Twelve years of FishBase: lessons learned

Gert Boden and Guy G. Teugels[†1]

Ichthyology, Africa Museum
Leuvensesteenweg 13, B-3080 Tervuren, Belgium
E-mail: boden@africamuseum.be

Abstract

FishBase is an extensive database with information on fishes that was started in 1990 and that is available on the internet since 1998. The number of hits increased from a few 100.000 in 1999 to more than 4 million in August 2002. Most users are individuals searching for information by common name. Researchers are also intensively using FishBase since they visit the specialized topics. Due to their limited number, it is obvious that their user sessions are relatively less numerous compared to those of the individuals. FishBase is trying not to duplicate information that is already available on the internet. It rather gives species-level links to these particular pages, mainly other databases and distribution maps. FishBase has a 'science first' attitude, *i.e.* information is based on cited scientific publications.

Keywords: FishBase; Biodiversity; Internet.

Introduction

FishBase started in 1990 as an initiative of the European Commission. The database fitted in with the whole program between the European Union and the developing countries. Since most of the available information and knowledge on research on fishes is only available in the developed countries, FishBase was seen as a tool for the transfer of this information and knowledge to the developing countries. The development of the FishBase-concept was given to ICLARM (International Center for Living Aquatic Resources Management, now the World Fish Center), member of the CGIAR-group. In 2000, the FishBase-Consortium was founded in order to maintain the database permanently. The seven members of this Consortium are all more or less complementary in their specializations: FAO (Food and Agriculture Organization, United Nations), ICLARM (World Fish Center), IfM (Institut für Meereskunde an der Universität Kiel), MNHN (Muséum National d'Histoire Naturelle, Paris), MRAC (Musée Royal de l'Afrique Centrale, Tervuren), NRM (Naturhistoriska Riksmuseet, Stockholm) and UBC-FC (University of British Columbia, Fisheries Centre, Vancouver).

What is FishBase?

A CD-ROM version of FishBase was released every year since 1996. Since 1998 FishBase is also available on the internet, the main site being www.fishbase.org. Two mirror-sites are

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[1] Since this paper was presented, Guy Teugels passed away. We will deeply miss him.

available since 2001: www.fishbase.de at Kiel, Germany, and ichtyonb1.mnhn.fr at Paris, France. FishBase on the internet opens with the 'Search FishBase' page. This page shows some numerical overview data and links to important tools. In October 2002 FishBase included 26.945 valid species, 75.240 synonyms, 135.700 common names, 32.655 pictures and 27.175 references. Eschmeyer (1998) counted the number of valid species at about 23.250, but estimated that the total number of valid species could reach 30.000 or 35.000. FishBase already contains a great part of the valid fish species and newly described fish species are regularly added. The second part of the first page gives the different possibilities to search for information. This can be by common name, scientific name, family, country, reference or other topics. Within a few clicks one is able to see the 'Species Summary' page for the species requested, with general data, links to more detailed data and links to other web pages for that particular species when available. These include information on taxonomy, morphology, distribution, ecology, reproduction and many other topics.

FishBase also offers a Fish Forum, which is a platform where people can ask questions and eventually provide answers. Other subjects include a Fish Quiz, a 'Best Photos' page and Fish Watcher.

FishBase hits and user sessions

Web statistics for FishBase on the internet are available since 1999. The evolution of the number of hits and user sessions per month is given in Fig. 1. In 1999 it reached only a few 100.000 hits each month, but the number increased to reach a peak of more than 4 million hits per month in August 2002. The number of user sessions per month follows the same growth, ending at about 200.000 in August 2002. Many of these users visit FishBase more than once.
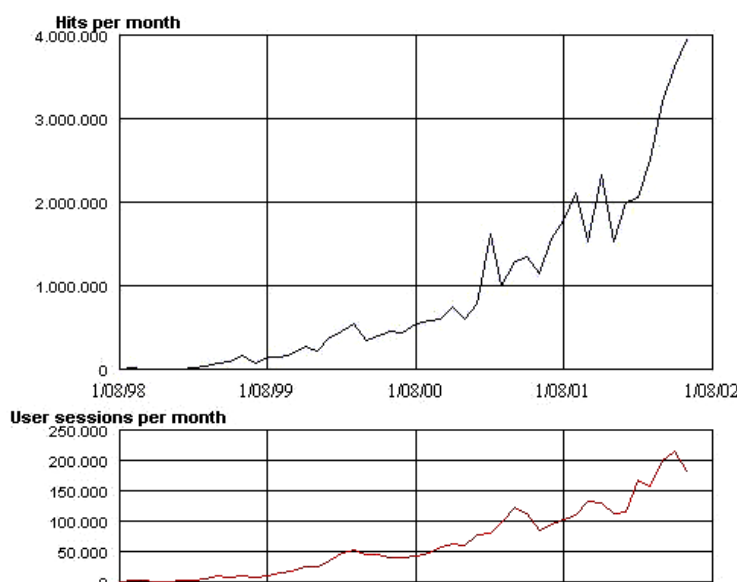

Fig. 1. Number of hits per month and user sessions per month in the period from 1 August 1998 to 1 August 2002.

While the number of unique users on the internet doubled in the period between January 2000 and May 2002, FishBase had more than 5 times more unique users in 2002 compared to 2000 (Table I). As more people are exploring the internet, a lot more are discovering FishBase as a standard database to search for information on fishes. This can be demonstrated by the fact that more unique users are entering the 'Search Page' and keep coming back after having seen the important amount of information and tools available in FishBase.

Table I. The number of internet users worldwide versus the number of FishBase users, during the period January 2000-May 2002 (source: NUA Internet Services)

	Global internet usage	FishBase usage
January 2000	254,29 million	20948
January 2001	455,55 million	43860
January 2002	562,47 million	62481
May 2002	580,78 million	114385

FishBase was running on only one server from the start in 1999. Soon, this server was not powerful enough to handle the rapid growth of FishBase users on the internet. In order to have a higher capacity, two mirror-sites were added at the end of 2001. With these mirror-sites FishBase was able to deal with a lot more visitors. This explains the enormous growth of FishBase users in the period after December 2001 (Fig. 1), while the number of unique users even doubled in the short period between January 2002 and May 2002 (Table I).

Who uses FishBase?

Based on the FishBase guestbook entries in June 2002 (Fig. 2), the main part of FishBase users are individuals. They represent nearly half of the total visitors. Together with visitors from private organizations and universities, they account for approximately 80% of the FishBase users. The international research centers and museums provide in terms of percentage less users. However, due to the limited number of researchers in the world, it is still an impressive percentage.

Since FishBase is available on the internet, it can be used worldwide (Fig. 3). Most of the visitors, about 60%, originate from North America or Europe. Asia is represented by 20% of the FishBase users, leaving another 20% for South America, Africa, Australia and Oceania. We can conclude that FishBase on the internet is less used in the developing countries, although it was primarily meant for them. The main reason is the connection with the internet. At many places in the developing countries there is simply no connection with the internet, and if there is, the connection is costly and not always reliable. If this will improve in the future, the percentage of users in the developing countries will increase. But until then most researchers in the developing countries are using the CD-ROM versions of FishBase rather than the internet version.

If we take a closer look at the FishBase usage by topic (Fig. 4), the most used topics are common names, species summaries and photos. This corresponds with the high number of individuals working with FishBase. Most of them only know the fishes by their common names

and are interested in general information, preferably with a picture or photo of it. These three topics are important for individuals, because the fish can be recognized or identified. However, scientific names, used by scientists and specialists, also represent a relatively great part of the topics used. This is clearly an indication that FishBase is used by many researchers, who find it a useful source for information on their investigation. In general, we can see an exponential decline in usage with increasing specialisation. The more a topic is specialized, the less people will use it. Specialized topics like fish collections, trophic ecology, reproduction and physiology are mainly interesting for people who are familiar with the specific terms used. Individuals not familiar with all these terms will not use these topics. Therefore we can conclude that FishBase is visited mainly by individuals, but also researchers are intensively using FishBase.
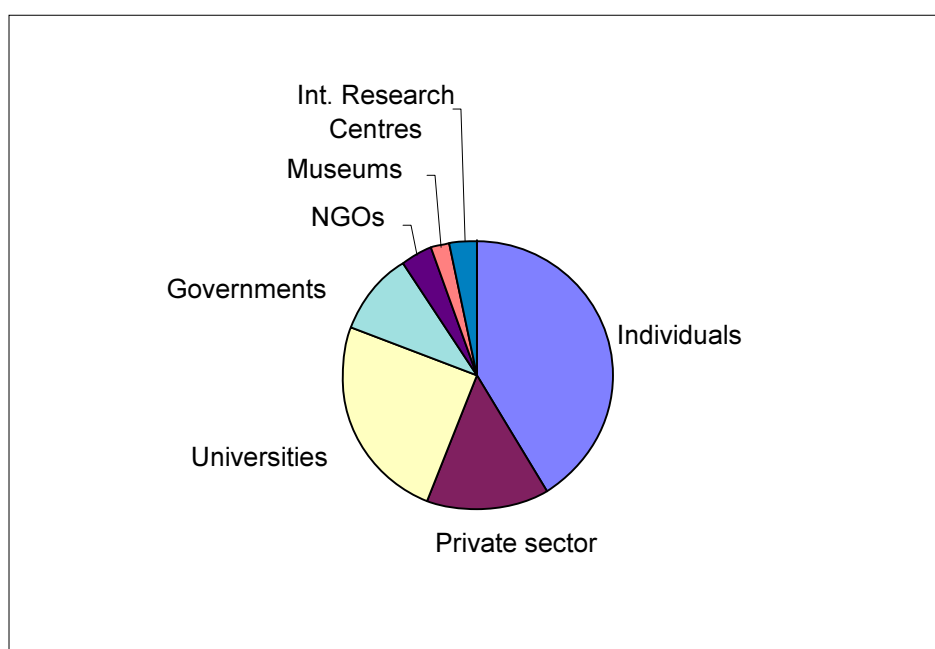

Fig. 2. FishBase users by activity, based on the FishBase guestbook entries in June 2002.

New items in FishBase

In Fig. 5 we compare the percentage of FishBase usage with the percentage of internet usage by country. A great part of the internet and FishBase users live in the USA, and as a result the point lies close to the idealistic line, somewhat to its left. But for FishBase, the interesting points are on the right side of the idealistic line. For these points, the FishBase usage is lower than suggested by general internet usage in these countries. Cases are China, South Korea, Japan, Taiwan, Russia and India. In order to improve the FishBase usage in these countries we have to look for reasons why people in these countries are not using FishBase as expected. A closer look at the countries reveals one thing in common: the scripts they use for their languages are non-Latin scripts. Therefore, FishBase now includes common names of fishes in a variety of non-

Latin scripts. Currently Greek, Chinese, Thai and Arabic are supported and more will follow in the near future.
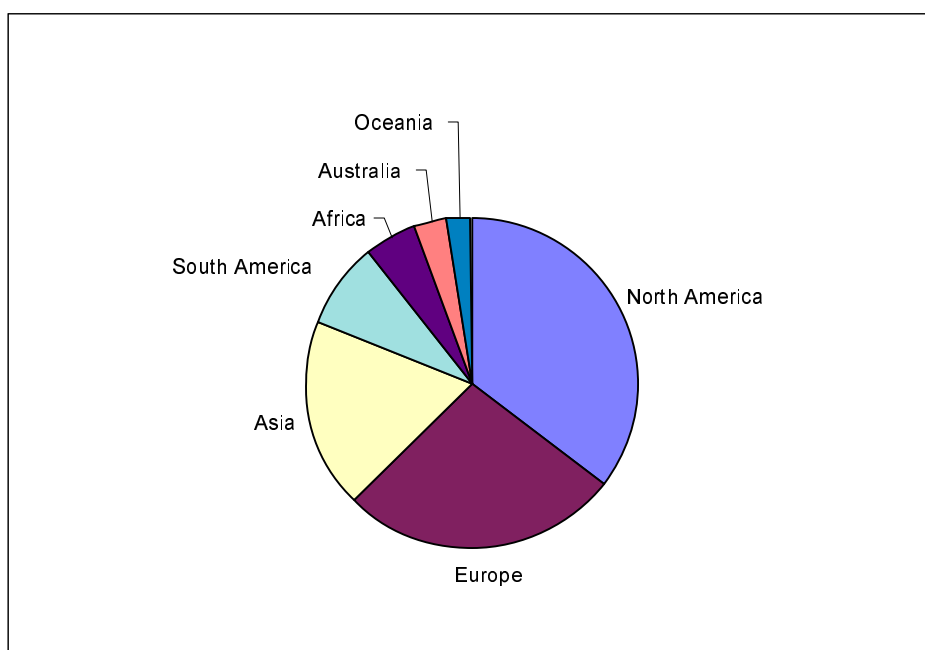

Fig. 3. FishBase users by continent, based on the FishBase guestbook entries in June 2002.

Recently, also other features were added to FishBase. It is now possible to make your own field guide for an area of interest, such as countries, ecosystems, or smaller areas. Technical terms used in FishBase are linked to the respective definitions in the glossary, available in four languages: English, French, Spanish and Portuguese. More pictures are added in FishBase every day and for some species these pictures are divided into different sections: general pictures, pictures uploaded by FishWatchers, stamps, pictures of diseases and pictures of eggs and larvae.

No duplication of effort

The internet is an enormous source and therefore a lot of information on fishes is already available through other databases or pages. Rather than to duplicate it, FishBase makes species-level links. Some of the databases already linked with FishBase are Eschmeyer's Catalog of Fishes, IUCN's Red List data, Museum collection databases, the FAO databases (SIDP, FIGIS, Catch and Aquaculture), ECOTOX and Genbank. For more regional information, FishBase has some links with national databases, *e.g.* the Fish Database of Taiwan and Checklist of Marine Fishes of Turkey. Extra references can be given by some linked bibliographies, like the Zoological Record, Fish and Fisheries and Scirus.
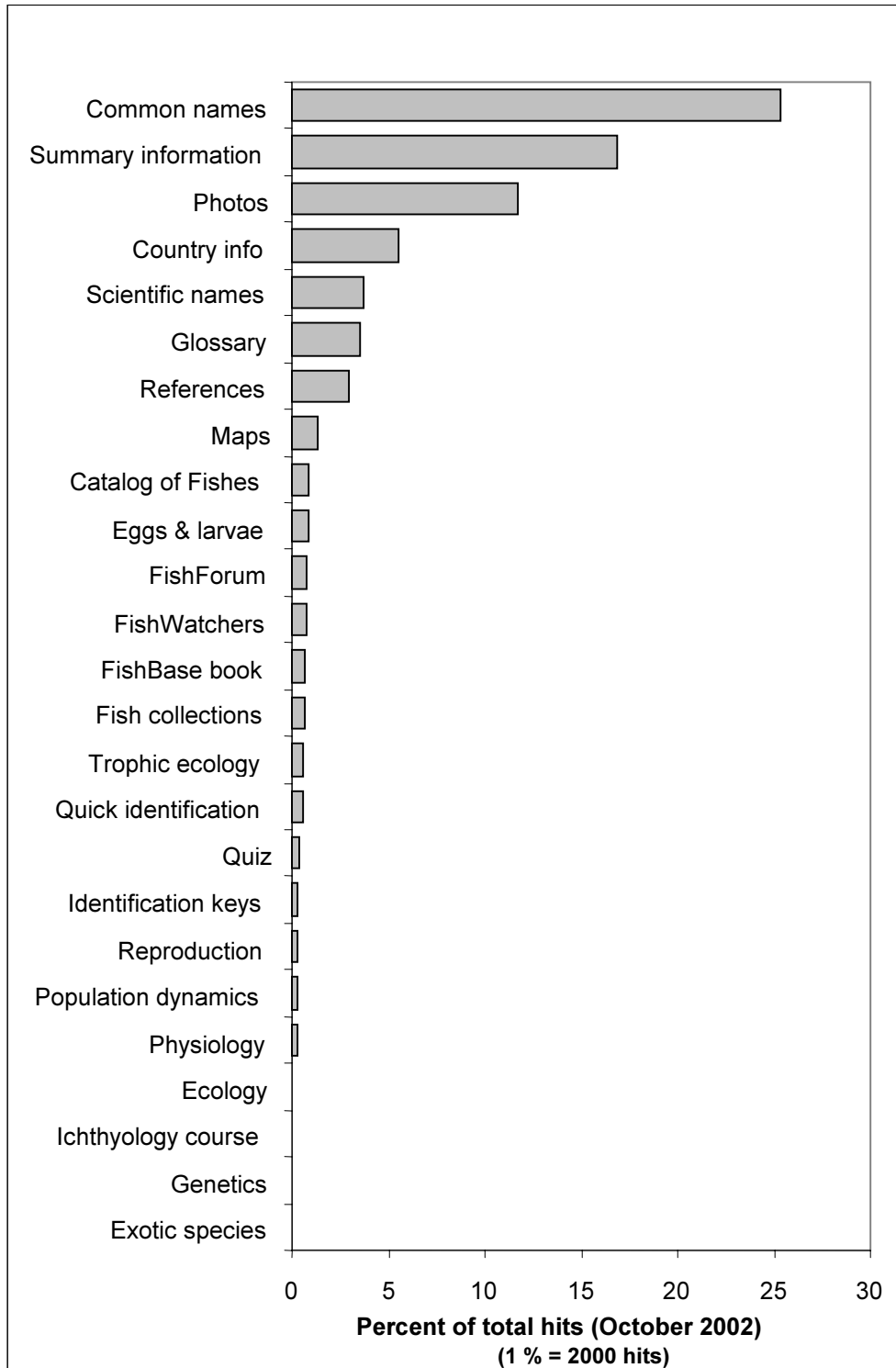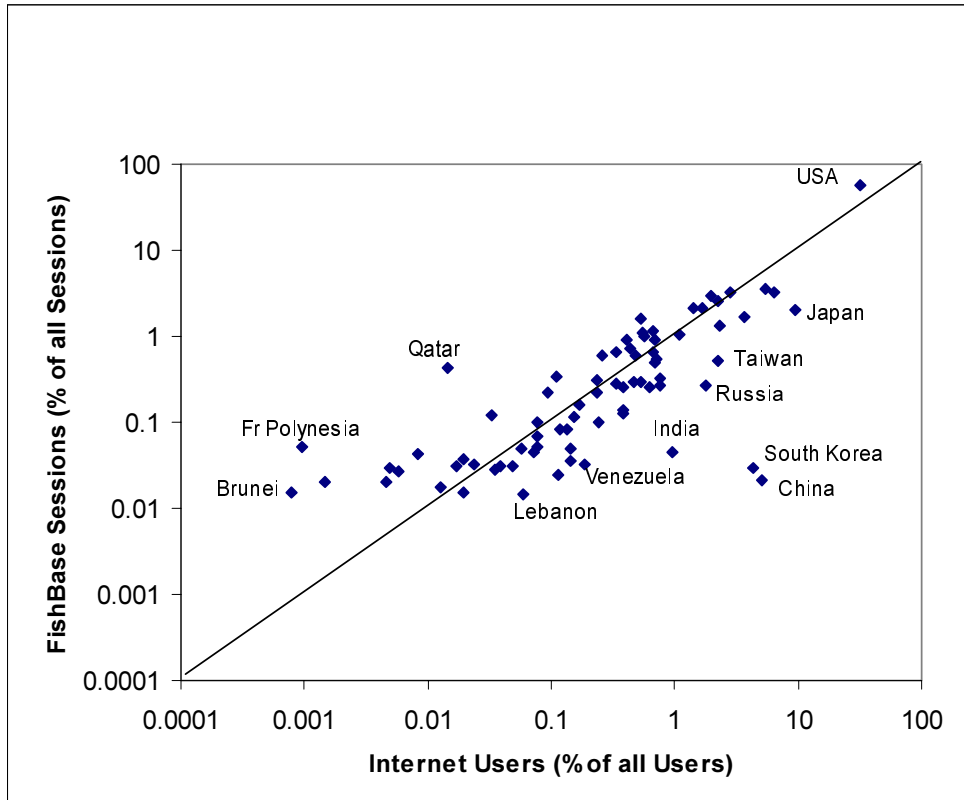
Fig. 4. Frequency of FishBase hits by topic.

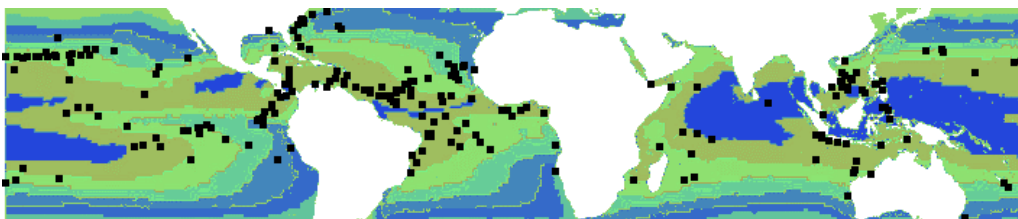*Fig. 5. FishBase usage compared with internet usage by country, in 2001.*

Fig. 6. Example of an 'active' distribution map: the distribution of Exocoetus volitans *Linnaeus, 1758 in relation to the minimum monthly sea surface temperature with the WhyWhere map.*

An important tool for FishBase are 'active' distribution maps for each species, constructed on-demand from occurrence data. Especially for the marine environment one can work with the OBIS map or the WhyWhere map. On these maps it is possible to compare the distribution of a certain species with different marine environmental parameters. For example the distribution of the species *Exocoetus volitans* can be seen in relation to the minimum monthly sea surface temperature (Fig. 6).

Conclusions

The conclusions of Froese (2001) published after ten years of FishBase remain the same today and can be summarized as follows:
- A 'science first' attitude. The information in FishBase is based on scientific publications and can be used for scientific research. Therefore FishBase strictly follows the scientific standards for the presentation of it.
- A 'Yes' attitude towards people. People who approach and want to contribute with FishBase are not neglected.
- Invite, accept and act on criticism. FishBase welcomes criticism as a way to improve its quality. Even if criticism is unjustified, we try to accommodate it and we interact with the user.
- Data quality and quantity first. FishBase is in the first place a database where people, especially researchers, can find information on fishes. Therefore the quality and the quantity of the information have to be good. This is more important than a good-looking website.
- Keep the design of the database simple. Software is always changing and new programmers have to be able to take over.
- Invest in people. A well-trained staff can do more than student assistants who are working for a short period.
- Give more credit than expected to contributors. It is always a pleasure to know that you are appreciated for the work you have done.
- What is not used is useless. The criterion has to be the actual use of information. FishBase gives priority to the well-used and successful topics.

Some additional conclusions can be given now, mainly about the FishBase usage. FishBase is visited by a lot of individuals, mainly people who are interested in general data about fishes. Mostly, the scientific name of the fish is not known by them, and they rather use the common name as a source to find information about it. With the pictures or photos, they are able to recognize the fish. Therefore, the topics used by them are the common names, the general species summary page and pictures. As a result, FishBase will have to focus on these topics and priority will be given to them. For the common names, some new non-Latin scripts are already added to FishBase and more will follow in the future. In this way, people can search for information on fishes using their language and script, which will increase the number of FishBase visitors, especially visitors from the developing countries. FishBase has already species summary pages for 26.945 valid species. It is already a great part of all known valid species, but not complete. Harmonizing with Eschmeyer's Catalog of Fishes will be necessary to include all valid fish species. The most important key information like distribution and diagnosis, as well as pictures and photos, has to be entered for every species in the near future. With this information in FishBase, one should be able to identify or recognize every valid fish species.

Other topics are mainly used by scientists and specialists, a relative low number compared with the number of individuals. But it's still an impressive number as scientists are just a little part of the entire population of internet-users. Proved by the fact that scientific names are well used in FishBase, this little group is intensively using the information in FishBase for their research. Therefore, FishBase cannot overlook this part of the users and also has to enter this information. After all, the publications of scientists are used as the basis for the information available in FishBase.

All these lessons are not neglected and are the basis of the success of FishBase. FishBase has now grown to one of the most reliable databases on the internet. As a matter of fact, it is mentioned in different scientific publications as a tool for research. Recent articles are recommending FishBase as an excellent example of an online database (Knapp *et al.*, 2002).

Acknowledgements

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