Argolic Gulf Environment Foundation

Scoping Report

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“If you take Greece apart, in the end you will see remaining an olive tree, a vineyard and a ship. Which means: with just as much you can put her back together.”

Odysseus Elytis

Table of Contents

Introduction 3
Aim 3
Executive Summary 3
The Long Term Goals of the AGEF 4
1. The Lands of the Argolic Gulf 6
1.1 Historical Background and Identity 6
1.2 Geography and Administrative Boundaries 8
1.3 Population & Economy 10
Primary Sector - Agriculture and Fishing 11
Secondary Sector - Manufacturing and Construction 11
Tertiary Sector - Services 12
1.4 Terrain & Land Use 12
1.5 Protected Areas 14
Natura 2000 Areas 14
Other Areas Protected by National Legislation 15
Areas of Wildlife Protection 15
Wetlands 16
Marine Protected Areas 17
1.6 Key Environmental Issues 17
Waste 17
Fresh Water 17
2. The Marine Environment of the Argolic Gulf 18
2.1 Geography and General Characteristics 18
Bathing Water Quality in the Argolic Gulf 20
2.2 Fish Stocks and Marine Biodiversity: Current State and Trends 22
General Trends in Greek Seas and the Broader Mediterranean 22
The State of Fish Stocks & Biodiversity in the Argolic Gulf 24
2.3 Fishing in the Argolic Gulf 27
The Commercial Fishing Fleet - Overview 27
Offshore Fishing 29
Minimizing the impact - key goals 29
Small-Scale Inshore Fishing 30
Minimizing the impact - key goals: 31
The “Black Box” of Recreational Fishing 32
Minimizing the impact - key goals: 35
2.4 Pollution of the Argolic Gulf 36
Waste 36
The Bay of Nafplio 36

Sewage Treatment in the Argolic Gulf 37
Plastic and Solid Waste 38
Fish Farms 39
3. Proposed Strategy: The Argolic Gulf Regeneration Project 42
Tagline 42
The Role of the AGEF 42
The Need for a Narrative 42
Creating a Marine Protected Area in the Argolic Gulf 43
Key Obstacles to the Creation of an MPA 44
Building Trust through Waste 44
Moving Towards Zero Waste 46
Compost Magic 46
Agriculture 46
Municipal Waste 47
Regenerating and Protecting Important Habitats 48
Potential Projects 49

Introduction

Aim

The purpose of this document is to chart an overall strategy for the grant-giving activity of the Argolic Gulf Environment Foundation (AGEF). The ultimate goal of the AGEF is to achieve real, demonstrable improvements in the environment of the Argolic Gulf and its management.

Below is an outline of the key environmental issues in the coastal areas of the Argolic Gulf, including the islands of Spetses and Hydra and the land masses opposite them. The main sources of environmental pollution and degradation of marine ecosystems are identified, as are the main environmental issues on land.

On the basis of the above, a grant-giving strategy is then outlined.

Executive Summary

The lands of the Argolic Gulf have been inhabited by humans for millennia. The terrain is characteristic of the Peloponnese, featuring a high diversity of ecosystems in a relatively small area; the broad region of the Argolic includes everything from deep water ecosystems almost a kilometer under the surface of the sea, to fir forests and alpine terrain in the nearby mountains. Much of the arable lands of lower-lying areas have been turned over to agriculture, with orchards (citrus, apricot, olive) predominating. Elsewhere, rocky hillsides covered in mixed low vegetation are home to a wide variety of birds, mammals, reptiles and amphibians.

With the exception of Mt Parnonas to the southwest of the gulf, there are limited terrestrial areas that could be described as truly “wild”. The land area to the northeast of the gulf is primarily agricultural in the plains and hills around Argos and Nafplio, while there is pronounced touristic and holiday home development in coastal areas such as Tolo and to the east in Porto Heli, Kranidi, Ermioni and the islands. Several small wetlands also exist along the coast.

There are no marine protected areas in or around the Argolic Gulf. While there are indications that the fisheries of the Argolic Gulf are in moderately better shape in terms of biodiversity and productivity than comparable areas elsewhere in Greece, the overall trend of over-exploitation and poor management seen throughout the Aegean and broader Mediterranean appear to apply here as well. This in turn has likely rendered areas of the Argolic Gulf more vulnerable to other threats such as those posed by

invasive species, jellyfish and algal blooms, and other climate change-related phenomena.

A relatively high concentration of fishing vessels – both professional and amateur – using a wide range of gear and techniques effectively means that there are few, if any, marine populations anywhere in the broader area that are not significantly impacted by fishing either through direct exploitation or collateral damage. In addition, the area is particularly popular for recreational boating, and anchors from vessels large and small regularly causing significant damage to marine ecosystems of high value, such as seagrass meadows. Waste discharges from such vessels may be an additional significant environmental pressure, if only for specific locales / times during the year.

In some areas, the Argolic Gulf is also impacted by land-based sources of pollution. In particular, untreated wastewater and agricultural runoff reaches the gulf from a number of sources. This issue is most pronounced in the northwesternmost corner of the gulf, where the sea is shallow over a broad area, water from the sewage treatment plant of Argos-Nafplio is discharged, and the Erasinos River and other streams enter the gulf. Together these release amounts of decomposing organic matter, inorganic fertilizers, pesticides and other effluents at concentrations that will vary over the course of the year. The precise impacts of such pollution on the marine ecosystems in the bay of Nafplio and at other sites throughout the gulf is largely unknown. However, it is likely that these are significant in certain areas and at certain times of the year.

Waste management, in general, is problematic over the entire region, be that agricultural waste, sewage or solid municipal waste. Recycling is implemented through a patchwork framework shaped by municipal boundaries and realistically reaches average levels at best. A large percentage of household waste ends up in improperly zoned landfills where it is sometimes burnt illegally, or simply buried in unlined pits, with leachate likely seeping into the groundwater and coastal waters. Several landfills are located by the sea, and as a result waste from these landfills often collapses or blows into the sea, contributing to the problem of marine plastic waste pollution. Much agricultural waste (cuttings, dry grass, etc) is burnt in the field, impacting local air quality.

The Long Term Goals of the AGEF

In the marine environment, the ultimate end goal should be a well-managed fishery, where traditional, small-scale inshore fishers act as stewards of the various ecosystems of the Argolic, harvesting sustainable quantities of fish and seafood which are sold at a premium.

Fishing would also be prohibited in one or more marine protected areas (MPAs) covering sites important for the reproduction of fish and other species. Large trawlers would be prohibited from operating anywhere in the gulf and purse seiners heavily restricted. Amateur fishers would be limited to fishing purely recreationally, and subject to local restrictions to further ensure sustainability. Fish farms would implement better practices to minimize pollution, with companies contributing to regeneration efforts elsewhere to further offset their impact.

Pollution from the land would also be minimized through effective blackwater and solid waste management programs, with robust composting and recycling strategies implemented across the region both for household and agricultural/industrial waste. More sustainable farming practices (organic cultivation / permaculture practices) would further reduce the use of inorganic fertilizers and pesticides, improving soil quality and water retention and reducing pressure on groundwater supplies. The resulting produce would have extra added value, while in certain areas of fruit tree and olive groves forms of eco/agritourism could be developed, such as temporary glamping sites, outdoor reception areas and more, boosting farmers' incomes and creating additional incentives to protect local flora and fauna.

Together, the above would allow fish stocks and marine ecosystems to recover, ensure the economic viability of traditional sustainable fisheries, and create myriad opportunities for the development of ecotourism and agritourism enterprises, fueling a virtuous cycle driving ever-greater ecosystem improvement and local prosperity. Over time, communities would adopt sound environmental management as a key part of their identities, with once commonplace destructive practices (such as unregulated landfilling of waste) considered unthinkable.

These may seem like highly ambitious long term goals, especially given the myriad pressures on the Argolic Gulf and the current incentive structures that drive them, but they are not unrealizable. Ultimately, an environment such as that described above would operate to the benefit of the vast majority of stakeholders in a range of sectors – and in particular the tourism economy, which is a vital source of employment in the region. Local municipal budgets would also benefit, through reductions in punitive fines and overall costs for municipal waste management.

This is evidenced by other areas in the Mediterranean where similar strategies have already been implemented with success. Furthermore, all of the changes described above are fully aligned with national, European and UN sustainable development goals.

1. The Lands of the Argolic Gulf

1.1 Historical Background and Identity

While the Argolic Gulf may not have the broad international name recognition of the Strait of Salamis or Corinth Canal, few other Greek waters of comparable size can claim to combine more elements of Greece's storied history and diverse natural wealth.

It was from the shores of the Argolic that ships of the Mycenaean fleet set off on their legendary campaign against Troy, according to Homeric accounts. While the reality behind these legends remains a matter of debate, it is undisputed that here rose one of the earliest European civilizations, with the Mycenaeans dominating land and sea in the northern Peloponnese and beyond from approximately 1600–1100 BC. Yet even before the great palaces of Mycenae and ancient Tiryns (near Nafplio) were erected, humans had already lived in the area for tens of thousands of years; stone tools found in Franchthi Cave near the settlement of Koilada on the Argolic Gulf show that it was inhabited over 40,000 years ago[1].

The prehistoric and ancient inhabitants of Argolis benefited from a land almost tailor-made for human habitation. A mild climate limited the privations of the winter months compared to more northern areas. Forested hills and mountains teemed with wild game; rivers and springs provided ample fresh water, while valleys and floodplains with fertile soils facilitated the development of agriculture. Meanwhile, the gulf itself would have featured an abundance of fish and marine life far greater than that seen today, with intact ecosystems that have now been severely degraded or replaced.

Yet from the Bronze Age onwards, the sea would be the source of an even more significant source of wealth, one that would play a key role in shaping the history of this corner of the Peloponnese through antiquity and the Middle Ages right up until the modern era. From the days when the Mycenaeans would set sail from the shores of ancient Tiryns in ships carrying olive oil and wine destined for locations all around the Mediterranean Basin, the Argolic Gulf's strategic position on key Mediterranean trade routes shaped its people's fate.

The Argolic Gulf's historical strategic importance is evidenced in the numerous coastal fortifications built and refined over the centuries by the ancient Greeks, Byzantines, Franks, Venetians and Ottomans, the most important of which was that of Nafplio. It

[1] Douka, K., et al. "Franchthi Cave Revisited: The Age of the Aurignacian in South-Eastern Europe." *Antiquity*, vol. 85, no. 330, 2011, pp. 1131–50.

also helped lead to the development of the great shipbuilding and shipping industries that peaked on the islands of Spetses and Hydra in the 18th and 19th centuries. The great wealth and knowledge amassed by these islands' captains and craftsmen through maritime trade in turn would prove instrumental in Greece's struggle for independence from Ottoman rule and the establishment of the modern Greek state. Nafplio, of course, would go on to become the seat of the first Greek government led by Ioannis Capodistrias.

Yet this period would mark the beginning of the end of the relative strategic importance of Nafplio and the Argolic Gulf in general. Capodistrias was assassinated in Nafplio in 1831 leading to a period of unrest, and in 1834, King Otto decided to move the capital to Athens, leading to an inevitable decline in Nafplio's influence. Meanwhile, the advent of iron-built steamships and changes in international shipping saw the relevant industries of Spetses and Hydra enter a decline from which they would never recover. After millennia, the age of the strategic importance of the Argolic Gulf for international trade had finally come to an end (although certain, likely vain, hopes for the future growth of Nafplio's commercial port remain).

In the 20th century, following the end of WWII and the Greek Civil War, tourism - both international and domestic - began to grow in importance for the communities around the Argolic Gulf, and today it constitutes the single most important sector of the local economy.

Yet it must be noted here that - due in part to the area's complex history - tourism (and not only) has developed largely in the absence of plans at the regional level; to the extent that such strategic plans exist, they tended to be at a municipal or community level. As such, the Argolic Gulf itself is rarely treated as a destination in its own right, with individual destinations such as Spetses, Hydra, Porto Heli and Nafplio being viewed - often by the residents themselves - as distinct entities with little in common, despite their geographic proximity and interwoven historical trajectories.

As such, a key challenge for the Argolic Gulf Environment Foundation as it seeks to promote environmental regeneration and eco-friendly practices across the region will be to help forge a common sense of purpose among the many different communities that share this region of the Peloponnese, each of which has its own distinct character and historical peculiarities.

1.2 Geography and Administrative Boundaries

The Argolic Gulf is located off the eastern coast of the Peloponnese, in between the regional units (formerly prefectures) of Argolis and Arcadia. Just off the coast to the southeast and east are the islands of Spetses and Hydra and a number of islets. Most of the latter are uninhabited, although several, such as Spetsopoula are privately owned with summer home complexes.

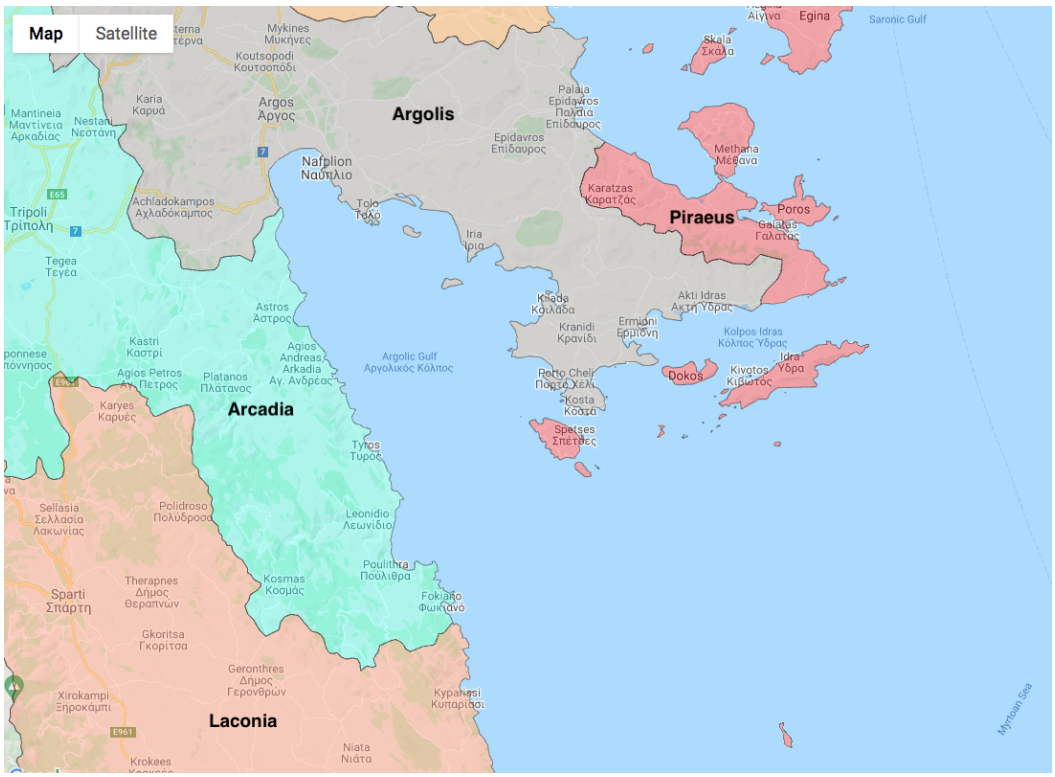
Administratively, all areas of the Peloponnesian coast on the Argolic belong to the Region of the Peloponnese (which is headquartered in the city of Tripoli). However, importantly, Spetses and Hydra and their neighboring islets belong to the Region of Attica. This is significant as regional governments have jurisdiction over many aspects of environmental policy, such as waste management schemes etc., playing a key role in implementing major regional development projects funded through EU structural and other development funds.

That said, the majority of the local environmental pressures on the Argolic Gulf (fishing, pollution, waste etc.) originate from the Peloponnesian coast, and in particular from the region of Argolis which features extensive farming and coastal development[2].

As such, much of this report will focus on these land areas, as well as the islands of Spetses and Hydra which play a key role in the local tourism economy. The terrain of the southwestern Arcadian coast is much more mountainous and generally “wilder”, featuring fewer settlements and overall development, and thus fewer environmental pressures.

[2] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR, 2010

The regional units of the Argolic Gulf (Source: geogreece.gr)



The municipalities of the Argolic Gulf (Source: geogreece.gr)

The maps above show the main administrative divisions in the area around the Argolic Gulf. As can be seen, a total of seven municipalities (Hydra, Spetses, Ermioni, Nafplio, Argos, Astros and Leonidio) have coastlines on the Argolic Gulf. Of these, the first four are likely to form the core area of the activities of the AGEF, due to the extent of their coastlines and their importance in terms of environmental pressures on the Argolic Gulf, and the tourism economy.

It is proposed that the municipalities of Troizina, Poros and Epidaurus be considered to lie outside the AGEF's core area of focus, as their coastlines are located squarely on the Saronic Gulf. For this reason, this report does not feature any environmental analysis of these areas. However, there will likely be times when it will make sense to extend certain programmes to these municipalities as well. For example, any information campaigns aimed at recreational sailors in the Argolic Gulf should also target Poros, as that is where many visitors charter their vessels before heading into the Argolic.

1.3 Population & Economy

Municipality	Regional Unit	Area (km2)	Population (2011)
Spetses	Piraeus	27.1	4027
Hydra	Piraeus	64.4	1966
Argos - Mycenae	Argolis	1,002.5	42022
Nafplio	Argolis	387.8	33356
Epidaurus	Argolis	338.1	8115
Ermioni	Argolis	417.6	13551
Leonidio (South Kynouria)	Arcadia	583.2	8294
Astros (North Kynouria)	Arcadia	575.7	10341
Total		**3,396.4**	**121672**

The table above shows the land area covered by each municipality located on the Argolic Gulf (and that of Epidaurus) and their populations. Of these areas, the municipalities of the region of Argolis account for about 80% of the population. Spetses and Hydra account for just 5% of the population, with the remaining 15% residing in the municipalities of Leonidio and Astros on the Arcadian coast of the Argolic (as well as in mountainous inland areas).

Economic statistics are only provided at the level of the regional unit by the Hellenic Statistical Authority (ELSTAT); this complicates analysis for Spetses and Hydra which are grouped together with Piraeus. As such, only figures pertaining to the economy of

the regional unit of Argolis are given below, although the broader conclusions are applicable to the wider area.

Primary Sector - Agriculture and Fishing

Agriculture and fishing remain important elements of the local economy, accounting for 13.7% of the gross value added (GVA) of Argolis (compared with a nationwide average of just 4%). Agriculture is the most important contributor to this sector, with citrus fruits (mainly oranges, mandarines, lemons) being the most common crops, accounting for about half of all arable land; the region is Greece's leading producer of citrus fruits, accounting for roughly 50% of the country's exports[3]. Other fruit trees cultivated include peach, apricot, apple, cherry and others. Olives also form an important crop, with the majority used to produce olive oil in local presses. As in much of Greece, most individual orchards and farmed plots are relatively small in size.

Smaller expanses are covered by vineyards, while there are also some greenhouses producing vegetables and cut flowers.

Animal farming is also a significant activity in the area, with active intensive pig, poultry and dairy farms, and significant numbers of sheep and goats that graze primarily on hillside scrublands.

The economic contribution of fishing is relatively minor in the area as a whole, although for certain coastal villages it employs a significant percentage of the local population.

Secondary Sector - Manufacturing and Construction

Manufacturing and construction also play a significant role in the economy of Argolis, contributing about 22% to GVA, according to ELSTAT (although this is down from 32% in 2000). Most manufacturing and processing facilities are located around the towns of Argos and Naflpio, where roads provide easy access to Athens.

One of the most important economic activities of this sector is the processing of the fruit, olives and other agricultural goods produced. The facilities active in this area, which include juice and olive pomace oil processing plants, also have significant environmental impacts, due to often improper treatment and disposal of associated waste. The olive pomace oil processing plants also impact local air quality at certain times of the year, and there has thus been much discussion about re-siting them away from population centers, although such plans face a number of obstacles.

[3] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR 2010

Argolis is also a significant producer of high quality marble, with about 50 such quarries in the regional unit, out of a (rather impressive) total of about 140 active and inactive quarries[4].

Tertiary Sector - Services

The tertiary sector forms the dominant sector in the area, accounting for 64% of the GVA of Argolis in 2017, up moderately from 56% in 1994 (yet still significantly lower than the national average of 79.8%). Tourism is, of course, the most important pillar of the local service economy.

Summer tourism has long been established in all seaside areas, although there are qualitative differences worthy of mention. The areas around Nafplio and Tolo, for example, have long been destinations for mass international tourism, whereas Spetses, Hydra and parts of the Kranidi peninsula tend to cater to higher-income tourists.

Today, there are ongoing efforts on the part of the municipality of Nafplio as well as other organisations and businesses to diversify their tourism product in order to extend the season and attract higher-income tourists. Key strategic goals include developing and promoting walking trails, cultural/archaeological tourism, sports tourism, food tourism, etc. However, agritourism and ecotourism remain at a fledgling stage and are not typically associated with the region's destination branding.

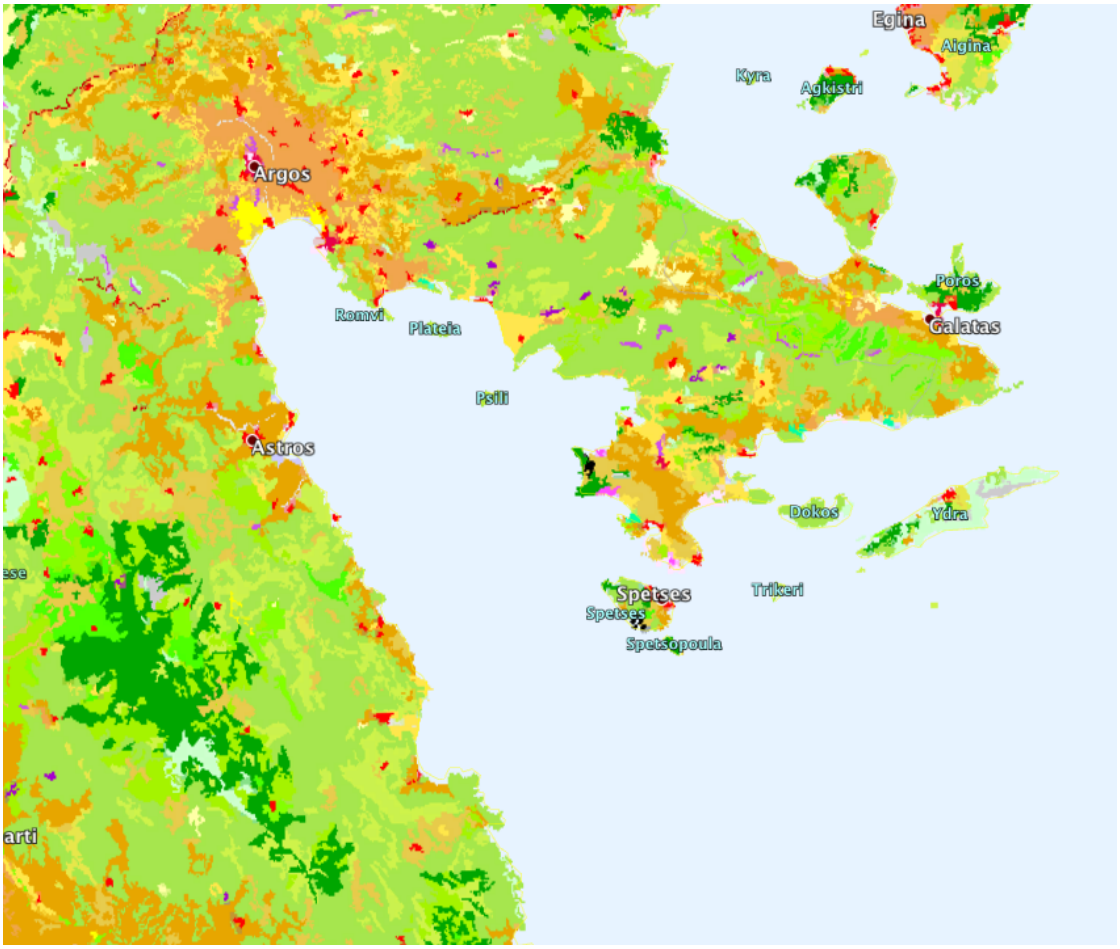
Sailing tourism is also a significant activity in the area, and expected to grow in the coming years, with projects such as a major new marina in Nafplio being advanced to add capacity. As such, the already significant impact of recreational vessels on the coastal areas of the Argolic is likely to grow.

1.4 Terrain & Land Use

The terrain around the Argolic Gulf is characterized by limited plains divided up by mountains and rocky hills. The most extensive plain is that of the region Argos-Nafplio located at the northeastern end of the gulf. This is also the most intensively farmed region, featuring large expanses covered in mainly fruit trees (although individual holdings are relatively limited in size). This area is also the site of two rivers: the Erasinos and the Inachos, although in the entire region, only the Erasinos river has a continuous flow of water throughout the year.

[4] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR 2010

Land use in the Argolic Gulf. Source: Corine 2018



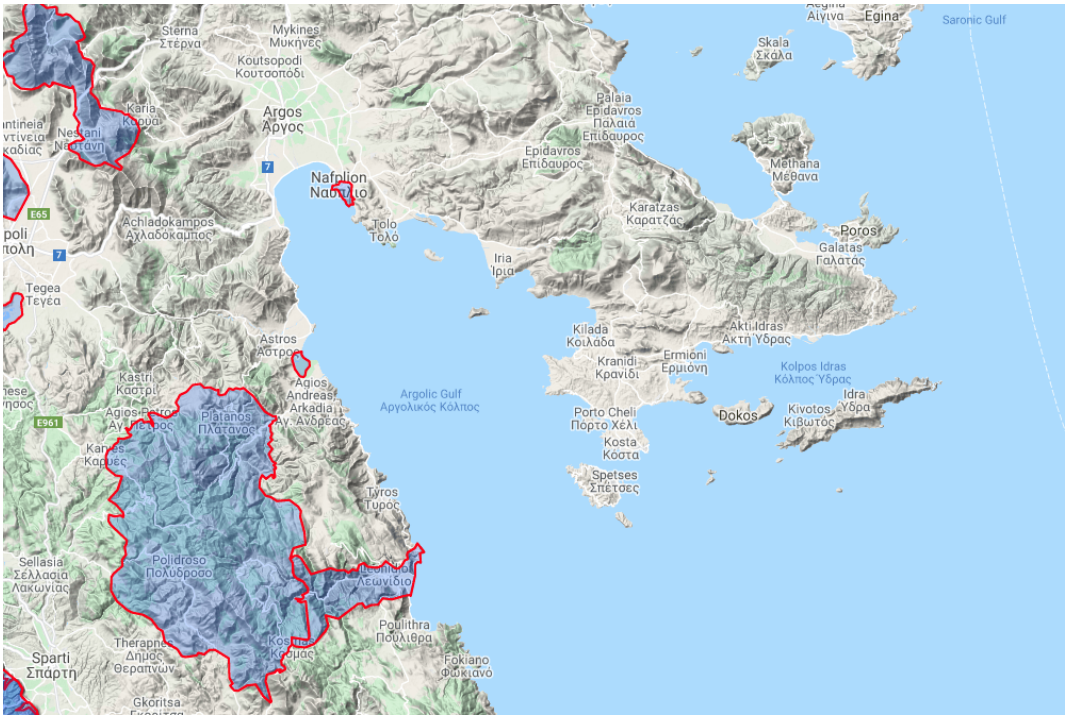
- Continuous urban fabric
- Discontinuous urban fabric
- Industrial or commercial units
- Road and rail networks and associated land
- Port areas
- Airports
- Mineral extraction sites
- Dump sites
- Construction sites
- Green urban areas
- Sport and leisure facilities
- Non-irrigated arable land
- Permanently irrigated land
- Rice fields
- Vineyards
- Fruit trees and berry plantations
- Olive groves
- Pastures
- Annual crops associated with permanent crops
- Complex cultivation patterns
- Land principally occupied by agriculture, with significant areas of natural vegetation
- Agro-forestry areas
- Broad-leaved forest
- Coniferous forest
- Mixed forest
- Natural grasslands
- Moors and heathland
- Sclerophyllous vegetation
- Transitional woodland-shrub
- Beaches, dunes, sands
- Bare rocks
- Sparsely vegetated areas
- Burnt areas
- Glaciers and perpetual snow
- Inland marshes
- Peat bogs
- Salt marshes
- Salines
- Intertidal flats
- Water courses
- Water bodies
- Coastal lagoons
- Estuaries
- Sea and ocean
- NODATA

To the northeast of the gulf, the mountains are smaller in size than on the Arcadian side, with only two peaks above 1000m. In the hillier and drier terrain of Ermioni to the southeast, the fruit trees give way to olive groves in the arable areas. To the southwest of the gulf, in Arcadia, steep hillsides rise out of the sea forming a complex terrain with alpine areas around the tallest peak near the gulf - that of Mt Parnonas which reaches an elevation just shy of 2000m.

Aside from the extensive fruit tree plantations, there are few forested areas anywhere in the regional unit of Argolis, with almost all wild and semi-wild areas covered by low mixed vegetation. However, both Hydra and Spetses feature forested areas (chiefly of Aleppo pine), although on the latter a sizeable fire several years ago caused significant damage. (Interestingly, however, the destruction of pine forest also revealed man-made terraces, highlighting the fact that some areas were once farmed in the past, before later falling into disuse and being colonized by pines).

1.5 Protected Areas

Natura 2000 protected areas around the Argolic Gulf. Source: geogreece.gr



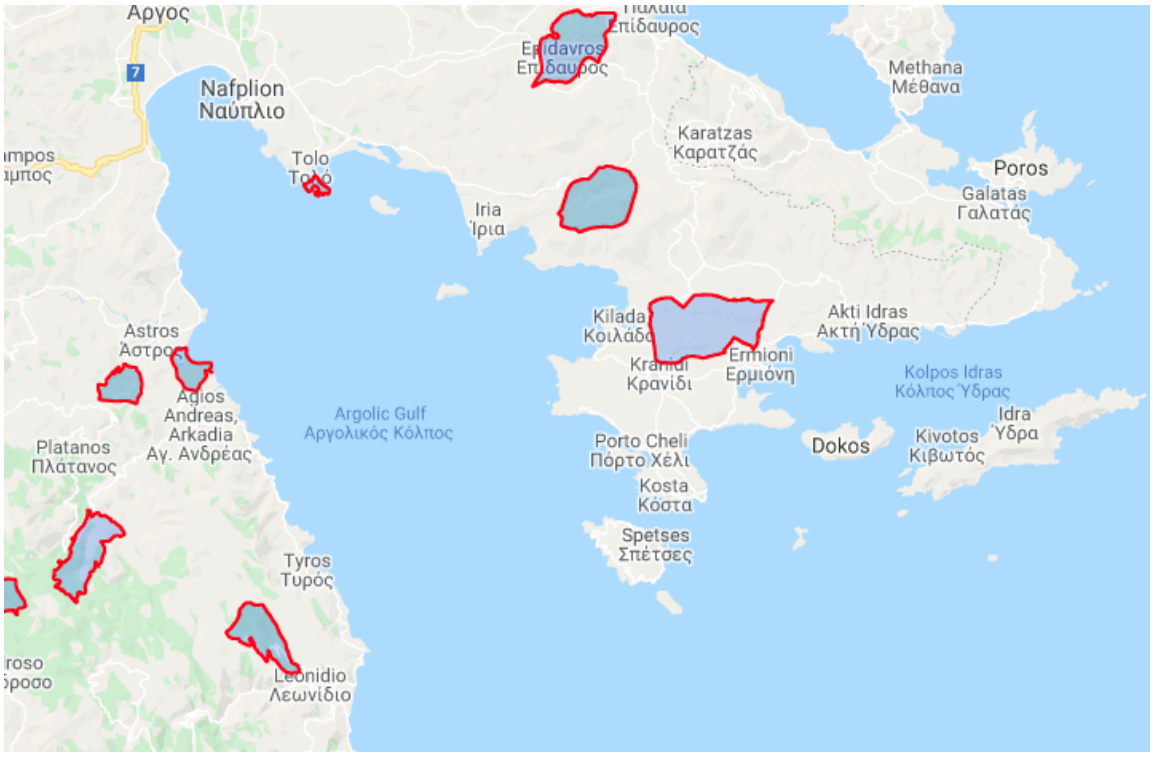
Natura 2000 Areas

The largest area on the Argolic Gulf protected as a part of the Natura 2000 network is located in the Arcadian mountains, covering an area of about 115,000 hectares of mainly fir forest on Mt Parnonas, and extending down to the sea in Leonidio.

The only other coastal Natura site is a 370 hectare expanse located around the Palamidi fortress of Nafplio, which is protected largely due to the presence of rare endemic plants that are associated with the historical site. It is also home to various vertebrate species, including birds, reptiles and bats.

To the northwest, several extensive areas in the Arcadian mountains (Mainalos and Artemisio kai Lyrkeio) also enjoy Natura 2000 protection, however they are geographically removed from the coastal areas of the Argolic Gulf.

Areas of Wildlife Protection - source: geogreece.gr



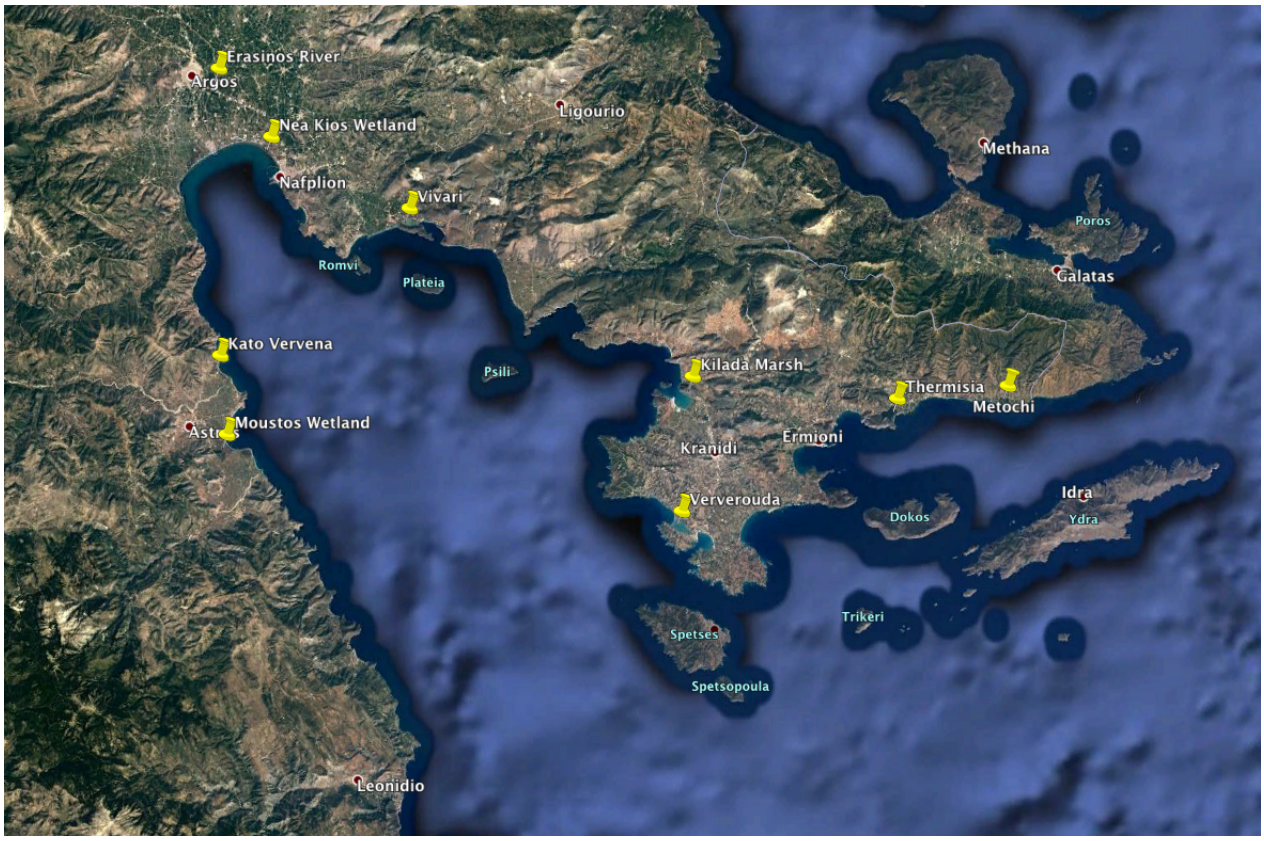
Other Areas Protected by National Legislation

In addition to Natura 2000 areas, the region also features areas that enjoy special protection under Greek law. These are:

Areas of Wildlife Protection

These include areas north of Koilada (Stavropodi - Kanapitsa), and on the Kranidi peninsula (Profitis Ilias - Avlona), and the island of Romvi-Daskaleio just off the coast of Tolo. On the Arcadian side, the Moustos wetland is also a protected area. In these areas hunting and other activities are prohibited to protect local fauna populations.

Key wetlands of the Argolic Gulf. Multiple sources



Wetlands

Under Greek law, wetlands such as coastal lagoons and salt marshes enjoy additional protections relative to other coastal areas (although these are not always observed or enforced), with activities such as hunting and fishing prohibited. Along both the Arcadian and Argolic coasts of the gulf, a number of small but important wetlands exist which provide food and nesting sites to many of the hundreds of species of birds found in Greece, as well as reptiles, amphibians and other species.

In addition, several closed, coastal lagoons form important nurseries for fish populations, namely those of Vivari near Drepano, Ververontas near Porto Heli and Thermisia opposite Hydra.

Despite their ecological significance and formal protection however, over the decades all of these wetlands have come under pressure, with many having been significantly reduced in size

due to the expansion of surrounding farmland and (more recently) touristic developments. All of the key wetlands are shown in the map above.

Marine Protected Areas

Aside from the coastal lagoons of Vivari, Thermisia and Ververontas, no other marine area in the Argolic Gulf or the broader area enjoys any form of protected status. According to divers in Tolo, local efforts were made to establish a marine protected area off the coast of the island of Romvi-Daskalio, but these failed to gain traction due to opposition from local fishermen.

1.6 Key Environmental Issues

Waste

See section 2.4 Pollution of the Argolic Gulf

Fresh Water

As is well known to all inhabitants of the region, freshwater supply is a chronic problem for almost all areas around the Argolic Gulf. This is primarily due to mismanagement, and mainly in the agricultural sector (which accounts for 92% of water use[5]). Poor and wasteful irrigation systems, as well as years of unchecked well-drilling and pumping from ground sources have caused the water table to drop significantly allowing saltwater to enter and contaminate the groundwater. Water is used both to irrigate crops using often very basic and wasteful systems, and also to protect against frost in the winter. In addition, the unchecked use of fertilizers has further impacted the water quality, with high levels of nitrates recorded.

As a result, throughout the region and even in the town of Nafplio most residents rely on bottled water, exacerbating the issue of plastic waste. The situation is even more acute in more eastern areas of Argolis and on the islands of Spetses and Hydra. The former is forced to rely on shipments of water by water tankers, while on Hydra a desalination plant operates, although the water produced is of poor quality, likely due to poor conditions of the plant itself and the grid.

While poor irrigation systems and agricultural practices are chiefly to blame, the growth of tourism in the region (and particularly luxury tourism) together with climate change are both expected to further exacerbate the problem. Farmers in the more eastern regions around Ermioni are particularly impacted, and have already suffered losses this year due to low levels of local rainfall. There are also reports of wealthy homeowners and businesses turning to small-scale desalination plants to meet their needs, raising questions about the handling of the resulting brine streams which may be impacting local land and marine environments.

[5] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR 2010

2. The Marine Environment of the Argolic Gulf

2.1 Geography and General Characteristics

At its northwesternmost (and shallowest) end, the Argolic Gulf receives runoff from the floodplain of Argos and the outflow of the Erasinos and Inachos rivers around the area of Nea Kios. At its other end, the gulf has a relatively broad opening, through which it communicates with the rest of the Aegean.

The mouth of the Argolic Gulf proper is defined as roughly level with the southernmost point of the islet of Spetsopoula. From here to the coast of Nea Kios, the gulf has a length of approximately 54 km, and it reaches 20 km across at its widest point. Along the gulf's western coast, steep mountainsides plunge into the sea and the continental shelf is quite limited, extending only a few dozen or hundreds of meters. Along the northeastern coast, while the terrain also features steep gradients, the continental shelf is more extensive, reaching 0.4-1 km. The shelf is most extensive at the gulf's northwestern corner where it reaches 3-5 km, due to the deposits by the Erasinos and Inachos rivers and other streams.

The north and northeastern coasts of the gulf comprise recent alluvial deposits, whereas the eastern and western coasts comprise primarily limestone formations. In terms of currents, the general movement of water appears to be in a southwesterly direction. There also appears to be a coastal current that moves water and materials in a westerly direction from Nafplio to the village of Myloi.[6]

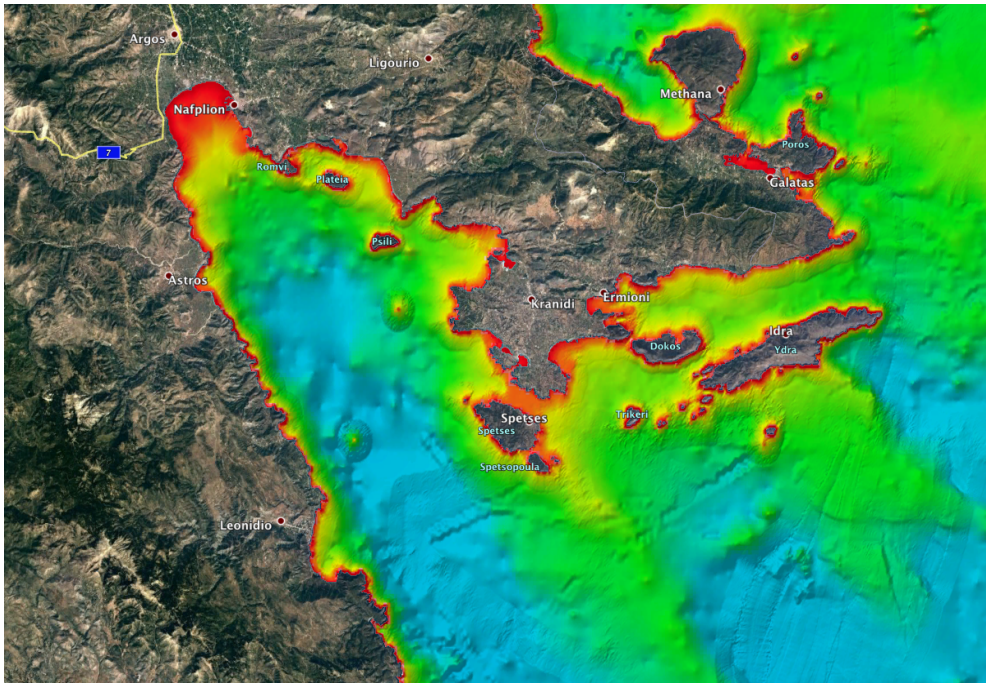
At various points along the coast of the Argolic Gulf small but noteworthy wetlands are found - the salt marshes and lagoons mentioned above.

As can be seen by the bathymetric map below, in the center of the Argolic Gulf, the waters are quite deep, with many areas beneath 500m depth (shaded blue), and the deepest point being over 800m below sea-level. This is roughly twice as deep as the deepest point in the Saronic Gulf to the north with which the Argolic Gulf is often grouped. Indeed, throughout the entire Aegean, the areas of equal or greater depths are relatively limited. (For the purposes of comparison, in the northern Aegean a maximum depth of approx 1,500 meters is found to the north of the Sporades island chain, whereas in the south the waters reach 2,500 meters to the northeast of Crete). As such,

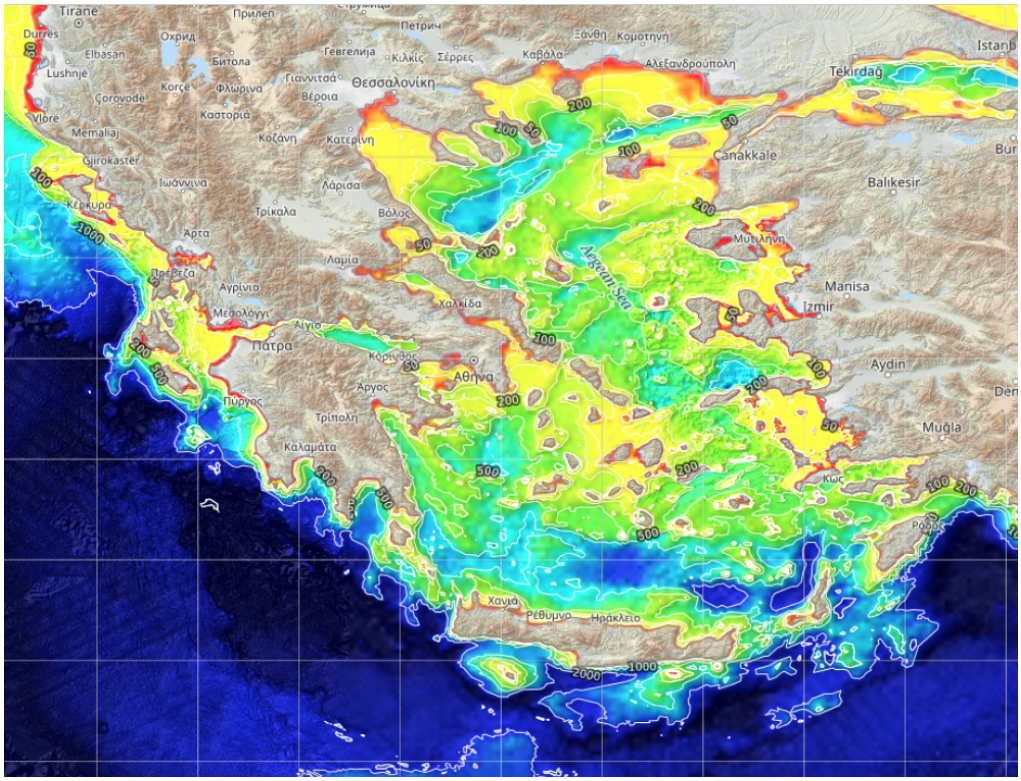
[6] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR 2010

in the center of the gulf, despite the relative proximity of land, the waters more closely resemble offshore expanses of open water.

A bathymetric map of the Argolic Gulf. Source: Emodnet-bathymetry.eu



A bathymetric map of the Aegean Sea. Source: Emodnet-bathymetry.eu.



Taken together, the above means that the Argolic Gulf is essentially a microcosm of the Greek seas as a whole, with a very high percentage of the many species found in Greek marine environments inhabiting or regularly visiting the region, including large and iconic species such as bluefin tuna, dolphins, Loggerhead sea turtles and even occasional whales. In terms of migratory fish species, it appears that the spring-early summer is a particularly important period for many species which enter the gulf from the open sea with the aim of spawning in its shallower areas.

Unfortunately, as with many areas of Greek waters, dedicated studies about the marine ecosystems of the Argolic Gulf are few and far between. While some surveys of marine life have been carried out at specific sites (such as near outflow of the Nafplio-Argos sewage treatment plant, and in the lagoon of Vivari), these have been very limited in scope. As a result, even for priority ecosystems such as *Posidonia oceanica* seagrass meadows – which operate as nurseries for many fish species – there are no maps of their distribution throughout the gulf. Furthermore, of the studies that have been carried out in the Argolic, many were conducted over 10-15 years ago, and therefore may well be outdated.

That said, research conducted in the area strongly indicates that the extensive shallow waters of the northwestern end of the gulf comprise an important breeding ground for a number of species. The same applies for the northeastern area, namely in the area around Tolo and Vivari[7]. Of particular note is a very shallow lagoon in Vivari that communicates with the sea through a narrow opening. The site of a traditional lagoon fishery (that is not currently operational), the lagoon is a natural nursery for fish, although over the years it has suffered somewhat from environmental degradation and poor management.

Overall, the Argolic Gulf features a rich array of ecosystems with a high level of biodiversity. However, as with most other areas of the Greek coastline, its marine ecosystems are subject to a number of significant environmental pressures.

Bathing Water Quality in the Argolic Gulf

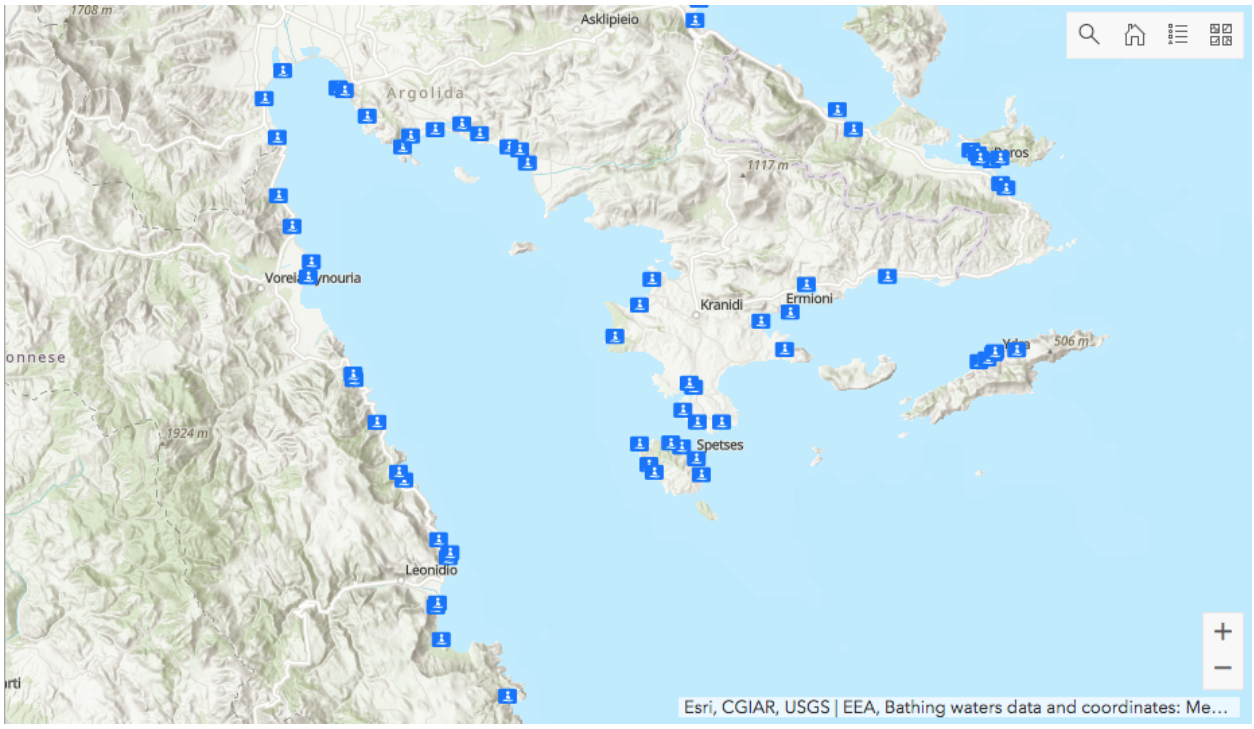
Due to the Argolic's size, depth and currents, overall, marine pollution from at least agricultural run-off and untreated sewage do not appear to currently exceed the gulf's capacity as a whole to absorb them. In the marine environment inorganic fertilizers are

[7] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR 2010

diluted and absorbed by photosynthetic organisms, while untreated sewage and other organic matter is broken down through microbial activity.

According to the European Environmental Agency, which monitors the state of bathing waters throughout the EU, all bathing sites throughout the Argolic received the top “excellent” rating in 2020. Furthermore, every site has received the same rating every year since 2010. Monitoring of European bathing waters is conducted by local authorities and results reported to the European agency by each country.

State of bathing waters of the Argolic Gulf in 2020



A map of the monitored bathing sites in the Argolic Gulf. Each site, as indicated by its royal blue colour, was rated of “Excellent” quality.

However, it should be noted that these ratings are given only on the basis of the levels of two types of bacteria found in the water samples: Escherichia coli and Intestinal enterococci. As such, other parameters are not typically examined in this type of monitoring.

Further, the monitoring schedule requires sampling only during the main bathing period and one month beforehand (i.e. from May through the summer). As such, certain temporary incidents of bacteria entering the gulf (such as following heavy winter rains) will not be detected.

Even given the above, the consistent “excellent” rating of some sites is somewhat surprising. For instance, as with the other sites, the bay of Mandraki on Hydra has been consistently rated “excellent”. Yet this bathing site is located immediately adjacent to a pipe which is known to release untreated sewage from the town of Hydra directly into the sea, a fact which one might expect to negatively impact the local water quality. This seeming discrepancy may be due to the effects of currents carrying the untreated waste away from the sampling site, or due to samples being taken at times when wastewater is not being released. Whatever the case, this suggests that bathing water quality ratings should be interpreted with some caution.

In short, while the universal and consistent rating of bathing waters of the Argolic Gulf as excellent is a decent indication that overall its waters are relatively clean, for any individual site an excellent rating does not mean that it is not subject to significant temporary or localized sources of pollution.

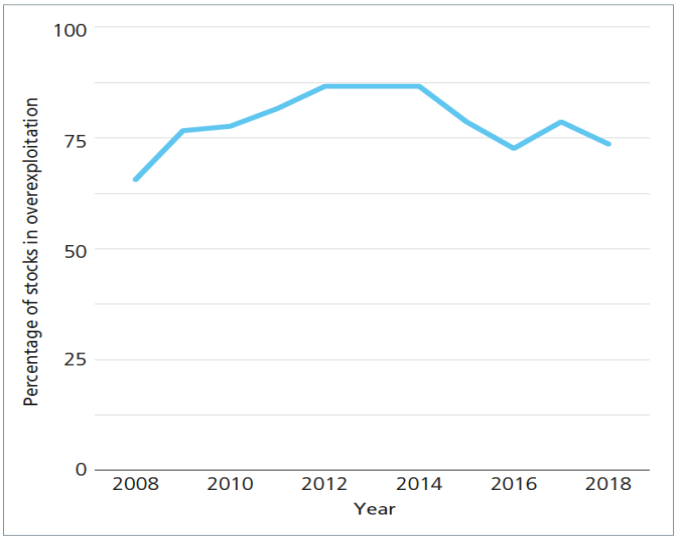
These, and the areas most affected are discussed below under the heading “Pollution in the Argolic Gulf”.

2.2 Fish Stocks and Marine Biodiversity: Current State and Trends

Before examining the specific environmental pressures affecting the populations of the Argolic Gulf in more detail, it is worth first considering the broader trends in Greek seas.

General Trends in Greek Seas and the Broader Mediterranean

Percentage of assessed stocks in overexploitation in the Mediterranean and Black Sea, 2008–2018 Source: FAO



Overall, despite international concern regarding overfishing stretching back many years, throughout the Mediterranean wild populations of fish and other species continue to be overexploited to a disconcerting degree. As noted by the UN’s General Fisheries Commission for the Mediterranean in its 2020 report: “Most stocks [in the Mediterranean and Black Sea] for which validated assessments are available continue

to be fished outside biologically sustainable limits."

In 2018 approximately 75% of such stocks were considered overexploited, down from a peak of 88% in 2014. According to the UN agency, this moderate decrease is due in part to various measures implemented across the region to protect certain commercially important fish species (and particularly bottom-dwelling species), "including overall effort reduction and the protection of coastal areas from trawlers."

While this decrease offers a glimmer of hope, highlighting the potential effectiveness of measures to reduce overfishing, for the vast majority of fish stocks these remain highly insufficient. Furthermore, it should be noted that there are significant gaps in the data even with regard to commercially important species (which are the focus of the GFCM), in particular for the eastern Mediterranean, including Greece, where national reporting schemes still have much room for improvement. The data is even weaker concerning the impact of fishing on species caught and killed as bycatch.

Beyond commercially important fish stocks, the broader decline in biodiversity in the Mediterranean is clearly pronounced and ongoing. As a whole, the Mediterranean is considered a biodiversity hotspot, home to more than 17,000 marine species (4 to 18% of the world's known marine species), while representing only around 1% of global ocean volume[8]. A high percentage of these species are found in Greek waters[9]. While there have been some moderate success stories for certain particularly vulnerable species thanks to targeted conservation efforts (such as the Loggerhead turtle and Dalmatian pelican), despite the commitments adopted by the international community towards protecting biodiversity following the 1992 Rio Summit, even today trends continue to be in a negative direction.

According to the *Living Mediterranean Report,* a major study coordinated by the Tour du Valat and released in June 2021 – and one of the few to offer estimates of the relative abundance of wild animal populations in the Mediterranean – between 1993 and 2016 the abundance of vertebrate populations in the Mediterranean Basin declined by an average of 20%. For marine vertebrates the decline was greater, averaging 52%. While the pandemic may have offered a moderate respite by easing certain environmental pressures, there is little indication that in the years since this trend has shifted significantly.

[8] United Nations Environment Programme/Mediterranean Action Plan and Plan Bleu (2020). State of the Environment and Development in the Mediterranean. Nairobi.
[9] Blue Growth in the Mediterranean Sea: The Challenge of Good Environmental Management, WWF Hellas, 2015.

The same report identifies the key pressures impacting biodiversity (across marine, freshwater and terrestrial environments) as the following:

- Over-exploitation of species (i.e. fishing and related activities)
- Intensive agriculture and aquaculture
- Climate change
- Invasive species
- Urban development and transport

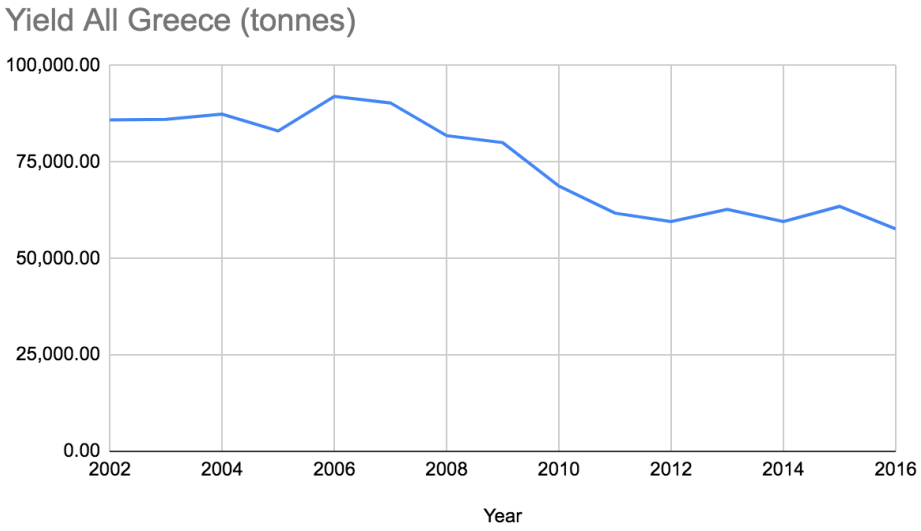
The State of Fish Stocks & Biodiversity in the Argolic Gulf

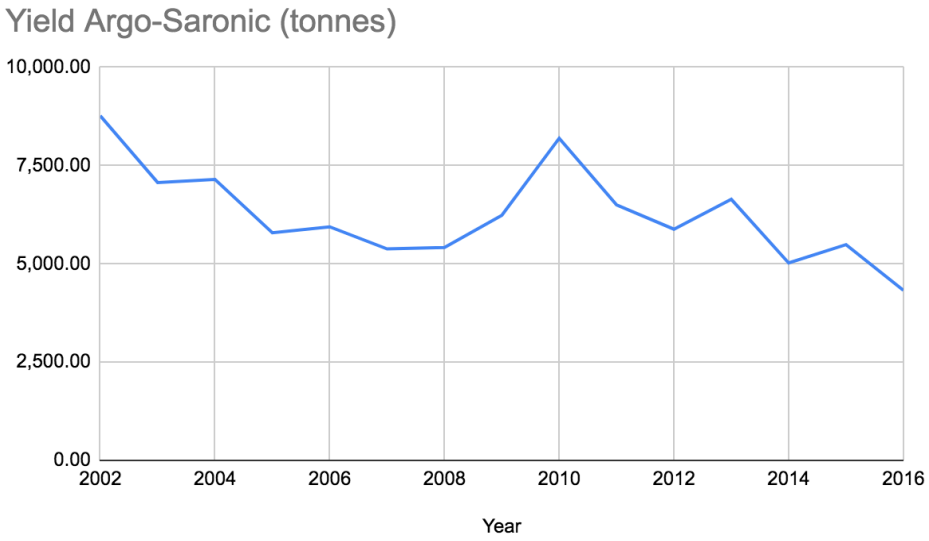
For Greek seas there is generally insufficient data to be able to quantify the degree of overfishing with any level of certainty, however all scientific and other indicators are that overfishing continues to negatively impact biodiversity throughout Greek waters[10].

The lack of data is even more pronounced in the Argolic Gulf than elsewhere. This is partly because there is no dedicated seafood market to collect and monitor catches from all of the vessels fishing in the gulf. Catches are offloaded in several ports in the area, or (in the case of larger vessels) in Piraeus. Furthermore, the Hellenic Statistical Authority (ELSTAT), which collects data on yields from the country's various fisheries, only provides data on yields from the Argolic and Saronic gulfs grouped together.

Nevertheless data from ELSTAT appear to confirm a fairly steady drop in yields over the past two decades, both countrywide and in the Argo-Saronic. While this drop in yields may be the result of several factors including reduction in fishing effort, it seems likely that declining fish stocks are a significant factor.

[10] Blue Growth in the Mediterranean Sea: The Challenge of Good Environmental Management, WWF Hellas, 2015.





Total yields from all Greek fisheries (top) and from the Argo-Saronic (bottom) from 2002-2016 from vessels ≥ 20 hp. (Note that while data on yields is available for the period 2017-2019, in 2016 ELSTAT revised its methodology to collect data on yields from all vessels, not only those with engines greater than 20hp. As a result, data from more recent years can not be directly compared to yields prior to 2016). Source: ELSTAT

Beyond the data collected annually by ELSTAT and other fishery monitoring bodies, there has effectively been only one systematic effort to assess the health of the Argolic Gulf fishery. The “Study for the Sustainability of the Argolic Gulf Fishery” was published in 2010 and sought to, “comprise a first scientific basis, in order for the Ministry of Rural

Development and Food to develop a comprehensive management programme with the aim of the sustainability of the Argolic Gulf fishery"[11].

The above study was conducted by Costas Kapiris, a researcher with the Hellenic Center for Marine Research (HCMR), who sadly passed away in 2018. Kapiris and his team assessed environmental, socio-economic and other data regarding fishing in the area, and conducted experimental fishing expeditions in the gulf in the summer of 2008. While the latter provided some first data points regarding the relative abundance of different species that live in the gulf, they were limited in scope and thus insufficient to properly assess the health of stocks.

Nevertheless, the researchers were able to draw some tentative conclusions from cataloguing the catches of small coastal vessels in the Argolic Gulf. On the one hand these showed "greater levels of abundance and diversity than other areas [of Greece]," indicating that the Argolic Gulf remains a productive fishery relatively rich in biodiversity (at least when compared with other Greek fisheries). Yet, at the same time Kapiris also writes:

> "However we must not ignore two facts: a.) that many fishermen are catching ever fewer fish, and b.) many young and juvenile animals are caught. These two facts strongly indicate that we are on a trajectory of overfishing."

On the basis of this and other data, Kapiris recommended a number of measures be taken to ensure the sustainability of fish stocks in the Argolic Gulf. These are discussed in more detail below, however for now it suffices to say that few, if any, of these have since been implemented.

Rather, in the decade since the Kapiris report was released, aside from a modest reduction in the number of commercial fishing vessels registered in the area (discussed below) there appear to have been few, if any, other substantive measures taken to curb overfishing in the Argolic Gulf. As a result there is little reason to believe that levels of biodiversity and abundance in the gulf will have since improved.

This view was strongly confirmed by interviews conducted in the context of this report in April-June 2021 with commercial and amateur fishermen, professional divers, former and current HCMR researchers and others with expert knowledge of the Argolic Gulf. While opinions vary about the main culprits responsible, an almost unanimous consensus emerged that fish and other marine populations in the Argolic Gulf continue

[11] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR 2010

to be in clear decline. Almost all circumstantial evidence points in this direction, although perhaps most telling is the fact that many of the fish caught by fishermen in the Argolic Gulf (such as groupers or common dentex that can reach considerable sizes) tend to be relatively small in size compared to those caught in past decades - a clear sign that fish species are under pressure, with individuals struggling to reach maturity and reproduce before they are removed from the population.

2.3 Fishing in the Argolic Gulf

While a number of anthropogenic factors are likely responsible for the reduction in species populations and ecosystem degradation in the Argolic Gulf, there is a broad consensus that fishing is by far the primary driver.

Fishers in the Argolic Gulf can be divided into distinct groups depending on whether they practice commercial or recreational/amateur fishing and the type of gear they use.

Below the activity of each of the main groups is described and their impact assessed.

The Commercial Fishing Fleet - Overview

Commercial fishing vessels in Greece are normally divided into two main categories: those that practice offshore fishing (“mesi alieia” in Greek) and those, usually small-scale vessels that practice coastal, or inshore, fishing (“paraktia alieia”).

Offshore fishing is practiced primarily by large bottom trawlers and purse seiners (the latter named after their large ring-shaped nets that target large shoals in the open sea - mainly of anchovy and sardines).

Inshore fishing is practiced using a wide variety of gear-types. One of the key characteristics of Greek fisheries is that the vast majority of the commercial fleet is made up of small scale vessels (12m or less).

As can be seen in the table below, countrywide in 2019 the Greek fishing fleet was made up of a total of 13,877 vessels, 96.5% of which were small-scale vessels practicing inshore fishing, and the remainder split fairly evenly between bottom trawlers and purse seiners. Yet even so, the larger vessels accounted for over 50% of the yield, in terms of tonnes of biomass landed.

The Greek Fishing Fleet in 2019

Category of Vessel	Number of Vessels	% of Fleet 2020	Yield (Tonnes)	% Total Yield
Small Scale	13,392	**96.51%**	29,360	**35.84%**
Trawlers	246	**1.77%**	15973	**19.50**%
Purse Seiners	239	**1.72**%	36,586	**44.66**%
Total	13,877	100.00%	81,919	100.00%

Source: ELSTAT

In terms of its make-up, the fishing fleet of the Argolic Gulf resembles that of the broader country. As can be seen below, at the beginning of 2021, there were exactly 600 commercial fishing vessels registered in the main fishing ports of the Argolic Gulf. Of these, 5 are trawlers and 9 are purse seiners.

Vessels in the main fishing ports of the Argolic Gulf (31/12/2020)

Port	Purse Seiners	Trawlers	Small Scale Fishery	Total
Astros			21	21
Ermioni	2	1	55	58
Hydra			46	46
Koilada			52	52
Leonidio			41	41
Nafplio	1		212	213
Porto Heli	6	4	92	102
Spetses			67	67
Total	**9**	**5**	**586**	**600**

Source: National Register of Fishing Vessels

This comprises a reduction since 2007 (the last year for which there is data in the Kapiris study) when there were a total of 697 commercial fishing vessels in the Argolic Gulf, including 10 purse seiners and 9 trawlers. This mirrors the gradual reduction in the Greek commercial fleet over the years due to the implementation of Europe's Common Fisheries Policy, under which financial incentives are offered to fishermen to permanently retire their vessels (often involving their physical destruction).

While one might have expected the reduction in the commercial fleet in the Argolic Gulf over the past decade to have led to a rise in fish abundance, as discussed earlier, this does not appear to have occurred, at least to any clear observable degree. One

potential reason for this is that the vessels that have been permanently retired were those that were already partly or entirely inactive (due e.g. to the advanced age of their owners). In addition, reductions in fishing effort by inshore commercial fishermen has likely been offset to at least some degree by increases in fishing by other groups - namely “amateur” fishers.

Below, the main characteristics of the different groups exploiting the Argolic Gulf fishery are discussed.

Offshore Fishing

Despite the modest reduction in their numbers over the past 2 decades and greater restrictions on their operation, large, offshore fishing vessels undoubtedly continue to have a significant impact on fish stocks in the Argolic Gulf.

Firstly, it must be noted that while fewer trawlers and purse seiners may be registered in ports in the Argolic Gulf, this does not necessarily mean that fewer such vessels are actually fishing in the gulf. Offshore fishing vessels often travel to fisheries considerable distances from their home ports; as such, vessels registered in other ports (such as in the Saronic) can and do frequent the Argolic Gulf at different times of the year, harvesting currently unknown quantities of fish. (By the same token, offshore vessels based in the Argolic Gulf also travel to other fisheries depending on the season).

As mentioned earlier, offshore vessels, while few in number, are responsible for over 50% of catches landed by weight at a countrywide level (more precise estimates for the Argolic Gulf are currently impossible). This already considerable removal of biomass from the sea does not take into account bycatch, which is significantly greater for offshore vessels as these use towed gear compared to small inshore fishing vessels which mainly use static gear. Further, as is well-known, bottom trawlers also cause major damage to the sea-bed, disrupting, or permanently damaging demersal ecosystems.

While a number of national and local regulations exist restricting the areas and seasons where trawlers and purse seiners can fish in the Argolic Gulf, many interviewed for this report claimed that these are regularly flouted with seeming impunity, as policing on the part of the Coast Guard and the upholding of regulations through fines and other punitive measures is lax.

Minimizing the impact - key goals

Due to the significant impact even small numbers of such vessels can have on marine populations and ecosystems in a given area, it seems clear that any campaign to rejuvenate the Argolic Gulf will be at odds with the continued operation of large offshore vessels anywhere in the gulf. This is particularly true of trawlers which indiscriminately remove large amounts of biomass of many different species from the sea (with animals such as sea turtles and dolphins sometimes among the collateral damage) and have major and lasting impact on the sea bed, disrupting entire ecosystems. However, inshore fishermen have also reported incidents of purse seiners operating in shallow waters (i.e. outside of areas where they are permitted) using methods (including powerful lamps) that are particularly destructive for juvenile fish populations.

As such, it is recommended that the ultimate goal of the AGEF should be the complete banning of trawlers from operating anywhere within the Argolic Gulf. The elimination, or major curtailment of the activity of purse seiners would also be desirable.

At a minimum, a key goal would be ensuring that the existing laws and exclusionary zones governing the operation of these vessels within the gulf are better enforced and observed.

Small-Scale Inshore Fishing

As in the rest of Greece, the majority of commercial fishermen in the Argolic Gulf practice small-scale inshore fishing. They employ a wide range of gear to target different vertebrate and invertebrate marine species including nets, traps and longlines. In general, because they primarily use static gear (in contrast to the towed gear used by trawlers and purse seiners), such fishing is considered more selective and sustainable, with undersized juvenile fish more able to escape from nets, and significantly less bycatch compared with offshore fishing. A range of restrictions governs such fisheries, regulating factors such as the minimum allowable mesh size of nets, and hooks on longlines[12].

When practiced responsibly, inshore fishing is widely considered to be sustainable. That said, small-scale fishing vessels certainly contribute to the phenomenon of overfishing in the Argolic Gulf. This is both due to practices that are currently legal, as well as practices that are prohibited but continue to be employed due to lax observance and poor enforcement of existing regulations.

[12] Blue Growth in the Mediterranean Sea: The Challenge of Good Environmental Management, WWF Hellas, 2015.

A positive step towards making Greece's small-scale fisheries more sustainable has been taken with the recent move to effectively prohibit coastal trawling at a national level ("vintzotrates") - a particularly destructive practice that damages the sea-bed in shallow areas near the shore. An extension was granted to vessels with such licenses until March 2021 (there were 221 such vessels active countrywide in 2019[13], and several in the Argolic Gulf), but according to announcements by relevant government ministers, these will no longer be renewed. At the same time, economic incentives have been offered to fishermen using this gear type in order for them to permanently retire it.

Minimizing the impact - key goals:

In his 2008 study, Costas Kapiris made a number of recommendations to improve the sustainability of the small-scale inshore fisheries of the Argolic Gulf. As most, if not all, of these are equally applicable today they are reproduced in full below:

"Given the following:

- *The majority of species examined in the current study reproduce in coastal areas - mainly end of spring-summer - in the northwest and northeast of the gulf, areas where inshore fishermen are particularly active,*
- *The interior of the gulf is considered a rich area in terms of food for fish, due to anthropogenic activity, a fact which contributes to the gathering of mature individuals that are ready to reproduce,*
- *The biomass of fish in coastal waters increases up until 60m, a depth at which the inshore fishermen are active,*
- *[Nets] with a mesh size of up to 20mm and long-lines that use hooks No 14-16 capture many undersized animals - both of commercial species and bycatch.*

"It is proposed that fishing effort of the inshore fishery is reduced to a degree in order to give populations the opportunity to recover. The manner that this will be achieved will be decided by the Ministry of Rural Development and Food. It is advised that this reduction could be achieved in the following ways:

- *A total ban on fishing with nets with a mesh size below 20mm throughout the year and throughout the Argolic Gulf. It is universally accepted that these nets cause damage to the fish stocks of the gulf, and the result of their use is already visible to all who fish in the wider area.*

[13] ELSTAT

- *Additionally, this reduction in fishing effort could be achieved with the seasonal (every other year) prohibition on all manner of fishing in certain sensitive areas, either for an extended period of time, or during the spring-summer period when species usually reproduce. These areas are those which have been identified by the current study as areas that attract mature individuals or juveniles. As such, for one year fishing could be excluded from an area in the northwestern part of the gulf (the area between Nea Kio and Kiveri), while the next year (i.e. every 2 years), the same could apply in an area in the northwestern part of the gulf (Vivari-Tolo).*
- *The fishermen propose an additional, alternative way of reducing the fishing effort: For fishing to be halted during the months when mature fish are known to enter the gulf with the aim of spawning (May). The majority of species follow specific "corridors" in order to enter the interior of the gulf to reproduce: they enter along the western part of the Argolic and follow the course: Astros, Xiropigado, Kiveri, Myloi, Nea Kios at depths less than the isobath of 25m. A prohibition on fishing in this extensive area during the month of May would undoubtedly help rejuvenate the populations.*
- *As for long lines, in the area no hooks above No 14 should be used because, as we have seen, even these catch many undersized individuals."*

The "Black Box" of Recreational Fishing

A significant - but quite poorly studied - source of pressure for marine life in the Argolic Gulf and broader region is recreational (or "amateur") fishing.

Overall, at both the national and European level, recreational fishing and its impact has been studied far less than commercial fishing. Only in recent years as a response to growing awareness of its impact have efforts begun to systematically monitor the activity, with European directives issued requiring the implementation of relevant programmes. In Greece the first (delayed) pilot study examining recreational fishing is currently underway, implemented by the Fisheries Research Institute (FRI) of the Agricultural Organization-DEMETER (which is overseen by the Ministry of Agriculture). However this first pilot study has yet to be completed[14].

Additionally, while for many years those fishing from boats or using spearguns were required to have an amateur fishing license issued by local port authorities (these were

[14] https://inale.gr/recreational-fishing/

not required for those fishing from the shore), that requirement was scrapped in 2014. As a result, there is little information available about the current number of recreational fishers active in Greece or the Argolic Gulf.

Nevertheless, some idea of the scale of the activity can be gleaned from past data. Tables 3 and 4 below display the number of recreational fishing licenses issued or renewed in 2006 and 2007 in Greece and the region of the Argolic Gulf (as licenses were valid for 2 years, data is provided over a 2-year period):

Table 3: Recreational Fishing Licenses Issued or Renewed in Greece 2006-2007

	2006	**2007**	**Total 2006-2007**
Recreational Fishing Licenses Issued (Vessels)	18903	20150	39053
Recreational Fishing Licenses Issued (Individuals)	50447	52953	103400
Recreational Fishing Licenses Renewed (Vessels)	28228	25673	53901
Recreational Fishing Licenses Renewed (Individuals)	41755	48243	89998
Total	139333	147019	**286352**

Source: Blue Growth in the Mediterranean Sea: The Challenge of Good Environmental Management, WWF Hellas, 2015.

As can be seen from the chart below, in the Argolic Gulf over the period 2006-2007 there were over 5,200 active recreational fishing licenses. As mentioned earlier, in the same period there were about 700 small-scale commercial fishing vessels registered in the same ports; in other words for every small scale commercial fishers, there were about 7.5 recreational fishers (not including those who only fished from the shore where, as mentioned, a license was not required).

Recreational Fishing Licenses Issued or Renewed in the Argolic Gulf 2006-2007 (*Kapiris, 2010)*

Port Authority	2006			2007			2006-2007
	Licenses Renewed	New Licenses Issued	Total	Licenses Renewed	New Licenses Issued	Total	Overall Total
Ermioni	41	111	152	96	103	199	351
Nafplio	674	727	1401	683	850	1533	2934
Poros	185	223	408	283	235	518	926
Porto Heli	109	137	246	150	115	265	511
Spetses	56	78	134	62	77	139	273
Hydra	70	47	117	68	49	117	234
Total	1135	1323	2458	1342	1429	2771	**5229**

Of course, by law, there are numerous restrictions on recreational fishing designed to ensure that such activity is only carried out for purely recreational or subsistence purposes and to minimize its ecological impact. These regulations govern both fishing quotas (eg. for most gear types no more than 5kg of fish is permitted to be removed every 24 hours) and the use of different types of gear (e.g. high wattage lamps are prohibited at night). Perhaps most importantly, the law stipulates that under no circumstances can fish or seafood caught by amateur fishers be sold.

It should also be mentioned here that the government recently published a draft law which will further tighten restrictions on recreational fishing (an open public consultation process ended on 4/06/21). The draft law includes measures such as extending the seasonal ban on spear fishing from May to April-May, reducing the number of hooks permitted on long lines, prohibiting the use of live bait (used to attract larger fish), etc. However it does not provide for reinstating the requirement that recreational fishers obtain licenses.

Yet, it is clear from interviews conducted in the context of this report as well as from past research that one of the main problems with recreational fishing is the frequency with which current laws are ignored. As such, rewriting the law without increasing outreach/policing efforts and punitive measures for rule breaking will likely have only minimal impact.

While it is impossible to know the true scale of the phenomenon, it is clear that a sizeable black market for fish exists in the Argolic Gulf, with so-called “amateur” fishermen illegally supplying restaurants and others with significant quantities of fish and

seafood. Together with the ban on commercial exploitation of their catches, these fishers will inevitably also violate other restrictions, grossly exceeding their permitted quotas, using prohibited methods (such as spearfishing with scuba gear), catching undersized individuals and employing other destructive practices.

While such individuals are likely a minority of the recreational fishers, given the large size of this group as a whole, their impact on the marine environment of the Argolic Gulf is likely very significant. In his 2010 study, Costas Kapiris described the illegal activity of recreational fishing as “one of the most serious problems faced by the [commercial] fishermen of the Argolic Gulf”.

In the years since, partly as a result of the Greek economic crisis forcing individuals to seek alternative sources of income, along with greater restrictions on the issuing of commercial fishing licenses, the severity of this issue appears to have only grown. Essentially, black market fish has become a significant source of supplementary income for certain locals whose main line of work is in other sectors (such as tourism, construction, etc.)

Further compounding the problem is the fact that many such fishermen now use sophisticated fish-finders and other high-tech tools whose prices have been steadily dropping, allowing them to be more efficient than ever before in their efforts, targeting fish at greater depths, depleting many of the fish stocks relied on by commercial fishers, and complicating any efforts to regulate fisheries.

Minimizing the impact - key goals:

Recreational fishers form a large and heterogenous group of whom many almost certainly cause little to no environmental damage. Others may cause damage due to ignorance which may be combated through public information campaigns.

However any plan to promote the regeneration of the Argolic Gulf must include a strategy for curtailing the more destructive practices of the most active (and deliberately rule-breaking) “amateur” or unlicensed fishermen.

In his 2008 report, Costas Kapiris recommends the following:

- Restricting recreational fishing either temporally (e.g. by permitting it only on certain days of the week) or geographically.
- Creating zones for recreational fishing in areas near to port authorities (e.g. outside Nafplio)
- Improving policing and increasing penalties for rule-breaking behavior.

2.4 Pollution of the Argolic Gulf

While likely secondary in importance when compared with fishing, it is clear from both past studies and other reports from the area that pollution is a significant problem for at least some marine ecosystems of the Argolic Gulf.

Due to the absence of systematic studies, it is impossible at this time to fully assess the impact of pollutants on marine populations, however it appears beyond question that the regular influx of agricultural run-off, untreated sewage and other pollutants, as well as the operation of intensive fish farms, has impacted at least certain locales, degrading ecosystems, impacting fish reproduction and reducing the productivity of the Argolic Gulf fishery.

Waste

The Bay of Nafplio

The northeastern most end of the Argolic Gulf receives runoff from the plain of Argos-Nafplio and the outflow of the Erasinos and Inachos rivers. As such, the seabed is formed by sediment deposited from its sources. It is also the area likely most affected by waste and other pollutants.

The area also receives outflow from the sewage treatment plant of Nafplio. In early 2021, the residents of Nafplio had a foul odor pervade their streets, and a cloudy stream of water could be seen entering the gulf coming from the sewage plant. The phenomenon persisted for several weeks drawing local attention and ire. According to numerous reports, the cause of this failure was that the facility had been overloaded by untreated waste primarily from nearby fruit processing plants. Such facilities are required by law to treat their waste before releasing it into the sewage system. However, due to inability due to a heavy seasonal workload or a desire to cut costs, they had not done this. A faulty pipe further meant that rather than in deeper water (as likely occurred in past years), the untreated waste was released near the shore.

The regional government has pledged to address the problem, although locals with expert knowledge of the matter hold few hopes for major immediate changes. And this is just one of countless instances of large amounts of organic and decaying matter flowing into the gulf at its shallowest end. Parts of both the Erasinos and Inachos rivers and their tributaries serve as illegal dumping grounds for liquid and solid waste from a

variety of sources, including raw sewage and household, industrial and agricultural waste. This waste enters the rivers, contaminates local groundwater and ultimately flows into the sea. In addition, intensive use of inorganic fertilizers and pesticides in the extensive orchards of the plain of Argos similarly enter the gulf.

Meanwhile, what remains of the natural wetland that once occupied the floodplain of these rivers remains under pressure from encroaching farmland and construction. Such wetlands can operate as filters, reducing the nutrient levels of water flowing into the sea which can lead to eutrophication in marine environments.

Indeed, past studies examining the operation of the Nafplio sewage treatment plant have found evidence of disruption to the marine ecosystem. And even if periods of high oxygen demand are temporary in the year, if these coincide with fish breeding periods, they could have a significant impact on local populations.

Sewage Treatment in the Argolic Gulf

Similar problems to those seen in the Bay of Nafplio exist throughout the Argolic Gulf, and particularly in areas with greater densities and levels of tourism. Most towns and villages on the Peloponnese are served by sewage treatment facilities – at least 70,000 residents are covered by 4 sewage treatment plants across the region[15]. Others have septic tanks which are periodically emptied (sometimes, of course, with the contents illegally dumped in streams). In areas such as Kranidi with high touristic development, and many holiday homes, local fishermen complain that the emptying of chlorinated pools has impacts on the marine environment, although this is unconfirmed.

Elsewhere, entire communities do not have access to sewage treatment facilities at all. On the island of Hydra, where most homes are connected to the grid due to the absence of motor vehicles rendering the use of septic tanks impossible, the effluent flows unimpeded directly into the sea through several pipelines, posing a risk to human health and the environment. Plans for the construction of a sewage treatment facility have been long in development, yet still remain unrealized. Part of the problem appears to be a legal dispute over a forced purchase of land necessary for the plant. According to Ioannis Belegris, the deputy mayor of Hydra, the expectation is for this to be resolved by the end of the summer 2021, and the tender for the project launched before the end of the year.

[15] Study for the Sustainability of the Argolic Gulf Fishery, Costas Kapiris, HCMR 2010

The situation is only moderately better on Spetses where a sewage treatment facility has recently been constructed, but has not yet begun operation as renovations are still required on the grid.

Finally, in addition to terrestrial sources of blackwater, a growing problem is the unregulated release of blackwater by recreational yachts. As the yachts that visit the region are growing in both number and size, in heavily trafficked areas during peak periods (including around the port of Hydra), such illegal discharges near the shore can have clear effects on sea quality, fouling coastlines and creating human health hazards.

Plastic and Solid Waste

Extensive and growing problems with plastic and other solid waste exist in the Argolic Gulf much as they do in other seas and waterways. Here, however, they are exacerbated by the very poor infrastructure for waste treatment and processing throughout the region.

As with sewage treatment, solid waste management plans are generally implemented at the municipal level, leading to a mix of different (although generally universally poor) schemes throughout the region. In most areas, blue bins for packaging to be sent for recycling (mixed plastic, metal and glass) are available, although doubts are often expressed by locals regarding the actual percentage of waste that is effectively recycled. This cynicism, whether based in fact or not, undoubtedly contributes to the low recycling rates across the region.

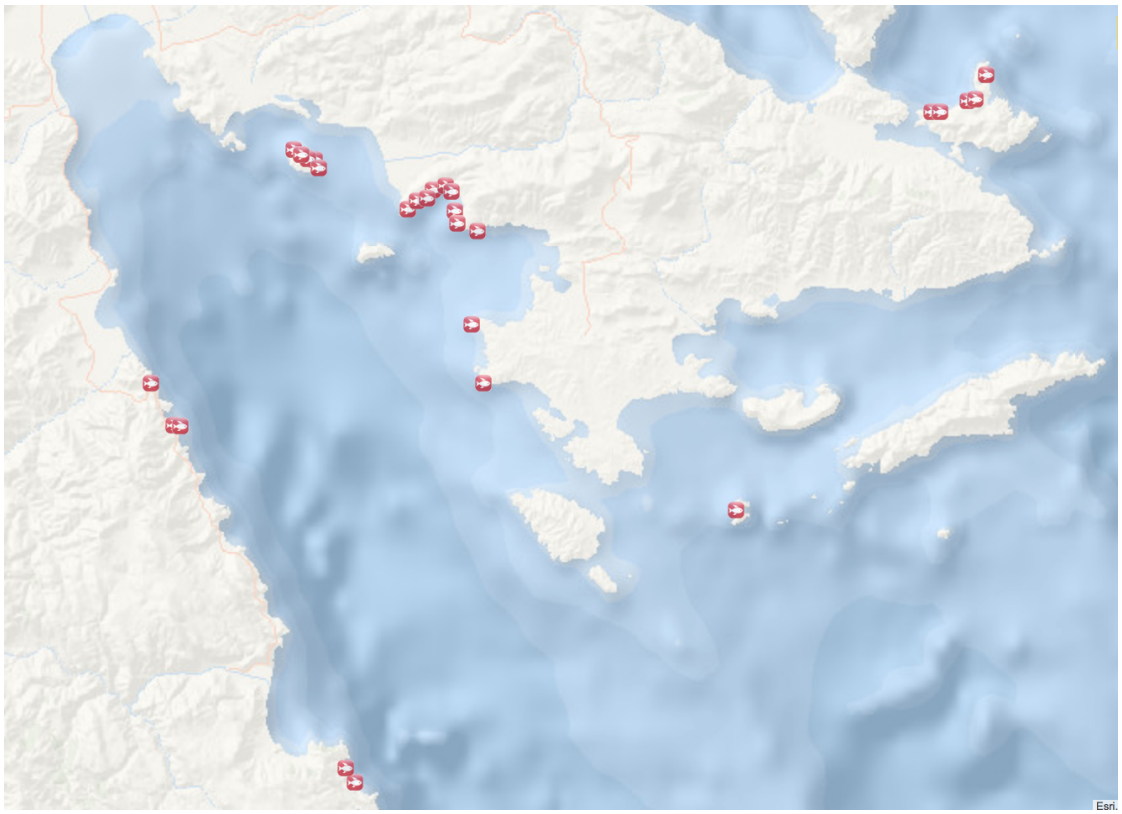
Meanwhile, there are no municipal composting programs to speak of. There is also little evidence of composting even of agricultural and green waste, with many cuttings - eg from olive and fruit trees - burnt in the field, impacting air quality. And as mentioned earlier, organic waste from industrial facilities similarly often ends up illegally dumped in fields and streams. On a recent site visit to the wetland of Nea Kios, it was not difficult to come across what appeared to be a recent deposit of a large amount of fruit pulp alongside other waste. The situation is similar across the Argolic countryside which features numerous small illegal dumps.

The net result is that large amounts of solid waste from homes and businesses continues to end up in unregulated landfills across the region. To take just three examples, Spetses, Hydra and Nafplio - all heavily touristed areas - continue to operate illegal landfills next to the sea. In Nafplio this is located in Karathonas, directly above an attractive local beach. In Hydra, the landfill - located on a bay only a few kilometers from

the main town - can be seen clearly spilling into the sea; it has also been the site of an outbreak of multiple fires including one that is still smouldering at the time of writing[16].

The Argolic Gulf itself is directly impacted through waste that collapses or blows into the sea. This is in addition to other waste that can have a major impact on marine life such as discarded fishing gear and hazardous materials such as boat engine batteries, which are often discarded overboard at the end of their life in harbors and other areas.

The locations of the fish farms of the Argolic Gulf. Source: European Atlas of the Seas



Fish Farms

The map above shows the locations of the aquaculture facilities that operate in the Argolic Gulf. These are all fish farms, (as opposed to shellfish farms) likely all producing sea bream and sea bass. As can be seen, various facilities are located throughout the area, although they are particularly extensive around the island of Platia off the coast of Tolo and in the bay of Vourlia south of Iria.

The precise impact of these operations is a matter of some debate. Without question, the fish farms have a major impact on the immediate areas where they are located, with high levels of organic matter - mainly waste from the fish and unconsumed food - accumulating underneath

[16] https://www.kathimerini.gr/society/561409504/ydra-provlima-dysosmias-apo-tin-pyrkagia-sti-chomateri/

the cages and at other sites depending on local currents, degrading the local ecosystems. This is confirmed by both eye-witness accounts from divers and some limited scientific studies that have been conducted to assess their impact. Additionally, antibiotics and other substances used to combat diseases and parasites undoubtedly enter the marine environment in significant quantities.

Some studies indicate that, due to dilution of this waste, further afield the impact of the fish farms is limited, a view supported by some marine researchers. The severity of environmental degradation caused by any given fish farm is also highly dependent on local conditions, such as depth, sediment composition, currents, etc.

That said, many maintain that fish farms also affect the gulf more broadly through the frequent escapes of fish, with fishers in particular reporting evidence of impact on wild populations.

Fish escaping from fish farms (either as adults or as fish spawn) can affect wild populations through the spread of diseases and parasites and interbreeding. As sea bream and sea bass are predatory, some also believe that the escape of significant numbers can further disrupt the balance of the local ecosystem by increasing predation on other wild species (and particularly juveniles) exacerbating problems caused by overfishing. However, systematic studies to assess these kinds of potential impacts have not been conducted (or at least published) concerning the Argolic Gulf. Due to the high concentration of fish, the farms are also known to attract predators such as monk seals that damage cages, bringing them in conflict with the fish farmers.

There are also numerous anecdotal reports that at least some of the farms are poorly run, with empty bags of food, for example, frequently washing up on nearby beaches after apparently being simply discarded into the sea.

For now, any plans to expand fish farming in the area are on hold. This is because they are operating in a semi-legal capacity. Under the current law, all fish farms must be sited in areas zoned as Areas of Organized Development of Aquaculture Activities (P.O.A.Y.), each of which will have detailed plans regulating the operation and zones of potential expansion of fish farms. However, to date, only one P.O.A.Y. has been established in Greece off the coast of Pieria (for shellfish farms).

The environmental studies that are necessary to establish P.O.A.Y. zones in the areas with active fish farms are still pending. In late 2020 these were published for areas around Poros, and provided for large sections of the coast (where a number of fish farms are already in operation) being zoned for the further development of aquaculture. These have met with fierce local opposition spearheaded by the mayor of Poros, and many critics argue that large fish farm companies have too much influence on the relevant environmental and planning studies.

It is not clear when the plans for a similar P.O.A.Y. in the Argolic Gulf will mature. However if, as seems likely, such plans ultimately provide for further expansion, they will undoubtedly meet

with local opposition. Among the most organized opposers of fish farms are local business leaders in Tolo, who recently waged a successful legal battle against the expansion of a fish farm off Platia.

While there are arguments to be made about the necessity of fish farming in general, on balance the Argolic Gulf already has its fair share of such units, many of which do not appear to be well-run, nor well-sited to minimize environmental impacts. In addition, further development of aquaculture in the region will inevitably come into conflict with efforts to develop ecotourism. As such, it is recommended that the AGEF support campaigns against any future fish farm expansion in the Argolic Gulf (and particularly along the coast of Argolis) as well as efforts to minimize and offset damage caused by the operation of the existing facilities.

3. Proposed Strategy: The Argolic Gulf Regeneration Project

Tagline

Supporting the health of the Argolic coast and the communities who live on it.
Υποστηρίζοντας την βέλτιστη υγεία των ακτών και των κοινοτήτων του Αργολικού Κόλπου.

The Role of the AGEF

No other environmental charities dedicated to the region were identified during the drafting of this report. Most groups active in the area in this sphere tend to be local cultural, professional or business associations, or informal groups focused on specific geographical areas and issues. Other national foundations and charities may engage in specific programs in the area (e.g. monitoring vulnerable species or key habitats), but not in any apparent systematic way.

As such, the AGEF can fill an important gap by addressing the gulf and its lands as a unified entity. As well as the direct impacts of the projects funded through its grants, it can help shape a new, more environmentally conscious identity for the region as a whole, fostering connections and spreading best practices, operating as a bridge between local and international communities.

The Need for a Narrative

The environmental challenges in the Argolic Gulf are many and varied, affecting an array of different ecosystems and communities, each with their own particularities. There is thus a danger that if the grant-giving strategy of the AGEF is unfocused, the ultimate outcome will not exceed the sum of its parts.

In order to achieve meaningful and lasting change, projects developed and/or funded by the AGEF must align with a broader narrative for the region.

It is proposed here that this narrative be one of “regeneration” (or “anagennisi” in Greek), which is at once forward looking, but at the same time implies earlier loss. Importantly, regeneration can also refer to improvements for both natural systems and for the communities that (often without realizing it) rely on them.

The Argolic Gulf is a place with a significant human population engaging in a variety of economic activities in intimate contact with nature. Tourism brings many tens of thousands more visitors every year. And history has shown that when perceived economic interest comes into conflict with natural systems, the latter almost always suffer at the expense of the former. Yet, in many cases this is a false choice: maintaining the status quo in waste management may seem

to cost less in the short term, but has multiple hidden costs such as from lost tourism revenue, increased healthcare costs etc.

The overarching aim should therefore be to promote actions that support a symbiotic relationship between humans and the natural world. The narrative should not be that humans must curtail their activities in order to protect nature. It should be that by learning to work better with nature, the human communities of the Argolic Gulf will themselves benefit.

A significant driver of this could be ecotourism. Projects that leave communities better placed to improve the value of their tourism product are more likely to leave lasting change. They are also more likely to be replicated by others; ultimately the most valuable environmental changes brought about by the AGEF will be those in which it had no direct involvement.

Thus, projects supported by the AGEF should ideally have both immediate and direct impacts, but also each contribute to a broader “destination branding” for the Argolic Gulf, which the AGEF can help promote and will help catalyze further positive change.

Below are the expected key areas of focus as the AGEF works to achieve these goals.

Creating a Marine Protected Area in the Argolic Gulf

From the analysis of the earlier two sections, an inescapable conclusion is that a vital component for any strategy to reduce the pressure on marine populations and ecosystems is the establishment of Marine Protected Areas - i.e. areas where all fishing activity is entirely prohibited. This conclusion is also supported by extensive international research and thinking on the issue – codified in the international effort to protect 30% of marine areas by 2030 – as well as the operation of existing MPAs in regions both in Greece and abroad.

In the Argolic Gulf, among the key issues contributing to overfishing is the poor adherence to and enforcement of existing regulations, particularly (but by no means exclusively) with regard to “amateur” fishers. Rule-breaking behaviour is commonplace throughout the region, and not limited to those actually fishing. In restaurants and fish markets, for instance, it is common to see undersized or vulnerable species on sale, either due to ignorance or deliberate flouting of existing regulations.

Essentially, a sizeable black market for seafood operates throughout the region with the competent authorities seemingly indifferent to the problem. Policing efforts on the part of the Coast Guard are few and far between; meanwhile relevant services of municipal and regional governments whose role it is to monitor fisheries are understaffed, and/or led by individuals with little to no relevant expert knowledge. This in turn contributes to the lack of data on fisheries further inhibiting action.

The unregulated behavior of unlicensed fishers also fuels cynicism on the part of the commercial fishers who, not unjustifiably, feel overburdened by taxes and regulations that others flout with impunity. As a result, they are more likely to engage in illegal practices themselves.

While by no means a panacea, the establishment of even a limited marine protected area would be an important step in the right direction. The simplicity of a no-take zone (which would be located near the shore) would render effective policing – both officially by authorities and unofficially the community itself – more likely. If the MPA is well-sited and managed, it is likely that tangible improvements in local marine populations would be soon evident, with improved catches near the boundary of the MPA for fishers and improved tourism potential through diving and other activities. The existence of an MPA in the area would also be a valuable asset in marketing the Argolic as a destination for eco-conscious tourism, helping feed a virtuous cycle and leading to improved environmental practices in other areas.

Key Obstacles to the Creation of an MPA

At the same time, it is also clear that, for an MPA to be effective, it would need to have significant support among the local population, and in particular the local small-scale commercial fishers who would need to both accept it and play a role in its enforcement.

Currently, this support is in very short supply. Past efforts by local groups in Tolo to establish an MPA failed due to opposition from the local commercial fishers. Even recent efforts by the regional government to assist fishers in the Argolic Gulf to obtain fishing tourism licenses failed to gain traction – one seminar held on the subject in the spring of 2021 in Koilada was attended by only three of the several dozen fishermen active in the area[17]. (Many feel that the legal requirements and bureaucracy make such licenses prohibitive).

As already indicated, part of the problem appears to be that commercial fishers already feel (rightly or wrongly) heavily burdened by regulations while facing unfair competition from others. Furthermore, many are of fairly advanced age and can cite a long history of promises made by both authorities and environmental organisations that subsequently proved to be empty. Many are squeezed economically and pessimistic about the future, due in part to reduced yields due to overfishing, the legacy of the Greek economic crisis and the pandemic, and competition with fish farms that are able to supply the market with relatively low-cost fish. The argument that an MPA would ultimately work to their benefit by improving yields elsewhere is not new to many of them, and tends to be discounted outright due to their lack of faith that such a protected zone could be reliably implemented.

Building Trust through Waste

Despite the perhaps bleak picture described above, it is believed that an effort to establish at least a limited MPA - with the buy-in of traditional fishers - can be successful.

[17] Personal communication with Nikos Elenis, president of the community of Koilada

Firstly, it should be noted that there is at least widespread acknowledgment among traditional small-scale fishers that fish stocks in the Argolic Gulf are on a downward trend (although there are varying opinions as to the reasons for this). Secondly, such fishers are, of course, far from a homogenous group, with some more amenable to changes than others.

The key challenge will be to start to build trust between the AGEF and groups of small-scale fishers. This will chiefly require overcoming an expected degree of suspicion about the AGEF and how its activities may negatively impact them.

In truth, the AGEF and the small-scale fishers will actually be naturally broadly aligned. Of the groups currently fishing in the gulf, the small-scale traditional coastal fishers are those who are most regulated, and whose activity is most in line with a sustainable fishery. As such, the AGEF should seek to promote their role as key stewards of the gulf's marine environments, highlighting desirable practices and local heros.

To further build relationships and trust, common ground must be sought and concrete support offered from the AGEF. This is probably best achieved in areas removed from fishing itself, namely in addressing the problem of plastic and other waste in the sea.

As a key priority of the AGEF in its early grant-giving activity, it would thus make sense to involve local small-scale fishers in programs to collect and gather waste from marine environments. Such programs could include compensating fishers for collecting garbage at sea during their normal activities, or involving them in beach / undersea cleanups as support vessels (again with appropriate compensation).

Such a strategy would have multiple benefits:

- Direct payments to fishers would be likely very effective in building trust and obtaining allies, not only with the direct beneficiaries themselves but also with others, helping to counter perceptions of the AGEF as an "alien" entity that has nefarious motives
- Inviting fishers to contribute to activities such as beach clean-ups could provide an additional impetus for them to obtain fishing tourism licenses. Legally, it would be much easier for the AGEF to compensate a fisher (e.g. by hiring them to transport volunteers for a day) if they have obtained such a license.
- It will provide ample opportunities to spend time with the local fishers, building relationships and obtaining more detailed knowledge of local ecosystems and specific environmental challenges. This knowledge would be invaluable in subsequently ascertaining where on the Argolic Gulf and MPA would be most suitable, and identifying other possible targets for action. Similarly, in an informal setting fishers are more likely to be open to discussions about MPAs and other measures, and offer their own proposals.
- Fishers who take part in such programs will also be more likely to change their own less-than desirable behaviors, becoming more responsible with their own waste such as old nets and batteries, which are often simply dumped in the sea.

This strategy would also tie in with other initiatives of the AGEF focused on solid waste on land (discussed below), helping to forge a clear narrative about the organisation and its goals. Finally, even in a worst-case scenario where such programs fail to win any meaningful support among fishers for the creation of an MPA, they will nevertheless still achieve meaningful results in terms of waste removal from sensitive areas.

Moving Towards Zero Waste

Given the current very poor management of waste of all kinds in the Argolic Gulf, the goal of “zero waste” may seem excessively lofty. However, as was explained by Enzo Favoino, scientific coordinator of Zero Waste Europe at a recent seminar hosted by the Conservation Collective, the zero waste movement seeks to achieve this ambitious goal through a series of small, realizable steps.

Ultimately, most problems with waste management in the region must be addressed at the level of the municipal or regional government. For large population centers such as Nafplio, only through proper, well-managed municipal waste collection and management schemes involving separation at source and high levels of recycling and composting, can the levels of plastic and other waste ending up in landfills or worse be realistically minimized.

Given this, beyond simply supporting local campaigns to pressure municipal authorities to realize necessary infrastructure projects and adopt better practices, how can AGEF contribute to resolving this key problem?

Compost Magic

Agriculture

While the AGEF cannot be a substitute for any municipal authority, it can make a meaningful impact on waste reduction primarily through the development and support of composting programs. Currently, composting is at very low levels throughout the region.

The situation is perhaps most absurd in the agricultural areas. Here, there is widespread use of inorganic fertilizers (often above legal levels) to ensure crop productivity. These fertilizers enter the groundwater - which in the region already has dangerously high levels of nitrates - as well as the sea. Over time, the level of organic matter in the soil drops, negatively impacting water retention and overall soil health. This then further contributes to excessive water use for irrigation.

At the same time, large amounts of organic waste in the form of cuttings, unsold fruit, animal manure and more is disposed of improperly with significant environmental impacts such as added pressure on landfills or degradation of local environments through illegal dumping.

The above are effectively two sides of the same problem, as with effective composting programs, agricultural waste could be turned into an asset. The resulting compost could be used to enrich soils, which would have a range of benefits, both for farmers and the local environment.

As such, the AGEF should develop and promote agricultural composting programs, working with local farmers to increase both levels of composting of agricultural waste, and promote the use of compost to enrich soils. Such initiatives could also be combined with programs to promote the use of organic and permaculture methods, potentially in parallel with agritourism activities that would provide farmers with additional sources of income, and raise the ecological profile of the area.

Municipal Waste

For municipal waste, while initiatives to promote home composting are to be welcomed and supported, the truth is that in many areas the only realistic way to significantly increase composting is to establish systems involving the collection of separated organic waste from homes. This organic waste would then be transferred to a composting facility (at least one such enterprise operates in Argolis) to become compost.

Aside from the direct benefit of reducing the waste that ends up in one of the region's overburdened landfills, encouraging individuals to separate their organic waste from other materials almost inevitably also boosts recycling, as further separation of waste becomes easy and obvious. The resulting compost can either be returned to participants in the program, or used elsewhere.

Ideally such an initiative would be implemented with the participation of local authorities and following consultation with the local community who would agree to adopt a zero waste target as a goal.

As a first step, a pilot scheme could be developed in an area with appreciable levels of community support for such a project. It would also be desirable if such a scheme offered part-time employment to one or more locals. In many communities in Greece, people are often more likely to support schemes out of a sense of social solidarity, than purely for reasons of environmental consciousness.

A logical starting point for such initiatives would be the islands of Spetses and Hydra. This is because of the relatively small size of their populations, and the fact that, as islands, waste management is a particularly pressing issue. (On Spetses there already is a fledgling effort to establish composting on the island). Their more cosmopolitan nature also makes it more likely that there would be significant levels of uptake. Other small communities where pilot composting schemes may be relatively well-received are Tolo and Koilada.

If successful, such pilot schemes could be integrated with municipal waste collection programs.

Regenerating and Protecting Important Habitats

Finally, another key area of focus for the AGEF should be the protection and promotion of high-value habitats, many of which have been neglected and risk being further degraded due to pressures of agricultural and tourism development.

In particular, the coastal wetlands and lagoons near Tolo and Ermioni are particularly important for local wildlife and have significantly underused eco-tourism potential. Potential projects could include clean-ups, monitoring (including through citizen science), and potentially some interventions to improve the health of the ecosystems.

Of particular note is the lagoon of Vivari, the site of a traditional lagoon fishery. In the past, the lagoon was once an important fish nursery teeming with fish, with juveniles able to hide from predators in the reeds surrounding the lagoon. However at some point in the 1990s, large amounts of fertilizer entered the lagoon which led to an algal bloom and a subsequent collapse in the levels of oxygen in the water which became foul-smelling and fetid[18].

The situation appears to be much better today, although works to expand the peripheral road have destroyed some parts of the natural reed beds lining the lagoon. It nevertheless appears relatively rich in fish as is evidenced by the number of amateur fishers who fish (although this is technically prohibited) from the shore.

There is currently an ongoing dispute over a recent auction for the license for the operation of the lagoon fishery, with two parties contending for it: Ilias Mantzavrakos, a local environmental consultant (whose grandfather once managed the fishery) and, somewhat oddly, the municipality of Nafplio. It is unclear who will end up with the license, however in either case there is potential for the AGEF to support any efforts to rejuvenate the lagoon. Situated in an area with potential for ecotourism growth, Vivari (the name of which is said to derive from the Latin “vivarium” due to its richness in life) could become a high profile regeneration project, with benefits for local fish populations as well as birdlife and other species.

Beyond these high-value ecosystems, it should also be noted that the broad area - as with the rest of the Peloponnese is rich in wildlife, home to thousands of species of birds, reptiles, mammals and invertebrates. Many of these are impacted by destructive practices such as the use of pesticides and poisons to control rodent populations. The AGEF should seek to highlight these species as valuable fellow inhabitants of the Argolic coast, and potentially engage in efforts to establish wild animal treatment centers which are absent from many areas.

[18] Personal communication with Ilias Mantzavrakos

Potential Projects

In addition to the key areas discussed above, in the context of researching this report a number of local initiatives and promising areas for potential grant-giving were identified. These are outlined briefly below.

Region-wide

- Mapping *Poseidonia* meadows (potentially through citizen science)
- Engaging with sailors and tourism boats operators to protect sensitive marine areas from ship anchors

Spetses

- Clean up of the harbor of Palio Limani
- Assisting the traditional shipyards of Palio Limani to comply with environmental regulations
- Establishing composting / permaculture seminars for locals and regionally
- Working with local hunter associations to clear footpaths and ensure viability of already successful programs to support prey populations
- Working with volunteer firefighters to protect forests
- Establishing water points where residents & visitors can refill bottles to reduce plastic waste
- Working with builders of the Armada boat (set alight during annual festival) to ensure it is constructed using environmentally friendly materials.
- Assisting with ongoing efforts to develop composting facility and network

Ermioni

- Clean ups and monitoring of wetlands
- Facilitating research on and regeneration of Thermisia Lagoon

Hydra

- Developing local composting network (as a matter of urgency)
- Supporting local campaigns for the swift completion of the municipal sewage treatment and solid waste management plant.
- Working with local school on environmental awareness programs / clean up activities
- Working with volunteer firefighters to protect forests
- Exploring possibility of underwater art installation

Porto Heli

- Working with local divers on sea bed clean-ups
- Organizing local conference on blue development / marine conservation

Kilada

- Working with local groups to protect and promote wetland & develop eco tourism
- Establishing collaborations with local fishers on sea bed / beach clean ups

Tolo

- Assisting campaigns to prevent fish farm expansion and promote their better operation
- Collaborating with local divers and fishers on clean-up operations
- Facilitating studies on local marine environment and ecosystems with aim of identifying potential sites for MPA
- Promoting eco- and agritourism tourism development

Vivari

- Assist in ecosystem regeneration efforts and development of a sustainable fishery in Vivari Lagoon

Nafplio

- Work with local environmental group on clean ups and protection of Nea Kios wetland, Erasinos and Inachos rivers
- Develop agricultural composting network and promote soil enrichment using compost, organic cultivation