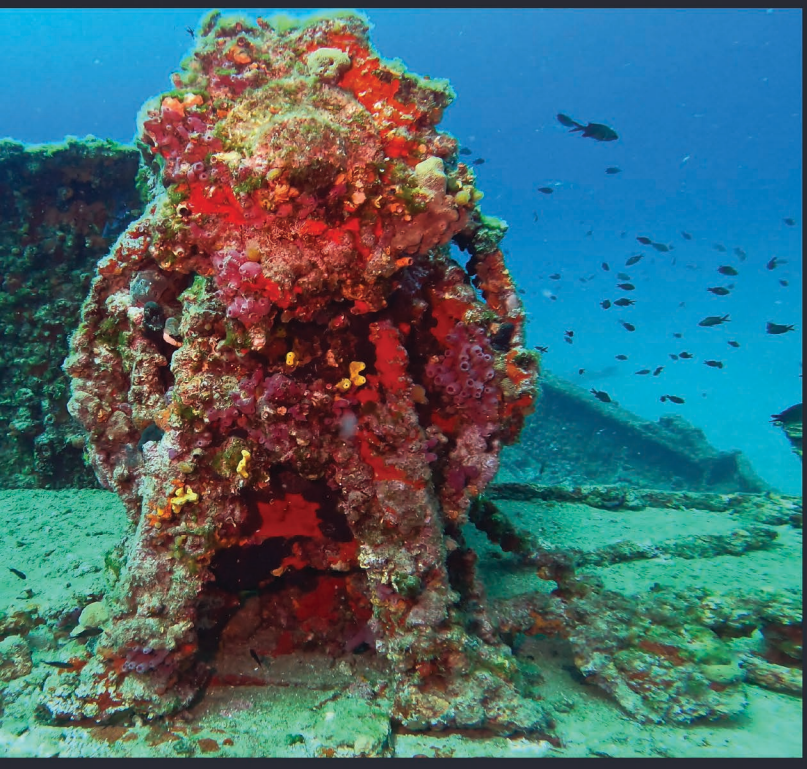

SHIPWRECKS OF THE GALLIPOLI CAMPAIGN AND PROTECTION OF MARINE BIODIVERSITY

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Macrofloral and macrofaunal biodiversity on the shipwrecks of the Gallipoli Campaign - Life on the deadliest battleships

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Abstract

A total of 127 macro organisms; 17 floral and 110 faunal, were identified by means of in situ observations on 7 of the Gallipoli Campaign shipwrecks. Twenty species have economical value and four species were determined to have been in IUCN List of Threatened Species on different levels. Protection measures should be taken not only for the sunken ships but also for the marine life growing on them.

Keywords: Marine biodiversity, underwater visual identification, Gallipoli Campaign, shipwrecks

Introduction

The Gallipoli Campaign shipwrecks serve as valuable historical artifacts and windows into the past, linking us to our national heritage. These submerged relics hold immense historical value, shedding light on past battles and heroic stories, offering scientists and historians a unique perspective. Moreover, these sunken ships and war artifacts have an ecological importance as artificial reefs that foster marine biodiversity. They are the artificial features those form the biogeographic patterns of macroorganisms (Hamdan *et al.* 2021). According to Meyer-Kaiser *et al.* (2017) the presence of shipwrecks as island-like systems on the sea floor shapes the biogeographic distribution of macroorganisms. These shipwrecks, once symbols of tragedy, have emerged as crucial contributors to marine biodiversity, as artificial reefs and islands of biological diversity (Svane and Petersen 2001; Perkol-Finkel *et al.* 2005).

Çanakkale province has always been rich in marine biodiversity due to its location on the route of two layered currents, consisting of oxygen-rich, nutrient-poor Mediterranean Sea, and the opposite, oxygen-poor, nutrient-rich Black Sea waters. In accordance, Saros Bay, is just around the corner, which is considered to be one of the most productive water bodies in the Aegean Sea, thus declared as a marine protected area in 2010.

The favour of their location, together with their appealing effect on marine species, make it just inevitable that the Gallipoli Campaign shipwrecks would have evolved into biodiversity hotspots.

Hence, an in situ research has been conducted to explore the marine biodiversity on and around the Gallipoli Campaign shipwrecks. A preliminary checklist of the macroorganisms is aimed to be prepared for these wreck sites.

Materials and Methods

Study area

Gallipoli Peninsula, the battlefields of the World War 1, have been under the administration of The Directorate of Gallipoli Historical Site, since 2014. In 2017, the Directorate initiated Gallipoli Historical Underwater Park project, which included 12 shipwrecks lying between 7 meters to 72 meters, together with 2 natural reefs. In this study, 7 wrecks residing in the sportive diving limits were observed.

Method

Scientific dive surveys were conducted for SS Milo, Louis, Arıburnu Lighter, Helles Barges, HMS Majestic, Lundy, and Arıburnu Barge, during the summer season of 2023. A commercial diving boat was hired with the support of the Directorate of Gallipoli Historical Site. All dives were recorded with an underwater video camera system, GoPro hero10 and 30000 lumen light system mounted on the handle. Images were mostly captured from the videos. In order to reach the highest possible number of individuals, and regarding the bubbles of divers cause to scare away especially the fish species, the first dive and video record of the site was made by a rebreather equipment, which does not allow the exhale bubbles outside the tank. A full record around the wreck is taken by the first diver. Following it, the divers with cameras and writing boards get in the water to gather the detailed information about the biodiversity of the site.

Visual identification was used to constitute the species list. In order to detect the organisms properly, catalogues, those formerly prepared according to the checklists of the region, including the underwater photographs and the distinctive features of the species were studied prior to each dive. No samples were taken in accordance with the protection measures of the wreck sites. The notes and the images taken were examined by all the divers together, after getting back to the land. Papers on the checklists (Bilecenoğlu *et al.* 2014; Çınar *et al.* 2014; Öztoprak *et al.* 2014; Öztürk *et al.* 2014; Topaloğlu and Evcen 2014) and scientifically approved online web sites, WoRMS (2023), AlgaeBase (2023) and FishBase (2023) were consulted for identifications.

Table 1. List of the identified marine species
Conservation status according to IUCN List of Threatened Species
(VU: Vulnerable, EN: Endangered, CR: Critically endangered)
Economical value (*: as souvenir, **: as food, ***: as high priced food)

FLORA
Phaeophyceae
Cystoseira compressa
Dictyota dichotoma
Gongolaria barbata
Padina pavonica
Rhodophyta
Corallinaceae sp.
Lithophyllum sp.
Mesophyllum sp.
Peyssonnelia sp.
Chlorophyta
Acetabularia acetabulum
Anadyomene cf. *stellata*
Codium bursa
Codium cf. *fragile*
Codium cf. *tomentosum*
Codium cf. *spongiosum*
Flabellia petiolata
Halimeda tuna
MAGNOLIOPSIDA
Posidonia oceanica
FAUNA
PORIFERA
Agelas oroides
Aplysina aerophoba
Aplysina cavernicola
Axinella polypoides
Chondrilla nucula
Chondrosia reniformis
Crambe crambe
Dysidea avara
Geodia cydonium
Haliclona fulva
Haliclona mediterranea
Hexadella racovitzai
Ircinia oros
Ircinia variabilis
Oscarella lobularis
Petrosia ficiformis
Phorbas tenacior
Sarcotragus foetidus
Sarcotragus spinosulus
Spirastrella cunctarix
Spongia lamella *
Terpios gelatinosus
CNIDARIA
Hydrozoa (spp.)
Anthozoa
Caryophyllia inornata
Caryophyllia smithii
Balanophyllia europaea
Hoplangia durotrix
Cladocora caespitosa (EN)
POLYCHAETA
Protula tubularia
Sabella pavonina
Serpula vermicularis

FAUNA
BRYOZOA
Bryozoa (spp.)
Bugula sp.
MOLLUSCA
Bivalvia
Ostrea sp.
Pinna nobilis (CR)
Gastropoda
Cerithium vulgatum
Hexaplex trunculus
Monoplex parthenopeus
Nudibranchia
Nudibranchia sp.
Cratena peregrina
Felimare orsinii
Flabellina affinis
Flabellina babai
Peltodoris atromaculata
Cephalopoda
Sepia sp. ***
CRUSTACEA
Chthamalus sp.
Galathea strigosa
Stenopus spinosus
Maja sp.
ECHINODERMATA
Asteroidea
Marthasterias glacialis
Ophiuroidea
Ophioderma longicaudum
Echinoidea
Arbacia lixula
Paracentrotus lividus
Sphaerechinus granularis
Centrostephanus longispinus
Holothuroidea
Holothuroidea (spp.)
Holothuria tubulosa **
ASCIDIACEA
Aplidium sp.
Clavelina dellavallei
Halocynthia papillosa
Microcosmus sp.
Polycarpa pomaria

FAUNA
TELEOSTEI
Congridae
Conger conger
Phycidae
Phycis phycis **
Scorpaenidae
Scorpaena maderensis
Scorpaena notata
Scorpaena scrofa **
Serranidae
Serranus cabrilla
Serranus scriba
Epinephelus marginatus ***
Apogonidae
Apogon imberbis
Carangidae
*Seriola dumerili****
Sparidae
*Boops boops***
Diplodus annularis
*Diplodus sargus****
*Diplodus puntazzo***
*Diplodus vulgaris****
*Oblada melanura***
*Sarpa salpa***
*Sparus aurata****
*Spicara maena***
*Spicara smaris***
*Spondyliosoma cantharus***
Sciaenidae
*Sciaena umbra*** (VU)

FAUNA
TELEOSTEI
Mullidae
*Mullus surmuletus***
Pomacentridae
Chromis chromis
Labridae
Coris julis
Ctenolabrus rupestris
*Labrus merula***
Labrus mixtus
Labrus viridis (VU)
Symphodus cinereus
Symphodus mediterraneus
Symphodus melanocercus
Symphodus ocellatus
Symphodus roissali
Symphodus rostratus
Symphodus tinca
Tripterygiidae
Trypterygion delaisi
Trypterygion melanurus
Blenniidae
Blennius ocellaris
Parablennius gattorugine
Parablennius rouxi
Gobiidae
Gobius auratus
Gobius bucchichi
Gobius cruentatus
Gobius niger
Gobius vittatus
Thorogobius ephippiatus

Results and Discussion

A total of 127, 17 floral, 110 faunal species were identified for the 7 wreck sites. Among these, 47 were fish species, of which 12 were members of Labridae and 11 were members of Sparidae families. Only 12 algae species, where 4 of it has been described as confirmation needed, and 4 coralligenous genus from Rhodophyta, have been listed. This restricted number of algae species is due to the lack of an algae expert among the colleagues, this study conducted with, so only the ones with sharp distinctive characteristics and the ones very well known from authors' previous studies were taken into consideration (Table 1).

Observations

Apart from the national spirit, mostly, the first thing noticed and got attracted to is the beautiful, colourful sponges and coralligenous habitat on and all around the shipwrecks. However, sponges and corals on two of the shipwrecks of Gallipoli Campaign have been explained in detail, in previous chapter, so mainly fish biodiversity will be focused on in this chapter.

In a similar biodiversity assessment study conducted on three shipwrecks of Çanakkale Strait, Özalp *et al.* (2017), have given a list of 32 fish species which 21 of them are mutual. The difference in the total number of fish species is thought to depend on the dynamics of water masses on and around the wrecks which affect the settlement of cryptic fish species. Among the list we built up, the number of cryptic fishes is 11, while Özalp *et al*. (2017) is only three. So it can be expressed that strong current of Çanakkale Strait, makes the life harder for cryptic fish species.

Chromis chromis (damselfish), *Diplodus vulgaris* (two-banded sea bream) and *Coris julis* (Mediterranean rainbow wrasse) were the most abundant ones those have been encountered at every site. *Sciaena umbra* (brown meagre), *Conger conger* (European conger) and *Phycis phycis* (forkbeard) were also among the dominant species observed hiding under the hulls and in inner cavities. While *Scorpaena* spp. (scorpionfishes), *Serranus* spp. (combers) and Labridae species (wrasses) prefer to be alone or in groups of two, *Chromis chromis*, *Boops boops* (bogue), *Oblada melanura* (saddled seabream) and *Spicara* spp. (picarels) were usually seen constituting large shoals. During its foraging behavior, *Mullus surmuletus* (surmullet) was accompanied by *D. vulgaris* and *C. julis,* those try to eliminate the disadvantages of being beardless on a sandy substratum. A group of seven *Seriola dumerili* (greater amberjack) juveniles were encountered wandering around, while waiting at a deco-stop after the dive at Arıburnu Barge (Figure 1). This behaviour was mentioned in FishBase as "*..small juveniles associate with floating plants or debris in oceanic and offshore waters, they form small schools or solitary*" with refer to Fischer *et al.* (1990). Another species with a high commercial value, *Epinephelus marginatus* (dusky grouper)

was came across at the site of HMS Majestic. These both encounters occurred only for once.

Figure 1. *S. dumerili* and *P. nobilis* juveniles

Marine environment features many diverse habitats including those dominated by seagrasses, algae and coralligenous species, each have their own type of residents. It has been observed that the shipwrecks' boards, hulls and all broken jagged parts constitute such habitats for cryptic species especially. Bohnsack *et al.* (1991) reported that the reason carnivorous species intend to dominate around marine artificial habitats is the presence of cryptic species as prays. Wrecks, such suitable for hiding, due to their complex and indented structure, are not only home to small fish, but also to small crustaceans, gastropods, echinoderms, arthropods, etc. which may have caused increased pressure of carnivores. Complying with these statements, one species of Cephalopoda, *Sepia* sp. was seen swimming near the Louis wreck, however, its tentacles were all eaten. It is thought to have been in a fight for life with *C. conger*, another resident of the same wreck. Paxton *et al.* (2020), who conducted comparative field surveys on thirty artificial and natural reefs, showed that large reef-associated predators were more dense on artificial than natural reefs and it was associated with higher densities of transient predators (e.g. jacks, mackerel, barracuda, sharks) on artificial reefs, but not of resident predators (e.g., grouper, snapper). In our short-term study, only two resident predator species *C. conger* and *E. marginatus* have been encountered. With another longer-term future study, this number probably increase and the findings of Paxton *et al.* (2020) can be examined.

In and around the interior parts and also under the hauls, cavities serve as shelters for nocturnal species, as well as, small holes and corners serve as shelters for small, cryptic species. On sandy substratum wide cavities under the hulls created by Sparidae species are observed as another peculiar feature of the wreck habitats. Many Labridae species have also been observed wandering around algae growing flat, open areas and feeding on arthropods and worms in small ranges. Sea slugs as well were seen feeding on Hydroid polips. In other words, this complex structure of wrecks creating feeding areas as well as shelters, are like the roadside flavour stops and roadside hotels.

The location where Arıburnu Lighter lies has a considerably richer biodiversity. Quite a healthy Posidonia meadow with leaf lengths reaching up to 1.5 m was

observed surrounding the Lighter. The presence of a dense meadow leads the place to be a nursery area of many species. Regarding the sustainability of the ecosystem, the high number of observed juveniles of a variety of species provide a healthy system. Although it is based only on observations, the breeding behaviour of *C.chromis* and in accordance presence of their blue juveniles reveal the existence of a breeding area, as well. A juvenile of *Pinna nobilis* (fan mussel) that has been in the Critically Endangered status of Red List of IUCN was seen on a sandy bottom in the vicinity of Helles Barges (Figure 1).

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