



Here's what all the fuss is about — cannonball jellyfish *Stomolophus meleagris* (© L. Brotz)

Jellyfishing in Mexico: the burgers are ready

Andrés Cisneros-Montemayor and Lucas Brotz

On a warm winter day in the capital of Sonora, a state in northern Mexico bordering the Gulf of California, over 80 stakeholders gathered for a pre-opening fishery planning meeting. Such a meeting — which included fishers, processors, scientists, and managers — is not unusual, but the fishery in question is anything but traditional. These men and women had come to discuss what has recently become one of the most valuable fisheries in the region: jellyfish.

The fishery for *Stomolophus meleagris*, the cannonball jellyfish (locally called *medusa bola de cañon*, or the generic *aguamala*), first started in the region in the early 2000s, with one well-established company hiring about 70 small boats (*pangas*) to dip-net for jellyfish. In addition to the fishers,

hundreds of workers were employed to help dry, salt, bleach, and package product for export to Asia. Fishers were paid about 6 cents US per kilo and the fishery lasted for up to four months, a boon during the dog months between the shrimp and crab seasons. Over the last decade, this new economic incentive in the absence of strong management and enforcement capacity has played out like a textbook case of the tragedy of the commons. Last year, over a thousand boats fished for jellyfish, at least two dozen processing plants sprang up (some of them literally beach-side tents paying cash), and the price paid to fishers more than tripled.

The fishery lasted for five days until there were no more jellyfish to catch.

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Processing plants may handle hundreds of tonnes of jellyfish in a single day (© Javier Álvarez-Tello).

Dr. Miguel Cisneros-Mata is the government researcher tasked with providing scientific advice for jellyfish management in the region. Over the course of the next few weeks, he and a team of young researchers from the National Fisheries Institute research station in Guaymas, Sonora, will survey the entire state coast for jellyfish. They will investigate the abundance and size structure of local jellyfish "veins" in order to recommend an opening date for the fishery, along with other advice for managers. We joined two such surveys, one in central Sonora (Las Guásimas) and one further south in Bahía Lobos, within native Yaqui territory. Between surface tows, GPS mapping, and biometric sampling, these surveys provide an excellent avenue for discussing new data, rumours and experiences from fishers, as well as providing

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a better idea of the fishery both in ecological and human terms.

A recurring theme in discussions with fishers, processors, and scientists, is the issue of truly enforcing science-based fisheries policy. Everyone agrees with and understands the need for size limits and spatial closures, but limited enforcement capability is a fact of life here, and there is little trust that handshake agreements will hold up beyond the first transgression. Dr. Cisneros-Mata thinks the keys to achieving a sustainable fishery include spatial zoning and processing plants. The entire coastline cannot be patrolled, but if processing plants can be held accountable for the jellyfish they receive, restrictions on size could trickle down to fishers. One processor at the jellyfish planning meeting, after openly (and rather refreshingly) admitting that their firm encourages illegal fishing in order to compete with others, stated that "you don't need much infrastructure to process jellyfish, we can do it as well as anyone; so why should only a few processors make the big money from this?"



Processed jellyfish nearly ready for export to Asia (© Javier Álvarez-Tello).

We have come to accept free markets as vital for economic growth, and restricting the number of jellyfish processors would likely bring the associated troubles of a planned economy. However, any processor should be required to comply with transparent safety, sanitation, and fisheries management guidelines in order to operate (so, no more

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The *Sea Around Us* Project website can be accessed at www.seaaroundus.org and contains up-to-date information on the Project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and The Pew Charitable Trusts that began in July 1999. The Pew Charitable Trusts work around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

tents). Combined with a flexible and adaptive framework for allocating fishing permits, as well as implementing policies in accordance with regional abundances of jellyfish (which are highly variable), this would allow for a natural restructuring of the sector where policies would be dictated by regional ecology while the business of processing could regulate itself.

Fisheries for jellyfish also present a unique set of management challenges due to the peculiar life cycles of the organisms. Many jellyfish, including cannonballs, have a bipartite life cycle. We are all familiar with the 'medusa' phase, but after spawning, fertilized eggs form ciliated larvae that seek out hard substrate in coastal waters. These larvae then metamorphose into tiny polyps that resemble miniature sea anemones or coral polyps without skeletons (note that all of these organisms belong to the phylum Cnidaria). Little is known about the sessile polyp phase, especially in the field, but polyps can presumably survive for years, sometimes even transforming into cysts capable of resisting harsh environmental conditions. When conditions are favourable, polyps will undergo a dramatic metamorphosis where they begin to segment and asexually release 'ephyrae' (baby jellyfish), in a process known as 'strobilation'. Each polyp may release numerous

ephyrae and will often strobilate more than once within the same season. Ephyrae join the plankton, grow rapidly, and develop into medusae, resulting in a jellyfish bloom. Abundances of jellyfish vary dramatically between years, and the environmental conditions that control their populations are not well understood. As such, determining the 'fishable stock' of jellyfish is difficult. While jellyfish polyps may provide a buffer against overfishing, they are not a guaranteed safeguard. Jellyfish fisheries have been depleted in other parts of the world, and although preliminary, recent catch data suggest that a similar trend could be unfolding in the Gulf of California.

The unique challenges presented by jellyfish fisheries, combined with the complicated situation of regulation and enforcement in Mexico, leaves us with more questions than answers. What should be the targets and goals of the cannonball fishery? Will maximizing economic profit restrict resources to only a few? Is the jellyfish fishery doomed to repeat the fate of so many other depleted stocks in the region and around the world, or can it be a sustainable resource? And perhaps most importantly, how bad have things become when thousands of people are fighting over jellyfish? 🌍

Note from your editor!

THE RECONSTRUCTIONS ARE ALMOST DONE!

Kyrstn Zyllich and Vicky Lam — our database wizards — have compiled data on our worldwide project of marine fisheries catch reconstructions, and only 30% of them are yet to be completed (but all are in progress). The other 70% are completed, although not entirely validated or published yet.

Dr. Daniel Pauly has also compiled and/or written over 200 summaries of these reconstructions, which will represent the backbone of our forthcoming Atlas. However, since this is only halfway to completion (290 summaries expected), the June publishing date has been pushed back to August.

The *Sea Around Us* Project is as productive as ever, with — to date — over a dozen articles in peer-reviewed journals (including *Conservation Biology*, *Cybium*, *Fish and Fisheries*, *Fisheries Research*, *Global Environmental Change*, *PLOS ONE*, and *Scientia Marina*), as well as several books chapters, e.g., by D. Al-Abdulrazzak, D. Zeller and D. Pauly (University of California Press), and S. Villasante, U.R. Sumaila and M. Antelo (Oxford University Press). Many Fisheries Centre Working Papers have also been published online since the beginning of 2014 (available at: www.fisheries.ubc.ca/biblio/type/1001), and one report in the Fisheries Centre Research Reports series has been completed (with many others on their way; available at: www.fisheries.ubc.ca/biblio/type/1000).

With the reconstructions nearing completion, this list is expected to grow by the day... so you can now get back to your reconstructions!

