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# Getting More From Image Libraries – New Computer Vision Tools

John La Salle

**NCRIS**

National Research  
Infrastructure for Australia

An Australian Government Initiative



ATLAS OF **LIVING**  
**AUSTRALIA**  
sharing biodiversity knowledge

## Specimens images from Australia's Natural History collections

Images from Australian Natural History collections made available by the museums and herbaria of Australia. To view images from all collections, [click here](#).

### South Australian Museum Terrestrial Invertebrate Collection

South Australian Museum



The collection has Australia-wide and Indo-Pacific representation, plus some world specimens for comparative purposes.

### Australian National Insect Collection

Commonwealth Scientific and Industrial Research Organisation



The Australian National Insect Collection is recognized both nationally and internationally as a major research collection.

### Museum Victoria Ornithology Collection

Museum Victoria



The Ornithology Collection contains more than 70 000 specimens of mounted birds, skins, skeletons, eggs and specimens preserved in alcohol. One of the largest Australian avian collections, primarily of Australian species and with a strong Victorian emphasis, it includes material from a broad spectrum of the world's avifauna and represents in excess of 4000 species.

### Australian Museum Entomology Collection

Australian Museum



### Museum Victoria Entomology Collection

Museum Victoria



### Australian Museum Marine Invertebrate Collection

Australian Museum



# Specimen images from South Australian Museum Terrestrial Invertebrate Collection

Clear filters

## Taxonomy

- Kingdom: ANIMALIA
- Phylum: ARTHROPODA
- Class: INSECTA
- Order
- COLEOPTERA (1983)
- HEMIPTERA (1421)
- HYMENOPTERA (101)
- LEPIDOPTERA (433)
- MANTODEA (36)
- NEUROPTERA (30)

## Types

- allotype (126)
- cotype (17)
- holotype (1547)
- lectotype (152)
- paralectotype (17)
- paratypes (68)
- syntype (386)
- type (598)
- all values

## Sex

- U (1857)
- M (643)
- F (382)
- Unknown (144)
- Unsexed (91)
- Male (39)
- Female (34)
- u (5)
- 2 (4)
- M,F (4)
- m (3)
- 3 (2)
- 4 (1)
- 5 (1)
- 7 (1)
- 8 (1)

4329 images are available.



## Images of 25 species from family: **TEPHRITIDAE**



False Oriental Fruit Fly  
*Bactrocera (Bactrocera) opillae*



Bitou Bush Seed Fly  
*Mesoclanis polana*



Asian Papaya Fruit Fly  
*Bactrocera (Bactrocera) papayae*



Mango Fly  
*Bactrocera (Bactrocera) frauenfeldi*



Cucumber Fruit Fly  
*Bactrocera (Aurodacus) cucumis*



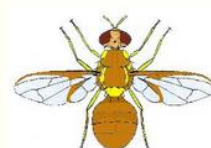
Medfly  
*Ceratitis capitata*



*Bactrocera (Bactrocera) torresiae*



*Acanthonevroides nigriventris*



Northern Territory Fruit Fly  
*Bactrocera (Bactrocera) aquilonis*



*Acanthonevroides jarvisi*



*Bactrocera (Bactrocera) bancroftii*



*Bactrocera (Bactrocera) speewahensis*



Noogoora Burr Seed Fly  
*Euaesta aequalis*



Queensland Fruit Fly  
*Bactrocera (Bactrocera) tryoni*



Banana Fruit Fly  
*Bactrocera (Bactrocera) musae*



*Calosphenisca uniceuneata*



*Clusiosomina puncticeps*



*Bactrocera (Bactrocera) mayi*



Spear Thistle Seed Fly  
*Urophora stylata*



Solanum Fruit Fly  
*Bactrocera (Bactrocera) cacuminata*



*Bactrocera (Bactrocera) nigrovittata*



Melon Fruit Fly  
*Bactrocera (Zeugodacus) cucurbitae*



Lesser Queensland Fruit Fly  
*Bactrocera (Bactrocera) neohumeralis*



Jarvis's Fruit Fly  
*Bactrocera (Bactrocera) jarvisi*



*Spathulina acroleuca*

[Load more images](#)

# LIBELLULIDAE

## Common Skimmers

Record a sighting Alerts

### Name source

[Australian Faunal Directory](#)

### Rank

Family

### Data links

LSID

JSON / WMS / RDF

### Species presence



Recorded In Australia



Terrestrial Habitats



Terrestrial Aquatic Habitats

Overview Gallery Names Classification Records Literature Sequences

## Specimen Images



*Brachydiplax denticauda*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma stenolaba*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma eurybia*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma stenolaba*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma eulia*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma stenolaba*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma virginia*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma aquililia*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma liberata*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma basilaris*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma lacerata*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma transmarina*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma loewi*  
Commonwealth Scientific and Industrial Research Organisation



*Trapezostigma roseleni*  
Commonwealth Scientific and Industrial Research Organisation

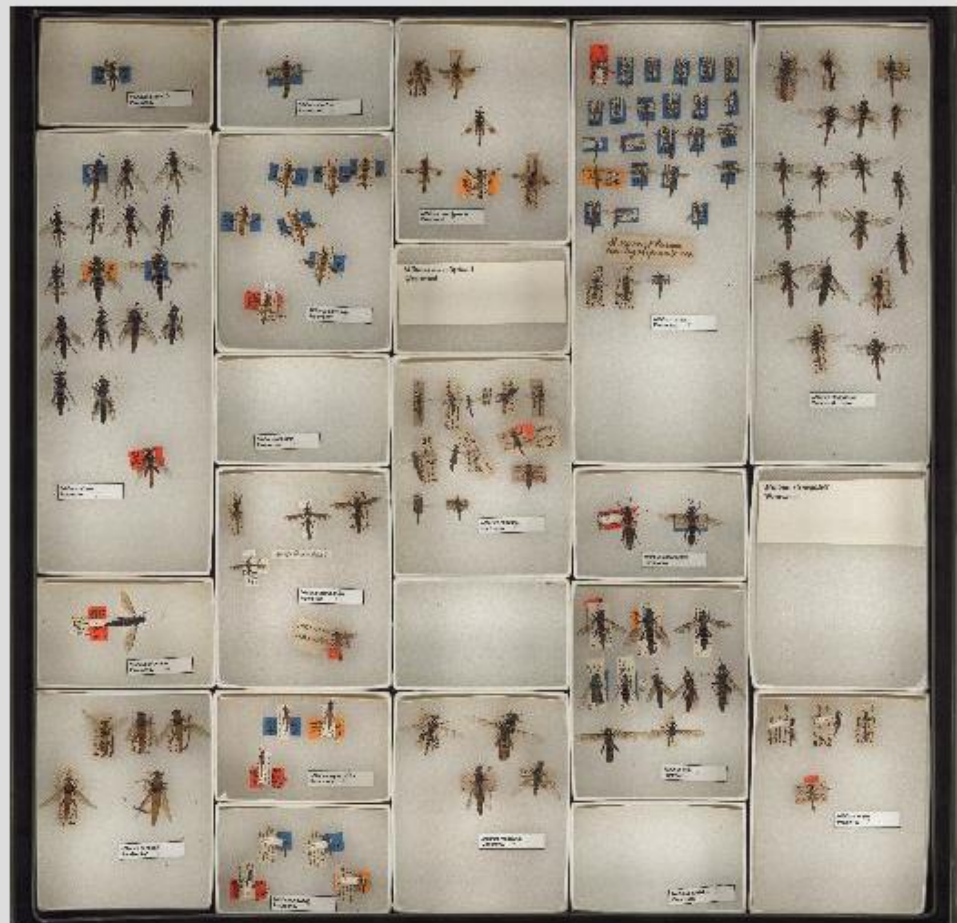


*Trapezostigma euroyele*  
Commonwealth Scientific and Industrial Research Organisation



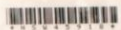
[Home](#) » [Image Details](#) » Viewing Image 4845307

Show subimages





NSW  
LOAN: 096/62



NSW  
LOAN: 099/49



NSW473233



Mr. Biggs paddock  
7/6/43

CONFIRMAVIT  
Seen for Flora of Australia  
Det. A.E. Holland (BRD) 21/11/1998

Seen for Flora of Australia ASTERACEAE  
*Hemistegia lyrata* (Bunge) Fisch. & C.A. Mey.  
Det. A.R. Bean (BRD) Oct. 2000

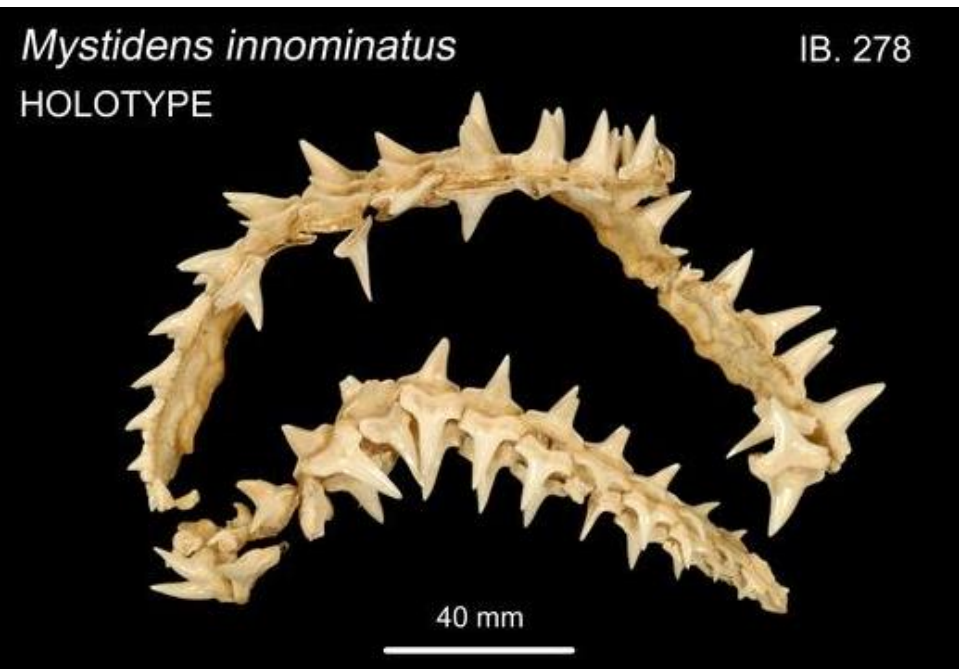
NSW DATA  
DATABASE

West side of the gulf

*Protoparce Cunninghamhamii*  
No. 42975  
[From map of route in Barrowmanus + Cramp,  
School Atlas, this colln. would date from 1944-5]  
Dr. Leckhardt.

Biggs Creek and  
paddock  
11/6/43

NSW473233  
*Synnotaxis Au-  
stralasica*  
first described  
*Saussurea carthamoides* Benth.  
Dr. Leckhardt.  
(27° 30' S 152° 45' E)

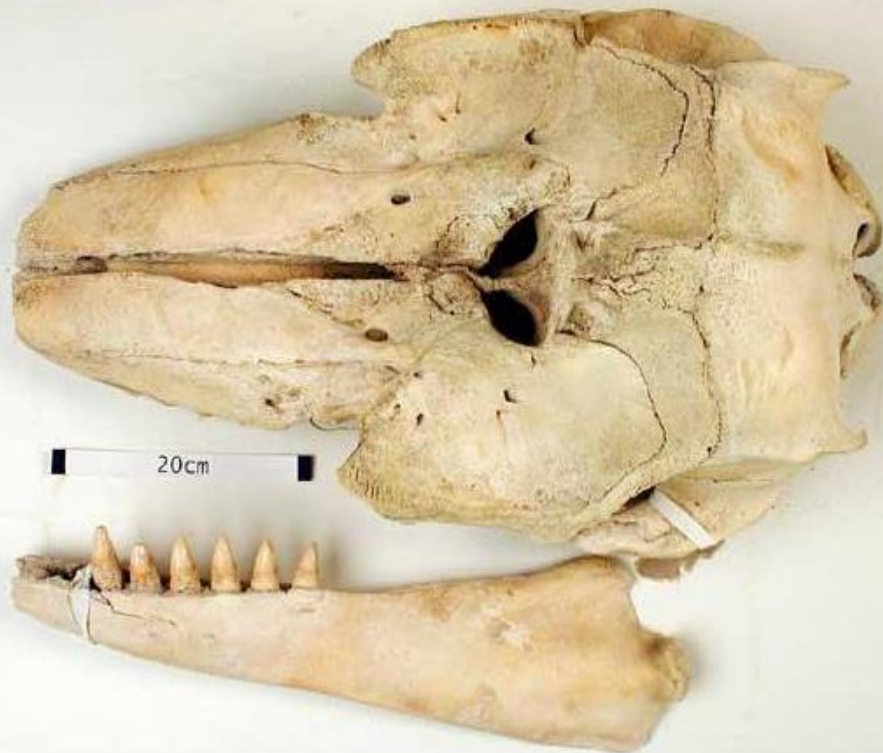




Syntype

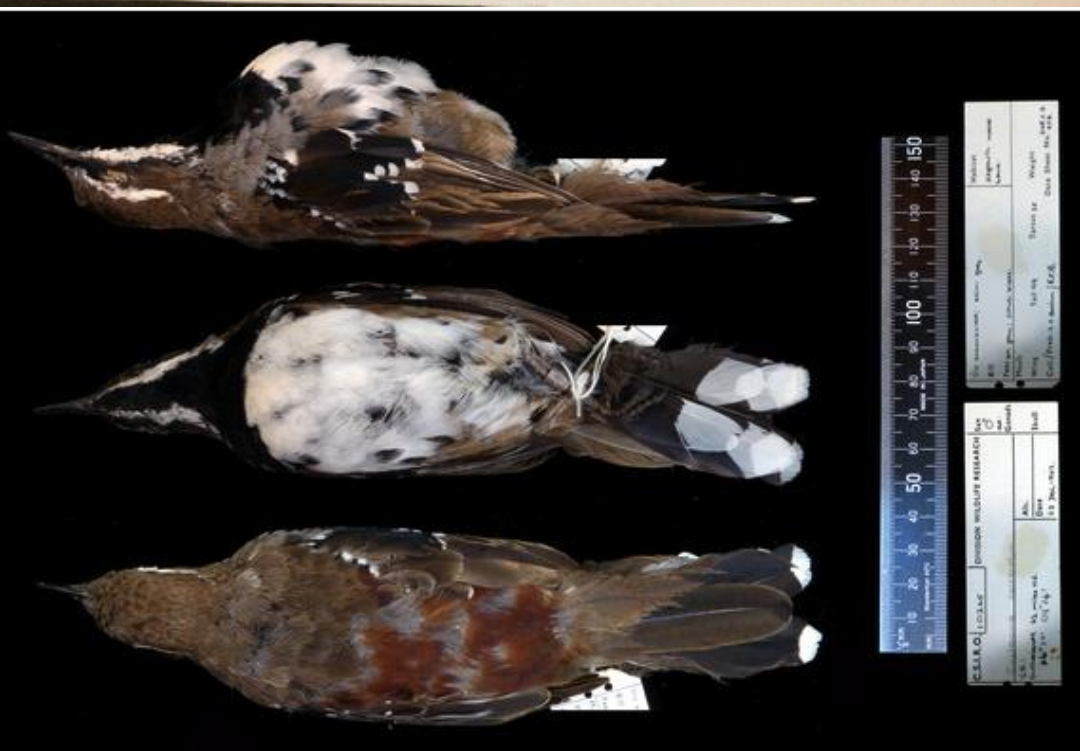
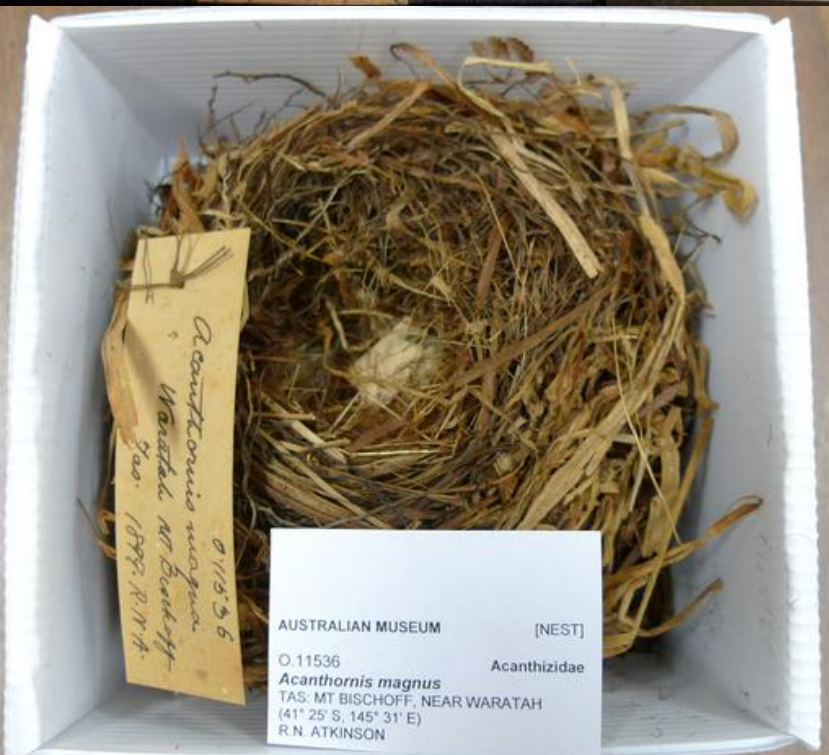
*Arctocephalus tasmanicus*

TMAG A808





QMO29676



Syntype  
*Trophon squamosissima*

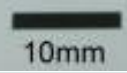


5 mm

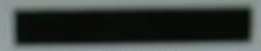
TMAG E164



*Calliostoma bellatrix*  
Holotype NTM P017143



10mm

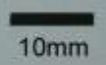


10mm



*Pyrene morisoni*  
Holotype NTM P016900

*Cymbiola bairdi*  
Holotype NTM R008918



10mm



Fig. 1



5 mm



2 mm

Fig. 1

*Leptothyra arenacea*  
Holotype

F 594



1 mm

## Extracting information from image libraries

1. No use having information libraries if you don't extract rich information from them ...
2. ... in a fashion that gives you the ability to store, manage, discover, **share and re-use** information associated with the images
3. Character matrix / trait bank (specimen and species level)

# Demo of true-color 3D insect models

3D models provided by [Chuong Nguyen](#) of [CSIRO Computational Informatics](#). The specimens were mostly from

This data set is provided to accompany the following paper:

Chuong Nguyen, David Lovell, Matt Adcock and John La Salle (2013) **Capture natural-colour 3D models of in**



This [YouTube video](#) describes the 3D insect scanning systems that created these 3D models.

This work is supported by [CSIRO Computational Informatics](#), [CSIRO Ecosystem Sciences](#), [Atlas of Living Australia](#)

Licence: 3D models are released under Creative Commons Attribution Licence.

Rights statement: All Rights (including copyright) CSIRO Australia 2013.

Contact: [Chuong Nguyen](#) of CSIRO Computational Informatics.

Note: 3D models were tested with Firefox 25.0 and Chrome 31.0. *Last update on 19 December 2013.*



Close

Annotations

Tools

[DEBUG] Event Test

[DEBUG] Texture Paint

Add Image

Add Viewpoint

Mark Body Part

Paint Highlight

Take Measurement

Collaboration

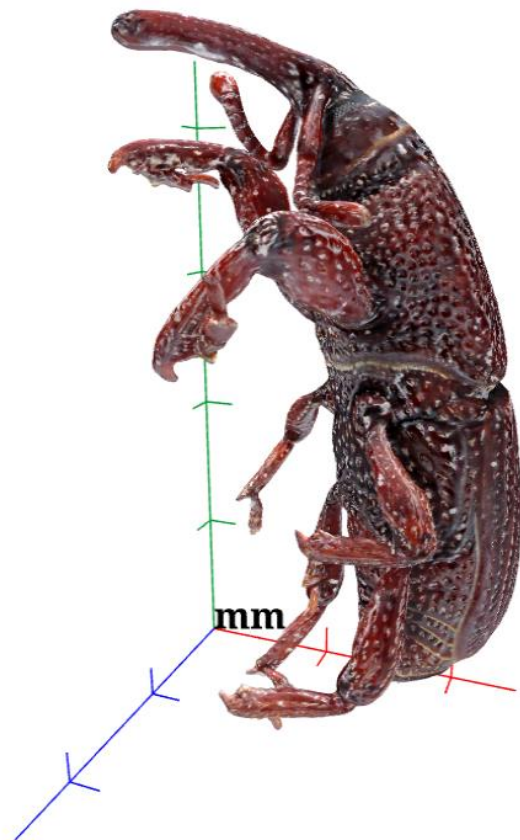
Model

Scale Bar

Lighting

Camera

Other





Close

Annotations

Enabled Labels

- eye viewpoint
- weevil eye SEM
- weevil eye - SEM

[elytra length sticky](#)  
Details: No Description

Type: Line

- Details
- Look At
- Remove

[body length](#)

Remove All

Browse

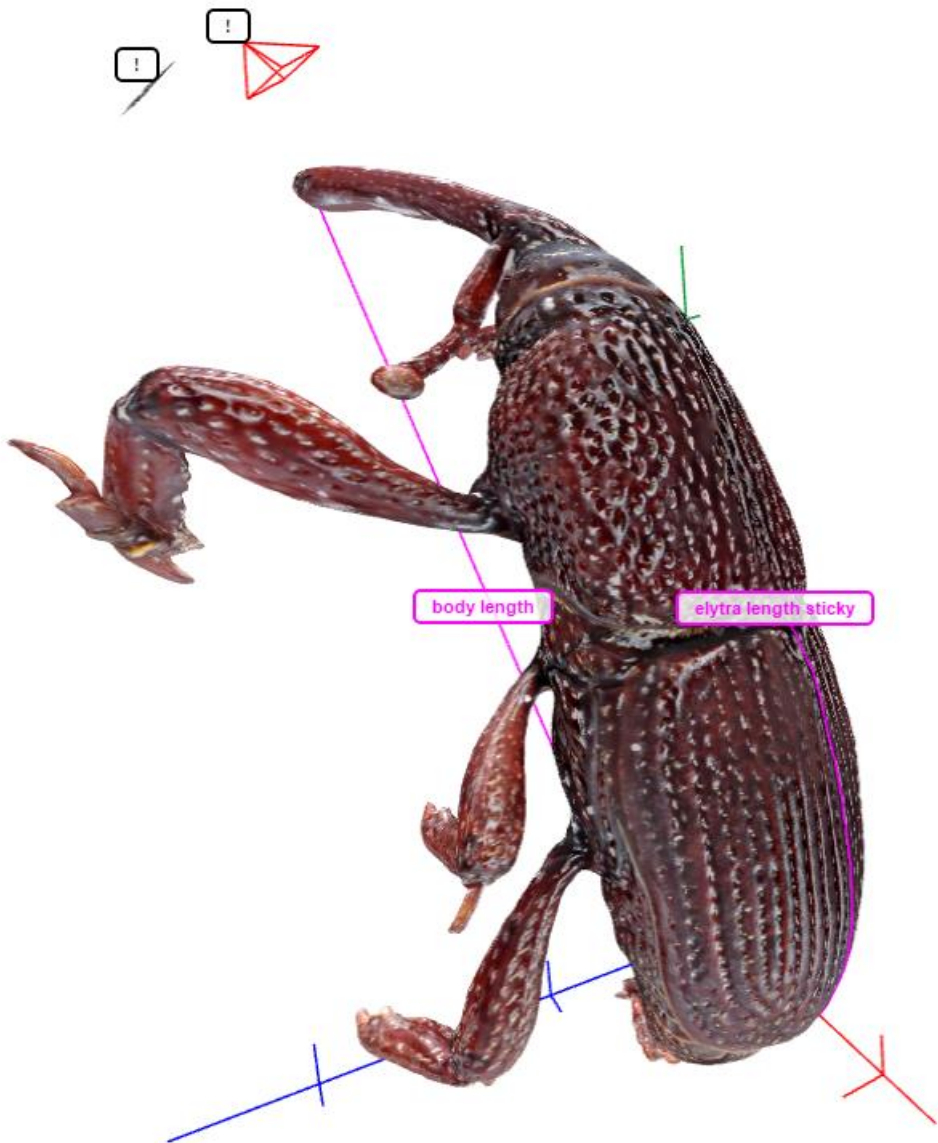
Tools

Collaboration

Model

Scale Bar

Lighting





Close

Annotations

Enabled Labels

eye viewpoint

weevil eye SEM

weevil eye - SEM

**Details:** No Description

**Type:** Image

Opacity



Details

Look At

Remove

Remove All

Browse

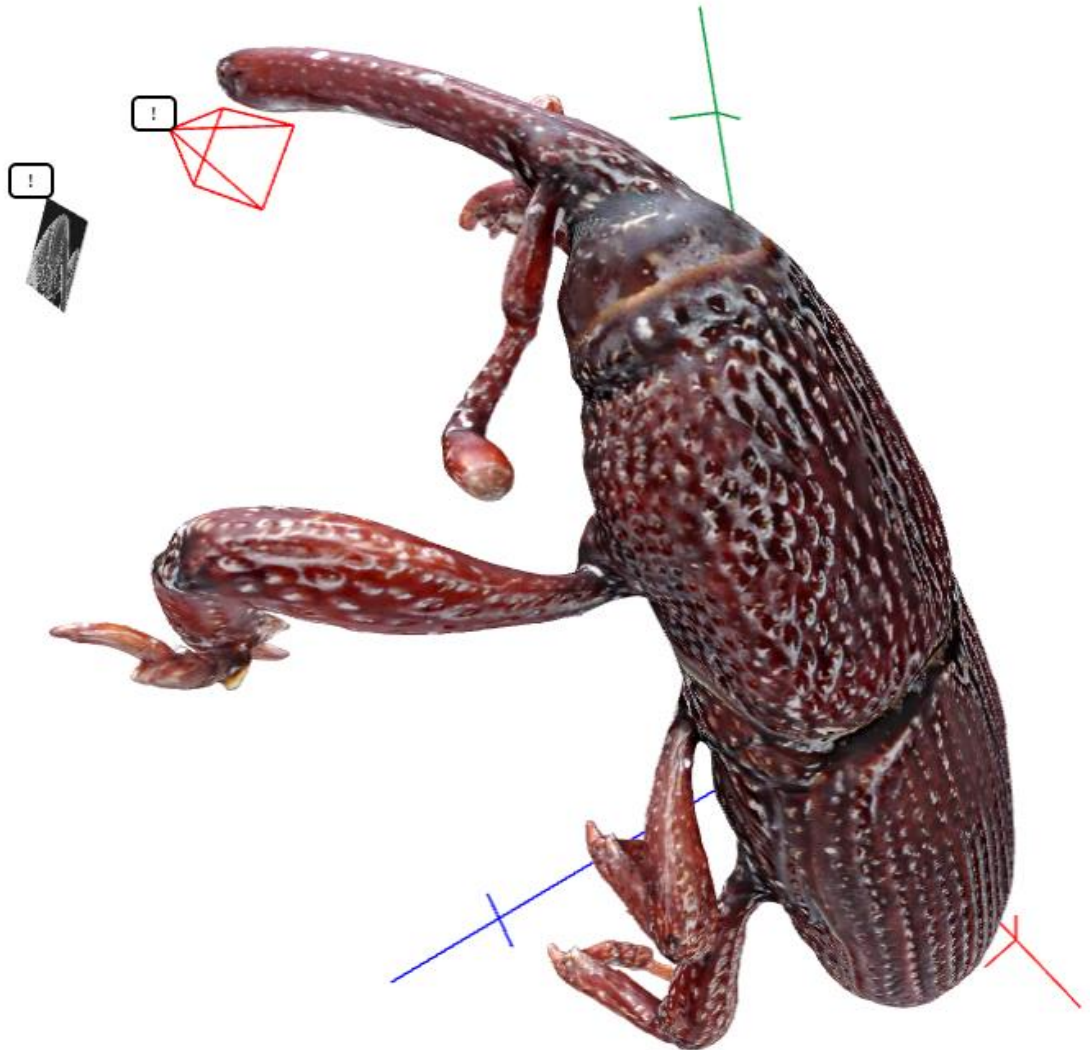
Tools

Collaboration

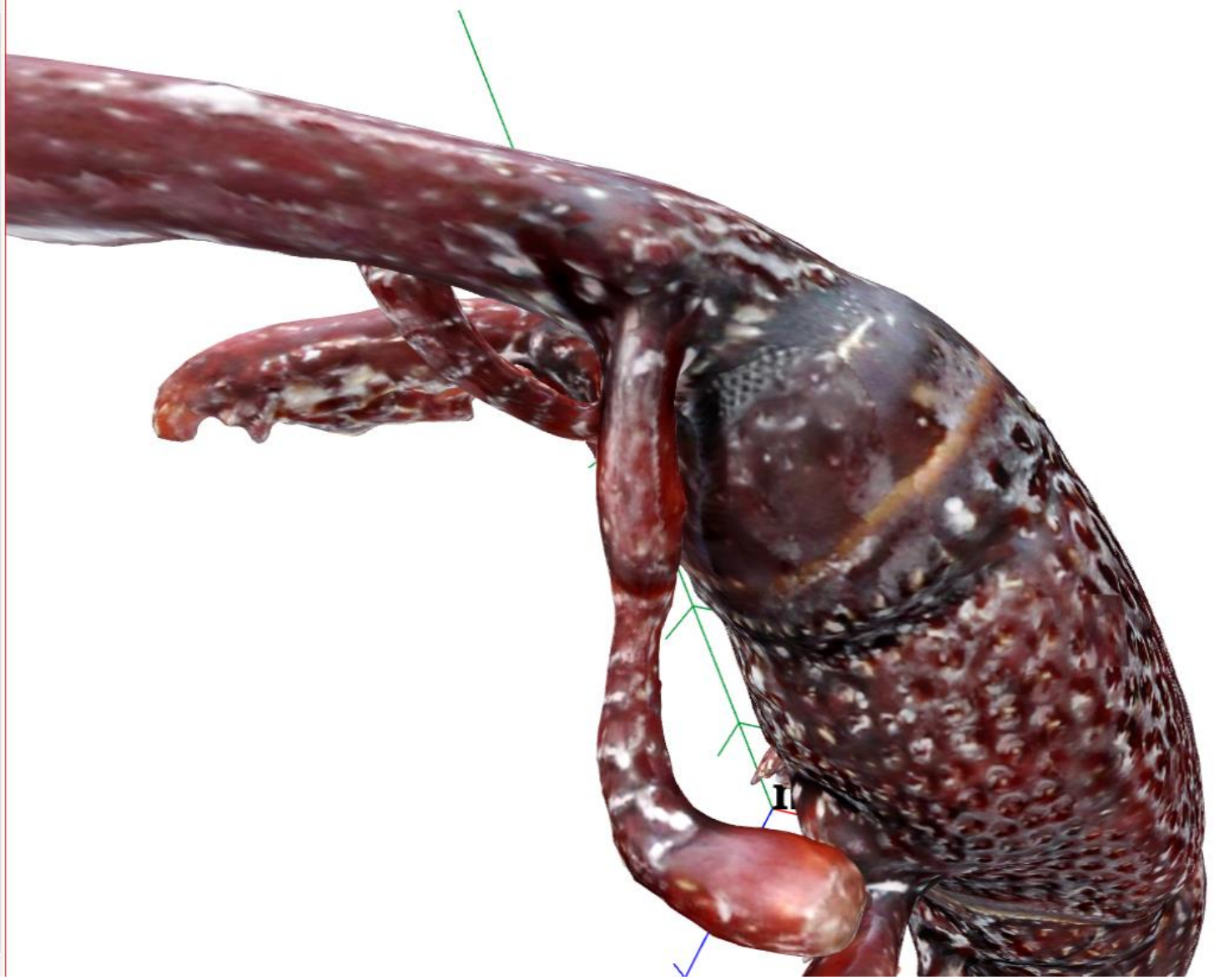
Model

Scale Bar

Lighting







Close

Annotations

Enabled Labels

eye viewpoint

Details: No Description

Type: Viewpoint

Details

Look At

Remove

weevil eye SEM

weevil eye - SEM

Remove All

Browse

Tools

Collaboration

Model

Scale Bar

Lighting

Camera

Other



Close

Annotations

Enabled Labels

eye viewpoint

weevil eye SEM

weevil eye - SEM

Details: No Description

Type: Image

Opacity

Details

Look At

Remove

Remove All

Browse

Tools

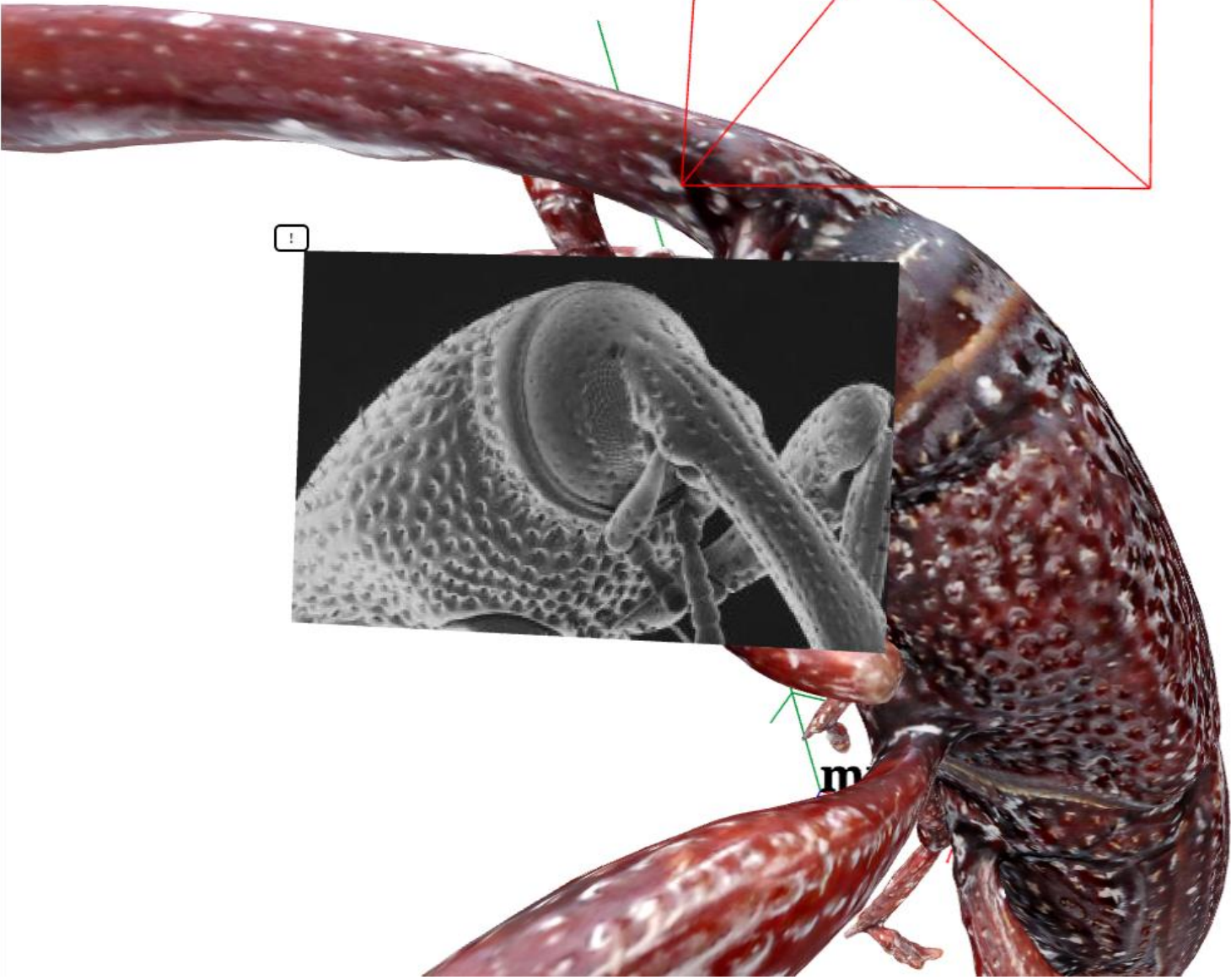
Collaboration

Model

Scale Bar

Lighting

Camera





Close

Annotations

Enabled Labels

- eye viewpoint
- weevil eye SEM
- weevil eye - SEM
- [elytra length sticky](#)
- body length

Details: No Description

Type: Line

Details

Look At

Remove

Remove All

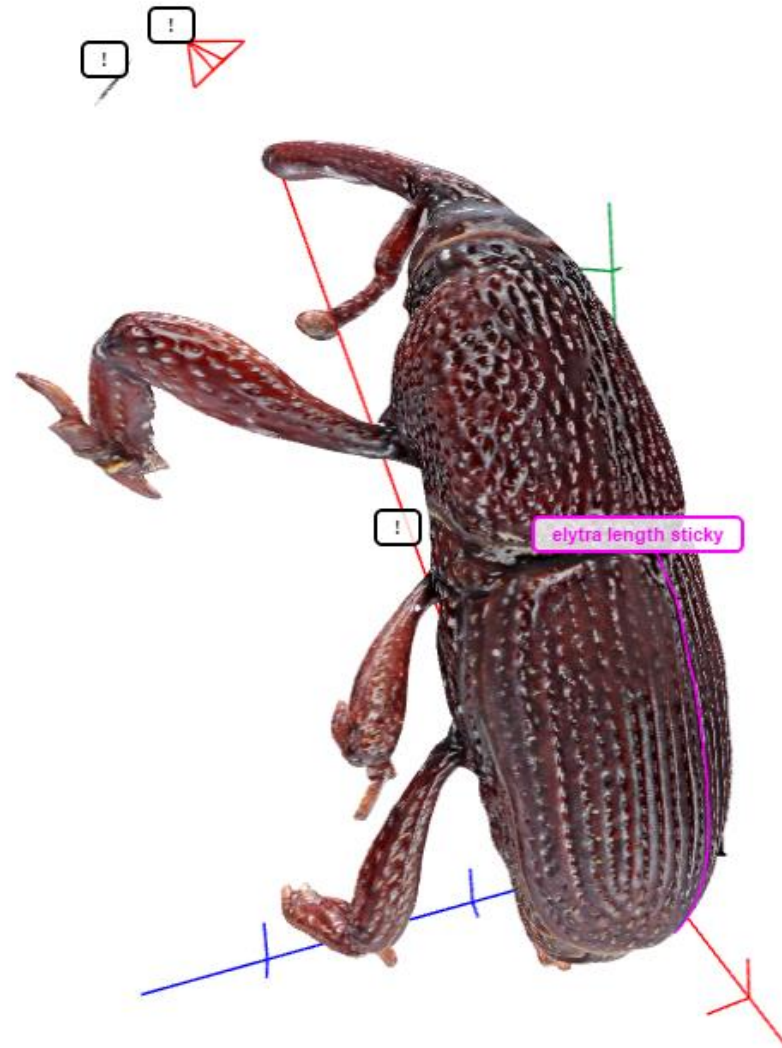
Browse

Tools

Collaboration

Model

Scale Bar



# Line

Created by You

## Basic Data:

**Name** elytra length sticky

**Details** No Description

**Model** 2bhqPqmKn8LEjTJY5

**Date Created** 2015-11-05T16:47:00.000Z

**Date Updated** 2015-11-05T16:47:00.000Z

## Advanced Line Data:

**Length** 2.039595704416064

**Distance** 1.9104981821567022

[Source File](#) | [Deep Link](#)

Done

Show On Model

Delete

Close

Annotations

Enabled Labels

length

fore leg

**Details:** No Description

**Type:** Body Part

Opacity



Details

Look At

Remove

Remove All

Browse

Tools

Collaboration

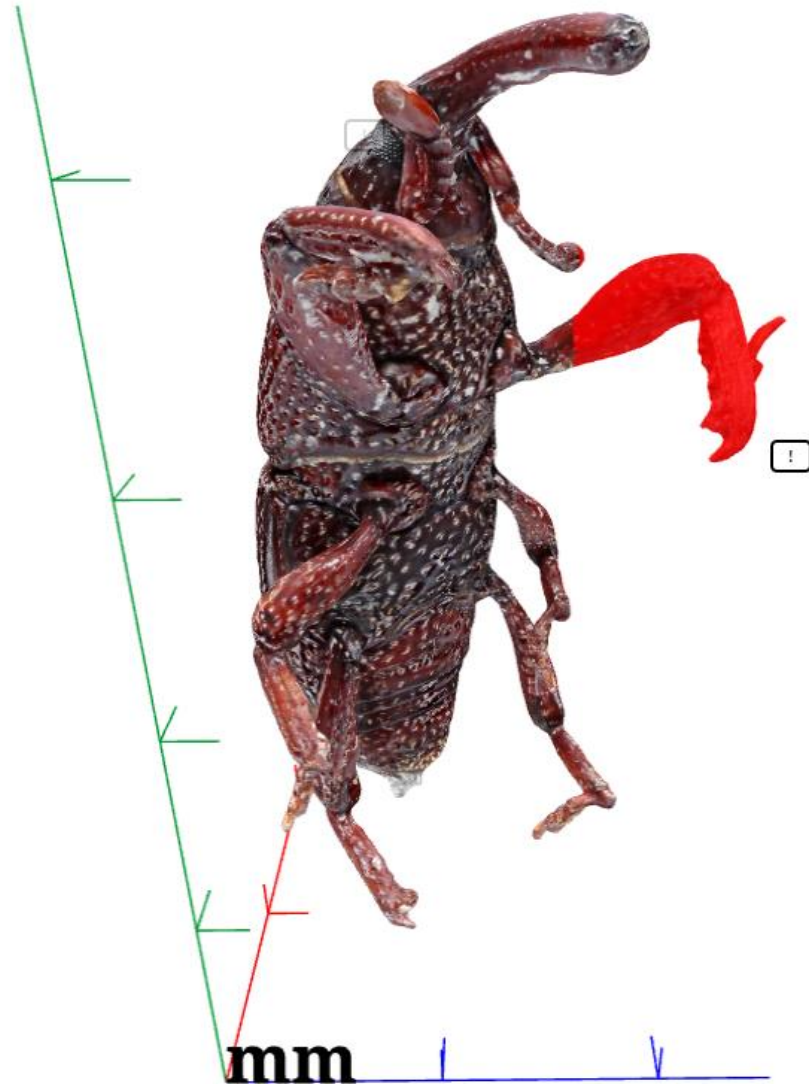
Model

Scale Bar

Lighting

Camera

Other





Close

Annotations

Enabled Labels

- eye viewpoint
- weevil eye SEM
- weevil eye - SEM

[elytra length sticky](#)

Details: No Description

Type: Line

- Details
- Look At
- Remove

[body length](#)

Remove All

Browse

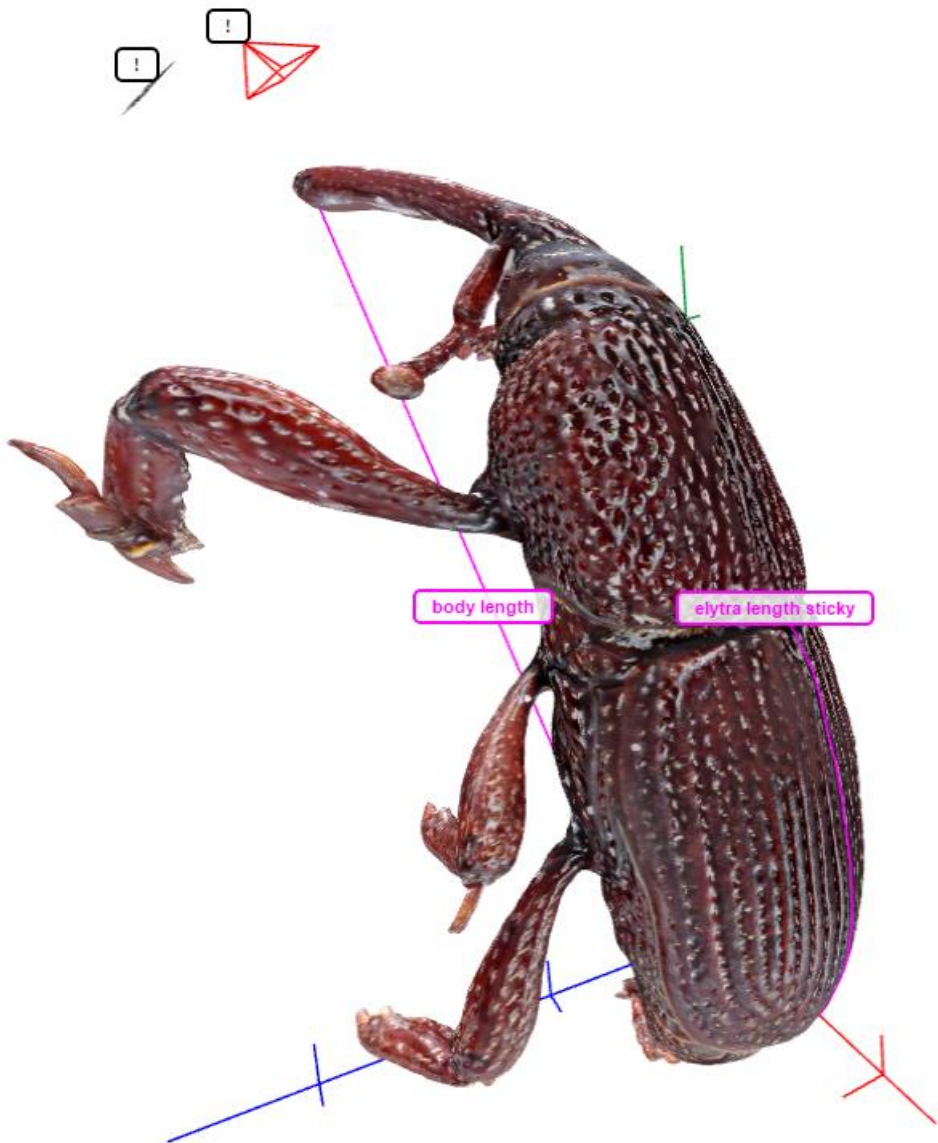
Tools

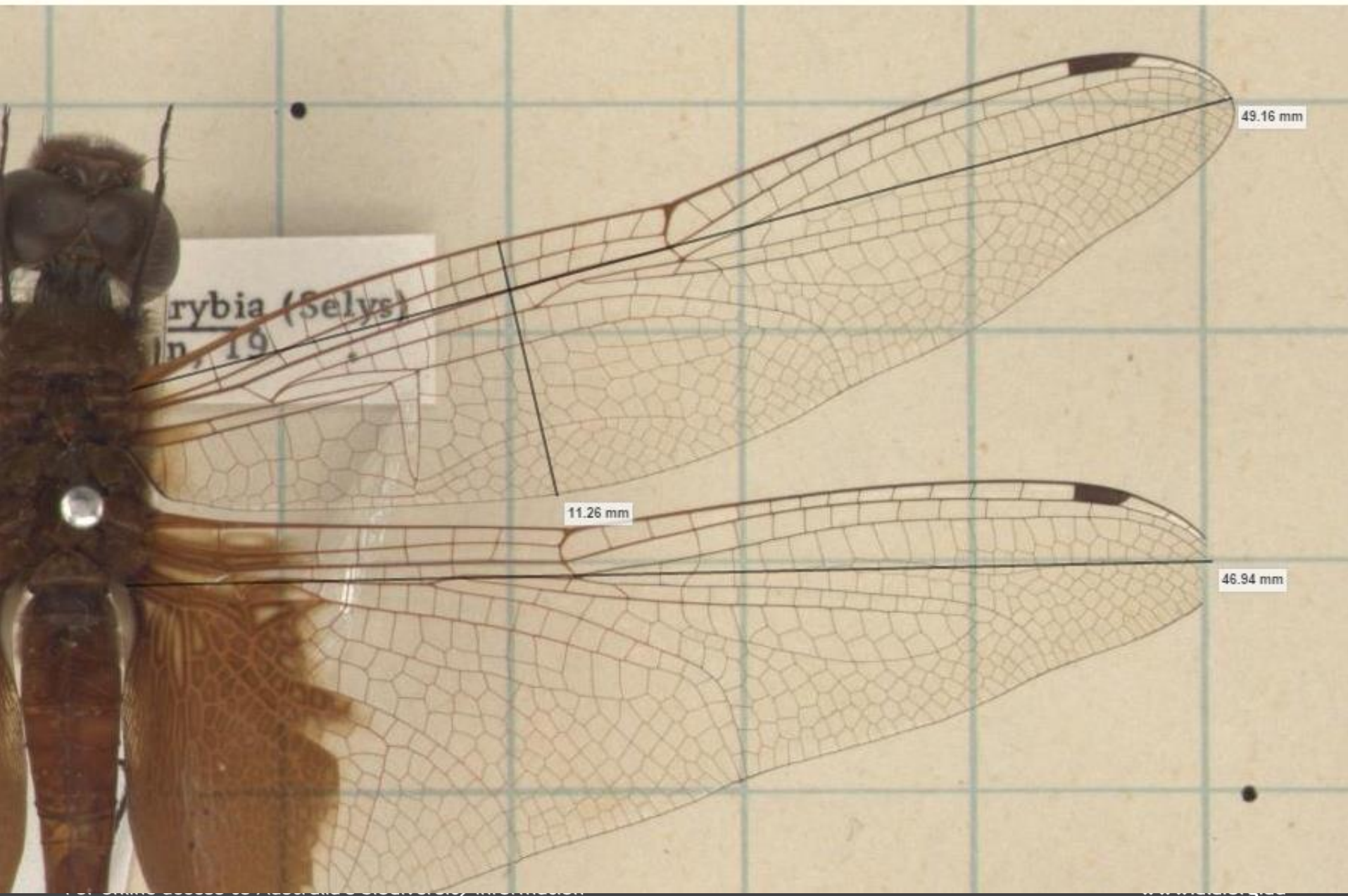
Collaboration

Model

Scale Bar

Lighting





Need an order of magnitude increase in how we capture information from image libraries

1. Working with CSIRO **computer vision team\***
2. Current “best practice” in image based phenomics is automated identification ...
3. ... which does not give you the ability to store, manage, discover, **share and re-use** information associated with the images

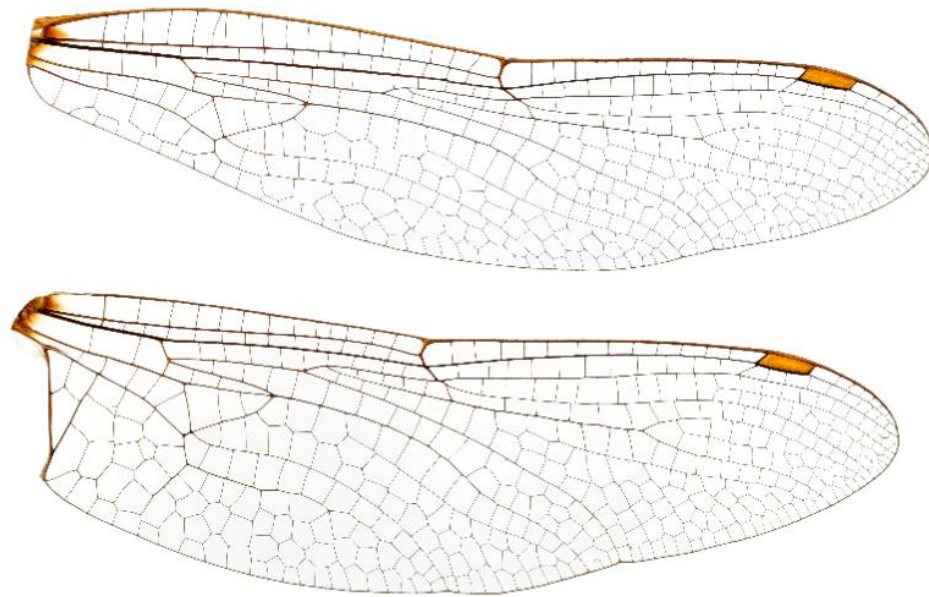
\*Changming Sun, Chuong Nguyen, Matt Adcock, Stuart Anderson



Drop to add images

test-large 9008x5067.jpg

Synlestes weyersii F.jpg



#### Image Details

**Name:** test-large 9008x5067.jpg

**Size (KB):** 4918.84

**Type:** image/jpeg

**Width (Pixels):** 9008

**Height (Pixels):** 5067

#### Image Actions

Analyse

Zoom To Fill

Delete

#### Analysis Results

No analysis performed

# Creating a “trait bank”

MorfPad

Drop to add images

No images available

No active image

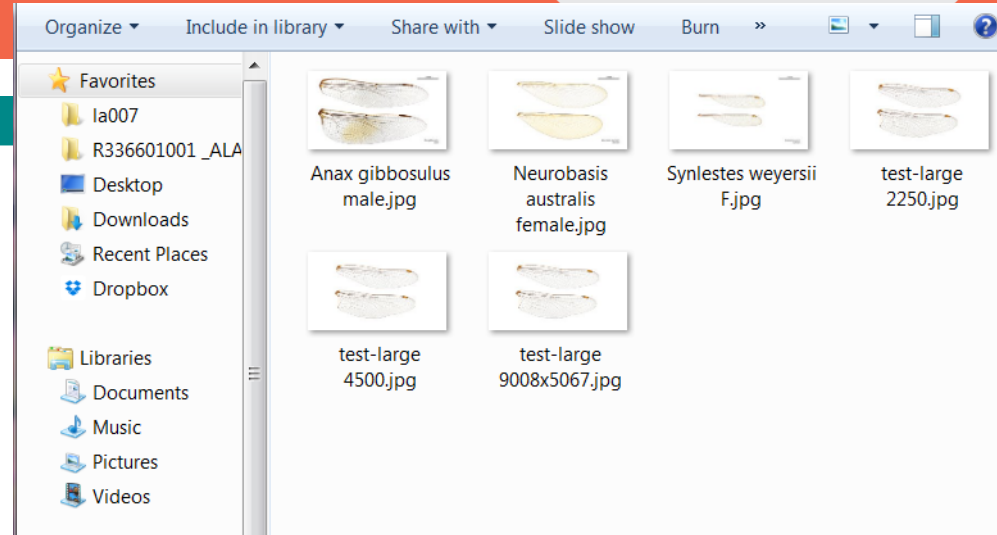
No active image

# Creating a “trait bank”

Drop to add images

No images available

MorfPad

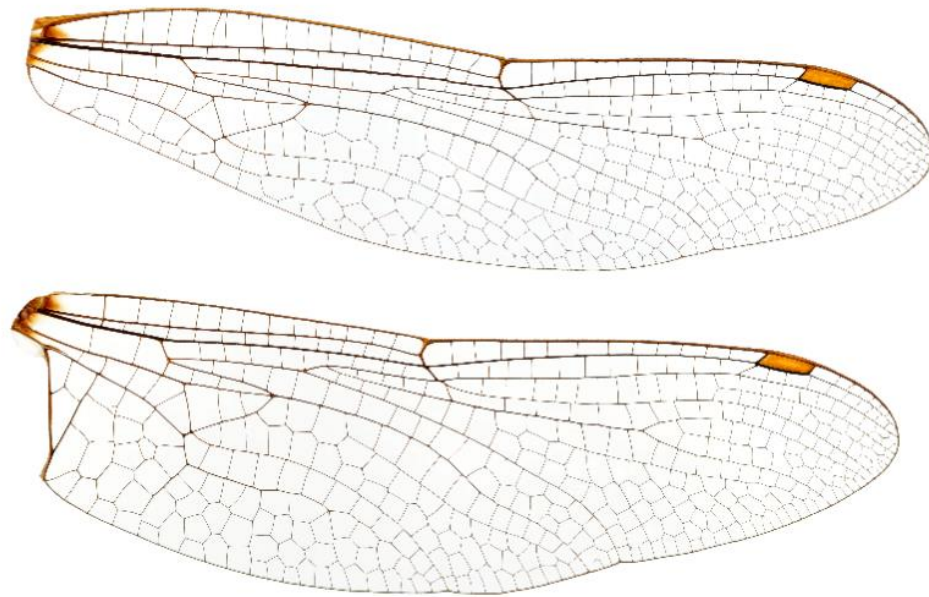


No active image

Drop to add images

test-large 9008x5067.jpg

Synlestes weyersii F.jpg



#### Image Details

**Name:** test-large 9008x5067.jpg

**Size (KB):** 4918.84

**Type:** image/jpeg

**Width (Pixels):** 9008

**Height (Pixels):** 5067

#### Image Actions

Analyse

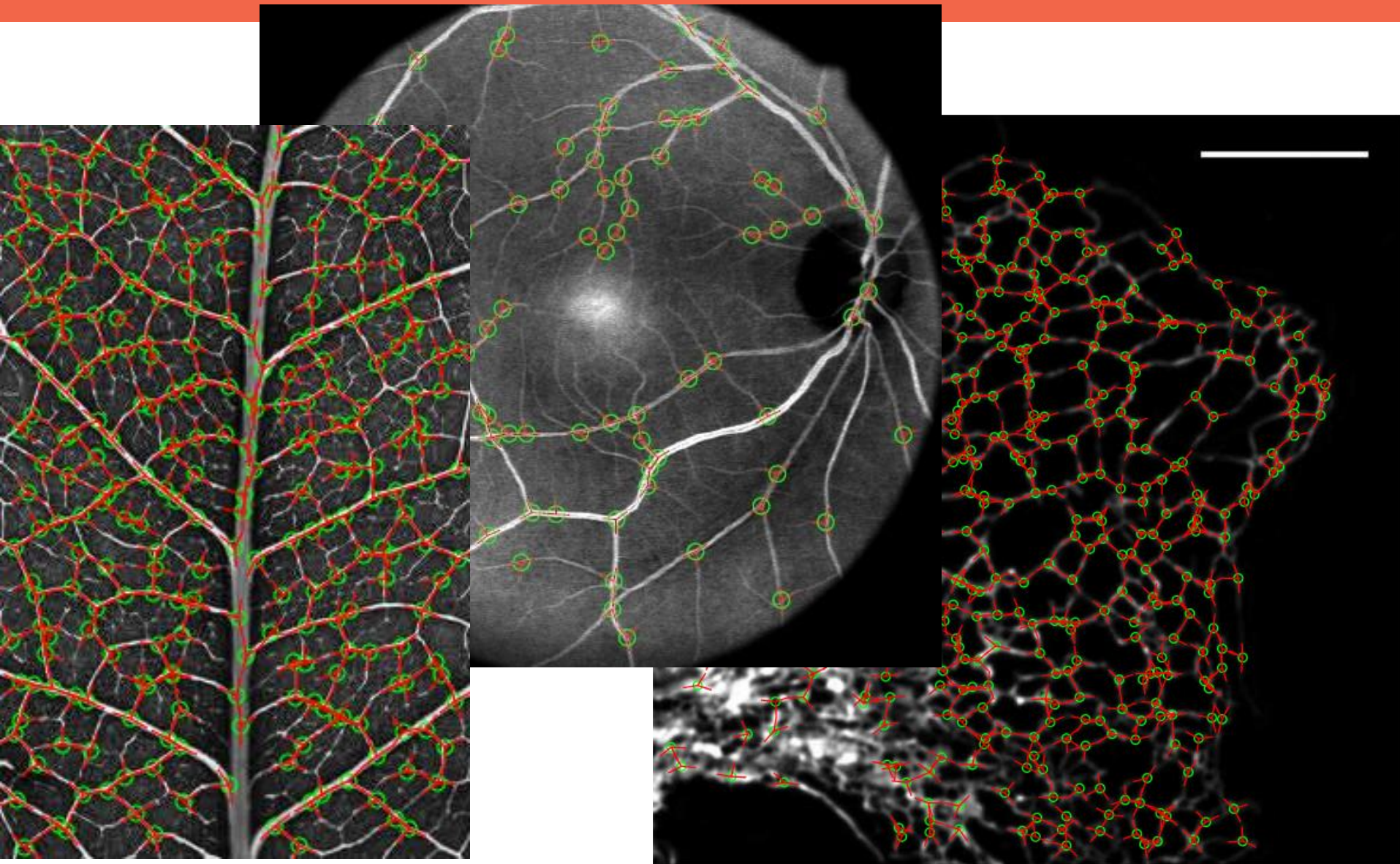
Zoom To Fill

Delete

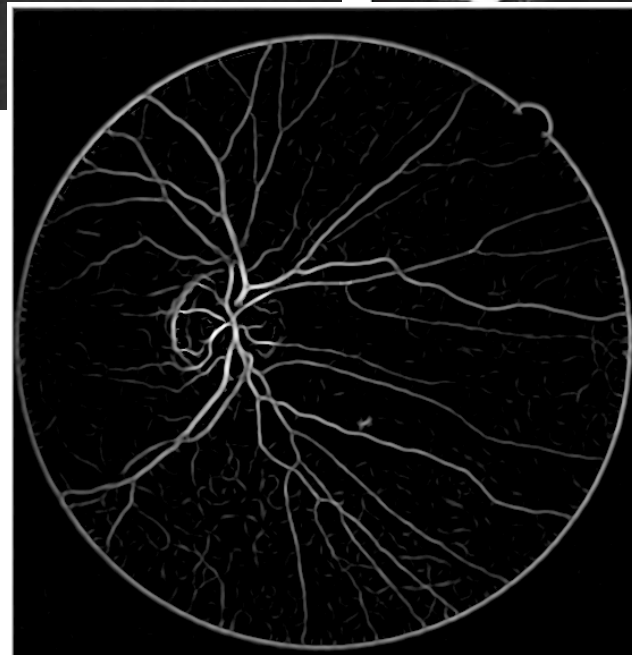
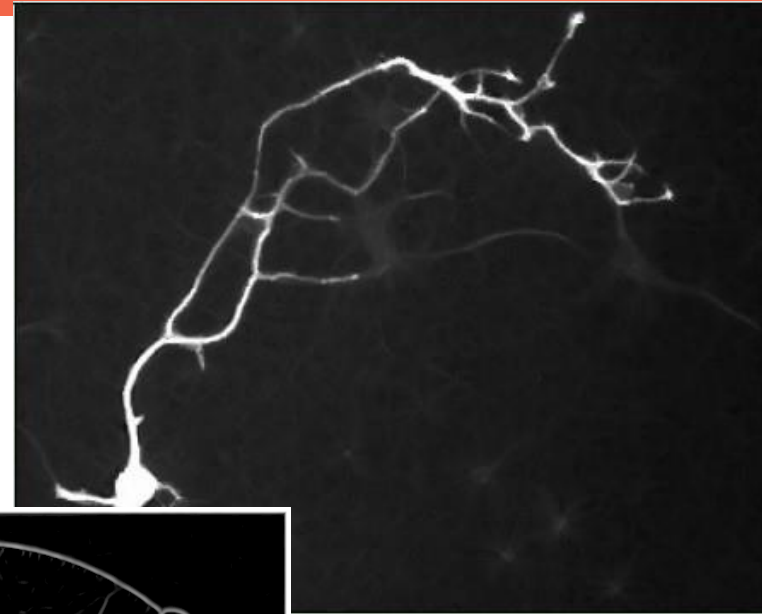
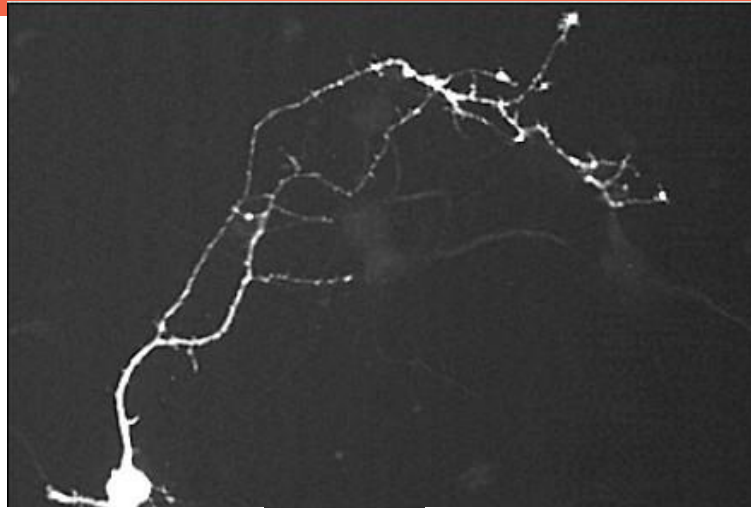
#### Analysis Results

No analysis performed

# Junction Detection

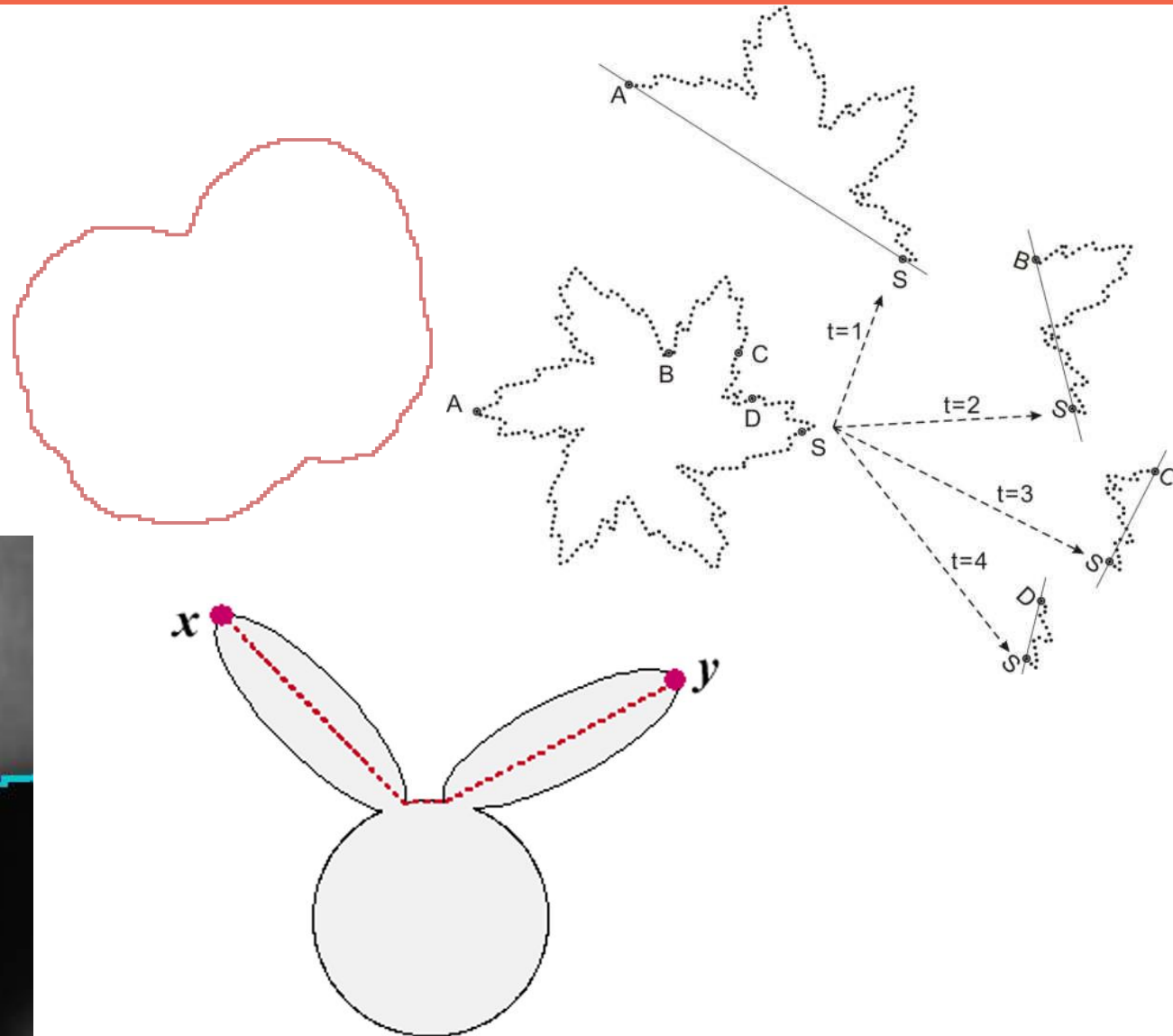


# Linear Feature Enhancement



# Object Boundary Information

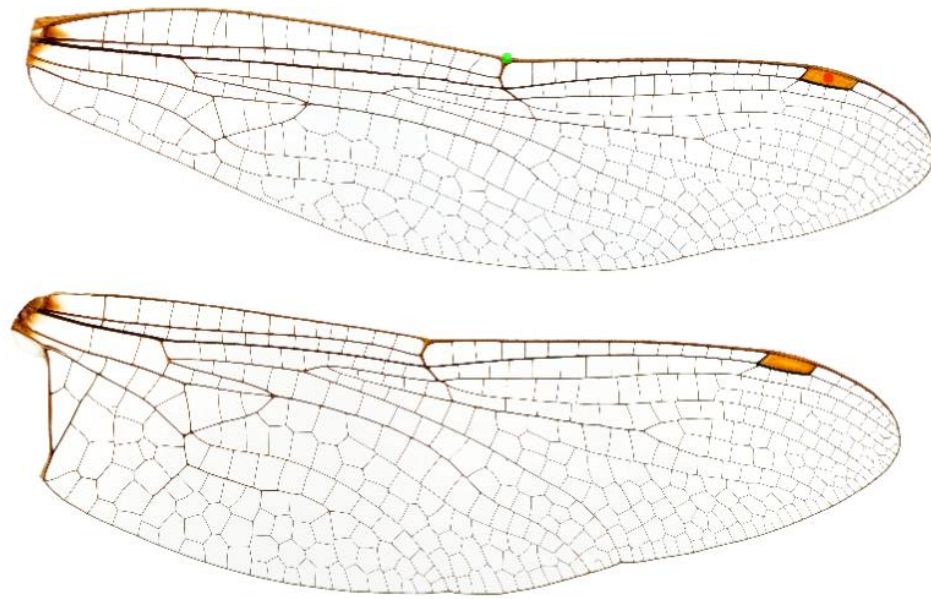
- Curvatures
- Concave points
- String cuts
- Inner distances



Drop to add images

test-large 9008x5067.jpg

Synlestes weyersii F.jpg



## Image Details

Name: test-large 9008x5067.jpg

Size (KB): 4918.84

Type: image/jpeg

Width (Pixels): 9008

Height (Pixels): 5067

## Image Actions

Analyse

Zoom To Fit

Export Character Matrix

Delete

## Analysis Results

Pterostigma: [6591,1263]

Nodus Point: [4706,1146]

Anti-Nodal Cross Veins: 17

Post-Nodal Cross Veins: 12

Wing Similarity: 0.760291

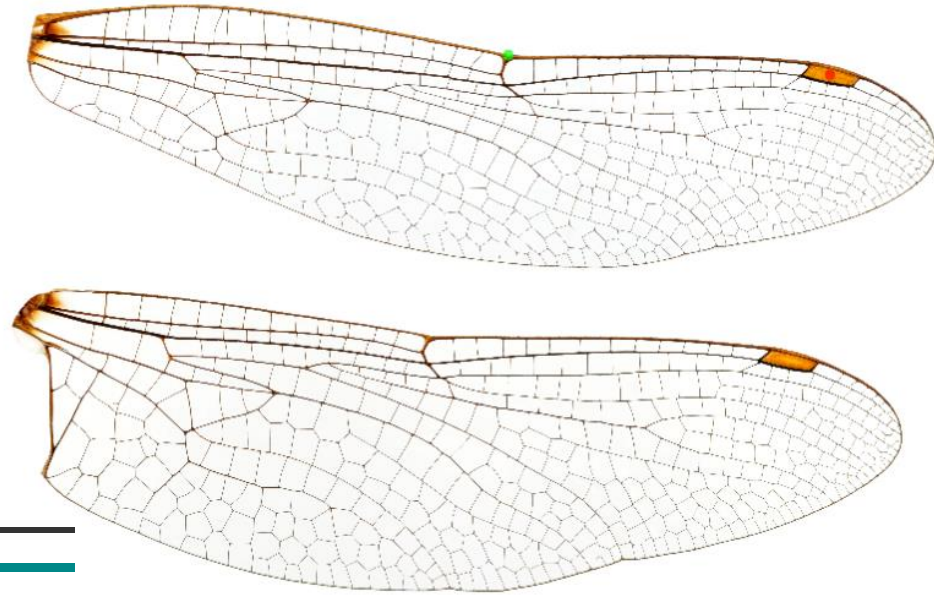
Forewing Length: 5365.83



Drop to add images

test-large 9008x5067.jpg

Synlestes weyersii F.jpg



## Analysis Results

**Pterostigma:** [6591,1263]

**Nodus Point:** [4706,1146]

**Anti-Nodal Cross Veins:** 17

**Post-Nodal Cross Veins:** 12

**Wing Similarity:** 0.760291

**Forewing Length:** 5365.83

### Image Actions

Analyse

Zoom To Fit

Export Character Matrix

Delete

### Analysis Results

**Pterostigma:** [6591,1263]

**Nodus Point:** [4706,1146]

**Anti-Nodal Cross Veins:** 17

**Post-Nodal Cross Veins:** 12

**Wing Similarity:** 0.760291

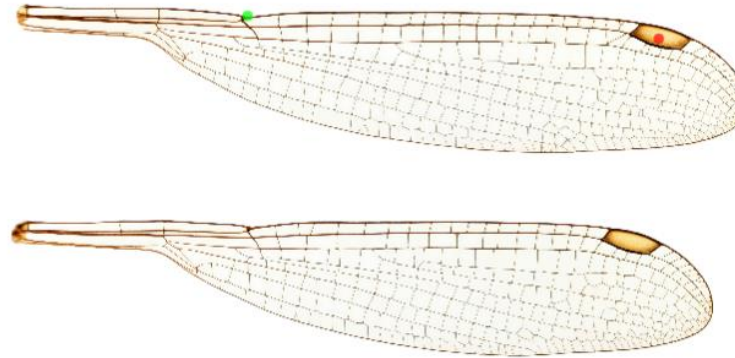
**Forewing Length:** 5365.83

Drop to add images

test-large 9008x5067.jpg

Synlestes weyersii F.jpg

10 mm



*Synlestes weyersii*  
Female

## Image Details

Name: Synlestes weyersii F.jpg

Size (KB): 3040.95

Type: image/jpeg

Width (Pixels): 9008

Height (Pixels): 5067

## Image Actions

Analyse

Zoom To Fit

Export Character Matrix

Delete

## Analysis Results

Pterostigma: [5694,1726]

Nodus Point: [3285,1592]

Anti-Nodal Cross Veins: 2

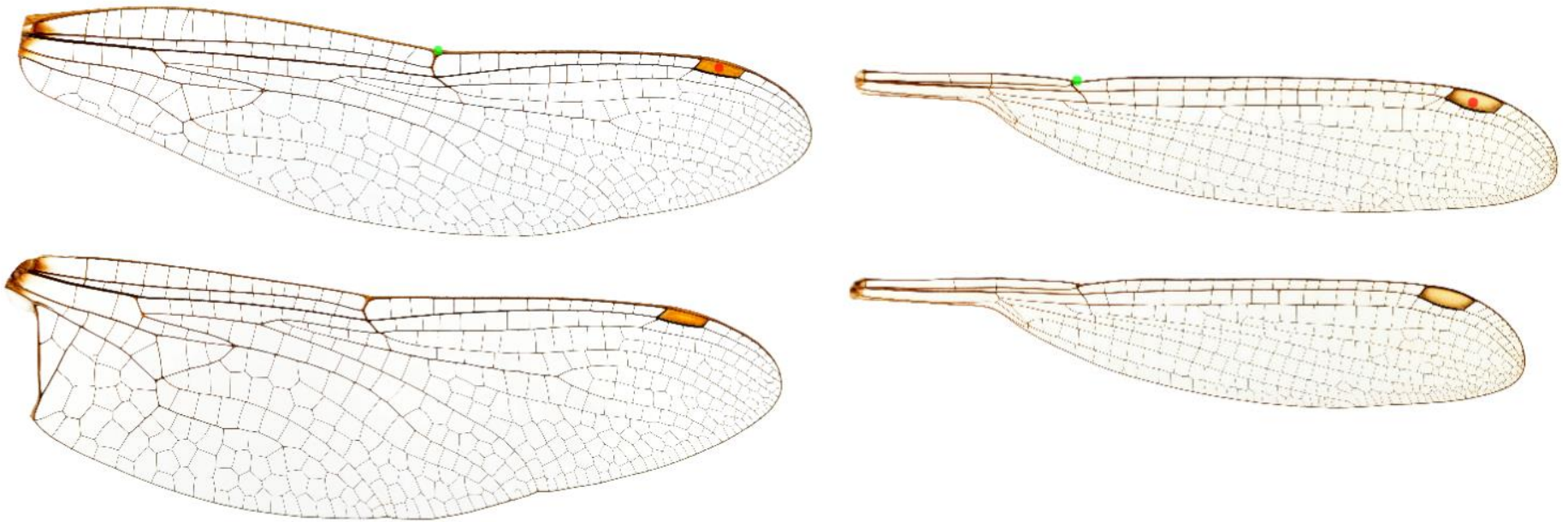
Post-Nodal Cross Veins: 19

Wing Similarity: 0.993792

Forewing Length: 3969.73

# Accelerating biodiversity discovery and documentation

	A	B	C	D	E	F	G	H	I	
1	Image name	Ptx	Pty	nAx	nPx	Nodusx	Nodusy	Sim	Length	...
2	Synlestes weyersii F.jpg	5694	1726	2	19	3285	1592	0.993792	3969.73	...
3	test-large 9008x5067.jpg	6591	1263	17	12	4706	1146	0.760291	5365.83	...
4										







# DigiVol

Volunteers building knowledge and communities through digitising collections

## Virtual expedition of the day



AUSTRALIAN MUSEUM MALACOLOGY COLLECTION

### Australian Museum Bivalve Expedition - 18

Australian Museum Bivalve Expedition - 18

Start transcribing [a](#) [A](#)

## More expeditions [View all](#)



Scaptomyza  
(Diptera: Drosophilidae) of  
Hawai'i II



South Africa - Acocks Collecting  
Register Book 5



Australian National Insect  
Collections - Bees



The Three Hearts of Belgium

## Honour Board

Day Tripper [View Top 20](#)

Erna van Zyl 115

Weekly Wonder [View Top 20](#)

Teresa Van Der Heul 980

Monthly Maestro [View Top 20](#)

Teresa Van Der Heul 980

DigiVol Legend [View Top 20](#)

Megan Edey 56798

[View my notebook](#)

## Expedition stats



263053 tasks of 267959 completed  
1412 volunteer [transcribers](#)

## News

29 Oct 2015

WeDigBio

# Welcome to the Australian Museum Tag a Fish-3



**Start transcribing** [a](#) [A](#)

[View tutorials](#)

[My tasks](#)

[Visit the Project Forum](#)

Australian Museum Tag a Fish-3 progress

1000 of 1000 tasks transcribed (100%)

## Australian Museum Tag a Fish-3 overview



*Ian Robertson/Flickr*

We are really excited about this project! Nearly 5000 species of fishes are known from Australian waters. Please help us tag the major characteristics of the fishes shown in these images. By doing so, you will be recording baseline data, which will be fed into a new fish identification website for Australia. Please join us on this exciting digital expedition.

## Australian Museum Tag a Fish-3 personnel



**Expedition Leader**

[Change leader icon](#)

1. [Erna van Zyl \(308\)](#)



**Scientists**

1. [Reiner Richter \(308\)](#)
2. [Karl Moy \(191\)](#)
3. [Hue Ng \(58\)](#)
4. [Vivien Zajicek \(52\)](#)



**Collection Managers**

1. [Wayne Murray \(20\)](#)
2. [Rachel Lee \(19\)](#)
3. [Bonnie M. \(13\)](#)
4. [Ava Tonin \(12\)](#)



**Technical Officers**

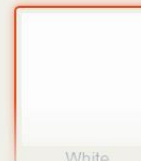
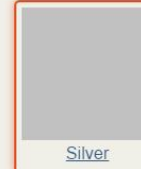
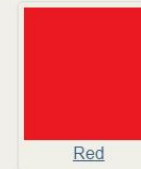
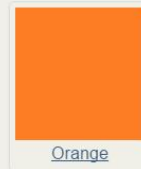
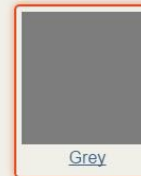
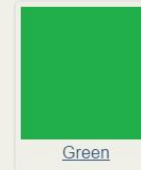
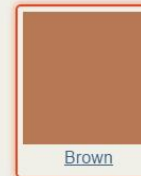
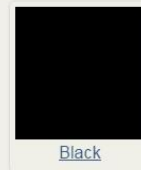
1. [Lillie McDonagh \(5\)](#)
2. [Sophie Woods \(4\)](#)
3. [Paul Flemons \(3\)](#)
4. [Clare Callinan \(3\)](#)
5. [Eloise O'Connor \(1\)](#)
6. [Dion Russell \(1\)](#)



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Colour - choose as many as you like.















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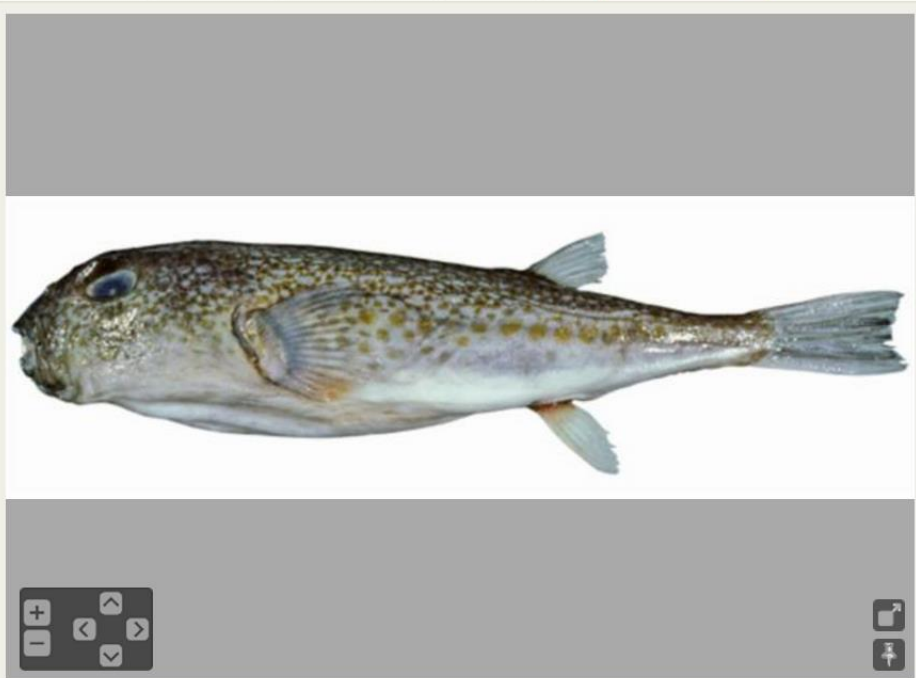


### Shape









 <a href="#">Deepbodied</a>	 <a href="#">Flattened</a>	 <a href="#">Flatfish</a>	 <a href="#">Rounded</a>	 <a href="#">Eel like</a>
 <a href="#">Typical fish</a>	 <a href="#">Ray</a>	 <a href="#">Shark</a>	 <a href="#">Slender</a>	 <a href="#">Unusual</a>



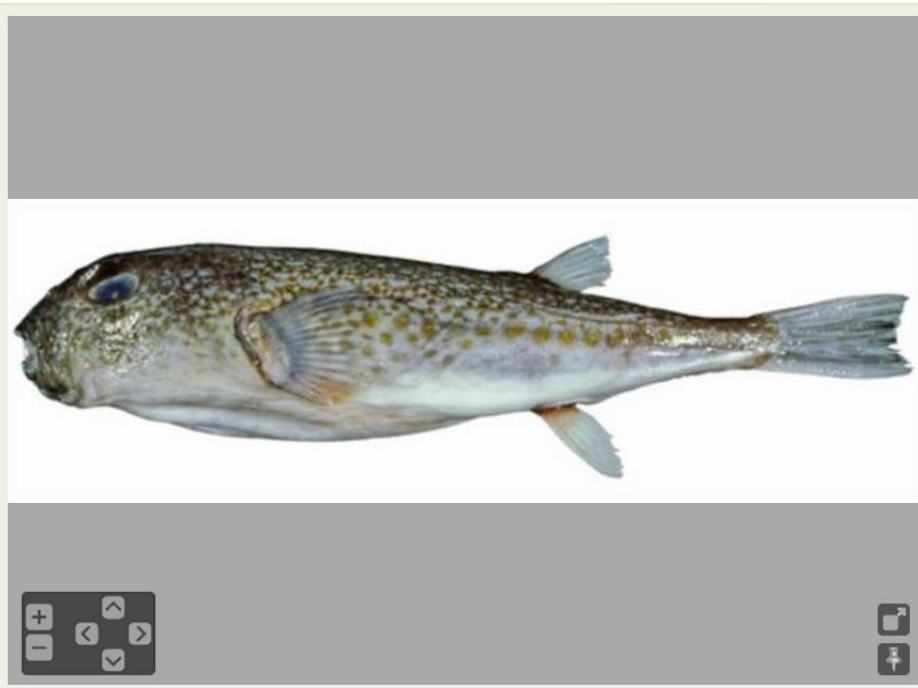
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Pattern- choose as many as you like.

 <a href="#">Bands (vertical)</a>	 <a href="#">Stripes</a>	 <a href="#">Spot(s)</a>	 <a href="#">Blotches</a>	 <a href="#">Countershaded</a>
 <a href="#">No pattern</a>	 <a href="#">Eye spot</a>	 <a href="#">Other pattern</a>		

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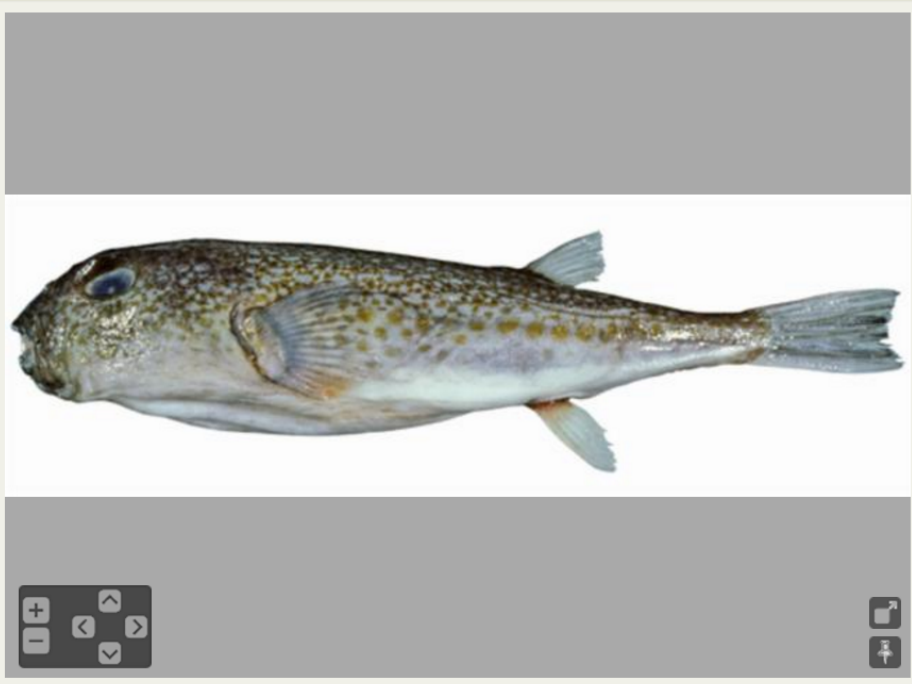


### Tail Shape





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### Other

Please add any other tags that you feel describe this fish. Separate words with a comma. Add as many as you like!













[DigiVol](#) » Volunteer for a virtual expedition

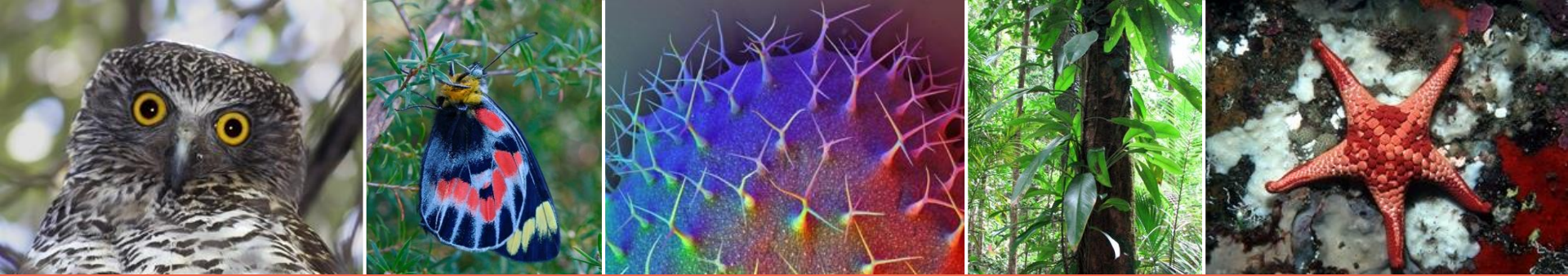
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4 matching projects

Name	Tasks completed	Volunteers	Sponsoring Institution	Type
<p><b>Australian Museum Tag a Fish-3</b></p> 	<p>1000 of 1000 tasks transcribed (100%)</p> 	<p>17</p>	<p><a href="#">Australian Museum Ichthyology Collection</a></p>	 Specimens
<p><b>Australian Museum Tag a Fish-4</b></p> 	<p>1431 of 1431 tasks transcribed (100%)</p> 	<p>19</p>	<p><a href="#">Australian Museum Ichthyology Collection</a></p>	 Specimens
<p><b>Australian Museum Tag a Fish-2</b></p> 	<p>1000 of 1000 tasks transcribed (100%) 1000 tasks validated (100%)</p> 	<p>78</p>	<p><a href="#">Australian Museum Ichthyology Collection</a></p>	 Specimens
<p><b>Australian Museum Tag a Fish-1</b></p> 	<p>1000 of 1000 tasks transcribed (100%) 1000 tasks validated (100%)</p> 	<p>12</p>	<p><a href="#">Australian Museum Ichthyology Collection</a></p>	 Specimens



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