

VIRTUAL MALACOLOGICAL COLLECTIONS IN ARGENTINA – A TECHNOLOGY FOR ENVIRONMENTAL EDUCATION APPLIED TO THE CLASSROOM SPACE DURING AND AFTER THE PANDEMIC, AIMED AT THE CONSERVATION OF BIOLOGICAL DIVERSITY

By Heliana Custodio, Alfredo Vilches & Gustavo Darrigran

According to Dioum (1968, as cited by Lotze, 2020), “...we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught”. Based on that, this study will contribute to the generation of a scientifically aware and literate society, for which specific environmental education activities will be implemented in the classroom through scientific-technological culture, as essential tools for inclusive innovation. The study will address education as a tool for society to be lucid about the crisis that biodiversity faces today (Vilches, *et al.*, 2015) and scientifically literate considering that science is more than a body of knowledge, it is a way of thinking (Sagan, 1996). The focus of the study is the second most diverse zoological group in nature (molluscs) (Fig. 1). Digital resources, much expanded during the current pandemic, will be implemented to make use of didactic resources such as biological collections (BC) in general, and malacological collections (MC) in particular. For their application, accessibility and inclusion, virtual biological collections (VBC) / virtual malacological collections (VMC) accessed through PCs, tablets, mobile phones, etc. will be developed.

The importance of this project is framed in the topicality of the issue (biodiversity crisis) and the feasibility of the objectives/time ratio for its development. Design, construction and management (DCM) techniques will be used for both BC/MC and VBC/VMC. These virtual collections will be easy to access and to include in university classrooms and higher education institutes for training of natural sciences teachers. The motivations of the students and teachers regarding BC as a didactic resource, its link with the web and their evaluations will be considered. Tools will be generated for teachers on BC, DCM techniques as a resource and to ensure that, through the generation of VBC, the levels of education considered can access the BC/MC that exist in institutions that have limited access, which makes their use as a teaching resource difficult (e.g. museums; Rabanaque *et al.*, 2021) (Fig. 2). Didactic recommendations will be developed regarding the use and construction of BC/MC and VBC/VMC, favouring their use as innovative strategies in the teaching of biodiversity conservation. BC/MC and information and communication technologies (ICT) will be used in the classroom (Custodio *et al.*, 2019). Quantitative/qualitative analysis methodology will be applied; exploratory design.

For the use of ICT, a quick response code (QR) will be attached to the images of the corresponding mollusc specimens, which will lead to the malacological records (Darrigran *et al.*, 2017),



Fig. 1. This work is based on the importance of molluscs for humans (e.g. food, aesthetics, fouling on a wide array of human infrastructure).



Fig. 2. A - The Museo de La Plata opened in 1888 and is now part of the National University of La Plata; education and scientific research are among its main goals. The malacology collection contains more than 13,000 lots, including 511 type lots. The lots are preserved in the traditional way: B - dry, C - wet, and microscope slides, as well as frozen tissue for molecular studies.

published since 2011 in an open-access digital education journal. Likewise, through this QR code, knowledge about molluscs can be expanded and updated, considering the educational level to which it is directed.

In order to implement accessible and cost-effective DCM-MC-VMC techniques, mobile phone images will be taken of batches of two Institutional Collections:

- 1) The didactic BC of the Biological Sciences Faculty of the National University of La Plata (UNLP).
- 2) The Malacological Collection of the Museum of La Plata (UNLP).

The importance of molluscs for ecosystems in general and for humanity in particular, and the importance of molluscs as a



Fig. 3. Instagram. Virtual Malacological Collection (VMC) (in preparation).

teaching resource for biology teachers in Argentina will be emphasised (Custodio *et al.*, 2018).

The [Tree of Life website](#) will be used for updated BC systematics and [MolluscaBase](#) for malacological collections. Network integration is proposed (e.g. [iNaturalist](#); Instagram - Fig. 3), with recreation of a didactic scenario and learning from e-platforms. The results of the project will provide access to the BC/MC and protocol for creating VMB/VMC.

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THE XERCES SOCIETY PETITIONS PROTECTION FOR *GONIDEA ANGULATA* (LEA, 1838) UNDER THE U.S. ENDANGERED SPECIES ACT

By Edward J. Johannes

On 18 August 2020, the Xerces Society for Invertebrate Conservation in Portland, Oregon, USA, filed a [petition](#) to have the U.S. Fish & Wildlife Service (USFWS) list *Gonidea angulata* (Lea, 1838) (western ridged mussel; Fig. 1) under the Endangered Species Act (ESA) (Blevins *et al.*, 2020).

This species has been designated in Canada as a species of Special Concern because of its limited occurrence, evidence of declining populations and continued loss or degradation of suitable habitat both in Canada and the western USA (COSEWIC, 2003).



Fig. 1. Right valve of *Gonidea angulata*. Specimen from the upper Sacramento River, California. (Photo: Stephanie Clark)

The only species in the genus, *Gonidea angulata* is found across the western USA in the states of California, Oregon, Washington, Idaho and Wyoming, and in the Okanagon River drainage (a Columbia River tributary) of southern British Columbia, Canada (Fig. 2).

The distributions of all western USA mussel species were recently assessed both in California (Howard *et al.*, 2015) and



Fig. 2. Range of *Gonidea angulata* in the USA and Canada. Light-blue shading (upper left) is its range in the Chehalis River drainage. Map modified from Mock *et al.*, unpublished.