Cyprus Federation of underwater Activities Cyprus Scientific Committee



Research: Biological Study at Mazotos shipwreck

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1. Introduction

According to Dr Stella Demesticha, the shipwreck situated at Mazotos marine area, is preliminary dated around the 4th Century BC Cyprus. The shipwreck constitutes of an "artificial" reef has passed, via the years, the various stages of succession. The study aims to record the biodiversity at the region of where the shipwreck is situated as it will constitute the

basis for further investigation of the hypothesis on how shipwrecks in deep water (50-100 metres) can constitute points of growth for aquatic fauna and flora, known as artificial reefs.

It is widely known that the creation of artificial reefs can act positively in the growth of aquatic fauna and flora, since their presence creates new hard substrata on which aquatic organisms can attach and develop and also attract other organisms such as fish, shaping with such way new marine biocommunity. Moreover, shipwrecks and artificial reefs constitute places of protection for organisms from their hunters and function as places of assembly and reproduction.

All of the above characteristics, alone or in combination could result to the increase of productivity but also biodiversity of particular marine region.

2. Description of the area

The shipwreck is found at Mazotos marine areas (Coordinates N 34°, 46, 388 E 033°, 32, 861). It covers an area of 18-20 meters length and 5 meters width. It is situated at a 45m depth, which is under the thermocline. It's distance from the coast is at 2.5 kilometers.

## Temperature and currents

According to the elements of the Department of Fisheries and Marine Research and the University of Cyprus forecast model (Oceanography Centre - CYCOFOS), the temperature of water in the marine area where the shipwreck is found, ranges between 16 to 28 degrees Celsius above the thermocline, which is fluctuated depending on the season. Below the thermocline, the temperature ranges between 16-18 degrees Celsius. The depth, at which the shipwreck is found, is under the thermocline.

The region near the coastline is characterized of high hydrodynamics, phenomenon that is connected with the coastline erosion. According to forecast model of the Department of Fisheries and Marine Research and the University of Cyprus, Oceanography Centre (CYCOFOS) the currents alter from East to West and from West winds to East winds. During

winter, the wind direction changes more frequently, while during summer the prevailing current direction is from East to West. The current speed ranges between 10 - 50cm/s.

#### 3. Materials and Methods

Due to the archaeological importance of the shipwreck, the sampling was limited only at in the sediment. The aim of the study was the preliminary assessment of the biodiversity of found at the shipwreck.

The samplings and area reconnaissance was conducted between the 14th and 31<sup>st</sup> May 2008. Eight (8) scuba diving sessions were held. The granulometry samples and macrofauna were done under the visual supervision of Dr. Stavros Kaniklides with contribution of scientists Dr. Yiannos Kyriacou, Msc Andri Heracleous and Dr. Pantelis Chimonides (Doctor of Microbiology) all members of the Scientific Committee of the Cyprus Underwater Society.

Most species identifications were done by the diving instructors as well as specialised divers of the scientific committee of CMAS (Mr. Andreas Troullides, Mr. Gregoris Savvides, Mr.Yiangos Hadjiyiannis, Mr. Polyvios Savva and Mr. Pantelis Themistocleous) that identified most of the fish species in the region while photographs were taken for identification of the invertebrates. The sediment samples were preserved for further analysis/identification

The 5 samples for the macrofauna were taken using a manual dredge covering 0.1m<sup>2</sup> from a 5 m distance from the shipwreck. The samples were rinsed (using a sieve of 500µm) and preserved in a 7% formaldehyde solution. A coloring substance was added for screening and identification purposes. The identification of the organisms was limited to the number of individuals per class.

For the granulometry analysis, two samples were taken using a corer. The first sample was taken close to the shipwreck while the second in a 30m distance away (perimeter). The first 10 cm of the sediment they were collected and analyzed after a graded sieving and desiccation.

#### 4. Results

# Granulometry analysis

The results of the granulometry analysis show that the sediment is mainly sludge in distance of 30 meters from the shipwreck while close to the shipwreck the sediment is characterized as sandy.

#### **Granule Size** Description Sample close to shipwreck Sample 30m away > 2mm Gravel 30.1g. 6.4g 0.6-2mm Very rough sand 38.8g 8.4g 0.3-0.6mm Rough sand 1.4g 2.6g Medium sized sand 0.2-0.3mm 0.2g 18.7g 0.015-0.2mm Thin sand 0.4g 7.6g 0.075-0.015mm Very thin sand 5.7g 14.7g <0.075mm Sludge 13.1g 36.5g

# Table of granular analysis of sediment

## <u>Macrofauna</u>

From the two samples used for identification of species at class level, there was no difference detected as for the number of individuals and the percentage for the macrofauna classes. The number of individuals per  $0.1m^2$  is about 78.5 + 7.8. At each sample, polychaeta class held the biggest percentage of the sample (53%).

	Sample 1		Sample 2	
	Number	%	Number	%
Polychaeta	37	50.6	46	54.8
Crustacea	12	16.4	19	22.6
Echinoderma	3	4.1	1	1.2
Bivalve	10	13 7	11	13 1
Gasteronodes	11	15.7	7	83
TYNOLO		10.2	/	6.5
ΣΥΝΟΛΟ	/3	100	84	100

# Fish Identification

One of the biggest number of individuals detected at the shipwreck was *Chromis chromis* and *Seranus scriba*. Also, individuals of the genus of Gobius sp., *Scorpaena* sp. and the species *Sargocentron rubrum*. Other species of fish identiofied at the area, were species of the genus *Epinephelus* spp., such as *Epinephelus guaza* and the species *Muraena helena*.

Moreover, many species of the family of Sparidae was detected such as *Diplodus vulgaris*, *D.* sargus and *Oblada melanura*. Also, species of *Puntazzo puntazzo Pagellus erythrinus* and *Pagrus pagrus* were located. Some other species identified were located were *Thalassoma pavo*, *Coris julis* and *Apogon imberbis*.

# Identification of invertebrates

The majority of invertebrate organisms detected at the area around the shipwreck were the sponges (*Spongia* sp., *Hypospogia* sp., *Ircinia* sp. *Disidia* sp. *Anixela* sp., Hmeniciadon) and other organisms such as ascidae, polychaeta, hydrozoa, anthozoa and bryozoa.

Echinoderms and crustaceans were also recorder as well as cephalopodes (*Octapus vulgaris*).

Around the shipwreck some ourochordota (tunicates) were also detected. All tunicate species live in benthos, stuck on with the rocks or sunk hard surfaces such as ropes, chains and barks of wooden structures eg. boats and holds of ships.

#### Identification of marine flora

Around the shipwreck and on the boat, two types of chlorophyceae were identified (*C. racemosa* and *C. prolifera*) as well as species of rodophyceae (*Liagora* sp.).

5. Discussion

According to the results of the granulometry analysis, the sediment near the shipwreck, differs to a large extent from the constitution of sediment in the wider region. This is likely to be observed due to the presence of shipwreck which acts as an obstacle to the circulation of currents. Moreover, accumulation of large granules (hard sand) around the shipwreck is likely to be caused to the accumulation of organic matter (dead individuals of bivalves and gastropods), from the detachment algae but also excrements of fish and other organisms.

The fact that close to the shipwreck, the sediment is characterized as rough sand is confirmed by the composition of the macrofauna in the sediment. Although polychatea are the prevailing species, they hold a percentage of 50%. Since the sediment is sandy, the oxidation-reduction should be larger (there were no measurements conducted) in combination with the area where the shipwreck is situated, creating thus good conditions for other species to settle such as crustaceans and gasteropods.

The existence of the shipwreck in the region resulted to the formation an "island" with many marine species, different from the marine life if the broader area. Due to the sludgy sediment, the growth of settlers is inhibited because of the absence of hard substrata. The region close to the shipwreck is covered mainly from chlorophyceae such as *C. racemosa* and *C. rolifera*, that grow on soft even at 50 meters depth.

The shipwreck has created the essential hard substrata for organisms that attach to hard surfaces like sponges and algae, while at the same time it formed spots for the protection of organisms. The fact that the shipwreck is situated under the thermocline, and the fact that the physicochemical conditions in the surroundings remain relatively constant this grants the possibility to organisms that have a slow growth rate (sponges) to prevail and of developed. Moreover, the growth of certain macroalgae is limited due to the depth at which the shipwreck is situated (*C. racemosa and C. prolifera*). Other types of algae that can grow at such depths are rhodophycea and archaecyatha. The latter are dominant species settling on hard substrata at depths of 50 metres.

The layers of coraliogenic algae constitute important hard substrata at depths between 40 with 50 metres, since they increase the available surface of hard substrata and additionally the pieces of dead particles that detach create the new rough sand sediment which is a shelter for a lot of organisms that cannot find shelter in sediments with low oxidation-reduction potential. Due to the small surface that the shipwreck covers, the phenomenon of competition between organisms that settle on hard substrata was obvious.

The presence of invertebrates is the reason why fish are attracted at the shipwreck area, as food is available as well as shelter between bryozoa, sponges and the cracks of the shipwreck. A natural consequence is the presence of larger hunter species, which is obvious. In general, the shipwreck is populated by a large number of different animal organisms that differ from the species that are observed in the wider region, at which no hard substrata exists and is characterized by soft substrata. At the majority of the shipwrecks surface, is covered by sponges, bryozoa and archaecyatha. Further study of the shipwreck as well as the surrounding region, will generate more useful information as to the effect of the shipwreck beyond from the space it is situated. The results of these studies can be used as a model for management purposes of the shipwreck but also other shipwrecks, as well as the placement of/formation of other artificial reefs.

Taking this Opportunity I would like to express my deep appreciation to CMAS Scientific committee and in particular to my personal friend the Kyrenia Mayor Glafkos Cariolou,

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and Dr. MD, Chimonides Pantelis.

Without them on this project, i highly doubt that it would have achieved the same results as they did. As their valuable contribution was the main reason this project succeeded. I once again want to thank you all for your extraordinary effort, and i hope that you continue putting in the hard work you have ever since you joint the Cyprus Federation Scientific committee.

Yours Cordially,

Dr. Stavros Kaniklides (Ocean Scientist) Cyprus Federation of underwater Activities President of the Scientific Committee