Educational use of FishBase by public aquariums

by

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Abstract. – With more than 700 million visitors annually, zoos and aquariums have the capacity of spreading scientific knowledge to a large public in order to raise awareness of conserving ecosystems with the help of their living collections. Zoological organisations have set standards to define the expectations in terms of education focusing on the quality of the information. To accomplish their mission, public aquariums need reliable sources of information. In anticipation of the FishBase-SeaLifeBase symposium which was held in Paris in September 2021, it was decided to conduct a preliminary survey to evaluate the use of these databases in public aquariums for educational purposes. This short survey was sent to approximately 2,000 aquarium curators and aquariologists around the world. It included questions about the type of information searched, how they were used, the constraints that currently hamper their use of FishBase and the tools that would be useful to them. With 93% of the 72 respondents claiming to use FishBase for educational purpose, the results of this preliminary work show that the database is probably widely used within this community to access accurate and relevant information about the species exhibited. Species distribution range, size and diet were among the most sought-after information and most of the respondents (74%) claimed that pictures and maps usable for signs and documents (high quality, free license) would be beneficial, which is consistent with the use made of this information to design exhibit signs. In conclusion, future collaborations would allow FishBase to reach a wider audience to raise awareness of the need to protect and conserve biodiversity and would ensure public aquariums provide accurate educational information. Yet the latter have specific needs regarding the format of the data they can use to communicate with their audience.

Résumé. – L'utilisation de FishBase à des fins éducatives par les aquariums publics.

Avec plus de 700 millions de personnes visitant annuellement un zoo ou un aquarium public, ceux-ci ont la capacité de toucher un large public afin de diffuser des connaissances scientifiques et de sensibiliser celui-ci à la conservation des écosystèmes. Des normes existent afin de définir des objectifs en termes d'éducation du public, mettant notamment l'accent sur l'importance de la qualité de l'information. Afin de remplir leur mission d'éducation, les aquariums publics doivent se baser sur des sources d'information fiables. En préparation du symposium FishBase-SeaLifeBase qui s'est tenu en septembre 2021 à Paris, il a été décidé de mener une enquête préliminaire auprès d'aquariums publics afin de connaître leur utilisation de FishBase. Un questionnaire a été envoyé à environ 2000 conservateurs d'aquariums et soigneurs à travers le monde. Celui-ci comportait des questions sur le type d'informations recherchées, l'usage qui en était fait, les contraintes qui limitent leur utilisation de FishBase et les outils qui leur seraient utiles. Avec 93% des 72 répondants affirmant utiliser FishBase à des fins éducatives, les résultats de ce travail préliminaire montrent que la base de données est probablement largement utilisée dans cette communauté afin d'accéder à des informations exactes et pertinentes sur les espèces présentées au public. L'aire de répartition, la taille et le régime alimentaire des espèces faisaient parties des informations recherchées par la majorité des répondants et 74% d'entre eux affirment que des photographies et des cartes de répartition utilisables pour la rédaction de documents et affiches leur seraient utiles. Ces résultats sont cohérents avec l'utilisation des données récoltées pour concevoir des panneaux d'exposition. En conclusion, de futures collaborations seraient bénéfiques tant pour les aquariums publics que pour FishBase qui pourrait ainsi atteindre un public plus large, mais il faudra porter une attention particulière aux contraintes liées à la façon de communiquer avec ce public.

INTRODUCTION

During the 19th century, zoos were designed to display a large number of species, and animals were kept in small cages. But, from the 19th century to the 21st century, most zoos and aquariums evolved from those menagerie type collections into conservation centres, aiming to educate their visitors about the living world and the importance of nature conservation (EAZA, 2013). In the 21st century, modern zoos and aquariums focus their activities around their three main roles: conservation, education and research (EAZA, 2013; Barongi *et al*., 2015).

With more than 700 million people annually visiting zoos and aquariums around the world (Barongi *et al*., 2015) of which more than 140 million are in Europe (EAZA, 2021), these institutions are uniquely positioned to spread scientific knowledge and to engage the public into conservation by displaying their living collections.

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USE OF FISHBASE BY PUBLIC AQUARIUMS FOR EDUCATIONAL PURPOSE

In this article, we will focus on the educational role of public aquariums and evaluate whether they use FishBase as a reliable source of information to fulfil their mission to provide accurate and relevant information about the species exhibited.

FishBase was designed as an information system with key data on the biology of all fishes, containing different kinds of data for a variety of users (Froese and Pauly, 2000). The quality of the information found on this database is recognised by the scientific community, with citations in thousands of scientific publications (Stergiou and Tsikliras, 2006; Froese, 2011; Froese and Pauly, 2021). It gives an easy access to data on more than 34,000 species, summarizing the information from 58,400 references (Froese and Pauly, 2021). The database provides comprehensive data (among others) on taxonomy, geographical distribution, morphology, behaviour, habitats and ecology, which could be used for exhibit signs. Other tools are useful, such as identification keys or lists of species inhabiting particular ecosystems or countries.

THE EDUCATIONAL ROLE OF ZOOS AND AQUARIUMS

In Europe, aquariums are governed by the EU Council Directive of 29 March 1999 relating to the keeping of wild animals in zoos. Following the article 3, zoos and aquariums are required to promote "public education and awareness in relation to the conservation of biodiversity, particularly by providing information about the species exhibited and their natural habitats" (Council of the European Union, 1999). This article was later developed as a good practice document edited by the European Commission (European Commission, 2015), emphasizing the social education role of zoos and aquariums in promoting the environmental, economic, cultural and intrinsic values of biodiversity and raising awareness of conservation and biodiversity issues. This responsibility is not limited to the educational activities but includes every action where animals are used to convey messages, including the image they portray of animals, which should be realistic, respectful and avoid promoting any inappropriate behaviour towards wildlife.

The educational role of zoos and aquariums is highlighted in the mission statements of the main zoological organisations across the world. Indeed, if the goal of conservation is sought, people need to be inspired to care about animals and understand the threats they face in the wild (EAZA, 2016).

The European Association of Zoos and Aquaria (EAZA) is the largest professional zoo and aquarium association in the world, with over 400 member institutions in 48 countries throughout Europe and the Middle East (EAZA, 2021). Its mission statement on conservation education is as follows (EAZA, 2016): "To mitigate the extinction of biodiversity through quality conservation education that raises awareness, connects people to nature and encourages sustainable behaviours in the millions of people that engage with EAZA zoos and aquariums annually." As for the European Union of Aquarium Curators (EUAC), it includes the increase of public awareness and the provision of education and educational tools in its mission statement (EUAC, 2021).

Here, the term "education" is used in its broadest sense, *i.e.* not only for schools or education focused on children, but in the way of encompassing learning opportunities, experiences and activities for all ages and needs (EAZA, 2016).

The World Association of Zoos and Aquariums (WAZA) and the European Association of Zoos and Aquaria use the term "conservation education" to reflect that biodiversity conservation must be at the core of the programmes of educational activities, highlighting the importance of visitor engagement in order to promote behaviour change for conservation (Barongi *et al*., 2015; EAZA, 2016).

The EAZA conservation education standards, approved by the EAZA Council in 2016 (EAZA, 2016) is a comprehensive six-page document that provides guidance as to what is expected of zoos and aquariums in terms of education, including the quality of the information used as well as the shared message. In this document, the EAZA highlights that conservation education in zoos "should aim to raise awareness of biodiversity loss, connect people to nature and encourage sustainable behaviours, […] aspire to make conservation issues relevant to visitors' own lives and experiences in order to inspire people to take action locally that can make a difference globally."

In this document, the EAZA also emphasizes on how conservation education messages must be an integral part of exhibit design, presenting accurate and relevant information about the species exhibited and on the importance of basing those messages on scientific facts (EAZA, 2016).

HOW DO ZOOS AND AQUARIUMS EDUCATE THEIR VISITORS?

There are many ways to engage visitors and to provide them formal and informal learning opportunities (EAZA 2013; Barongi *et al*., 2015). First, well-designed environments with healthy animals behaving in a species-specific way are significant to engage visitors. Providing signs at each animal enclosure, with clear information about the animals and their habitats is the simplest and traditional way to provide visitors with basic information.

When space and resources are available, interactive displays can be designed, where visitors will not only read texts or look at pictures, but also be allowed to touch some material or play a game. Engaging and informative presentations are also a good way of reaching the visitors, by interacting with them. Keepers can for example give a talk during feeding time or educators can offer tours at a set time. This is an effective way to attract numerous visitors and to provide them information in an engaging manner, although this requires staff time.

For schools, educational programs are often set up, offering activities to be carried out on site or off site, with or without the support of an educator.

Of course, technology is increasingly used and can help to engage visitors, for example by linking to specific website though QR codes, through the development of apps and social media to access more information on a topic or species, or build a supportive community.

In the rest of this article, we will focus on the signs found in public aquarium exhibits, as they are the most traditional and simple way to educate visitors and are found in every institution.

With less than 25% of visitors reading a panel in its entirety (Barongi *et al*., 2015), it is important to keep the information concise and attractive. So, which information should be displayed to visitors? According to the EAZA conservation education standards, the signs must include at least the following information: the species name (both scientific and common), its natural habitat and some of its biological characteristics and details of its conservation status (preferably using the IUCN red list status and the national species status) (EAZA, 2016).

Most public aquariums display the following information on their signs (author's personal observation): the scientific and common name of the species, sometimes in different languages; a photo or a drawing of the species; its distribution (as text or a map); its size; its diet and its IUCN red list status (Fig. 1). This information is enough to fulfil the objective of most of the visitors, which is to know a few basic things about the animals they see and how they live in the wild (EAZA, 2013). They also fulfil the requirements suggested by the EU Council Directive of 29 March 1999 (European Commission, 2015)

When enough space is available, some institutions display more detailed information about the behaviour and

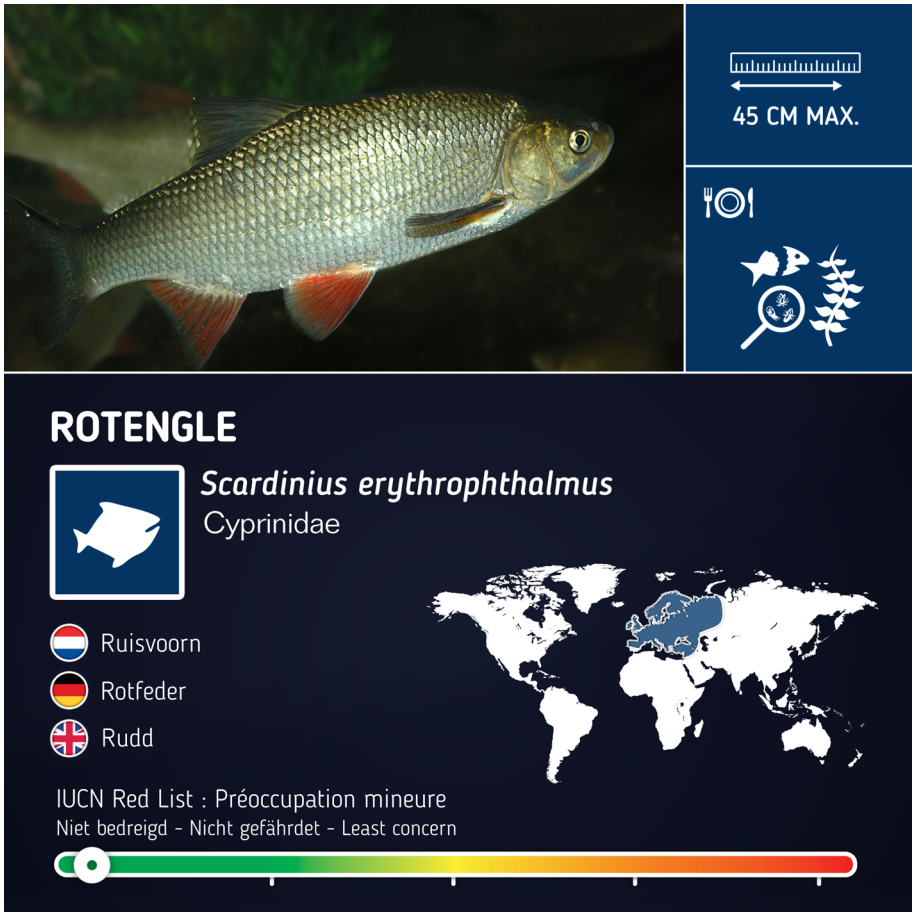

Figure 1. – An example panel in a public aquarium displaying information about the species, its family, its common name in four languages; a photograph; its distribution range as a map); its size; its diet and its IUCN red list status.

ecology of the species or the ecosystem they live in, and even fun facts or information about an individual animal. This latest information is intended to engage the visitors by making it more personal. But, in comparison with zoos, aquariums face an additional difficulty as the exhibits often display numerous species with limited space, so there is a risk of tiring visitors with too much information.

Table I. – Overview of the survey performed; questions and answers (n = 72).

Questions	Proposals	Positive answers (%)
Name of the institution, country and contact person		
Do you use FishBase for educational purpose?		93
If yes, what information are you looking for?	IUCN status	69
	CITES status	54
	Correct scientific name	88
	Common name in the language of your country	65
	Common name in foreign languages	46
	Family	47
	List of species in the taxa (family, genus …)	40
	Other classification information	29
	Maximum size	82
	Average size	68
	Maximum weight	54
	Diet	69
	Other information on species biology	68
	Distribution range	89
	List of species inhabiting the geographical area or ecosystem	24
	Other information on habitat	33
	Physical description	44
	Pictures	78
	Other (to be specified)	
If yes, how do you use this information?	Information gathering for creation of exhibit graphics and ID labels	68
	Collecting pictures for exhibit graphics and ID labels	18
	Maps collection for exhibit graphics and ID labels	19
	Inspirational maps and species pictures to draw your own maps and pictures	26
	Information gathering for collection planning	63
	Information gathering for captive ecosystems creation	50
	Other uses (to be specified)	
What other information sources do you use (for educational purpose)?	SeaLifeBase	29
	IUCN RedList website	65
	Animal Diversity Web	26
	CITES website	36
	Other (to be specified)	
Are there any constraints that hamper your use of the FishBase?		32
What tools would be useful for you?	Pictures usable for signs and documents (high quality, free license)	74
	Maps usable for signs and documents (high quality, free license)	74
	Some web service to automatically import data and/or pictures from FishBase	43
	Other (to be specified)	
Do you have any comments?		

SURVEY ON THE USE OF FISHBASE BY PUBLIC AQUARIUMS

During many informal discussions with colleagues from different public aquariums, FishBase was identified as a reliable source of information that is widely used. In anticipation of the FishBase-SeaLifeBase symposium, held in Paris in September 2021, it was decided to conduct a survey about the use of FishBase and SealifeBase database made by public aquariums. The first step was to send an email in July 2021 to colleagues from European aquariums, asking them if and how they used FishBase for educational goals. This allowed us to identify some trends and to prepare a survey, which was sent by email in August 2021 to about 2,000 aquarium curators and keepers around the world. Supposing that we would receive more answers if the questionnaire took a short time to complete, the author chose to make a series of proposals for certain questions (Table I) in order to make it easier for respondents. Those propositions were based on the results of our preliminary survey, but this method probably resulted in a bias in the responses.

SURVEY RESULTS

Of the 72 completed surveys, 16 countries were represented and dominated by European countries (43%) and the United States (54%) (Table I).

This is due to the communication channels used to send the survey, mainly via the European Union of Aquarium Curators and a professional mailing list widely used by American aquarium curators.

Over 90% of respondents claimed to use FishBase for educational purposes. The most searched information was the distribution range (89% of respondents), the scientific name (88%), the maximum size (82%), the IUCN status (69%) and the diet (69%); 78% of the respondents were also looking for pictures of species (Fig. 2).

The majority of respondents (68%) indicated that they use information from FishBase to create exhibit signs and species identification labels. Half of respondents also claimed that they gather information to guide the design and creation of captive ecosystems (Fig. 3), which is in line with the recommendations of the EAZA and WAZA about the necessity of well-designed captive environments to engage visitors (EAZA, 2013; Barongi *et al*., 2015).

When asked which other information sources they use, the IUCN RedList website is cited by most of the respondents (65%). The two other most cited sources are the CITES website (36%) and SeaLifeBase (29%). Although not on the list of suggested sources in the questionnaire, the World Register of Marine Species was cited by 13% of respondents (Table I).

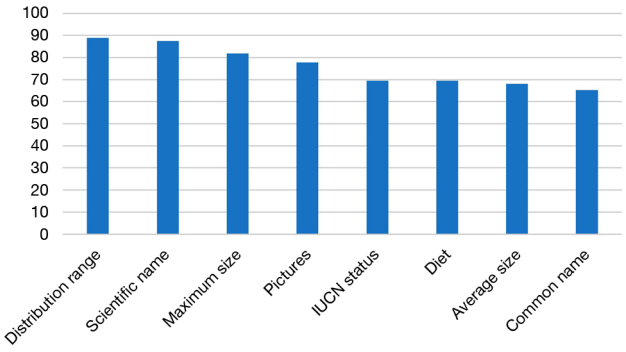

Figure 2. – The percentage of respondents searching for a certain kind of information when consulting FishBase.

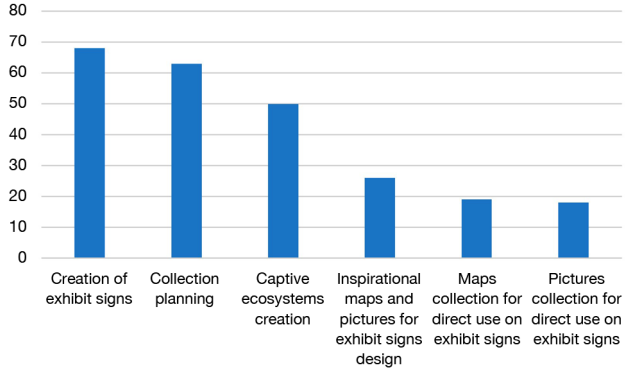

Figure 3. – The percentage of respondents using different information types provided by FishBase.

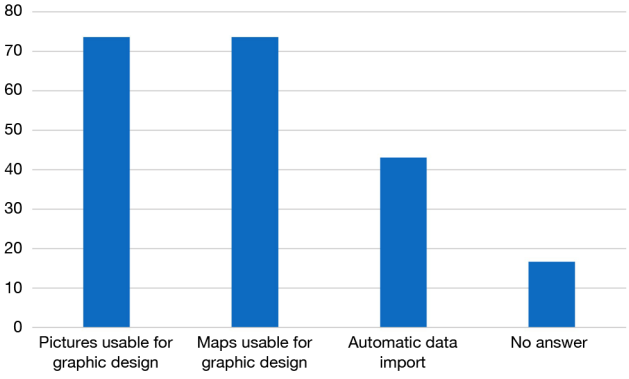

Figure 4. – Percentage of respondents looking for supplementary tools for their educational use of FishBase, mainly for graphic design.

Most of the respondents (68%) stated that there were no constraints to their use of FishBase. For those who encounter difficulties, the connectivity to FishBase servers is the biggest problem (15%). Some respondents also cited the lack of pictures or their quality (7%), taxonomic issues (6%) and the interface not being user friendly (6%), but those complaints were few. Overall, most respondents were very satisfied by

the service offered by FishBase, illustrated by additional positive and praising comments made by respondents.

When asked which tools would be useful for their educational work, most of the respondents (74%) claimed that high quality and free license pictures and maps would be beneficial for use in aquarium signs and documents. Almost half of respondents (43%) suggested that a tool allowing automated imports of data or pictures from FishBase would be useful (Fig. 4).

FISHBASE AND PUBLIC AQUARIUMS: PARTNERS IN THE FUTURE?

This study was designed to provide a preliminary overview of the way public aquariums use FishBase to fulfil their educational mission. The results indicate that FishBase is already widely used within this user group.

Many respondents desired to have access to usable pictures and maps in order to create exhibit signs and identification labels There are two major constraints to achieving this in FishBase: copyright issues and high-resolution file storage. The first of these could be the subject of a potential collaboration between FishBase and public aquariums. Indeed, some have embarked on a pilot collaborative project, involving the sharing of data collected on animals kept in captivity and the provision of image banks with FishBase (Chardard *et al*., 2023; Teletchea *et al*., 2023).

FishBase is a unique tool to gather scientific data and to generate new knowledge. But, in his current design, its use is restricted to an informed audience.

During the preparation of this manuscript, FishBase released a new simplified and responsive interface designed for use on mobile devices, and at the end of 2021 launched the FishBase Guide app on the Google Play Store (https://play.google.com/store/apps/details?id=se.fishbase.qquatics&hl=en&gl=US; Nauen *et al*., 2023). This app is designed to reach a larger audience by simplifying the interface and functionality of FishBase to provide users with an offline list of the fish species inhabiting a chosen region; their common names; minimum length at maturity; and information about their vulnerability to fishing and climate change (Nauen *et al*., 2023).

Public aquariums have the ability to popularize and disseminate scientific knowledge. As hundreds of millions of people annually visit zoos and aquariums (Barongi *et al*., 2015), future collaborations would be beneficial to both public aquariums and FishBase, to amplify the impact of FishBase and SeaLifeBase and to ensure that accurate and up to date information is being used in educational activities and engagements.

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