

INTERNATIONAL PACIFIC



HALIBUT COMMISSION

# IPHC 5-year program of Integrated Research and Monitoring (2022-26): updates

Agenda item: 5

IPHC-2023-RAB024-05

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# The use of AI for ageing

- The IPHC Secretariat is looking at options for supplementing current Pacific halibut ageing protocol with automatized ageing that does not require extensive otolith-reader training.
  - Investigation of the potential use of **artificial intelligence (AI)** for determining the age of Pacific halibut from images of collected otoliths.

# Database

- IPHC to date aged over 1.5 million otoliths – aged otoliths are stored in our archives
- Already aged otoliths provide a resource that can be used in creating a database of pictures with expert-provided labels for ageing use
- Taking pictures can be incorporated into the ageing process at relatively minor time added



8.5MP USB 3.0 High-performance  
Color CMOS C-Mount Microscope  
Camera with Reduction Lens

# Modeling approach

- Application of a convolutional neural network (CNN) model (deep learning application) with initial modeling framework adapted from Deep Otolith project (<http://otoliths.ath.hcmr.gr/>) applied to Greenland halibut, red mullet and salmon (scales)
- Approach doesn't offer a binary result – the current trial is intended to determine whether the approach offers accuracy of ageing suitable for products such as stock assessment
- AI is evolving rapidly and adapting to new developments may improve results over time
- Utilizing automated ageing will continuously rely on trained readers for training the model with inputs that capture temporal changes – this may be particularly important in the context of changing environmental conditions/climate change

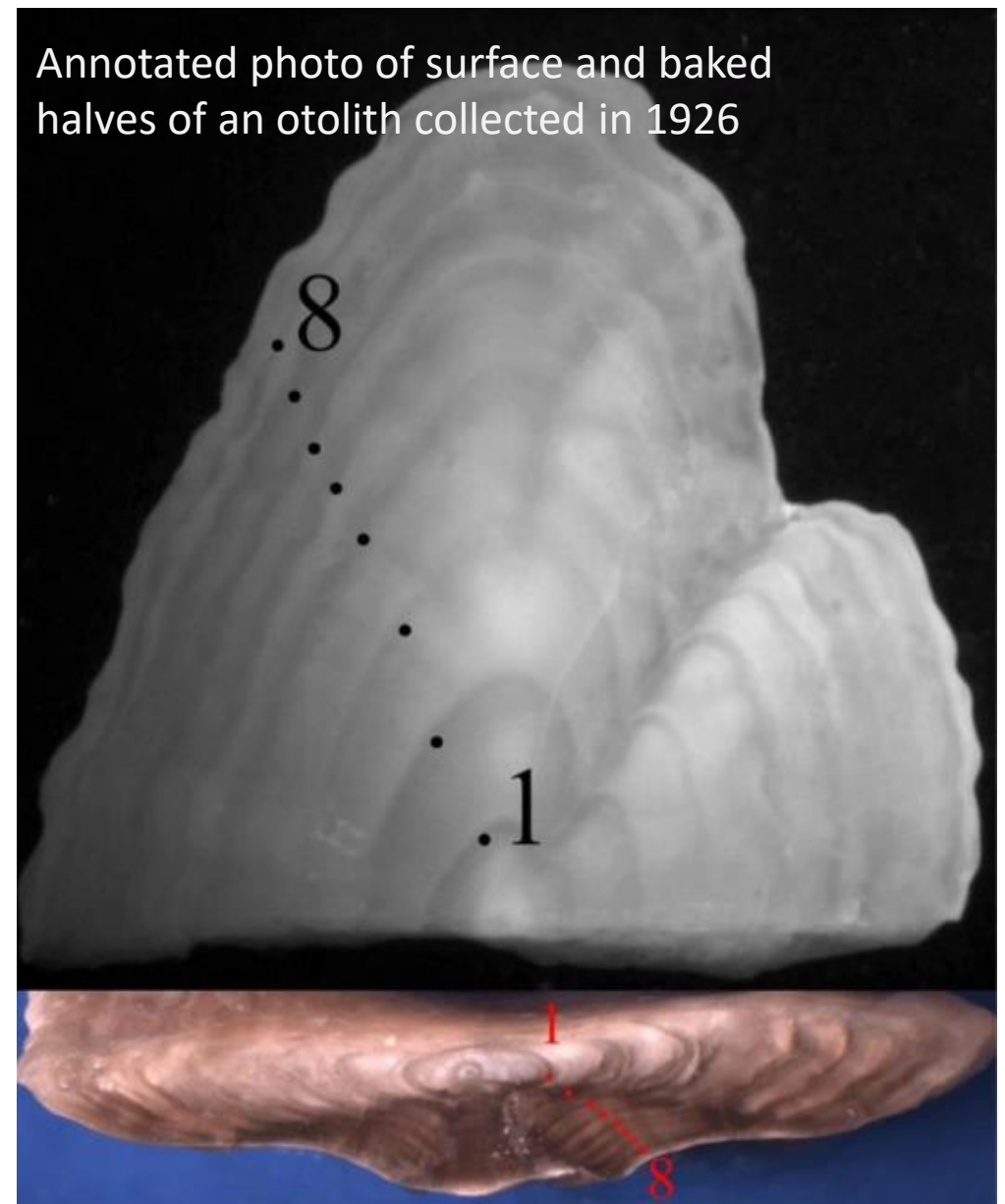
# Labeling vs. annotation

Otolith	Image	Age
ID	ID.tif	X

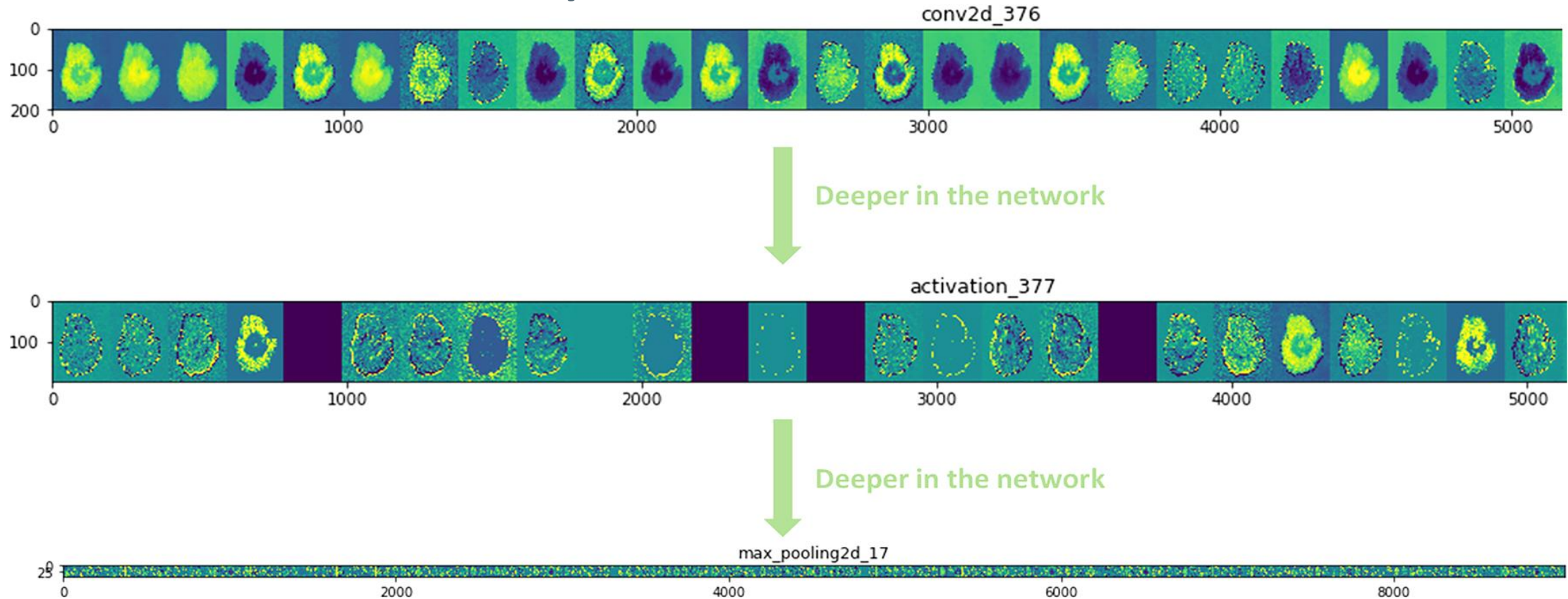
Label as a separate data table  
(may include auxiliary data  
supporting age estimation)



Annotated photo of surface and baked halves of an otolith collected in 1926

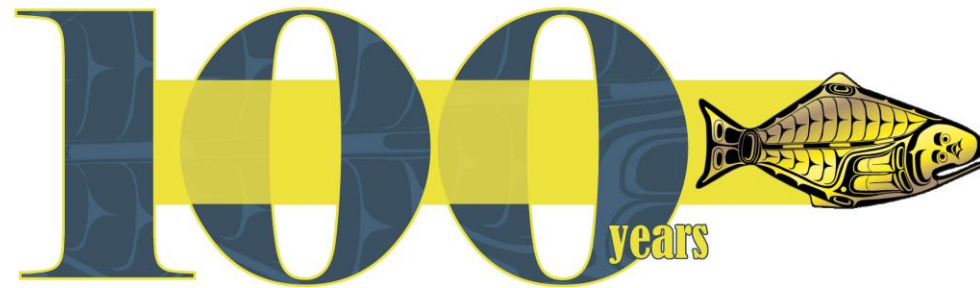


# Convolutional layers



Features of an otolith image identified through the Inception V3 network layers – example (Greenland halibut)

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