

HOW OVERFISHING IMPACTS YOU: 1

The battle for ocean supremacy: the jellyfish conquests



OCEAN2012
Transforming
European Fisheries

This briefing published by OCEAN2012 exposes how overfishing impacts on coastal communities and people's favourite seaside resorts in Europe. It is part of a series of briefings illustrating the impacts of overfishing on people or marine ecosystems caused by the excess removal of millions of tonnes of marine life every year.

The blooming jellyfish threat

In 2010 jellyfish blooms (swarms) reaching plague proportions led local officials to close beaches in the Mediterranean and Black Seas during the height of their summer tourist seasons. The same year a jellyfish expert from Barcelona's Institute of Marine Sciences warned that the potentially deadly box jellyfish (*Carybdea marsupialis*) had been seen in swarms off the Spanish Costas (Brava, Blanca and del Sol)¹. In early August, in just half an hour, the Red Cross treated 50 people in Denia, Costa Brava for injuries from the mauve stinger jellyfish (*Pelagia noctiluca*), although this appears minor compared to the 4,000 people who needed treatment there on a single summer's day in 2008, following a major infestation².

For many people, one jellyfish might cause a mild sting and rash. But for others, the box jellyfish, mauve stinger and Portuguese man o'war (*Physalia physalis*) can cause excruciating pain, severe allergic reactions or even death for people with respiratory or cardiac problems^{3,4}. If one jellyfish can do this, think of the consequences for unsuspecting swimmers encountering dense swarms, dozens of kilometres long, with around 10 mauve stinger jellyfish per cubic metre of water (about the same as the space inside a large bin bag)⁵.

1 <http://www.diariodemallorca.es/mallorca/2010/06/30/medusa-peligrosa-mediterraneo-llegar-balears-presencia-litoral-alicantino/582850.html>

2 <http://www.dailymail.co.uk/news/travelnews/article-1299851/Tourists-warned-guard-mauve-stinger-swarms-jellyfish-invade-Spains-Costa-Brava.html>

3 Burnett, J.W. and Calton, G.J. (1987) Jellyfish envenomation syndromes updated. *Annals of Emergency Medicine*, Vol.16, No.9, pp.1,000-1,005.

4 Bentlage, B., Cartwright, P., Yanagihara, A.A., Lewis, C., Richards, G.S. and Collins, A.G. (2010) Evolution of box jellyfish (Cnidaria: Cubozoa), a group of highly toxic invertebrates. *Proc. R. Soc. B.*, Vol.277, No.1, 680, pp.493-501.

5 NSF (2008) *Jellyfish Gone Wild: Environmental Change and Jellyfish Swarms*. Special Report of the National Science Foundation. Arlington, VA: NSF. http://www.nsf.gov/news/special_reports/jellyfish/index.jsp



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...overfishing is making way for invasion by jellyfish

Why is this happening?

For decades scientists have been studying the causes and consequences of jellyfish blooms in ecosystems. They agree that jellyfish and fisheries-based ecosystems have a complex relationship and evidence suggests that these ecosystems can reach a tipping point, shifting rapidly from being fish-dominated to jellyfish-dominated^{6,7}.

In simple terms, jellyfish blooms are growing – and stresses caused by human activity such as overfishing are said to be the most likely cause. Fisheries-based ecosystems are frequently overfished, and taking too many fish out of ecosystems creates ecological space for jellyfish to thrive⁸.

The arrival of jellyfish on beaches on any given day may be caused by several factors including currents, salinity or temperature. Some scientists and politicians blame climate change for jellyfish entering more northerly waters, or pollution for jellyfish population explosions. While these factors may be connected, researchers have demonstrated that overfishing is a significant contributory factor in almost every major jellyfish bloom they studied⁸.

In fact, some researchers say that overfishing gives jellyfish populations an exponential boost⁹. Research has shown that overfishing is removing so many fish from some local ecosystems that it is making way for invasion by jellyfish¹⁰.

6 http://news.bbc.co.uk/1/hi/northern_ireland/7655568.stm

7 http://www.world-nuclear.org/info/cooling_power_plants_inf121.html

8 Richardson, A.J., Bakun, A., Hays, G.C. and Gibbons, M.J. (2009) The jellyfish joyride: causes, consequences and management responses to a more gelatinous future. *Trends in Ecology and Evolution*, Vol.24, No.6, pp.312–322.

9 Pauly, D., Graham, W., Libralato, S., Morissette, L. and Palomares, M.L.D. (2009) Jellyfish in ecosystems, online databases, and ecosystem models. *Hydrobiologia*, Vol.616, No.1, pp.67–85.

10 Jackson, J.B.C., Kirby, M.X., Berger, W.H., Bjorndal, K.A., Botsford, L.W., Bourque, B.J., Bradbury, R.H., Cooke, R., Erlandson, J., Estes, J.A., Hughes, T.P., Kidwell, S., Lange, K.B., Lenihan, H.S., Pandolfi, J.M., Peterson, C.H., Steneck, R.S., Tegner, M.J. and Warner, R.R. (2001) Historical overfishing and the recent collapse of coastal ecosystems. *Science*, Vol.293.

The bottom line is that the more degraded a fishery ecosystem becomes, the more likely it is that jellyfish populations will benefit⁹.

Where could this lead?

Systematically removing large predatory fish like tuna and cod, as well as overfishing crustaceans and molluscs, can lead to devastating changes. Gradually, large organisms, species diversity and structural diversity are replaced in ecosystems by more primitive species groups such as jellyfish⁹.

The effect on the oceans – some examples

The collapse of small fish living closer to the surface, such as sardines or anchovies, can reduce predation pressure on jellyfish while increasing jellyfish food sources. In Namibian waters, sardine overfishing is believed to have

caused the previously fish-rich ecosystem to become dominated by jellyfish⁸. This shift in the ecosystem is then amplified as the sheer numbers of jellyfish out-compete the fish by preying on the same zooplankton species^{9,11}.

Large marine creatures such as turtles prey upon larger jellyfish, so an increase in jellyfish abundance may seem like good news for critically endangered species like the leatherback turtle. However, turtles are one of only a few predators of larger jellyfish but are themselves at risk from overfishing and so negates any corrective effect they might have on jellyfish numbers. To make matters worse jellyfish prey upon the eggs and larvae of fish species, directly impacting on fish populations⁹.



COREY ARNOLD

THE OVERFISHING FACTS

In 2011, mainly due to poor data, the state of 64 percent of fish stocks in EU waters was unknown. Of those known, 63 percent of stocks were overfished, compared with a global average of 28 percent. In the Mediterranean, a staggering 82 percent of known stocks were overfished.

North Sea catch limits for 2011 decided by EU Fisheries Ministers were on average 11 percent higher than scientific advice, while limits for the Irish and Celtic Seas and west of Scotland were 42 percent higher.

Despite subsidised reductions, the EU fishing fleet still has the capacity to fish

two to three times the sustainable level.

Between 2007 and 2013, the EU's European Fisheries Fund will have subsidised fishing and related industries with €4.3 billion. Fuel for fishing vessels is exempt from energy taxes, and State aid and EU-funded fisheries partnership agreements with

non-EU countries also serve to subsidise fishing fleets and the fishing industry across the European Union.

Sources: COM(2011)298 Consultation on Fishing Opportunities, May 25 2011. European Commission fact sheets on the CFP, 2008.

...swarms of mauve stingers invaded the Med

Trawling and other methods impacting the seabed could create improved conditions for jellyfish: removing competitors and predators from the seafloor while simultaneously leaving rocky outcrops as jellyfish refuges may give the advantage to jellyfish over fish^{9,11}.

The cost to coastal industries

Estimates suggest that the severe jellyfish invasion of the Black Sea has cost tourism and fishing industries about €240 million since the 1990s⁵.

Every year since 2000 Spanish officials on the Costas, concerned about the health and safety of millions of holiday-makers, have closed beaches because of jellyfish invasions^{5,12}. Over the decade swarms of mauve stingers invaded other popular Mediterranean tourist destinations from France to Greece¹².

11 Purcell, J., Uye, S. and Lo, W-T. (2007) Anthropogenic causes of jellyfish blooms and their direct consequences for humans: a review. *Marine Ecology Progress Series*, Vol. 350, pp.153–174.

12 <http://www.timesonline.co.uk/tol/news/world/article554006.ece>; <http://www.telegraph.co.uk/news/1525957/Jellyfish-invasion-shuts-Mediterranean-beaches.html>; <http://www.amb-cotedazur.com/Eco-France-2/jellyfish-swarms-descend-on-the-french-riviera.html>; http://www.typicallyspanish.com/news/publish/article_26947.shtml

Research suggests that on the French Riviera in 2004 as many as 45,000 people were treated for severe jellyfish stings¹². With around two million tourists a year visiting the Costa Brava alone, regular beach closures cost local businesses and communities because beach-loving tourists are forced away from the shores to spend their holiday cash elsewhere. The cost to the public health system is incalculable.

Meanwhile, some coastal communities are spending vast sums to prevent jellyfish swarms reaching shallow water and beaches. Cannes and Monaco built floating barriers. Antibes uses a vacuum-boat to suck hundreds of jellyfish from the water at a time. Other communities use offshore nets and booms. Yet each of these costly solutions is aimed only at treating the symptom – jellyfish – not the cause.

Since 2000, Scottish and French salmon and trout farms have suffered losses of several million Euros. Fishing nets become clogged with jellyfish and split, or fish quality may be significantly reduced – last year fishermen from San Sebastian, northern Spain collected more than 300 deadly Portuguese man o'war jellyfish from their nets in one day¹².

What can I do about it?

As we have seen, the longer-term concern is that in the battle for marine ecosystem supremacy, the current jellyfish conquests may be the result of systematic human-induced stress. This is leading to the destruction of highly evolved marine ecosystems and ultimately their reversion to a less evolved, more gelatinous state. This is called a phase shift. Some think it is not too late to prevent our fish seas from phase shifting to gelatinous seas⁸. There is still time to avoid higher costs to communities dependent on tourism, fishing, fish farming and other industries. There is still time to prevent greater risks and costs to public health and safety.

How do we end overfishing? Politicians have responsibility for making the decisions that will end overfishing; citizens have the responsibility of choosing what they eat, and by encouraging and supporting their politicians to make those decisions. You can help end overfishing by speaking up and taking action to achieve a far-reaching ecological vision of healthy oceans and sustainable fisheries.



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OCEAN2012 is an alliance of organisations dedicated to stopping overfishing, ending destructive fishing practices and delivering fair and equitable use of healthy fish stocks.

OCEAN2012 was initiated, and is co-ordinated, by the Pew Environment Group, the conservation arm of The Pew Charitable Trusts, a non-governmental organisation working to end overfishing in the world's oceans.

The steering group of OCEAN2012 consists of the Coalition for Fair Fisheries Arrangements, Ecologistas en Acción, The Fisheries Secretariat, **nef** (new economics foundation), the Pew Environment Group and Seas At Risk.

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