

MARINE PROTECTED AREAS & DIVING TOURISM IN THE GREEK SEAS: PRACTICES AND PERSPECTIVES

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The adoption of a new legal framework concerning recreational diving activities in Greece has generated an increased demand for the development of diving tourism in the country. The present report draws upon previous experience regarding the promotion of sub-aquatic activities found elsewhere, analyses the potential of establishing diving tourism in the Greek Marine Protected Areas, and describes what an adequate management plan should ideally encompass, in order to ensure the conservation of the marine environment and subsequently the long term viability of this highly profitable form of ecotourism.

Keywords: *Diving Tourism, MPAs, Management, Biodiversity, Greek Seas*

INTRODUCTION

Over the last decades, the number of Marine Protected Areas (MPAs) is globally increasing since a considerable number of studies have pointed out the necessity for the establishment of MPAs and Networks of Marine Reserves worldwide, as 'tools' for the conservation and safeguarding of the marine environment and biodiversity (Agardy, 1997; IUCN-WCPA, 2008; WWF, 2008). Alongside with the potential environmental benefits, MPAs are usually expected to profit local communities and contribute to the increase of economic revenues, through the replenishment of fisheries,

and the development of marine tourism (Badalamenti et al., 2000; López Ornat, 2006). Moreover, MPAs provide favourable conditions for educational activities (e.g. environmental education, summer schools, marine laboratories), while they constitute reference sites for scientific research (Kelleher, 1999; PISCO, 2007). For all these reasons, the establishment of an MPA could potentially raise the environmental and socioeconomic profile of a coastal or insular region and promote sustainable development (López Ornat, 2006; Dalias et al., 2007).

Current experience has shown that tourism is among the first sectors that benefit from the establishment of an MPA (López Ornat, 2006). The positive ecological consequences resulting from the protection of biodiversity attract a large number of visitors not only within the protected zones but in the adjacent regions as well (Badalamenti et al., 2000; López Ornat, 2006). Environmental friendly tourism in MPAs is commonly promoted through marine recreational activities, such as snorkelling and SCUBA diving. Economic surveys (e.g. Brown et al., 2001) have indicated that MPAs support the development of sub-aquatic tourism that subsequently favours the installation of new facilities and the creation of new employment opportunities (Dalias et al., 2007). The development of environmentally responsible tourism along with a number of market related revenues (e.g. entrance and diving fees, diving equipment rents, hotels sub-charges, guided tours, short courses) are often used in order to fund the costs for the management, surveillance and monitoring of an MPA (Alban et al., 2006; López Ornat, 2006).

As the tourism industry heavily depends upon the coastal zone (Bellan and Bellan-Santini, 2001; UNEP/MAP/Blue Plan, 2005; UNEP, 2006), marine related tourism constitutes an important source of income for many coastal and insular areas globally (e.g. Red Sea, Caribbean, many Mediterranean MPAs and small island states such as the Maldives). Although diving tourism was initially considered as an advantage of the tropics (Hawkins and Roberts, 1992; Van Treeck and Schuhmacher, 1998), it is now rapidly increasing in the Mediterranean coasts (Milazzo et al., 2002), which are supposed to be a leading tourist destination of the world and consequently one of the most seriously affected regions by tourism.

INTENSIVE DIVING TOURISM: IDENTIFYING AND FACING THE PROBLEM

Marine biodiversity admittedly constitutes the main natural resource upon which the development of diving tourism is based. According to this

point of view, diving tourism directly depends on the increasing demand for ecological quality (UNEP/MAP/Blue Plan, 2005; López Ornat, 2006), and thus, there is a critical need to conserve the marine environment in order to ensure long-term viability of such a development. SCUBA divers are usually environmentally aware, motivated by their admiration for the sea, and willing to pay user fees or taxes in order to protect environmental quality of their diving destinations (Davis and Tisdell, 1996; Arin and Kramer, 2002; Depondt and Green, 2006).

Since MPAs are usually established in areas characterized as biodiversity 'hot-spots', such as the tropical coral reefs (Hawkins and Roberts, 1992) and their Mediterranean equivalent (i.e. the complex hard substrate communities) (Ballesteros, 2006), many MPAs worldwide, including those of the Mediterranean Sea (e.g. Port-Cros National Park in France and Islas Medas Marine Reserve in Spain), constitute popular diving destinations (Dalias et al., 2007).

Although recreational marine activities, such as snorkelling and SCUBA diving are considered to be environmental friendly forms of ecotourism, several studies have pointed out that once intensive and uncontrolled they can have a negative cumulative impact on the marine ecosystem. This is the case when divers disturb or damage vulnerable species and habitats, either accidentally or deliberately, directly or indirectly, with their hands, knees, fins, hanging equipment, boat anchoring, etc (Prior et al. 1995; Harriott et al., 1997; Tratalos and Austin, 2001). Furthermore, the level of human impact in some highly visited MPAs has surpassed the ecological carrying capacity (López Ornat, 2006), while marine communities undergo through a strong seasonal stress as the number of divers visiting a particular site usually increases during summertime.

Since the marine ecosystems are largely being affected by these recreational activities, the adoption and implementation of adequate conservation measures is considered to be vital both for the protection of the marine and coastal environment and for the subsequent long term success and promotion of marine related tourism.

With regards to diving tourism several measures have been proposed worldwide, in order to eliminate the potential negative impacts of the aforementioned activities. These measures usually include:

- Diving restrictions (e.g. limitations posed to the number of SCUBA divers or dives per day; closing of vulnerable marine areas; rotation of dive sites) (Garrabou et al., 1998; Lloret et al., 2006)

- Special training and briefings in order to increase environmental awareness and ameliorate divers' behaviour (Medio et al., 1997)
- Better management of divers' groups by decreasing their size (Tratalos and Austin, 2001) and/or through underwater interventions, when needed, by the dive guides in order to avoid contact with the substrate (Barker and Roberts, 2004)
- Better allocation of divers among the different dive sites (Davis and Tisdell, 1996), or even increasing the number of sites, with the aim to avoid overcrowding of particular diving 'hot-spots' (Milazzo et al., 2002)
- Concentration of divers in low vulnerability habitats during the initial part of the dive and procedure to more vulnerable habitats only when they have adjusted properly their buoyancy (Di Franco et al., 2009)
- Confining training courses and low level dives to less vulnerable sites (Hawkins and Roberts, 1992; Zakai and Chadwick-Furman, 2002) or in areas of artificially constructed reefs and underwater theme parks that also present interest for diving (Van Treeck and Schuhmacher, 1998)
- Spatial control of divers and snorkelers through the establishment of specified underwater paths (Hawkins and Roberts, 1992)
- Adoption of specific regulations for underwater photography since photographers usually come into direct contact with the substrate in order to take a picture (Rouphael and Inglis, 2001)
- Installation of permanent moorings in popular sites and adoption of regulations for environmental friendly anchoring (Francour et al, 1999)
- Creation of raised boardwalks or submarine paths which allow easy "entry/exit" points for divers, snorkelers or swimmers (Liddle, 1991; Rouphael and Inglis, 2001).

Additionally, before any such measure is adopted, a good knowledge of the target area through detailed mapping is considered necessary in order to identify and quantify the level of vulnerability of the different marine habitats to anthropogenic impacts, record the environmental factors that could potentially boost or hinder marine recreational activities, mark the main sources of pollution and define the ecological state of the natural environment. All this information is essential and should be considered in any future visitors' management plan.

Over and above the direct effects of diving, there are several other environmental and social effects related to the development of rapid,

unplanned tourism, such as pollution, uncontrolled construction of coastal facilities, loss of traditional jobs and authenticity, conflicts between different groups of people, stakeholders, etc. (Badalamenti et al., 2000; Milazzo et al., 2002). All these factors, either environmental or social, should be taken into account, in order to estimate the carrying capacity of any given area, avoid further “impoverishment” of the environment, and to establish effective tourism management that will enhance sustainable development.

DIVING TOURISM IN GREECE: CURRENT STATE AND POTENTIALS

The Greek coastline covers approximately 16500 km along the Aegean, Ionian, and Libyan seas at the NE part of Mediterranean, and is comprised of more than 9,800 islands and rock islets that are scattered around the Greek archipelagoes. As a result of the geographic position between the Mediterranean and the Black Sea, alongside with the topography and bathymetry of the seascape, the complexity and length of the coastline, and a great variety of physico-chemical features, the Greek Seas host a rich marine biodiversity, both in terms of number of species and types of habitats. Recent scientific research on the biodiversity of the Aegean Sea revealed that it could be ranked as the second richest area after the NW coasts of the Mediterranean (Chintiroglou et al., 2005).

Moreover, the Greek Seas are characterized by a high level of water clarity, compared to the more eutrophic Western Mediterranean basin, high geomorphologic complexity, mild Mediterranean climate (warm temperatures for an extended period of time) and quite safe swimming conditions. All these characteristics offer a good basis for the development of sub-aquatic tourism in the country.

Until 2005, recreational SCUBA diving in Greece was restricted to only a few marine areas (136) due to a number of legislative limitations that were mainly related to the existence of a large number of marine antiquities. Since 2005 a new law (P.D. 3409/273/2005) regarding recreational diving activities was adopted, aiming to promote diving tourism in the country. The law includes an accreditation system, which is in accordance with the relevant EU directives, concerning all training programs, organizations and providers of diving services. Additionally, the majority of the Greek marine areas are now open to recreational diving, with the exception of those that are defined as ‘submarine archaeological sites’ by the Ministry of Culture and a few other specific cases (e.g. ports). Yet, the law allows the prospect for certain areas with

marine antiquities to be characterized as 'submarine museums' that would only be visited under the supervision of an expert guard diver. Furthermore, it provides some general measures regarding the future potential establishment of 'Diving Marine Parks' (equivalent to the Marine Parks found elsewhere) and the installation of additional 'Hyperbaric Medical Centers' in the country.

Since the adoption of the new law in 2005, recreational diving activities have become more popular in the country. Indeed, unpublished statistics reveal that there has been a boom in the number of recreational SCUBA diving certifications issued in Greece per annum, reaching a total of 14,120 certifications in 2007 (data from the Greek Ministry of Mercantile Marine), while equivalent individual figures for Malta, Cyprus and Turkey for the years 2006 and 2007 were lower (PADI records). Up until now the annual numbers remain quite stable and high. Moreover, the number of dive centers operating in Greece doubled within the first years of the adoption of the new law, while the rise in demand for the establishment of 'Diving Marine Parks' in several coastal and insular areas, provide further evidence regarding the increasing interest for diving tourism in the country. However, basic guidelines and measures towards an integrated management plan for the sustainability and long-term viability of diving tourism, compatible with strategies for the conservation of biodiversity and biological resources in the Greek Seas are still missing and remain a crucial necessity.

In Greece there are two large MPAs: 1) the National Marine Park of Alonissos – Northern Sporades (NMPANS) at the North Aegean Sea, established in 1992, and 2) the National Marine Park of Zakynthos (NMPZ), at the Ionian Sea, established in 1999. The first was mainly created for the protection of the last European population of the Mediterranean monk seal (*Monachus monachus*), and the latter for the conservation of the most important nesting beaches of the loggerhead sea turtle (*Caretta caretta*) in the Mediterranean. Both MPAs attract a large number of visitors.

With regard to recreational diving activities, three dive sites within the NMPZ are annually visited by more than 6,500 SCUBA divers through four diving centers (Dalias et al., 2007). On the other hand, in the NMPANS, state conditions and legislative rules concerning SCUBA diving activities remain unclear, since the whole marine area (the largest Mediterranean MPA after 'Pelagos' Sanctuary, covering approximately 2,260 km²) has been characterized as a 'submarine archaeological site' by the Greek Ministry of Culture. It is known that a number of ancient shipwrecks and marine antiquities are situated within the NMPANS.

These should be accurately spotted and mapped, so that the areas that host such antiquities can be officially declared as 'submarine archaeological sites', while the remaining part of this vast marine area could be open for regulated recreational activities. However, no such effort has ever taken place. Thus, although the management body of the NMPANS and the local administrative authorities are highly interested in developing sustainable diving tourism in the area, there are a number of obstacles that restrain any sort of diving activity, mainly related to the aforementioned legislative framework. Yet, there are two diving centers that operate within the boundaries of the NMPANS. They are both based at the island of Alonissos and visit 3-4 specific underwater sites in zone 'B' of the park (Alonissos, Peristera and Dyo Aderfia islands), although only under the supervision of a marine archaeologist of the Greek Ministry of Culture. Recent data show that during the last two years the number of diving tourists who visited the NMPANS has doubled, reaching approximately 600-800 SCUBA divers annually (personal communication with local diving centers).

Apart from the two aforementioned MPAs, there are more than one hundred 'Sites of Community Importance' (SCI) of the Greek NATURA 2000 Network (92/43/EEC), which comprise marine areas and several coastal 'Special Protected Areas' (SPA) of the EC Birds Directive (79/409/EEC) (Thessalou-Legaki and Legakis, 2005). Many of these environmentally important sites already support several tourist activities, including yachting, sailing, spear fishing, SCUBA diving and snorkelling, and are therefore annually visited by an ever increasing number of tourists. Yet, in most cases, no specified management plan is being applied.

A different type of potential MPAs in Greece includes four artificial reefs which have been established over the last decade: Two in the N. Aegean (Gulf of Ierissos, and Fanari at Rodopi prefecture); one in S. Aegean (Kalymnos Island); and one in the Ionian Sea (Preveza prefecture). Furthermore, new plans for the establishment of more artificial reefs in several other parts of Greece are being proposed (e.g. coasts of Pieria). However, no recreational diving activity takes place at these artificial structures, despite the fact that both local administrative authorities and diving centers have expressed relative interest. Finally, a last type of MPA in the S. Aegean involves the Underwater Technological Park of the Hellenic Center of Marine Research (HCMR), at the north coasts of Crete, which is only used for scientific research (personal communication with C. Dounas, HCMR).

MPAs and Diving Tourism in the NE Aegean Sea

The marine ecosystems of the NE Aegean Sea and more specifically those of Lesvos Island have attracted human interest at an early period. Therefore, research on the marine biodiversity of the island can be traced back to the age of Aristotle, when the great Greek philosopher studied and recorded the marine biota of the Aegean Sea (Voultsiadou et al., 2010). During the last two decades several studies have indicated the marine richness and certain physical and biological qualities of this part of the Eastern Mediterranean (e.g. Millet and Lamy, 2002).

Over the last years the University of the Aegean has carried out considerable research with the aim to investigate the perspective of MPA establishment and promotion of diving tourism at the islands of the NE Aegean Sea, in the framework of national and European scientific projects (e.g. Koutsoubas et al., 2006; Gerovassileiou et al., 2008a). Research has mainly concentrated on Lesvos prefecture and is gradually expanding to neighbouring areas (e.g. Chios prefecture). The prefecture of Lesvos encompasses the islands of Lesvos and Limnos which are annually visited by a large number of tourists (e.g. 115,216 visitors who spent 578,223 nights in Lesvos Island during 2006), and the less touristic small island of Agios Efstratios which has been recently characterized as a 'green island' due to efforts for the establishment of environmental friendly sources of energy and ecotourism. Over the last years there has been a marked increase in the interest expressed regarding 'eco-touristic' activities, including recreational diving, in Lesvos prefecture. As a result, local authorities along with the University of the Aegean and private enterprises have made several attempts towards the development of environmentally orientated 'green' entrepreneurships.

In the NE Aegean Sea, there are 9 coastal and marine areas that belong to the NATURA 2000 Network (92/43/EEC), either as SCIs or as SPAs. Additionally, the unique petrified forest of Sigri in Lesvos Island, which encompasses terrestrial, coastal and marine sites, has been declared as a national 'Natural Monument' (P.D. 443/85). A number of tourist activities already take place in some of these sites, including several types of eco-tourism (e.g. SCUBA diving, bird watching, nature walks, cycling, geo-tourism), while the 'Lesvos Petrified Forest Geopark' of Sigri recently won the 'Skål International Ecotourism Award' in the category of 'General Countryside' (2008). Furthermore, some of these areas are close enough to other important tourist destinations, while most of them suffer from uncontrolled human developments. However, effective

measures of protection, or any sort of integrated management plans are still non-existent.

According to research findings (Koutsoubas et al., 2006), apart from the aforementioned areas which already experience some status of protection, there are many other marine areas in the NE Aegean Sea which fulfill a number of environmental criteria and should be protected. These criteria include a) rich biodiversity (in terms of species richness and variety of natural habitats), b) naturalness (natural unaffected marine areas), c) criticality (endangered and/or protected marine species and habitats), d) representativeness (representative types of Mediterranean marine habitats), and finally e) an important covering of certain biotopes that are protected by the EU environmental legislation (e.g. *Posidonia oceanica* seagrass meadows, coralligenous beds and submarine caves) (Tunisi and Diviacco, 1993; Kelleher, 1999; Roberts et al., 2003).

At the same time, these marine areas receive a high interest value as ideal sites for the development of recreational diving activities, since they encompass a wide variety of sites which exhibit an interesting geomorphology (e.g. walls, reefs, arches and caves) and support a great diversity of marine life. More specifically, recent findings have revealed the existence of more than 200 megabenthic and pelagic marine species from 14 taxonomic groups (floristic and faunistic) that were recorded in the 3 main dive areas off Lesvos Island by means of SCUBA diving (Gerovasileiou et al., 2008b). Therefore, these coastal and marine areas could form the basis for the future development of 'eco-friendly' marine recreational activities in the area.

In Lesvos Island there is one diving center that operates since 2002 and has carried out more than 850 training courses at an increasing rate over the years. During the last two years three more diving centers have started operating in Lesvos, Limnos and Chios Islands respectively. The increase of diving activity in this region follows the general trends that have been observed for diving tourism in Greece after the adoption of the new diving law. Marine areas where diving activities take place in these islands include a variety of topographic features, as well as easily accessible wrecks which make them suitable for a wide range of diving experiences (e.g. wreck, cave and multilevel dives).

However, certain species like the fan mussel (*Pinna nobilis*), the long-spined sea urchin (*Centrostephanus longispinus*), Scleractinian stony corals, gorgonians (*Eunicella* spp.), and Bryozoans, as well as several types of habitats (e.g. seagrass meadows, coralligenous beds, submerged caves), which have been recorded in the aforementioned areas (Gerovasileiou et al., 2008b; 2009), have been characterized as fragile as

they are extremely vulnerable to anthropogenic impacts (Milazzo et al., 2002; Lloret et al., 2006). Areas that encompass such species or habitats are usually perceived as 'hot-spots' for SCUBA diving, rendering these species prone to damage as a result of the accumulative effects of intensive and unregulated marine tourism (e.g. increased physical contact by divers, boat anchoring), pollution and other human related pressures (e.g. commercial fisheries, coastal constructions), that could potentially impoverish the structural complexity of the marine habitats in an area and eventually lead to a decrease of habitat cover and loss of biodiversity. Thus, there is a serious threat that once unregulated marine tourism is intensified, conflicting interests (e.g. tourism, fisheries) may lead to a deterioration of the ecological quality and consequently, of the long-term viability of diving tourism in the area.

DISCUSSION OF RESULTS AND POLICIES IMPLICATIONS

It is essential to adopt a formula for managing the development of diving tourism at the Greek coastal zone in the framework of an integrated precautionary approach. Recent experience has proved that there are two options to choose from: a) the long-term sustainable development and b) the short-term prospect (UNEP/MAP/Blue Plan, 2005; López Ornat, 2006), which unfortunately is the most commonly followed in Greece. Diving tourism should be used as a driving force with the aim to promote environmental conservation along with ecologically responsible coastal development (Dalias et al., 2007). Protection of the natural ecosystems must be a priority, in order to maintain the high aesthetic and ecological value of the marine sites. Previous experience from other Mediterranean MPAs (e.g. measures for eliminating potential human induced impacts) should be used as a tool for planning a new management model, adjusted to the local facts and conditions.

The implementation of a well designed management plan focusing on the development of regulated recreational diving activities within any type of MPA could potentially: a) bring about important economic sources to support the costs of surveillance and monitoring, b) benefit local communities by reinforcing sustainable development, and finally c) increase public awareness with regard to the conservation of the marine environment. However, the primary step for designing any such plan is the conduction of baseline studies to assess local environmental conditions, while its implementation should be based on regular monitoring. Yet, no relevant management plan or integrated monitoring scheme has been applied so far in any of the two Greek MPAs, where

monitoring, carried out by the management bodies of the parks and associated NGOs, involves only the two threatened species *Monachus monachus* and *Caretta caretta*, but rules out the rest of the marine environment.

Moreover, effective planning, management and decision making should take into account the carrying capacity of all marine sites that would directly or indirectly be affected by tourism (López Ornat, 2006), while the needs for infrastructure of the various tourist activities should be treated separately. More specifically, the establishment of regulated diving tourism within an MPA usually demands analytical depiction of dive sites, creation of underwater paths and routes for diving and snorkeling, investigation of the optimal distribution of divers between the different dive sites, establishment of mooring systems for boats and finally the installation of dive centers, 'Hyperbaric Medical Centers', and the associated tourism infrastructure (e.g. marinas). Similar steps are needed in order to develop diving tourism at the existing artificial reefs or those to be established in the near future, in order to safeguard funds for their monitoring. The nomination of artificial reefs as diving sites could potentially redirect SCUBA divers from vulnerable natural marine sites (Van Treeck and Schuhmacher, 1998).

On the other hand, the creation of new marine parks in the Greek Seas should follow the current management approaches and practices along with the environmental trends and needs which have been described by the scientific community, NGOs and the management authorities of the Mediterranean MPAs. Therefore, the approach of 'Diving Marine Parks' that has been suggested by certain authors (e.g. Markatos and Koutsis, 2008) seems yet to be quite dubious and unclear. We strongly believe and propose that the future development of eco-friendly diving tourism in Greece should be combined with the establishment of Networks of Coastal and Marine Protected Areas (networks of permanent or periodically alternating no-take zones). Future candidate target areas should include existing protected areas, which often receive inadequate level of protection (e.g. NATURA sites), as well as new areas that fulfill a number of environmental and socio-economic criteria. These new areas, could be used as buffer zones at a rotational basis, so that the local environment would not be fully 'exploited' at any given site, while at the same time they would protect and finance the permanent MPAs or the core no-take zones of the new parks which host vulnerable ecosystems and where visitation is limited or prohibited (López Ornat, 2006).

The creation of 'Networks of Marine Protected Areas' can provide more effective conservation of different habitats and important nursery

grounds for the early life stages of fish and other marine biota, without interrupting human activities at the intermediate areas (PISCO, 2007). Moreover, networks of small MPAs are proved to be more easily managed (López Ornat, 2006), while the large size of the existing Greek MPAs seems to cause many problems with regard to the surveillance and the acceptance of local communities (e.g. conflicts between fisheries and tourism). However several issues, such as the number, size and distance between the protected zones comprising a network have to be carefully investigated through scientific research (Roberts et al., 2003). Therefore, planning and design of these networks has to be based on both pre-existing information and environmental data taken *in situ*, in order to assess the current state conditions and to ensure a good representativeness and distribution of protected natural heritage (e.g. biodiversity, habitat cover, and fisheries stocks) and environmental processes. This requires the conduction of oceanographic environmental studies at the potential target areas. The need for environmental studies prior to any establishment of MPAs is in accordance to what the global experience has shown (Browman and Stergiou, 2004; PISCO, 2007).

Furthermore, before the establishment of an MPA, within an integrated approach, socio-economic factors from the neighboring coastal areas (e.g. conflicting interests among the different groups of users) also have to be investigated (Badalamenti et al., 2000), while the involvement of the local communities must be a priority, from the first stages of this process, in order to improve the chances of success and the long-term viability of any development plan (Kelleher, 1999).

Both existing and new MPAs of the Greek Seas, should additionally focus on the establishment of educational activities and appropriate facilities (e.g. special training courses for SCUBA divers, visitor centers and information points) and the production of awareness raising material (e.g. educational tools, brochures, guide books and scientific publications) through which, conservation of the marine environment will be promoted. Moreover, it is essential to maintain local customs and traditions that illustrate the relationship between humans and the marine environment (e.g. historical background, monuments, religious sites, human uses of the marine resources, fishing lifestyles).

The decision making process within the MPAs has to be based on a periodic monitoring scheme of ecological and socio-economic alterations which is expected to eliminate potential habitat loss and identify the needs of the local communities. Regional universities, research institutes and NGOs could significantly contribute in the monitoring and consultation process.

Overall, the establishment of any type of MPA and the development of diving tourism alone do not safeguard the success of environmental or socio-economic purposes. A well designed management plan in the framework of a precautionary approach, alongside with an organized management body, responsible for the effective surveillance, sustainable use and scientific monitoring of the marine and socio-economic environment, are absolutely critical to be established.

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