**Supplementary Information 1: Contributing to Fishboneviz**

This document is a guideline for contributing 3D media (CT scans or meshes) to Fishboneviz. Please direct any queries to the Fishboneviz team, Ariana Lambrides (ariana.lambrides@jcu.edu.au) or Vera Weisbecker (vera.weisbecker@flinders.edu.au).

**Specimen** **eligibility**

Only specimens that can be published on MorphoSource with open download can be added to Fishboneviz. To be eligible for upload, 3D media should be from accessioned specimens from a reputable collection. This is usually a museum collection, but specimens can also be from collections with expertise in specimen identification (e.g. university collections). Aside from exceptional circumstances, the physical specimens from which scans are derived should be accessible through normal collection visit protocols.

**Data formats**

A list of formats that MorphoSource accepts can be found [on this link](https://duke.atlassian.net/wiki/spaces/MD/pages/35422892/Critical%2BFormatting%2BDetails). Most common 3D mesh formats are accepted. At the time of writing, CT scans require compressing as a .zip or .tar archive, containing only .tif, .jpeg, .bmp, or .dcm files. If these individual files are larger than 4 GB, conventional Windows and Mac Operating Systems will create archives that are not compatible with most software environments. In this case, use another archiving software (MorphoSource recommends winZIP, winRAR, 7zip and Keka [for Mac]) and always use the ‘.zip’ file extension.

**Metadata**

Minimum metadata include:

***Physical specimen***

* Collecting organisation
* Accession data: specimen collection code and catalogue number. For example, SAMA M 12345 for ‘South Australian Museum, Mammal collection, number 12345’)
* Date of specimen collection
* Location of collection (coordinates with the map projection are preferred but approximate location, such as township and country, is acceptable)

***Acquisition event***

* Date the 3D object was created
* Technician involved in creation of the 3D object (if available)
* Scanning instrument (if the instrument is not listed on MorphoSource, it can be added; you can request addition by e-mailing MorphoSource or sending the details to the Fishboneviz team. See the instrument and organisation details required [on this link](https://duke.atlassian.net/wiki/spaces/MD/pages/35422899/Frequently%2BAsked%2BQuestions#FrequentlyAskedQuestions-HowdoIsetupanorganizationrecordformyscanningfacility?))
* IP holder (this can be the collection or the person acquiring the 3D media, depending on the agreement between the collection and the acquirer)
* If the scanning was supported by funding, the funding attribution
* If CT scans are uploaded, the voxel dimensions (image pixels size + distance between images) of the scan

***Licensing***

In accordance with [FAIR](https://www.nature.com/articles/sdata201618) data practices, we recommend providing users with clear and accessible data usage license conditions by completing the ‘Copyright’ and ‘Creative Commons licence’ fields for each 3D media. We use ‘In Copyright’ and ‘CC-BY-NC’. Information on options can be found [on this link](https://duke.atlassian.net/wiki/spaces/MD/pages/35422314/Rights%2BLicenses%2Band%2BUsage%2BSettings%2Bfor%2BMedia).

To increase the usability of the 3D object, more metadata are always better. Additional metadata can include specimen collector, details of 3D acquisition (e.g. machine settings), and anomalies present in the 3D media and/or the physical specimen that could be misinterpreted as morphological structures. These can be included in ‘media description’. Additional notes can also be added in free-form fields.

It is useful to also include an image of the media (such as a screenshot), which will appear as a thumbnail. If dry, skeletonised specimens are imaged, we recommend including photographs of the original specimen, with scales, in a .zip file along with the 3D media. These can assist the user to independently verify the morphology present in the 3D object.

**Contributing to Fishboneviz**

There are two ways that specimens can be contributed. For details of signing up to be a contributor and upload instructions, see below.

1. *Preferred option: For larger numbers of 3D media and/or requirement to retain management control over media on MorphoSource:*

Sign up to be a MorphoSource contributor and upload the 3D media. Contact the Fishboneviz team with the media IDs. We will request you share each media with a Fishboneviz manager who will add these to the Fishboneviz project. Note that the original uploader retains management control over the 3D media. The Fishboneviz team can be contacted for support with the workflow, if required.

1. *For small numbers of 3D media and/or no requirement to retain management control over media on MorphoSource:*

Contact the Fishboneviz team and request upload of the 3D media of your specimens with their minimum metadata, including confirmation that the scans can be set to Open Download.

**Technical instructions**

Because of its high data curation standards, MorphoSource requires a substantial amount of metadata information. However, once these are gathered, the online forms and uploading are straightforward.

MorphoSource provides extensive guidance for its use, which is updated regularly. We therefore here provide a list of links that detail instructions to become a contributor and upload 3D media. These also connect to other information that might be relevant (e.g. copyright options or more advanced usage). The FAQs are an excellent source of information.

To become a MorphoSource contributor, visit MorphoSource’s ‘[How to become a Contributor](https://duke.atlassian.net/wiki/spaces/MD/pages/35422461/How%2BTo%2BBecome%2BA%2BContributor)’ link. This is a straightforward process that requires information on your affiliation.

Instructions for creating specimen records and uploading 3D media are on the ‘[How to Create and Edit Media](https://duke.atlassian.net/wiki/spaces/MD/pages/35422701/How%2Bto%2BCreate%2Band%2BEdit%2BMedia)’ link. This contains several resources, including links to the MorphoSource [YouTube](https://www.youtube.com/%40morphosource3ddatareposito45) page, which provides step-by-step guidance for the media upload process and many more details on uploads.

Instructions for sharing media are on the ‘[Sharing Access to Media](https://duke.atlassian.net/wiki/spaces/MD/pages/35423757/Sharing%2BAccess%2Bto%2BMedia)’ link. To share with Fishboneviz, follow the instructions for Individual Sharing and provide ‘Edit access’ to the nominated project manager.