

Biodiversity



ISSN: 1488-8386 (Print) 2160-0651 (Online) Journal homepage: http://www.tandfonline.com/loi/tbid20

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To cite this article: Theodore N. Karfakis & G. N. Karfaki (2018): Setting priorities for addressing community historical rights and conserving biodiversity in the Inner Ionian Marine Protected Area, Greece, Biodiversity, DOI: 10.1080/14888386.2018.1478750

To link to this article: https://doi.org/10.1080/14888386.2018.1478750



Published online: 24 Sep 2018.



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Setting priorities for addressing community historical rights and conserving biodiversity in the Inner Ionian Marine Protected Area, Greece

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ABSTRACT

The Inner Ionian Marine Protected Area (MPA), currently the fifth largest MPA in Greece and one of the largest in the Mediterranean Sea, although internationally recognised as important for marine megafauna and marine biodiversity, exists mainly on paper, rather than in reality. The Inner Ionian MPA has a long history of environmental degradation whilst it has been under government control, something which began decades prior to its official designation as 'protected'. Our research has found that reports from various government and non-governmental scientific groups have consistently reported only commercial fishing and, to a much lesser extent, mass tourism-related pressures as the chief culprits of environmental degradation in the area. However, we argue that another principal cause for this degradation is aquaculture and we also identify several others based on our experience on the ground and interviews with local people. In this paper we also offer predictions for the future of the area given the current reforms in Greek legislation and budgets relating to Nature Protected Areas, along with a set of actions that we believe need to be taken in order to protect and restore the area's biological diversity whilst also providing livelihoods and wellbeing for the communities that border it, advocating for community-based conservation as the philosophical basis for this.

ARTICLE HISTORY Received 20 April 2018

Accepted 16 May 2018

KEYWORDS

Marine Protected Area; community conserved area; fishing; marine megafauna; aquaculture; precious corals

Introduction

The year 2018 is likely to be a high point in the history of the protected area system of Greece. The Greek Government is under pressure from the European Union (EU) for not having achieved the desired goals for its Natura 2000 areas, a part of a network of nature-protected areas within the EU. This initiative created legislation and pledged funds and resources, including EU funds, towards reorganising existing protected areas and for conducting management and environmental studies for them. Officially, the ultimate goals are to secure environmental protection and to install sustainable management systems to control the available natural resources and human activities associated with them. This reorganisation includes a unified plan to merge some Natura 2000 areas with respect to the management body responsible with some existing national parks and biosphere reserves. This does not include wildlife reserves, however, which still lack effective management controls. Currently, responsibility for law enforcement and environmental protection relies on the efforts of the forest service, the coastguard and the police. The legislation also resulted in the creation of entirely new protected areas, which meant a significant expansion of areas under protection.

This latter series of measures has been heralded, by the Greek government, as a breakthrough for protected areas in

the country. The government advocated that both expansion and restructuring were done in a way that led to both an increased contribution to the local and national economy as well as more effective control and monitoring systems, such as those found in other parts of the world.

However, the legislation and indeed much of the whole package of measures have come under criticism early in its inception from both government bodies and nongovernmental organisations. Contentious issues have included the likely devaluation of local forest services and related local government bodies, whilst also reducing the powers of protected area management authorities in favour of concentrating power in the hands of central government.

An additional criticism of the Natura 2000 revised legislation has been that this new package of measures essentially exposes areas to environmentally unsound practices that can be licensed with greater ease by the often-unchecked hand of central governments. This has been regarded by many groups as the next stage in the process of collapse of Greek environmental legislation that started with the 2011 ministerial decree on aquaculture that essentially zoned Greece according to the wishes of the aquaculture industry and continued with other pieces of legislation for wind farms, oil drilling and even legislation over a previously banned fishing method known 'winch fishing'.

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Justification for the latter was based on the fact that only a limited number of licences were issued and only to be used for scientific purposes. Irrespective of this however, some protected areas in Greece face disproportionately more threats and pressures relative to others. Resources and attention dedicated to some areas may simply be a waste of precious resources or resources not optimally spent in relation to those areas which most need it.

We propose resources that the necessary attention and funds for allocating MPAs are sometimes lacking deliberately due to the persuasive nature of extractive industries upon governments, and even some nature conservation organisations. It is also possible that this area is too 'sticky' and is simply out of the comfort zone of conservationists and politicians to deal with: a phenomenon that sometimes ultimately results in the degradation or altogether disappearance of such important biodiversity areas. We feel the Inner Ionian MPA falls into this category.

Based on currently available information we report on its conservation status, whilst providing our review on its potential future based on current conditions. We also provide a set of priorities that need to be addressed immediately for guaranteeing its survival, protection and restoration of its biodiversity and the livelihoods and rights of the local communities bordering it, on which their way of life depends.

Biological importance of the area

The Inner Ionian MPA is currently classed as an official Natura 2000 site (GR02220003) (e.g. Gonzalvo et al. 2011). The area was originally declared as a site of 'community importance' within the MPAs system and later as a 'Special Area of Conservation (SAC)'. The area is additionally protected under the ACCOBAMS treaty for marine mammals and is considered very important for marine megafauna, as well as the waters surrounding it, including species such as the fin whale (Balaenoptera physalus), several of which are endangered (Frantzis et al. 2003). Known commonly as 'the Greek trench', this area contains one of the four most important areas for the conservation of cetaceans in Greece (Notarbartolo Di Sciara and Bearzi 2010). The waters around Kalamos and Kastos specifically harbour large numbers, due to this area being a passing point for important prey species of fish for them (Piroddi, Bearzi, and Christensen 2010; Gonzalvo et al. 2011; Crivellari 2007). The area is also at the core of one of 8 marine biodiversity hotspots identified for the Mediterranean (Coll, Piroddi, and Steenbeek et al. 2010; Coll et al. 2012).

Two critically endangered species that reside here are the short-beaked common dolphin (*Delphinus delphis*) which is critically endangered locally and the Mediterranean monk seal (Monachus monachus) which is critically endangered globally. For or the former, the last known numerically significant population lives around the island of Kalamos in the Eastern Mediterranean, save for one other community living around the island of Ischia in Italy (Bearzi et al. 2002). Here is one of the most important strongholds the species has from the region (Bearzi et al. 2008). This species is the principal reason that several leading conservation groups have advocated for the designation of a stricter protected unit around the islands of Kalamos and Kastos (e.g. Bearzi et al. 2002). For both Kalamos and Kastos, the frequent presence of monk seals, a species listed in the International Union for the Conservation of Nature (IUCN) - Red Species list, is documented (Pesante, Politi, and Bearzi 2003).

Additionally, the island of Kalamos and its surrounding waters falling within the core of the MPA are regarded as one of the most important areas for birds in Greece by the Hellenic Ornithological Society and Birdlife International. Due to the important marine habitats such as Posidonia seagrass communities, nursery grounds for important fish species – such as hake and round sardinella – this area has been considered a prime fishing site for centuries. For a more detailed general overview of scientific information on the habitats and fish nursery sites of the area, Issaris et al. (2012) provide the most presently up to date literature review with relevant maps.

Socioeconomic considerations

The terrestrial borders of the Inner Ionian MPA host a variety of ethnic groups that can be classed in two broad categories: islanders and mainlanders. The latter group is perhaps the most diverse and includes people who have descended from settlers or agriculturalists from the Greek interior. It also includes some former nomadic and semi nomadic pastoralists from ethnic groups such as the *Vlachs*.

The mainland has had people moving there from the nearby islands as well as refugees of Greek identity from Asia Minor. During the Greek–Turkish conflicts of the 1920s, a large number of these refugees were resettled in Greece, dramatically increasing the population.

Much of the settlement along the coastal mainland areas is relatively recent, mainly due to its awkward geography in that it is a combination of steep mountains rising next to the sea with flat areas which were formerly wetland systems and not ideal for agriculture. Government projects drained these wetlands however and coupled with a continuous growth of infrastructure, people have been encouraged from the interior to settle move here, for the past 100 years or so.

Until a few decades ago, the small populations who lived and worked on the mainland were not involved in fishing,

or even boat transport within the current MPA. . According to our current knowledge of the area, it was the people of Kalamos who taught the new settlers how to fish and make and use boats as late as the 1960s and 1970s. This happened in tandem to the rise and fall of the country's right-winged military regime: a force that sought to suppress local initiatives or local governance systems, especially in what is now the Ionian MPA and the archipelago in general. Our research clearly indicates that prior to the militarisation of the area there was in fact a highly formal organised local governance system in the islands of Kalamos and Kastos in place for effectively and sustainably managing decision making and communal resources within the marine area, which of course included the fishing grounds of the local communities. This was effectively a 'community conserved area' but regrettably ceased being so due to interventions by the said military regime as well as the general socio-political turbulence of those times. From this point until the present, the management of communal forests and waters was managed by the state. Arguably, though, these community-conserved areas continued 'underground', thanks to the perseverance of the local people of the Kalamos and Kastos Islands. Their struggles against industries wishing to move into the area - especially wind farming and aquaculture - have never ceased.

Giving this ethnographical context, coupled with collapsing Greek environmental legislation and the country's current economic depression, one can appreciate the pressures and dangers the inner Ionian MPA not the entire system of MPAS in Greece. Just some of the contradicting factors making up this complicated environmental soup include: (1) rich fishing grounds with high densities of endangered marine megafauna that rely significantly on the fish for their survival; (2) ideal environmental conditions for the development of aquaculture; (3) the area being a chief passing point for marine transport; as well as (4) a prime spot for mass tourism activities. Combined with a relatively poor economic situation and unfettered development of the mainland, there is extreme lack of protection and incentive for creating and enforcing strict MPA legislation in this area.

Pressures and threats

Once rich in wild fish and marine megafauna, the Inner Ionian archipelago is currently a degraded lagoon-like hydroscape with once abundant marine organism spawning sites.

Ironically, the area contains very little of the marine megafauna that should be the main reason for the creation of the MPA in the first place. The populations of this megafauna, particularly when accounting for dolphins as the prime indicators (Bearzi et al. 2002, 2006, 2008), have suffered and in fact have collapsed over the last 20 years or so. Reasons cited for this range from increasing numbers of pollutants and contaminants, including agricultural run-off, in coastal water, causing increased mortality rates of young and adolescent individuals as well as reproductive failure all together (Bearzi et al. 2002). Another reason is possibility due to significant decreases in the abundance of food availability due to mismanagement of natural fisheries with overexploitation being a prime culprit, as is evident from relevant scientific research (Bearzi et al. 2007; Gonzalvo et al. 2011; Piroddi, Bearzi, and Christensen 2011).

Based on detailed analyses using simulation models and time series analyses of historical data on various fisheries species and cetaceans from the area, Piroddi, Bearzi, and Christensen (2010) posit that the ecosystem has been degraded since the 1970s, principally due to pressure from fishing activities and, to a lesser extent, changes in primary productivity of the ecosystem. They also theorise that this change in productivity could be attributed to changes in nutrient loading, which is a consequence of changes in water mass features, which have been reported by other studies on the dynamics of water mass in the Mediterranean for the period between 1986 and 1997. We argue that these changes can be attributed - either partially or entirely - to anthropogenic pollution and contamination, which has undoubtedly increased from the 1980s to now. It is important to note that it was during the same time period, that aquaculture farms where rapidly and increasingly installed in the area that is now the MPA and its surrounding area, and also in the period after it was declared protected.

The aforementioned thesis with respect to commercial fishing pressures on the ecosystem being the principal anthropogenic pressure gradient by far formed the basis for a 2009 call to action from various organisations and institutes calling the Greek government to act in protecting wild fish nursery sites and a host of marine megafauna, which included the short-beaked common dolphin, the loggerhead turtle (*Carreta carreta*) and the Mediterranean monk seal.

We agree partially with this thesis firstly with respect to the fact that it was government mismanagement that produced this dramatic degrading effect. We do not agree that it was due to commercial (including artisanal) fishing, and management of stocks, but rather the combined effect of many other pressures. These where not just mismanaged but where to a large extent deliberately allowed to be augmented due to political pressures and an unwillingness to address critical issues within the protected area and the waters surrounding it, combined with the acute lack of suitable data needed to address such issues including socioeconomic and historical data especially those on resource and marine space use.

We do agree with some of the recommendations on fishing method changes in the call, but we also believe that more measures are required at this level before any meaningful effect can take place. We also propose that the needs and rights of communities with 'historical right of use', i.e. of ancestral domains, of these resources need to be fully taken into account.

Below we discuss in order of decreasing ecological impact the significant anthropogenic threats and disturbances to the inner Ionian MPA, based on currently available information according to our opinion. These provide a very different picture to an EU-FP7 project on monitoring and evaluation of spatially managed marine areas of a project known as 'Monitoring and Evaluation of Spatially Managed Marine Areas (MESMA) (see Vassilopoulou et al. 2012 for details).

Aquaculture farming

Despite the apparent illogical nature of licensing aquaculture farms within and directly around MPAs even though Greece is a member of the EU, such a licence is allowed under certain environmental conditions and is accepted within the Natura 2000 protected areas system. Although these farms *do* need to provide a management study, which includes an environmental assessment component, it does not conform to any specific standards, based on our research. The government of Greece has shown a clear bias towards this type of activity, commencing at the 2011 ministerial decree where some ministers who signed it also happened to be major stockholders in the industry at the time.

These aquaculture farms in the inner Ionian MPA are essentially industrial meat producing farms which produce waste outputs equivalent, if not more, to industrial poultry and pig farms. Despite this we found that the relevant MESMA project (as detailed above) chose to list these as probable when having to choose between possible and probable.

Various allegations have emerged from national new channels that formaldehyde has been used in aquaculture farms across Greece, which governmental environmental inspectors reported use in an illegal manner and this has included farms in the general area. Pollution from these farms may potentially relate to the observed decline of megafauna in the area. Researchers working on monitoring their population and behaviour cited one potential reason for their decline may be due to contamination by xenobiotic compounds that accumulate in dolphin tissue, through biomagnification and cause particular immunesuppression and reproductive failure, though they did not mention any specific source for this in their discussions (Bearzi et al. 2002). If the situation with formaldehyde is a valid one for inner Ionian, then this may very well be a contributing factor as this substance has been shown to be a driver of birth defects and reproductive anomalies including reductions in fertility in other species including humans (e. g. Wang et al. 2015). Whatever the case may be, we propose that no form of industry can be awarded a licence to either have facilities to dispose or store waste - in any form - or both into nature protected areas and that there should be some form of buffer zone around this area where this can be done with specific restrictions much higher than any other type of area outside a protected one which are also specific to each individual area. We argue that even when not accounting for the effects of such pollutants, there are significant ecological effects. It is worth mentioning that significant changes due to pollution in specific have been noted in other areas of Greece (Machias et al. 2006) resulting in ecosystem level changes. These types of changes are probably already occurring or have occurred in the Inner Ionian MPA.

Based on research we have collected in peer reviewed literature, as well as our experience from conducting conservation work the area, we have thus far identified three main negative environmental impacts relating to aquaculture. The first has to do with genetic contamination of wild populations either from escaped or, for whatever other reason, purposefully released (e.g. diseased fish from farms). The work by Katsares et al. (2006) indicates genetic mixing of wild fish with cultivated species in fish farms, notably European sea bass (Dicentrarchus labrax). Their analysis included fish from farms from within the general area including the MPA under discussion and more specifically outside of the town of Astakos in Akarnania, and wild fish from areas ranging from the Atlantic to Igoumenitsa in an area outside the Inner Ionian MPA. The potential effects of genetic contamination have been examined in other studies and range from decreased adaptability to the wild environments to an increased risk to certain types of diseases and other health and immune issues.

The second has to do with *the collapse of ecological food webs and ecological processes* in the area through behavioural change and increased mortality, coupled with decreased reproductive rates in threatened marine megafauna. As has been noted in a variety of studies from the area already so far for both the critically endangered short beaked common dolphins and the critically endangered Mediterranean monk seal (Pesante, Politi, and Bearzi 2003) have been noted in and around aquaculture farms in the areas consistently for the former and opportunistically for the later. The researchers have also reported other general feeding behaviour and general presence around the pens. Therefore, one of the most important ecological relationships which exist in the MPA, i.e. megafauna and its interactions with its prey is being broken down and thus the surrounding ecosystem is being degraded from this form of disturbance. It also means emblematic megafauna, such as seals and dolphins, are coming into ever increasing contact with human activities, especially aquaculture farmers. We believe these behavioural changes are evidence of ecosystem collapse for species such as Mediterranean dolphins (Díaz López and Shirai 2007, 2008; Díaz López 2012). The potential negative effects for dolphins and seals can be extrapolated from similar situations that have been noted for these animals in other parts of the Mediterranean, such as increased risk and entanglement of finishing nets and wires as well as injury in associated marine structures. Another major issue for them is habitat exclusion from aversive acoustic or light emitting devices (Díaz López and Mariño 2011), and other general risks commonly noted such as habitat exclusion, which results from physical structures in the water for this type of habitat modification (Watson-Capps and Mann 2005). We believe that this factor is happening in tandem to the collapse of wild fish stocks and therefore dolphins are more likely to go to these farms for this reason. Despite that, dolphins in general are likely not to venture into these areas as they know they run the risk of being injured, which for dolphins also means a very high chance of death.

The third has to do with the degradation or even potential destruction of wild fish nursery sites where wild fish such as round sardinella and to a lesser extent European hake, in the areas identified by Somarakis et al. (2006) and Issaris et al. (2012) respectively, greatly overlap with fish farm locations in the area listed by Issaris et al. (2012) and Piroddi, Bearzi, and Christensen (2011), in the scale of hundreds of metres or less perhaps.

This we feel is unsurprising since the conditions needed for wild fish eggs and juveniles to develop are similar for many species, and for certain species, conditions such as these mean they can be farmed to large sizes relatively fast. However, due to fish farms occupying this space coupled with the subsequent loading of farm contaminants and pollutants, the nursery sites for wild fish are compromised. Another potential mechanism of compromise at the site is through the passing of the smaller sized non-predatory sardines to be consumed by cultivated predatory carnivorous species such as sea bass and sea bream; thereby turning the breeding site into a high-stress area and somewhat of a death trap. Within the adjacent mainland of Akarnania, what used to be a sardine celebration is now called the Fish Celebration where fish from fish farms are being donated by the farms to be cooked for the event. Research suspects similar negative effects are occurring with many other species of fish and marine organisms in the area with respect to wild fish nursery grounds being lost or endangered. The precise impacts finally remain still elusive at this level since not all nursery sites for various marine organisms in the area have been identified based on our estimations of ecological and environmental conditions. This includes sites which have been lost in distant or more recent years due to human activity.

Precious coral legal harvesting and poaching

Based on selected qualitative interviews with the local communities and from our own observations, coralliferous formations exist within the Inner Ionian MPA. More specifically, Mediterranean red coral (Coralium rubrum) can be found here albeit nowadays in much reduced numbers and is arguably predominantly due to legal coral harvesting vessels allowed within the EU, up until it was banned in 1994. During our research, we met community members bordering the MPA who claimed to have worked in this industry and described the ecologically destructive practice of using metallic nets to trawl the sea floor: a practice which not only picked up all desired red coral from the ocean floor, but in its path removed most of the existing Marine life including the rocks to get only a few kilograms of red coral from the bottom, The ecological consequences were immense and we suspect that some of the current seagrass meadows (Posidonia oceanica) in the area may be secondary ecosystems that arose after the ocean floor had been trawled or scoured. Red corals tend to exist at depths of only a few metres to several hundred meters below sea level. The same reports tell us that what could not be harvested in this way legally was in series harvested illegally (poached) until only a fraction of the red corals that used to exist remain at any depth above that with which diving can occur without nitrogen/ helium tanks. When coral trees and fragments are of big enough size, red coral can reach a similar price as elephant ivory within the global market and is classed almost as valuable as rhino horn. Current information at present is that such operations started in the mid-1980s and continued at least until relatively recently although we are still investigating this.

The following quote is taken from an interview with a local fisherman in the Ionian MPA. 'There used to be around 20 species of fish we would catch however now there is really only five. If the last shallow water corals – around 10 m depths – are fished completely, you can guarantee there will not be any fish left in the area.' Coralliferous formations are prime breeding habitats for many species of fish including Mediterranean ones and so if the coral goes so too do the fish. Again, though the relevant project conducted under the MESMA framework did not identify this as a pressure gradient, regrettably.

Fishing and hunting

Commercial fishing has myriad negative impacts upon marine megafauna and issues and effective management, along with succinct presentation of the relevant scientific evidence (Call 2009), is limited. This information on fishing in Greek waters is itself greatly limited, especially for recreational and illegal fishing, for which data could be regarded as practically non-existent (Moutopoulos et al. 2015). The findings of Gonzalvo et al. (2011) suggest that law enforcement for sustainable fishing and hunting in area is extremely weak. They indicate that over a 12month period in 2007, the number of industrial fishing boats exceeded those registered in the Common Fisheries Register (CFR) for the three administrative ports involved with a large proportion of the CFR netters being small and effectively inactive. Given the sensitive ecology of the area, we posit that industrial vessels inside MPAs are unacceptable in general, especially in and around prime nursery sites for fish. . Recreational fishing in the area in and around the inner Ionian MPA is also allowed and does not take into account the status of the area as protected, but rather is often treated as any other part of the ocean. Such activities, especially given the extremely low levels of law enforcement, can have potentially devastating ecological effects upon marine biodiversity, adding high pressures from mass tourism to their population numbers. However, fishing pressures from recreational fishing (tourist fishing included in this), were not noted as activities, let alone pressures, within an assessment carried out under the MESMA framework (as described above).

Poaching operations on marine fauna other than fish and related groups of species such as seals, dolphins and sea turtles have not yet been officially reported according to the best of our knowledge in the area, however during interviews with local fishermen, within the past 10 years we were told on certain instances that; it was recently deemed illegal to carry a gun on board a fishing vessel, something which the fishermen interviewed believe has been a deterrent and have reduced the number of deaths of marine animals from revenge shooting for destruction of fishing nets. Research on this area has proven that the species hunted by dolphins has an insignificant impact of local fishermen and fishing fleets currently active and are therefore not reducing catch size to any noticeable extent for fishermen (Bearzi et al. 2010). To the best of our knowledge this information has not reached the local fishermen still.

Sea turtle meat and eggs are valued and sold within the international black market and extrapolation from global evidence suggests that there is a potential for poaching of these within the inner Ionian MPA.

Active hunting of marine megafauna, such as dolphins and whales, took place in Greece until the end of the military regime in the 1970s and was in fact part of a government policy to cull these species who 'threatened the livelihoods of local fishermen'. There exist reports of local inhabitants 'heroically' capturing these marine mammals and images and reports of military navy vessels attacking whales in newspapers of the time. Such practices are now of course banned as these species are protected. It is finally worth noting that Piroddi et al. (2010) conclude from their modelling efforts that based on the data available monk seal numbers within and around the protected area fell so low that the reduction could only be accounted by killings by people.

Noise and light pollution

The Inner Ionian MPA is coastally relatively densely populated and during the summer period receives a high number of both national and international tourists. This includes a significant amount of tourists in sailing package holiday programmes, often operated by large international commercial tourist providers. This high number of tourists, with tourist-based coastal activities, naturally increases light and noise pollution in the area. In most of the areas surrounding the MPA, electricity came as late as the 1960s and 1970s (1974 for Kalamos island) and motorised boats – bringing with them a host of water pollution from diesel, water disturbance and noise – where not a norm in the areas before the 1970s.

Plastic litter pollution

Because the Inner Ionian is a closed lagoon it is vulnerable to being the ideal accumulation spot for plastic pollution. This is further aggravated by the presence of the resident population as well as related touristic activities. Throughout this area the beaches are dotted with litter. Despite some of it being collected by local governments and groups, in many places the sheer amount simply outweighs the clean-up attempts. This is something that needs to be taken into serious consideration and should be monitored and tackled within the management plan for the entire MPA.

Oil and gas exploration and drilling

The Inner Ionian MPA has not yet been targeted for oil and gas surveys but many local believe it is only a matter of time. If extraction went ahead, this would mean a likely onslaught of environmental effects for the marine megafauna such as whales and dolphins for which the area is so important for. The surveys that have already been done in many areas surrounding the Inner Ionian MPA and the marine space has been already zoned in relevant lots for oil and gas exploration. As many of these areas fall very close relatively to the area we believe that oil exploration in adjacent areas can have detrimental effects on the protected area.

Vulnerability of the area

In general, we consider the Ionian MPA is considered as extremely vulnerable to further environmental degradation due to the current legal framework under which it is protected. Moreover, decisions for the area which are now officially passed by government would have previously been resolved, in most cases, by the local community managing it. In the case with fish farms, our research suggests that the government has generally a positive attitude and is supportive of industrialisation, namely fish farms, and tourism-driven urbanisation. We have also observed that in local level politics there is a dislike of environmental impact assessments as they are considered cumbersome and limiting for local economic growth.

In 2018, a management body was assigned to the inner Ionian MPA which until recently was exclusively managed the nearby Amvrakikos protected area. The management body is mainly responsible for producing relevant scientific information about the measures needed for the MPA, but ultimately most of the decision-making power belongs to the central government ministries and not the management body itself. It will be the local police and coastguard enforcing the local protection laws however which our research suggests will be inadequate for the type of protection needed.

Due to political corruption and pressure from local industries, we predict that this management body in charge will not have the autonomy to make decisions based on what is best and what is needed for the protection, restoration and sustainable development of the Ionian MPA. Furthermore, they may perhaps deliberately act towards blocking such initiatives.

Expert opinions that advocate for potential benefits of fish farms in the waters of Greece to the fishing sector (Somarakis et al. 2006) and to the marine megafauna of the Inner Ionian MPA (Bearzi, Quondam, and Politi 2004; Piroddi et al. 2011) can only serve to aggravate the problem for the MPA under discussion further.

It is worth reporting that in the Amvrakikos protected area and the area surrounding it in the past no fish farms where removed under the management body authority in its past structure nor it seems that the management body in the past had been in the position to exert a significantly positive influence towards the conservation of the biodiversity of the area, solving conflicts and providing for restoration and sustainable development in the area. The Amvrakikos protected area is at present considered degraded as an ecosystem although aquaculture was not the only contributing factor. We therefore expect very little will and power to act from the recently assigned management body due to the significantly more limited authorities and powers of such bodies as dictated by relevant national legislation combined with relevant political and corporate pressures.

The ecological condition of the ecosystem is also an important factor given that it is at present a degraded one and would likely rank low in terms of conservation priorities in relation to other MPAs, which are considered more pristine, not just in Greece but also globally. We argue that this is the exact reason as to why the Ionian MPA needs careful attention as it would dramatically benefit from effective management.

Currently most bordering communities members and many people outside the area see the sea as a 'breadbasket' and anyone should be able to take as much as they want, whenever they want and it is the role of the state to regulate. It cannot do this however due to the lack of a central body for enforcing the appropriate legal authority. Long term systems for collecting data are currently not in place including the resources to alleviate conflicts and for restoration of the damage done by anthropogenic factors. Above all, however, there needs to be an incentive to protect the ecosystem and the livelihoods of the communities that depend on it. The value of aquaculture units in the area are high due to the extreme level of funding and support they have received from the Greek state up until the very recent past. This is yet another significant factor making the area more vulnerable.

Synthesis and actions needed

Based on ecological analysis by Piroddi et al. (2010), it is evident that the serious degradation of the Ionian MPA and its marine ecosystems started during the same time as the rise of the 1960s military regime to power. It was also in tandem with the period when based on our current information from preliminary interviews with locals, relevant local governance systems of Kalamos and Kastos were replaced with government rule and top-down decisionmaking for issues in marine resources. The degradation continued from the 1980s to the 1990s and was made worse with pollution and the increase in aquaculture; spreading rapidly in the area under government and EU backing. The 1980s also saw precious coral being harvesting at an alarming rate. Our research, both on the ground and via literature reviews, finds proposes that it is down to the mismanagement from the state of the Ionian MPA which has led to its rapid demise. This included the licensing of aquaculture for which it is clear that members of government at least from a time onwards gained in power and money from this industry. This to us opens the possibility for involvement of government and political persons with the apparent destructive fishing practices that started in the 1960s and where still being observed more recently (e.g. Gonzalvo et al. 2011)

An overview of the current situation leads one to conclude that the Greek government and the EU does not officially acknowledge all the pressures currently facing the Inner Ionian MPA today, including pressures from the communities of people bordering it. In addition to this, the international community including expert scientists who have worked in this area and should fully acknowledge the many other forms of disturbance which are evidently effecting this MPA.

We propose that pressure should be put on the Greek Government and the EU to remove all aquaculture facilities in the area and through redistribution of resources and funds, provide restoration and compensation for those people employed in this industry and in the fishing sector. There also needs to be the ultimate goal of reorganising the economy of the area based around its protected area and not against it. Actions should focus around the issue of historical rights in the different communities currently bordering the MPA, something we propose should be the main driving force for regulating human activities within it.

We are expressly against the militarisation of the area for the purpose of conservation and for protecting the MPA's natural resources.

This is not only because we are against the use of physical force in general for conserving nature, along with the obvious problems that have arisen in other parts of the world where local communities exist alongside emblematic wildlife zones, but because thus far all discussions around the Ionian MPA have largely been focused around putting restrictions on the activities of local populations, with an emphasis on artisanal fishing. In many cases, it is the local communities who have created community conserved areas and are in fact stewards for the area.

During our ongoing research, we have heard consistent accusations, from large organisations in the country, about local people that are worse than such industries in such areas. As a testament against this thesis, we would like to quote relevant data on indigenous and community conserved areas which indicate that these exceed government designated ones (Berkes 2009) along with the outcome of the struggles of local people including people reporting illegal activities over the years or even directly helping with issues such as wildfires, without the presence of which the situation for the Inner Ionian MPA would be a lot worse. We propose it is crucial to support the local communities, who have proven to be effective custodians that are living and working in and around the Ionian MPA, and empower them in their struggle against environmental degradation.

We propose the following measures need to be taken in order to safeguard the future of the Inner Ionian MPA and the livelihoods of the local communities that surround it:

- (1) Divestment from destructive industries and put into biodiversity conservation funds, resources and attention for areas deemed protected with recent legislation. Funds and assistance should be redistributed in ecosystem restoration, protection and empowering local environmental governance in the area. The mechanism of allocation should consist of international independent auditors and the local communities with historical rights to the area as the council for this.
- (2) *Identify* wild fish nursery sites and ensure their direct protection and where needed their restoration and remove aquaculture farms and ban fishing activities when needed.
- (3) Identify red coral formations (past and present) and ensure direct on the ground protection of these areas is implemented. Establish and implement restoration schemes for coral formations previously destroyed by commercial harvesting or other human activities, both as part of a specific programme for coralliferous/ spongiferous ecosystems.
- (4) Identify different marine biotopes in the MPA and ensure their direct protection. This special emphasis should be put on the identification of marine megafauna breeding, feeding and resting sites and ensure direct on the ground protection.
- (5) *Identify* community conserved areas and provide support for strengthening or rebuilding pre-existing local governance systems. This should be coupled with and be part of a management system of the area as a whole that should be created. It should be based on the different community conserved areas that are identified and incorporating direct consultation with local communities in public assemblies.

- (6) *Enforce* a complete ban on fish farms and large fishing trawlers from entering the MPA and delineate a buffer zone surrounding it; to be decided in consultation with local communities in public assemblies.
- (7) Create a more effective legal protection framework within the context of Greek legislation with direct consultation of local communities and taking into account the varying historical rights of these within the MPAs and relevant adjacent buffer zones.
- (8) Create a marine and terrestrial buffer zone for protected areas based on sound ecological data and the wishes of local communities. An essential goal should be to ensure a more robust legal and official status protection of the adjacent coastal zone to the MPA; of the islands and the mainland (most of it is not protected and restoration measures are needed for removing introduced predators such as ship rats and feral cats, as well as restoring and maintaining habitats, especially beaches).
- (9) *Enforce* an EU level ban on oil drilling, all forms of aquaculture (except where it is a historical, small-scale activity led by local communities) that does not compromise any of the significant biodiversity features of the area, and wind farming within NATURA 2000 protected areas and for a specific zone around them to be also spared from such activities.
- (10) *Recognise* the historical rights of communities at the international level and the historical context of the past century which has led to the current situation. This needs to include recognition of the variety of ethnic groups that border and use the MPA and the large variation in type of historical rights to use it.
- (11) *Recognise* rewilding as the most viable ecosystem restoration activity which should be actively supported by government and other international mechanisms who have the power to restore ecosystems.
- (12) *Regulate* fishing rights by local communities in large public assemblies who have the historical rights to perform these activities. This must include the establishment and management of 'take' and 'no take' zones for fishing based on the historical rights of local communities and ecological parameters.
- (13) *Involve* (directly) the international community in policing the area in a manner which is robust to corruption and is approved by the relevant local communities. This must first be preceded by

appropriate international recognition of Greek marine and coastal wetland waters and lands as a conflict zone for the environment which needs urgent attention. The model for the situation that needs to be recognised should follow the one for the Amazon in a manner similar to that of soya and cattle ranching for aquaculture for the former and fishing for the latter.

Geolocation information

The Google Earth centre of the MPA discussed in this paper is latitude: 38°33'5.45" N; longitude: 20°50'59.32" E.

Disclosure statement

The authors of this article would like it to be known that Terra Sylvestris is a local non-profit grassroots organisation formed from people of the islands as a consequence and in support of the struggles of local communities as a whole against the environmental degradation caused in the area and aggression on their ancestral lands and waters. This has been primarily from industries such as large fishing vessels, aquaculture, and windfarming, as well as the continued environmental and biodiversity degradation that they have observed in their area.

Thus, in the context of potential conflicts of interest, we as members of the board of Terra Sylvestris are practitioners working on the ground level, within the area itself, and we believe that the practices of the commercial industries reported in our article are not compatible with the sensitive ecology of the area, nor with the will of the local people who inhabit our islands.

That said, we have done our very best to provide a critical, independent appraisal of the information we could find up to the point of writing the article.

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