

Husbandry Manual for the

# Yellow-Bellied Glider

*Petaurus australis*

[Mammalia / Petauridae]



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# 1 Introduction

The Yellow-bellied Glider is the largest Australian member of the family Petauridae and was classified by Shaw as *Petaurus australis* in 1791 as Australia's first gliding possum. It has a patchy distribution across the eastern and southeastern parts of Australia in wet and dry sclerophyll forests and woodlands.

The species is characterised by its dark to pale grey covering above with a darker stripe down the centre of the back. The belly ranges from whitish through yellow to orange with increased age and the gliding membrane extends from the wrist to the ankle. The distinctive ears are large, pink-grey and bare and its tail is long, broad and bushy. It is the most vocal of the Australian gliders and can be heard up to several hundred metres away.

The Yellow-bellied Glider is the least studied member of its family and very little data is available on this species in captivity.

Currently, wild populations of the Yellow-bellied glider are under threat. This is due to the destruction of their habitat through clearing and logging and predation by foxes and cats. In NSW the species is listed as vulnerable and the National Parks and Wildlife Service [NPWS] have released a recovery plan to ensure of its ongoing viability in the wild.

## 2 Taxonomy

### 2.1 Nomenclature

<b>CLASS</b>	Mammalia
<b>ORDER</b>	Dipriontoidea
<b>SUB-ORDER</b>	Phalangeridida
<b>SUPER FAMILY</b>	Petauroidea
<b>FAMILY</b>	Petauridae
<b>GENUS</b>	<i>Petaurus</i>
<b>species</b>	<i>australis</i>

### 2.2 Subspecies

- *Petaurus australis australis* – eastern Australia from Portland Victoria to central coastal Queensland.
- *Petaurus australis reginae* – northern Queensland to western slopes of rainforest between Mount Windsor and Yamanie, on the bank of the Herbert River Gorge. [Russell 1995, p228]

### 2.3 Recent Synonyms

- None

### 2.4 Other Common Names

- - Fluffy Glider
- - Flying Glider
- - Dusky Glider

### 3 Natural History

The Yellow-bellied Glider is the largest exudate-feeding arboreal mammal in Australia and amongst the largest of this foraging class in the world [Henry & Craig 1984, p331]. Its anatomical characteristics are therefore adapted to arboreal dwelling and feeding. Some of these include: a gliding membrane, long claws, protruding incisors and a black dorsal camouflage stripe.



*Petaurus australis* jaw & skull  
[Museum Victoria 2002]



Front claws of *Petaurus australis*  
[Museum Victoria 2002]

To date, various studies have contributed to the biological knowledge of the Yellow-bellied Glider including: social behaviour and organisation [Craig 1985; Russell 1984]; litter size and reproductive strategy [Craig 1986]; diet and foraging behaviour [Goldingay 1986; Goldingay 1990; Kavanagh 1987; Henry and Craig 1984]; longevity [Slater 1997]; and calling behaviour [Goldingay 1994; Kavanagh & Rohan-Jones 1982].

### **3.1 Morphometrics**

#### **3.1.1 Mass And Basic Body Measurements**

*Head and Body Length*

270 – 300mm

*Tail Length*

420 – 480mm

*Weight*

450 – 700g

#### **3.1.2 Sexual Dimorphism**

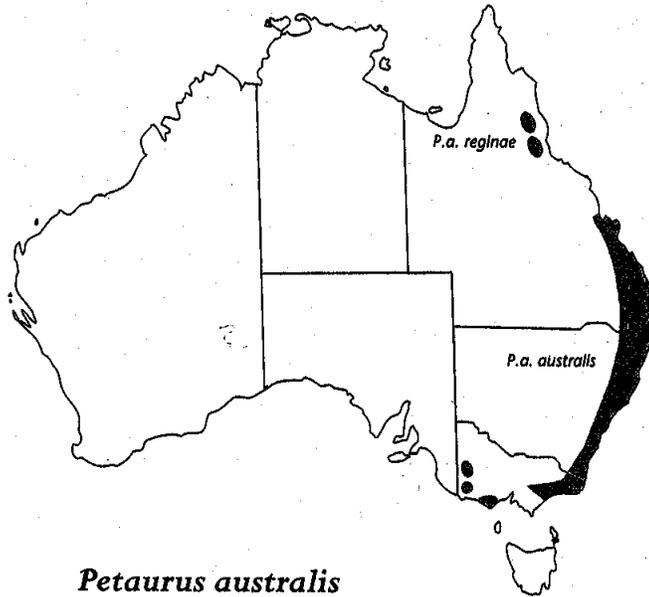
- Males are heavier and the northern race smaller. [Cronin 1991, p64]

#### **3.1.3 Distinguishing Features**

- The Yellow-bellied Glider is the largest Australian member of the family Petauridae and the second largest glider in Australia.
- The head and body is much longer than that of the Sugar or Squirrel glider but shorter than in the Greater Glider.
- Tail is relatively longer [approx. 1.5 times the body length] than in other gliders.
- A characteristic feeding habit of the species is incising ‘V’ shapes into the trunks of eucalypts to obtain sap.
- It is the most vocal of all the Australian gliders

### 3.2 Distribution and Habitat

- Distribution is patchy across a wide range of eastern and southeastern areas of mainland Australia. The southern subspecies *P.a. australis* occurs along the east coast of Australia to central Queensland and the northern subspecies *P.a. reginae* occurs in two small populations in north Queensland. [Russell 1995]
- In NSW its distribution is essentially coastal, extending inland to adjacent ranges. [NPWS 2003]



[Russell 1995, p228]

- Preferred habitats are productive, tall, open sclerophyll forests where mature trees provide shelter, nesting hollows and year-round food resources. A predominance of smooth-barked eucalypts within a mixed eucalypt forest is ideal. [NPWS 1999; Goldingay & Kavanagh 1991]
- Critical elements of habitat include sap-site trees, wintering flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types. [Tanton 1994 in NPWS 1999]

### 3.3 Conservation Status

**Table 1: Summary of conservation status of the Yellow-bellied Glider**

Legislative or scientific list	Taxon	Status
NSW TSC Act	<i>P. australis</i>	Vulnerable
South Australian <i>National Parks and Wildlife Act 1972</i>	<i>P. australis</i>	Endangered
Qld <i>Nature Conservation (Wildlife) Regulation 1994</i>	<i>P. a. reginae</i> (northern subspecies)	Vulnerable
Commonwealth EPBC Act	<i>P. australis</i> unnamed subsp. (Wet Tropics)	Vulnerable
Action Plan for Australian Marsupials and Monotremes (Maxwell <i>et al.</i> 1996)	<i>P. a. australis</i> (S subspecies)  <i>P. australis</i> unnamed subsp. (N subspecies)	Lower Risk (near threatened)  Vulnerable
2000 IUCN Red List of Threatened Species (Hilton-Taylor 2000)	<i>P. australis</i>  <i>P. a. australis</i>	Lower Risk (near threatened)  Lower Risk (near threatened)

Note:

EPBC Act – Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

IUCN – International Union for the Conservation of Nature and Natural Resources

[NPWS 2003]

### 3.4 Diet in the Wild

- As an exudate-feeding mammal, the diet consists primarily of phloem sap from eucalypts as well as nectar, pollen, manna and insect exudates. [Henry & Craig 1984, p331] In NSW, the sap tree species which they select are widely varied. [see Appendix 2]
- Pollen and insects are an important protein source for all members of the Petauridae. A high carbohydrate-to-nitrogen ratio in their diet provides additional energy for activity and territorial defence but has limited reproductive potential. [Macdonald 2001, p835]
- Foraging occurs within a wide range of canopy heights and a very high proportion of nocturnal activity [90%] is dedicated to foraging. [NPWS 1999]

### **3.5 Longevity**

#### **3.5.1 In the Wild**

- Individuals live for at least 6 years. [Goldingay & Kavanagh 1991]

#### **3.5.2 In Captivity**

- Individuals have been known to survive in captivity for up to 10 years. [Bellchambers 2004]
- The longest longevity record for the species in captivity is for over 14 years at Healesville Sanctuary, Victoria in 1996. [Slater 1997]

#### **3.5.3 Techniques Used to Determine Age in Adults**

- The under part fur on the belly ranges from whitish through yellow to orange with increased age. [NPWS 2003]
- In a study by Henry & Craig [1984], the precise aging of captured gliders was not possible, but gliders were classified as subadults or adults according to weight, body size and social status determined by subsequent observation.
- Other aging techniques include the wear of incisors and evidence of lactation in females. [Slater 1997] Non-active scent glands in males and shallow pouches with small teats in females indicate lack of sexual maturity. [Goldingay 1992].

## 4 Housing Requirements

### 4.1 Exhibit/Enclosure Design

- Depends on type of captive holding facility. If the Yellow-bellied Glider is held at a conservation zoo, public viewing is at night as animal is nocturnal. In this instance a night enclosure is required. If held at a standard zoo or wildlife park, a nocturnal house enclosure is needed for public viewing during the day. [Phipps]
- Airlocks are the most practical and provide the most security when entering and exiting the enclosure as Yellow-bellied Gliders are able to squeeze past the keeper and doorway quickly and successfully. [Tantini, Taronga Zoo]
- The internal exhibit lighting must be covered in a durable mesh as the gliders continually climb upon it. [Tantini, Taronga Zoo]
- Tree trunks and branches or replicas of trees are necessary for the gliders to glide between and should be placed as far away as possible from each other to increase gliding distances. Landing branches are also necessary. [Tantini, Taronga Zoo]
- Hollow logs or nest boxes are required for den sites and should be located near the top of the enclosure. [Bellchambers 2004]

### 4.2 Holding Area Design

- Holding areas may be smaller than the public display enclosures however they still need to be big enough for the glider to practice natural behaviours.
- Appropriate furnishings such as nest boxes, branches and tree structures are necessary to ensure the glider is comfortable whether the time in holding is short or long term. [Carroll, pers. obs]
- Holding areas at Taronga Zoo include outdoor enclosures as well as indoor enclosures within the nocturnal house. It is necessary to have holding areas in the nocturnal house for the resident gliders so they can continue living in the reverse-cycle lighting. This is especially important for short-term holding periods.
- At Taronga Zoo the approximate size of the holding areas are 3m x 2m x 2.5m which includes an airlock if needed.

### **4.3 Spatial Requirements**

- Recommended enclosure/cage sizes for static displays of the Yellow-bellied and Greater Gliders:  
Min floor area        20sqm  
Max no of animals    1  
Min height            3m  
Increased floor area for each additional animal    10sqm  
[DPI]

### **4.4 Position of Enclosures**

- Nocturnal houses are designed fully enclosed with the main reason being they are on reverse cycle lighting. Therefore, the position of the enclosure is not limited. [Carroll, pers. obs]
- Ideally outdoor exhibits should be partially enclosed and should not be positioned in direct sunlight.

### **4.5 Weather Protection**

- Outdoor enclosures require a partly covered area for shelter from weather extremities as well as nest boxes for added protection and comfort. [Carroll, pers. obs]

### **4.6 Temperature Requirements**

- Yellow-bellied Gliders adapt to most eastern Australian temperature ranges however heat lamps may be used during the colder winter months.
- The temperature within the nocturnal house is not electronically controlled, however there is a ventilation system to ensure clean air is continually provided. [Carroll, pers. com]

### **4.7 Substrate**

- Wood chips, pine bark and/or leaf litter are ideal floor coverings as waste blends in during the day when visitors are present. [Tantini, Taronga Zoo]

#### **4.8 Nestboxes and/or Bedding Material**

- Dimensions of nest-boxes are a combination of those required for the Greater Glider and the Common Ringtail Possum:  
Position in enclosure – min 4m or as high as possible in the enclosure  
Height – 43cm  
Floor – 20x24cm  
Entrance – 6-8cm  
Depth below entrance – 30cm  
[Walraven 1990, p41]; [Uni.Of Ballarat]
- Nest-boxes with hinged lids make it easier to clean and also to catch the glider for examination.
- Hollow logs, closed at one end with a piece of wood or tin, may also be used by gliders for sleeping. [Walraven 1990, p32]
- Peat moss is an ideal base for bedding material and gliders will add leaves and bark to the nest for extra comfort.

#### **4.9 Enclosure Furnishings**

- Aerial runways [eg. limbs, branches and vertical logs] providing a great variety of possible aerial pathways near the top of the enclosure are important and necessary components in any enclosure. [Bellchambers 2004]
- Nest boxes should be elevated high in the enclosure and should not be secured to the walls. [Tantini, Taronga Zoo]
- Suitable hiding holes/places are hanging plant holders lined with pieces of peat moss. [Tantini, Taronga Zoo]
- Stainless steel food and water containers should be spread out around the enclosure and are best situated attached to the tree structures.  
[Tantini, Taronga Zoo]

## 5 General Husbandry

### 5.1 Hygiene and Cleaning

- Excrement and other animal waste, leftover food, unwholesome food and water, bones, fur, feathers, dead animals and introduced rubbish and foreign objects must be removed daily. [EAPA]
- Daily spot checks for faeces, left over food or any other waste products is essential in maintaining a hygienic environment. Wood chips or pine bark is an ideal floor covering as waste blends in during the day when visitors are present. [Tantini, Taronga Zoo]
- **Daily:** a spot check clean is essential to remove wastes by raking and brushing with a dustpan. Stainless steel food holders are washed with general purpose detergent and rinsed. [Tantini, Taronga Zoo]

**Weekly:** browse changes are required. As well as the routine spot checks, tasks such as replacing eucalypt branches may be required. [Tantini, Taronga Zoo]

**Monthly:** branches and trunks are to be scrubbed and nestboxes washed out with a general purpose detergent. Nestboxes do not need more frequent cleaning as the gliders take time to create ideal sleeping environments. [Tantini, Taronga Zoo]

**Every second month:** a major enclosure clean is essential. Pine bark to be completely replaced. Enclosure to be hosed and cleaned with a general purpose detergent. Disinfectants are only to be used in a disease break-out and great care is to be taken as gliders are highly sensitive to strong cleaning products ie.bleach. [Tantini, Taronga Zoo]

### 5.2 Record Keeping

This involves recording and keeping information on the following:

- Identification numbers of animals
  - Health problems
  - Veterinary examinations
  - Veterinary treatments
  - Behavioural problems
  - Reproductive stages, condition or behaviour
  - Changes in diet
  - Movements within and between institutions
  - Body mass and measurements
- [Jackson 2002, p235]

### **5.3 *Methods of Identification***

- Ear tags and/or microchips are used for identification of the Yellow-bellied Gliders at Taronga Zoo.
- In a research study by Russell [1984], ear notching was found to be more permanent and less irritating to the glider than use of ear tags.

### **5.4 *Routine Data Collection***

- Captive data on the Yellow-bellied Glider is limited. Many areas associated with reproduction, growth and development are still unknown. Currently Taronga Zoo has been successful in breeding the species in captivity. Data collection and records is therefore vital for future breeding successes at Taronga Zoo as well as at other captive institutions. [Carroll, pers. com]

## 6 Feeding Requirements

### 6.1 Captive Diet

- Gliders require a varied diet consisting of fresh branches, leaves and flowers from eucalypts and other native trees and shrubs. Live foods such as mealworms, crickets and moths are also highly recommended.
- Supplementary foods include various fresh and dried fruits, vegetables and nuts such as apple, pear, fresh sweet corn, carrot, cucumber, sunflower seed, sultanas, banana, rockmelon, watermelon, peanuts and almonds. [The Marsupial Society]
- Taronga Zoo provides a high protein, high energy gruel called **Leadbeaters Mix**:
  - 150g Heinz high protein baby cereal [Available at all leading supermarkets]
  - hard-boiled eggs [shelled]
  - teaspoon Sustagen
  - 900ml honey
  - 900ml warm water

Mix all ingredients in blender for two minutes to make a palatable and balanced feed. Makes two litres. This mix can be stored in the refrigerator for up to two weeks. [Walraven 1990, p71] & [De la Motte 1996]

NB. Substitutes for Heinz high protein baby cereal are as follows:-

Gerber: single grain cereals [rice cereal]

Farax: high protein rice cereal

Beech-Nut Stage 1: rice baby cereal

Earth's Best: Whole Grain Rice Cereal

Bellamy's Organic baby food: Rice Cereal

[Smith, Sydney Wildlife] [Available at most leading supermarkets]

#### **Recommended daily feeding quantities:**

- 30ml Leadbeaters Mix
- 20g Fruit

#### **Activity feeds:**

- Mealworms, crickets & grasshoppers
- Smooth-barked Eucalypt branches and floral browse

#### **Breeding Diet** [Nov – May]

- 30ml Leadbeaters Mix
  - 10g Fruit
  - 10x Mealworms – [Sat & Sun]
  - 20x Crickets/Grasshoppers – [Mon, Wed & Fri]
  - 1x Fresh Eucalypt branch/Browse flowers – [Mon, Wed & Fri]
- [De la Motte 1996]

- The captive diet used at Fleay's Fauna Sanctuary in Queensland included:
  - Bread and milk
  - Melon jam
  - Honey
  - Gum blossom
  - Slabs of sapwood from preferred Eucalypt trees
 [Bellchambers 2004]
 

Whilst this is not a detailed description of the captive diet, it is evident that the sanctuary focused on providing high amounts of carbohydrate. The inclusion of a protein source, such as live invertebrates, will ensure the diet is balanced.
- Clean potable water must at all times be available for the animal to drink. [EAPA]

## **6.2 Supplements**

- Taronga Zoo does not provide any additional supplements for their captive Yellow-bellied Gliders. All nutritional requirements are met by feeding Leadbeaters Mix, fruit and vegetables and activity feeds. [Davies, Taronga Zoo]

## **6.3 Presentation of Food**

- Leadbeaters mix is placed in stainless steel food holders. These are attached to tree structures around the enclosure. Fruit and vegetable chunks may be spiked onto nails which are also dispersed around the enclosure. [Tantini, Taronga Zoo]
- Mealworms, crickets and grasshoppers may be released under leaf litter in boxes as a foraging exercise. [Tantini, Taronga Zoo]
- Gum reservoirs may be included in exhibits by drilling holes into branches and filling them with plant exudates. This type of feeding provides the gliders with a naturally textured substrate and encourages natural foraging behaviours. [Kelly 1993]
- Activity feeds include smearing peanut butter on tree trunks and squirting natural gums from syringes onto enclosure leaves. [Tantini, Taronga Zoo]
- Pieces of native blossoms, such as Grevillia, Banksia and Protea plants, also encourage natural foraging. [Tantini, Taronga Zoo]

## 7 Handling and Transport

### 7.1 *Timing of Capture and Handling*

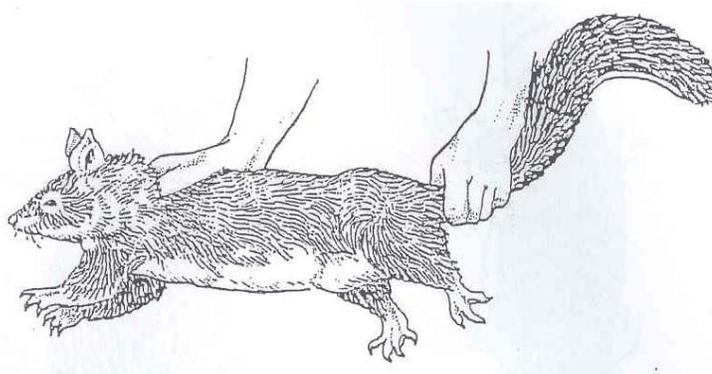
- Gliders are most easily captured whenever they are sleeping. This is normally during the day as they are nocturnal however, in a nocturnal house environment the lights will dim at approx 8.30am – 10am leading them to believe that nightfall has begun. [Tantini, Taronga Zoo]

### 7.2 *Catching Bags*

- Calico bags work best as the fabric is strong enough to resist tearing from teeth and claws but still allows for ventilation. Softer fabrics, such as cotton, tend to tear too easily. [De Voss, Taronga Zoo]
- Size is generally as big as a standard pillowcase.

### 7.3 *Capture and Restraint Techniques*

- Gliders are readily handled by the tail, while the neck and shoulder region is grasped simultaneously. [Walraven 1990, p70]
- Beware – teeth and claws  
Capture – use pillowcase as a glove and scoop inside  
Handling – hold back of head and base of tail firmly



[White, 1997]

## **7.4 Weighing and Examination**

- To weigh, use the capture and restraint techniques demonstrated in the previous notes and place glider in a catching bag. Secure the bag and weigh.
- Ideally, examination should be a two persons job. One person is required to capture and restrain the glider, as above, whilst the other person examines, pouch checks, administers medication or whatever the examination requires. [De Voss, Taronga Zoo]

## **7.5 Release**

- Gliders should be released from a securely tied woven bag in front of their nestbox opening. This enables them to crawl into the safety of the nestbox rather than confusing and overwhelming them in an open area. [Tantini, Taronga Zoo]

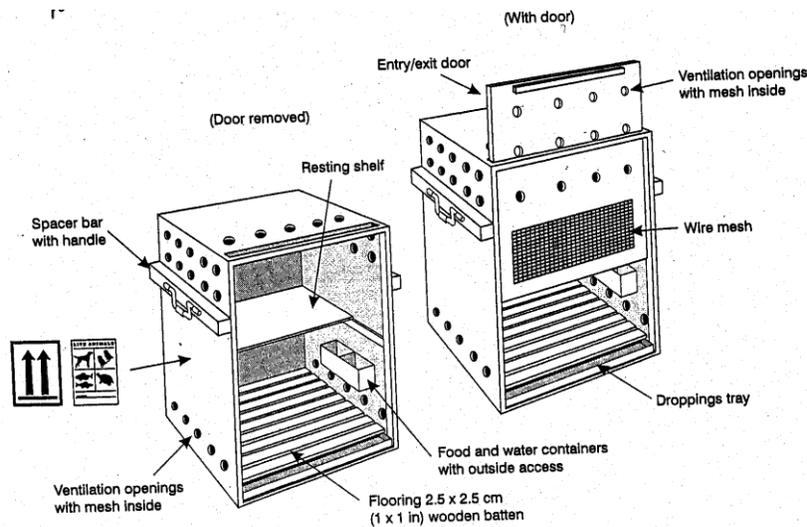
## **7.6 Transport Requirements**

- For short-term transporting, hessian sacks or straw-filled boxes are adequate. [Walraven 1990, p70]
- The following is for long-term transporting:

### **7.6.1 Box Design**

- Frame – solid wood, screwed or nailed and glued with a non-toxic glue, metal or non-toxic plastic. [IATA]
- Sides – wood, metal or plastic. The front must consist of a 2/3 solid panel with ventilation openings above a 1/3 wire mesh. [IATA]
- Spacer Bars/Handles – must be provided on three sides of the container. [IATA]
- Floor – a slatted floor must be firmly fixed to the base of the container which must be covered with absorbent material. [IATA]
- Roof – solid but with meshed ventilation openings optional. [IATA]
- Door – must be fastened with tamper proof fastenings. [IATA]
- Ventilation – fine wire mesh must be securely fixed over the door grill and all ventilation openings, these must also be covered with a muslim, or similar material, curtain. [IATA]

- The container must be correctly labelled with
  - ‘Live Animals’ label/tag [green]
  - ‘This Way Up’ label/tag on all four sides of container [IATA]



### 7.6.2 Furnishings

- A resting shelf of 1/3 the length of the container must be provided in the rear of the box, or
- Branch-like timber must be provided and be firmly attached within the container so that the animal can climb and rest safely. [IATA]

### 7.6.3 Water and Food

- Animals do not usually require additional feeding or watering during 24 hours following the time of dispatch. If feeding or watering is required due to an unforeseen delay, appropriate food must be provided but care must be taken not to overfeed. [IATA]
- Separate food and water containers, with outside access, must be fixed to the upper part of the door grill in order that the animal cannot sit on them. Water must only be offered when required and must not remain in the container after use but must be siphoned out. [IATA]

#### **7.6.4 *Animals per Box***

- Animals of the same species and size may be shipped together in the same container *only* if they have previously been housed together. Otherwise, they must be carried completely separately. [IATA]

#### **7.6.5 *Timing of Transportation***

- Preferably during the day as they are normally inactive at this time which may minimise stress levels. [Tantini, Taronga Zoo]

#### **7.6.6 *Release from Box***

- Preferably on nightfall when they are becoming active. This allows them start immediately adjusting to the new surroundings. [Tantini, Taronga Zoo]

## 8 Health Requirements

### 8.1 Daily Health Checks

- The health of the animal is to be checked daily and any distressed, sick or injured animal must be reported immediately. [EAPA]
- The daily health check includes a Distant Examination [DE] or General Health Assessment [GHA]. This involves using sight, sound and smell to detect any abnormalities. Generally a glider in good condition will be as follows:
  - Behaviour: alert, active, foraging, inquisitive
  - Gait: even, gliding, climbing
  - Coat: smooth, full, no signs of alopecia
  - Body: evenly proportioned, no signs of injury
  - Nose: moist, no discharges
  - Eyes: clear, bright, no discharges
  - Ears: intact, no discharges
  - Anus: clean, no discharges or unpleasant smells
  - Feet: soft, no injuries, nails should be intact, no lumps or lesions
- Daily head counts are necessary to ensure all the gliders are present in the enclosure. This should be recorded.
- Check that the food has been eaten from the previous day and ensure there is no vomit or diarrhoea in the enclosure as well as unfamiliar smells or odours. [Tantini, Taronga Zoo]
- Gliders are known to fight within the group often inflicting serious wounds on each other. Daily checks for fighting injuries are therefore very important.

### 8.2 Detailed Physical Examination

#### 8.2.1 Chemical Restraint

- Any chemical procedures required for examination including anaesthetics or sedatives are given by a veterinarian.

## 8.2.2 Physical Examination

- A physical examination involves handling and closely examining the glider to ensure of good health. Key points include:
  - keen reflexes with sharp reaction to stimuli
  - an even weight with no sign of obesity or muscle wastage
  - an even coat free from wounds and parasites
  - no lumps present on or under the skin
  - free limb movement with no sign of stiffness or pain
  - ears, eyes, nose and anus free from unpleasant discharge
  - teeth should be straight and even with no signs of being damaged or overgrown

## 8.3 Routine Treatments

**Daily**                      - Distant Examinations  
                                    - Head counts – recorded

**Weekly**                     - Physical examinations of each individual

**Monthly/Seasonal** - Individual weighing - recorded  
                                    - Pouch checks [except during breeding season from Nov-May] [Phipps]

**Half Yearly**              - Faecal samples taken and tested

- Worming treatments and prophylactic drugs are only given if the faecal sample results indicate the presence of disease and/or parasites. [Davies, Taronga Zoo]
- The gliders' health status is to be recorded daily and veterinary attention is to be sought if any unusual conditions are present. [Tantini, Taronga Zoo]

## 8.4 Known Health Problems

- Yellow-bellied gliders have been known to fight within their groups causing lesions, bites and loss of toe, tail and ear tips. These wounds usually repair themselves but incompatible animals should be separated. [Tantini, Taronga Zoo]
- Stress can occur in gliders which are exposed to drastic food changes, sudden noises, overcrowding, unsanitary surroundings, isolation and boredom. This leads to behavioural and health problems such as cage pacing, biting and overeating. [Glider Connection 2003]

- Overgrown teeth may result from not regularly supplying eucalypt or native plant branches, or a sufficiently varied diet. [The Sugar Glider]

- ***Hind Leg Paralysis*** [HLP]

Discovered as a common health problem in captive Sugar Gliders [*Petaurus breviceps*] however, all captive gliders are at risk.

It is a symptom of nutritional secondary hyperparathyroidism.

*Cause:* inadequate calcium absorption due to a poorly balanced diet of low calcium, high phosphate and low vitamin D levels. Causes increased parathyroid hormone which removes calcium from the bones.

*Signs:*

- paralysis
- lethargy
- limping
- fractured bones
- tumours
- weakness
- loss of use of hind legs or favouring one leg
- poor gripping ability

*Diagnosis:* Clinical signs

*Treatment:* Seek veterinary care – usually devise a treatment plan

*Prevention:*

- Provide a balanced diet
- Know Calcium: Phosphate [Ca:P] ratios of food and maintain a positive balance [1.2:1]  
[Sugar Glider Basics: Medical Reference]

- ***Stress Syndromes***

*Cause:* inadequate captive living conditions which may be one of or a combination of factors. Some of these include; unsuitable enclosure design, inadequate diet, the inability to breed, housing non-compatible animals, capture, transport, loud unfamiliar noises and unfamiliar human contact.

*Signs:* Abnormal behaviours are the main indications that a glider is stressed. These may include any of or combinations of the following:

- failure to eat or drink
- depression
- weight loss
- diarrhoea
- pacing in enclosure
- not active

- not sleeping in nest boxes
- biting
- overeating

*Treatment:* Work out and remove/eliminate the stressor/s. This may involve animal behaviour observations over a period of time to work out what is stressing the glider. Examples of solutions may be enclosure re-structures, housing compatible animals only, revising the diet, animal conditioning and providing suitable breeding conditions.

*Prevention:* To prevent a glider suffering from stress it is important that the captive keeper completely understands all the requirements of the animal. Some stress preventative measures include:

- providing an adequate diet
  - natural surroundings in the enclosure
  - environmental enrichment
  - developing breeding programs
  - practicing good husbandry
  - animal conditioning to captive routines including husbandry and medical procedures
- A variety of worms may be found in gliders however tapeworms, fluke and roundworms appear to be common. Gliders and possums do not carry as many worms as macropods. Most gliders carry worms but often this does not cause any health problems. [Stanvic 1992, p40]

## **8.5 Quarantine Requirements**

The following information has been summarised from the Primary Industries & Natural Resources Division, Wildlife Husbandry 2 Resource Manual, 2001.

- Newly received animals should be quarantined to prevent contact with existing animals until their health has been evaluated.
- In general, mammals should be quarantined for a minimum of 30days.
- Factors affecting the length of quarantine include:
  - disease potential
  - incubation periods
  - facilities available
  - source of quarantined animal [commercial, wild, farm, zoo – national/international]

- Quarantine facilities should be physically separate/isolated from the rest of the collection.
- Hygiene procedures and personal hygiene practices are vital to prevent cross-contamination to:
  - other animals in quarantine
  - animals in the collection
  - feral animals
  - humans

## 9 Behaviour

### 9.1 Activity

- The Yellow-bellied Glider is nocturnal and during the day it rests in dens in a hollow branch, usually in a living, smooth-barked eucalypt. [Russell 1995]
- It emerges at night and is an active and very mobile climber. It may travel over two kilometres from its den to forage within a wide range of canopy heights. [Russell 1995]
- They spend more than 80% of the time outside their dens feeding. When feeding time is added to other essential foraging behaviours [such as gliding and climbing], approximately 90% of this time is accounted for. This is one of the highest values yet found for a mammal. [University of Wollongong 2000]
- While foraging, they are essentially solitary except when food resources are localised and clumped as at sap-site trees. [Henry & Craig 1984]
- Yellow-bellied Gliders work their way through the upper branches of trees, tearing away decorticating bark and investigating the exposed surface. Frequently they open hanging rolls of dead bark even when hanging by their hind legs. [Henry & Craig 1984]
- Grooming of the tail and lower body is undertaken while hanging head-down from a slender support. [Russell 1995]
- The most distinctive call is a short, high-pitched shriek that subsides into a throaty rattle. This territorial call can be heard at a distance of 400 metres. [Russell 1995] Russell [1984] has constructed an extensive call classification table [see Appendix 1].

### 9.2 Social Behaviour

- The Yellow-bellied Glider has a large home-range between 30 and 65 hectares [Goldingay & Kavanagh 1991] and usually occurs in densities of 0.05 – 0.14 individuals per hectare in its preferred habitat. [Russell 1995]
- There is a high degree of sociality. In the southern range it is usual for a male to share a den with an adult female and one young. In the northern range a male may associate with two to three adult females and up to three young. [Russell 1995]
- Dominant males scent-mark their group members by head and tail rubbing. They have an active scent exuding gland on their head and tail. [Russell 1984]

- Scent-marking indicates group cohesion by communicating an individual's social status, sex, group membership, and reproductive position. [Macdonald 2001, p838]
- The defence of home ranges from intruders is usually undertaken by the glider of the same sex of the intruder. More simply, males will challenge intruding males whilst females will challenge intruding females.

### **9.3 Reproductive Behaviour**

- Mating generally occurs from August - December in Victoria but throughout the year in Queensland. [Nowak, online]
- Mating can occur while the pair is clinging to the underside of a stout branch. Strahan 1995, p227]
- There are no extensive records of courting behaviour however in a study by Russell [1984], buccal clicks, which are non-vocal soft clicking sounds, were recorded when a male and female were moving about together with the female possibly in oestrous. [See Appendix 1]

### **9.4 Bathing**

- Yellow-bellied Gliders have not been recorded bathing in any type of medium.
- Grooming is predominantly performed individually by using their incisors to comb through the fur. Studies also show that lower rank gliders may groom those of higher status.

### **9.5 Behavioural Problems**

- Fighting amongst the group is a main behavioural problem. Many males will fight to the death if the problem is not dealt with and females have been known to fight viciously also. [The Marsupial Society]
- Becoming overly tame and friendly is an unnatural behaviour. This can become a problem when entering and exiting the enclosure as these gliders will playfully pounce on a keeper when entering and follow the keeper on exiting. [Tantini, Taronga Zoo]

## **9.6 Signs of Stress**

- Abnormal behaviours are the main indications that a glider is stressed. These may include any of or combinations of the following:
  - not eating or drinking
  - pacing at front of enclosure / cage pacing
  - constantly waiting at the entry/exit door
  - not active at night
  - not sleeping in nestboxes
  - biting
  - overeating[Tantini, Taronga Zoo]

## **9.7 Behavioural Enrichment**

- Provide activity feeds and novel food items to increase foraging times. Eg. providing live invertebrates. [EATA]
- Placing tree structures far apart with landing branches encourages natural gliding behaviour. Branches should be positioned close to the public viewing window to increase visibility of the glider. [Tantini, Taronga Zoo]
- At the time of complete enclosure cleaning, furnishings are positioned differently in the exhibit. This is a form of environmental and behavioural enrichment as the gliders love to explore the new surroundings. [Tantini, Taronga Zoo]
- In nocturnal house enclosures the lighting is on reverse-cycle. The lights will dim between 8.30am and 10am mimicking nightfall and feeding will take place at this time. This increases the gliders' activity levels to benefit the public's viewing.
- Spiking various foods on tree structures facing the public viewing window is not only a form of behavioural enrichment but increases visibility of the glider for the public.

## **9.8 Introductions and Removals**

- Newly received animals should be quarantined to prevent contact with existing animals until their health has been evaluated. [Primary Industries & Natural Resources 2001]
- Yellow-bellied Gliders live in family groups comprised of a dominant male, female/s and young offspring. Introducing a new glider to an existing colony, especially another male, is risky as dominant gliders will fight intruders to the death.

- Removal of a glider that is to be returned to the group should be as minimal as possible to avoid a change in the groups' hierarchy and aggressive encounters upon returning.

### **9.9 Intraspecific Compatibility**

- Yellow-bellied gliders are best kept in pairs as they are highly social animals. The young have a long period of association with the parents and the male aids in the rearing of the sub adult offspring. [Henry & Craig 1984, p340]
- Gliders have very strong social bonds and members of a colony know each other intimately by their scent. Males mark their territory by scenting from head glands and both sexes regularly mark [using urine] practically everything in their enclosure. [The Marsupial Society]
- Fighting will sometimes occur within a group of gliders. Some animals will prove themselves incompatible and will require permanent separation. [The Sugar Glider]
- Avoid housing separate colonies of gliders in adjacent cages where animals can bite each other through the dividing wire. [The Sugar Glider]

### **9.10 Interspecific Compatibility**

- Yellow-bellied Gliders share well with a range of ground dwelling animals including Potoroos and Brush-Tailed Bettongs. It is not suitable to enclose them with another arboreal species as overcrowding in the tree structures will occur. [Tantini, Taronga Zoo]

### **9.11 Suitability to Captivity**

- There are aspects of the Yellow-bellied Glider which makes it rather suited to a captive life and some which makes captive requirements more difficult. Suitable aspects are as follows:
  - Classified as non-hazardous therefore protocols are less complicated compared to that of dangerous animals.
  - Stress is main disease of concern but can be easily prevented with good husbandry practices and enrichment.
  - They are an arboreal species and may be housed with certain ground dwelling species. This makes the exhibit appear more lively and reduces the number of exhibits.
 Less suitable aspects are as follows:
  - Being a nocturnal species a nocturnal house is required for public viewing at captive institutions open during the day.
  - Since 90% of the gliders nocturnal activity is foraging, the keepers are required

to provide ample foraging activities which can take up a large portion of time.

- Breeding potential is low and is thought to be linked to reliability and availability of food resources. Therefore it is difficult to provide the right balance of certain food types to trigger breeding.
- Fighting often occurs between incompatible gliders and requires the separation of the animals which can take up valuable room in other enclosures.

## 10 Breeding

### 10.1 Mating System

- In Victoria and the NSW southern tablelands, the Yellow-bellied Gliders' mating system is monogamous comprising of a single breeding pair, with or without offspring. [Henry & Craig 1984]
- Mating systems in north Queensland and the south coast of NSW alternate between monogamy and polygyny and groups may contain up to six individuals. [Russell 1984; Goldingay 1992 in NPWS 2003]
- The differences in family group dynamics and breeding systems are thought to be linked to reliability and availability of food resources. [Goldingay 1992 in NPWS 2003]

### 10.2 Ease of Breeding

- The Yellow-bellied Glider has low breeding potential. A high sap and low insect diet would imply a restrictive protein intake and may explain the species observed low fecundity. [Bellchambers 2004]
- The availability and abundance of certain food resources appears to coincide with mating, lactating and weaning processes.
- Recently Taronga Zoo has successfully bred a single young for the first time. Previous breeding attempts have been unsuccessful. Australian Mammal keeper Paul Davies believes the success comes from not disturbing the gliders such as not performing regular pouch checks. The only interference from the keepers was increasing feeding amounts prior to the breeding season.

### 10.3 Reproductive Condition

#### 10.3.1 Females

- *Juvenile, non-breeding*: pouch clean and dry, and teats small.
- *Adult, non-breeding*: pouch dry and dirty.
- *Oestrous*: behaviour patterns or cornified epithelial cells.
- *Pregnant*: pouch pink in colour and glandular in appearance.
- *Post-partum*: pouch young present.
- *Lactating*: young visible on parent's back or in the nest.
- *Post-breeding*: teats expressing only clear liquid and/or regressing.

### **10.3.2 Males**

- Females will only mate with the dominant male of their group. Only the dominant male has an active scent exuding gland on his head and tail which he rubs onto his group members. This is a signifier of the reproducing male.

### **10.4 Techniques Used to Control Breeding**

- Sex separation
- Pouch checks
- Removal of pouch young  
[Phipps]

### **10.5 Occurrence of Hybrids**

- Unknown

### **10.6 Timing of Breeding**

- The time of breeding varies depending on factors such as location and certain food availability. In general, a single young is born between November and May in the southern range species and from May to September in the northern species, although some births have been recorded throughout the year in the north.  
[Russell 1995; Cronin 1991]

### **10.7 Age at First Breeding and Last Breeding**

- Sexual maturity is 18 -24 months however, age at last breeding is unknown.

### **10.8 Ability to Breed Every Year**

- The Yellow-bellied Glider has low breeding potential. A single young is usually produced each year, but breeding may sometimes occur in alternate years.  
[Goldingay & Kavanagh 1990 in NPWS 2003]

### **10.9 Ability to Breed More than Once Per Year**

- A single young is usually produced each year, however a study conducted by Russell [1984] showed that if the female loses a young, she is able to fall pregnant again within that year. The study also found that females are able to abort their young as in the case of a dominance change in males. Therefore most females will usually only rear the dominant males' young.

### **10.10 Nesting, Hollow or Other Requirements**

- Henry & Craig [1984] found nest sites of the Yellow-bellied Glider were primarily in living eucalypts.
- Gliders of both sexes nip leafy twigs from the crown of the nest site tree and transport them into the den, carrying the leaves in a twist of their tail. [Henry & Craig 1984]
- The entrance of the nest site is typically large enough to permit the entry of the occupant, but small enough to preclude predators and other species that may attempt to usurp the use of the den. [Macdonald 2001, p837]

### **10.11 Breeding Diet**

- Taronga Zoo provides a breeding diet for the Yellow-bellied Glider between November and May. This includes:

30ml Leadbeaters Mix

10g Fruit

10x Mealworms – [Sat & Sun]

20x Crickets/Grasshoppers – [Mon, Wed & Fri]

1x Fresh Eucalypt branch/Browse flowers – [Mon, Wed & Fri]

[De la Motte 1996]

In comparison to the usual diet, the breeding diet is higher in protein with a decreased amount of fruit provided. The increased protein is vital for the growth and development of the young.

### **10.12 Oestrous Cycle and Gestation Period**

- The gestation period for the Yellow-bellied Glider is unknown, however in the Petauridae family the gestation period ranges between 12–50 days with all young weighing less than 1g [0.035oz] at birth. [Macdonald 2001, p834]
- Pouch life is 90-100 days after which the young is left in the nest while the mother forages. After leaving the pouch the young is suckled for a further 40-60 days. [Russell 1995]

### **10.13 Litter Size**

- A single young is almost always produced. Despite the female pouch having two compartments each with a teat, there have only been two records of twins in the species. [Craig 1986; Goldingay *et al* 2001 in NPWS 2003]

### **10.14 Age at Weaning**

- Weaning is between 180-240 days [Johnson 1994]. At this time the young begin to leave the nest and start foraging independently. When first venturing abroad, the young make very short glides, travelling chiefly by clambering and jumping between branches. [Russell 1984]
- The male parent aids in the rearing of the subadult offspring, particularly when the female has another pouch young. This involves socialisation with the young, babysitting and leading the young to foraging sites. [Henry & Craig 1984]

### **10.15 Age of Removal from Parents**

- The young have a long period of association with the parents, during which they do not appear to be sexually active. [Henry & Craig 1984]
- A study by Henry & Craig [1984] showed that dispersal from the parent group primarily occurred when subadults were 18 to 24 months old, by which time they had attained adult body weight.

### **10.16 Growth and Development**

Eyes open: 100 days

Final pouch exit: 100 days-left in nest whilst female forages for food

Age at weaning: 180-240 days

Sexually mature: 18-24 months

Fully grown measurements:

*Head and Body Length*

270 – 300mm

*Tail Length*

420 – 480mm

*Weight*

450 – 700g

# 11 Artificial Rearing of Yellow-Bellied Gliders

## 11.1 Housing

- Yellow-bellied Gliders are marsupials therefore it is important to mimic a pouch environment when artificially rearing them.
- A pouch substitute should be provided. It should be a snug fit around the joey and be flexible. [Stanvic 1992, p25]
- A woollen beanie is ideal as it flexible and can stretch. However, wool constantly snags onto the glider's claws and is difficult to clean therefore it is recommended to line the inside with a cotton handkerchief or similar material. This liner can also be easily cleaned and replaced between meals. [Stanvic 1992, p25]
- The woollen pouch can be placed in a pet pack or a type of secure basket to protect the joey and also make transporting easy.
- For furred joeys, suitable housing includes a carry cage with bars close together or small wire and shade cloth. A plastic picnic box is ideal. It should have newspaper on the floor covered in native leaf litter [taken from an area where dogs and cats have not been in contact with it]. Native branches should be fitted for climbing. The glider's pouch should be secured to the side of the cage so it is able to climb in and out. [Wood 2005, p174]
- When the glider is well furred, it can be placed in its pouch, in its glider box, in an outside aviary. Assure that it is escape proof by totally lining it with shade cloth. Preferable dimensions are 1.8 x 5 x 3metres however these are a minimum, the bigger the better. The glider should slowly acclimatise to the outdoor enclosure and should be offered native branches of varying thicknesses for climbing and chewing on. Native leaf litter, a shallow bowl of water and a nestbox should also be provided. [Wood 2005, p175]

## **11.2 Temperature Requirements**

- The temperature inside a mother glider's pouch is approximately 38°C when the joey is in the pouch and about 35°C when the joey is out of the pouch. She also often licks the joey and the pouch lining which increases the humidity. [Stanvic 1992, p25]
- Temperature recommendations during artificial rearing are as follows:
  - Furless joeys 30-35°C
  - Furred joeys 32°C
  - Weaned young 28°C
- The relative humidity should be high enough to ensure the joey's skin does not dry out. [Stanvic 1992, p25]
- To regulate the temperature, items such as hot water bottles, heat pads or humidity cribs are the most recommended. [Stanvic 1992, p25]
- Yellow-Bellied Gliders' need a heat source until they are about 100 days old and around 60 to 70 grams. The heat source may be removed when they are tolerating 5 feeds per day, thermoregulating and have a good covering of fur. Start by first turning off the heat source during the day then gradually at night. [Wood 2005, p173]

### **11.3 Diet and Feeding Routine**

- Hand rearing formulas for gliders are milk substitutes. The most commonly used products are Wombaroo, Di-Vetelact, Digestelact and Biolac[see Appendix 3]. These are recommended as they are the closest formulas to resembling the mother glider's milk. They can be purchased from leading pet stores and pet suppliers.
- The makers of these products provide quantities of the formula as well as providing information via tables and charts regarding weight, measurement, growth and feeding amounts. [Stanvic 1992, p26]
- Glider milk changes in composition after the young becomes furred. It increases in protein as the joey matures. It is important to determine an approximate age of the joey and to weigh the joey to formulate the correct amount of food and frequency of feeding. Following the charts on the product boxes is highly recommended. [Stanvic 1992, p28]
- Method of delivering food to the joey will depend on the joey's age. Stanvic recommends using a glass syringe with a marsupial teat on the end as it gives the user better control of the flow of the milk formula. Stanvic states that she never uses bottle on baby gliders as there is no way of controlling the milk flow. [Stanvic 1992, p28].
- Stanvic recommends wrapping the joey firmly in a handkerchief whilst feeding and placing the teat in the side of the joey's mouth. It can sometimes take time for the joey to adapt to feeding from the teat. [Stanvic 1992, p28]
- Joey's should never be fed in a laying position. They should always be upright. Also do not feed a chilled joey. [Stanvic 1992, p28]
- Fully emerged furred young need to be taught to lap from a small dish and should be offered native browse, gum tips and fruit as much as possible. [Stanvic 1992, p32]
- Washing the joey's face with a moist cotton ball or tissue before a feed will often stimulate them. After feeding the raiser must toilet the glider by gently rubbing the cloaca with a moist tissue or cotton ball. [Stanvic 1992, p29] Urine should be colourless and odourless. [Wood 2005, p171]
- If the joey does not eat it may be:
  - cold: therefore warm the joey and try again later
  - thirsty: ie. needing water/Lectade not milk
  - in pain: so examine the joey carefully[Wood 2005, p172]
- Unfurred joeys should be able to cope with 4 hourly feeds. When the joey is stable and gaining weight [at least 1 or 2gms] and its faeces are solid, a night feed may be missed and 3 days later another feed may be ceased. [Wood 2005, p172]

- Weaning of the Yellow-Bellied Glider is as follows:
  - at 150g 3 feeds/day.
  - at 200g 2 feeds/day
  - at 250g 1 feed/day
  - fully weaned at 300g [approx. 180-240 days old]
 [Wood 2005, p 176]
- A small amount of lorikeet/honey-eater mix [no more than 20mls], fruit pieces [spiked in enclosure] as well as mealworms should be provided during and after weaning. [Wood 2005, p176]
- Ideal native browse to provide in the aviary includes:
  - Eucalyptus [gum]
  - Acacia [wattle]
  - Callistemon [bottlebrush]
  - Grevillea
  - Leptospermum [tea tree]
  - Melaleuca [paper bark]
  - Pittosporum
  - Brush Box
  - Lilly Pilly
  - Banksia
 The browse will attract insects. The new growth also incubates insect larvae and pupae which the gliders love to chew on. [Wood 2005, p175-176]

### **11.4 Specific Requirements**

- When fostering a pouch aged joey the recommended procedure is as follows:
  - Weigh and measure the tail
  - Check for dehydration by pinching the skin at the back of the neck. If the skin fails to immediately return to normal and stays wrinkled the joey should be given Lactade instead of milk formula for 24 - 48 hours. [Stanvic 1992, p27]
  - Get a heat source ready but do not place the joey directly on it.
  - Once the joey is hydrated, stress is less of a problem. Make sure the joey is warm and then begin feeding the milk formula. [Stanvic 1992, p27-28]
- Whilst the joey is still naked, try to feed, toilet and clean it inside the beanie as this will minimise stress. [Stanvic 1992, p26]
- If a naked joey's skin begins to dry out or peel, 'Sorbolene' cream may be applied to the skin to rehydrate it. [Stanvic 1992, p29]
- Brushing furred joeys' mimics the mother's natural instinct to continually groom and lick her young. It is important the joey feels secure and clean which helps

prevent stress related diseases. [Stanvic 1992, p29]

- If the fur is not growing properly the glider may have internal parasites and need treatment. Another reason may be the glider has a vitamin deficiency. Pentavite drops added to the milk formula [2 drops per 50ml] may assist this. [Wood 2005, p176]
- Use the same washing liquid/powder all the time. Different smells will cause stress. [Wood 2005, p168]
- Hang washed pouches and linen out in the sun whenever possible as sunshine kills bacteria and fungal spores. [Wood 2005, p168]

### **11.5 Data Recording**

- The information recorded during the hand-rearing process is very important as it:
  - provides background information, such as food consumption, that will assist a veterinarian reach a diagnosis if the animal becomes sick or fails to grow or gain weight
  - allows comparison with established growth curves to assess development or
  - facilitates the creation of standard growth curves for those species where they are not already available [Jackson 2002, p240]
- The following information should be recorded on a daily basis:
  - Date
  - Time when the information was recorded
  - Body mass to the nearest 1g, if possible
  - General activity and demeanour
  - Characteristics and frequency of defecation and urination
  - Amount [g or ml] and types of food offered
  - Food consumption [g or ml] at each feed
  - Veterinary examination and results [Jackson 2002, p240]

### **11.6 Identification Methods**

- Information on the growth and development of pouch young is limited and there has been no specific data recorded on distinct physical characteristics of growing joeys at different ages. Refer to previous 10.16 Growth and Development for the limited information which has been provided.

### **11.7 Hygiene**

- Hygiene is very important. The raiser should wash their hands before and after feeding and cleaning time. All feeding equipment must be sterilised in a mild disinfectant and beanies, liners, towels etc. should be soaked in a sterilising

solution such as Napisan. [Stanvic 1992, p31]

- Hygiene of the joey is also important. It is necessary to clean any milk formula left on the skin or fur to prevent it from ingesting bacteria when it grooms itself.
- Take out left over fruit and lorikeet mix from the enclosure during the day as it attracts ants and fruit flies and can breed bacteria. Inspect each glider for sticky fur daily and clean any spots with warm water. [Woods 2005, p176]

### **11.8 Behavioural Considerations**

- Yellow-bellied Gliders are best raised with other young as they naturally occur in family groups
- When introducing gliders to each other for the first time, it can be highly stressful for them, especially if you put them into the same box straight away. Leave them in separate cages next to each other for approximately 3 nights to allow them to acclimatise to their new situation. [Wood 2005, p178]
- Possums and gliders unlike parrots do not human-bond. They see the raiser as a food supply and security if they need it. However, if the glider is to be released back to the wild, human contact should be kept to a minimum to ensure they do not lose their FFF [Fright, Flight, Fight] distances from humans and pets. [Stanvic 1992, p29]

### **11.9 Use of Foster Species**

- Unknown. No records available.

### **11.10 Weaning**

- Weaning the Yellow-Bellied Glider is as follows:
  - at 150g 3 feeds/day.
  - at 200g 2 feeds/day
  - at 250g 1 feed/day
  - fully weaned at 300g [approx. 180-240 days old][Wood 2005, p 176]
- A small amount of lorikeet/honey-eater mix [no more than 20mls], fruit pieces [spiked in enclosure] as well as mealworms should be provided during and after weaning. [Wood 2005, p176] They should be offered native browse [types listed in 11.3], gum tips and invertebrates. The diet should mimic the glider's natural diet as much as possible. [Stanvic 1992, p32]

### **11.11 Rehabilitation and Release Procedures**

- Animals that are to be returned to the wild should not be tamed at any time during rehabilitation as this will be detrimental when they return to their natural habitat. [Walraven, p201]
- Timing of the release must be managed to avoid releasing during breeding season as well as in some seasons such as the middle of winter when food supply is more scarce. [Walraven, p202]
- Yellow-Bellied Gliders should be released 3 or more weeks after being weaned and given time to build up their muscle tone and attain a good, healthy weight. An ideal release weight is 350gms at about 8-10months old. [Wood 2005, p179]
- Since Yellow-bellied Gliders are nocturnal, they should be released just after dark to give them the maximum active hours possible to settle and find somewhere safe to rest. [Walraven, p202]
- The release site should satisfy the following:
  - correct habitat for the glider
  - be within the species known distribution
  - all the biological, nutritional and behavioural needs of the animal to be released
  - be free of known factors likely to prevent survival [Walraven, p203]
- The glider to be released should:
  - show normal behaviour for the species towards humans [ie. fear, aggression]
  - have no permanent physical impairment
  - be of appropriate weight for the age and sex of the species
  - be acclimatised to the local temperatures of the release site
  - be able to recognise, manipulate and process its natural diet [Walraven, p203]
- There are 3 types of releases:
  1. **Soft Release:** An animal and its buddies are housed in aviary at the release site for 2-3weeks. The door of the aviary is then opened to allow the gliders to explore their new surroundings for a week whilst still having access to their den. The den is then affixed high in a tree and the aviary closed. A little supplementary lorikeet mix may be left for a few days. [Wood 2005, p183]
  2. **Hard Release:** An animal and its buddies are taken to a release site and put into their den which has been affixed in foliage high in a tree. Some supplementary food is left. A follow up is unable to be undertaken.
  3. **Self Release:** An animal or animals escape from care at any stage during the rehabilitation.
- In the case of the Yellow-Bellied Glider a soft release is most preferable, however at times there may be no soft release facilities anywhere in the suitable range so it will have to be hard released. This is highly unsatisfying and the success rate is not good. [Wood 2005, p185]

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## 15 Glossary

<i>Acclimatise</i>	to adapt to a new climate or environment.
<i>Aerial</i>	existing in the air.
<i>Alopecia</i>	loss of hair due to stress or disease.
<i>Arboreal</i>	living in trees.
<i>Browse</i>	leaves and twigs of shrubs and trees.
<i>Canopy</i>	the leafy branches of forest trees, forming a dense cover for the vegetation beneath, as in a rainforest.
<i>Cloaca</i>	a single opening containing the termination of the digestive, urinary and reproductive tracts in birds, reptiles, many fish and some mammals.
<i>Dehydration</i>	loss of water from the bodily tissues.
<i>Den</i>	a secluded place, as a cave, serving as the habitat for a wild animal.
<i>Detergent</i>	a cleaning agent.
<i>Disinfectant</i>	a strong chemical that removes or disables micro-organisms.
<i>Distant exam</i>	the senses sight, smell and sound are used to examine an animal.
<i>Dwell</i>	to live in a place.
<i>Ear notching</i>	cutting a V-shape in the edge of the ear for identification purposes.
<i>Ear tags</i>	a strip or label attached to the ear for identification purposes.
<i>Enrichment</i>	to improve in quality by adding to.
<i>Excrement</i>	waste matter discharged from the bowels.
<i>Exudate</i>	discharged matter from pores or incisions.
<i>Fecundity</i>	fertility.
<i>Fingerling</i>	a young fish.

<b><i>Forage</i></b>	to search for food.
<b><i>Gestation</i></b>	the act or period of carrying young in the womb; pregnancy.
<b><i>Gruel</i></b>	a thin porridge mixed with water or milk.
<b><i>Habitat</i></b>	an area providing the physical and biological needs of a species.
<b><i>Incompatible</i></b>	not able to exist together in harmony.
<b><i>Incisors</i></b>	any of the front cutting teeth at the front of the mouth.
<b><i>Juvenile</i></b>	of a young age; not fully mature.
<b><i>Lactating</i></b>	the secretion of milk.
<b><i>Manna</i></b>	sugary exudate of leaves and branches.
<b><i>Mesh</i></b>	a knitted, woven, or knotted fabric, with open spaces between the threads.
<b><i>Monogamous</i></b>	mating of a single male with a single female involving no other individuals of either sex.
<b><i>Nocturnal</i></b>	active during the night.
<b><i>Oestrous</i></b>	the period of ovulation in mammals.
<b><i>Palatable</i></b>	a pleasant, acceptable taste.
<b><i>Peat</i></b>	decayed plant and vegetable matter which is dried for fuel or fertiliser.
<b><i>Phloem</i></b>	the tissue responsible for transporting food throughout a plant.
<b><i>Polygyny</i></b>	where both males and females mate with more than one partner during a breeding season.
<b><i>Potable</i></b>	drinkable.
<b><i>Prophylactic</i></b>	a preventative measure or medication for guarding against disease.
<b><i>Reservoir</i></b>	an extra supply or store.
<b><i>Sap</i></b>	the juice or vital circulating fluid, especially of a woody plant.

<b><i>Sclerophyll</i></b>	any of various plants, typically found in low rainfall areas, having tough leaves which help to reduce water loss.
<b><i>Social</i></b>	living in a community; not solitary.
<b><i>Solitary</i></b>	living alone; single.
<b><i>Substrate</i></b>	the base or material on which an organism lives i.e soil, pine bark, concrete.
<b><i>Territory</i></b>	the area which an animal or a pair of animals claim as their own and defend against intruders.
<b><i>Thermoregulating</i></b>	ability to self-regulate body temperature.
<b><i>Vulnerable</i></b>	weak, in respect of defence.

# 16 Appendix

## Appendix 1

## Appendix 2

## **Appendix 3**

### **MILK PREPARATION**

WIRES Training Manual. Rescue and Rehabilitation and Release of Possums & Gliders.  
Pgs 189-191.





