# GAIOLA UNDERWATER PARK: SMALL-SCALE FISHERIES MONITORING AND MITIGATION OF ILLEGAL FISHING WITHIN THE FEAMP PROJECT

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**Abstract**: This work aims to show the results obtained with the FEAMP Project, realized under the measure 1.40, in particular, results and data concerning the third target of the project: "Mitigation and fishing effort". The study was conducted alongside the coastal sector of the city of Naples, with special attention to the coastal area within the Marine Protected Area Gaiola Underwater Park and the SAC IT8030041- Gaiola and Nisida Seabeds. The project involved small-scale fishermen, members of the two cooperatives of the Naples fleet. Data on fishing effort and fishing areas were collected, in relation to the different types of fishing gear used. Data were gathered from August to October 2023, by monitoring the catch at landings. The data were related to the trends concerning illegal fishing within the MPA, showing the benefits on the catch for the small-scale fisheries due to the activities of protection carried out in the MPA.

**Keywords**: Gaiola, Marine Protected Area, Small Scale Fisheries, Conservation.

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## Introduction

This work was realized under the FEAMP 2014-2020 project, managed by the Marine Protected Area (MPA) Gaiola Underwater Park, in collaboration with CoNISMa and Parthenope University of Naples. In line with measure 1.40 of the Regulation (EU) n. 508/2014, the general objective of the project was the protection, conservation and in situ restoration of coastal and marine ecosystems and their associated resources. The study focused on the entire coastal sector of the Municipality of Naples, with special attention to the sites nearby the MPA Gaiola Underwater Park. The Park, established in 2002, covers a surface of almost 42 hectares and extends for about 2 kms along the coastline of Posillipo in the city of Naples.

Despite the metropolitan context, the MPA still preserves large area of naturalness along with bio-ecological, historical and archaeological aspects [1, 2, 3]. Furthermore, the MPA is part of the larger (167 ha) Special Area of Conservation (SAC) IT8030041 "Gaiola and Nisida Seabeds" under the Natura 2000 network. The project aimed to collect, for the first time in Naples, data on small-scale fisheries and its connections with the fishing sites nearby the MPA or the SAC, also to evaluate possible positive effects on fish stocks due to the protection activities and the strong reduction of illegal fishing inside the MPA.

Since 2015, the Park has been committed in monitoring activities, data collection and illegal fishing counteraction, in collaboration with maritime forces, succeeding in the considerable eradication of illegal fishing inside the protected area of about 97 % [4]. Furthermore, since 2020, the application of the sustainable model of fruition of the Park has contributed to the abolition of other anthropic disturbing factors in the area [4].

The project focused on the: data collection to better understand the ecological status of the existing biocenoses, with special attention to the local fish community; data collection of the fishing effort in the coastal sector concerned; monitoring of the illegal fishing activities, even to safeguard local fishermen committed in small-scale fisheries.

## Materials and Methods

Data collection was conducted from August to October 2023. Twelve fishing units, members of the two cooperatives involved in the project, were monitored, out of a total still operating fleet of 29 units, with 9 units currently inactive (Fig. 1). The monitored units were selected proportionally according to the different fishing typologies praticated by the total operating fleet. Figure 2 demonstrates that the most commonly praticated fishing typology is with pots (FPO); considering the passive nets, there is an evident preference for Gillnet (GNS) with respect to the Combined (GTN) and Trammel (GTR).
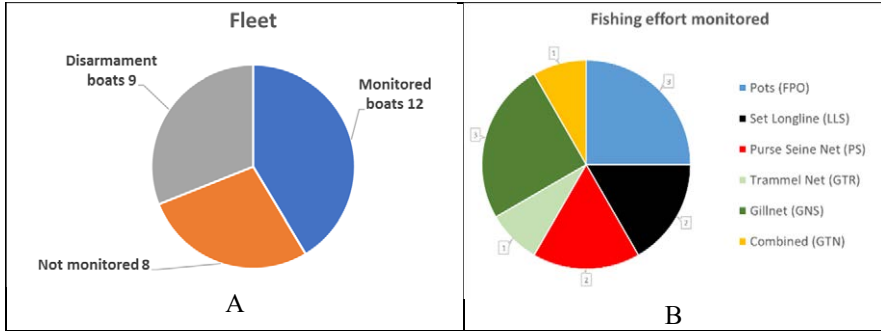
Figure 1 - A) Fishing fleet and monitored units - B) Monitored fishing typologies.

For each unit, during the landing phases, the following data were collected:
• Typology, number of fishing gear used and target species;
• Fishing areas, periods and time of installation;
• Data on the catch: size, weight, species and bycatch;
• Socio-demographic data on shipowners and crew;

Before collecting data on the catch and the fishing areas, the fishermen involved were interviewed through questionnaires in order to gather general information on their activity.

To collect data on the fishing areas, a map of the study area, corresponding to the coastal sector of the Municipality of Naples, divided into sectors, was used (Fig. 2-A).

At the same time, the monitoring of illegal fishing activities within the MPA was reinforced, through visual census of night recordings from the surveillance cameras supplied by the Park, along with night and day surveys with operators. For this activity the map of the Park divided into sectors was used (Fig. 2-B).
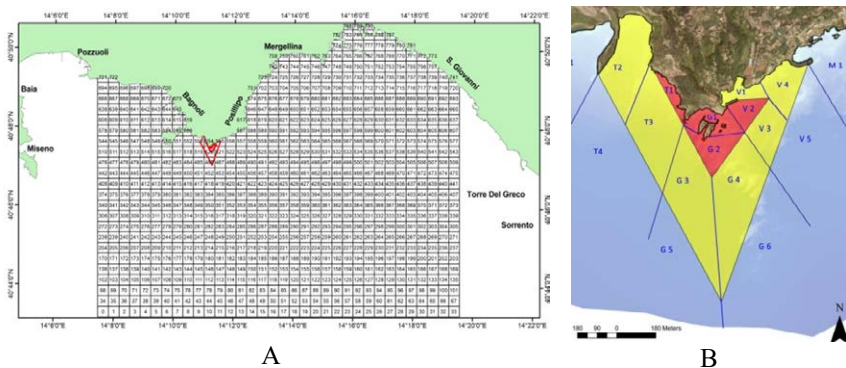


Figure 2 - Maps used for the monitoring of coastal fishing (A) and illegal fishing (B).

The fishing units involved in the project were also equipped with a GPS tracking device, in order to collect as accurately as possible information about the fishing areas frequented (Fig. 3-A). At the end of the day, the data on the catch were collected along with the GPS tracks of the day, from which the fishing areas of catch's origin were extrapolated. Regarding the data on the catch's size (Fig. 3-B), the total lengths of the fish were measured while for molluscs and crustaceans the specific length of the coat or carapace were measured.
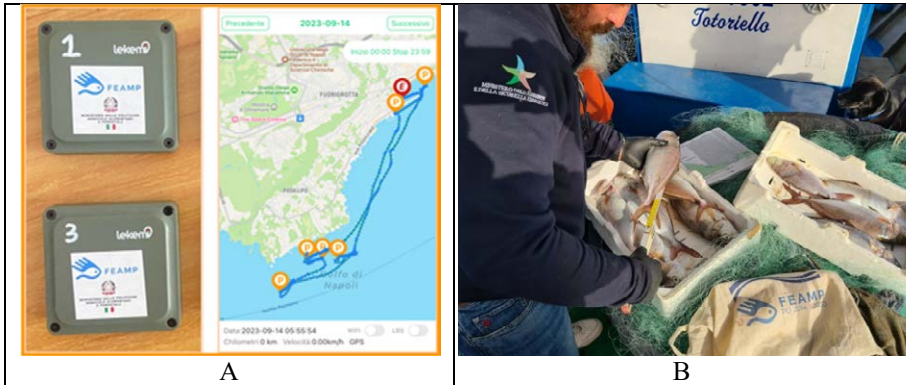


Figure 3 - A) monitored units' GPS tracks B) Measurements at landing.

## Results and Discussion

The socio-economic interviews revealed interesting data related to the fisherman's job in the city of Naples. In Fig. 4, the following data are showed: the current age of the fishermen; the age fishermen had when they started to work in the small-scale fisheries; whether the job was inherited and whether they are passing it on, in their turn.

It is evident that the average age of the fishermen is quite high and that all of them inherited the job from a family member. Furthermore, many of them started to work at a very young age, embarking with their father or grandfather, from whom they learned the job. Instead, today, only one fisherman works with his son, passing the job on.

Figure 5 shows the map of the spatial distribution of the different fishing activities. It is evident an equal distribution along the coast, identifying 5 fishing macro-areas: Nisida, Gaiola-Posillipo, Cenito-Mergellina, Castel dell'Ovo and San Giovanni.
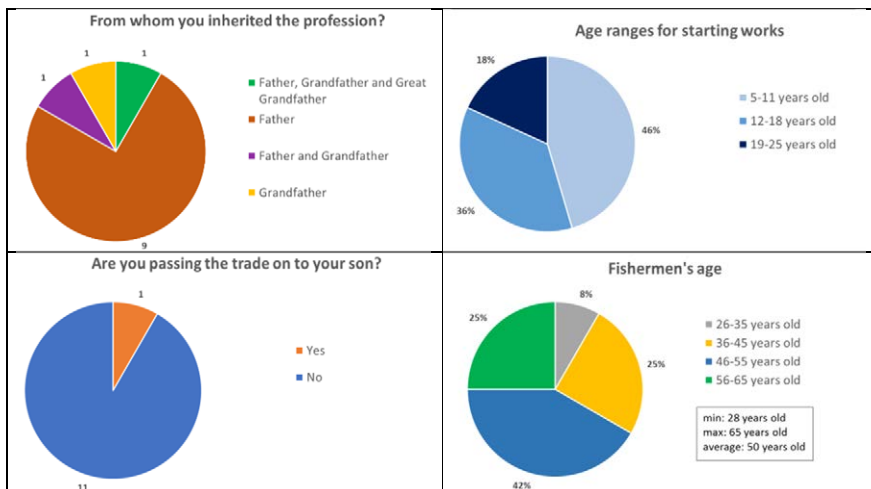
Figure 4 - Demographic data on the fishermen's activity in the City of Naples.
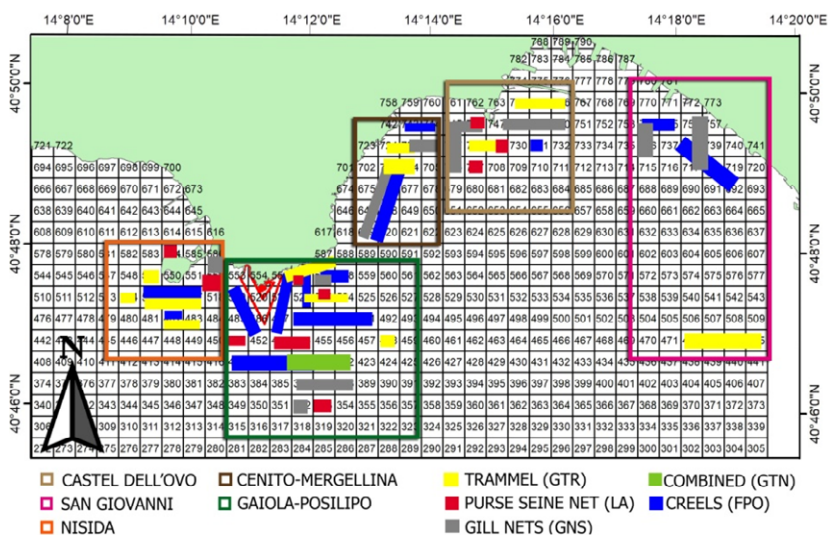


Figure 5 - Macro-areas of distribution of the fishing activities in the Gulf of Naples.

It is evident, for all the monitored fishing activities, a clear preference for the areas nearby the MPA, specifically the Gaiola-Posillipo macro-area.

The graphs in fig. 6 display data regarding the distribution and characterization of the catch in the different identified and mapped fishing sites. In particular:

- A: fishing effort for each gear in the different areas;
- B: characterization of the catch in different areas;
- C: total biomass and number of species caught in the different areas;

Comparing these data, it is clear that the Gaiola-Posillipo area is the most frequented for all the monitored fishing activities, where more than 40 % of the monitored fishing activities occur, with a predominance of fishing with pots (Fig.6-A).
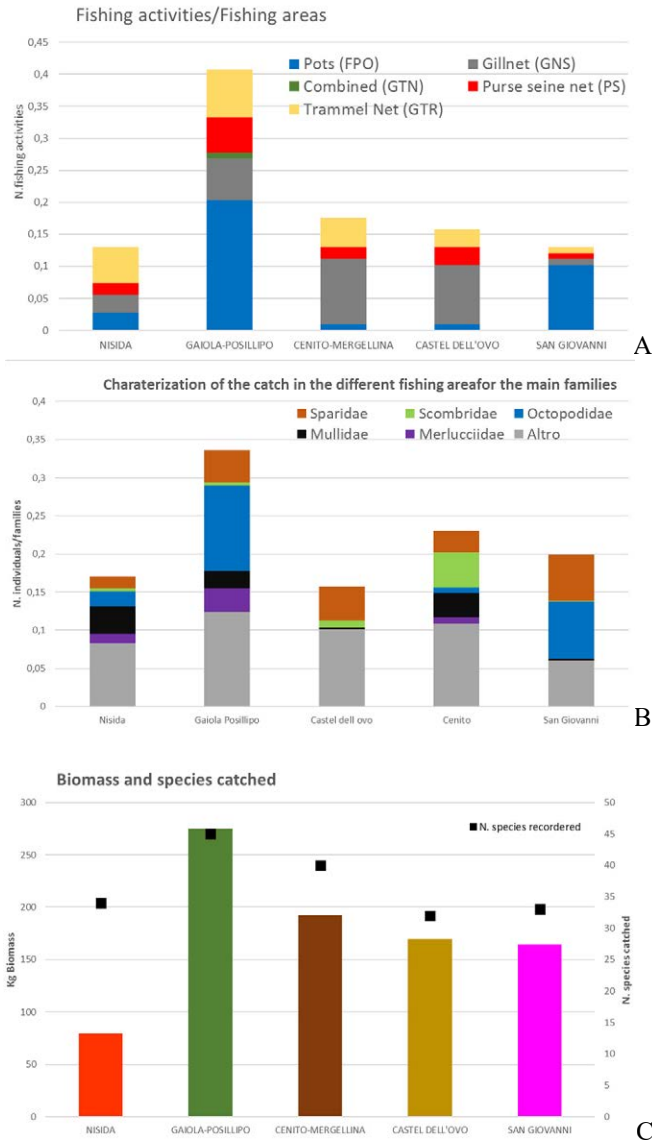


Figure 6 - For every fishing macro-area: A) Fishing effort; B) Characterization of catch for each fishing gear; C) Total Biomass and number of caught species.

It is evident that this area is perceived as the richest fishing ground by fishermen, thanks to the *spill over* effect generated by the protective measure adopted in the MPA. Observing the graphs in Figure 6-B, it is clear that the area is very rich both in terms of diversity and number of organisms. This is indicated by the highest number of different families caught, associated with the highest number of individuals per family caught. The graph in fig. 6-C confirms the data for the Gaiola-Posillipo area, showing higher values both in terms of total biomass and number of species compared to the other areas.

The following graph (Fig. 7) shows the characterization of the fishing catch in the Gaiola-Posillipo area.
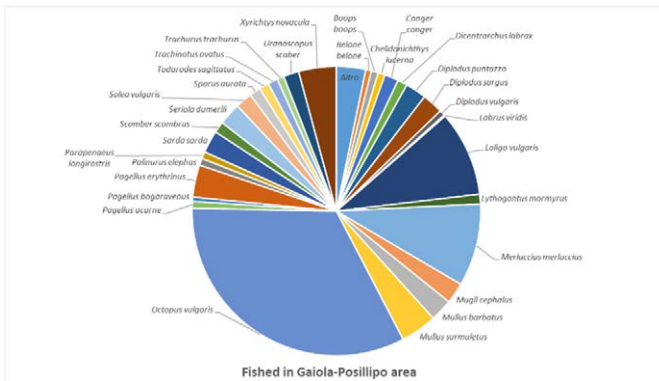


Figure 7 - Characterization of the catch in the Gaiola-Posillipo area.

In this macro-area, there is a clear predominance of octopus fishing (*Octopus vulgaris*), primarily using pots. The images in fig. 8 show the high specific fishing effort targeting octopus in the Gaiola-Posillipo area (A). Nevertheless, biomass parameters (B) for octopus in this area are significantly higher compared to other areas.
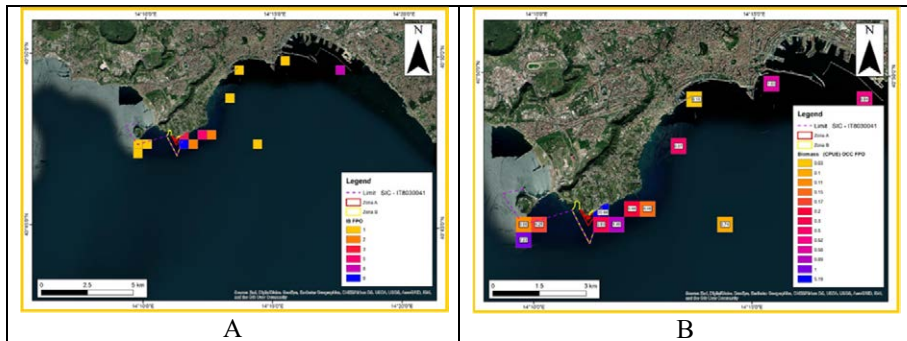


Figure 8 - A) Octopus fishing effort with pots B) Octopus biomass captured with pots.
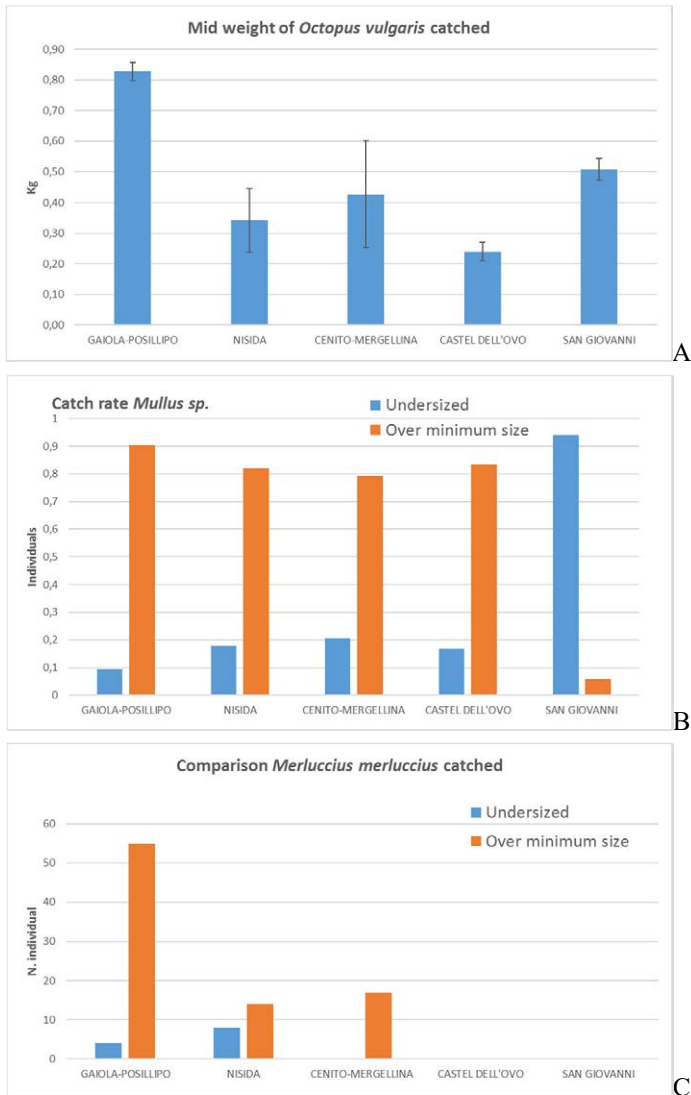
Figure 9 - For the different fishing macro-areas: A) Average weight of the *Octopus vulgaris* and number of individuals legal-sized and undersized per *Mullus* sp. B) e *Merluccius merluccius* C)

Even the average weight parameters in the Graph A in Fig. 9 confirm significantly higher values for this specie, with respect to other areas.

Similarly, this trend is observed for the other two identified target species: *Mullus* sp. (Fig. 9-B) and *Merluccius merluccius* (Fig. 9-C). Specifically, the ratio of legal-sized and undersized catch is markedly higher in the area affected by the

presence of the MPA, confirming that larger and more numerous organisms of different species are caught in the MPA.

To conclude, Fig. 10 shows data on the decrease of illegal fishing activities inside the MPA Gaiola Underwater Park, from 2015 until today. There is a significant reduction of all the illegal fishing activities inside the Park (A). Some fishing typologies inside the Park have effectively disappeared, such as fishing with air breathing apparatus (B); while spearfishing activities persist above all in border sectors, albeit in greatly reduced numbers compared to the past.
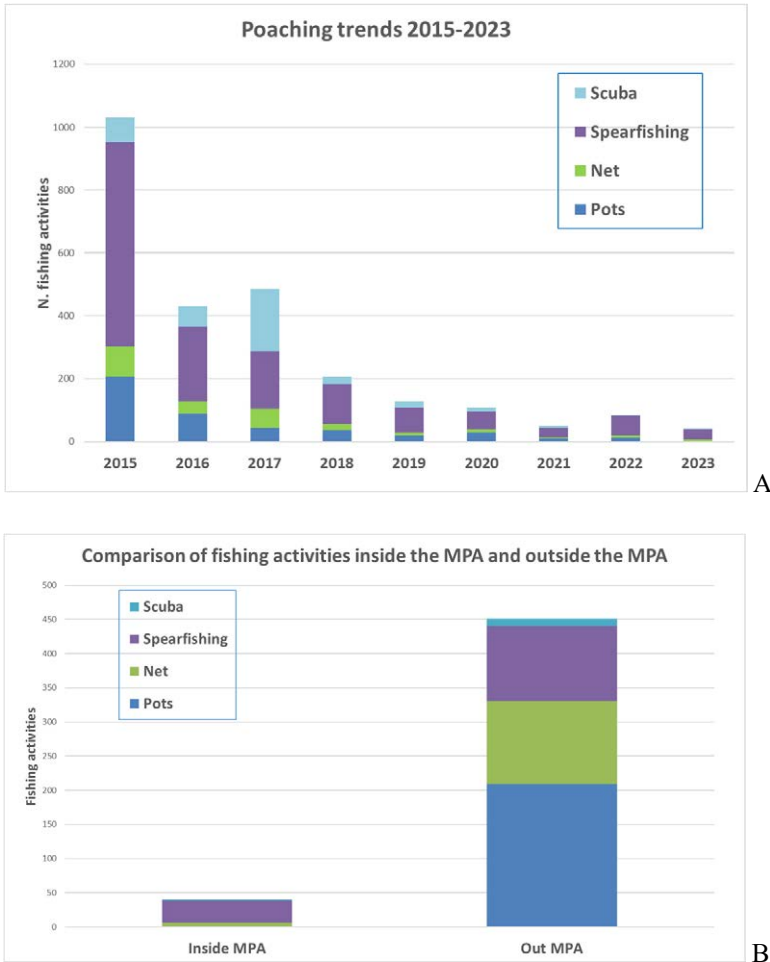


A



B

Figure 10 - (A) Illegal fishing activities from 2015 to 2023 inside the MPA and difference between inside and outside the perimeter of the MPA (B)

## Conclusion

This work shows that the action of protection, reduction of anthropic disturbing factors and the counteraction of illegal fishing implemented by the MPA Gaiola Underwater Park are producing a positive "Reserve Effect" in terms of abundance, diversity and size of the catch in the coastal sector nearby the MPA.

This is a clear evidence of the *spill over effect* generated by the Park and perceived by the small-scale coastal fishermen in the City of Naples, who report a richer ground in the sectors nearby the Park. However, the demographic and social data on the local small-scale fisheries are concerning, showing a low, if not entirely absent, generational turnover and the transmission of the job from father to son, which has kept this traditional activity alive until today.

Undoubtedly, this project has strengthened the relationship with the local fishing community. Many fishermen, at the end of the monitoring period, admitted to feeling protected, with some even reporting the presence of illegal fishermen in the MPA to the Park Authority.

Additionally, the surveillance activity of the area through the video-camera system has not only intensified but also made the control activities of the Park, conducted by maritime authorities in collaboration with the Park's staff responsible for data collection and monitoring, more efficient.

## Acknowledgments

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