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THE INTERNATIONAL BARCODE OF LIFE INITIATIVE TISSUE SAMPLING AND ANALYZING POLICY

The *International Barcode of Life* (iBOL) is an international consortium research initiative aimed at developing DNA-based systems for fast and cost-effective taxonomic identification of all living organisms. The principal outcome of this research is the acquisition of *DNA Barcodes* for organisms under study through genetic analyses and the maintenance of a reference databank of DNA barcodes of well-vouchered and authoritatively identified specimens in an online repository — the *Barcode of Life Data Systems* (BOLD)¹.

The *Canadian Centre for DNA Barcoding* (CCDB), housed at the *Biodiversity Institute of Ontario* (BIO), University of Guelph, acts as the leading analytical node of iBOL. Due to the collaborative nature of the international DNA barcoding effort, the CCDB is highly dependent on input from participating institutions and individual contributors (hitherto referred to as *External Collaborators*) through their professional expertise in selected taxonomic groups of living organisms and provision of biological samples for molecular analyses. This input is critical for the attainment of project goals; therefore BIO/CCDB makes special effort to ensure that mutual benefits derive from this collaboration, in addition to fulfilling the iBOL's general mandate. The information below outlines the general policy of CCDB and BIO in pursuing these goals.

The research activities of iBOL are organized into *campaigns* and individual *research projects* focused on particular taxonomic groups and geographic regions and involving one to multiple collaborators. This is mirrored by the structure of virtual projects on BOLD. Projects for which molecular analyses are done at the CCDB are facilitated internally by the BIO *Project Coordinator*, whose responsibility is to coordinate the analytical process in the laboratory with input from external project participants.

BIO collection specimen storage policy

Any collection specimens or tissue samples submitted to the CCDB for DNA barcoding analysis are housed by the BIO collection management module. BIO is not a permanent collection depository; however, it has all necessary facilities to assure appropriate long-term storage and maintenance of research collections of various taxonomic origins and forms of preservation. The scope of collection materials managed at BIO includes various forms of fluid-preserved small or medium-sized (usually under 1 kg) animals and plants or parts thereof, dried whole specimens (e.g., pinned or slide-mounted insects, freeze-dried small animals, herbarium specimens), parts thereof (e.g., study skins, skull or skeletal material) or frozen materials. The general purpose of holding these temporary collections is tissue sampling and/or taxonomic investigation by BIO staff members. Such material is regarded as being 'on loan' or 'on hold' and, upon processing, is intended for return to the loaning institution (museum) or (if recently collected) for deposition in a specialized collection facility.

¹ The Barcode of Life Data Systems (BOLD) is the standard workbench used by iBOL to generate and process DNA barcodes. It is an independent project operated by BIO at the University of Guelph under Creative Commons Licence.

Small (less than *ca.* 1 ml in volume) pieces of tissue, detached parts of organisms and whole individuals which have to be sampled consumptively are regarded as tissue samples and may be stored indefinitely in the BIO Tissue Storage Facility.

BIO does not manage biological materials possessing hazardous properties.

Origin of tissue samples or DNA extracts

Most of the tissue samples held and processed by BIO, are provided by collaborating institutions and individual researchers. BIO welcomes tissue samples or DNA extracts of various origins, however, preference is given to samples originating from specimens deposited with a museum or institution. Such specimens should be properly catalogued and available for study by third-party researchers. For the purpose of accomplishing certain research projects BIO/CCDB research staff may also request to borrow tissues stored in museums and tissue repositories.

Prior to each tissue transaction External Collaborator(s) should contact the corresponding Project Coordinator to negotiate the details and receive standard BIO sampling and data submission kits.

Terms and conditions of tissue acquisition

BIO is committed to following the internal regulations and loan policies of all contributing institutions and to respecting the intellectual and physical property of individual collectors and External Collaborators acting as *Donors* or representing their *Donor Organization*. By default, any transaction of biological materials between the CCDB and an External Collaborator falls under the standard provisions of the *BIO/CCDB Biological Material Transfer Agreement (BMTA)*. However, under certain circumstances specific terms and conditions of the loan can be negotiated to ensure satisfaction of the Donor and compliance with reciprocal policies and regulations of the Donor Organization. Any tissue loans from museums or other centralized depositories are arranged in compliance with their internal loan policies and are coordinated with the appropriate curatorial and management staff of that collection, museum or repository.

Generally, if an individual researcher deposits voucher specimens with a centralized collection depository, the respective tissue samples and DNA extracts, either deposited with the specimens or taken subsequently from them are regarded as part of that collection and fall under the tissue policy regulations of that depository. However, any samples provided directly to BIO/CCDB prior to that time retain their initial status negotiated with the Donor and any tissue samples or DNA extracts remaining in possession of the researcher are considered the original Donor's property, thereby rendering the Donor's consent sufficient to accommodate and/or analyze them.

The person or institution providing the samples has the option to choose the terms on which samples are stored at BIO. Generally these *loan conditions* should be established by participating researchers at the initiation of each project and *specified in the BMTA Implementing Letter*. There are three ways in which tissue samples could be provided to BIO/CCDB.

Donation. When donating tissue samples or DNA extracts to BIO, the Donor waives their right of ownership to these materials and allows BIO/CCDB administration and curatorial staff to make sole decisions on future sub-sampling, analyzing and loaning samples to other researchers and research organizations for non-commercial purposes. However, Donors will have priority in using their samples and DNA extracts stored at BIO/CCDB for their own future research, including consumptive analyses. Donation as a form of specimen submission is a requirement if sampling or collecting activities were supported by grants provided to BIO/CCDB. Individual

researchers or institutions which do not have the facilities for proper storage of collection specimens and tissue samples are encouraged to donate their materials to BIO/CCDB, thereby ensuring their long persistence and availability for future analysis and reexamination.

Permanent loan. When providing tissue samples on a permanent loan basis, the sender retains the right of ownership, but the residual tissue and/or DNA extracts are housed permanently at the BIO cryogenic storage facility. Any further analyses or sub-sampling of these materials may only be conducted upon approval from both the Donor (or a representative of the contributing institution, e.g., collection curator) and a member of BIO/CCDB administration or curatorial staff. If loan conditions are not specified in the BMTA Implementing Letter, material is being assumed as sent on permanent loan.

Temporary loan. Tissue policies of certain museums and cryogenic storage facilities preclude borrowers from retaining residual tissue and DNA extracts and using them for subsequent research, other than the initial intent of the loan. In such cases, specifically agreed on by both parties and stipulated in the BMTA Implementing Letter, all residual tissue and DNA extracts involved in a project will be returned to the Donor or Donor Institution upon completion of analysis. The minimal period of such temporary loan corresponds to the time required to process all samples employed in a given project. All such loans should be initially destined for consumptive analysis and no responsibility is assumed by BIO/CCDB if a sample and/or DNA extract is used up completely. Temporary loan conditions pertain only to the tissue sample itself (or whole specimen, where appropriate) and its direct derivative (DNA extract) and do not extend to any artificial matter derived (e.g., PCR product) or information generated (e.g., sequencer trace file) in the course of the analytical process (see below). Whenever possible, contributing institutions are encouraged to avoid providing their samples on a temporary loan basis.

Destructive sampling of collection specimens

Whenever considered logistically appropriate, whole specimens may be loaned to BIO/CCDB for destructive tissue sampling. If these specimens are being loaned on a temporary basis, they will be housed at BIO for a reasonable period required to obtain the samples and assure their sufficient quality for molecular analyses. In some cases a BIO staff member may be dispatched to sub-sample tissues or specimens housed by a collection depository, institution or individual researcher. Unless specifically negotiated otherwise, tissue taken from whole specimens or sub-sampled from larger tissue fragments under either of the above circumstances are considered as being on permanent loan from the specimen holder. Specimens sent to BIO/CCDB on permanent loan will have the same restrictions imposed on destructive analyses as tissues sent on permanent loan, but their availability for non-invasive morphological examination to all interested researchers will not be subject to approval by the Donor.

Shipping documentation and permits

All shipments of biological materials sent to BIO/CCDB must be done in compliance with Canadian and International regulations pertaining to the acquisition and shipment of such samples. BIO is a CITES-registered institution, however, it is not a conservation or enforcement authority; therefore it does not assume responsibility for verifying the accuracy of collection, sampling and export/import permits by its external collaborators. Generally, it is the sender's responsibility to ensure that all samples shipped to BIO have been obtained in compliance with applicable local nature conservation and animal care regulations in their country of origin and to arrange all relevant accompanying documentation. In certain cases BIO/CCDB may be requested by the External Collaborator to assist in arranging the necessary Canadian import paperwork.

Reimbursement and compensation

Instances of tissue or specimen loan requiring reimbursement of shipping (including collect shipments), permit expenses, or compensation of sampling effort on behalf of BIO/CCDB are considered exceptional. All such cases should be negotiated with the Project Coordinator and are subject to approval by BIO/CCDB administration at the initial stages of collaboration and definitely prior to any shipments. Requests to ship samples collect should be explicitly stated in the BMTA Implementing Letter.

Submission of specimen information

All submitted samples should be accompanied by label data containing information on the source specimen: voucher specimen identifier (field and/or museum number), taxonomic identification, collection date, collector's name, geographic locality, and any relevant comments, in BOLD-compliant data submission format, as defined on the BOLD website: <http://www.barcodinglife.org/docs/boldmas.html>. Full specimen data should be submitted to BOLD prior to the beginning of the analyses. Collection data on the source specimens for DNA barcodes is a critical part of the Barcode of Life Database. However, it does not replace the original specimen documentation. Each BOLD entry has a reference to the museum/institution housing the source specimen or tissue and researchers using published BOLD data in their studies are expected to acknowledge them in their resulting publications. If repositories have online catalogs of their collections, they are encouraged to provide links to data records for the source specimens of tissue samples, so that respective entries in their online catalogues can be cross-referenced directly from BOLD. External Collaborators are encouraged to contact their corresponding Project Coordinators for details on data submission procedures and for blank data submission forms. A digital photograph (or a set of photographs) of the source specimen is a valuable asset and a requirement if a voucher collection specimen is not available.

A newly created BOLD project is closed for public view. External Collaborators directly involved in it are provided with secure access to view the specimen data and the analytical results contained therein, via the BOLD online interface. Requests to get access to active project details and reports on possible data errors and inconsistencies should be submitted to the BOLD system administrator through respective project managers. Project users are encouraged to verify the accuracy and completeness of the data contained in their relevant projects.

Co-authorship, acknowledgments and copyright issues

In complex collaborative projects involving multiple donors and institutions it is the responsibility of all project participants to ensure that interests and rights of each person and institution are pursued and their input is acknowledged in resulting publications, proportional to their contribution to the study and to the preparation of these publications.

Irrespective of the terms of tissue possession, all materials (e.g., PCR products) and information (e.g., DNA sequences) derived from the analyses using BIO/CCDB laboratory facilities, personnel and funding, as well as any collateral documentation generated during the analytical process (e.g., laboratory journals), are considered to be the intellectual and/or physical property of BIO/CCDB and staff members directly involved in the analyses. BIO/CCDB also retains copyright on any derived illustrative or analytical material (e.g., Taxon ID trees, distribution maps) generated using the BOLD online interface. Sequence data generated by BIO/CCDB at the expense of the External Collaborator become joint intellectual property.

In accepting this, all collaborating researchers directly involved in a given project have the right to access and use all results of the analytical process pertaining to this project through BOLD's online interface and its available analytical tools. They are also welcome to download the sequences and analyze them, using alternative analytical algorithms and software. However, sequence submissions and changes to sequence data contained in BOLD can only be made by authorized BIO laboratory staff and database managers.

Any images or collateral specimen information supplied by External Collaborators remain the intellectual property (and copyright, if applicable) of their original submitters and/or the institutions they represent. It is understood that, once the data submission has been made to BOLD, specimen data and images become partially available to the public online through the **BOLD Taxonomy Browser** at http://www.barcodinglife.org/views/taxbrowser_root.php. This information is used to generate summary statistics and illustrative distribution maps. However, there is no disclosure of the contents of individual research projects. Upon the publication of each BOLD project, all specimen data and images contained therein become publicly available through the BOLD online interface.

Specimen provenance data and the results of analyses conducted within the framework of each project remain accessible only to contributor(s), donor(s) and BIO staff members directly affiliated with this particular project and are not to be communicated to third parties until project completion, without prior consent from principal project participants. Upon project completion, usually following a co-authored publication, DNA sequences become available to the public on BOLD and are submitted to NCBI GenBank, subject to approval by all project participants.

It should be understood by all parties that sequence data contained in BOLD projects with restricted access may be used by the **BOLD identification engine** to provide DNA-based taxonomic identifications to public users submitting DNA barcode sequences. The reports generated by the BOLD identification engine include probability scores and tree-based identification with branch labels containing taxonomic names and broad geographic localization (to province level). However, individual specimen identifiers and sequence data are not being disclosed by the BOLD identification engine.

It is possible for both External Collaborators and their Project Coordinators to use unpublished project data in other simultaneously prepared and submitted publications (e.g., specialized taxonomic revisions or new species descriptions). However, this has to be negotiated on a case-by-case basis with all relevant project participants. It is desirable that this intent be stated clearly at the initial stages of prospective projects.

If the data contained in a closed project remain unchanged for a period of over one year and no manuscript is submitted for publication by participating external collaborator(s) for a period of over two years since the submission of DNA barcodes, the project is designated as "orphaned". If funding for the analyses was provided through CCDB/BIO, and no response is received from the External Collaborator on the intended publication schedule, BIO/CCDB retains the right to make the online contents of an "orphaned" project publicly available through the BOLD web site, subject to approval by the CCDB/BIO and iBOL administration.

NOTICE: Researchers and institutions conducting DNA barcoding studies and generating molecular data using their own analytical facilities are encouraged to submit their data to BOLD. Such cases, however, are not covered by this policy statement and interested parties should contact the BOLD data team directly for further information.