Photography and ichthyology

Content

A. Use of pictures in ichthyology

B. Getting started …

C. Taking pictures in the lab

D. Taking pictures in the field

E. Pictures in FishBase

F. Geometric morphometrics

A. Use of pictures in ichthyology

« an illustration is worth more than 1,000 words »

- **For first (quick) identification** (family>genus>species)
  - External characteristics (body shape, fins, barbels, lips, mouth, color, …)

- **For research purposes**
  - Biomechanics/anatomy: staining
  - Taxonomy: X-ray
  - Taxonomy: geometric morphometrics

- **For documentation purposes** (digital collection databases, BMNH, MNHN, CAS, …)

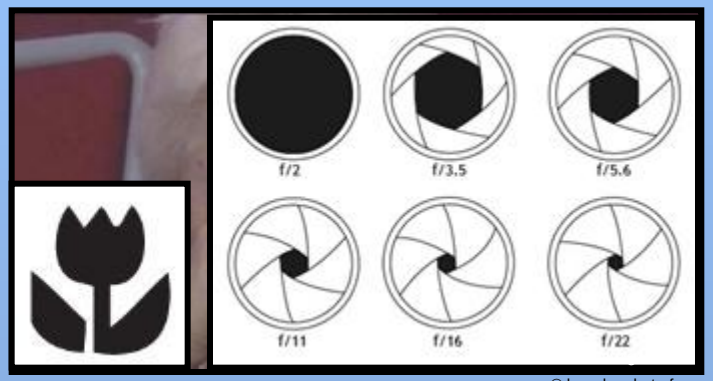
- **To make article, poster, presentation, … visually more attractive**

➔ **ease to share, transport and preserve!**

B. Getting started …

- **take time to figure out how your camera works** (read user guide)

- **try to use other mode than Auto Mode (M, P, Av, Tv) and understand function of** :
    - aperture (f/ value)
    - shutter speed
    - ISO speed
    - close-up



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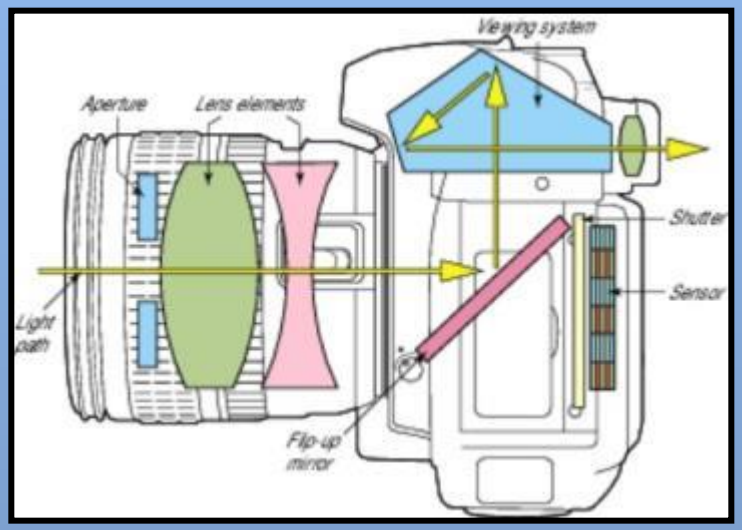
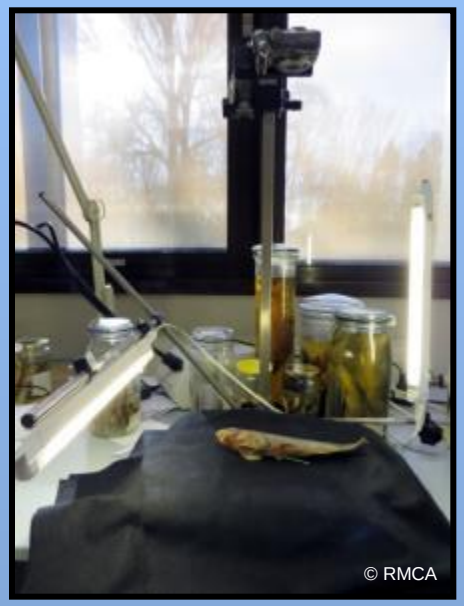



© RMCA

C. Taking pictures in the lab (preserved)

- **Equipment**
  - camera
  - tripod
  - uniform background
  - needles
  - tweezers
  - towel
  - scale (graph paper, ruler, …)
  - notebook



- **Important**
  - use natural light (no direct sunlight)
  - pat specimen to avoid reflections
  - take picture of label
  - take series of pictures with different shutter speeds and apertures
  - use a unique code:
    - MRAC **73-39-P-1897-904** 1b
    - Syntype MNHN 1924-52 2c
  - be consequent: left lateral side

D. Taking pictures in the field (alive/dead)

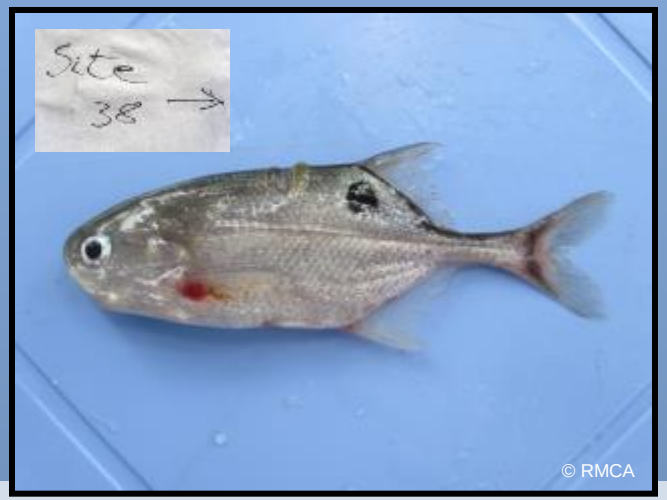
- **Advantages:** live color (if fresh), form, fins, …

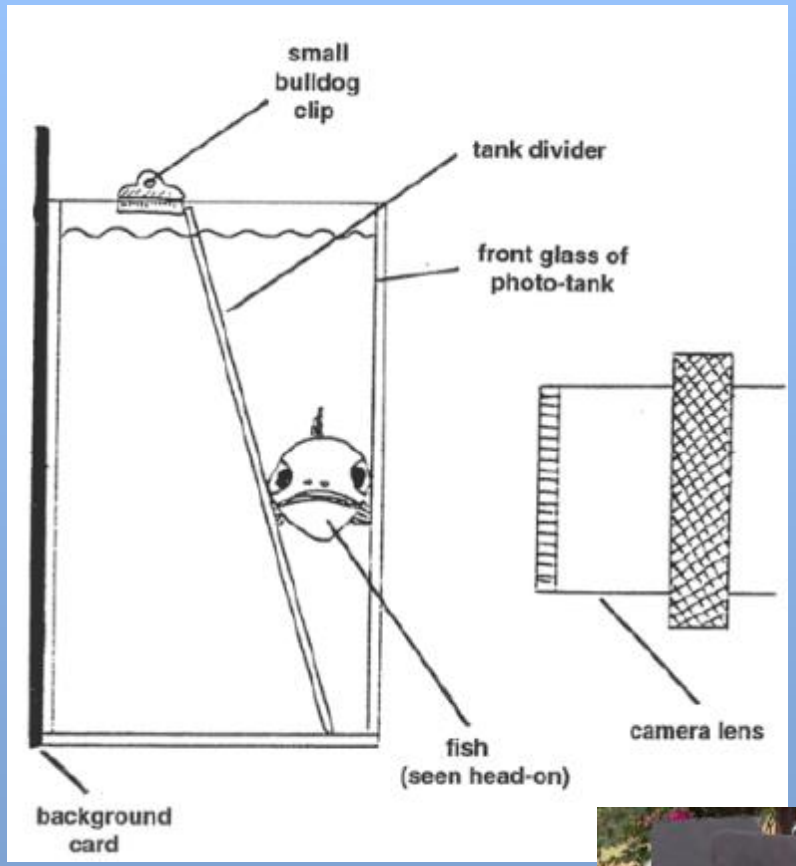
- **Equipment**

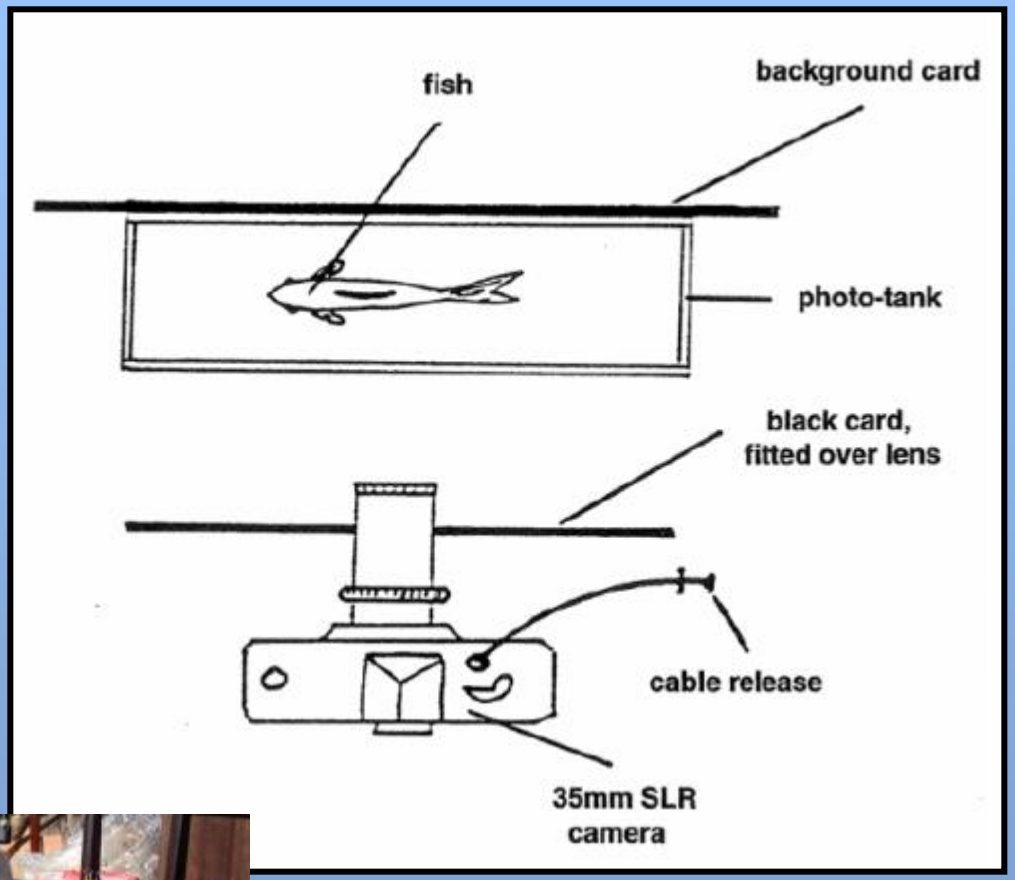
  - camera, memory card, batteries, …
  - (tripod)
  - small aquarium for living specimens
  - uniform background (towel, table, canvas, …)
  - scale,
  - towel
  - …

- **Important**

  - select specimens in good condition and of different sizes if possible
  - stretch fins
  - take close-up of barbels, head, mouth, fins, …
  - label specimens (locality, date, …)
  - use flash only if unavoidable
  - do not forget a picture of sampling locality

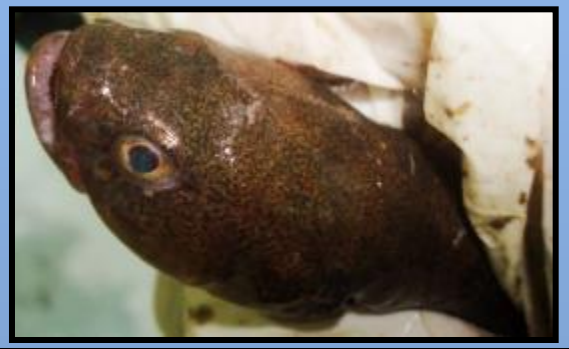








What's wrong with these pictures?




More information?

- Taylor, W. R. and Van Dyke, G. C. (1985). Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybium* **9(2):** 107-119.

https://www.youtube.com/watch?v=haopSRCuPdo#t=42

Coad. B.W. (1998). Expedition Field Techniques. Fishes (pdf available on internet)

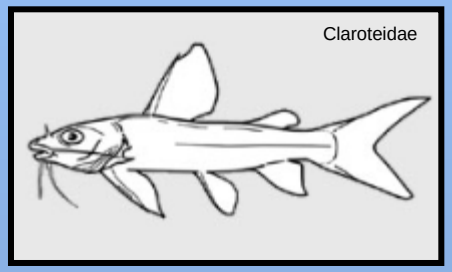
E. Pictures in FishBase

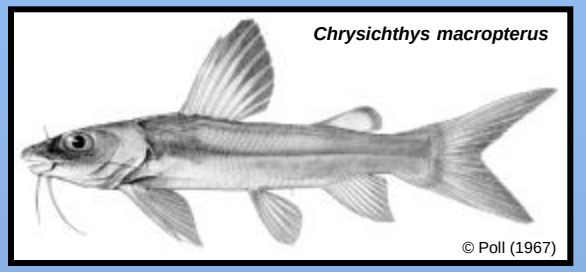
- **about 55.900 pictures in FishBase**
  - Family pictograms, drawings, sketches, live specimens, preserved specimens, stamps, …

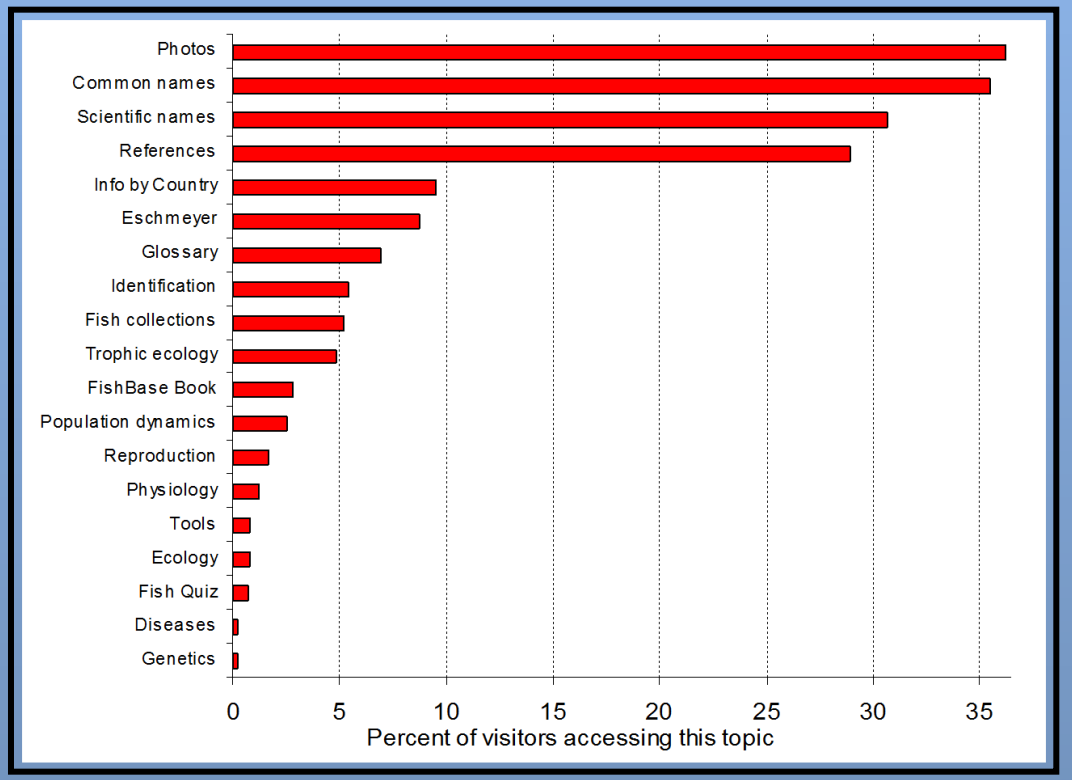
- **photos are very popular**

- **objective is to have, for each species in FishBase,**
  - a morphological drawing
  - a picture of a preserved specimen
  - a picture/drawing of a living specimen
  - an underwater picture of a specimen in its natural habitat

- **How can you contribute?**







June-August 2009

Species Summary Page

About this page | Languages | User feedbacks | Citation | Uploads | Related species

Like 0

Attach website
Upload photo
Upload video
Upload references
Fish Watcher

Bathybagrus sianenna (Boulenger, 1906)

Upload your photos and videos

Pictures | Google image

Bathybagrus sianenna

Picture by de Vos, L.

observation in Fish Watcher

age | All suitable habitat | PointMap

This map was computer-generated and has not yet been reviewed.

Bathybagrus sianenna AquaMaps Data sources: GBIF OBIS

Classification / Names

Common names | Synonyms | Catalog of Fishes (gen., sp.) | ITIS | CoL | WoRMS | Cloffa

Actinopterygii (ray-finned fishes) > Siluriformes (Catfish) > Claroteidae (Claroteid catfishes) > Claroteinae

Etymology: *Bathybagrus:* Greek, bathys = deep + Greek, pagros = a fish (Dentex sp.) (Ref. 45335).

Environment / Climate / Range

Ecology

Freshwater; demersal, usually 25 - 75 m (Ref. 36901). Tropical; 3°S - 9°S

Size / Weight / Age

Maturity: L_m ? range ? - ? cm

Max length : 23.0 cm SL male/unsexed; (Ref. 3236)

Distribution

Countries | FAO areas | Ecosystems | Occurrences | Point map | Introductions | Faunafri

Africa: widely distributed in Lake Tanganyika (Ref. 36901, 75075, 78218), occurs in deltas of Malagarasi and Rusizi Rivers (Ref. 36901) and also found in the Lower Malagarasi River (Ref. 54847).

FishBase Upload your photos here!

Species: *Bathybagrus sianenna* **Family: Claroteidae (Claroteid catfishes)**

You can now easily upload your fish photos to FishBase. Just fill up the form below and click 'Submit'. Successfully uploaded photos will be included in the photo page for this species. Please include your email if you want to be contacted by FishBase concerning this activity.

Picture Info	
*Select picture:	Browse... *max file size is 2MB
*Country:	(where photo was taken)
Locality, date, length:	
Provider Info	
*Name:	
E-mail address:	Uncheck to hide email address. We encourage you to include your email address for our record

Copyright (Select copyright applying to your uploaded photo:)

- CC-BY (Image can be freely copied and altered, as long as original author and source are properly acknowledged.)
- CC-BY-NC (Image can be freely copied and altered but may be used only for non-commercial purposes. Original author and source must be properly acknowledged)
- All Rights Reserved (Image may not be used for any purpose without permission from the copyright holder.)

NOTE: When no copyright is selected above, picture will fall under 'All Rights Reserved' license by default. All photos uploaded in the past will remain as they are, without copyright terms showing under the photo.

Optional: If you are a FishBase collaborator, you may enter your collaborator ID number here (please note this is not referring to the FishWatcher ID number). This will help link this record to your existing records in FishBase.
FB Collaborator ID:

Submit *Required information

Check list of species with missing pictures here. << Back | Go to FishBase

For comments, corrections please contact Aque Atanacio.

Information by Family

Mormyridae

- Family info.
- All fishes
- Nominal species
- Identification by pictures
- List of pictures
- Identification keys
- References (FishBase)
- Missing photos
- Stamps and coins
- Graphs
- Species Ecology Matrix

Mormyrus kannume

List of Pictures Available for Family *Mormyridae* (Elephantfishes)

Show photos n = 65

Scientific Name	English Name	Picture	Photographer	Locality
Boulengeromyrus knoepffleri			Hopkins, C.D.	Ivindo
Brienomyrus brachyistius			RMCA	
Brienomyrus longianalis			RMCA	
Campylomormyrus alces			Hippocampus-Bildarchiv	
Campylomormyrus bredoi			Feulner, F.	
Campylomormyrus cassaicus			Hippocampus-Bildarchiv	
Campylomormyrus christyi			RMCA	
Campylomormyrus christyi			RMCA	
Campylomormyrus curvirostris			Feulner, F.	
Campylomormyrus elephas			Germeau, G./ Doumont, Y.	
Campylomormyrus luapulaensis			Feulner, F.	
Campylomormyrus mirus			Feulner, F.	
Campylomormyrus numenius			Feulner, F.	
Campylomormyrus rhynchophorus			AquaNet	
Campylomormyrus rhynchophorus			Hippocampus-Bildarchiv	

Information by Topic

Trophic ecology
- Diet
- Food items
- Food consumption
- Ration
- Predators

Physiology/Behavior
- Metabolism
- Gill area
- Brains
- Vision
- Fish sounds
- Swim. speed

Life history
- Growth
- L-W relationship
- Length frequencies
- Recruitment
- Reproduction
- Maturity
- Spawning
- Fecundity
- Eggs
- Egg dev.
- Larvae
- Larval dynamics
- Abundance

Uses
- Aquaculture
- Aquaculture profiles
- Introductions
- Diseases
- Ciguatera
- Processing
- Ecotoxicology
- Genetics
- Allele frequencies
- Heritability
- Otoliths
- Mass conversion

Miscellaneous
- Treaties & Conv.
- CITES
- CMS
- National databases
- Names by Language
- Collaborators
- Public aquariums
- Expeditions
- Video
- Fish stamps and coins
- Uploaded photos online
- Editor messages

Tools

- Quick Identification
- Identification keys
- Identification by morphometrics
- Adverse introductions
- Global introductions
- Invasiveness
- Species by ecosystem
- Graphs
- SeaFood Advisory
- Shifting Baselines WP2 - Online Toolset
- Preferred algae/plants of herbivorous fishes
- Match names
- Disease diagnosis
- My Fish Page

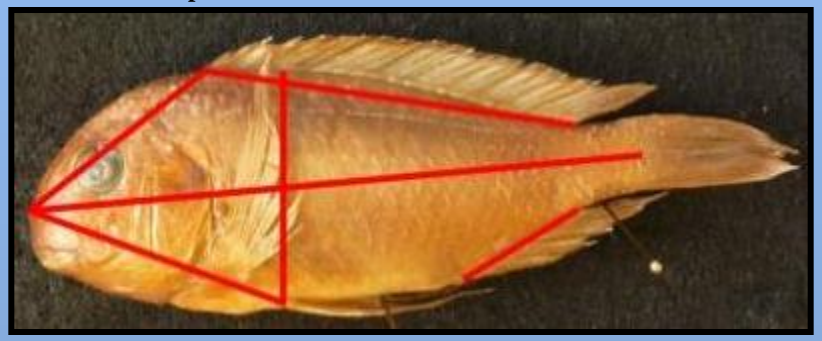
Life-history tool
- L-F Analysis
- Information gaps
- Sea Around Us
- ISSCAAP Troph
- FAO aquaculture
- FAO catches
- Catch analysis
- ICES catch
- Catch-MSY
- Classification List
- Classification Tree
- Fish statistics
- World records
- Country codes
- Catalogue of Life
- Fish collections
- Collection History
- Trophic pyramids
- Ecopath parameters
- AquaMaps
- New species in FishBase
- New species in Welt der Fische
- New photos
- Web Stats
- Top 100
- Coastal Transects Analysis Model (CTAM)

F. Geometric morphometrics

- **Discipline to study and analyse the shape of a structure**

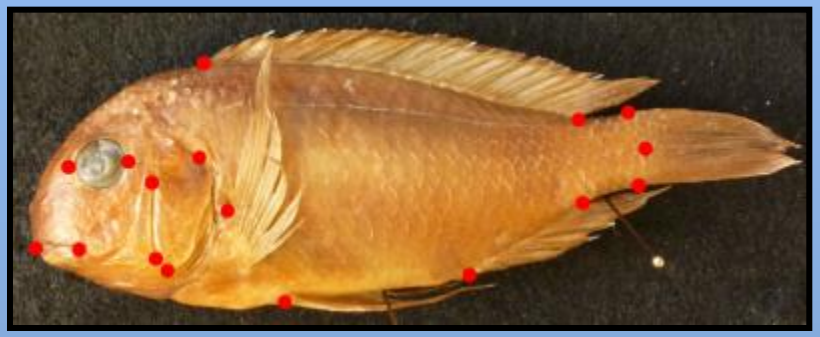
- **Captures geometry (shape) of morphological structures and preserves this information throughout analyses**

Traditional morphometrics



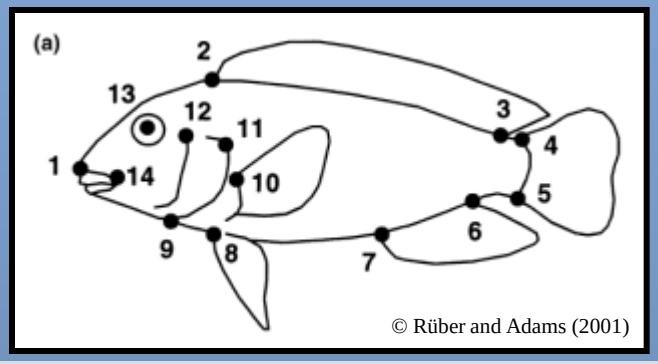
Linear distance measurements + multivariate statistical analyses (e.g. PCA)

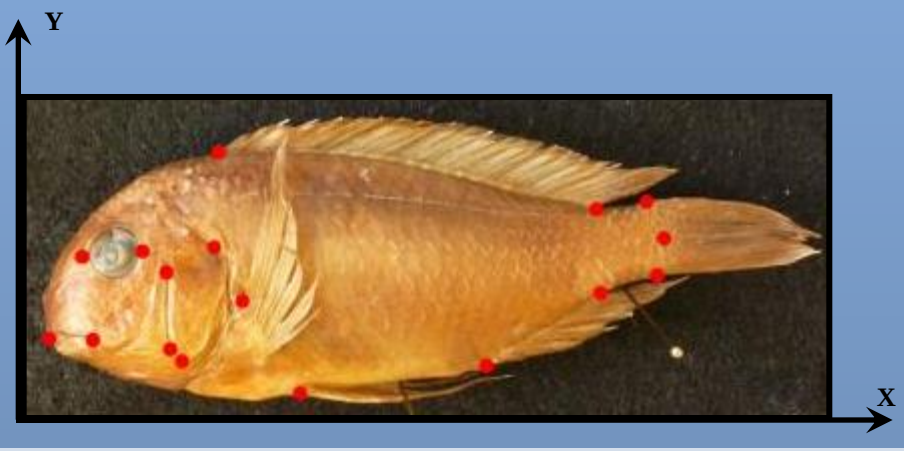
Geometric morphometrics



Landmarks + multivariate statistical analyses (e.g. PCA)

- **Method:**
  - define points of interest on studied structure
  - mark points with landmarks (homologous points)
  - obtain coordinates in 2D (x, y) or 3D (x, y, z) using appropriate software





F. Geometric morphometrics

- eliminate effects of position (transition), scale and orientation (rotation) (non-shape variables) using Bookstein's shape coordinates OR Generalized Procrustes analysis (GPA)

  ➔ superimposing landmark configurations allows objective comparison between different forms






Procrustes superimposition

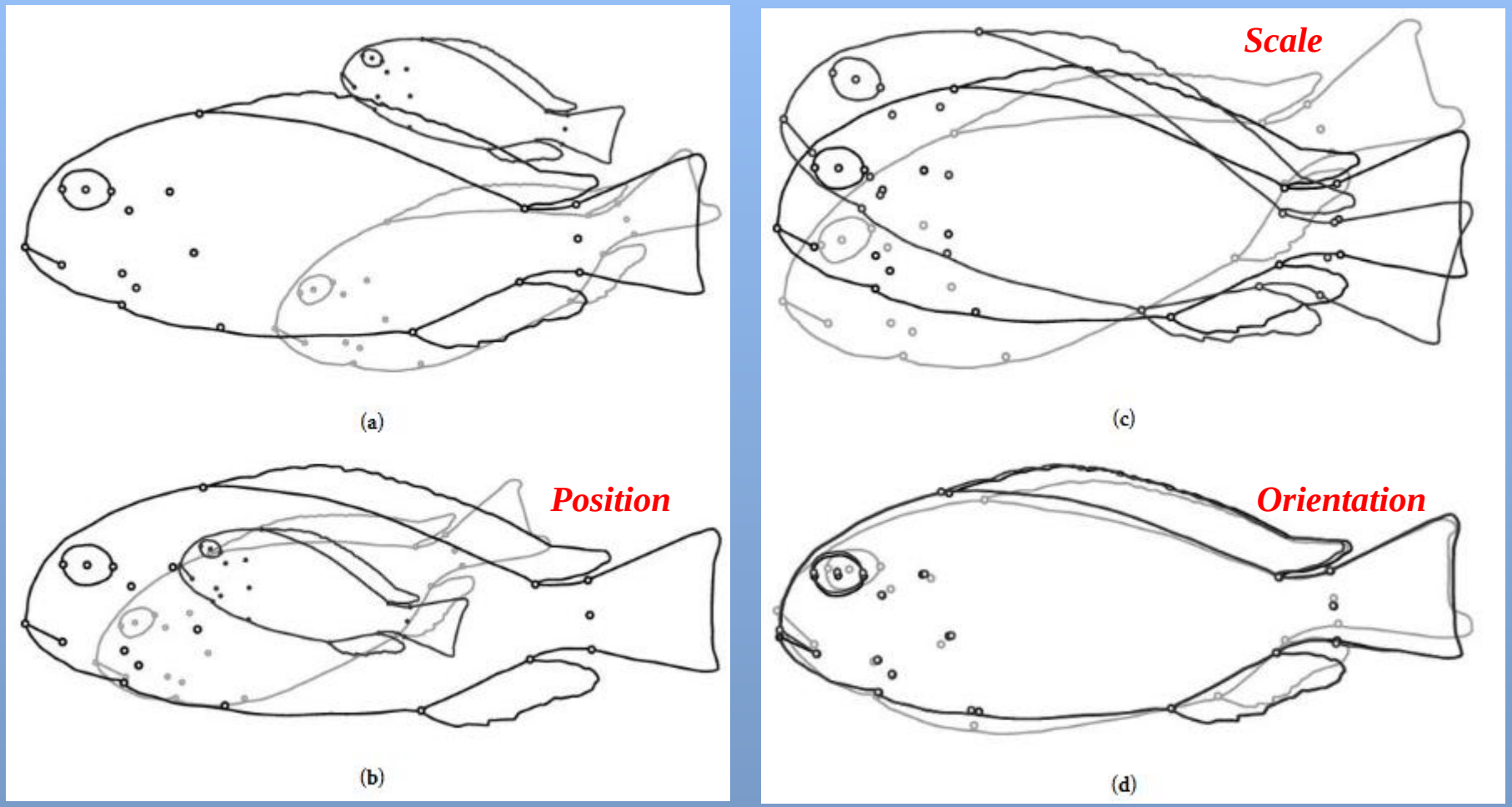
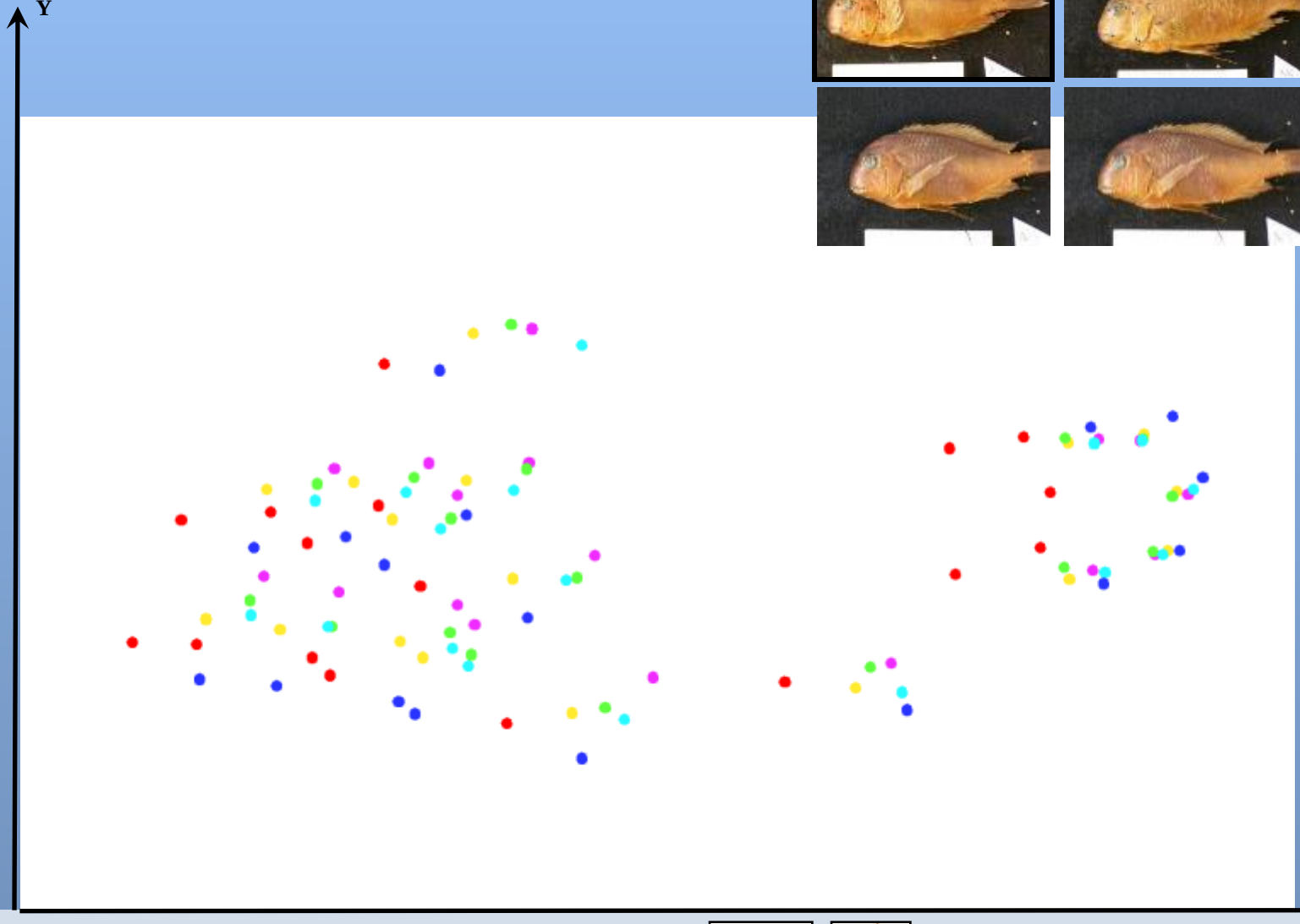


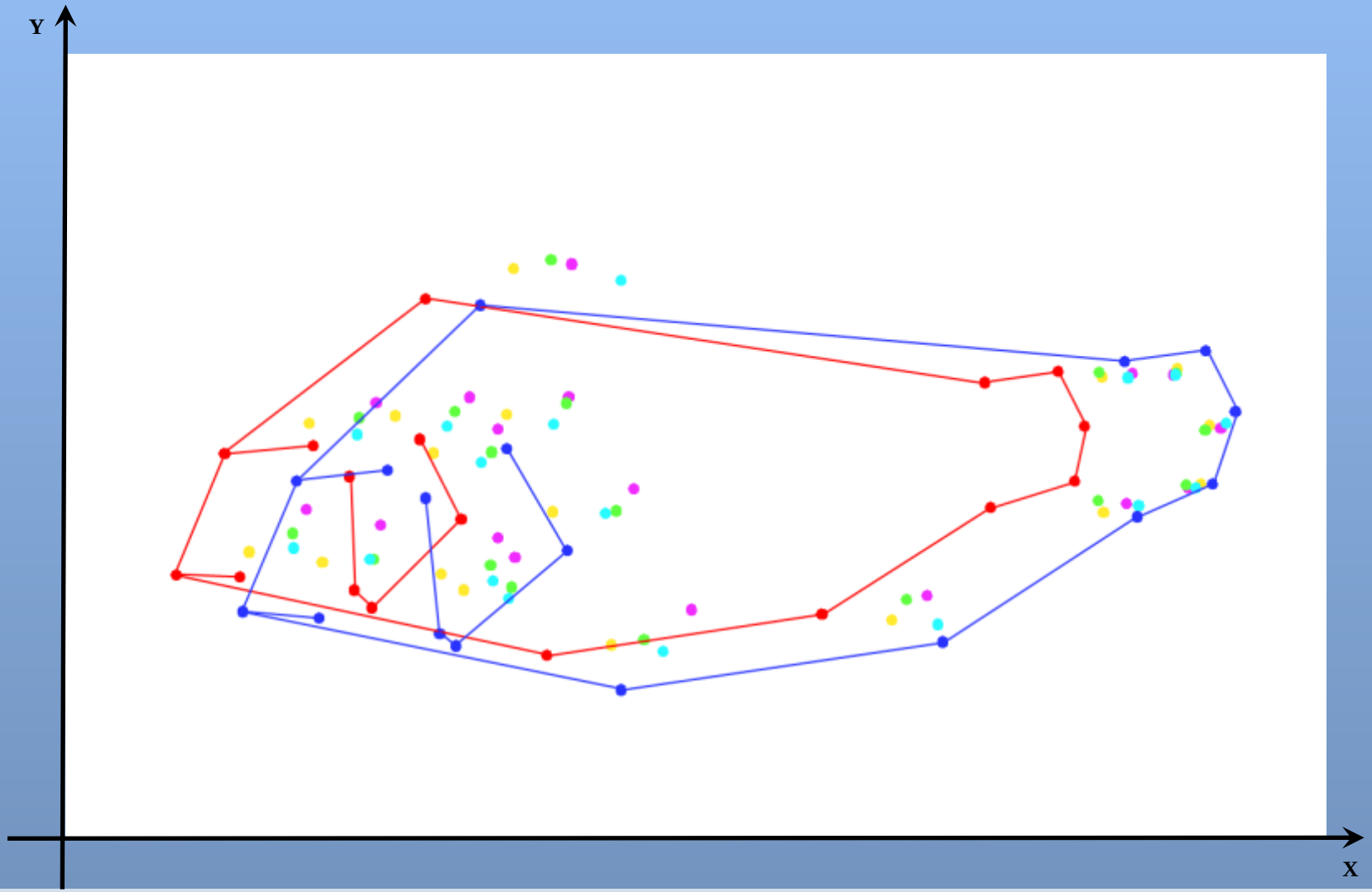
Figure 2: Illustration of the Procrustes superimposition of the (a) original configuration (raw coordinates). (b) First, the centroid of each configuration is translated to the origin. (c) After that, configurations are scaled to a common unit size and (d) optimally rotated to minimize the squared differences between corresponding landmarks.

F. Geometric morphometrics



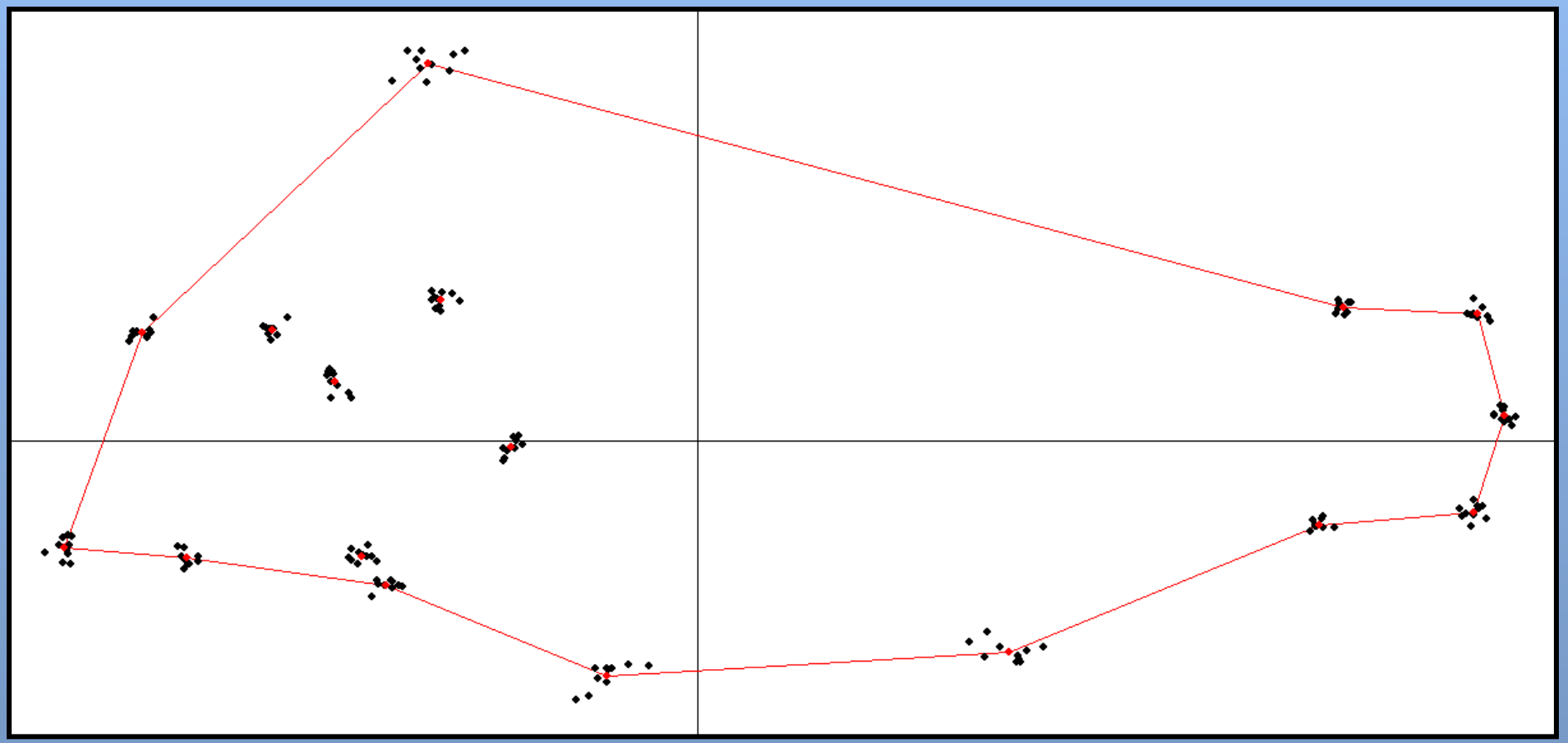
- Aligned coordinates of 6 populations projected

F. Geometric morphometrics



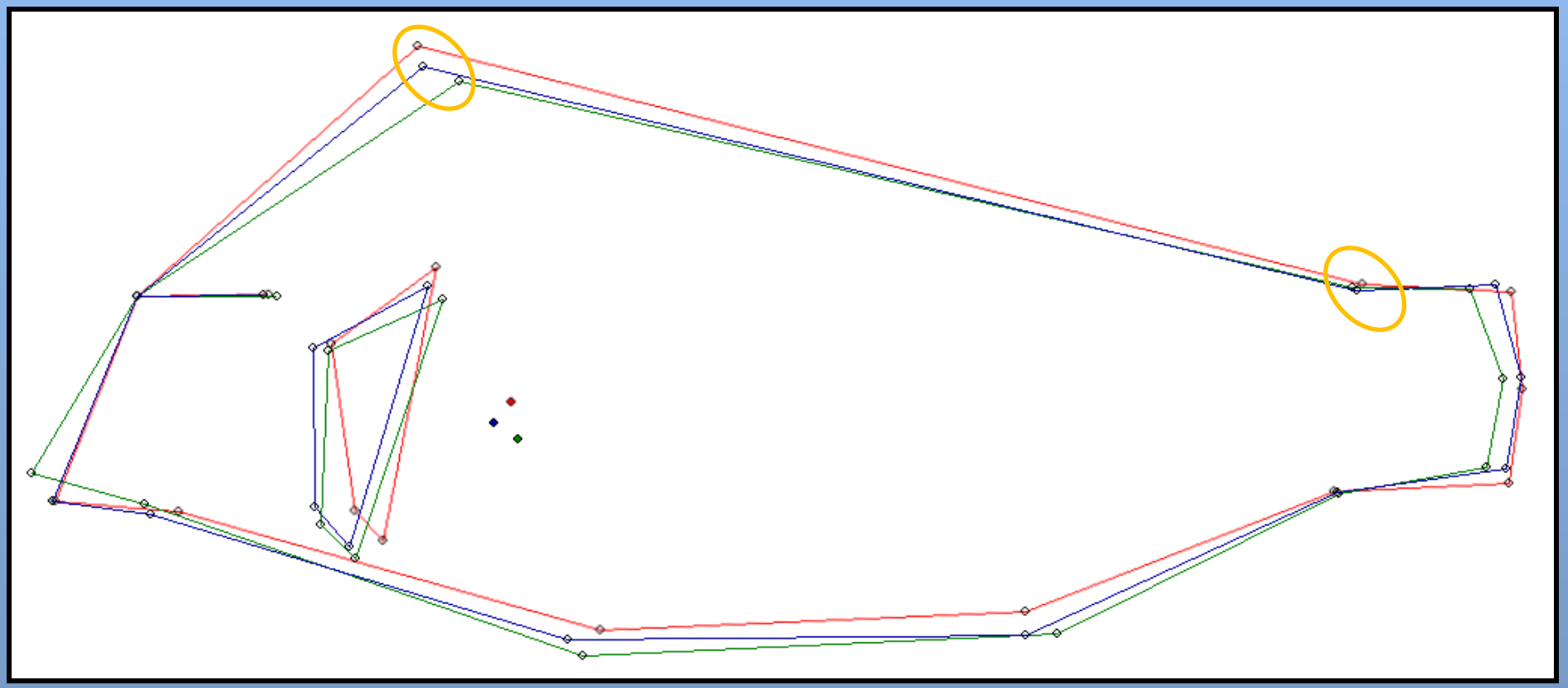
F. Geometric morphometrics

- Consensus for different specimens of 1 population



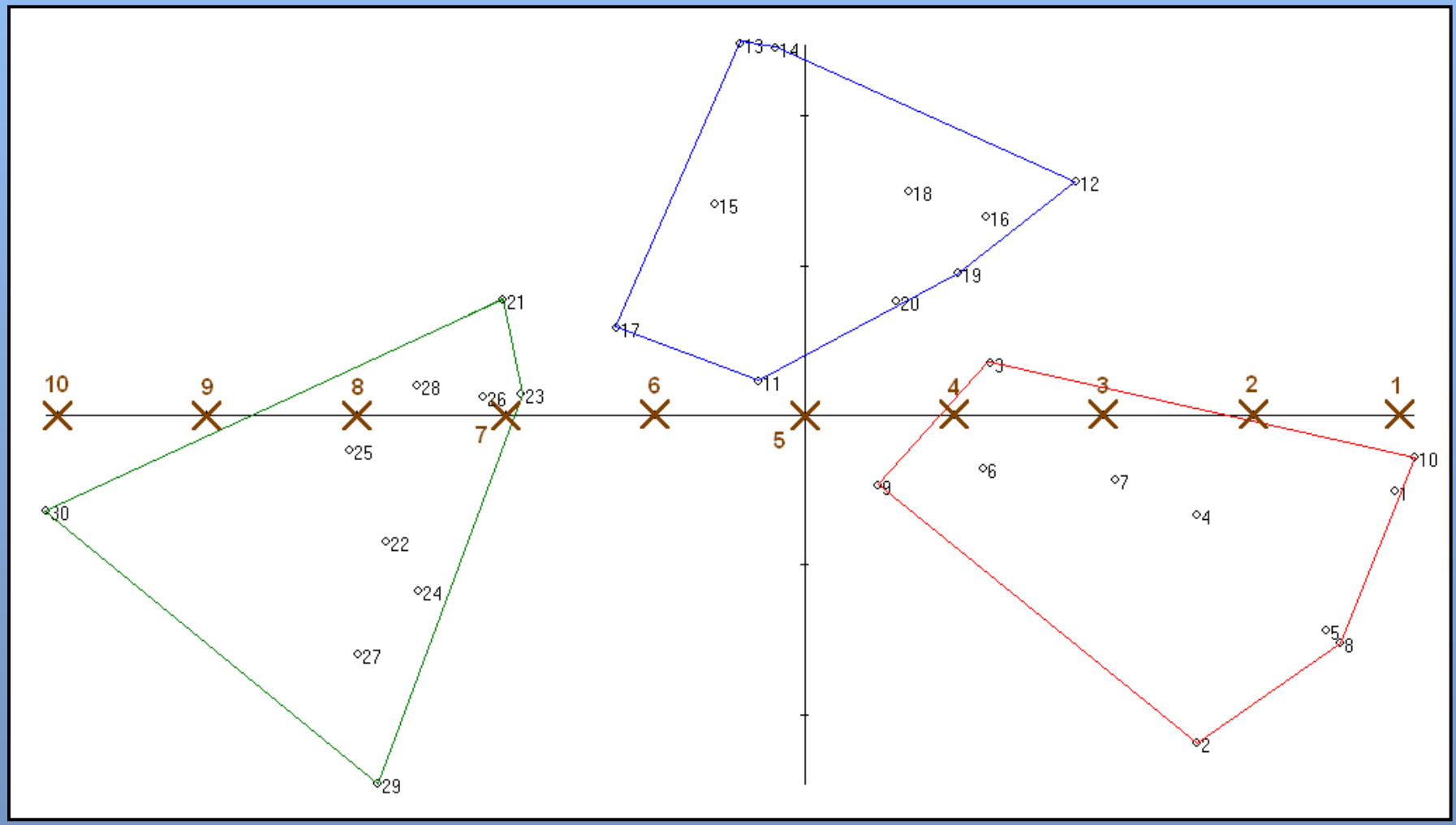
F. Morphométrie géométrique

- Consensus for three populations of the same species
- Differences in coordinates of corresponding landmarks are then used to describe shape differences using multivariate analysis



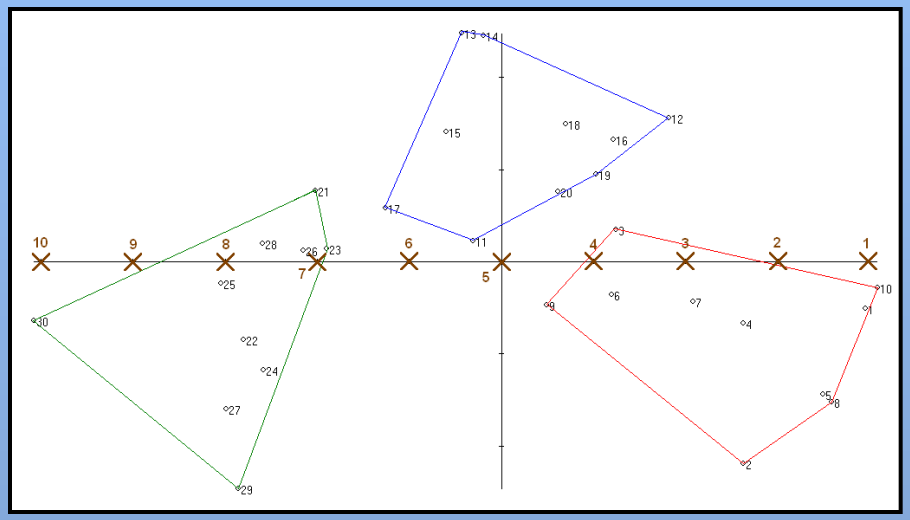
F. Morphométrie géométrique

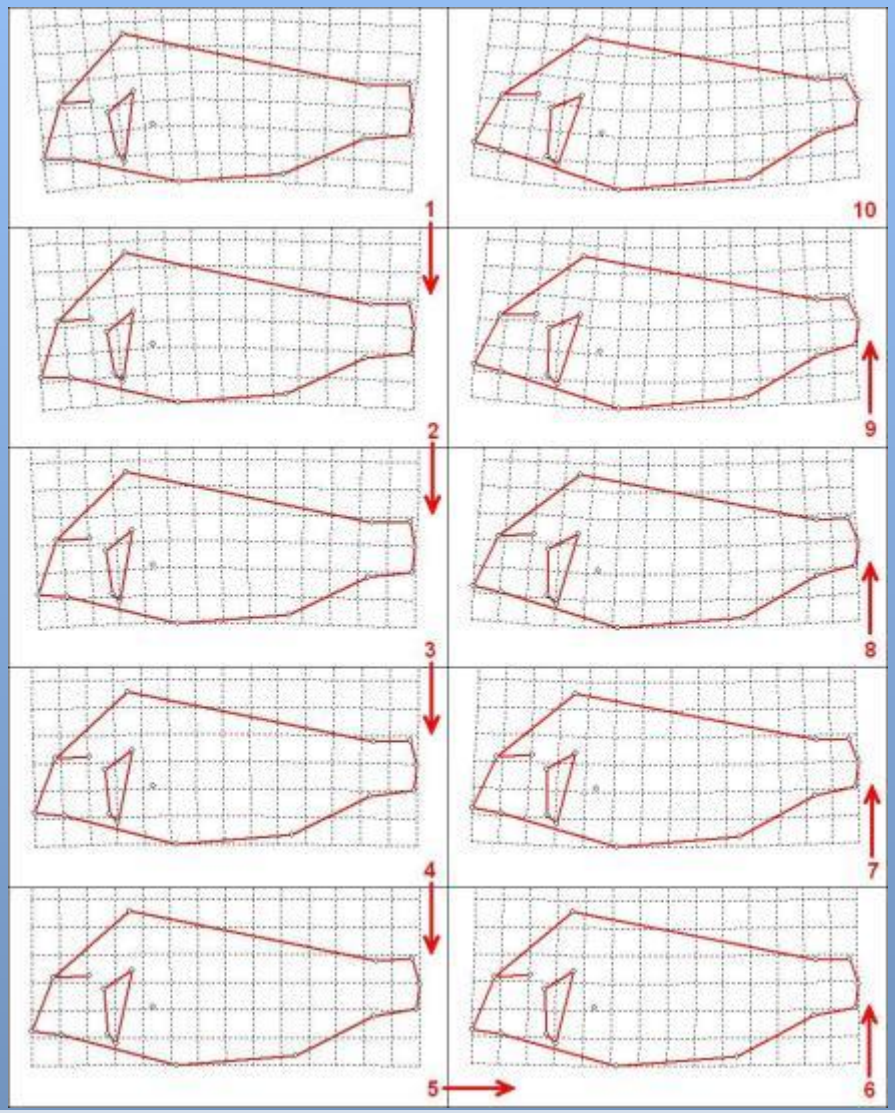
- PCA of the coordinates (specimens of three populations)



F. Geometric morphometrics

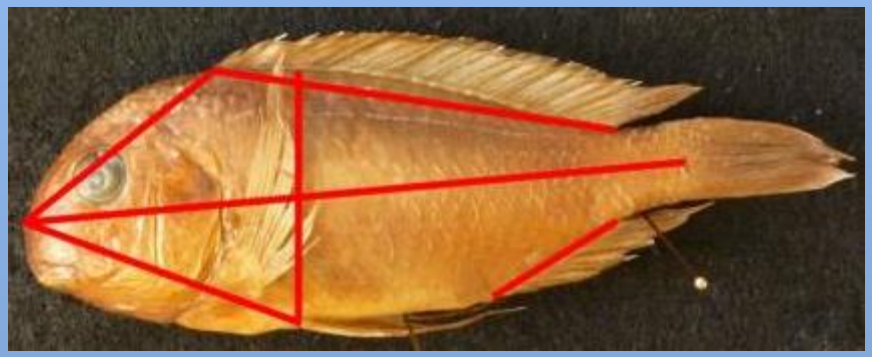
- **Visualisation of results**

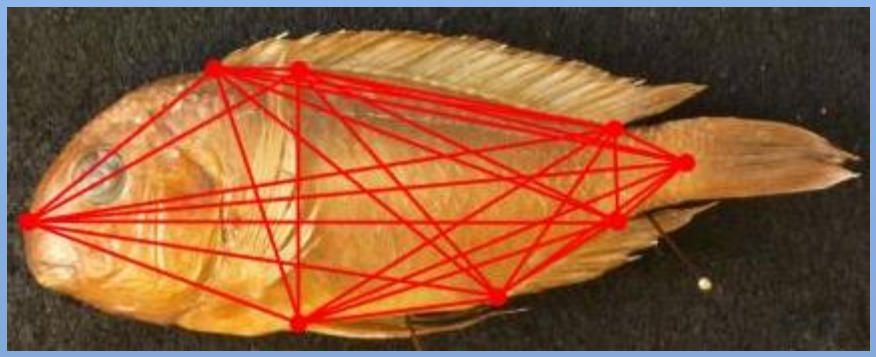




F. Geometric morphometrics

- **Advantages:**
  - relatively simple: selecting and indicating points on digital photos
  - possible to retrieve and analyze more information on shape while reducing the number of variables



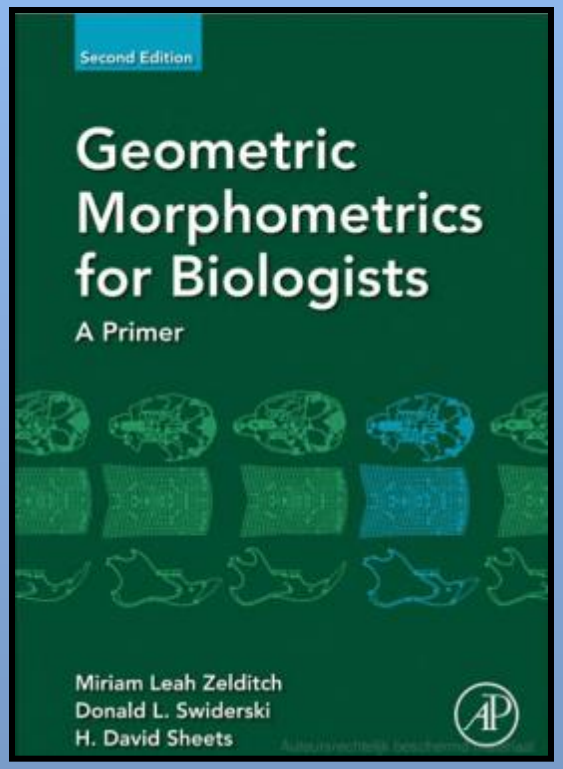


  - visualisation of differences between species, populations, etc.

- **Disadvantages:**
  - selection, definition and application of landmarks need to be precise, but not always possible (effects of conservation, soft tissues, …)
  - analysis of coordinates, not measurements
  - allometry: information on size is absent despite its biological importance

More information?

- Method was developed at the Stone Brook University in New York (SUNY) (search « Morphometrics @ SUNY » in Google)
- Articles, books, presentations by Dany Spencer Adams, F. James Rohlf, Dennis E. Slice, etc.
- http://www.indiana.edu/~g562; http://life.bio.sunysb.edu/morph



A Practical Companion to Geometric Morphometrics for Biologists:

Running analyses in freely-available software

Miriam Leah Zelditch, Donald L. Swiderski, and H. David Sheets

SAGE-Hindawi Access to Research
International Journal of Evolutionary Biology
Volume 2011, Article ID 290245, 8 pages
doi:10.4061/2011/290245

Review Article

The Utility of Geometric Morphometrics to Elucidate Pathways of Cichlid Fish Evolution

Michaela Kerschbaumer and Christian Sturmbauer

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Ital. J. Zool., 71: 5-16 (2004)

Geometric morphometrics: ten years of progress following the 'revolution'

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Evolutionary convergence of body shape and trophic morphology in cichlids from Lake Tanganyika

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