ACCESS AND USE OF

BIODIVERSITY RESEARCH INFRASTRUCTURES

IN BELGIUM

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REPORT ON SURVEY TO BELGIAN SCIENTISTS

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This report outlines the results of a survey that was initiated by the Belgian Biodiversity Platform (BBPf) in October 2017. It aimed at a better understanding of how well Biodiversity Research Infrastructures are known and used in Belgium, and whether they are easily accessible. It builds on a similar exercise done in the context of the BiodivERsA Partnership. In order to identify which infrastructures are available for the Belgian research community, we applied the definition of the European Commission for Research Infrastructures (RIs)[1] and the definition of BiodivERsA for Biodiversity Research Infrastructures (BRIs)[2], as well as the selection criteria mentioned therein. This resulted in a first list of 35 BRIs useful for and available to the Belgian scientific community[3].

1 - Research infrastructures (RIs) are facilities, resources and services used by the science community to conduct research and foster innovation. They include: major scientific equipment, resources such as collections, archives or scientific data, e-infrastructures such as data and computing systems, and communication networks. RIs can be single-sited (a single resource at a single location), distributed (a network of distributed resources), or virtual (the service is provided electronically). https://ec.europa.eu/research/infrastructures/index.cfm?pg=about

2 - In principle a BRI must be focused on Biodiversity and Ecosystem Services (at least to a large extent) and meet certain minimum requirements like be devoted to study biodiversity per se or ecosystem functions and services and their dependency to biodiversity. It has also to be useful and easily accessible by researchers from local to national level and from abroad, and/or offer of long series of accessible data. A BRI must refer to a facility, resource or service that allow the development of cutting-edge research in biodiversity and ecosystem services and related fields, but also must be able to transmit, share and preserve knowledge and information obtained, and provide easy access to interested researchers.

3 - This includes Europe-wide or international BRIs that contain data on Belgian biodiversity or provide services that are available to the Belgian scientific community.

The information on the use and accessibility was collected through an online questionnaire, focusing on a shortlist of 12 BRIs selected on the basis of pre-defined criteria. This was intended to give us a first impression about the usefulness and accessibility of Belgian BRIs, and some insights on how to optimise their access and use. We, however, acknowledge that the list may not be a perfect representation of the BRI landscape. We also note that selected BRIs are quite heterogeneous and number of responses to the survey is relatively small. Results should thus be interpreted with caution and not be generalised.

Based on the feedback received, it may be useful to expand and/or update the exercise in the future.

The survey targeted the Belgian researchers' community specialised in fields related to biodiversity. This community was expected to be well represented within the BBPf communications channels (mailing lists, newsletter, website, Twitter, etc.) that were used to spread the survey. The survey consisted of a series of three short questions on a selected list of 12 BRIs (part 1), followed by three generic questions about users' perception of the Belgian BRI landscape at large (part 2). The questions asked to the respondents are in the Annex I.

PART 1: USE AND CHALLENGES REPORTED BY THE USERS FROM QUESTIONS ON SPECIFIC INFRASTRUCTURES

Because the differences in nature and activities of all the identified BRIs and the need to understand the specific challenges related to the different types of BRIs (online databases, research vessel,...) without having to end up with a never-ending list of names, we decided to select only a reasonable number of infrastructures to represent the BRI landscape in Belgium.

The selection of the BRIs was made by considering and putting in balance:

- The **relevance and size** of the infrastructure for biodiversity research.
- The coverage of different kinds of **ecosystems** (Freshwater, Terrestrial, Marine).

- The representation of different **types of services** (access to information/data, access to sampling material/technical facilities, space for networking and exchanges,...).
- **Scale**: to avoid having a long list of subsets of smaller but interconnected infrastructures funded by the same institution or project, we sometimes merged them into larger encompassing infrastructures (e.g. we encompassed all musea under one single BRI).

This resulted in a list of 12 BRIs:

1. **AnaEE** - Infrastructure for Analysis and Experimentation on Ecosystems
2. **biodiversity.aq** - (SCAR) Antarctic Biodiversity Portal
3. **BCCM** - Belgian Co-ordinated Collections of Micro-organisms
4. Belgian LifeWatch infrastructure
5. **EMBRC**[4] - European Marine Biological Resource Centre
6. **FIP** - Freshwater Information Platform
7. **GBIF** - Global Biodiversity Information Facility
8. **LTER** - Belgium - Long-Term Ecosystem Research Network in Belgium
9. **Musea** infrastructures and collections
10. Research vessel **Belgica**
11. Research vessel **Simon Steven**
12. **WoRMS** - World Register of Marine Species

4 - At the time of the survey dissemination, the EMBRC was in the preparatory and organisational phase. The EBMRC services, fully operational since June, were therefore not accessible to the targeted scientific community.

For each BRI, a short description as well as the link to the website were provided to give the respondents access to any relevant information. Respondents were invited to answer a series of questions for each BRI, allowing them to:

- Indicate whether the BRI is relevant for their specific expertise and work (if no, respondents could skip the other questions for this specific BRI and go the next one).
- Identify at which frequency they use it.
- Identify any limitations to access and use (see Annex I).

At the end of the questionnaire, respondents could suggest additional BRIs to be included in future surveys.

PART 2: GENERAL QUESTIONS ABOUT THE BRI LANDSCAPE

We also asked a set of open questions giving respondents the opportunity to express their overall perception of the BRI landscape in Belgium. We asked them if they feel there is a lack of appropriate infrastructures in their field, and to indicate which needs should be covered by existing or future BRIs (based on a pre-defined list of needs).

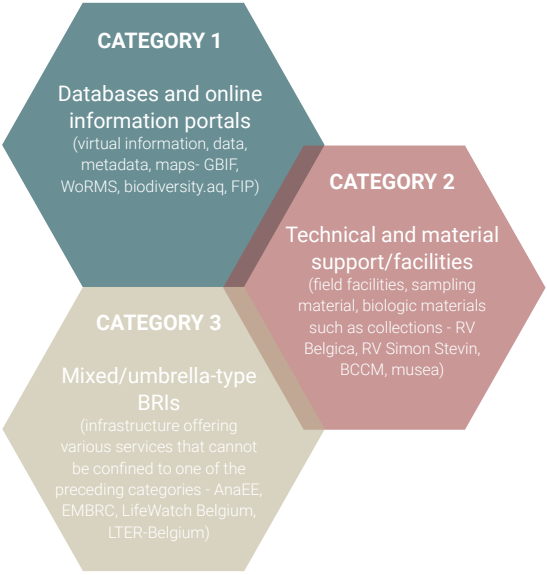
SURVEY OUTREACH

To spread the survey, we used different communication channels in the hands of the BBPf. This includes the BBPf mailing list, the mailing list of our host institutes, the BBPf website, and BBPf Twitter account. We estimate to have reached some 1000 people, of which 84 answered the survey (estimated response rate: 8,4%).

ANALYSES

The infrastructures falling under the BRI definition can still be very different in nature, ranging from online virtual databases to research vessels. Challenges related to these BRIs can be expected to be equally diverse. We therefore clustered the 12 BRIs into three distinct categories according to the type of services they offer, and the analyses were performed accordingly. We noticed that a large number of marine scientists answered the questionnaire whereas very few botanists responded to our questionnaire. This is potentially due to the relatively larger number of marine BRIs included in the survey.

CATEGORIES OF BRIs



I. PROFILE OF THE RESPONDENTS

A total of 159 respondents answered to the survey, of which 84 were taken into account in our analyses. The others were discarded as the researchers did not seem to be living and working in Belgium (hence, they were not considered as "Belgian researchers" strictly speaking).

We requested information on the respondent's profiles and activities through simple, non-mandatory questions. To gather as much information as possible, we allowed them to give multiple answers to the questions (for example, to indicate more than one type of ecosystems of their expertise).

The majority of respondents were from the academic/research world, which is consistent with the target audience of the questionnaire, however a few of them also have some of their activities in other fields (public administrations, science-policy interfacing, NGOs, etc.). (Figure 1)

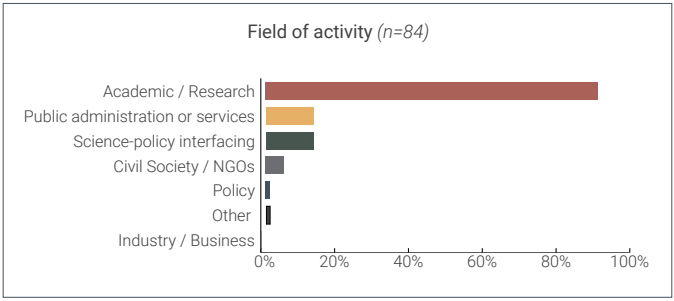


Figure 1 Field of activity of the respondents (multiple answers possible)

More than half of the respondents (52%) indicated to focus their work on more than one single geographical area; some of them reported up to five areas. Europe, the global scale, and Belgium at regional level were the most represented (Figure 2).

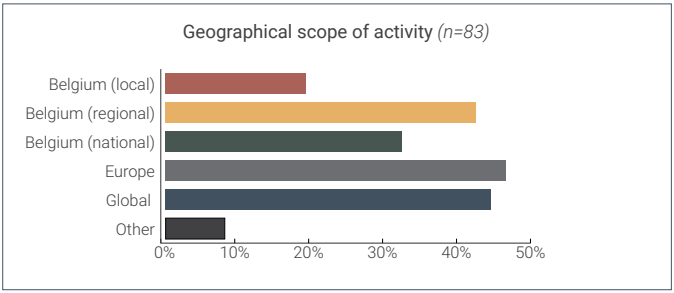


Figure 2 Geographical scope of research activities of the respondents (multiple answers possible)

Most researchers focus on only one type of ecosystem (⅔ of the respondents). Taking into account all the answers provided (unique or multiple), marine ecosystems are the most represented (51%), closely followed by terrestrial ecosystems (50%), but well ahead of freshwater ecosystems (35%) (Figure 3).

With regard to taxonomic group, most respondents said to be working on invertebrates (36%, with terrestrial vs aquatic invertebrates equally represented) or vertebrates (27%). Other groups (bacteria, plants, fungi,..) are less well represented (Figure 4).

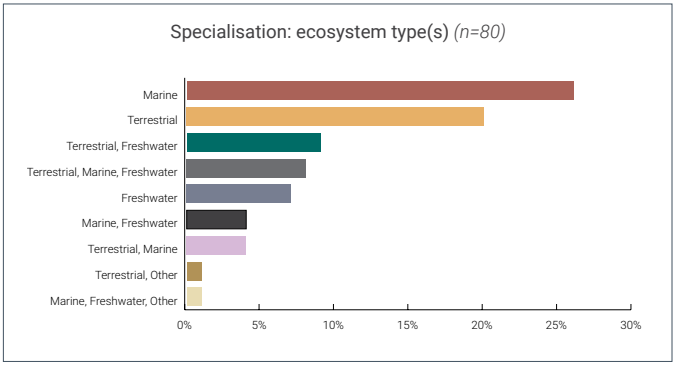


Figure 3 Focus of the research activities of the respondents, per type of ecosystem (multiple answers possible).

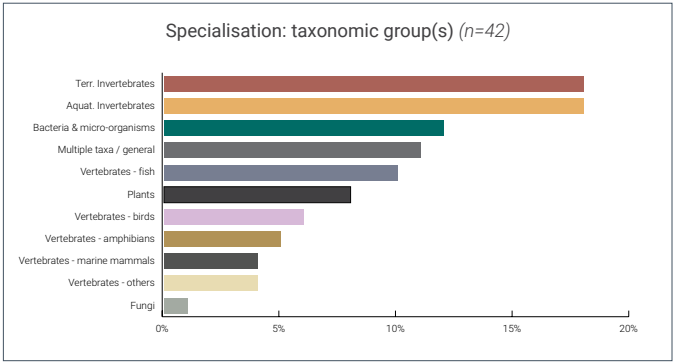


Figure 4 Focus of the research activities of the respondents, per taxonomic group (multiple answers possible).

II. THE BIODIVERSITY RESEARCH INFRASTRUCTURES

The below section summarizes the outcomes of the analysis (84 respondents; 12 BRIs - *see methodology*) and compiles the main suggestions and comments. Among the 12 BRIs, the respondents considered - on average - five of them as potentially relevant to their research.

II.A. RATES OF USE

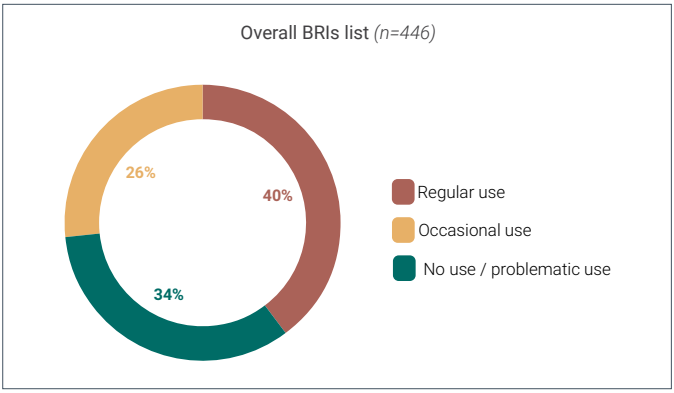


Figure 5 Rate of use described by respondents for all the BRIs.

When considered relevant for them, respondents had to indicate whether they make use of the infrastructure on a regular basis (« *regular use* »), occasionally (« *occasional use* ») or if they don't use it or have problems using it (« *no use / problematic use* »). A total of 446 answers was collected for the BRIs that the respondents considered relevant for them, the others could skip the question (Figure 5).

Considering the average of the rates of use described for the entire BRIs list, about a third of the responses (34%) referred to a non-use / problematic use of the infrastructure. The distinction between regular and occasional users was included in the survey design for informational purposes, scoring respectively 40% and 26%.

Generally speaking, we found that there are more regular users than occasional users. This observation is even more obvious for the BRIs in the category *"Databases and online information portals"*, where there are two times more regular users than occasional users (Figure 6).

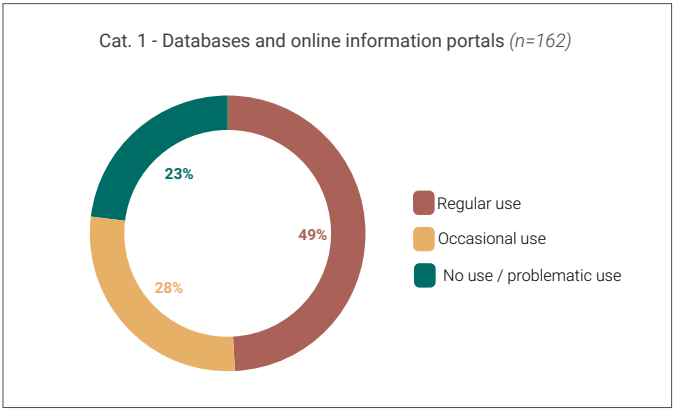


Figure 6 Rate of use described by respondents for the BRIs of category 1 described by respondents for all the BRIs.

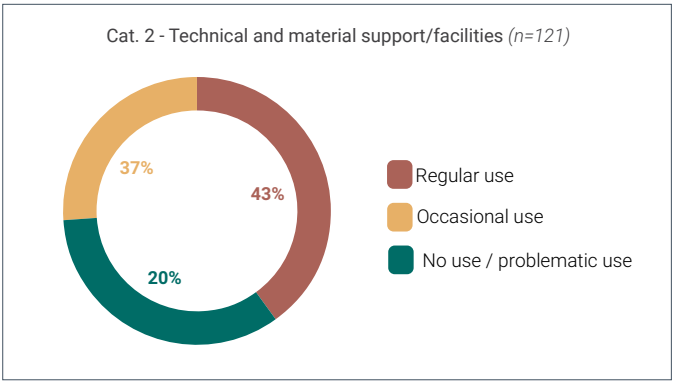


Figure 7 Rate of use described by respondents for the BRIs of category 2.

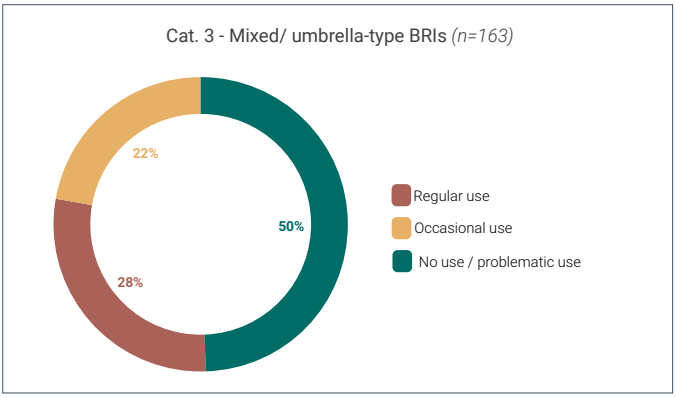


Figure 8 Rate of use described by respondents for the BRIs of category 3.

II.B. REPORTED PROBLEMS AND LIMITATIONS

OVERALL RESULTS

A total of 187 answers was collected by the respondents who declared not using or having problems using the infrastructures.

The most frequently reported limitation by the respondents was that they were not aware of the existence of that infrastructure (on average, 48%). The second major limitation (20%) relates to the interaction with the infrastructure (i.e. the practical issues that seem to limit the access to and use of a BRI by a potential user). The third major limitation is the fact that some people never really felt the need to request the services of the infrastructure, even if they recognize that it may be relevant for their research (17%).

The access to similar infrastructures by another intermediary (6%), the low quality of the resource (2%) and other issues (6%) are the less frequent types of issues mentioned. None of the respondents identified the financial aspect as a limitation (i.e. the costs scientists have to make themselves to use these BRIs), hence it does not appear on the graphs (Figure 9).

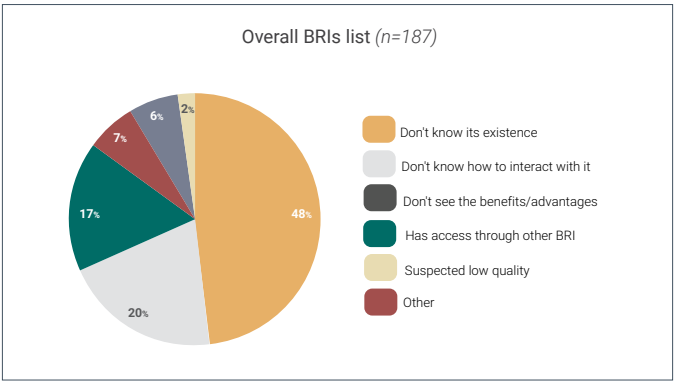


Figure 9 Limitations to the use described by respondents for all the BRIs.

SPECIFIC RESULTS FOR THE THREE CATEGORIES OF BRIs

The first category of BRIs - Databases and online information portals (total of 52 answers) - shows a distribution of limitations that is very similar to the general pattern across all BRIs. Not being aware of the existence of the infrastructure is also the most frequently reported challenge (56%). In this category, reporting of "low quality of the data/resources/services" is the highest (6%), even if it still remains one of the less frequently mentioned (Figure 10).

The second category of BRIs - Technical and material support/ facilities (34 answers) - shows a distribution of limitations that is the most different from the overall trend. Users seem

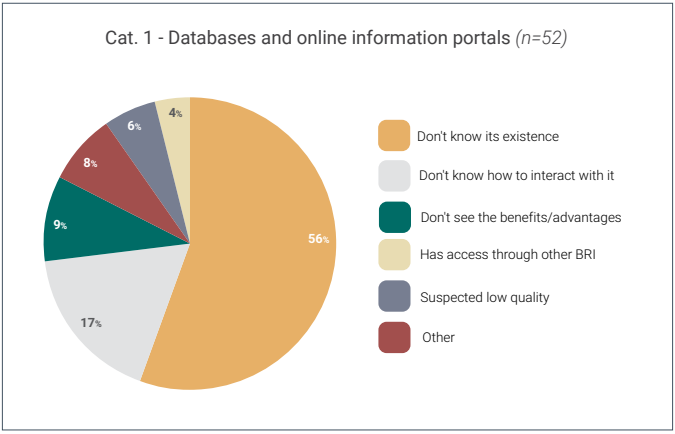


Figure 10 Limitations to the use described by respondents for the BRIs of category 1.

to have a rather good knowledge of the existence of this type of infrastructures. Indeed, less than a quarter (23%) indicates that they are not aware of their existence, which its two times less than what is reported for the other categories. The same observation can be made regarding the interaction issue, which is also much less reported (12%) than for the other categories. Users have, however, more often indicated not having a particular need to use these infrastructures or that they could access similar services or tools through another BRI (41% and 18%, respectively) (Figure 11).

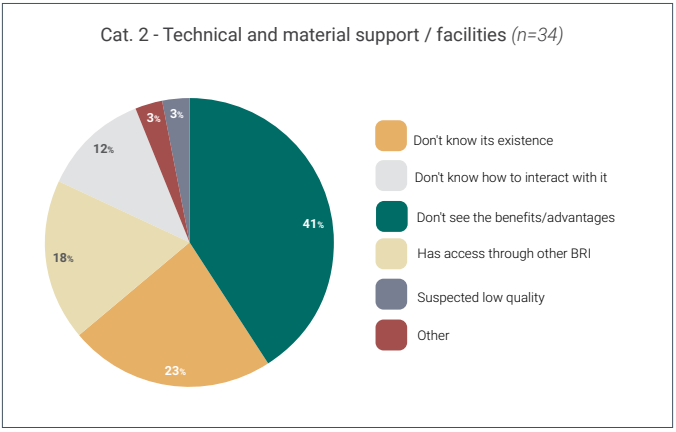


Figure 11 Limitations to the use described by respondents for the BRIs of category 2.

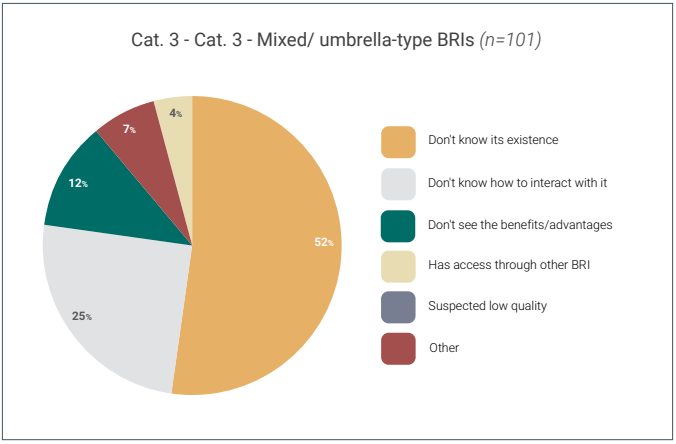


Figure 12 Limitations to the use described by respondents for the BRIs of category 3.

The trends for the third category - Mixed/umbrella-type BRIs (101 answers) - are fairly comparable to the trends of the first category: not being aware of the existence of the infrastructure and having issues in interacting with it are the two most frequently mentioned limitations (respectively 52% and 25%) (Figure 12).

OTHER ISSUES & REMARKS

The following remarks have been shared by the respondents through open answers:

- A few respondents reported having access to similar infrastructures (sometimes even included in our listing, or having a connected content) to access the same information. But the presence of identical information in two different databases may also indicate that there are good connections between the data portals.
- Some researchers indicated that there is a lack of collections and/or data corresponding to the specific biological group or ecosystems they are working on (e.g. Cyanobacteria, peatlands, heathlands).
- Other respondents emphasized that the choice of the infrastructures they use is mainly influenced by their network. Researchers working on similar issues can use different BRIs depending on their affiliation or network.

II.C. THE BRI LANDSCAPE AND NEEDS FLAGGED BY RESPONDENTS

More than half (55%) of the respondents is satisfied with the availability of BRIs for their research, while another third of them (32%) thinks that there is a lack of BRI in their field of expertise (Figure 13).

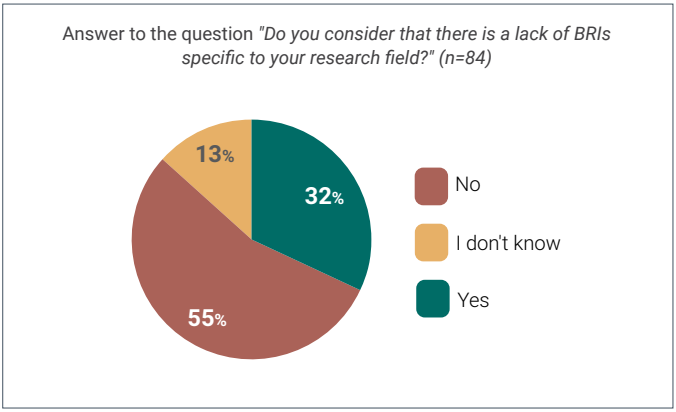


Figure 13 Evaluation of perceived availability of BRIs by the respondents.

When asked to select, from a proposed list, the most important needs that should be covered by BRIs in general, it becomes apparent that six services stand out and have been identified more or less equally frequent (in a range from 10% to 13%), while the three other services seem to be less important for the users (Table 1).

Database of functional traits of organisms	13%
Infrastructure with material for fieldwork, sampling, and campaigns	13%
Database of organisms' distribution	12%
Support for the management of collections and taxonomic information, including harmonisation	11%
Infrastructure for species distribution modelling	11%
Infrastructure with in situ ecosystems experiments facilities	10%
Infrastructure for the management of genetic resources	10%
Infrastructure with ex situ/controlled ecosystems experiments facilities	8%
Infrastructure for experimental analyses and modelling of ecosystems dynamics, and/or their interactions	5%
Infrastructure for in situ research in palaeontology and on past surveys	3%
Other	4%

Table 1 List of services that existing or potential BRIs should to cover, according to the users.

We assume that the proposed list covered well the type of services that BRIs are expected to offer to their users, for only a few other services were mentioned in the "other" section:

- Systems linking different existing databases.
- Observatories for microbial diversity.
- Support in needed revisions, namely cross-revisions of nomenclatures.

- More funding allowing the use of these structures.
- Structures to study the links between culture and nature, the link with health.

Respondents had the opportunity to leave comments and suggestions on the BRIs in their field of expertise through open questions. Some comments were unique, some were shared by 3-4 respondents. We compiled them into main statements and assigned them under our predefined categories of BRIs when relevant.

GENERAL COMMENTS

- Some respondents considered that some BRIs lack funding and are understaffed, although they are essential tools for biodiversity research and its community.
- According to others, more facilities and resources would be needed for inter-regional cooperation in Belgium for ecological research.
- Many felt that information about existing BRIs and on their access is missing and that it would be useful to have one reference point (website,..) to list them all.

COMMENTS RELATED TO DATABASES AND ONLINE INFORMATION PORTALS

- Confidence issue regarding the quality of the data: some respondents are wary that online information may not always be sufficiently checked or verified.

- Some reported that, although an important number of online data portals or databases do exist, it seems that there is no real coordination between them.
- Other respondents had the feeling that some ecosystems were overrepresented, like marine ecosystems and aquatic biota. Experts working on more specific topics (e.g. biodiversity for a particular region; taxa such as molluscs; historical or revision work,...) said they do not find appropriate BRIs related to their research.
- Finally, a few users indicated that BRIs should find a way to have their databases interconnected/linked to each other, not only inside the field of biodiversity but, in a holistic approach, to other databases like, for examples, containing data on abiotic components (temperature, etc.).

COMMENTS RELATED TO TECHNICAL AND MATERIAL SUPPORT/FACILITIES

For this category, the only comment was regarding deposits of biological material in culture collections and public repositories, saying that it should be encouraged and part of the strategy of Belgian BRIs to ensure that valuable material is kept for future research.

The survey showed that many BRIs under study are relevant for the researchers. Also, more than half of the respondents feel that there are enough BRIs available for their research. The proportion of regular users, occasional users, and limited users/non-users varies a lot depending on the BRI itself, and on the nature of the infrastructure (online data portals, physical collections and material for sampling, etc.).

The most frequently reported challenge is that researchers do not know which BRIs are existing and available to them (on average 48%, across all categories). This might reflect a need for better communication, both at the level of the 'senders' (BRI managers) and the 'receivers' (BRI users). Overall, there were only a few problems reported linked to the quality of the data (which means there is some good confidence in the BRIs), and none of the respondents mentioned the financial aspect as a barrier.

For the **databases and online information portals**, the main reason stated by researchers for not using them is that they do not know them (56%). Issues in user-infrastructure interactions are also an important limitation to their use. A reason might be that this category of BRIs requires quite specific informatics skills, especially some knowledge on biodiversity-related standards, as well as a relative ease in using informatics formats and tools.

For the BRIs providing **technical and material support/facilities**, the main reason for not using them is because researchers do not feel they need their services (41%). This category has also the lowest rate of issues related to access and interaction. This observation might be explained by a lower need to access material facilities among the different research units in Belgium because researchers already have their own equipment, adapted to their specific needs in their field of expertise. A better awareness of the existence of these infrastructures and of the way of interacting with them can be explained by the fact that their services are very practical, and because of their well-known, 'historical' presence in the field of biodiversity research.

The **mixed/umbrella-type BRIs** seem to have the most issues in terms of awareness and accessibility, the problem being that they are not well known by the community (52%) and that researchers don't know the way to access them (25%). One explanation could be the fact that these infrastructures are often complex and include multiple services which require more acquaintance in order to make use of them. This could be a barrier to some researchers in understanding how these BRIs could be useful to them.

The match between the respondents to the survey and the potential users of the BRIs is not perfect: not all Belgian

researchers are concerned with all the BRIs, and each BRI does not have all its users among the Belgian community. Despite this, and earlier indicated limitations (see *Methodology*), the comparison of the general trends provides interesting information on the focus that should be given in order to optimise the use of the BRIs by the biodiversity research community. The survey reveals a list of needs and gaps identified by the users that proved to be very helpful in this context. By using the results of the analyses, the answers given in the open questions, and the answers on the perception of the BRI landscape, we established a list of recommendations:

RECOMMENDATIONS

- The biodiversity research community in Belgium could be better informed on the existing Biodiversity Research Infrastructures. Efforts to address this should be the responsibility of potential users and providers of BRIs, and Platforms like the BBPf. As regards the latter, the website biodiversity.be could host a webpage listing all the existing BRIs and ensure the listing is regularly updated with new information. This would serve as a support for potential users to find a point of contact for the BRIs that are of interest to them, and be a first step to overcome networking limitations.

- The interactions issues can take different forms, and it would be worth to investigate them further in order to have a better understanding of how and why this problem arises. This issue was particularly apparent for BRIs that hold informatics data or provide informatics services/components. A pro-active approach by the BRIs themselves to solicit enquiries and suggestions from potential users could help to address this. At the level of the BBPf, the open data team could also play a role, by maintaining its efforts in helping the scientists to develop their informatics skills and by being a reference point to answer their specific problems or requests related to biodiversity informatics.

- The three categories of BRIs in this survey do not seem to offer equal research infrastructure services for all biological groups, ecosystems, or geographical areas. It would be interesting for the BBPf to further investigate the perceived gaps, especially in the context of open data mobilisation prioritisation. More direct interaction with groups of biodiversity researchers claiming particular unaddressed needs should also help speed up discussion of how these needs can best be addressed.

ANNEX I: STRUCTURE OF THE QUESTIONS AS PRESENTED IN THE SURVEY.

SPECIFIC QUESTIONS (REPEATED FOR EACH BRI)

Q1. Is this BRI relevant to your research field?
- Yes
- No (you can skip the questions below and go to the next page)

Q2. If yes, indicate your use.
- I use it regularly (once a year or more)
- I use it occasionally (less than once a year)
- I don't use it or I have problems using it (please go to the next question)

Q3. If you don't use it or have problems using it, please indicate why.
- Because I do not know it.
- Because I do not know how to interact with the tool or its deliverables.
- Because I do not see the benefits/advantages of using it.
- Because I can access the same kind of data/resources/services through another infrastructure.
- Because of the low quality of the data/resources/services.
- Because it is too expensive.
- Other (please specify): …

GENERIC QUESTIONS

Q1. Generally speaking, do you consider that there is a lack of BRIs specific to your research field?
Q2. Please indicate what needs should then be covered?
Q3. Do you have any other comments about BRIs in your field of expertise?

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