

USE OF COPPER ALLOY MESH IN MEDITERRANEAN MARINE AQUACULTURE

P.A. Efstathiou*, E. Kouskouni, P. Karlovasiti, Z. Manolidou, A.P. Efstathiou

Biopathology Laboratory, Aretaieion Hospital of the Medical School of the National and Kapodistrian University of Athens

E-mail: panosefstathiou@usa.net

Cu

Hellenic Copper
Development Institute

Copper Alliance



HELLENIC REPUBLIC

National and Kapodistrian
University of Athens

EST. 1837

Introduction

Biofouling is a major problem in marine aquaculture with significant production impacts. Nets made from nylon are susceptible to biofouling and require frequent maintenance with high costs. The use of copper alloy nets in aquaculture brings a promising solution to this problem (Chambers et al. 2012). In the present study, that was conducted for the first time in Greece, we demonstrate the comparative results between fish's microbial flora, length, weight and mortality being cultured in conventional net cage and those being raised in brass UR30[®] copper alloy wire net cage. The wire UR30[®] copper alloy wire is environmentally friendly, antifouling, has antimicrobial properties, durability, is corrosion resistant and 100% recyclable.

Materials and methods

As part of the research process, two fish cages were used in Kefalonia Fisheries where the species *Sparus aurata* (Linnaeus, 1758) (sea bream) was cultured. The cage A-249 was made of copper alloy UR30[®] mesh whereas the cage B-228 was constructed of nylon mesh. Video recordings of fish and algae growth were conducted with a camera GHOST-S, HD DRIFT at various stages in both cages. Seven samplings of 10 random fish from each cage took place between December 2014 and November 2015. The somatometric characteristics of fish (weight, length) were measured. For the microbiological research of fish, samples of the oral cavities, the gills and blood were examined. The evaluation of the microbial flora of fish tissue samples took place at the Biopathology Laboratory of the Medical School of the National and Kapodistrian University of Athens by using 5 different culture media (Blood Agar, MacKonkey Agar, Chapman Agar, Sabouraud Agar, and SS Agar). The identification of the strains was made by the automated system VITEK2 of Biomérieux Company.

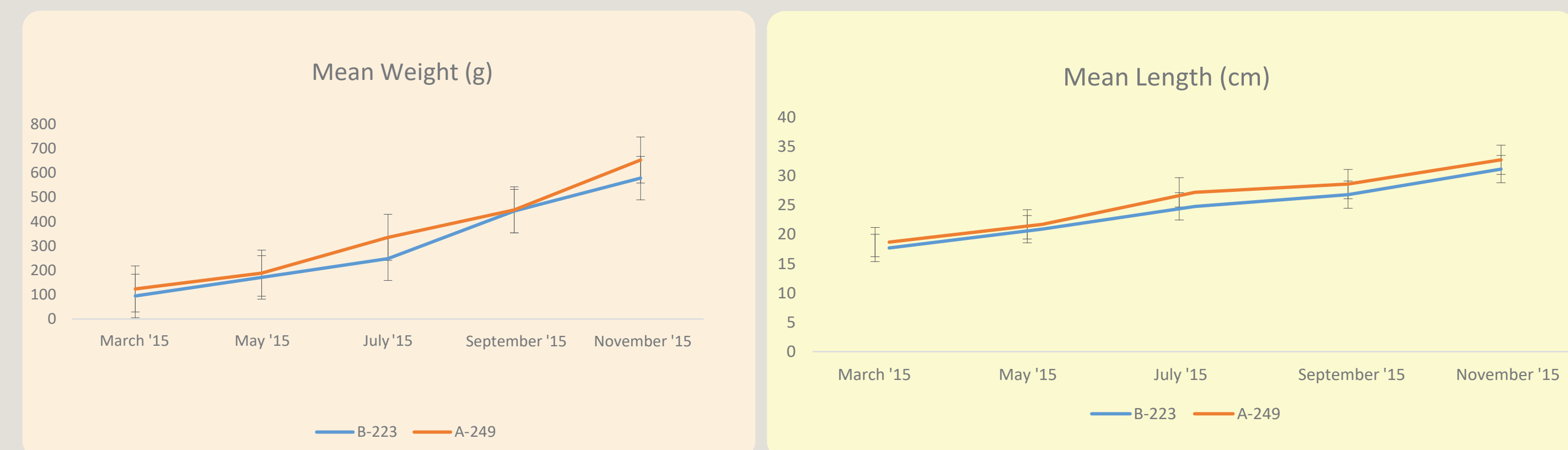


Fig.1. The somatometric characteristics of the fish that were cultured in the nylon cage (B-228) and in the copper alloy cage (A-249).

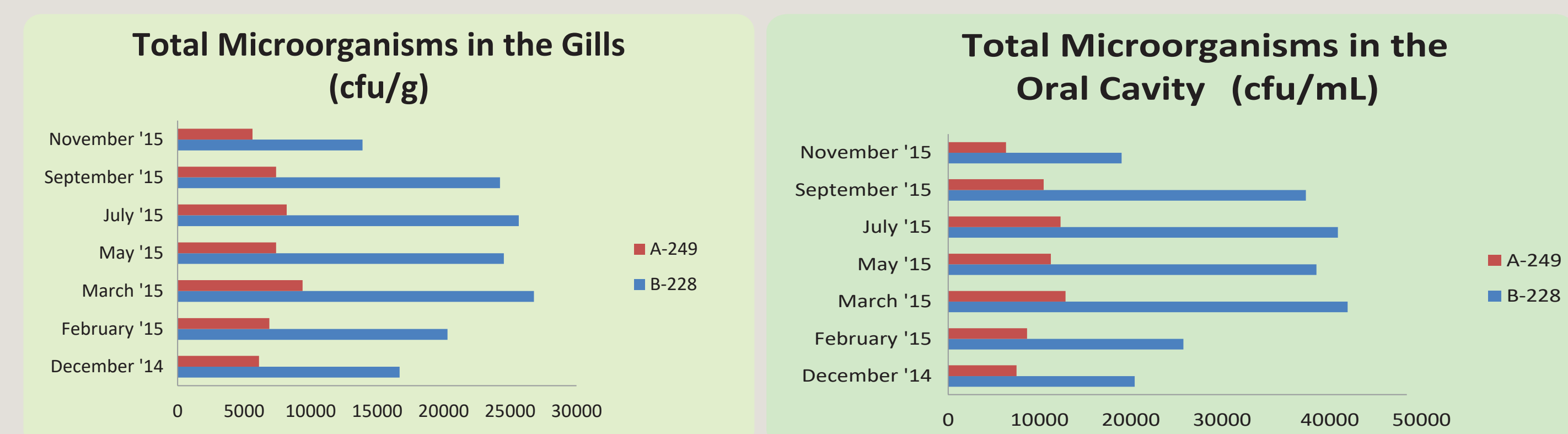


Fig.2. The microbiological flora of fish from nylon cage (B-228) and from copper alloy cage (A-249).



Results

No biofouling was recorded in the copper alloy net cage A-249 in contrast to nylon cage B-228 during the study period (Photo 1). The fish in the copper alloy mesh cage demonstrated increased mobility. The weight and length measurements of the tested fish are shown on Figure 1. The fish from the copper alloy cage were of greater length and weight compared to those raised in the nylon cage.

The microbiological examination showed that the microbiological flora (*Aeromonas* spp., *Vibrio* spp., *Pantoea* spp., *Brevudimonas* spp., *Sphingomonas* spp., etc.) of fish from both cages (A-249 and B-228) ranged in normal levels (Figure 2). However it was clear that the samples from the gills and the mouth of fish coming from the copper alloy cage showed lower microbe values compared to those of the nylon cage. No microbial growth was recorded in the blood of fish from either cages.

Discussion and conclusion

The increased mobility of the fish in the copper alloy mesh cage is an indicator of good health in fish, which was also confirmed by the reduced mortality in copper alloy net cage, in relation to that of the nylon cage. The greater length and weight of the fish from the copper alloy cage can potentially reduce the harvest time, leading to multiple economic benefits for aquaculture. The absence of biofouling from the copper cage can increase the oxygen levels in the cage and reduce the microbial load of the fish. Thus, the fish health is promoted and the operational costs associated with net cleaning are decreasing. Therefore the use of copper alloy nets can contribute to a sustainable aquaculture.