

The Lionfish Is the Tip of the (Melting) Iceberg

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The Mediterranean is becoming an ideal environment for tropical species arriving through the Suez Canal, but then settling permanently, with incalculable damage to marine

biodiversity and local economies. There are many ideas to address this phenomenon, from gastronomy to cosmetics, but the key issue is climate change: if we don't address that, we won't solve anything.

Its scientific name is *Pterois miles*, it originates from the Red Sea and the Pacific Ocean, and it was first identified in Mediterranean waters in 1991 in Israel. From that moment on, sightings have multiplied: Turkey, Greece, Cyprus, and in 2023 it appeared in the waters off Calabria. Most likely, it arrived accidentally, in the ballast water of ships passing through the Suez Canal.

Its common name is "lionfish," a name only slightly more reassuring than that of its close relative *Pterois volitans*, also known as the "scorpionfish," another tropical species already sighted in the Mediterranean.

The association with the lion comes from a sort of mane made of spines that characterizes *Pterois miles*, and which, along with its bright colors, makes it particularly sought after by aquariums—only for owners to realize it's very difficult to manage, needs huge amounts of space, and any "companions" it's housed with will quickly become its food. This trait, perhaps, also makes it similar to the king of the jungle.

Whether lion or scorpion, their spines are not just for show: they carry a toxic substance that helps them when hunting prey, but is also neurotoxic to humans who might get stung while fishing or handling them (the spines remain active even 48 hours after the fish's death). The consequences include intense pain, temporary loss of sensation in affected areas, occasional loss of consciousness, tachycardia, difficulty breathing... and all of this can last for several days.

It's Not About How It Got Here, But Why It Stayed

Now, if this species, along with many others, has been able to find a comfortable habitat in the Mediterranean, it's for reasons that have nothing to do with aquariums or even with more structural factors like the expansion of the Suez Canal—which has significantly increased maritime traffic in the Mediterranean since 2015. Of course, that factor has had and continues to have major importance, to the point that we've had to learn a new word to describe species arriving in the Mediterranean through trade routes: we call them Lessepsian species, named after the engineer who designed and oversaw the construction of the canal, Ferdinand Marie de Lesseps. Lessepsian species are those that migrate from the Red Sea to

the Mediterranean; anti-Lessepsian species go in the opposite direction. However, the Suez Canal was inaugurated in 1869, and migrating species were never a serious problem until the last few decades.

So the real issue isn't how they get here, but how the Mediterranean ecosystem has changed—if animals accustomed to very warm waters now find themselves so comfortable here.

The central point is that the waters of the Mediterranean are getting increasingly warmer, and therefore increasingly welcoming to the lionfish today, as well as the blue crab, *siganus*, pufferfish, and various types of jellyfish in past years.

The current situation of the Mediterranean as a haven for tropical species is well described by Stefano Liberti in his *Tropico Mediterraneo* (Laterza, 2024), which includes accounts from experts and sector professionals. Marine biologist Ernesto Azzurro, perhaps the leading expert on alien species in the Mediterranean, told him:

“Our sea is now a subtropical sea. This is not something that will happen in the future—it has already happened.”

The lionfish thrives in water temperatures between 22 and 26°C, and the Mediterranean, being a closed sea with shallow waters and slow circulation, heats up more quickly than the oceans—at a rate of 0.4°C every 10 years. Think that's nothing? You'd be wrong, because that means each human generation will find the water a degree warmer, leading to the disappearance of organisms that can't adapt and the emergence of others that once couldn't survive in these waters.

This replacement, this change in Mediterranean biodiversity, is painful for many reasons—the first of which is the speed at which it's happening.

Local economies, consumption habits, and fishing activities can adapt to new species—but not at this speed. When changes occur this rapidly, the most immediate and likely consequences are negative: the species fishermen know how to catch disappear, the economies built around them collapse, and the communities that relied on those activities empty out. This is already happening: fishermen in the southern Mediterranean are selling their boats to smugglers, their children are migrating in search of a future elsewhere, coastal tourism is dwindling and dying out—precisely because the communities that once sustained those territories are disappearing.

The lionfish is certainly not the first “unwelcome guest,” **but it’s one of the most concerning**, for several interrelated reasons:

- **It’s voracious:** it’s a carnivorous fish, part of the scorpionfish family, and it eats anything smaller than itself. It usually stays on the seabed, where it easily finds fry and larvae.
- **It has no predators:** it’s a top predator that doesn’t risk being preyed upon—other species don’t recognize it as food, and its venomous spines protect it from attacks.
- **It’s prolific:** males fertilize the eggs of multiple females, and each female lays up to 2 million eggs per year.
- **It’s hard to catch:** it doesn’t swim in schools; the most common fishing method uses trained divers who catch them one at a time with spearguns.
- **It’s hard to handle, sell, and cook** due to its venomous spines.
- **It’s long-lived:** a specimen found in the National Marine Sanctuary of the Gulf of Mexico was 10 years old. Multiply each year by the potential egg-laying capacity of a single female, and you’ll understand why there’s reason to worry.

The result of this “perfect storm,” according to experts, is that if nothing is done, in 10 years we could see a 30% decrease in fish in the Mediterranean.

Where to Begin?

Certainly with data—so **research** should guide action. But the European Union’s DG Mare requires a mapping of lionfish presence before it will fund any initiatives. In reality, there’s already quite a bit of research, but the problem is the lack of a platform that can systematize this data, share it, and make it a common resource among different research centers. Researchers need to be able to work together, and right now the tool that would allow this doesn’t exist.

Meanwhile, many voices are calling for turning the problem into an opportunity, and that could be done in several areas: gastronomy, education, diving, non-food transformation (using the skin and exoskeleton for leather goods or costume jewelry), even the production of dietary supplements (omega-3 and omega-6).

Among these options, the most promising is surely the gastronomic one: we humans are basically the only potential predator of the lionfish, and so European tables—at home or in restaurants—could feature this new character. But be aware: at present, there is no

regulation allowing this product to circulate in Europe—it can be consumed in the country where it's caught, but any form of export is currently illegal.

A Body of Saltwater That Allows Us to Survive

But before teaching chefs how to clean and cook lionfish; before teaching divers how to catch or cull them; before inventing technologies to help fishermen target them (instead of catching them by accident); before launching startups to process them safely and at scale (if sufficient quantities can be caught); before informing consumers that lionfish can be delicious—we must all first understand what is happening, why our sea is getting warmer, and what we—citizens, businesspeople, politicians—must do to reverse this trend.

Perhaps even before the mapping that DG Mare rightly requests to fund countermeasures, we should demand that DG Mare make a massive investment in scientific outreach on the fundamental role oceans play in climate change.

According to IPCC estimates, about 93% of the excess heat in the atmosphere is absorbed by the oceans (which means they are warming), just over 2% is absorbed by polar ice and glaciers (which means they're melting), another 2% by continental landmasses (heating air and soil), and a bit over the remaining 2% stays in the atmosphere.

This is because the thermal capacity of oceans is vastly greater than that of the atmosphere, land, and ice—about 4,000 times greater than the atmosphere's at equal volume, meaning all the heat in the entire atmosphere could fit in just the top 2.5 meters of ocean depth.

Everything clear? The damage we see on land is caused by just 7% of the excess heat we produce—because the seas absorbed 93% of it. The fever we measure is not the real one, because most of the fever is underwater.

Not Just Warmer—More Acidic

Regarding the greenhouse gases emitted by human activity (mainly from burning fossil fuels), the IPCC reports that about 30% of global CO₂ emissions are absorbed by plants and natural ecosystems, just under 30% by oceans (which dissolves into marine waters, causing ocean acidification), and the remaining 40% stays in the atmosphere, intensifying the natural greenhouse effect.

If we look at the damage in the seas, we've already passed the urgency threshold.

All this means that a 0.1°C increase in the temperature of the first 20–25 meters of ocean depth is equivalent to a 1°C increase in atmospheric temperature. The mass of water involved is so vast that the time it takes for the ocean to change temperature is about 100 times longer than the atmosphere.

These comparisons give an idea of the enormous amount of energy stored in the oceans, and how the ocean responds—with much less and much slower temperature change—than the atmosphere when there are changes in the climate system’s energy balance.

In short: if we’re already able to measure warming in ocean waters, the damage done is already enormous.

The current climate depends not only on the present ocean conditions or those of recent years, but also on the state of the oceans in the distant past.

The Trump Card: Ocean Evaporation

The rise in average global temperature seen over the last century—and especially in recent decades—is not only altering ocean energy content, but is already causing increased evaporation of ocean waters. The IPCC has calculated that in recent decades, the average evaporation rate from oceans has increased by about 0.75% per decade. This means more water vapor in the atmosphere, amplifying global warming, because water vapor is itself a greenhouse gas.

The additional greenhouse effect caused by increased ocean-derived water vapor has been estimated at 1 watt/m² for each 1°C increase in global temperature

Hotter, More Acidic, and Saltier

Our small Mediterranean Sea reflects all these processes on a smaller scale. But since it’s a closed and shallow body of water, its evaporation rate is higher, which naturally **increases water salinity**—with predictable consequences for native marine species that can’t adapt, and advantages for tropical species that can.

Let’s Listen to the Lionfish’s Roar

So, let’s go back to the lionfish: yes, we can figure out how to fish it, reduce its fertility, or turn it into an innovative dish—but before all of that, we should listen to what it’s trying to tell us. It’s not true that fish are silent—this one speaks volumes.

Thanks to **Silvio Greco**, marine biologist, and **Vincenzo Ferrara**, climatologist, for their kind collaboration.

For further information:

Silvano Focardi, [Specie aliene: il pesce leone si diffonde nel Mediterraneo](#)

Stefano Liberti, *Tropico Mediterraneo. Viaggio in un mare che cambia*, Laterza, Bari, 2024

Fonte: <https://www.ruralhack.org/en/the-lionfish-is-the-tip-of-the-melting-iceberg/>