BIOACCUMULATION OF CADMIUM AND LEAD IN SCALLOP *Argopecten purpuratus* (Lamarck, 1819) IN BOTTOM CULTURE, AT SECHURA BAY

Eng. Loaiza Iván[1], M.Eng. Miglio María[2], Dr. Mendo Jaime[3]

[1,2,3] Faculty of Fisheries, Department of Hydrobiological Resources Management and Environment. National Agrarian University, La Molina Avenue, La Molina, Lima 12, Peru. E-mail: ivan.loaiza.alamo@vub.ac.be; mcmiglio@lamolina.edu.pe; jmendo@lamolina.edu.pe

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INTRODUCTION

In Sechura Bay, Peru bottom culture of the scallop *Argopecten purpuratus* is an important economic activity with a production around 69 millions dollars in 2010. However due to the nearby presence of cities, fishery industries, fishing piers and oil companies, this production area is subject to pollution and heavy metals are a concern **(Fig 1)**.

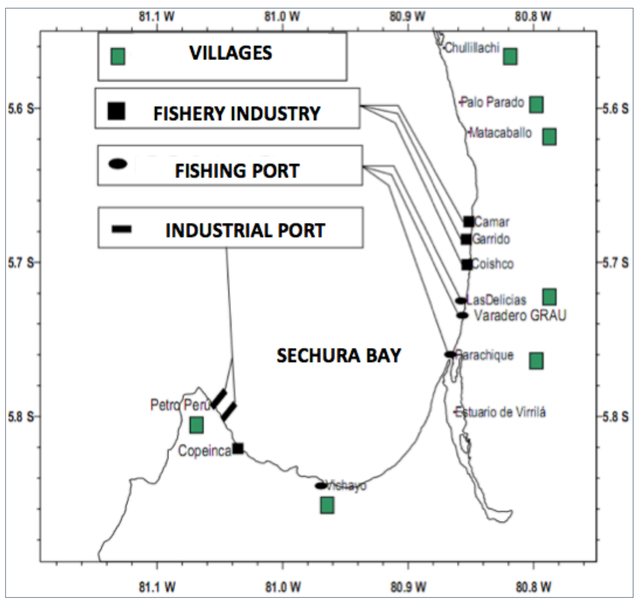


Fig 1. Main sources of pollution in Sechura Bay, Peru (Source: IMARPE, 2007)

Therefore, the bioaccumulation of cadmium and lead in *Argopecten purpuratus* was determinated, as well as its variation with the size of individuals (50 - 65 and 70 - 80mm) and its relationship with the concentration of Cd and Pb in water and sediment and some abiotic variables during January to April 2010 at Sechura Bay was established.

MATERIALS & METHODS

The evaluation was performed in-situ (Lat: 05°44'23,0"N; Long: 80° 55'39.5" O), where 1700 specimens (50 - 65mm/70 – 80mm) were extracted by semi-autonomous diving for planting randomly in two cages (per size range) at a density of 10 ind.m^{-2} as bottom culture **(Fig 2)**.

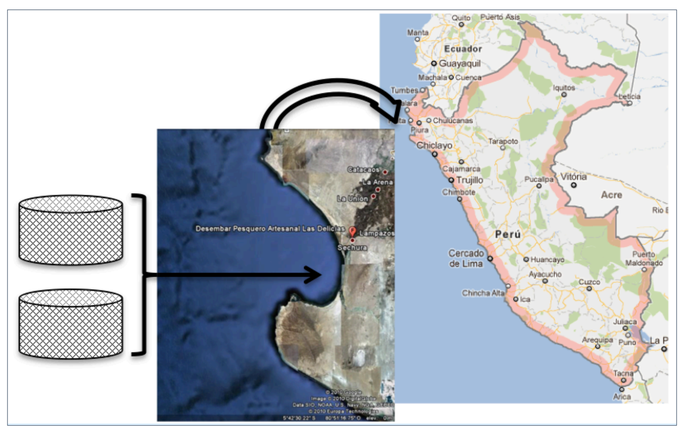
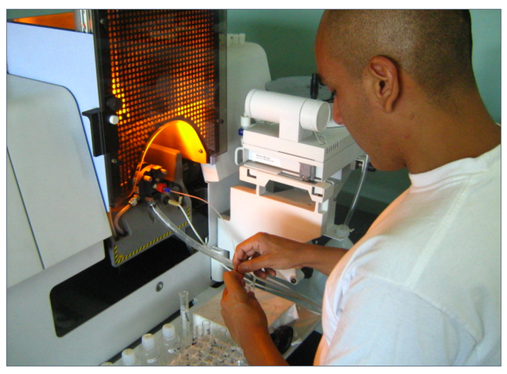


Fig 2. Location for installation and collection of scallops from Sechura Bay, Peru.

Samples of 500 individuals were collected monthly for biometric and heavy metals analysis (Atomic Absorption Spectrophotometry (ASS)) **(Fig 3 and 4)**.

Fig 3.

Fig 4.



Additionally, samples of seawater and sediment were collected (also analyzed with ASS) with Niskin Bottle and plastic spatula respectively **(Fig 5 and 6)**. Measurements of temperature, dissolved oxygen, electrical conductivity and redox potential were performed with the Multi-parameter HACH® **(Fig 7)**.

Fig 5.

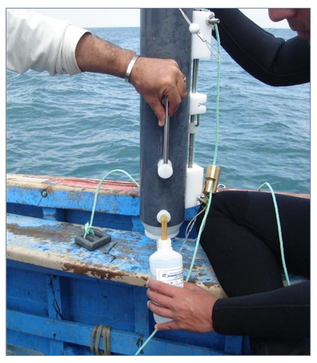


Fig 6.

Fig 7.

The data sample was analyzed with MINITAB 15, 16, PASW Statistics 18 and IBM SPSS Statistics 19, using t-student for comparisons between Cd and Pb concentrations of different sizes and Pearson for correlations between Cd and Pb concentrations in tissues, sediments and abiotic variables.

RESULTS

Both size ranges showed similar concentrations in the bioaccumulation of cadmium in muscle adductor and lead in gonad but the lowest tissue Cd concentrations were observed in the adductor muscle **(Fig 8)**.

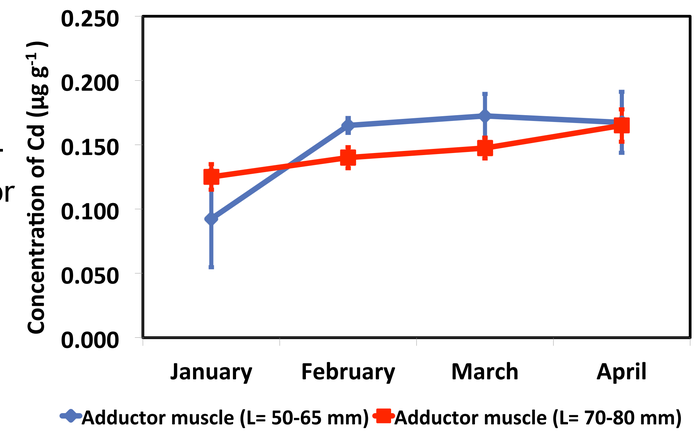


Fig 8. Concentration of Cd (µg g^{-1}) in adductor muscle of *Argopecten purpuratus*, January to April, 2010

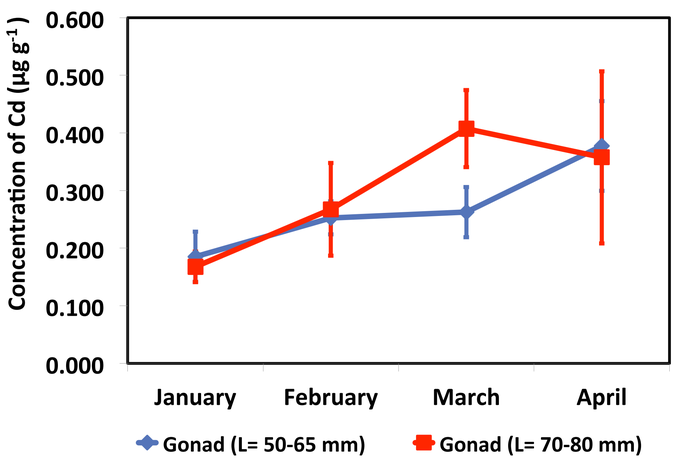


Fig 9. Concentration of Cd (µg g^{-1}) in gonad of *Argopecten purpuratus*, January to April, 2010

The bioaccumulation of Cd in gonads of individuals from 50 to 65mm showed an increasing trend throughout the evaluation period, while individuals 70 to 80mm showed more variability **(Fig 9)**. Pb always exhibited considerable variability **(Fig 10)**.

There were no significant correlations ($\alpha < 0.05$) between the bioaccumulation of Cd and Pb in scallops and the concentration of Cd and Pb in bottom sediments. The abiotic variables; temperature and salinity were directly related with the bioaccumlation of Cd and Pb in *Argopecten purpuratus*.

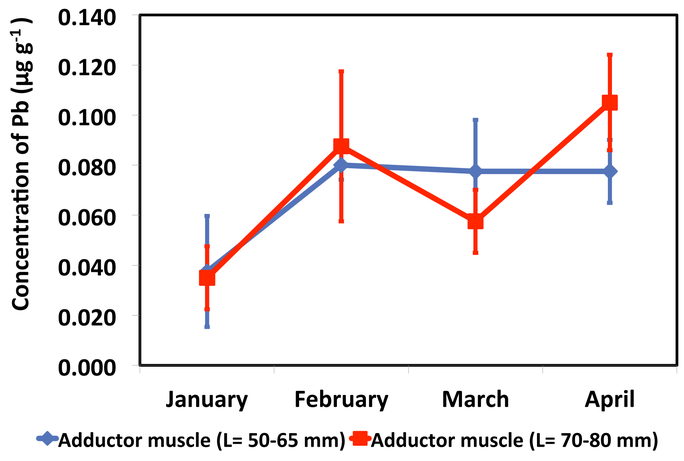


Fig 10. Concentration of Pb (µg g^{-1}) in adductor muscle of *Argopecten purpuratus*, January to April, 2010

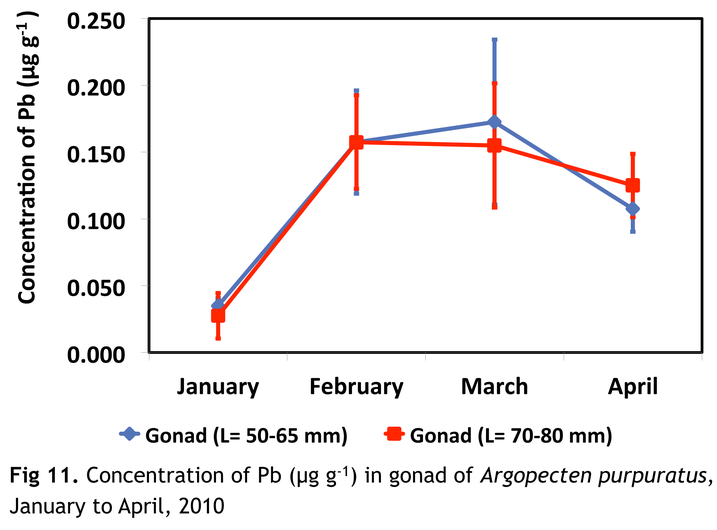


Fig 11. Concentration of Pb (µg g^{-1}) in gonad of *Argopecten purpuratus*, January to April, 2010

Although traces of cadmium and lead are present we conclude that the values in edible tissue (gonad + adductor muscle) of scallop are below the maximum levels of 1mg kg^{-1} for Cd and 1 and 1.5 mg kg^{-1} for Pb of the European Union (EU) and World Health Organization (WHO).

CONCLUSIONS

The bioaccumulation of cadmium and lead in individuals from 50 – 65mm of *Argopecten purpuratus* are slightly higher than individuals from 70 – 85mm.

The bioaccumulation of cadmium and lead in *Argopecten purpuratus* are mostly related with the temperature and salinity.

The bioaccumulation of cadmium in gonad increased in individuals *Argopecten purpuratus* (50 - 65mm) throughout the period of experimentation.

The concentration of cadmium and lead in edible tissue of scallop are below the maximum levels of the European Union (EU) and World Health Organization (WHO).

ACKNOWLEDGES

This work was supported and funded by UNALM-FINCYT Project "Bases científicas y tecnológicas para incrementar la productividad del cultivo de concha de abanico en áreas de repoblamiento en la Bahía de Sechura". The authors gratefully thank ASOCIACION DE PESCADORES ARTESANALES BEATITA DE HUMAY from Sechura, Piura - Peru for their help during the fieldwork and Dr. Gudrun de Boeck and Oceans & Lakes program for their advices.