

DIGI**V**OL

SPECIMEN HANDLING AND DIGITISING



January 2016

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Document Author	Version	Release Date	Status	Comments
Rhiannon Stephens	1.0	4 August 2011	Draft	Contributor
Leonie Prater	1.0	4 August 2011	Draft	Contributor
Dave Britton	1.0	4 August 2011	Draft	Contributor
Paul Flemons	1.5	5 August 2011	Final	Review and Approval
Rhiannon Stephens	2.0	15 Sept 2012	Final	Updated
Rhiannon Stephens	3.0	18 Sept 2014	Final	Updated
Rhiannon Stephens	4.0	14 April 2015	Final	Updated
Rhiannon Stephens	5.0	14 Sept 2015	Final	Updated

Acknowledgements

This document and the processes and procedures it describes have been developed at the Australian Museum (AM) with initial funding assistance provided by the Atlas of Living Australia (ALA) and further funding provided by the Australian Museum Foundation and the AM.

This document has been written by the following staff in the AM's Collection Informatics Unit: Paul Flemons (Manager), Rhiannon Stephens (DigiVol Coordinator), Leonie Prater (DigiVol Coordinator) and Michael Elliot (Senior Technical Officer). Special thanks to Dave Britton (Entomology Collection Manager), Jacquie Recsei (Technical Officer), Mandy Reid (Malacology Collection Manager), Alison Miller (Technical Officer) and Stephen Keable (Marine Invertebrates Collection Manager) for their valuable contribution.

1 Introduction

1.1 Why digitise museum collections?

The data attached to objects in museum collections are as important as the objects themselves. Data in natural history collections is usually in the form of labels attached to specimens. Information on labels includes details on where the specimen was collected, such as location, date of collection, collector name, and method of collection. In some cases there will be a separate label with taxonomic information, such as the specific name of the specimen.

The role of the DigiVol project is to make specimen label data accessible without needing to go to the physical collection and laboriously transcribe label data. Every time a worker handles specimens to obtain specimen data it increases the risk of damage to fragile and often irreplaceable specimens. The digitised specimen data that is created in this project can then be accessed through portals such as those associated with the ALA. Digitisation of specimens in the collection also assists collection management in routine tasks such as specimen inventory and loan preparation.

2 Entomology

2.1 Entomology Collection

Entomology is the study of insects. Insects are the class of animals that have an exoskeleton, a body divided into three parts (head, thorax and abdomen), three pairs of jointed legs and a pair of antennae. Insects are the most diverse group of animals on the planet.

The AM Entomology Collection contains over six million specimens. Most of the specimens in the collection are Australian but there is a strong non-Australian representation of beetles, psocids (booklice), flies, butterflies and moths. The collection also has many undescribed species, and species found in no other collections. The AM has one of the world's largest collections of bark lice and Australian acalyptrate and asilid flies, along with major collections of antlions, dragonflies, butterflies, ants, alderflies and beetles.

The Entomology Collection consists of five sections in the lower ground Vernon wing and two large areas in the Research and Collection Building.

Specimens come from amateur collectors, staff, field surveys and donated private collections. The Collection is used by entomologists, ecologists, educators and many others for research and taxonomic purposes. They can be loaned out to different institutions and scientists for research purposes.

2.2 Storage of specimens within the Entomology collection

The storage environment for museum specimens in the collection means that dried insect specimens can last indefinitely provided they are properly protected and carefully handled. The dry collection rooms have controlled temperature and humidity to prevent mould and discourage pests which would otherwise damage or destroy specimens. In addition new incoming material is frozen to eliminate any living pests in the collected specimens. Previous collection management practices relied on chemical barriers such as naphthalene ("moth balls") to prevent pests entering dry collection storage. This practice stopped several years ago, but there is still a legacy of naphthalene present in older drawers.

2.2.1 Cabinets, drawers and unit trays

Specimens are stored within the collection in cabinets. Each cabinet holds drawers and within each drawer there are unit trays. The unit trays store individual specimens from the same family, genus and species.



Cabinets



Drawers



Unit Tray

2.2.2 Naphthalene

Naphthalene was historically used as a deterrent against insect pests to avoid damage of the specimens in the museum collections.

Although naphthalene is no longer added to the collection it is still present within drawers. Unfortunately removal of this naphthalene from the drawers is impractical in terms of time, worker safety, and the safety of collection items.

The air levels of naphthalene have been measured in the collection areas and are a tiny fraction (1.2%) of the nationally recognised safe exposure limit. However, some people are sensitive to this chemical and may have adverse reactions. Collection management is taking active steps to replace older impregnated drawers to ensure that collection workers are able to work in a safe environment, but this is dependent on additional funding for purchase of new storage items.



Naphthalene ingrained in edge of drawer.

2.3 Equipment

The equipment used in the Entomology collection that is most relevant to our project include:

- Entomological forceps: stainless steel forceps used for handling pins
- Fine curved or straight forceps: forceps used for removing and handling labels
- Pins: stainless steel entomological pins of different thickness (or gauge). The gauge of the pin is measured by a number, with larger numbers indicating large gauge pins. These pins are used for pinning specimens or pinning staged mounts
- Minutens pins: tiny headless stainless steel pins, used for pinning small specimens onto stages of pith and foam.
- Foam or cork: used to line drawers and unit trays in which specimens are pinned.

2.4 Drawers

Drawers should always be placed on a trolley to transport them. Always use two hands to move drawers, keeping the drawers flat. When a drawer is not being used a sheet of paper should be placed over the lid to stop light causing specimen deterioration. No more than 3 drawers should be put on top of each other at a time to avoid the drawers being damaged by the weight and possibly falling off each other and causing damage to the specimens.



Trolley with drawers, note: only three on top of each other and sheet of paper on top.

Although a standard size drawer has been used in the collection, minor changes to manufacture and design of the drawers mean that some drawer lids do not fit well. Some lids may be too tight and some may be too loose. Please make sure that a drawer lid is not separated and is returned to that drawer. Care should be taken when removing ill-fitting lids.

Lids should be removed slowly to avoid a sudden gust of air damaging the specimens. The lid should then be placed in a safe spot to avoid it being broken. Do not place the lid in a position where it could fall and damage the specimens as well as breaking the lids.

When working over the drawers avoid wearing loose clothing, pendants and other jewellery, access cards on lanyards or other objects that might damage specimens. Avoid carrying unnecessary objects over drawers in case they damage specimens. Care must be taken using forceps within the drawers. Be aware that some unit trays may be tight fitting in the drawer and care needs to be taken when removing them from and returning them to the drawer.

2.5 How specimens are mounted

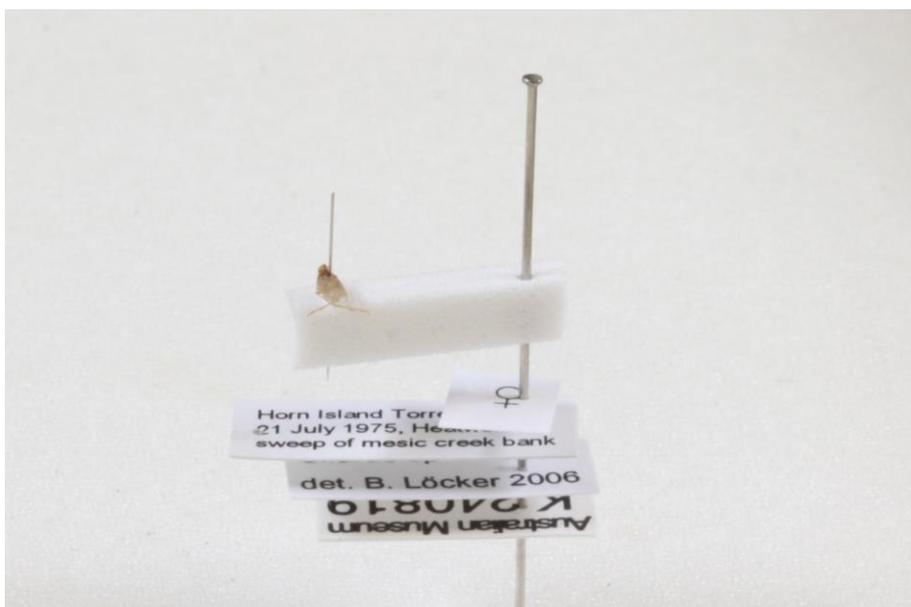
Dried insect specimens are very fragile. They are mounted in a way that preserves them and allows parts of the insect to be observed.

The four main ways that dried specimens are mounted are:

- Specimens pinned directly through the body using a size 2 or 3 entomological pin.



- Smaller specimens may be pinned with a minuten pin to a stage made of pith or foam which is then mounted on a size 2 or 3 pin



- Small specimens can also be glued to the tip of a card point mounted on a pin or



- Glued directly on a card mounted on a pin



Data labels are attached to the bottom of the pin underneath the specimen. Multiple labels are common on specimen pins. The order in which the labels are on the pin is of historical interest with the first (and often oldest) label being closest to the specimen. Typically the label which details collecting data is uppermost.

2.6 Working with specimens in the collection

Every drawer and each specimen within the drawer is to be returned in exactly the same way in which it has come to us from the collection with a new registration label attached to each specimen.

Due to the fragility of the specimens and the way they have been mounted it is expected that there will be potential problems when handling them. Listed below are the most common issues that you will encounter when handling specimens:

- When handling a small specimen near plastic, the static charge created by the plastic can remove wings and other appendages from the specimen, so care must be taken.



- Specimens usually stay in place on the pin because their body fluids act as glue when the insects dry. However some specimens will come loose and spin on the pin potentially damaging themselves and adjacent specimens.
- An insect mounted on pith, foam, points or card may also become loose, or the pith/foam/point/card itself can be loose and spin on the pin.
- Sometimes minuten pins can protrude down through the pith. When the label is returned to the main pin care must be taken to ensure that the minuten pin doesn't push into the label.
- Insects that are point or card mounted can have the glue fail and the specimen can fall off the mount.
- Old pins made of brass and steel are often corroded, especially with humidity and by chemical reactions with insect body fluids. This can make them break in half, or cause damage to the specimen. The heads of old pins can also break off so care must be taken when removing them from the drawer. In some cases the heads have been cut off to allow the specimen to fit in obsolete shallow drawers. Use forceps if appropriate.



- Corroded brass pins are often recognised from the green copper oxide evident around the specimen and labels on the pin. Damaged specimens from copper oxide can explode or break in half. Always take care when removing pins with obvious corrosion as both they and the specimen they hold will be fragile. There will often be a node or nodes of corroded material on the pin on which the label can get stuck. Again use forceps to slowly and carefully push the label over the nodule, holding the tips of the forceps as close to the pin as possible without actually gripping the pin. It will often be necessary to pre-pin a hole when attaching a new registration label to specimens with corroded pins. Use a pin with a slightly smaller diameter than the specimen pin to create the hole. When you are replacing a specimen with a copper oxide affected pin into cork or foam make sure that you use the forceps below the labels and guide the top of the pin with your fingers.



- Narrow gauge (size 1 or less) pins are sometimes used for direct pinning of smaller insects but they bend very easily and can flick when released after pinning. Even size 2 pins can easily bend when replaced into hard cork drawers. The hardness of cork varies greatly between drawers and within drawers.
- When a specimen is pinned too high it can lead to damage being done to the specimen when the pin is handled by the head. Use forceps to handle the pin below the specimen to avoid this where possible.
- When a specimen is pinned too low it may allow only limited room for labels to be attached beneath the specimen. Take care to avoid pushing the labels up into the specimen.
- A short training session before starting each family will be provided to avoid potential problems particular to that family.

2.7 Labels

Labels display important data about the specimen including the collection event (location, date, collector and method), the species name and other determinations, and sometimes a registration number that relates either to paper registers or the collections database, or both.

Labelling methods and materials vary considerably throughout the collection. Many labels are fragile as the paper or card used may be acidic, poorly manufactured or very old. Old labels are often recognised because they are yellowing or dark brown and crumbling.

As with the specimens, handling and interpreting labels raise many issues including:

- Labels can be handwritten or printed. Some may be very difficult to read.



- Labels can become loose on pins, and swing potentially damaging adjacent specimens. Labels can be made more secure by gently pushing the paper fibres back in on the hole. This is preferable to creating a new hole in the label.
- Labels which have been removed and then reattached to pins by users often have multiple holes, which can obscure data. It is important that you don't make a new hole in the label and obscure data.
- Large labels can create a risk of damage to other specimens when they are being moved in the collection.
- Sometimes a label may be folded up then placed on the pin. These labels need to be carefully unfolded after being removed. A microscope slide may be used to weigh down the label for photography. After the image has been taken it is important to fold the label up the same way and replace the pin in the holes that have already been made.



- The order of multiple labels is of historical interest and they should always be replaced in the same order in which they were taken off the pin.

- Multiple labels should be spaced appropriately on the pin and not bunched together and should be orientated so that the critically important labels (collection information and registration label) are visible in at least part without removing the specimen from the drawer. For registration numbers, it helps if at least the last three digits of the number are visible without having to move the specimen, or take off labels. This orientation should also consider the shape of the insect, and whether the labels will interfere with or damage adjacent specimens. Avoid handling the labels more than necessary, as this will make them loose on the pin.



- There can be labels that have information written on the back, in this case the label needs to be photocopied, cut out neatly and imaged alongside the label 'right side up'.
- If the paper of the label is very old and brittle check with the supervisor, as there may be a need to return it back to the collection staff for conservation treatment.

2.8 Getting a specimen ready for imaging

Most of the specimens in the collection should be considered as irreplaceable. The security and condition of the specimens is of utmost importance, and must not be compromised for imaging.

Both the Specimen Handler and the Digitiser need to assess each new drawer to get a 'feel' for that particular drawer. Species labels are generally placed below the series of specimens but that is not always the case. Spend the time to assess how many species changes there are in the drawer and note the approximate numbers of specimens in each species. This is to help the Digitiser to avoid errors when entering data into the database. If a specimen already has a new registration label, it has already been databased and therefore there is no need to image that specimen and data. Check that all family, subfamily, genus and species names in the drawer are entered into the database before imaging.

Follow the steps below to prepare a specimen for imaging.

- The Specimen Handler starts by putting the stage in front of them and will always work within the stage.
- The specimen is removed from the drawer using fingers or forceps, bracing fingers on the edge of the drawer or unit tray to assist in pulling the pin out in a controlled fashion.
- The position of the specimen within the drawer is noted using a stage labelled pin.
- The labels are then removed from the pin using forceps.

- The labels are placed centrally on the label block above the scales with the label closest to the specimen on the top and subsequent labels below. Check that there is no writing on the underside of the label. If so, photocopy the label and cut it out and image it along with the label 'right side up'.
- Place a new 'K' registration number below the lowest label that was set on the pin before the scales.
- Position the specimen on the stage with the head in the same orientation as the label block.
- The specimen is ready to be imaged.

2.9 Replacing a specimen after imaging

After the specimen has been imaged it can be replaced in the drawer. Move the labels to the foam 'pinning' block alongside the label block and pin them in the order that they were removed from the specimen i.e. start at the top and work down.

Pre-pin a new 'K' registration label, so you don't need to force the specimen pin through the card. Attach the registration label to the bottom of the pin underneath the original labels. Pin through the space between the K and the number.

The labels should be orientated in line with the body or wings of the specimen. The new registration label should be slightly angled out at the top right with the last 3 numbers visible from above. The distance between adjacent specimens may influence how the labels are attached. If spacing between specimens is very tight, it may be necessary to align labels to avoid damage.

Replace the insect in the same pin hole in the drawer where you have removed the stage labelled pin.

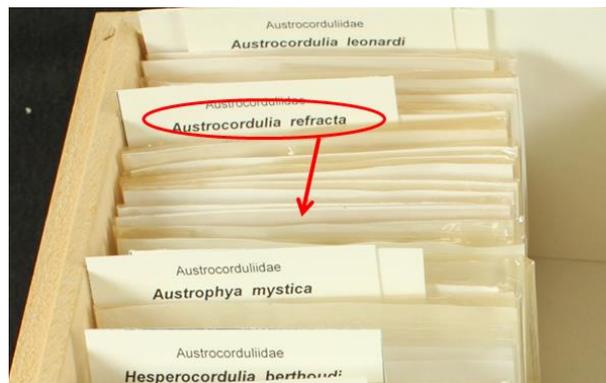
At the end of each drawer, review the information you have entered in the database by using the arrows at the bottom. Double check that the new registration number matches the image file number and that species names have been changed appropriately.

2.10 Papered Dragonflies



Start working in the drawer from the top left downwards.

The species name is on the card that appears before the specimens. The card does not need to be included in the image.



Before starting a new genus and species, count the number of specimens and then check there are the same number of images and records on completion.

Place the orange “Start here” insert behind the next specimen to be digitised.

Remove the backing card, specimen and labels from the bag.

Use a paintbrush to move the specimen, do not pick it up or remove it from the backing card. Labels can be picked up with forceps.

If the specimens K number is illegible replace it with a new one and dispose of the old one.

Place the labels clearly visible at the bottom of the bag with the K number in the bottom right hand corner.

Replace split bags.

Replace backing cards if it is difficult to reposition specimen in bag.

Place the specimen on the left hand side of the card with the abdomen positioned at the bottom of the image. Place the labels to the right of the specimen with the location/collector label at the top, then the determination label/s underneath, followed by the K number which is placed on the colour bar/scale stage.

Do not search for duplicates.

Please identify already damaged specimens on the records sheet.

2.11 What to do with damaged specimens

If any part of the specimen breaks off immediately consult your supervisor. Any pieces must be associated with the parent specimen, and preserved and appropriately handled.

A damaged specimen is placed in a unit tray within the hospital drawer. Each damaged specimen will have a hospital drawer label inserted in the unit tray for further drawer identification purposes.

At the end of the day, close everything on the computer desktop and shut the computer down. Turn off the camera, put the lens cap on and turn off the flash. Put away all forceps and other equipment and make sure the workstation is neat.

3 Malacology

3.1 Malacology Collection

Malacology is the study of molluscs including chitons, clams, mussels, snails, nudibranchs (sea slugs), tusk shells, octopus and squid.

Molluscs are animals that have an unsegmented soft body, an internal or external shell (most species but not all), a mantle (fold in the body wall that lines the shell) and a muscular foot and/or tentacles

The AM Malacology collection is one of the world's largest of its kind, covering all groups of recent (up to 1.6 million year old) and tertiary (65-1.6 million year old) molluscs. Many of the specimens are dry shells, but there is also a large collection of preserved molluscs. The collections date from the 1860s and include marine, terrestrial and freshwater molluscs. They are predominantly from Australia and the south-west Pacific, but also include specimens from other parts of the world.

3.2 Storage of specimens within the Malacology collection

Malacology specimens are held in unit trays within drawers. The specimens may be placed loose in the dark blue unit trays or in glass vials. Sometimes, there is a micro vial placed within the larger vial. Fossil specimens are generally recognised by their light blue unit trays.



Drawers are transported to the lab in trolleys.



The Malacology specimen drawers may be heavy to handle due to the weight of the specimens, so care must be taken to use a safe lifting technique. If a drawer is too heavy for a volunteer to handle, please advise the Digitisation Officer who will handle the drawer.

When finished digitising a drawer, return it to the blue trolley and mark it off before taking the next drawer in the trolley.

3.3 Equipment

The equipment used in the Malacology collection that are most relevant to our project include:

- Fine forceps and small paint brushes are provided to handle specimens and sweep small shells back into the vial.
- Archival pens have been provided to write the new registration number on the specimen label.
- The piece of paper in the bottom of the stage box needs to be replaced periodically as colourisation of the paper due to shell sediments.

3.4 Working with specimens in the collection

It is important to handle specimens with care as they can be very fragile. Every drawer and each specimen within the drawer is to be returned in exactly the same way in which it has come to us from the collection.

Some specimen labels placed in a vial need to be removed by using any of the appropriate handling methods:

- Fine forceps may be used to first remove the cotton wool and then to carefully remove the specimens.
- A small paint brush may be used to sweep the specimens back into the vial, carefully to avoid flicking the specimens.

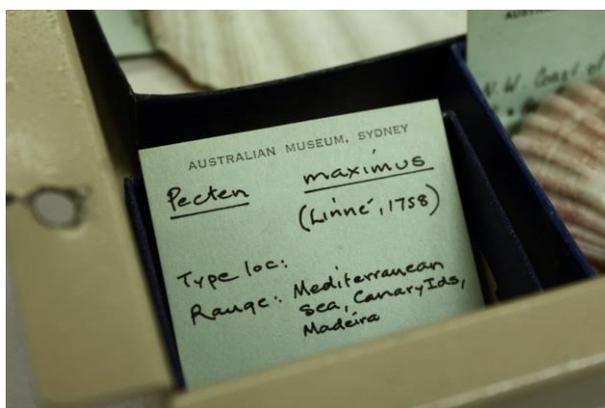
- A folded piece of paper may be used as a receptacle and funnel to collect and return specimens.

The specimen count is a count of the number of specimens in a unit tray or in a vial. If specimens are small you may need to use a magnifying glass to count them. If there are more than 20 specimens, enter >20 and if unsure, leave the database field blank. If it is difficult to determine what is a specimen or fragment due to its very small size, then leave the count blank. If there are 2 halves of a bivalve detached, then this counts as 2 specimens. Obvious broken parts of a specimen are counted as 1 specimen.

3.5 How specimens are labelled in the Collection

Malacology drawers may have the family name written on the drawer label but this is not always the case. Identification of a specimen's family may not be easily apparent so for marine species you can refer to WORMS (World Register of Marine Species) website, <http://marinespecies.org/>.

Header labels, which state the specimens' genus and species, are found in a box at the beginning of a group of specimens of the same species.



If there are a series of header labels, only use the top header label. If the header label has identification information different to the specimen label, then **always use the name from the header label**. This has occurred because the specimen(s) have been re-identified but has not yet been relabelled. For this reason it is very important to return the header label to its original position in the tray as this may be the only record of the new identification.

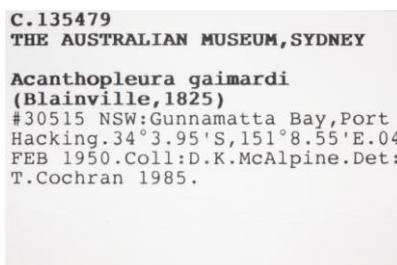
If the specimen has only been identified to family level, do not digitise it as there is insufficient taxonomic data. However, if it has been identified to genus level then it can be digitised with the genus name entered into the database and **sp.** put into the species field in the database.

If there is a blank header label, then digitise the specimens behind it, if there is a genus name.

3.6 Digitising specimens

Make an assessment of the drawer to identify which header labels belong to which specimens.

First, assess the labels currently with the specimen. Do **not** digitise if the specimen label is typed printed with a 'C. XXXXXX' number (conchology registration number) as this specimen has already been electronically databased (see example below). If typed printed labels do not have 'C.' numbers or if the 'C.' numbers are handwritten then digitise these specimens. The 'C' number will need to be checked to see if that number has already been used.



Digitise all specimens that meet the above criteria, excluding paratypes/topotypes. (Holotypes are stored elsewhere and are already electronically databased.)

Digitise Australian specimens (white labels) and non-Australian specimens (green labels).

Do **not** digitise fossils contained in light blue boxes. In addition, if you locate a specimen with an 'F' number in a non-fossil box, then do not digitise it.

Digitise written (non typed or partial) specimen labels which may or may not have a 'C.' registration number.

If a label is inside a vial, remove it with forceps carefully. If a label is sticky taped to the inside of a specimen, take it out to image and then place it back with the specimen without using sticky tape.

Use coloured inserts to keep track of where header labels and specimens belong.

Loose specimens in a unit tray are removed and laid out in the stage box with the labels and scale bars lined up on the right hand side. Specimens placed in vials or in microvials (within a vial) can be placed, minus the cotton wool, on the small foam rest to angle the vial and reduce the light reflection in the image. Take microvials out of the larger vial to image and place it on the foam rest to image.

Do not image header labels.

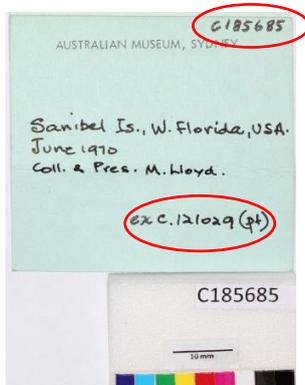
When taking an image, place large labels with blank spaces on top of each other and overlapping without blocking out the previous label to reduce overall label size.

If a label has a 'C.' number written on it, check to see if this number already exists in the data base by using the search function. If it does already exist, then it means that it is a duplicate number and a new 'C.' registration number needs to be assigned to make sure every specimen has its own unique 'C' specimen number. In this case, cut out a new 'C.' number and enter the duplicate 'C.' number in the 'old registration number' field and enter the new 'C.' registration number in the 'new registration field'. If the 'C.' number is not a duplicate, then enter the 'C.' number in the 'new registration number field' in the data base.

If a label doesn't have a 'C.' number or the 'C' number it has already exists, then cut out a new 'C.' number and place it on top of the scale bar to image. Scale bars are placed under all of the labels. If there are 2 columns of labels, then place the scale bar under the column beside the specimen.

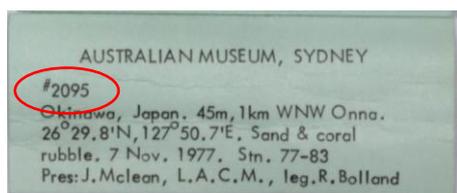


After taking an image, place the 'C.' number in front of the label in the vial or in the case of a specimen in a unit tray, place it loosely in the box and write the 'C' number in small, clear print at the top of the existing specimen label with the pen provided by Malacology. If an old 'C' number has been written on the label and will no longer be used write 'ex' next to the old 'C' number.



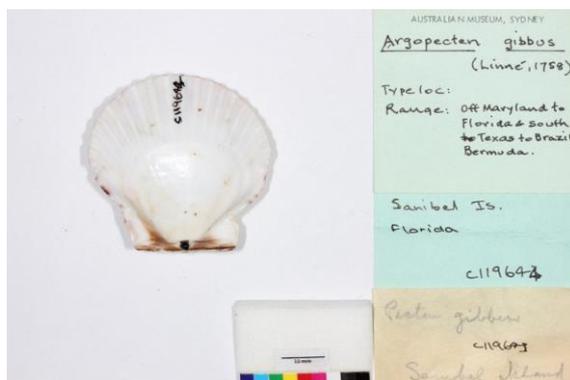
Any old 'C' numbers need to be entered in the 'old registration number' field in the data base.

If there is a '#' followed by a number, enter the number in the collection code field. Add the 'C.' number to the 'new registration number' field in the data base.



If you find a specimen already broken in its box, take an image and replace it in the drawer.

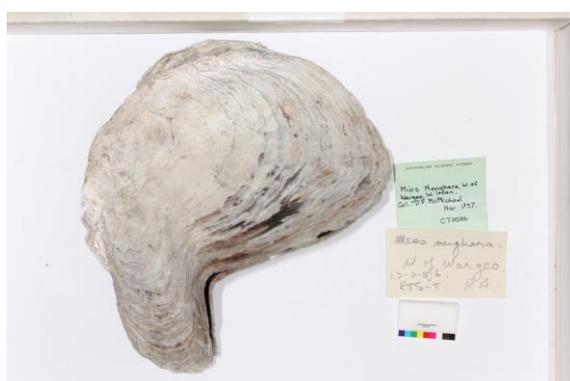
The priority for imaging is to get a clear image of the labels so that they can be easily transcribed. It is also desirable to have a good close-up image of loose specimens in the unit tray or specimens in the vial, taking up as much of the camera frame as possible. If there is only one specimen to be imaged, show the inside view of the shell as it is the most relevant view to Malacology.



If there are a few loose specimens, then carefully handle specimens to display both sides of specimens. Sometimes a shell will have a written 'C' registration number written on it which should be included in the image when possible.



If the stage box is too small for the display of specimens or you can see the edges of the box in the frame (see example below), then use a large piece of white paper.



Please ensure that the drawer will be returned in the same condition prior to digitising.

3.7 E.N. Drier Collection Rules

Only enter the Family name and not specimen genus and species

The items grouped in a single large bag should only be given one registration 'C.' number, which will include the total number of specimens in the large bag but the contained bagged lots need to be kept physically separate in their individual bags with their labels as they will be housed this way in the collection.

All labels should be imaged and a shell with a number written on it should be captured.

3.8 What to do with damaged labels and broken vials

Image broken labels and specimens as best you can and replace the specimen carefully back in the drawer.

If there is a broken vial, then give it to the Digitisation Officer who will replace it with a new vial.

Please advise the Digitisation Officer if the specimen or label is damaged with handling.

4 Marine Invertebrates

4.1 Marine Invertebrates Collection

The Marine Invertebrate collection contains specimens from all invertebrate groups except molluscs, insects and spiders.

The current focus of the collection is on polychaetes (segmented worms) and crustaceans (lobsters, crayfish, prawns, crabs, seed shrimps, barnacles, slaters and pill bugs) which reflects the research interests of the marine invertebrate staff.

4.2 Storage of specimens within the Marine Invertebrates collection

Marine Invertebrate specimens are held in unit trays or boxes within drawers much like the Malacology collection. The specimens may be placed loose in the cardboard unit trays or in glass vials. The specimens in the cardboard trays are kept in plastic bags.

The Marine Invertebrate specimen drawers may be heavy to handle, so care must be taken to use a safe lifting technique. If a drawer is too heavy for a volunteer to handle, please advise the Digitisation Officer who will handle the drawer.

When finished digitising a drawer, return it to the cabinet and mark it off the list before taking the next drawer.

4.3 Equipment

The equipment used in the Marine Invertebrate collection that are most relevant to our project include:

- Always use gloves when handling the specimens.
- Fine forceps and small paint brushes are provided to handle specimens and sweep small crustaceans back into the vial.
- Archival pens have been provided to write the new registration number on the specimen label.
- The piece of paper in the bottom of the stage box needs to be replaced periodically as colourisation of the paper occurs due to dirt sediments.

4.4 Working with specimens in the collection

It is important to handle specimens with care as they can be very fragile. Handle the crustaceans by their carapace (the body). If you can avoid handling the specimens and are able to take an image of the crustacean within the box then do so, laying the label gently on top.

Some specimen labels placed in a vial need to be removed by using any of the appropriate handling methods:

- Fine forceps may be used to first remove the cotton wool and then to carefully remove the labels.
- If the labels cannot be removed without moving the specimens, the specimens can then be removed carefully with forceps.

- A folded piece of paper may be used as a receptacle and funnel to collect and return specimens. Forceps and a small paint brush may be used to sweep the specimens back into the vial, carefully to avoid flicking the specimens.

The specimen count is a count of the number of specimens in a unit tray or in a vial. If specimens are small you may need to use a magnifying glass to count them. If there are more than 20 specimens, enter >20 and if unsure, leave the database field blank. If it is difficult to determine what is a specimen or fragment due to its very small size, then leave the count blank. The crustaceans can be counted by the number of carapace (body) of crustaceans in the box.

4.5 How specimens are labelled in the Collection

The Marine Invertebrates crustacean drawers will have the family name written on the drawer label at the front. The scientific name may or may not be on the individual labels. If the scientific name is there and the handwriting is very hard to read, the WORMS (World Register of Marine Species) website, <http://marinespecies.org/> or the Checklist of Crabs may be of help to identify the correct spelling of the name.

If the only label with the specimen is of a number, give it a new 'P' number and digitise it. Advise the Digitisation Officer if several of these specimens have occurred in the drawer i.e. the ones having only a number on their label.

Follow the below table to determine what name to add to the database:

Written on the label	What to enter in the database
No scientific name on the specimen label	Use the family name on the front of the drawer.
You can read the scientific name but cannot find it either in the book or on the internet.	Leave it out and enter the family name from the front of the drawer.
You can read and find the genus name but not the species name	Enter the genus name and put sp. in the species field
There are several labels in the one specimen and each label has the same genus with a different species name	Put in the genus name with sp.
There are several labels in the one specimen sample and each label has a different scientific name and these names do not occur in the same family and the specimens are obviously crabs.	Put aa-Brachyura in the family field as we do not have an order field.
If the scientific name is no longer the accepted name	Use the original name on the label for a history of identification.
The scientific name on the label is not in the family that is on the front of the drawer	Use the currently accepted family name.
If the material is obviously a crab (5 pairs of legs including anterior pair modified into pincers and 4 pairs for walking, abdomen calcified and strongly reflexed under the body so not visible when viewed from	Use family aa-Brachyura

above) but there is no genus or family name on the label or drawer

If the material is obviously a hermit crab (i.e. encased in a mollusc shell or with 5 or 4 pairs of legs including anterior pair modified into pincers and 3-4 pairs for walking (if 4 pairs of walking legs present the posterior pair reduced), abdomen membranous and not strongly reflexed under body so visible when viewed from above)

Use family aa-Paguroidea

If the specimens are obviously not a crab or hermit crab

Use aa-Crustacea (unless it is just a mollusc shell – in which case don't register it)

If the specimens are both crab and hermit crab in the one box

Use aa-Crustacea

4.6 Digitising specimens

None of the specimens in these crustacean drawers have been digitised, so they can all be imaged and all of them can get a new 'P' registration number.

Use coloured inserts to keep track of where the specimens belong when they are removed to photograph.

Loose specimens in a unit tray can be left in their box with the label laid out on top of the specimens. Specimens placed in vials, can be placed, minus the cotton wool, on the small foam rest to angle the vial and reduce the light reflection in the image with their labels beside them in the stage box. The new 'P' number will be placed on top of the scale bars.

After taking an image, place the 'P' number in front of the label in the vial or in the case of a specimen in a unit tray, place it loosely in the box and write the 'P' number in small, clear print at the top of the existing specimen label with the pen provided.

If you find a specimen already broken in its box, take an image and carefully replace it in the drawer.

The priority for imaging is to get a clear image of the labels so that they can be easily transcribed. It is also desirable to have a good close-up image of loose specimens in the unit tray or specimens in the vial, taking up as much of the camera frame as possible. If there is only one specimen to be imaged, show the top dorsal side of the crustaceans shell.

If the stage box is too small for the display of specimens or you can see the edges of the box in the frame (see example below), then use a large piece of white paper.

Please ensure that the drawer will be returned in the same condition prior to digitising.

4.7 What to do with damaged labels, specimens and broken vials

Image broken labels and specimens as best you can and replace the specimen carefully back in the drawer.

If there is a broken vial, then give it to the Digitisation Officer who will replace it with a new vial.

Please advise the Digitisation Officer if the specimen or label is damaged with handling.

5 Ornithology

5.1 Ornithology Collection

The Australian Museum has one of the largest ornithological collections in the Southern Hemisphere. It contains a large variety of bird skins, mounts, skeletons, eggs, nests, spirit specimens and tissue samples, representing approximately 95% of the world's bird families.

5.2 Storage of specimens within the Ornithology egg collection

The bird eggs are held in small boxes within a bigger box. They are currently held in the off site storage facility.



Within each small box the eggs and their labels are surrounded by cotton wool.

5.3 Equipment

The equipment used in the Ornithology collection that are most relevant to our project include:

- Fine forceps can be used to remove labels that are tucked behind the eggs in the box.
- Pencils are provided to write the registration number on the front of the box.
- Cotton wool is provided to lay on top of the eggs if it is missing.
- Labels will be provided at the end of the box for the small egg boxes to be labelled on both the top and side.

5.4 Working with specimens in the collection

Every box and each specimen within the box is to be returned in exactly the same way in which it has come to us from the collection with the exception of new labels.

Even though the eggs are surrounded by cotton wool, it is important to handle the egg boxes with care as the eggs are extremely fragile.

5.5 How specimens are labelled in the Collection

The boxes have the scientific name and the registration number written on the lid. If the registration number is missing, write the number with pencil on the lid. The box will be labelled on the top and side upon completion of digitising.

5.6 Digitising specimens

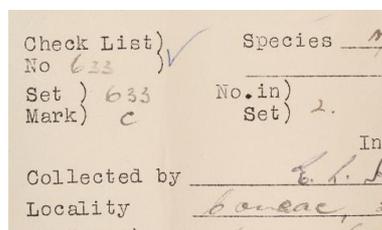
Do not remove the eggs from the box. Take the top piece of cotton gently out of the box, try not to touch the eggs. Leave the eggs in the box to take the image. Find the labels in the box, you may have to use forceps to get the labels out. Be aware that some of the labels are extremely fragile. Check the back of the label as it may need photocopying. If a specimen does not have cotton wool in the top, add some from the supply in the equipment box.

Put the lid on an angle to be able to read the pencil on it. Elevate the labels with 3 pieces of foam to get the eggs and labels at the same height for depth of field. Keep the specimens on the left of the image.



Most specimens will have O numbers although some have A, B or S numbers. Add any of these numbers to the database. If there is a number with no letter prefix then add PA to the beginning (PA means it is from the Palmer (first) Register).

In the database, the fields – check list # and set mark will be on the specimen label. The egg field will be the number of eggs in the specimen.



If there is no O number on the lid, add it in pencil, no need to add the scientific name.

Sometimes the box may have the number O.14774-7 on the front and no O number inside. This means that they have registered each of the 4 eggs inside the box with a different number, O.14774, O.14775, O.14776, O.14777. Write all these numbers on the top of the box. Take 4 images and enter 4 records changing the O number for each record. Each of these records will have 1 in the specimen count field.

If you encounter problem specimens, place them in the 'problem eggs' box. Write on a post it note which original box they came from and what the problem is then stick the note on top of the box. The collection manager will deal with these specimens at a later date. Some examples of problem specimens may be:

- 2 x O numbers in the one box, 1 of the numbers is written on all the labels and the top of the box and the other number is not written anywhere.
- A box may have a range of numbers on the front (O.14774-7) but inside has more than 4 eggs.

When a box is finished being digitised, return it to the cabinet and mark it off the list before taking the next box. Let the supervisor know so that they can print the labels off and the labels can be put on.

5.7 What to do with damaged labels, specimens and broken vials

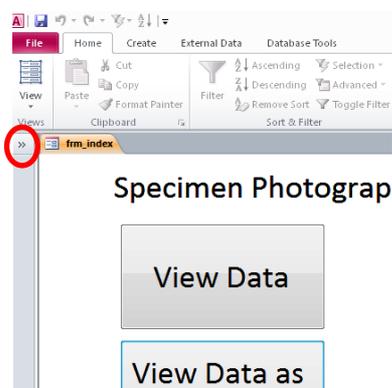
When you lift the cotton wool out and see broken eggs, fill out the 'broken eggs' spreadsheet. Fill out the box number, the registration number, the image number and the number of eggs broken.

Drawer number	O Number	Image number	Number of broken eggs
30	(0.55230)	98	1
32	(0.48247)	175	1
32	(0.52057)	176	1
35	(0.67494)	253	1
35	(0.69191)	288	2

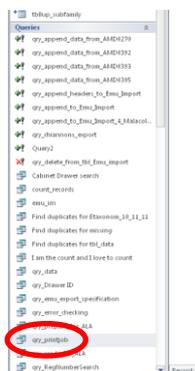
5.8 Printing Labels

After the box has been complete a supervisor will check the quality of the images and then print the labels. The process for printing labels is below.

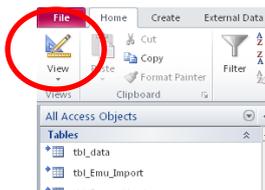
- Open EMu.
- Open Bird Access Database.
- Do an error check on the drawer/box that you want to print the labels for.
- In the database open the double arrows



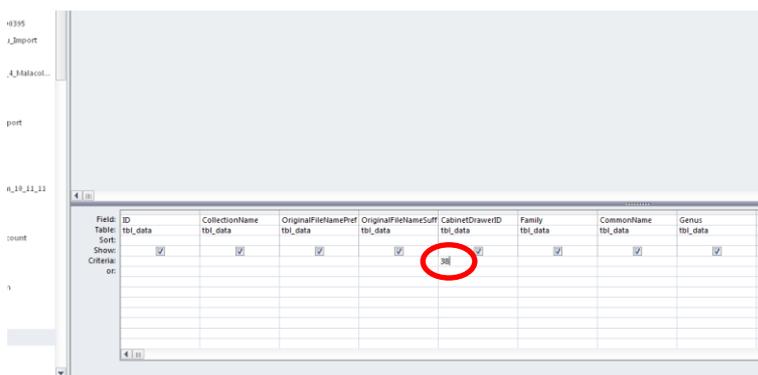
- Scroll down to find under Queries – qry_printjob



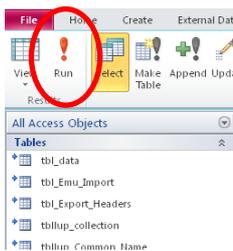
- Double click on qry_printjob



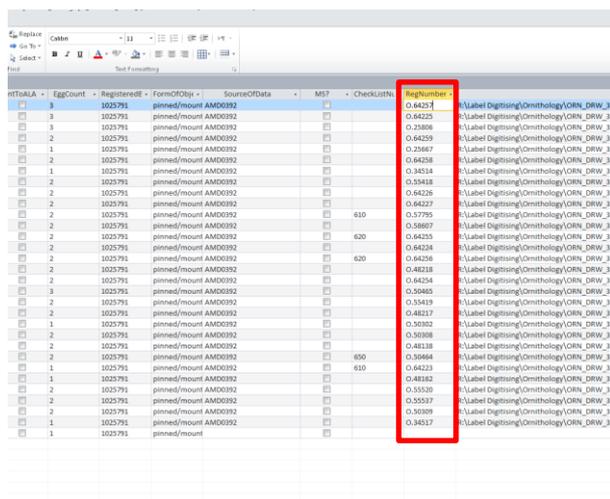
- Click on the arrow underneath view and choose design view



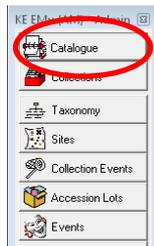
- Change the CabinetDrawerID to the number of your box.



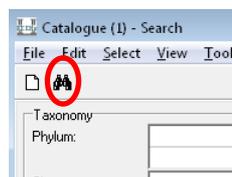
- Click on Run



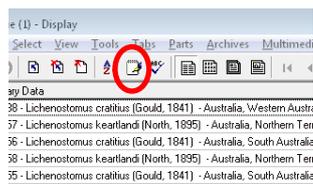
- Scroll across to the RegNumber column. Copy (Ctrl C) the RegNumber column.
- Go to EMu.



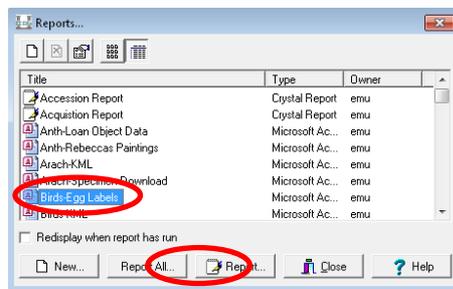
- Click on the Catalogue tab.
- In the Catalogue window, click on Edit. Click on Clear All.
- Copy and paste (insert) the RegNumber column to the Reg No. field in the catalogue window.



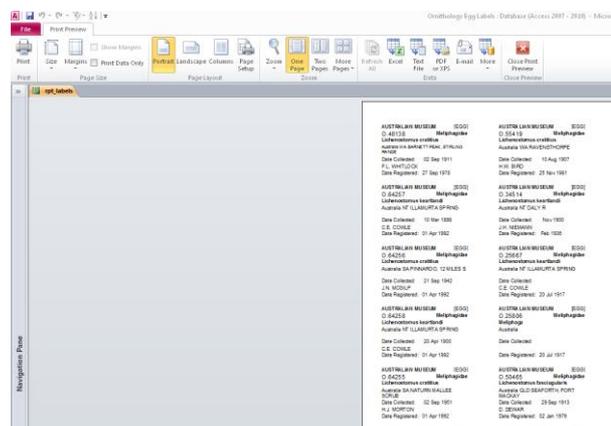
- Click the binoculars to search for the reg numbers



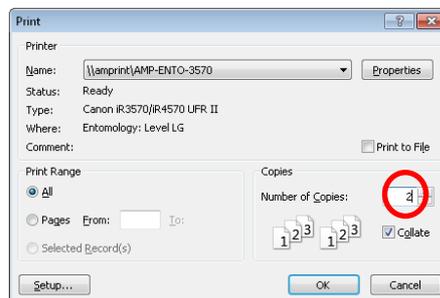
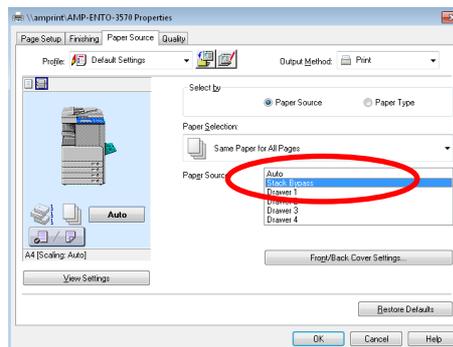
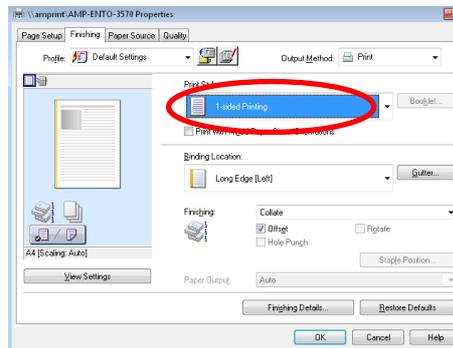
- Click the note pad and fountain pen icon



- Select Birds-Egg Labels and click Report All...



- Click on print. Change print properties to the below:



- Put the labels in the stack bypass on the printer to print.

The specimen boxes are now ready to be labelled. Two labels are stuck to the box, one on the top and one on the side.

6 Workstation setup

Each workstation is set up with a camera on a copy stand, the specimen drawer, a stage and a computer with dual screens.

It is a three step process to capture the image of the specimen and label data:

1. Preparing the specimen for imaging by removing its labels from the box, vial or pin and placing it in the stage
2. Imaging the specimen and data entry
3. Reassembling by putting the labels back on or with the specimen and returning it to the drawer.

At each workstation there will be two volunteers. One volunteer will be handling the specimen (the Specimen Handler) and the other volunteer will be imaging the specimen (the Digitiser).

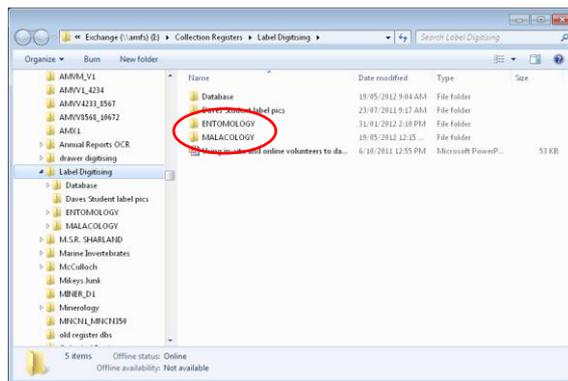
The following steps will guide you in the systematic usage of the equipment (i.e. computer, camera and database) for digitising the specimens.

- Use the generic login to log onto the computer.
- Turn the camera on and remove the lens cap, place the lens cap in the equipment box.
- Turn on the ringflash.

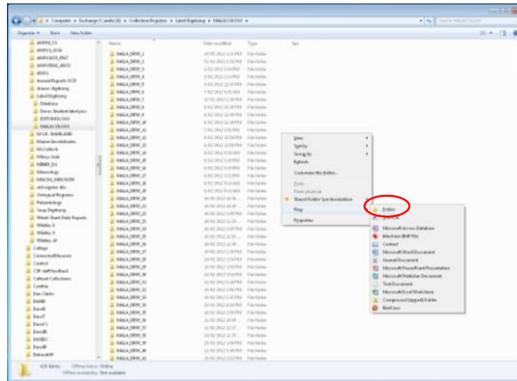
6.1 Creating a new folder

Before starting each new drawer, a new folder must be created.

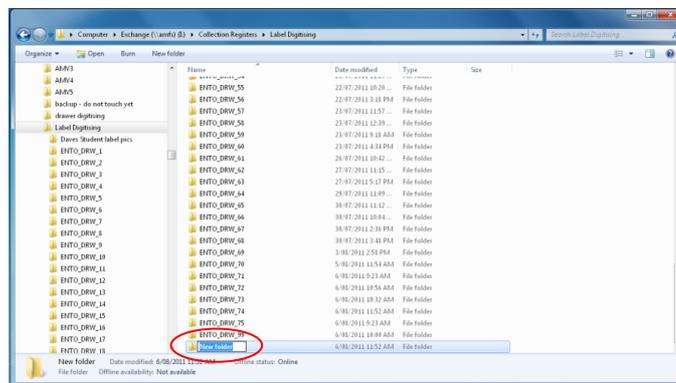
Create a new folder in I:/Collection Registers/Label Digitising. To do this go to Windows Explorer, open Collection Registers on the left hand side and then Label Digitising. Choose either Entomology or Malacology depending on the collection being worked on.



Click on the right hand side of the window with the right mouse button to get a new folder as shown below.



Type in the name of the folder, for example, ENTO_DRW_1, MALA_DRW_1.



6.2 Applications to open on the desktop

6.2.1 EOS utility

Double click on the EOS Utility icon on the desktop (unless it opened automatically when the camera was turned on), this will open up the below window. Click on Camera settings/Remote shooting.



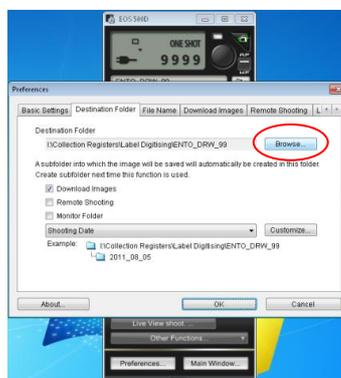
By clicking on Camera settings/Remote shooting, the EOS 500D window will open to the camera's remote shutter control. Check that the settings are the same as below with the exception to the F number.



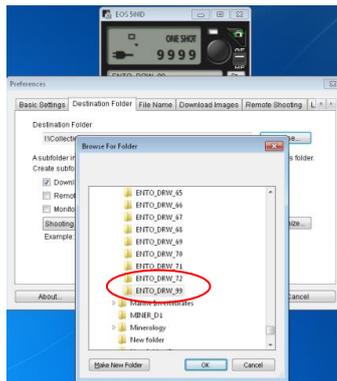
Click on the folder icon to change the folder where the images are saved if needed.



Click on Browse in the Preferences box.



Navigate to and select the folder where the images for the drawer will be saved and press OK.



6.2.2 Remote Live View Window

Click on Live View Shoot on EOS utility.



This will open the Remote Live View window.

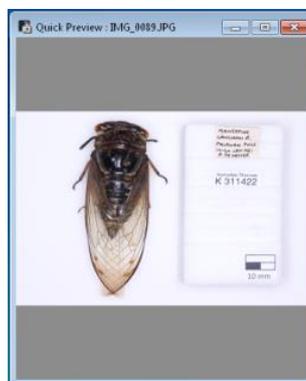


6.2.3 Quick Preview

Click on Other Functions on EOS utility and then on Quick Preview.

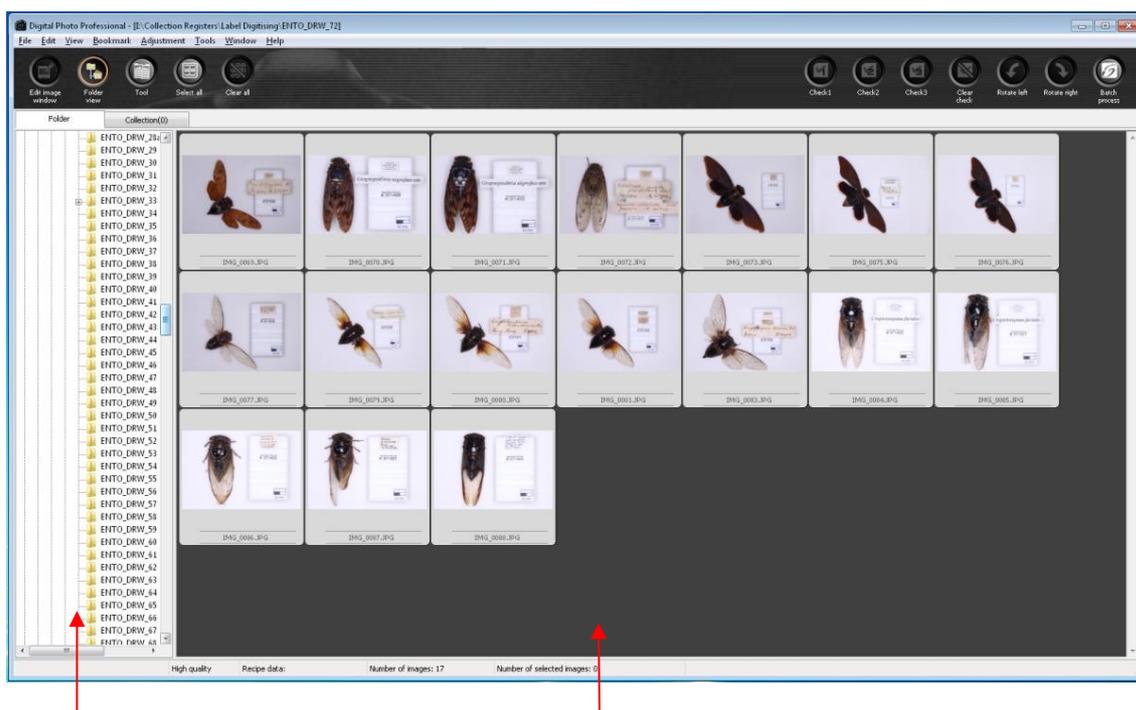


This will open the Quick Preview window.



6.2.4 Digital Photo Professional

Double click on the Digital Photo Professional icon on the desktop. On the far left hand side go to: My Computer/I:/Collection Register/Label Digitising/ENTO_DRW_... (the name of the drawer that is being digitised).

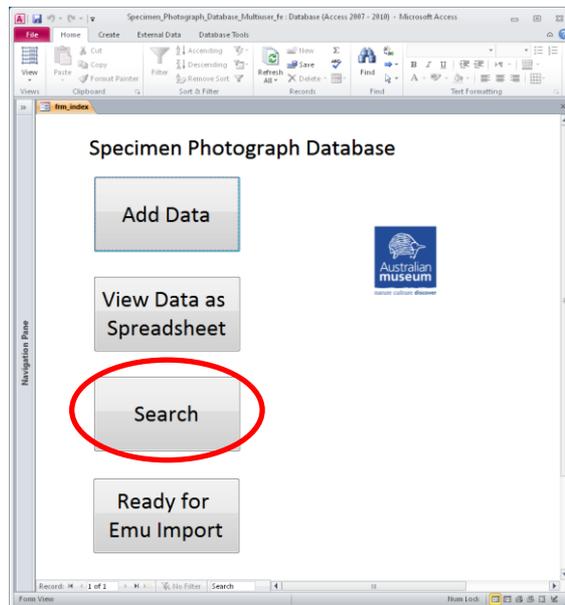


Folder where the image is saved

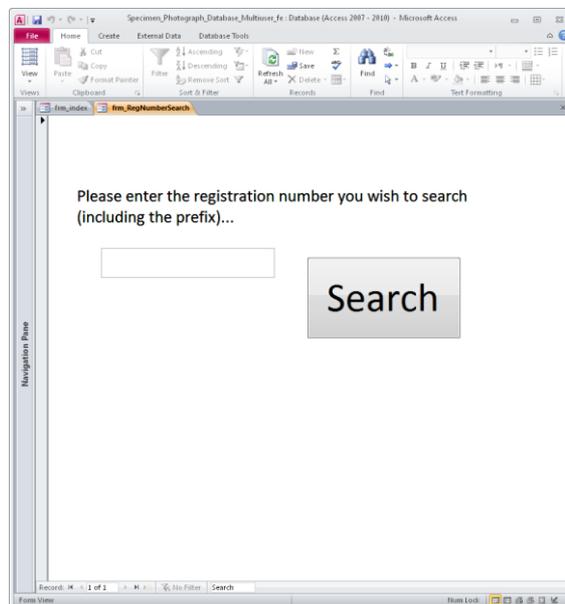
Image library

6.2.5 Database

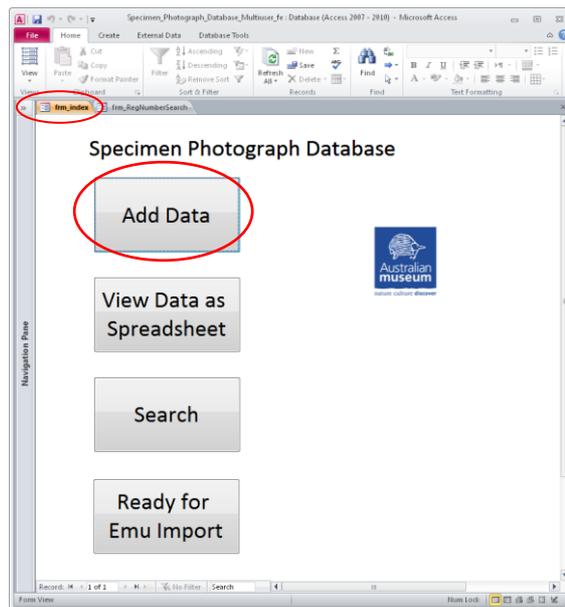
Open Specimen_Photo_Database which can be found on the computer desktop.



Click on the Search button

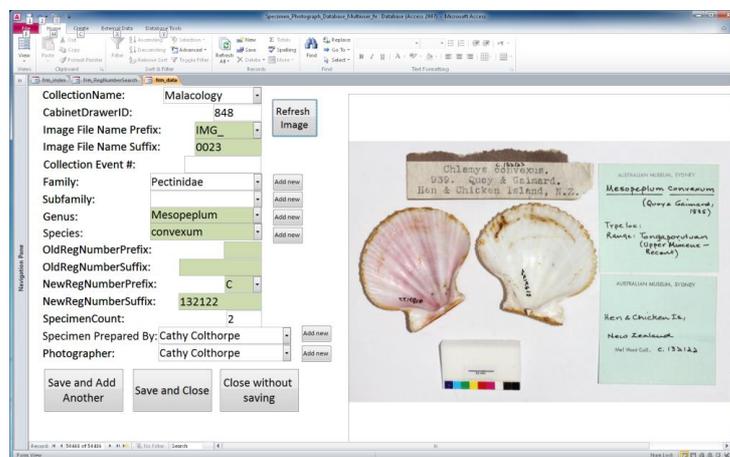


This will bring up the above form. This form is used to search that a registration number in Malacology does not exist and is available to be used. 'C.' must be entered in the field before the number, see 5.4.1.



Go back to the frm_index tab and click on Add Data

So now you have both frm_RegNumberSearch and frm_data tabs open. Frm_data is the usual form that is used to add the data.

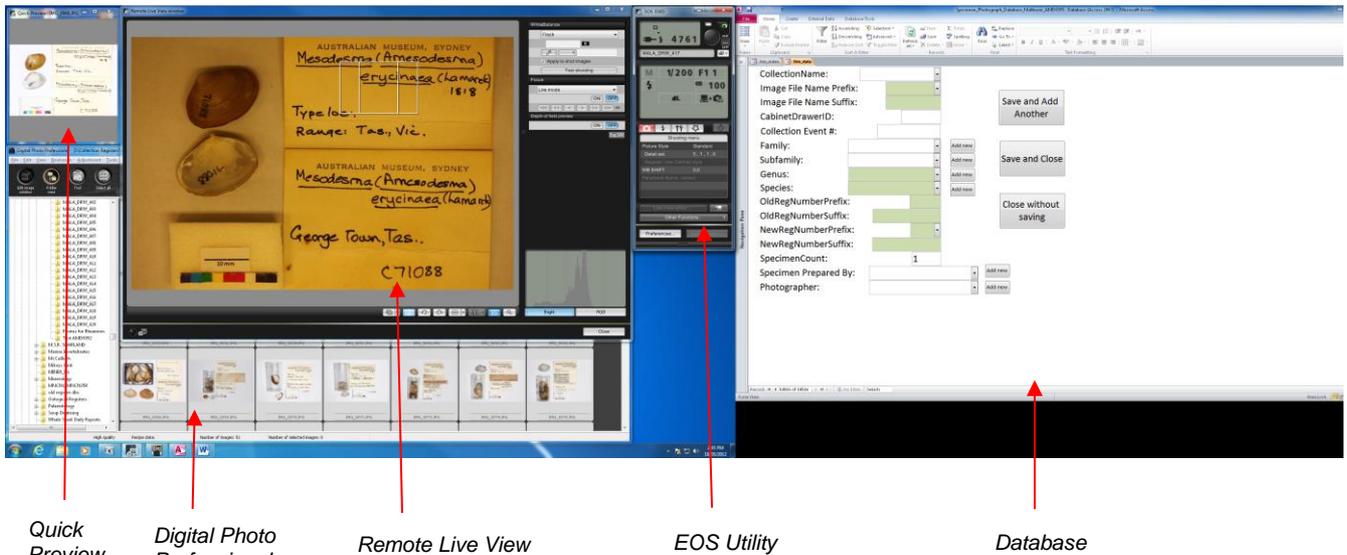


6.2.6 Position of open windows

The positioning of the open window applications on the dual monitors is a personal preference however guidelines are outlined below.

Monitor 1 (left)

Monitor 2 (right)



6.3 Taking the image

Before adjusting anything on the camera or copy stand, make sure you have moved the specimen away from underneath.

The camera that we are using in the workstation is a Canon EOS 500D or 550D with a ring flash mounted to a copy stand.

The Digitiser positions the stage under the camera 'upside down' in the same orientation of the camera. This step saves the image being rotated after it has been taken.

Use the camera's remote live view finder, to ensure that the specimens and labels are in the camera frame. The specimen and label should be centred in the image and take up as much of the field of view as possible.

The base line settings for the camera are shutter speed 1/200, ISO 100, Flash 1/8, the Aperture (F number) needs to be assessed at any change to the copy stand's height.

A basic explanation of the camera settings is as follows:

Shutter speed. The time that the shutter is open. These settings are usually measured in seconds or fractions of a second e.g. 1/30, 1/60 and so on. The smaller the fraction the faster the speed (e.g. 1/1000 is much faster than 1/30). The greater the seconds or fraction of a second setting the longer the shutter is open. This can create problems with camera shake due to movement of the copy stand for long exposure times.

Aperture. The aperture is the size of the iris in the lens that also controls the amount of light that the lens lets into the camera and the depth of field (i.e. how much of the image is in focus). The settings for aperture are called f-stops and are usually a standard set of numbers f/2.8, f/5.6, f/8, f/11, f/16, f/22, f/32. These numbers are actually fractions (where the number 1 has been replaced by the letter f), but are usually expressed as full numbers (e.g. f 1/16 is usually expressed as "f sixteen").

Each step up in aperture value halves the amount of light reaching the sensor. Each step down in aperture value doubles it.

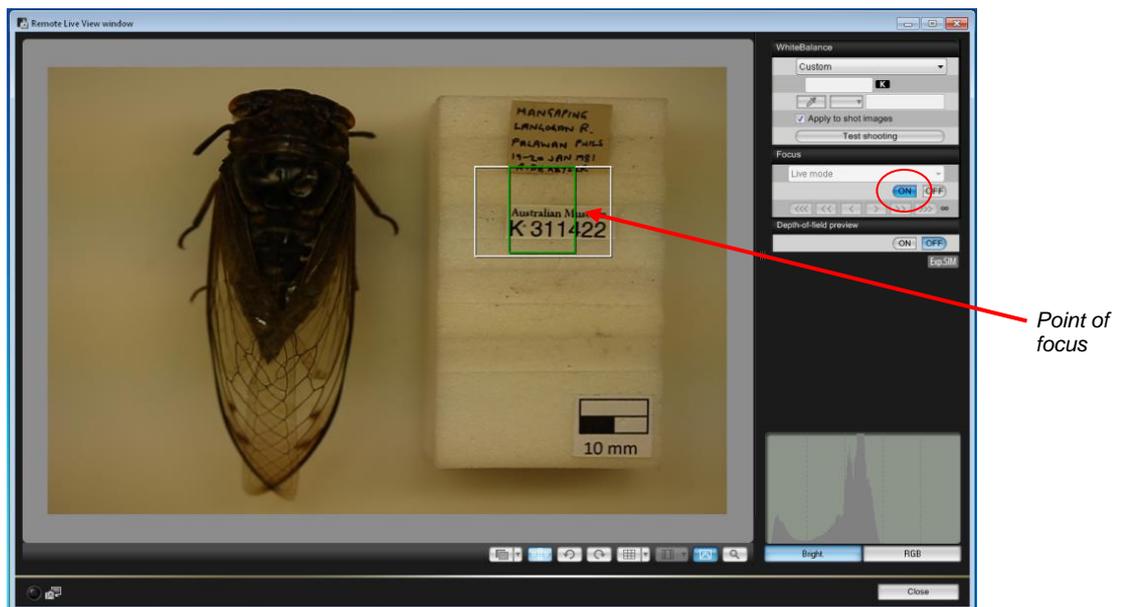
Larger apertures (where lots of light gets through) are given smaller f-stop numbers and have shallower depth of field. Smaller apertures (where less light gets through) have larger f-stop numbers and a greater depth of field.

ISO Settings. ISO is the sensitivity to light of the imaging chip in the camera. The lower the number the less sensitive the camera is to light, and the lower the electronic noise. Higher ISO are generally used in darker situations to allow for a faster shutter speed (like in the Dinosaur exhibition). However, the cost is noisier shots. ISO 200 is sufficient for adequate image quality for specimen data capture.

These parameters can be changed in the EOS 500D/550D window.

In Remote Live View window the point of focus is used to ensure that the labels and specimen are sharp.

Click on Focus>Live Mode>On to focus the image.



The computer operated shutter control on EOS Utility is used to take the final image.



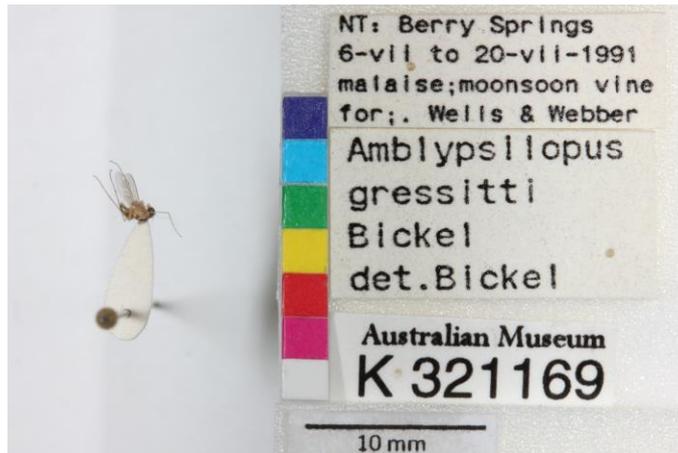
Take the photo and maximise the Quick Preview window to check the positioning of the specimen and label block. Double clicking on the image in Digital Photo Professional can also be used to zoom in on an image to check the focus and clarity.

6.3.1 Composition

The composition of an image is the placement or arrangement of both the specimen and the labels.

The specimen and the labels will be as large as possible in the camera frame.

With smaller images the labels will be on the right hand side with the specimen in the remaining area on the left.



With larger specimens again keep the specimen to the left and the labels towards either the top right or bottom right hand corner of the camera frame.



It won't always be possible to follow this but remember to always make the specimen as large as possible.

Badly composed images are ones that are not positioned to maximise the space in the camera frame, have parts of the labels missing or not straight or are blurry.

Some examples of badly composed images.



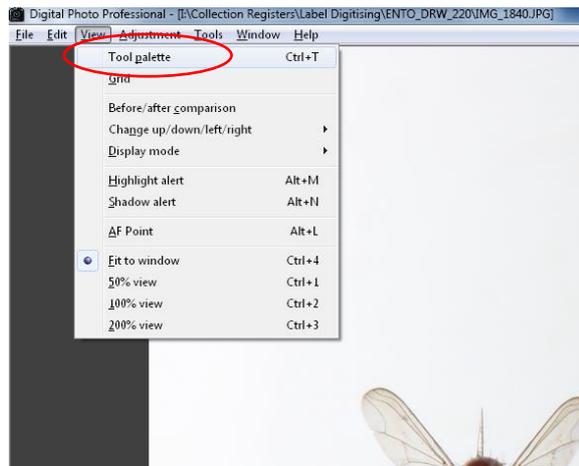
6.3.2 Lighting

When an image is overexposed it is too bright, when an image is underexposed it is too dark.

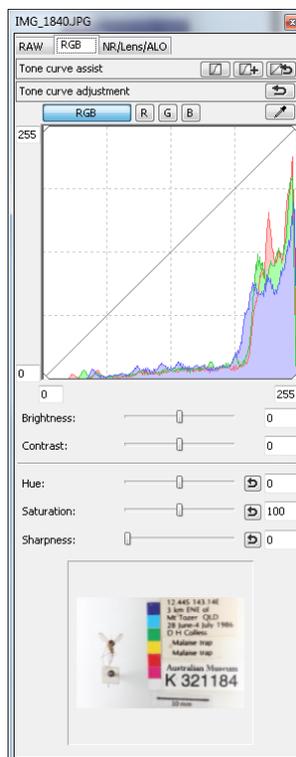
The tone curve histogram can be used to see if all the information for that image has been captured.

To open the tone curve histogram, double click on an image in Digital Photo Professional

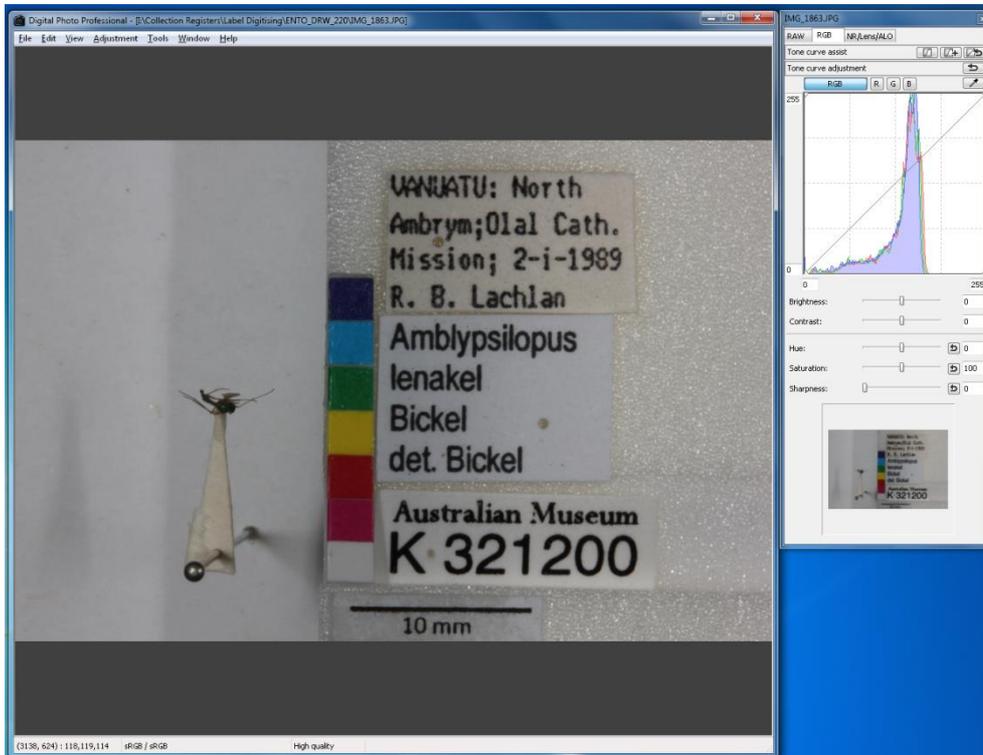
Once the image has opened, click on View and then Tool Palette



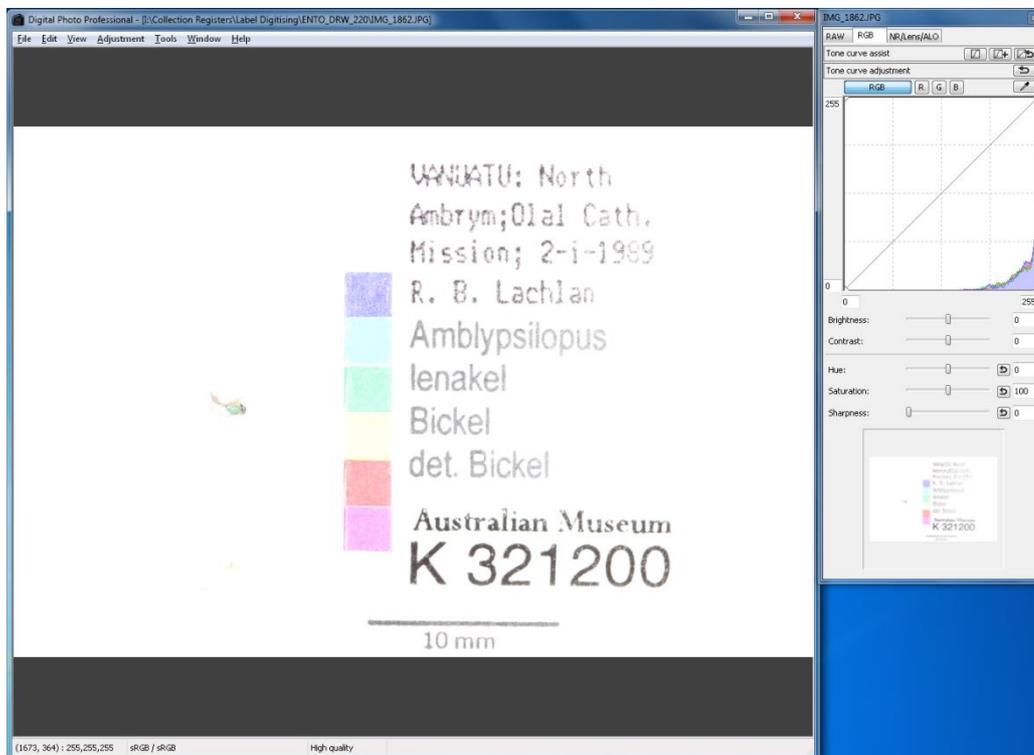
This will open the histogram



A dark image will have all the curves creeping towards the left of the graph



And an image that is too bright will have all the curves to the far right.



The aim is for the peaks of the curves to appear in the middle of the last quarter section.



The camera and/or flash settings are not to be changed with the exception of the aperture. The aperture can be adjusted when the copy stand is moved up and down. The flash should be set at 1/8.

The below table can be used as a guide. Make sure the height is read from the bottom of the camera.

Height cm (bottom)	Aperture
20	F22
25	F20
30	F18
35	F16
40	F14
45	F13
50	F11
55	F10
60	F9
65	F9
70	F8
75	F8
80	F7.1
85	F6.3
90	F6.3
95	F6.3
100	F5.6
105	F5.6
110	F5.6
115	F5

6.3.3 Things to do at the beginning of the day

- Change the paper on the stage and make sure the label block/stage is clean.
- Change the batteries in the flash and make sure the flash is set to 1/8
- Check all settings are the same as below. Note the aperture may be different depending on the height of the copystand



If the image is not satisfactory, go into Digital Photo Professional and click on the image so that a yellow outline appears, press the delete button and yes to delete the image. Care must be taken that only one image is selected for deletion and that the image number correlates in the database.

Once the Digitiser is satisfied with the final image they will pass the stage back to the Specimen Handler to reassemble the specimen.

The Digitiser will then enter the label information into the database.

6.4 Database steps

6.4.1 Checking registration numbers for Malacology

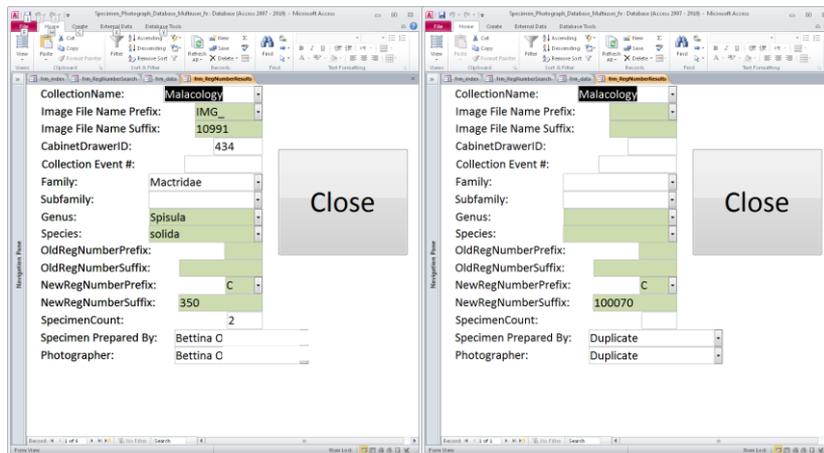
In Malacology specimen labels, sometimes the 'C' registration number will have (pt) written after it. This means that the specimen is part of a bulk of specimens all with the same C number. For each specimen to have a unique registration number it is essential that we make sure that a C number has not been used before.

Every C number that appears on the specimen labels will need to be checked to see if it has already been used as sometimes the (pt) has not been written on the label. To do this the database must be checked for duplicate numbers.

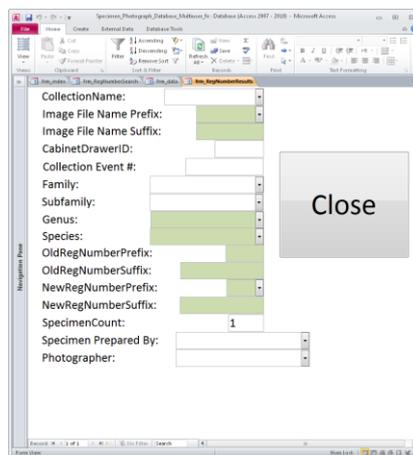
To do this go into the Reg Number Search form. Type in the box the registration number that you wish to check, remembering to include the prefix, for example C.12345.

If a registration number has already been used, it will come up with a form that already has data in it. You will need to give this specimen a new printed C number.

See below for examples:



If the form is empty, as below, this C number may be used for the specimen.

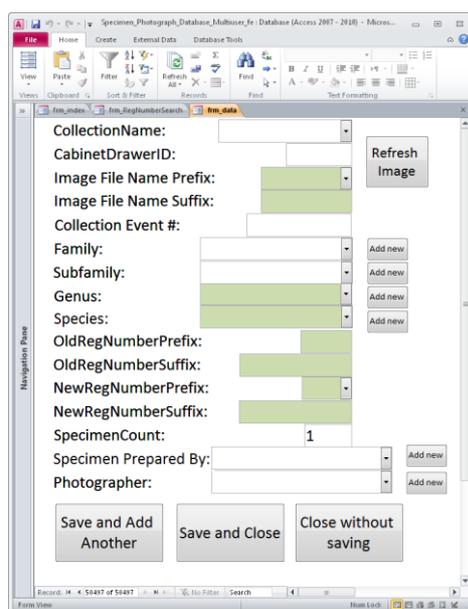


The 'Close' button must be used to search for another number.

6.4.2 Database fields

The fields of the database need to be filled out to correspond with that of the specimen image.

If a name does not exist in the drop down box, type in the name and click on the Add new button.



Collection Name: The collection from where the specimens come from e.g. Entomology

CabinetDrawerID: The number on the front of the drawer.

Image File Name Prefix: Camera file name of the image i.e. IMG_

Image File Name Suffix: The number of the camera file name which is found under the image in Digital Photo Professional

Collection Event #: A number seen on the label with a # in front of it.

Family: The name of the family of specimens (on the front of the drawer).

Subfamily: The name of the subfamily of the specimen (may not need to be filled out)

Genus: The genus name (first letter is always a capital letter).

Species: The species name (first letter is always a lower case letter).

OldRegNumberPrefix: The prefix letter of the old registration number (in the drop down box)

OldRegNumberSuffix: The number after the letter of the old registration number.

NewRegNumberPrefix: The prefix letter of the new registration number (in the drop down box)

NewRegNumberSuffix: The number after the letter of the new registration number.

SpecimenCount: How many specimens can be seen in the image or on the one pin.

Specimen Prepared By: Specimen Handler's name.

Photographer: Digitiser's name

Most of the fields will automatically populate except for the old registration number. Care must be taken when changing from one genus or species to another, using the drop down boxes in the database or adding a new name.

Once the database fields have been checked and are correct, the image will appear in the box to the right of the data. If the image does not appear the 'Refresh Image' button can be used, if it still

does not appear the database fields need to be checked. After this the Digitiser can click on Save and Add Another in the database and is ready to receive another specimen for imaging.

