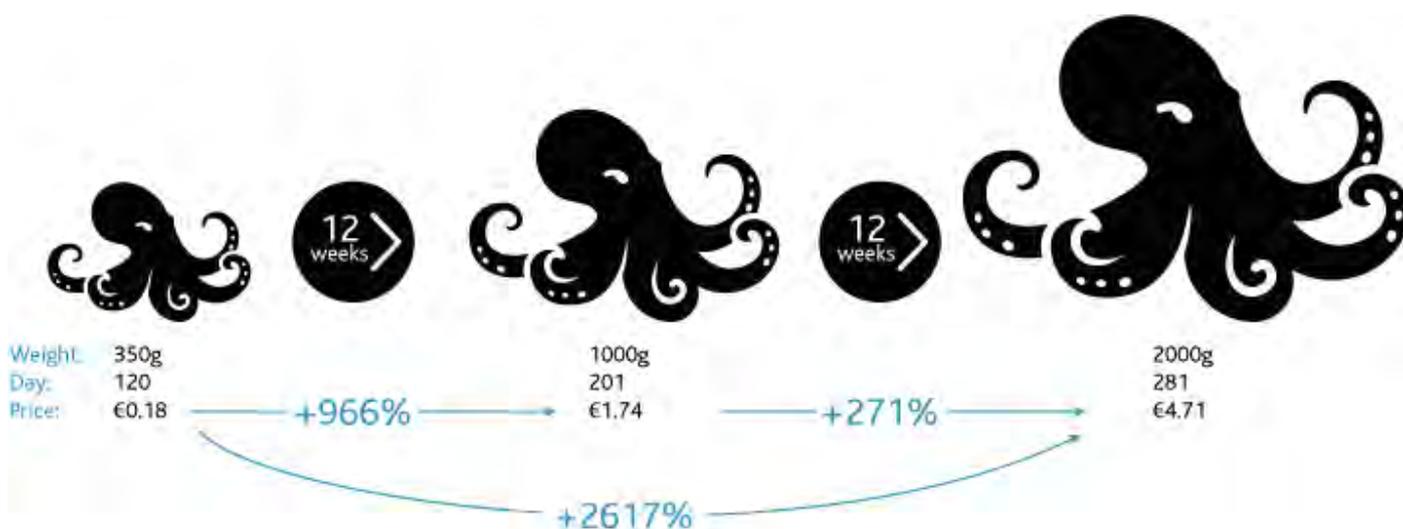
## Community-Led Fishery Improvements

Actions such as community-led, temporary fishing closures would build on Indonesia's strong historical tradition of customary coastal resource management (Buchary et al. 2007; OECD 2013), including the traditional use of temporary closures to enhance catches of *Trochus*, sea cucumbers and fish. Experience from the western Indian Ocean demonstrates the efficacy of such actions in empowering traditional fishers to secure and manage their customary fishing grounds and restore them as productive commons. This can help small-scale fishers avoid collapse of the resource commonly seen in unregulated, open-access areas. In particular, actions such as community-led temporary fishing closures can catalyse local support for securing and controlling access, establishing sustainable harvest limits, and monitoring and enforcing these limits effectively. These are the three most important enabling conditions considered essential to rebuilding healthy fish stocks.

In the future, should demand for octopus lead overseas buyers to seek MSC-certified octopus product from Indonesian suppliers, the establishment of these customary coastal resource management systems, formalised as village regulations under Village Law 6/2014, would provide the foundation for, and accelerate the implementation of, a Fishery Improvement Project (FIP) and eventual MSC assessment.

## National governance

Indonesia's octopus fishery presents new opportunities for local stakeholders to work with regional and national government authorities to improve the governance and sustainability of small-scale fisheries and to create a context where local management and FIPs can succeed. Under MMAF's leadership, a national octopus management plan (RPP), based on a deeper understanding of the fishery and its considerable socioeconomic importance, would result in Indonesia's first fishery management plan focused exclusively on a traditional small-scale fishery. This could help to inspire the development of similar plans for other traditional small-scale fisheries.



*The economic case for leaving octopus in the water longer, through temporary fishing closures: Growth in weight and price of *O. cyanea* over time. Growth rate data adapted from Herwig et al. (2012); prices are those paid to fishers in Popisi, Banggai Island, Central Sulawesi, September 2017.*

## Fisheries value

Quality, and therefore value, is lost because of inefficiencies in local supply chains. Furthermore, there is no differentiation or branding of Indonesian octopus caught by traditional fishers at the end market. Improved supply chain logistics and traceability systems offer ready opportunities to drive value. The growing market for octopus in Europe and the USA that is sourced from sustainable fisheries with a strong human and conservation narrative indicates further strong commercial opportunities to incentivise FIPs implemented by traditional fishers.

## Footnotes

1. Though estimates of the number of fishers vary depending on the source, ranging from 2.5 - 3.7 million (1) to 7.9 million (2).

(1) CEA, 2016. "Indonesia Fisheries: 2015 Review." Prepared for The David and Lucile Packard Foundation.

(2) International Fund for Agricultural Development (2015) Investing in Rural People in Indonesia

2. In 2014 the Minister of Fisheries issued an administrative circular (Surat Edaran Menteri Kelautan dan Perikanan Republik Indonesia, 7 November 2014) lifting the requirement for artisanal vessels under 10GT (i.e. between 5 & 10GT) to obtain fishing licenses. These vessels are still, however, required to report and sell their catch at designated auction places. This change is expected to be enshrined in law under a new (2019) fisheries law.

3. Data compiled by Barunastra with support from the Ministry of Maritime Affairs and Fisheries (MMAF) SocioEconomic Research Agency, comparing available export and production data on octopus for the period 2011 - 2017 as published by the National Statistics Agencies (BPS) and MMAF.

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