Гербарийді цифрлау және GBIF IPT арқылы деректерді жариялау
Оцифровка гербария и публикация данных через GBIF IPT
Herbarium data digitization and publishing through GBIF IPT

Полевая биология в цифровом мире

Карагандинский университет имени академика Е.А. Букетова, 15-17 марта 2023 г.

План лекции

Открытая наука и FAIR-принципы для данных о биоразнообразии

Глобальные порталы и инициативы по оцифровке данных о биоразнообразии

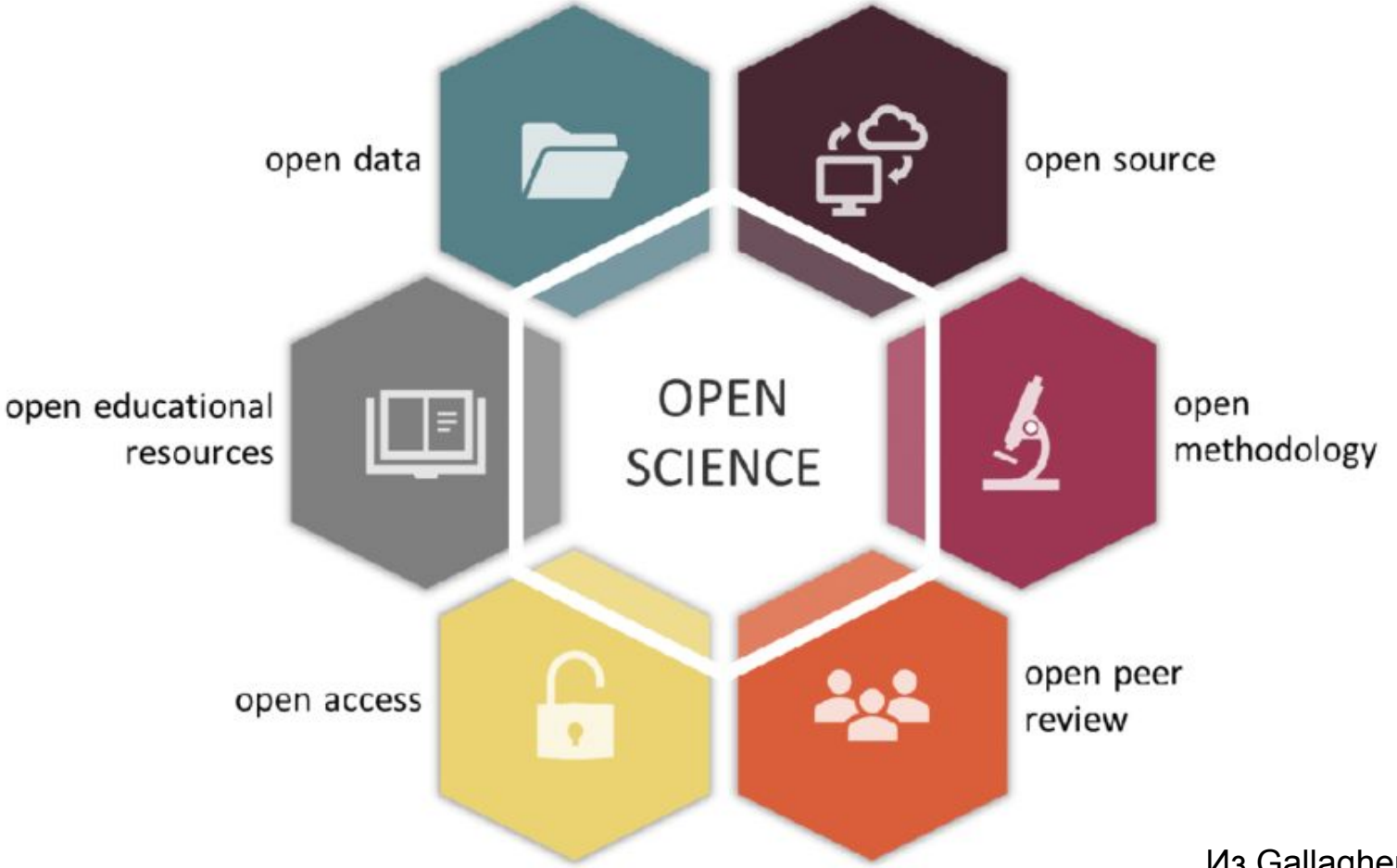
Статьи о данных

Собирать полевые данные сложно

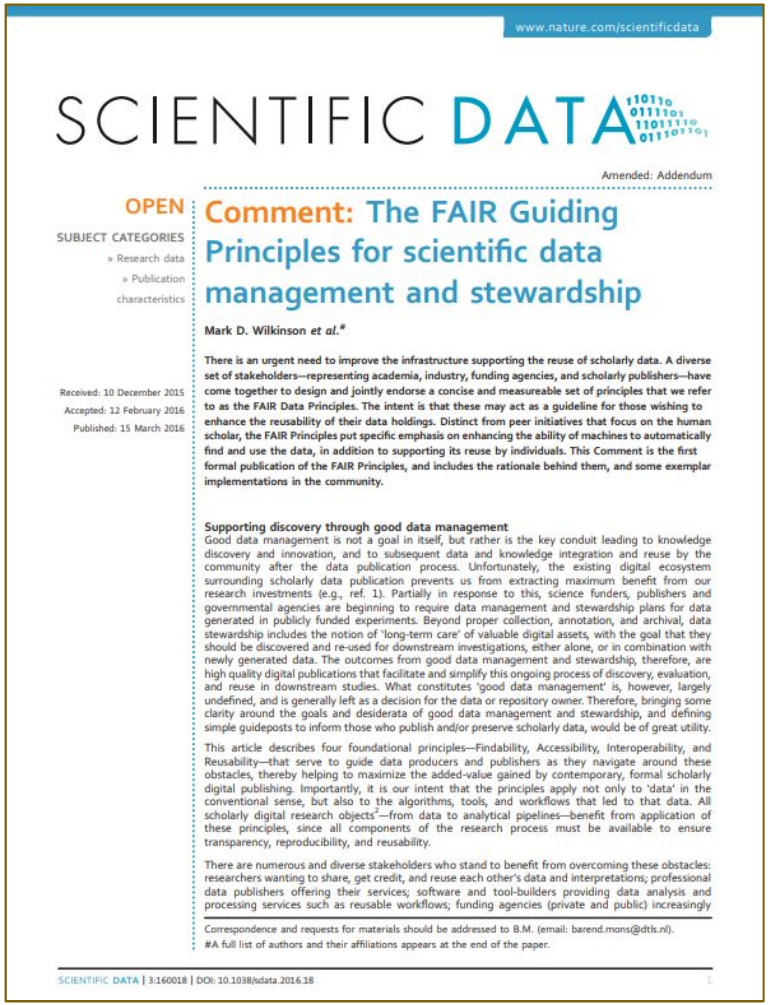
Расширение доступа к научным процессам и результатам может повысить эффективность и продуктивность научных систем за счет сокращения расходов, связанных с дублированием усилий при сборе, создании, передаче и повторном использовании данных и научных материалов, что позволит проводить больше исследований на основе одних и тех же данных.

https://www.unesco.org/en/natural-sciences/open-science

UNESCO, Проект рекомендации по открытой науке, Париж 2021



Из Gallagher et al., 2019



www.nature.com/scientificdata

SCIENTIFIC DATA

Amended: Addendum

OPEN

SUBJECT CATEGORIES
» Research data
» Publication characteristics

Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson *et al.*#

Received: 10 December 2015
Accepted: 12 February 2016
Published: 15 March 2016

There is an urgent need to improve the infrastructure supporting the reuse of scholarly data. A diverse set of stakeholders—representing academia, industry, funding agencies, and scholarly publishers—have come together to design and jointly endorse a concise and measureable set of principles that we refer to as the FAIR Data Principles. The intent is that these may act as a guideline for those wishing to enhance the reusability of their data holdings. Distinct from peer initiatives that focus on the human scholar, the FAIR Principles put specific emphasis on enhancing the ability of machines to automatically find and use the data, in addition to supporting its reuse by individuals. This Comment is the first formal publication of the FAIR Principles, and includes the rationale behind them, and some exemplar implementations in the community.

Supporting discovery through good data management

Good data management is not a goal in itself, but rather is the key conduit leading to knowledge discovery and innovation, and to subsequent data and knowledge integration and reuse by the community after the data publication process. Unfortunately, the existing digital ecosystem surrounding scholarly data publication prevents us from extracting maximum benefit from our research investments (e.g., ref. 1). Partially in response to this, science funders, publishers and governmental agencies are beginning to require data management and stewardship plans for data generated in publicly funded experiments. Beyond proper collection, annotation, and archival, data stewardship includes the notion of 'long-term care' of valuable digital assets, with the goal that they should be discovered and re-used for downstream investigations, either alone, or in combination with newly generated data. The outcomes from good data management and stewardship, therefore, are high quality digital publications that facilitate and simplify this ongoing process of discovery, evaluation, and reuse in downstream studies. What constitutes 'good data management' is, however, largely undefined, and is generally left as a decision for the data or repository owner. Therefore, bringing some clarity around the goals and desiderata of good data management and stewardship, and defining simple guideposts to inform those who publish and/or preserve scholarly data, would be of great utility.

This article describes four foundational principles—Findability, Accessibility, Interoperability, and Reusability—that serve to guide data producers and publishers as they navigate around these obstacles, thereby helping to maximize the added-value gained by contemporary, formal scholarly digital publishing. Importantly, it is our intent that the principles apply not only to 'data' in the conventional sense, but also to the algorithms, tools, and workflows that led to that data. All scholarly digital research objects[2]—from data to analytical pipelines—benefit from application of these principles, since all components of the research process must be available to ensure transparency, reproducibility, and reusability.

There are numerous and diverse stakeholders who stand to benefit from overcoming these obstacles: researchers wanting to share, get credit, and reuse each other's data and interpretations; professional data publishers offering their services; software and tool-builders providing data analysis and processing services such as reusable workflows; funding agencies (private and public) increasingly

Correspondence and requests for materials should be addressed to B.M. (email: barend.mons@dtls.nl).
#A full list of authors and their affiliations appears at the end of the paper.

Универсальная концепция, которая применяется в разных областях науки

Применение FAIR-концепции в исследованиях одобрено на саммите G20 в Ханчжоу в 2016 году

GO FAIR International Support and Coordination Office (GFISCO) - международный офис поддержки этой инициативы

https://www.nature.com/articles/sdata201618

FAIR принципы данных

Данные можно найти в сети Интернет
! идентификаторы !
! метаданные !

Данные должны быть доступны
! бесплатно и в открытом доступе !

Данные должны быть совместимыми с другими подобными массивами данных
! стандарты !

Данные могут быть многократно использованы для решения разных научных и практических задач
! лицензии (правила использования) !

Wilkinson *et al*. 2016 doi:10.1038/sdata.2016.18

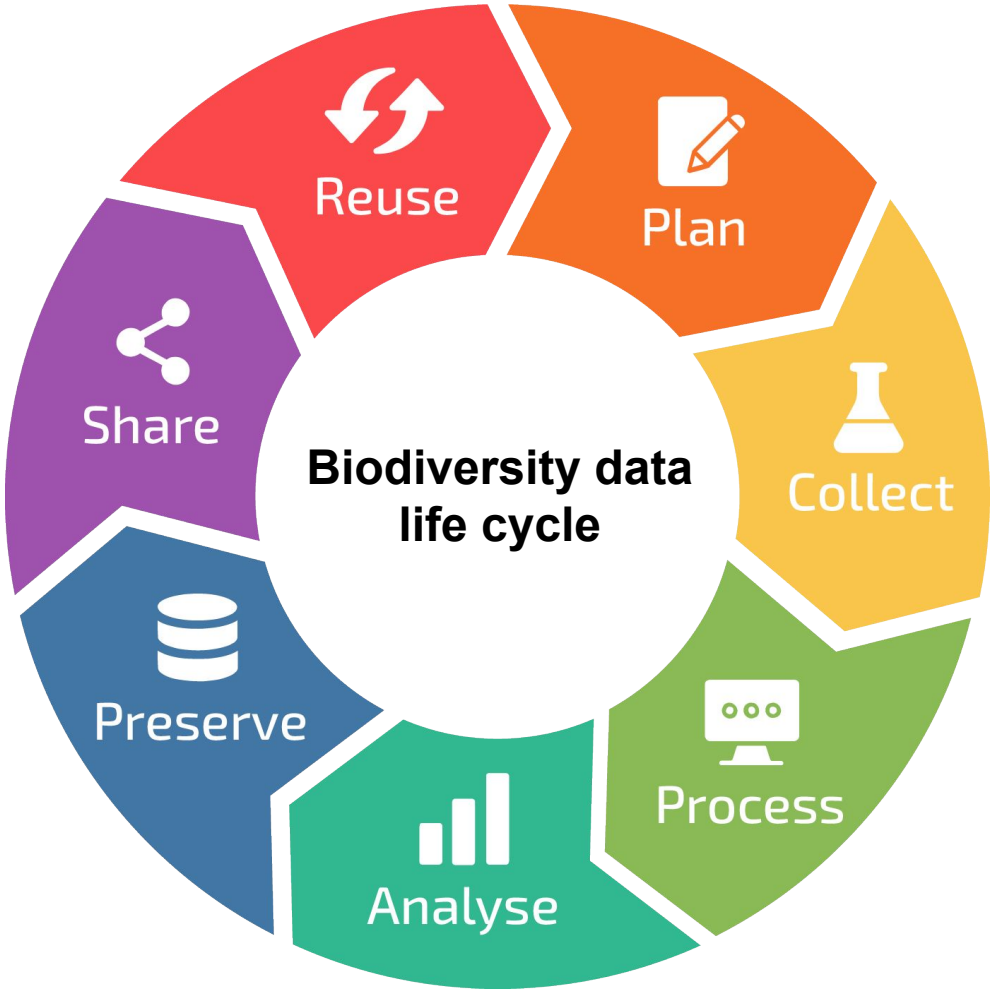
Лицензии Creative Commons

Лицензия CC-0 позволяет другим распространять, редактировать, поправлять и брать за основу ваше произведение, даже коммерчески.

Лицензия **CC-BY** позволяет другим распространять, редактировать, поправлять и брать за основу ваше произведение, даже коммерчески, с обязательным указанием авторства.

Лицензия **CC-BY-NC** позволяет другим изменять, поправлять и брать за основу ваше произведение некоммерческим образом. Обязательно указывать авторство.

https://creativecommons.org/


Biodiversity data life cycle
Plan
Collect
Process
Analyse
Preserve
Share
Reuse

International Biodiversity Informatics Landscape
Информатика биоразнообразия в мире

Vocabularies & Standards

Biodiversity Information Standards
TDWG

CETAF
CONSORTIUM OF EUROPEAN TAXONOMIC FACILITIES

Catalogue of Life

International Portals

GBIF
Global Biodiversity Information Facility

LifeWatch ERIC

BOLD SYSTEMS

OBIS
OCEAN BIOGEOGRAPHIC INFORMATION SYSTEM

Digitization

BHL

iDigBio
Integrated Digitized Biocollections

DiSSCo
Distributed System of Scientific Collections

Soft & Data analysis

R
QGIS

ATLAS OF LIVING AUSTRALIA
sharing biodiversity knowledge

Citizen science

eBird

iNaturalist

Share

PENSOFT®

arpha
Journal Publishing Platform

https://www.idigbio.org/

Оцифровка научных биологических коллекций

Making data and images of millions of biological specimens available on the web

iDigBio
Integrated Digitized Biocollections

Digitization
Learn, share and develop best practices

Sharing Collections
Documentation on data ingestion

Working Groups
Join in, contribute, be part of the community

Proposals
New tool and workshop ideas

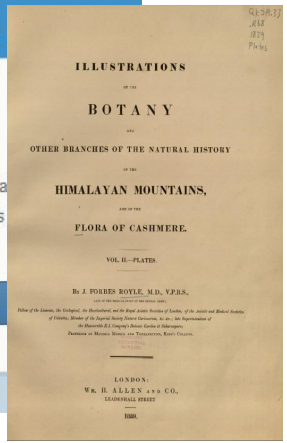
Citizen Scientists
How can you help biological collections?

https://www.idigbio.org/

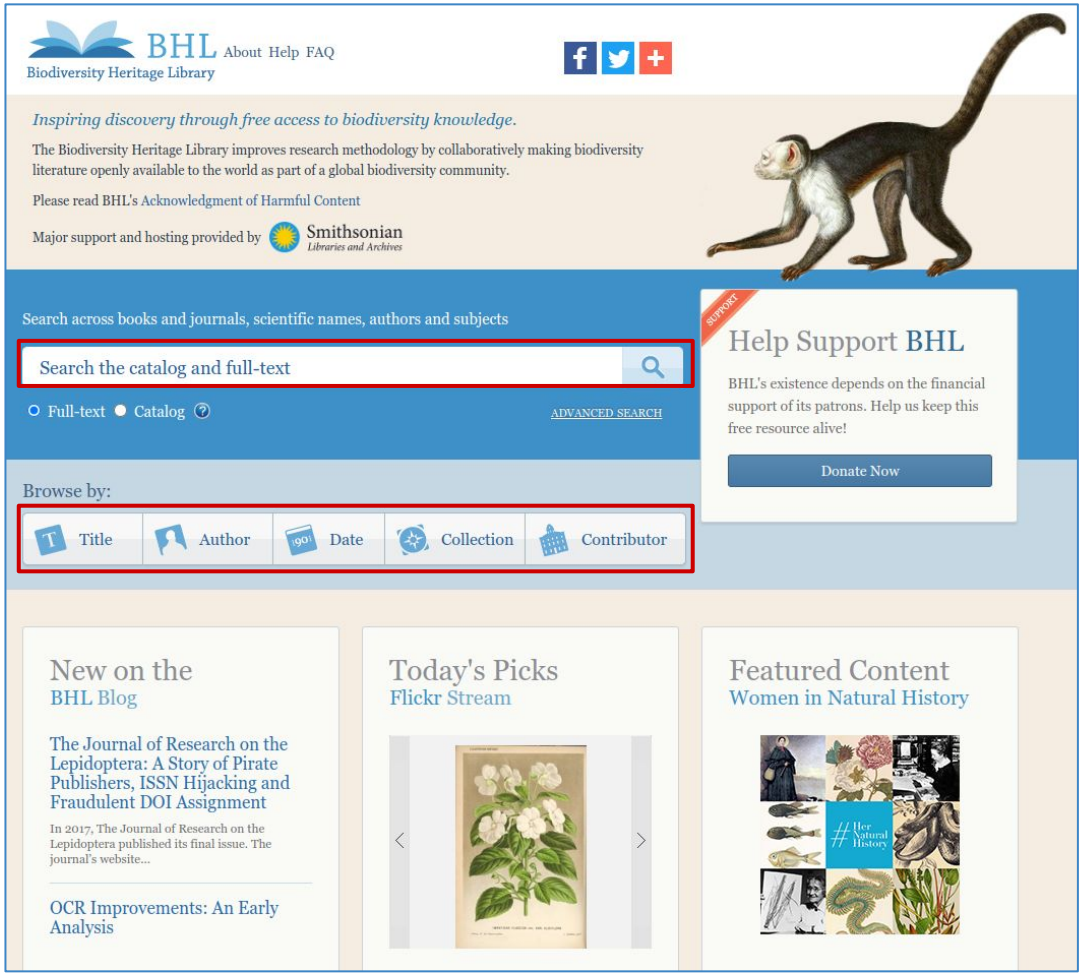
Biodiversity Heritage Library

https://www.biodiversitylibrary.org/

- Открытый доступ к литературе о биоразнообразии
- >147000 источников, опубликованных с 1450 по 2022 гг.



https://www.biodiversitylibrary.org/page/2913426#page/35/mode/1up

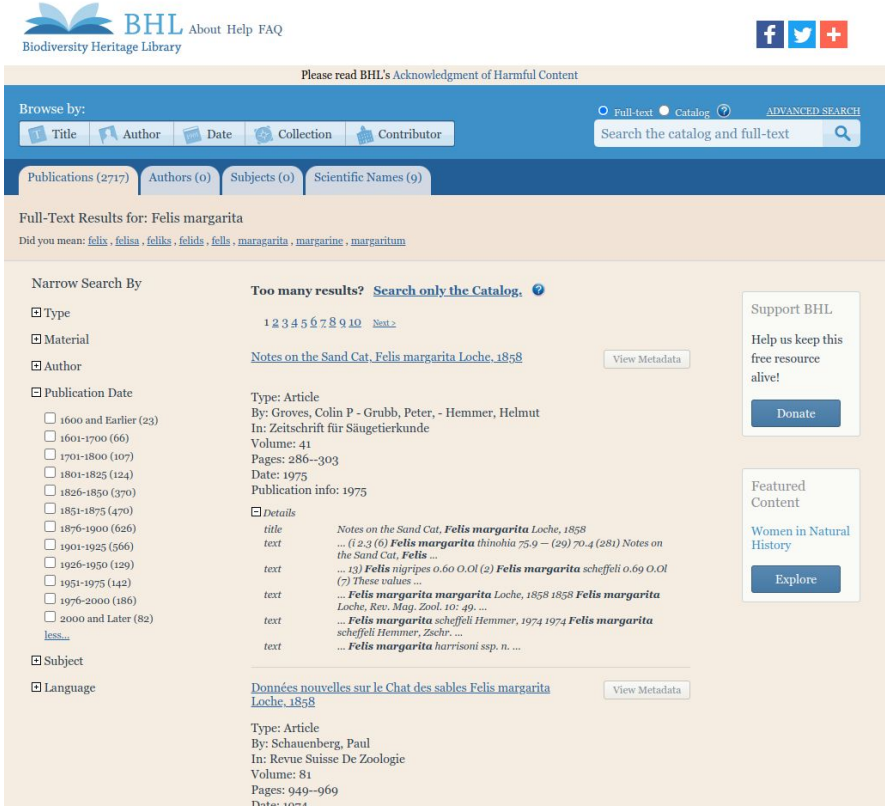


Поиск по

- Латинскому названию вида
- По названию книги (журнала)
- По дате публикации
- По тематическим коллекциям
- По организациям-участникам

https://www.biodiversitylibrary.org/

Шағыл мысығы | Барханный кот | *Felis margarita*

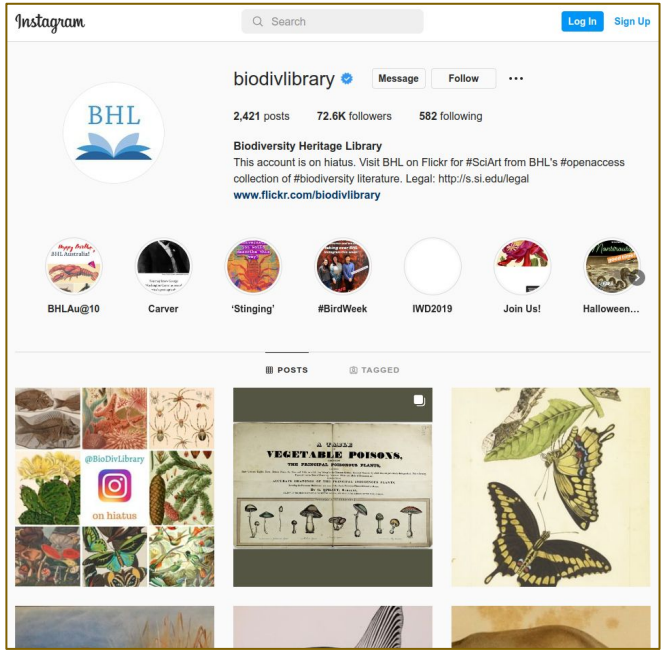


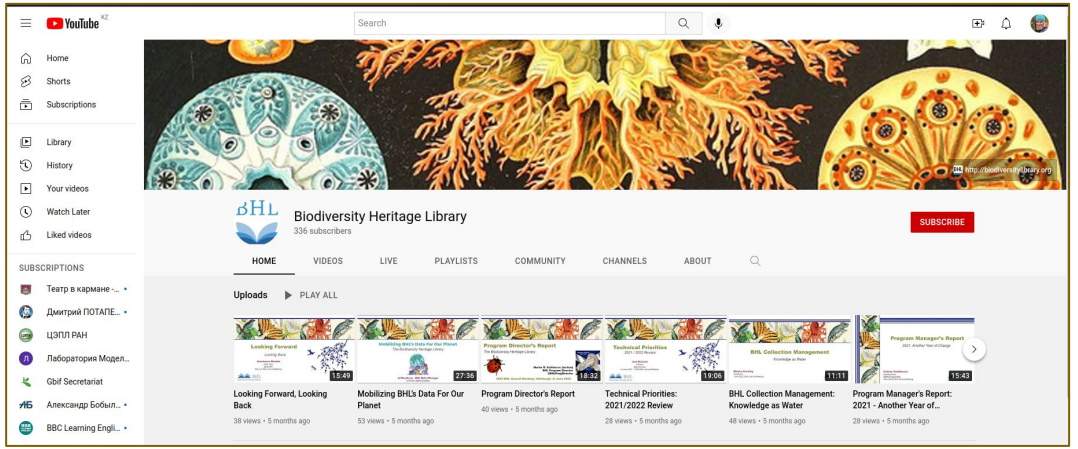
2717 источников,
опубликованных с XVII в. по настоящее время

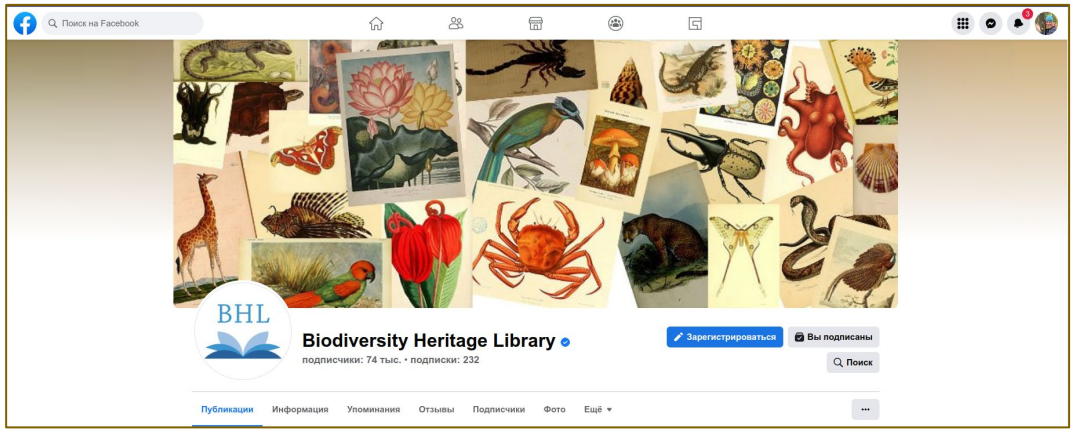
BHL

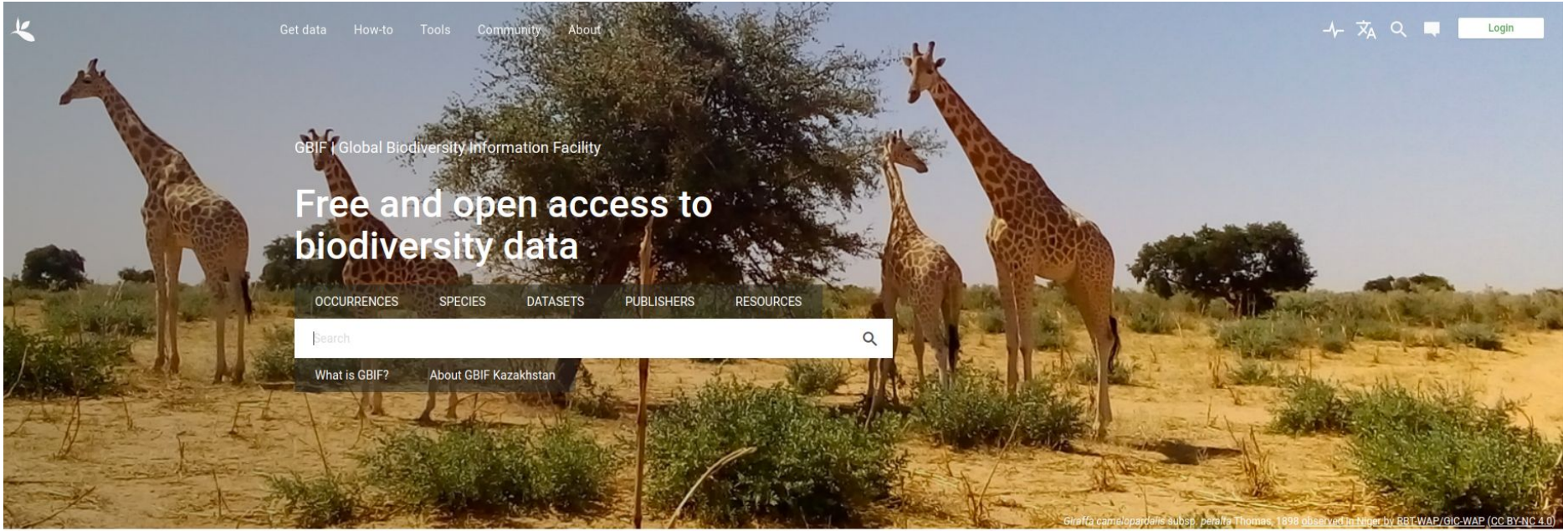
Biodiversity Heritage Library

в социальных сетях









2,285,946,277
Occurrence records

83,105
Datasets

1,969
Publishing institutions

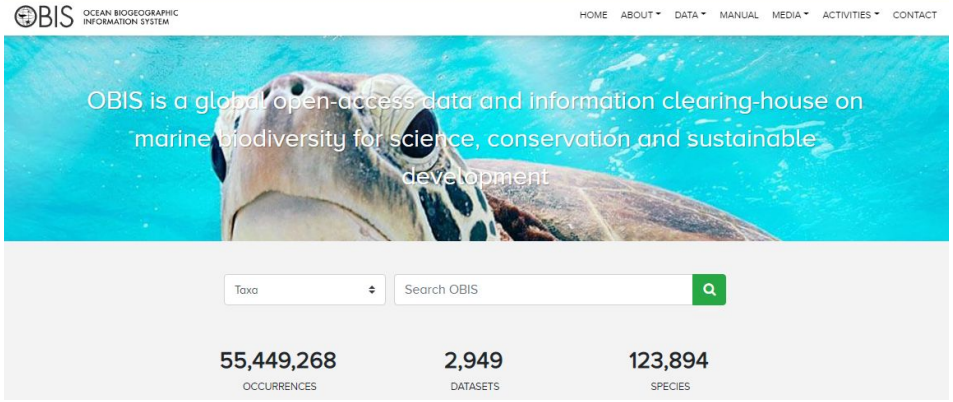
8,420
Peer-reviewed papers using data

https://www.gbif.org/

https://obis.org/

OBIS

OCEAN BIOGEOGRAPHIC INFORMATION SYSTEM

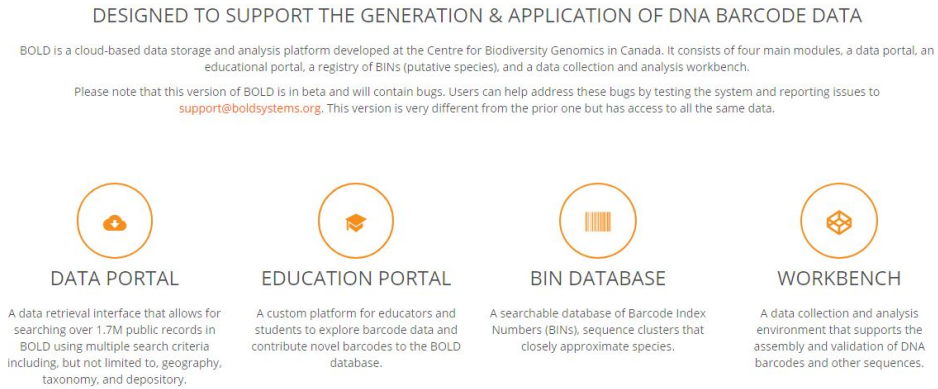


Находки синего кита из OBIS (17280 записей)

http://www.boldsystems.org/index.php

BOLD SYSTEMS

BOLD - это облачная платформа для хранения и анализа данных, разработанная в Центре геномики биоразнообразия в Канаде. Он состоит из четырех основных модулей, портала данных, образовательного портала, реестра BIN (предполагаемых видов) и инструмента сбора и анализа данных.



Citizen science

Привлечение волонтеров к сбору научных данных под руководством профессиональных исследователей

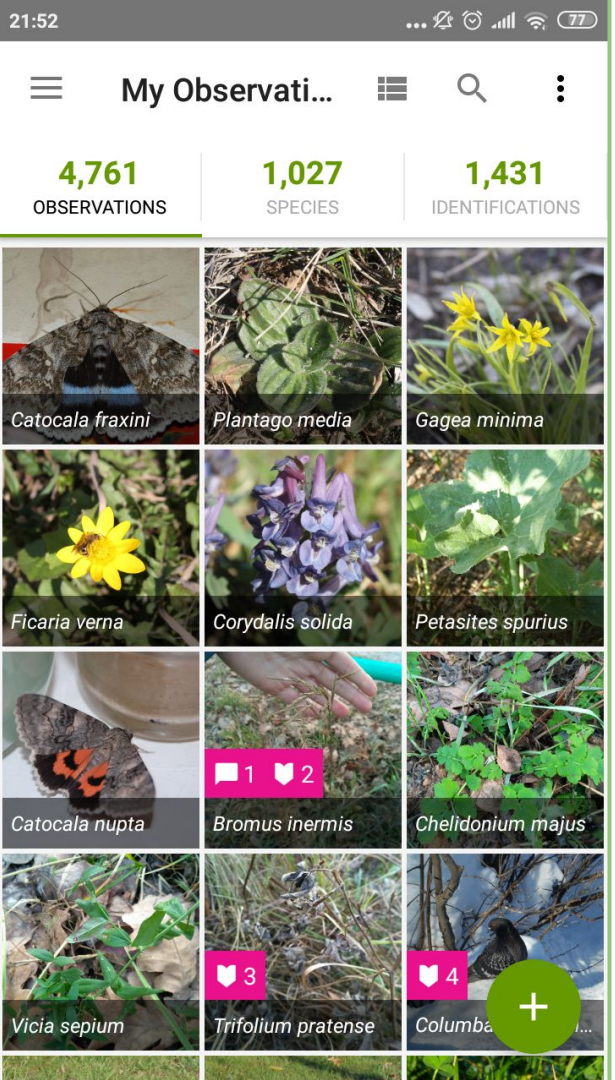
Подробнее: https://en.wikipedia.org/wiki/Citizen_science

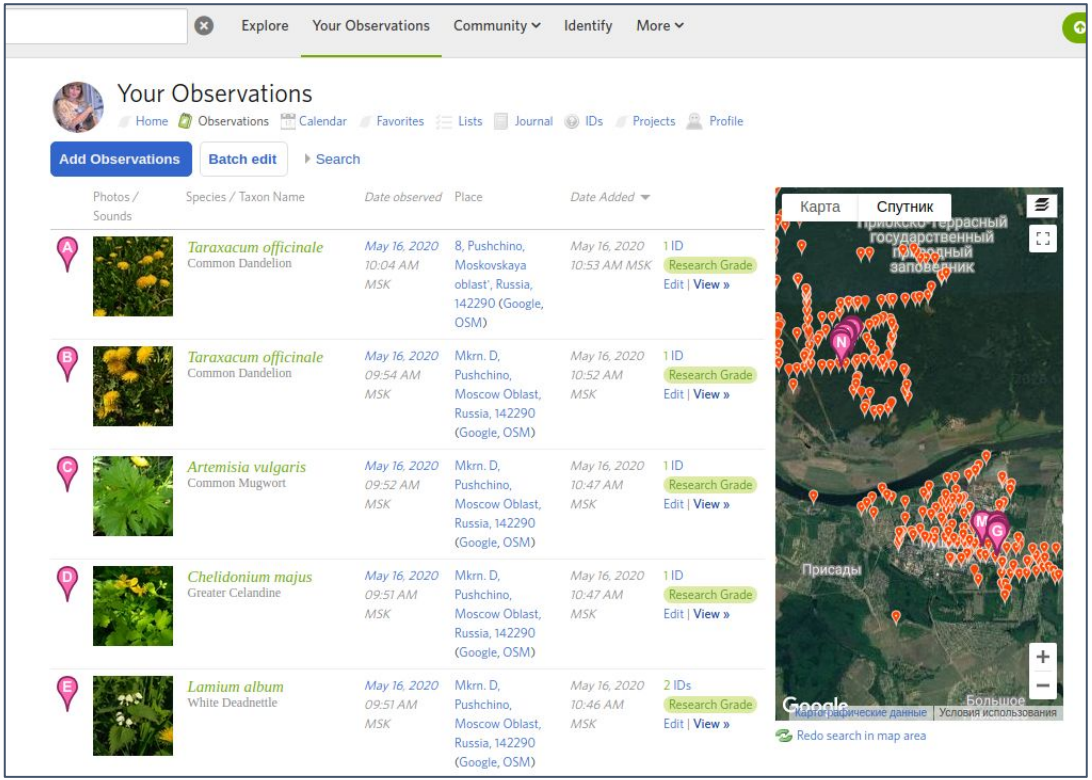
Объем данных, собираемых через системы любительских наблюдений,
в мире возрастает существенно быстрее по сравнению с «научными» источниками

Для данных, доступных через GBIF

- EOD – eBird Observation Dataset
  > 1 млрд наблюдений
- Observation.org > 58 млн наблюдений
- iNaturalist Research-grade Observations
  > 52 наблюдений

Мобильное приложение iNaturalist





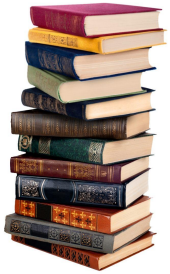
Версия, доступная через браузер

www.inaturalist.org/home

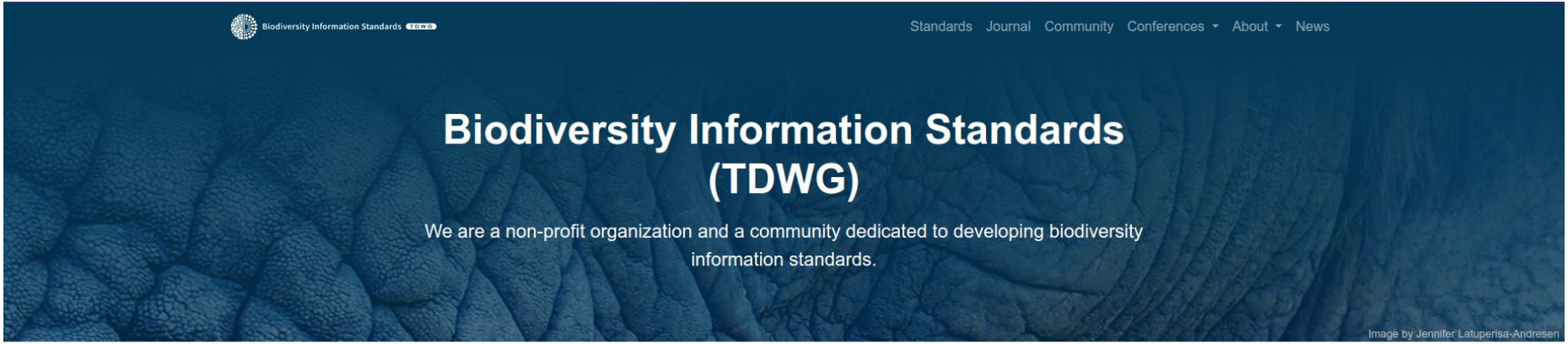
Как объединить разные данные?

OBIS
OCEAN BIOGEOGRAPHIC INFORMATION SYSTEM

Правила (стандарты)



iNaturalist



Historically known as the Taxonomic Databases Working Group, today's Biodiversity Information Standards (TDWG) is a not-for-profit, scientific and educational association formed to establish international collaboration among the creators, managers and users of biodiversity information and to promote the wider and more effective dissemination and sharing of knowledge about the world's heritage of biological organisms.

To achieve its goals, TDWG:

- Develops, ratifies and promotes standards and guidelines for the recording and exchange of data about organisms
- Acts as a forum for discussing all aspects of biodiversity information management through meetings, online discussions, and publications

See the About section to learn how TDWG operates and how you can participate. Active Interest Groups are described under Community.

Biodiversity Information Standards TDWG

Subscribe to our announcements

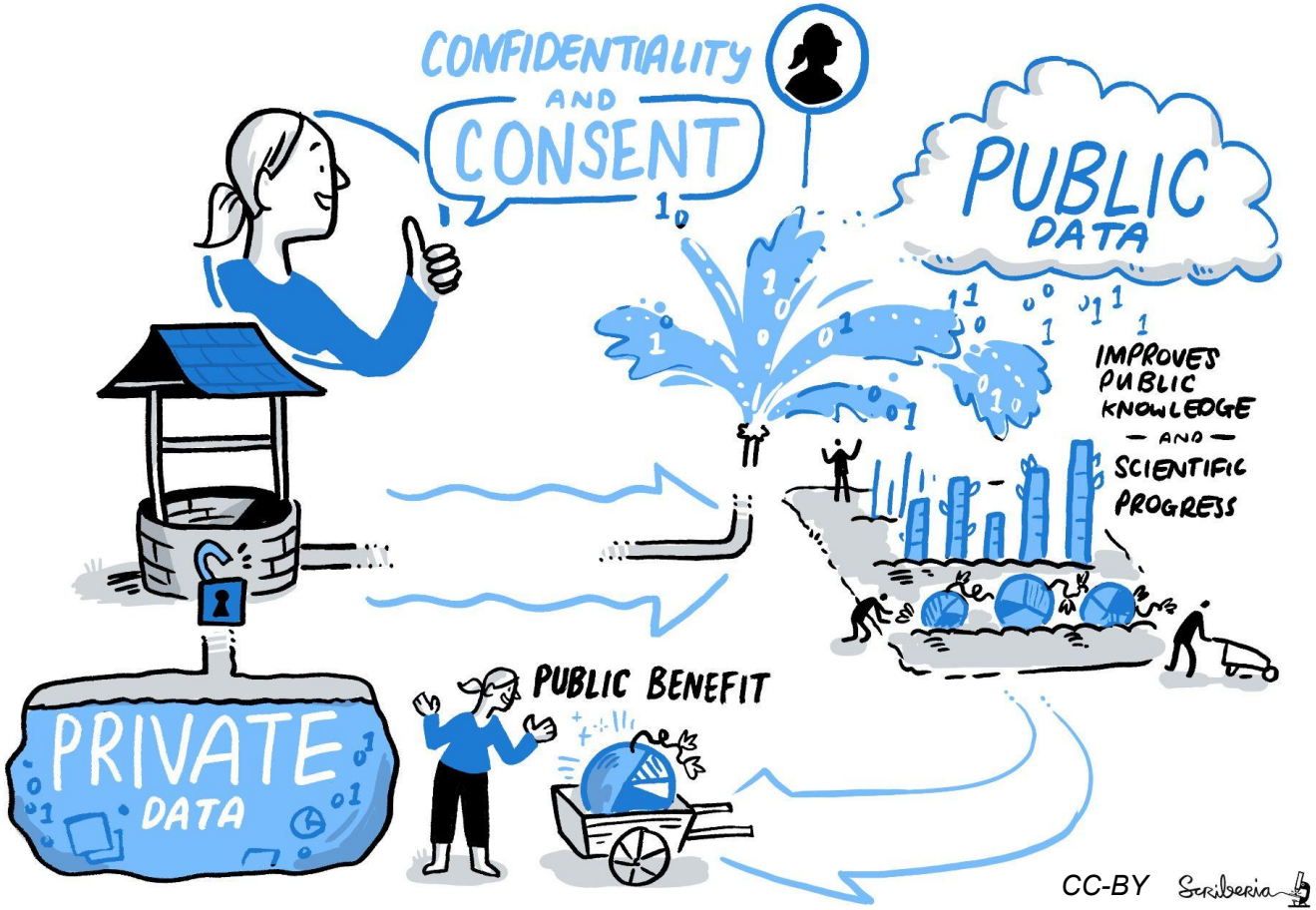
Become a member

Featured

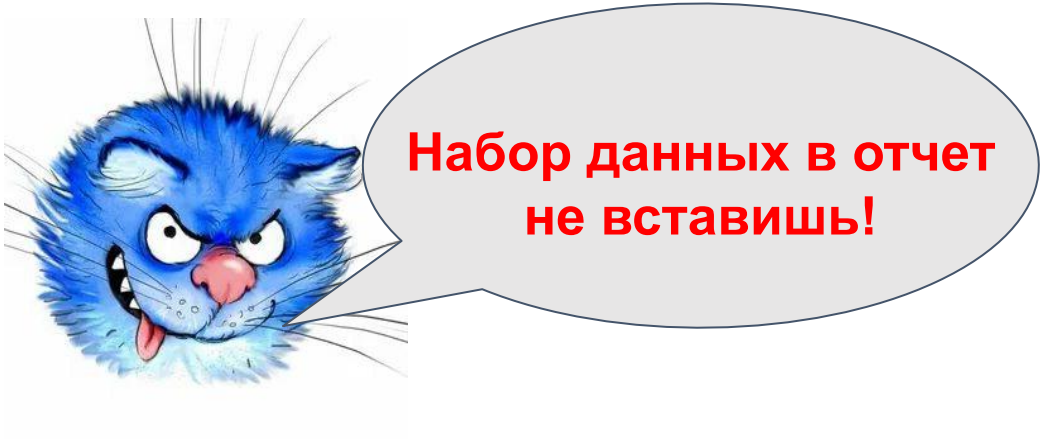
TDWG 2023 will be held in Hobart, Tasmania, Australia, **9-13 October**. Save the date!

Read more

https://www.tdwg.org/



DOI: 10.5281/zenodo.3695300



Статьи и данных. Data Papers.

	Исследовательская статья **Research paper**	**Статья о данных** **Data paper**
ЦЕЛЬ	Проверка научной гипотезы	Описание первичных полевых данных, приведенных к требуемому формату
РАЗДЕЛЫ	Введение Материалы и методы Результаты Обсуждение Заключение	Введение Материалы и методы Описание данных
РЕЦЕНЗИРОВАНИЕ	Рецензирование текста рукописи	Аудит данных Рецензирование текста рукописи

В чем польза статей о данных*

- Регистрация приоритета и авторства данных в общепринятой научной публикации в журнале
- Публикация и цитирования статьи о данных дает авторам те же бонусы, что и публикация исследовательской статьи
- Возможность отслеживать использование и цитирование опубликованных данных
- Метаданные, опубликованные в виде статьи о данных хранятся и архивируются различными способами, что обеспечивает стабильно доступное через Интернет описание соответствующего набора первичных данных

*Chavan & Penev, 2011 https://doi.org/10.1186/1471-2105-12-S15-S2

Примеры журналов, публикующих статьи о данных*

Журнал	Издательство	Стоимость публикации	Импакт-фактор
Biodiversity Data Journal**	Pensoft	EUR 650	1.54
Scientific Data	Nature Publishing Group	EUR 1790	8.501
Taxon	IAPT	EUR 1800	2.586
Diversity	MDPI	CHF 2000	3.029
GigaScience	Oxford University Press	EUR 1089	7.658
Earth System Science Data	Copernicus GmbH	0	11.815

*полный список см. https://www.gbif.org/data-papers
**а также другие журналы этого издательства https://pensoft.net/browse-journals

PENSOFT

About Pensoft | Books | Journals | News & Blog | Contact | Natalya Ivanova

A peer-reviewed open-access journal

Biodiversity Data Journal

Making your data count! ISSN 1314-2828 (online)

Search this journal... Full Text Author Title

Submit manuscript | My drafts | My tasks

About | Articles | Topical collections | Guidelines for Authors | Editorial Team | Contacts

Most Visited Papers
Highly Accessed Papers
Most Active Editors
Most Active Reviewers
Most Productive Authors

Latest | Highly accessed


NEWS

Clarivate Web of Science Journal Impact Factor: 1,54 Q3

Scopus Scopus CiteScore 2021: 1.8 Q2

CiteScoreTracker 2022: 1.9 (updated monthly)

Become Editor | Edit a Topical Collection | Post your news

Publication types: Single Taxon Treatments, Species Conservation Profiles, Alien Species Profiles, Taxonomic Papers, Species Inventories, Identification Keys, Data Papers, Software Descriptions

Archived: PubMedCentral, CLOCKSS, Zenodo, Portico, Europe PMC

Indexed: Web of Science (SCIE), Web of Science (Current Contents), Web of Science (BIOSIS Prev.), Web of Science (Biol. Abstr.), Web of Science (Zool. Rec.), Scopus, DOAJ, AGRICOLA, AGRIS, Altmetric, ASOS Indeks, Baidu Scholar, BASE, British Library, Cabell's Directory, CABI (CAB Abstracts), ChronosHub, CNKI, CrossRef, Dimensions, EBSCO Essentials, EBSCOhost, eLibrary, EZB, GALE Academic OneFile, Genamics JournalSeek, GoOA, Google Scholar, iDiscover (University of Cambridge), IPNI, JournalTOCs, LetPub, Library of Congress, LIVIVO, MIAR, MyScienceWork, NAVER, NAVIGA, Norwegian Register, OpenAIRE, OpenCitations, Ou-Publier?, Paperity, ProQuest, ProQuest Central, ProQuest (Natural Science Collection), PubAg, Publons, PubMed/MEDLINE, QOAM (Quality Open Access Market), ReadCube, Research Gate, ROAD, Science Data Bank, ScienceOpen, Scilit, Semantic Scholar, Sherpa/Romeo, SJR Scimago, SOLO (Search Oxford Libraries Online), Transpose, Ulrichsweb™, Unpaywall, Vifabio, WanFang Data, WorldCat, ZDB

ISSN 1314-2828 (online) | ISSN 1314-2836 (print)

https://bdj.pensoft.net/

Тематический номер Biota of Northern Eurasia, поддержанный GBIF

PENSOFT

A peer-reviewed open-access journal

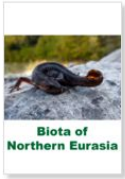
Biodiversity Data Journal

Making your data count! ISSN 1314-2828 (online)

About Articles Topical collectio Contacts

My tasks

In this collection



Papers published: **11**

Documents added: **11**

Printed version: **Paperback**

OPEN ACCESS

Biota of Northern Eurasia

Sort by: Publication date newest

Edited by Dmitry Schigel

In collaboration with the Finnish Biodiversity Information Facility (FinBIF) and Pensoft Publishers, GBIF has announced a call for authors to submit and publish data papers on Northern Eurasia in a special collection of *Biodiversity Data Journal* (*BDJ*).

In correspondence with the funding priorities of this programme, at least 80% of the records in a dataset should have coordinates that fall within the priority area of Northern Eurasia, defined as Russia, Ukraine, Belarus, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan, Moldova, Georgia, Armenia and Azerbaijan.

See full description of the call and additional resources.

doi 10.3897/bdj.coll.197

Data Paper

The dataset of bat (Mammalia, Chiroptera) occurrences in Ukraine collected by the Ukrainian Bat Rehabilitation Center (2011-2022)

Alona Prylutska, Maryna Yerofeieva, Valeria Bohodist, Alona Shulenko, Anzhela But, Ksenia Kravchenko, Oleh Prylutskyi, Anton Vlaschenko

10.3897/BDJ.11.e99243 07-03-2023

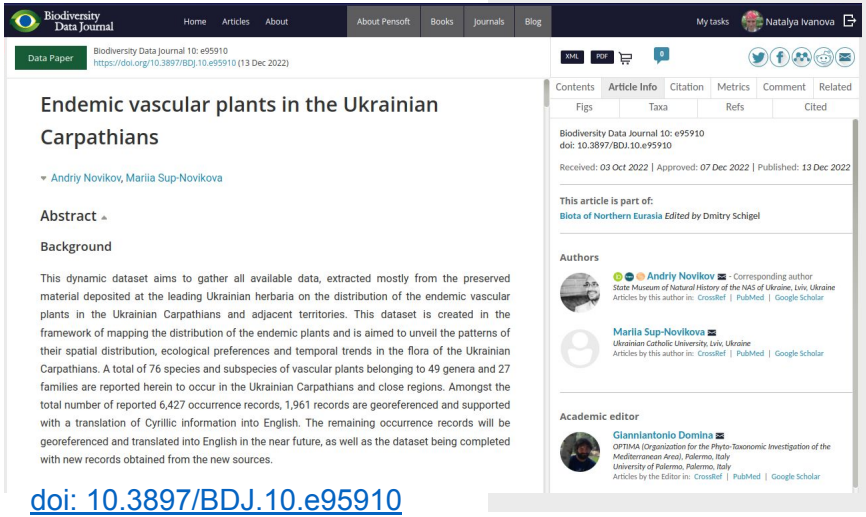
Unique: 208 | Total: 272 Reprint: € 4,80

HTML XML PDF

Data Paper

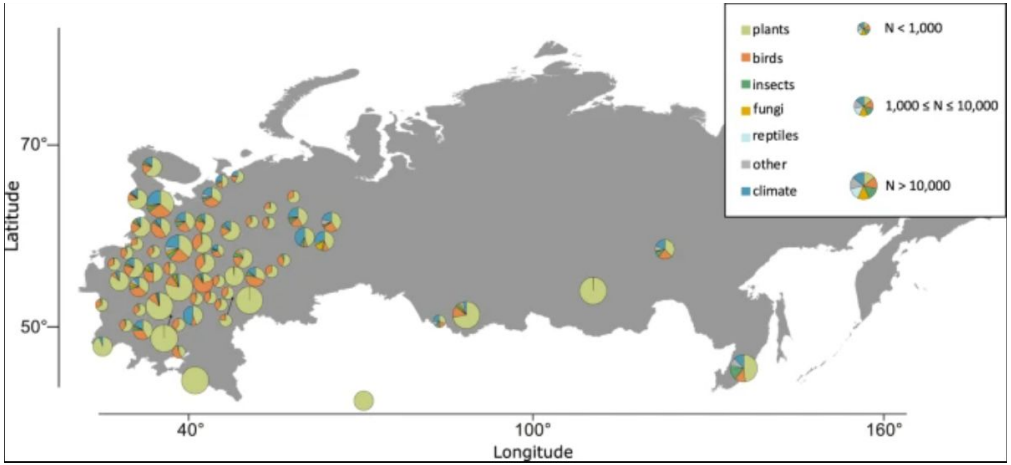
Biodiversity surveys of grassland and coastal habitats in 2021 as a documentation of pre-war status in southern Ukraine

Nadiia Skobel, Dariia Borovyk, Denys Vynokurov, Ivan Moysiyenko, Andriy Babytskiy, Iryna Bednarska, Olesia Bezsmertna, Olha Chusova, Polina Dayneko, Jürgen Dengler, Riccardo Guarino, Kateryna Kalashnik, Alexander



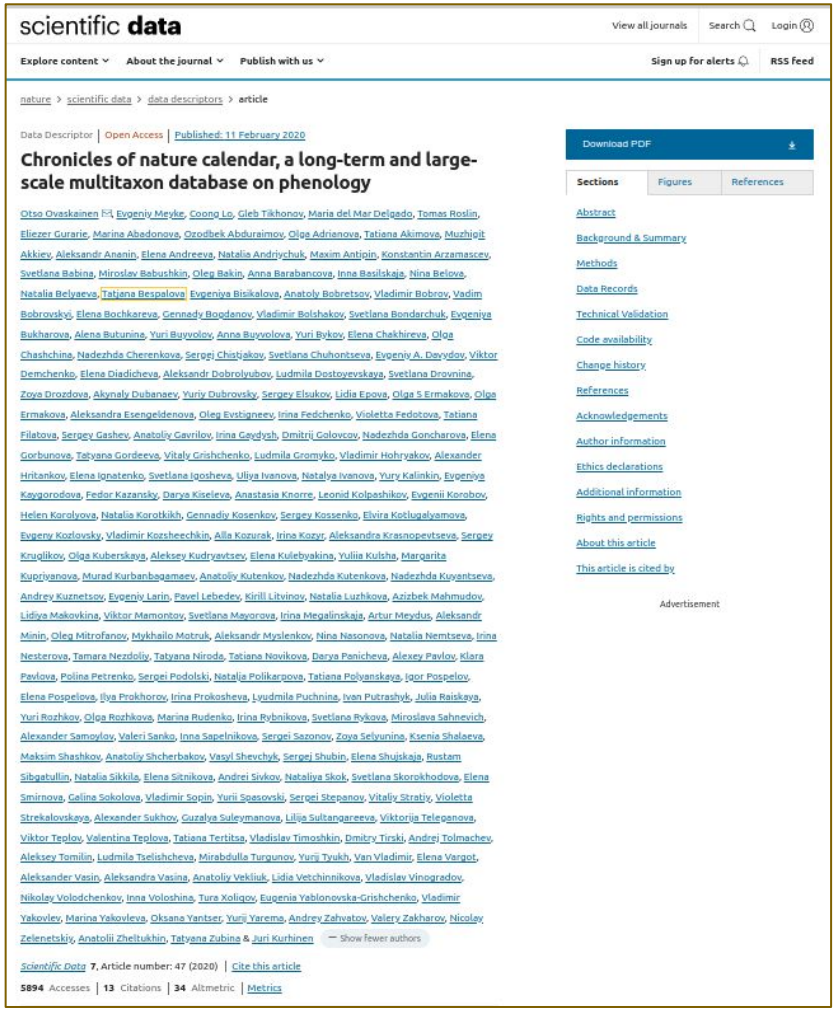
doi: 10.3897/BDJ.10.e95910

Данные, оцифрованные по проекту “Летопись природы Евразии”



506186 фенологических наблюдений
из **471** заповедника, расположенных в России, Украине, Узбекистане, Беларуси и Кыргызстане (Ovaskainen et al., 2020).

https://www.nature.com/articles/s41597-020-0376-z



scientific data

View all journals | Search | Login

Explore content | About the journal | Publish with us | Sign up for alerts | RSS feed

nature > scientific data > data descriptors > article

Data Descriptor | Open Access | Published: 11 February 2020

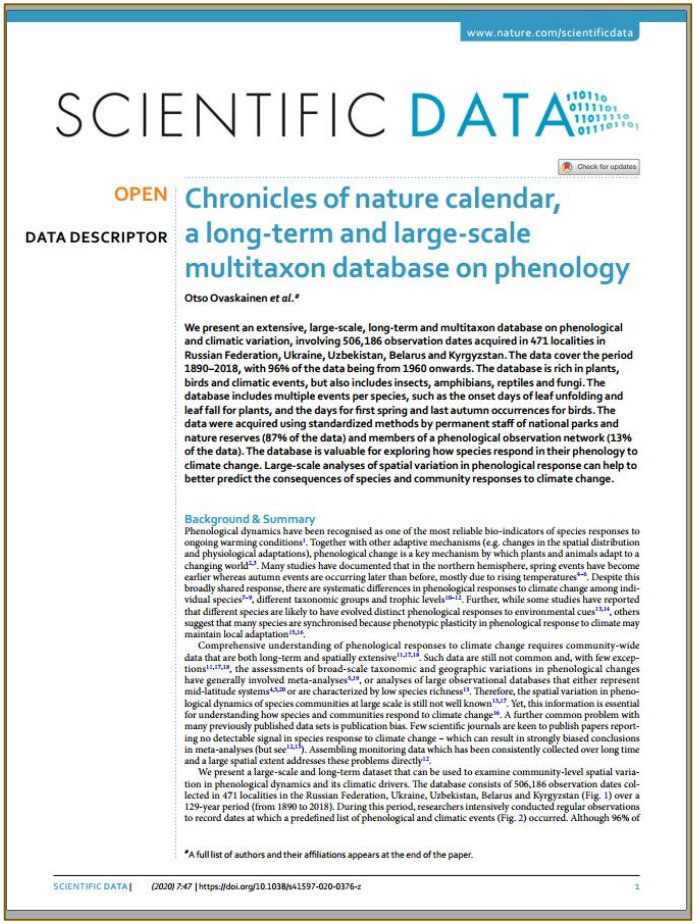
Chronicles of nature calendar, a long-term and large-scale multitaxon database on phenology

Otso Ovaskainen, Evgeniy Meyke, Coong Lo, Gleb Tikhonov, Maria del Mar Delgado, Tomas Roslin, Eliezer Gurarie, Marina Abadonova, Ozodbek Abduraimov, Olga Adrianova, Tatiana Akimova, Muzhigit Akkiev, Aleksandr Ananin, Elena Andreeva, Natalia Andrychuk, Maxim Antipin, Konstantin Arzamascev, Svetlana Babina, Miroslav Babushkin, Oleg Bakin, Anna Barabancova, Inna Basilskaja, Nina Belova, Natalia Belyaeva, Tatjana Bespalova, Evgeniya Bisikalova, Anatoly Bobretsov, Vladimir Bobrov, Vadim Bobrovskyi, Elena Bochkareva, Gennady Bogdanov, Vladimir Bolshakov, Svetlana Bondarchuk, Evgeniya Bukharova, Alena Butunina, Yuri Buyvolov, Anna Buyvolova, Yuri Bykov, Elena Chakhireva, Olga Chashchina, Nadezhda Cherenkova, Sergei Chistjakov, Svetlana Chuhontseva, Evgeniy A. Davydov, Viktor Demchenko, Elena Diadicheva, Aleksandr Dobrolyubov, Ludmila Dostoyevskaya, Svetlana Drovnina, Zoya Drozdova, Akynaly Dubanaev, Yuriy Dubrovsky, Sergey Elsukov, Lidia Epova, Olga S Ermakova, Olga Ermakova, Aleksandra Esengeldenova, Oleg Evstigneev, Irina Fedchenko, Violetta Fedotova, Tatiana Filatova, Sergey Gashev, Anatoliy Gavrilov, Irina Gaydysh, Dmitrij Golovcov, Nadezhda Goncharova, Elena Gorbunova, Tatyana Gordeeva, Vitaly Grishchenko, Ludmila Gromyko, Vladimir Hohryakov, Alexander Hritankov, Elena Ignatenko, Svetlana Igosheva, Uliya Ivanova, Natalya Ivanova, Yury Kalinkin, Evgeniya Kaygorodova, Fedor Kazansky, Darya Kiseleva, Anastasia Knorre, Leonid Kolpashikov, Evgenii Korobov, Helen Korolyova, Natalia Korotkikh, Gennadiy Kosenkov, Sergey Kossenko, Elvira Koklugalyamova, Evgeny Kozlovsky, Vladimir Kozsheechkin, Alla Kozurak, Irina Kozyr, Aleksandra Krasnopevtseva, Sergey Kruglikov, Olga Kuberskaya, Aleksey Kudryavtsev, Elena Kulebyakina, Yuliia Kulsha, Margarita Kupriyanova, Murad Kurbanbagamaev, Anatoliy Kutenkov, Nadezhda Kutenkova, Nadezhda Kuyantseva, Andrey Kuznetsov, Evgeniy Larin, Pavel Lebedev, Kirill Litvinov, Natalia Luzhkova, Azizbek Mahmudov, Lidiya Makovkina, Viktor Mamontov, Svetlana Mayorova, Irina Megalinskaja, Artur Meydus, Aleksandr Minin, Oleg Mitrofanov, Mykhailo Motruk, Aleksandr Myslenkov, Nina Nasonova, Natalia Nemtseva, Irina Nesterova, Tamara Nezdoliy, Tatyana Niroda, Tatiana Novikova, Darya Panicheva, Alexey Pavlov, Klara Pavlova, Polina Petrenko, Sergei Podolski, Natalja Polikarpova, Tatiana Polyanskaya, Igor Pospelov, Elena Pospelova, Ilya Prokhorov, Irina Prokosheva, Lyudmila Puchnina, Ivan Putrashyk, Julia Raiskaya, Yuri Rozhkov, Olga Rozhkova, Marina Rudenko, Irina Rybnikova, Svetlana Rykova, Miroslava Sahnevich, Alexander Samoylov, Valeri Sanko, Inna Sapelnikova, Sergei Sazonov, Zoya Selyunina, Ksenia Shalaeva, Maksim Shashkov, Anatoliy Shcherbakov, Vasyl Shevchyk, Sergej Shubin, Elena Shujskaja, Rustam Sibgatullin, Natalia Sikkila, Elena Sitnikova, Andrei Sivkov, Nataliya Skok, Svetlana Skorokhodova, Elena Smirnova, Galina Sokolova, Vladimir Sopin, Yurii Sosovski, Sergei Stepanov, Vitaliy Strativ, Violetta Strekalovskaya, Alexander Sukhov, Guzalya Suleymanova, Lilija Sultangareeva, Viktorija Teleganova, Viktor Teplov, Valentina Teplova, Tatiana Tertitsa, Vladislav Timoshkin, Dmitry Tirski, Andrej Tolmachev, Aleksey Tomilin, Ludmila Tselishcheva, Mirabdulla Turgunov, Yurij Tyukh, Van Vladimir, Elena Vargot, Aleksander Vasin, Aleksandra Vasina, Anatoliy Vekliuk, Lidia Vetchinnikova, Vladislav Vinogradov, Nikolay Volodchenkov, Inna Voloshina, Tura Xoliqov, Eugenia Yablonovska-Grishchenko, Vladimir Yakovlev, Marina Yakovleva, Oksana Yantser, Yurij Yarema, Andrey Zahvatov, Valery Zakharov, Nicolay Zelenetskiy, Anatolii Zheltukhin, Tatyana Zubina & Juri Kurhinen — Show Fewer authors

Scientific Data 7, Article number: 47 (2020) | Cite this article

Download PDF

Sections | Figures | References



www.nature.com/scientificdata

SCIENTIFIC DATA

Check for updates

OPEN

DATA DESCRIPTOR

Chronicles of nature calendar, a long-term and large-scale multitaxon database on phenology

Otso Ovaskainen *et al.*[#]

We present an extensive, large-scale, long-term and multitaxon database on phenological and climatic variation, involving 506,186 observation dates acquired in 471 localities in Russian Federation, Ukraine, Uzbekistan, Belarus and Kyrgyzstan. The data cover the period 1890–2018, with 96% of the data being from 1960 onwards. The database is rich in plants, birds and climatic events, but also includes insects, amphibians, reptiles and fungi. The database includes multiple events per species, such as the onset days of leaf unfolding and leaf fall for plants, and the days for first spring and last autumn occurrences for birds. The data were acquired using standardized methods by permanent staff of national parks and nature reserves (87% of the data) and members of a phenological observation network (13% of the data). The database is valuable for exploring how species respond in their phenology to climate change. Large-scale analyses of spatial variation in phenological response can help to better predict the consequences of species and community responses to climate change.

Background & Summary

Phenological dynamics have been recognised as one of the most reliable bio-indicators of species responses to ongoing warming conditions[1]. Together with other adaptive mechanisms (e.g. changes in the spatial distribution and physiological adaptations), phenological change is a key mechanism by which plants and animals adapt to a changing world[2,3]. Many studies have documented that in the northern hemisphere, spring events have become earlier whereas autumn events are occurring later than before, mostly due to rising temperatures[4–6]. Despite this broadly shared response, there are systematic differences in phenological responses to climate change among individual species[7–9], different taxonomic groups and trophic levels[10–12]. Further, while some studies have reported that different species are likely to have evolved distinct phenological responses to environmental cues[13,14], others suggest that many species are synchronised because phenotypic plasticity in phenological response to climate may maintain local adaptation[15,16].

Comprehensive understanding of phenological responses to climate change requires community-wide data that are both long-term and spatially extensive[11,17,18]. Such data are still not common and, with few exceptions[11,17,18], the assessments of broad-scale taxonomic and geographic variations in phenological changes have generally involved meta-analyses[8,19], or analyses of large observational databases that either represent mid-latitude systems[4,5,20] or are characterized by low species richness[21]. Therefore, the spatial variation in phenological dynamics of species communities at large scale is still not well known[18,17]. Yet, this information is essential for understanding how species and communities respond to climate change[16]. A further common problem with many previously published data sets is publication bias. Few scientific journals are keen to publish papers reporting no detectable signal in species response to climate change – which can result in strongly biased conclusions in meta-analyses (but see[12,18]). Assembling monitoring data which has been consistently collected over long time and a large spatial extent addresses these problems directly[12].

We present a large-scale and long-term dataset that can be used to examine community-level spatial variation in phenological dynamics and its climatic drivers. The database consists of 506,186 observation dates collected in 471 localities in the Russian Federation, Ukraine, Uzbekistan, Belarus and Kyrgyzstan (Fig. 1) over a 129-year period (from 1890 to 2018). During this period, researchers intensively conducted regular observations to record dates at which a predefined list of phenological and climatic events (Fig. 2) occurred. Although 96% of

[#]A full list of authors and their affiliations appears at the end of the paper.

https://www.nature.com/articles/s41597-020-0376-z

Материалы для самостоятельного изучения

De Prins J. (2019) Global Open Biodiversity Data: Future Vision of FAIR Biodiversity Data Access, Management, Use and Stewardship. Biodiversity Information Science and Standards, 3: e37190 DOI: 10.3897/biss.3.37190

Wilkinson M.D., Dumontier M., Jan Aalbersberg IJ., et al. (2016) The FAIR Guiding Principles for scientific data management and stewardship. Scientific Data, 3: 160018. DOI: 10.1038/sdata.2016.18

Chavan, V., Penev, L. (2011) The data paper: a mechanism to incentivize data publishing in biodiversity science. BMC Bioinformatics 12 (Suppl 15), S2. https://doi.org/10.1186/1471-2105-12-S15-S2