

Husbandry Guidelines
for
Splendid Fairy-Wren
Malurus splendens
(Aves: Maluridae)



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WORK HEALTH AND SAFETY RISKS

WHS Introduction

As with any task undertaken in the Zoo industry the husbandry for *M. splendens* has WHS risks. The animal in these husbandry guidelines is not classified as hazardous or dangerous and is unlikely to inflict any serious injury. However the animal's exhibit or surrounding areas may cause injury.

Here are a list of possible hazards and ways to reduce risk of injury or illness:

Tripping hazards – ensure walkways are clear of fallen branches or equipment. Any depressions or raised areas should be levelled to reduce tripping risk.

Low branches or perches – watch for low branches or perches and even remove them from walkways if they are a hazard.

Working outside – working outside becomes a huge WHS issue for keepers as we spend most of our time outdoors. To reduce the risk of sun damage, wear appropriate PPE such as sunscreen, a hat, long sleeve shirt, long pants and UV protectant sunglasses. Remember to stay hydrated throughout the day.

Heavy loads – if a heavy load needs to be lifted, a proper lifting technique should be used by bending at the knees, and use a wheel barrow to transport the object. If the object is too heavy ask for assistance.

Low doorways – sometimes doorways into aviaries or buildings will be low and keepers need to watch for this as it has the potential to cause injury.

Collecting browse – safe use of secateurs and watch for bugs which may cause irritation.

Cleaning aviaries or equipment – when cleaning aviaries or equipment used in aviaries, a face mask and gloves should be worn to reduce the risk of zoonoses. Hands should also be washed immediately after being in contact with the animal or anything within the enclosure.

Hazards should be dealt with according to the institutes policies and procedures. Keepers should be aware of WHS risk and should always keep themselves and fellow keepers safe at all times. If a risk becomes known the hazard should be dealt with immediately or as soon as possible.

HM Species Risk Category

M. splendens, is in the low risk category. This species is unlikely to cause injury, but is likely to cause illness if safety precautions aren't followed correctly. *M. splendens* are a small bird measuring 11-13 cm long from head to tail. The beak and feet are very small and may cause a small injury when handling the bird such as a scratch but nothing of great consequence. *M. splendens* like any bird can carry zoonotic diseases, which can be transferred to humans. To reduce the risk of zoonoses proper safety precautions should be followed.

Workplace Risk Types

Biological

When working with animals there is always a risk of contracting Zoonosis. The risk is fairly low for working with *M. splendens*. As long as all precautions are taken to minimize the risk such as washing hands with an anti-bacterial hand wash after any contact with the animal, its old food, cleaning equipment or faeces.

Chemical

A disinfectant should be used when cleaning equipment used in aviaries such as scrubbing brushes used for cleaning regimens. Various disinfectant can be used when cleaning equipment, for example a Milton solution can be used. Milton is sterile for 24 hrs and sterilizes items in 15 minutes. There is no need to rinse after soaking and is a much safer and less harsh chemical than bleach.

Environmental

Appropriate sun protection such as sunglasses, long sleeved shirt, long pants, sunscreen, and a hat should be worn whenever working outside.

Ergonomic

Lifting of heavy loads should always be done safely by bending at the knees when lifting and if too heavy for one person ask for assistance. Watch for low branches, and low airlock doors.

Physical

When catching birds with a net be cautious of tripping hazards or low branches. If collecting live food from natural sources (such as termites) be aware of possible snake threats.

Psychological

Keepers of any species shouldn't become emotionally attached to the animals they care for as the death of an animal may affect the keeper's mental wellbeing.

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1 Introduction

Malurus splendens are an amazing species of bird. They have such lovely characters, songs, and a stunning colour. They are a great occupant to any exhibit. As described by Richard Schodde in his book *The fairy-wrens* “The sparkle of sapphire hardly compares with the shimmering blue of the male Splendid Fairy-wren. So incandescent is its hue that it literally glows in its often drab bushland setting.”

Due to low numbers of *M. splendens* in captivity in Australia there is a restriction on the amount of husbandry available. There are no Husbandry Guidelines relating to any species of Fairy-wren. There are approximately 71 animals in NSW private aviculture as of 30th March, 2015. There are very low numbers held by members of the Zoo and Aquarium Association of Australia.

Their co-operative breeding system is fascinating and is described within this document. While studies on *M. splendens* co-operative breeding have been on wild populations, there have been cases of them replicating this behaviour in captivity.

2 Taxonomy

2.1 Nomenclature

Class: Aves

Order: Passeriformes

Family: Maluridae

Genus: *Malurus*

Species: *splendens*

2.2 Subspecies

M. s. splendens (Quoy & Gaimard, 1830) – subtropical Western & Central Western Australia.

M. s. musgravi Mathews, 1922 – Central Australia from Central & South West Northern Territory South to South Australia (E to Flinders Ranges).

M. s. emmottorum Schodde & Mason, 1999 – Central Queensland (Cooper-Diamantina Divide, Opalton).

M. s. melanotus Gould, 1841 – South Queensland, inland New South Wales, extreme North Western Victoria and South Eastern South Australia (East from Flinders Ranges). (HBW Alive, 2016)

2.3 Recent Synonyms

Saxicola splendens

Malurus pectoralis

2.4 Other Common Names

Banded Superb Warbler, Splendid Wren, Turquoise Fairy-wren (*musgravi*), Black-backed Fairy-wren (*melanotus*) (HBW Alive, 2016)

3 Natural History

M. splendens are a magnificent species, as described by Richard Schodde in his book *The fairy-wrens* “The sparkle of sapphire hardly compares with the shimmering blue of the male Splendid Fairy-wren. So incandescent is its hue that it literally glows in its often drab bushland setting.”

M. splendens were first discovered by French zoologists J. R. C. Quoy and J. P. Gaimard in October 1826 on Dumont D’Urville’s second voyage of exploration to Australasia. They took the very first specimen, and named it *splendens* when they returned to France in 1829. Three years after this John Gould also found the species, calling it *Malurus pectoralis*, meaning Banded Wren. By the time Gould went to write his account of it for his *Birds of Australia* in 1841, he realized that Quoy and Gaimard had already pre-empted him. (Schodde, R., 1982)

Due to low numbers of *M. splendens* in captivity there isn’t a great amount of husbandry about them. There are no Husbandry Guidelines written about any species of Fairy-wren. In private aviculture in NSW there are approximately 71 animals as of 30th March 2015, they are also held privately in WA, SA and VIC in low numbers. (Steve Sass, pers. comm). Institutional members of the Zoo and Aquarium Association of Australia hold 1 male *M. s. musgravi* and 3 pairs, 1 male and 4 unknown *M. s. splendens* as of 2014. However the above figures don’t include non-members of ZAA such as On the Perch who hold 1 pair and 5 unknown *M. s. melanotus* as of February 2017.

There have been a few studies done on *M. splendens* in regards to co-operative breeding, but these studies have been completed on research from wild populations. The reason these studies have been complied with wild population data is due to *M. splendens* not being known to mimic their co-operative breeding behaviour in captivity.

3.1 Morphometrics

3.1.1 Mass And Basic Body Measurements

Total length, in cm: 11.5-13.5 (males), 11-13 (females); weight, in g: 8-11 (males), 7-10 (females). (Schodde, R., 1982)

3.1.2 Sexual Dimorphism

M. splendens are sexually dimorphic. Males and females can very easily be identified visually. The male in nuptial plumage is predominantly a rich violet-blue, with a black pectoral band, and a black stripe from the beak to the eye, following through the eye to join a band across the back of its neck. His ear-tufts are sky-blue, and he has a cobalt-blue tail. His beak is black, and his legs and feet are brown-grey. The male in nuptial plumage can be seen below in figure 1. The females are grey-brown with a bluish-turquoise tail, she has a reddish-tan line from her beak to eye that extends into a ring around her eye. Her beak is reddish-tan and her throat and underparts are whitish. The female can be seen below in

figure 2. In eclipse plumage, the male is very similar to the female, but he retains a blue wash on his wings and tail. The juveniles are practically impossible to visually sex, they display the same look as the females. The males in nuptial plumage of subspecies differ mainly in the intensity of the blue and the depth of the pectoral band. (HBW Alive, 2016; Bird Life Australia, 2012)



Figure 1: Male *M. splendens* in nuptial plumage (Photograph by Holly Sass)



Figure 2: Female *M. splendens* (Photograph by Holly Sass)

3.1.3 Distinguishing Features

The male *M. splendens* when in nuptial plumage is quite distinct from other male fairy-wrens. A pale wash of blue on the male's wings during eclipse distinguishes the male from other species of fairy-wrens. The main distinguishing feature of female *M. splendens* to other female fairy-wrens is that the tail is usually bluer than other species. (Bird Life Australia, 2012)

3.2 Distribution and Habitat

M. splendens are widely distributed in the arid and semi-arid zones across Australia. See figure 3 below.

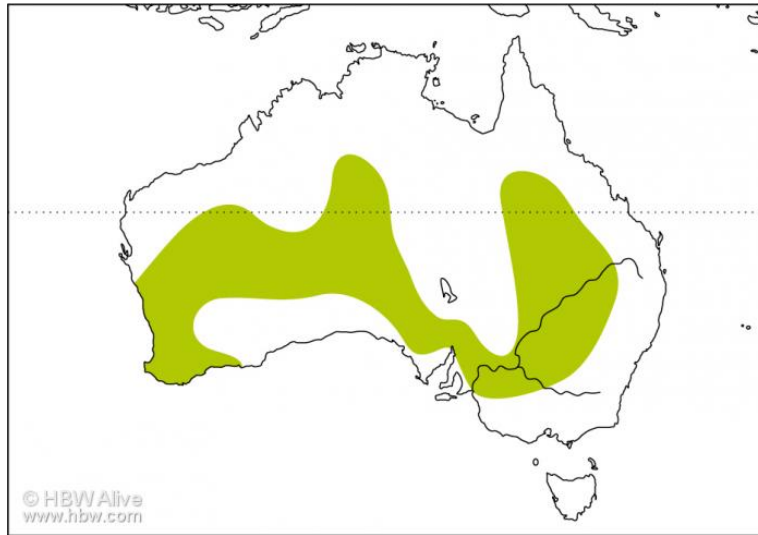


Figure 3: Distribution map of *Malurus Splendens* (HBW Alive, 2016)

M. splendens inhabit arid to semi-arid areas, in mostly dense shrubland, woodlands of acacia and mallee eucalypt with dense shrubs. (Bird Life Australia, 2012)

3.3 Conservation Status

According to the IUCN Red List *M. splendens* are of least concern. (The ICUN Red List of Threatened Species, 2012)

3.4 Longevity

3.4.1 In the Wild

The lifespan of *M. splendens* in the wild is unknown, but we can assume the lifespan is less than captive birds due to captive birds being provided a stable diet and being free from predators and disease.

3.4.2 In Captivity

The estimated lifespan of *M. splendens* is 7-8 years. (Steve Sass, pers. comm)

3.4.3 Techniques Used to Determine Age in Adults

M. splendens males gain sexual maturity at 1 year. Adults are usually unable to be given an age unless accurate records have been kept. In some cases males have been known to reach approximately 4 years of age and then become unable to molt from nuptial plumage to eclipse plumage (Steve Sass, pers. comm). This could be used as an indicator of age in non-breeding season if males are still in nuptial plumage.

4 Housing Requirements

4.1 Exhibit/Enclosure Design

An exhibit going to hold *M. splendens* needs to be designed with certain attributes in mind. *M. splendens* don't require large amounts of space if they are the only occupants within the aviary. Either plenty of dry brush or a planted aviary is necessary as *M. splendens* need to feel safe from predators, in order to breed and stay healthy. They also require mass amounts of live food, a planted aviary will produce more live food than a non-planted aviary will. The aviary needs to be very secure, as *M. splendens* will work the edges of an aviary collecting insects and if a hole is found, they will squeeze their way through it and escape. The exhibit needs to have a closed in shelter to protect the birds from the elements. Details of all aspects of an aviary containing *M. splendens* is outlined below.

4.2 Holding Area Design

M. splendens don't need sparse amounts of space, they can be kept in fairly small aviaries for holding. An aviary at 2.5m x 1.5m x 2m high, would be of a sufficient size. (Steve Sass, pers. comm) *M. splendens* do need cover from wind, cold and heat. They should be able to access shade, and sun as they please. *M. splendens* should never be housed in a bare aviary with no cover. They require a very well planted aviary or an aviary containing plenty of dry brush (such as a tea tree species) to survive. Dense planting reduces stress and allows for privacy. (Bird Care, 2008)

M. splendens are very territorial and can become aggressive. Only one pair and/or a nest of fledging's should be kept together, fledging's should be removed well before the next breeding season or at the first signs of aggression. Two pairs housed together usually ends in one pair being severely injured or killed. If *M. splendens* are being housed in an aviary with little to no live plants more livefood needs to be provided as the live plants would have attracted insects to the aviary. Keep this in mind when keeping *M. splendens* in a planted or non-planted aviary. (Steve Sass, pers. comm)

If it was absolutely necessary *M. splendens* can be housed in a cabinet for a few days. The cabinet should be 2m in length with at least half of it being dry brush to allow for cover. Again, no live plants means providing more food. However if keeping *M. splendens* in a cabinet they would be using less energy, meaning more food may not be necessary. (Steve Sass, pers. comm)

4.3 Spatial Requirements

There are no specific requirements for keeping *M. splendens* in NSW. There are general standards for exhibiting animals to be followed. However in the General Standards for Exhibiting Animals in New South Wales written by NSW Department of Primary Industries, clause 18: Spatial requirements, it states as follows:

1. The size and shape of enclosures must provide freedom of movement, both horizontally and vertically.

2. An enclosure must be of sufficient size, and the animals in the enclosure must be so managed, as to:
 - a. avoid undue domination of a herd or group by an individual or individuals; and
 - b. avoid the risk of persistent and unresolved conflict between herd or group members or between different species in enclosures containing different species; and
 - c. make it possible for an animal to avoid, or withdraw from, contact with other animals or with people; and
 - d. ensure that the carrying capacity of the enclosure is not exceeded; and
 - e. prevent an uncontrolled accumulation of parasites and other pathogens; and
 - f. encourage and permit exercise and behavioural enrichment.
3. Each animal must be provided with sufficient space in all directions to enable it:
 - a. to take exercise; and
 - b. to be protected from undue dominance and conflict; and
 - c. to be provided with its social, breeding and husbandry needs.
4. With the approval of the Secretary, a bird rendered flightless may be kept in an enclosure smaller than that which would be required if it could fly.

A basic size for one pair of *M. splendens* would be about 4m x 2m x 2.1m high. (Hutton, R, 1991) *M. splendens* need to be provided with sufficient privacy, space to perform courtship, nesting sites and adequate food sources. If *M. splendens* are to successfully breed, the young offspring will need to be removed, so another suitable aviary would be needed. Aggression from a breeding pair is unavoidable. *M. splendens* need to feel safe and secure from predators, they should have sufficient cover to be able to hide away when they feel threatened. (Brown, D, 2015)

M splendens have been successfully housed with finches and other birds, but care needs to be taken to ensure your wrens don't kill other species or each other. *M. splendens* are capable of killing birds larger than them. Never house finches with a blue plumage with *M. splendens*, as this can result in the cock bird becoming aggressive, seeing the finch as a threat. Birds should always be given adequate space to escape and hide from one another when they need. (Bird Care, 2008)

4.4 Position of Enclosures

Aviaries should be positioned to allow for maximum sunlight and cover from wind. *M. splendens* should be able to access sunlight, shade and protection from the cold and wind.

4.5 Weather Protection

M. splendens need shelter from extreme cold and heat. They should be provided with access to direct sunlight, shade, and protection from wind. The aviary is best to be of a semi open design.

4.6 Temperature Requirements

There are no heating requirements for *M. splendens*. Except allowing plenty of direct sunlight into the aviary they are housed in.

4.7 Substrate

Multiple types of substrate can be used for an aviary housing *M. splendens*. It is recommended to use a few different types in the one aviary. The floor of an aviary should never get too wet, it is best if the floor is kept dry most of the time. Concrete should be avoided, as it doesn't attract insects into the aviary for food. It also doesn't provide an area to grow live plants. Suitable substrates include:

Gravel, which will help keep the floor dry and allow for heat, the heat from the gravel will also attract insects for food; and

Soil, will be needed to grow plants in, which attract insects and the soil allows the birds to forage and scratch in search for insects. (Steve Sass, pers. comm)

4.8 Nestboxes and/or Bedding Material

M. splendens do not use nest boxes to roost, nor do they build a roost nest. They do build a nest for breeding, but this will be outlined in the breeding section. *M. splendens* roost among shrubs or dry brush, depending on which is available. They roost close to the ground, within a metre.

4.9 Enclosure Furnishings

M. splendens require a variety of furnishings, including: rocks, logs, perches, shrubs, and grasses. The rocks and logs attract insects as a source of food. Shrubs and grasses should be planted, or dry brush provided to allow for cover, roosting and nesting. There should still however be small open spaces to allow for sunny areas. *M. splendens* roost in shrubs close to the ground, within a metre.

4.10 Sustainability

When constructing enclosures, recycled materials or structures should be used where possible. Waste from materials should be kept to a minimum. Try and be resourceful with materials and don't throw away anything that could be used for a future enclosure. Left over building materials can be used for all sorts of things and possibly made into enrichment tools. Sustainable building materials should be used.

If using a night light to attract bugs into the aviary, a solar light can be used. These will become charged during the light of the day, and once the sun goes away, they will automatically turn on.

5 General Husbandry

5.1 Hygiene and Cleaning

Cleaning of aviaries should be done regularly to maintain a clean and healthy environment for the occupants. *M. splendens*, like any bird, should be exposed to some level of bacteria to allow for a natural immune system to develop. Not exposing a bird to any bacteria will cause even the slightest bit of bacteria to make the bird sick. The extent to which aviaries are cleaned is up to each individual holding the species, but the below information can be followed and adjusted to individual preference. Warm soapy water can be used to clean aviaries with the occasional disinfectant used to clean. Below is a guide to follow for cleaning an aviary with *M. splendens* housed.

5.1.1 Annual cycle of Activity

Task	Daily	Weekly	Monthly	Bi-annually	Annually
Water dishes emptied and refilled	X				
Food dishes removed, washed, replaced	X				
Water dishes scrubbed free of algae		X			
Perches scrubbed to remove faeces		X			
Faeces cleaned from aviary surfaces		X			
Accumulative droppings removed		X			
Floor substrate turned/raked		X			
Rodent bait stations checked and bait replaced if needed		X			
Disinfect water and feed dishes			X		
Dry brush in shelter replaced				X	
Replace perches if required					X
Replace floor substrate if required					X

Above tasks in further detail:

- Food dishes should be washed with warm soapy water and left to air dry on a daily basis.
- Once a week water dishes should be scrubbed free of algae build up.
- Perches and aviary surfaces can be cleaned with warm soapy water.
- Accumulative droppings on aviary floor can be scraped, and faeces on plants can be sprayed with a hose.
- Floor substrate such as gravel, sand, or soil should be raked/turned to remove visual build up.
- Water and feed dishes can be disinfected with a mild disinfectant such as Milton, eucalyptus disinfectant, F10 and any other mild disinfectants of choice.
- Dry brush in shelters should only be replaced off breeding season, half can be

replaced, then the alternate half the next time.

- Perches and floor substrate can be replaced if necessary due to faeces or loss of quality.

This cleaning regime should be adjusted if needed. The above will most likely be adjusted when *M. splendens* are housed with other species which will have different cleaning needs. Chemicals should be used at a minimum for the sake of the animal's health. Chemicals such as bleach are harsh and should most definitely be avoided. If choosing to use bleach for disinfecting, birds should be removed from aviaries to appropriate holding areas and surfaces should be rinsed very well to remove bleach before birds are reintroduced. Bleach needs to be used safely otherwise it may cause harm to the animal or the user. Mild disinfectants can be used, following safety precautions for each chemical. Some disinfectants that can be used include milton, eucalyptus disinfectant, and F10. MSDS sheets of these products can be found in the appendixes.

5.2 Record Keeping

Keeping records plays a huge role in the animal care industry. Records assist with good animal management, and can help when writing scientific papers or conducting research. For *M. splendens* records need to be kept in accordance to a business's policies and procedures. Each animal housed within the establishment should have an individual record kept, this allows for more accurate records on separate animals. Information which should be kept on *M. splendens* is shown below:

- Date of birth
- Sex
- Identification number
- Internal movements
- Captures
- Medical notes
 - Veterinary treatment
 - Veterinary diagnosis
 - Recovery from illness
- Physical condition
 - Body condition
- Diet and feeding
- Behaviour
 - Reproductive behaviours
 - Social behaviors
- Breeding
 - Courting
 - Mating – who with
 - Nest building
 - Chicks fledged and their given ID
- Date of Death
 - Cause of death (if known)

Anything observed of an animal which is out of the ordinary should be recorded for future reference incase anything occurs at a later date. The record can be looked back on and

whatever is happening may not be so unusual for that animal.

5.3 Methods of Identification

Birds in zoological institutions can be banded for identification purposes. The Australian Bird and Bat Banding Scheme recommends a size 01 alloy band (internal diameter: 2.0mm; height: 5.5mm; gauge: 0.38mm) for *M. splendens*. Alloy bands are light weight and durable. (Environment Australia, 2000)

5.4 Routine Data Collection

On a routine basis information should be collected and recorded about a species or individual to assist with general husbandry, this information includes:

- Dietary changes or needs
- Medical needs
- Breeding behaviours
- Nesting behaviours
- Unusual behaviours
- Internal movements
- External movements

5.5 Pest Control Maintenance

Pest related to *M. splendens* include, birds of prey, rats, mice and ants.

Birds of prey can scare and cause stress to *M. splendens*. To reduce stress to *M. splendens* aviaries should be well planted for birds to shelter and obtain privacy. *M. splendens* will not breed if they feel threatened, they also may refuse to eat at the sign of a threat. The most that can be done to reduce birds of prey is to deter the animal by making loud noises and throwing rocks in the direction of the animal. Most birds of prey will realise they cannot get into the aviary and move on.

Rats can eat birds, carry disease and contaminate food sources. Rats will also chew through nylon netting and dig into aviaries, which can compromise the integrity of the aviary. Mice create the same problems as rats. However mice do not eat birds, mice are less likely to chew through netting and mice are incontinent. This will contaminate food sources and spread disease wherever mice go. The risk of mice and rats can be reduced by placing bait stations around the inside and outside of the aviary.

Due to the diet for *M. splendens* rats and mice are less likely to be attracted to the aviary as there is no seed or fruit to be eaten. This does not mean rats and mice won't be a problem. Although *M. splendens* will not eat a deceased mouse or rat, wild animals, such as owls may prey on the mice or rats that have digested the poison. In order for native wildlife not to be harmed by poison, poisons such as the brand Ditrac can be used. Ditrac is not a secondary poison, one animal would need to eat a large amount of rats/mice affected by the poison to be affected themselves.

Ants are attracted to aspects of *M. splendens* diet. *M. splendens* are usually provided with a tray of termites as a source of insects, and ants like to eat termites. This can attract ants into the aviary. Ants can bring in worms, and pass them onto *M. splendens*. Ants will also foul the food supply. To reduce the risk of ants it is best to keep trays of termites up off the ground and spraying the poles with an ant surface spray. Ant spray should be sprayed in well ventilated area and not be deliberately inhaled. Always read safety instructions.

6 Feeding Requirements

6.1 Diet in the Wild

M. splendens eat primarily insects, they eat a variety of sorts. Mostly eating arthropods, such as ants, grasshoppers, crickets, spiders and bugs. They will also sometimes eat seeds, flowers, and fruit. Insects are gathered by hop and search. Sometimes they will forage for insects in the canopies of flowering eucalypts. They generally stick fairly close to cover and forage in groups. Food can be scarce in winter and ants become an important 'last resort' option. Adult *M. splendens* feed their young larger insects, such as caterpillars and grasshoppers. (HBW Alive, 2016)

6.2 Captive Diet

M. splendens eat a variety of foods in captivity. The diet fed in captivity will differ between institutions. *M. splendens* still highly rely on insects in captivity. Certain insects can be bred to feed to the birds, but there are also various ways insects can be attracted into the aviary to allow the birds to forage. Madeira cake, mashed egg, cheese, turkey crumbles and a softbill meat mixture can also be fed. Insectivore can be fed all the time, or when insect numbers are low. The above food will be further detailed below.

Most often, aviaries containing *M. splendens* will be planted. They can be kept in non-planted aviaries but they need a lot of dry brush and cover, and more insects. Keeping them in a planted aviary brings more insects into the aviary, and allows them to naturally forage. Figure 4 below shows a small area of an aviary at On the Perch, located on the Far South Coast of NSW, Australia. The *M. splendens* use all of the aviary but this area is used more often. They spend a lot of their day foraging for insects in this area. This is also the area in which they nested early 2016 and twice early during the 2016/2017 breeding season.



Figure 4: Area of aviary at On the Perch where the *M. splendens* love to forage, and where they have nested every time. (Photograph by Holly Sass)

M. splendens will only breed when food is abundant, there needs to be a constant plentiful supply of live insects so they are able to provide the feeding requirements of their young. When young are in the aviary the insect demand will be much higher, *M. splendens* will readily take mealworms to feed to their young.

Insects can be attracted into the aviary in various ways. A light (15-watt globe) can be left switched on in the aviary overnight. The light will attract insects into the aviary which will be eaten by the birds. The light will also provide a form of protection from disturbances by unwanted night intruders. (Shepard, M., 1989). A compost heap can be maintained within an aviary, which will allow birds to forage on the bugs attracted to the compost. Certain areas of the aviary floor can be covered in gravel substrate, which will heat up and attract insects to the warmth. There are countless and varied types of insects found in, or attracted to plants. Native flora is best suited to attract insects, but some 'exotics' such as Honey-suckle are excellent. Flowers of *Callistemons*, *Kunzeas* and *Grevilleas* are used by *M. splendens*, they drink the nectar and also eat the stamens of the flowers. Grasses grown in the aviary will also attract insects. (Hutton, R., 1991)

Recommened plants to attract insects are: *Callistemons*, *Eremphilas*, *Melaleucas*, *Thryptomene*, *Grevilleas*, *Acacias*, *Harden-beergias*, *Kennedias*, *Kunzeas*, *Baecheas*, *Chorezemas*, *Beaufortias*, *Banksias*, *Cassias*, *Clematis*, *Correas*, *Darwinias*, *Hibbertias*, *Pimeleas*, *Sollyas*, and *Westringias*. (Hutton, R., 1991)

Some insects are able to be bred, so they can then be fed to *M. splendens*. The insects mainly bred by aviculturists are mealworms and maggots. Mealworms and maggots have the equivalent food value. (Martin. R. M., 1980). For details on how to breed maggots and mealworms see appendix I, for maggots and appendix II, for mealworms. Termites can be harvested from mounds if available. For further details on collecting termites see appendix III.

All of the below foods can be fed to *M. splendens*:

- Madeira cake – this can be bought or made. However it is easier and generally cheaper to purchase from a supermarket.
- Egg and insectivore mixture – hard boiled eggs can be mashed, and then have insectivore mixture mixed through.
- Soft Bill Meat Mix – a mixture consisting of hardboiled egg, kangaroo mince, grated cheese, insectivore mix, and turkey crumbles. The recipe will be outlined in appendix IV.
- Grated Cheese – a finely grated mild cheddar cheese can be fed.
- Boiled Eggs – mashed hard boiled eggs can be fed.
- Turkey Crumbles – meat chicken/turkey starter crumbles can be fed.
- Egg, cheese, and turkey crumbles – a mixture of the above three foods can be mixed together and fed.
- Insectivore – Wombaroo Insectivore Rearing Mix can be fed at all times, or when insect numbers are low. It can also be mixed into foods.

Mealworms can be placed in insectivore mix to condition the birds to eating insectivore. Insectivore is useful as a supplement to ensure birds are receiving their needed intake of

nutrition. It is also helpful when insect numbers are low, but only if the birds will eat it. Insectivore can be mixed into food such as the Madeira cake or boiled eggs. Mealworms can be placed in the insectivore every day until the birds become conditioned to the insectivore. (Steve Sass, pers. comm). The most popular insectivore mixture used by aviculturists is ‘Wombaroo Insectivore Rearing Mix’, for details on this product, see appendix V.

Browse species can include native Australian species. Such as *bottle brush*, *eucalypt*, *wattle*, *she-oak*, *tea-trea* and *grevillea*. Browse is used as enrichment, it brings in new insects for the birds to forage among. Browse should be replaced fresh daily. (Steve Sass, pers. comm)

6.3 Supplements

The only supplement needed for *M. splendens* is an insectivore mixture. The most popular insectivore mix used by aviculturists is ‘Wombaroo Insectivore Rearing Mix’. Details on the product can be found in appendix V.

6.4 Presentation of Food

Mealworms can be thrown around the aviary in different places at different intervals of the day to encourage *M. splendens* to forage for their food. During a non-breeding situation, approximately 20 mealworms would be fed per day, per bird. During breeding this would be upped to 60 – 80 mealworms per day, per bird. These should be fed at intervals during the day. (Hutton, R., 1991) Maggots will perish fairly quickly once they are taken from their moist conditions. These will be eaten quickly, but it is best to throw them where the birds will find them quicker, so they don’t perish. Termites can be presented in a large tray along with the dirt from their mound. This should be kept off the ground, as ants will sometimes find the termite supply and eat the termites. These insects should be fed daily.

Madeira cake can be fed daily in a small bowl. The boiled eggs, cheese, and turkey crumbles can all be fed daily, but the softbill meat mixture contains the same foods plus kangaroo mince. Only one of these mixtures needs to be fed each day, they can be presented in a small tray. The uneaten food should be removed and replaced daily. All food fed to *M. splendens* should be kept off the ground so ants do not foul the food supply. Sometimes if ants become a problem, the poles of the food stand can be sprayed with an ant surface spray.

An insectivore mixture can be fed daily to ensure *M. splendens* are receiving the required nutrition, or it can be fed when insect numbers are low to provide energy that insects would normally provide. This can be placed into a small bowl off the ground, and any uneaten mixture should be removed and replaced with fresh mixture weekly.

Browse can be placed in a PVC pipe attached to a star picket, pole or wall. Browse should be replace fresh daily. Browse should not be presented too far off the ground.

6.5 Sustainability Aspects of Feeding, Including Food Security Considerations

Food for *M. splendens* is mainly insects. Insect costs are fairly low, due to the ability to attract, harvest and breed them.

- Termites: Can be harvested locally, when available. If termites are found locally they are a free food source. Time just needs to be spent collecting them from their mounds.
- Mealworms: Can be purchased from insect breeders such as 'Pisces'. However this is not a very sustainable way to feed mealworms, to keep purchasing more and more. They can be purchased and then bred.
- Maggots: Can be bred, and is practically free. Breeding maggots just takes time to set up and maintain.

Other various insects can be attracted to aviaries using a variety of techniques. Using a night light will attract bugs overnight. Old fruit from other aviaries you may have can be used to create a compost pile. If feeding *M. splendens* foods such as eggs, meat mixtures, etc. Try to use locally sourced ingredients and have minimal food waste.

7 Handling and Transport

7.1 Timing of Capture and Handling

The best time to capture *M. splendens* is in the morning. This makes an easier capture if using the trap cage technique (see 7.3). They will be hungrier in the morning before feed time, which makes them more likely to go into the trap cage for the food. Capturing of *M. splendens* can also be done earlier morning before public arrive to an institution, this ensures public do not disrupt the capture or witness any issues with the capture that may occur. This species is very delicate and stress can cause death. *M. splendens* should only be handled and captured when necessary. (Steve Sass, pers. comm)

7.2 Catching Equipment

Depending on which method is chosen to capture *M. splendens* will depend on what equipment will be needed. Equipment that could be needed will include:

- Padded net
- Small cage/cabinet
- Small tray to contain food
- Food source (live food is best, mealworms, maggots etc)
- Long roll of string

7.3 Capture and Restraint Techniques

M. splendens are very small birds only measuring approximately 12cm, due to this small size capturing can become quite a task, especially when housed in a large planted aviary. When in a smaller sized aviary where the birds don't have anywhere to go a padded net can be used and they can be caught by hand. The best way to capture *M. splendens* in a larger aviary is using a trap cage technique. It consists of using small cage, a string attach to the door so it can be dropped from a distance, and a food of choice inside. The best results from this technique are usually when capturing in the morning before feeding times, this is because the birds are hungry and will be more encouraged by food. Details on how to catch *M. splendens* using this method is detailed below:

- A small budgie style cage or cabinet can be used, a cage similar to the one below will be sufficient. It doesn't need to be very large.



- A small handful of mealworms or another live food (live food works best) can be placed in the bottom of the cage in a tray which they cannot escape from.
- A thin stringline will need to be tied onto the door of the cage. A simple knot is sufficient. The position on the door where the string should be attached will depend on the angle and position in where you are standing from the cage. Trial and error is the only way to know. Once the string is tied onto the door you should be able to pull on it and the door will lift up, then when you loosen the string the door should slide shut with ease.
- Patience is needed with this method, especially if your birds are shy or they are housed in a mixed aviary. Wait a reasonable distance from the cage holding the door open with the string.
- Once the correct bird enters the cage loosen the string and close the door.
- You can then approach the cage and catch the bird out with your hand.

One way to make this method possibly go quicker is to leave the cage in the aviary for about a week leading up to the capture. Mealworms can be left inside, and the door should be tied open or removed. This will allow the bird to become used to going in and out of the cage when it pleases. The bird should also be less timid about going in for the food.

Be cautious when capturing *M. splendens* using the trap cage method, as it may take some time and expose you to long sun exposure. Wear correct sun protection when capturing using this method to reduce the risk of sun damage. If capturing using a net be aware of tripping and falling hazards.

Restraining *M. splendens* should be done very gently, they are very delicate birds. No huge amount of pressure should be applied, especially around the head. Too much force and the windpipe can be cut off. Figure 5 below demonstrates one way to restrain *M. splendens*.



Figure 5: Steve Sass, head bird keeper of On the Perch, physically restraining a male *M. splendens*.
(Photograph by Holly Sass)

As shown, the bird can be held in the palm/fingers and the thumb can be used to restrain the bird. *M. splendens* are very light and do not require much force to keep restrained.

7.4 Weighing and Examination

With *M. splendens* being such a small bird, weighing them can be a task. This species generally wouldn't need to be weighed, but if it is necessary to weigh this species a technique will be outlined below.

Using a digital hanging scale, a small calico bag can be weighed. Then you would place the bird inside the bag and secure the opening, being careful as this species is very fragile. The bag containing the bird would then be weighed again. The weight of the bag can be subtracted from the second measurement, and the remaining measurement is the weight of the bird. (Steve Sass, pers. comm)

Techniques used to restrain *M. splendens* is outlined above in 7.3

7.5 Transport Requirements

7.5.1 Box Design

The 'IATA Live Animal Regulations - General Container Requirements for Birds (CR 11-23)' state the following under the section 'Design and Construction':

"When constructing containers for shipment of birds, the normal habitats and necessary freedom of movement must be considered.

For general transport purposes, birds will be carried only in closed containers. The container must be well constructed and be able to withstand other freight damaging it or causing the structure to buckle or collapse. It must be constructed of non-toxic materials. Chemically impregnated wood may be poisonous and must not be used.

It is recommended that the material for the sides, frame, roof and floor be standardized as follows:

Sides – 0.6 cm (1/4 in) plywood;
Frame – 2 x 4 cm (3/4 x 1 1/2 in) solid wood;
Roof, floor – 1.2 cm (1/2 in) plywood.

The container must be suitable to keep the bird inside at all times and protect the bird from unauthorised access. The door must be constructed so that accidental opening cannot occur, either from the inside or the outside.

The container must not cause the bird to damage itself. All inside edges must be smooth or rounded. There must be no sharp projections, such as nails, upon which the bird can injure itself. Joints of a wooden container must be made so that they cannot be damaged by a bird's beak or claw from the inside.

Wooden perches must be provided for birds that rest by perching. There must be sufficient perch space for each bird inside the container and enough height for the bird to perch with its head upright and its tail clear of the floor. The diameter of the perch must be large enough to permit the bird to maintain a firm comfortable grip with its claws. The perches must be placed so that the droppings do not fall into the food and water troughs, or onto other perching birds. Non-perching birds must be able to stand upright except in the case of pheasants.

The container must be clean and leak proof. If it is being reused, it must be thoroughly disinfected or sterilised. Absorbent bedding must be provided by the shipper that is suitable for the species. Straw is unacceptable as many countries prohibit its importation.

Handles and/or spacer bars must be provided to facilitate handling and preventing the ventilation openings becoming blocked by other freight.”

A transport box for *M. splendens* should be constructed following the above general requirements. The box should be constructed using plywood. A sufficient sized box should be 30cm x 30cm, and be 15cm tall. This size allows for the freedom and movement of the bird. The box should be fully enclosed except for the front of the box. The front of the box needs to be enclosed using 6mm vermin mesh or aluminum fly wire. To minimise the possibility of the bird rubbing its beak, fly wire should be used. The front of the box can also be covered with a black shade cloth to allow for privacy. The shade cloth will also reduce cold breezes from affecting the bird. A perch should be provided 5cm above the base, it should also be 10mm in diameter. Ventilation holes are necessary and should be 4mm holes, the ventilation holes should be made all along the edges of the box and on the top. 2 doors should be constructed, one for access and one for release. The door used for access should be covered with a rubber flange to allow for access into the box without the bird escaping. The other door should not have this cover, to allow for easy release. The doors need to be secure to stop unauthorised access into the box. A screw can be used to keep the doors in place, is using a screw it needs to be short enough not to protrude into the box, as the sharp end may injure the bird. Water and feed containers are necessary for *M. splendens* as they have a very high metabolism. *M. splendens* cannot be left without food for about 10 minutes. Small lightweight plastics containers can be used for food. They need to be secured and not have any sharp edges. (Steve Sass, pers. comm)

If only transporting *M. splendens* for 10 minutes or less they can be transported in the same box as above but will not require food. (Steve Sass, pers. comm)

7.5.2 Furnishings

A perch needs to be provided within the transport box for *M. splendens*. The perch should be 10mm in diameter and be 5cm above the base of the transport box. (Steve Sass, pers. comm)

7.5.3 Water and Food

M. splendens cannot be left for more than about 10 minutes without food due to their high

metabolism. Feeding *M. splendens* during transport is fairly simple. More food than necessary is best to be provided in case the trip is longer due to unexpected delays. An insectivore mixture can be fed, along with Madeira cake and live mealworms.

If someone is accompanying the bird during the trip mealworms can be added through the ventilation holes periodically. However if someone is not accompanying the bird there are ways to allow mealworms to be fed periodically, one way is to use a small pvc pipe with holes drilled in it big enough for mealworms to fit through, the pipe is then filled with bran and mealworms and sealed at the ends. The mealworms will slowly find their ways to holes and fall out into the box, allowing the bird to eat them. Mealworm feeders intended for lizards can also be purchased, they use the same premise as above but don't need to be constructed. Details on where to purchase this product will be outlined in appendix VI.

Small lightweight plastic containers should be used for foods. These can be attached to the wire mesh front of the transport box. They should be secured well and not have sharp edges to ensure they do not injure the bird during transport. Containers such as D cups can be used. Water can also be in a small plastic container, but a sponge should be added to the water dish. Doing this will ensure the bird doesn't drown and that the water doesn't spill.

For a 24 hour period when travelling, the containers being used can be filled to the rim with the Madeira cake and insectivore and approximately 20 mealworms (or more) should be provided. Sufficient food plus more should be provided. If the food doesn't look like enough, don't be afraid to add more. You should also account for more food in case the mealworms don't make their way into the box. You do not want to be stuck in a situation where the bird runs out of food. It is best to have excess food left at the end of transport rather than no food and a starved bird. (Steve Sass, pers. comm)

7.5.4 Animals per Box

M. splendens can be very territorial and aggressive birds, they should never be transported in the same box. They can be transported in separate compartments of the one box but they must not be able to get into each other's compartments. *M. splendens* will kill unwanted residents, even if they are paired birds can still become aggressive, especially when they are in an unknown place such as a transport box. (Steve Sass, pers. comm)

7.5.5 Timing of Transportation

There is no specific time of day or time of year when *M. splendens* should be transported. However it is best to avoid extreme temperatures where possible. As long as the box doesn't overheat or become cold, the bird should be fine. Transport should be as short as possible to ensure minimum stress in the bird. (Steve Sass, pers. comm)

7.6 Release from Box

Release of *M. splendens* should be done early morning. Release can be done sometime before midday in summer, and before 9am during winter. Releasing *M. splendens* during the morning ensures the birds have plenty of usable daylight to allow them to adjust to

their new surroundings and find food. *M. splendens* should be released a facing an aviary wall, and a few metres from the wall. This should be done so that the bird isn't fluttering around trying to find somewhere to land, and the bird can land at the wall and look around their new surroundings. If *M. splendens* are released in the middle of an aviary, their first instinct will be to fly towards the light or straight ahead until they reach a wall, which could be a fair distance. Birds may injure themselves if they do this, so it is best to release them as outlined above. Releasing them near the wall will also allow birds to become accustomed to the aviary quicker, rather than trying to recover from the exhaustion of finding somewhere to perch. (Steve Sass, pers. comm)

7.7 Sustainability

An article written by 'Sydney Morning Herald' titled "*Planes, trains or cars?*" outlines which mode of transport is better for the environments. Damon Honnery, a Monash University expert says that jet fuel is the most environmentally damaging fuel – given that it produces not only carbon dioxide, but also nitrous oxide, which has a global warming potential about 300 times worse than carbon dioxide. Many different variables depends on whether car or planes are better for the environment. Most scientist will agree that when both aircraft and car carry nearly full loads, car travel is nowhere near as bad.

However with all the above, when transporting *M. splendens* a keeper doesn't NEED to be present with the bird for the duration of the trip. If transporting via car, the keeper then has to travel back from wherever they took the bird to and are most likely travelling alone. If sending the bird on a plane, it only has to be transported one direction.

Whether a car or plane is better for transportation, all depends on the individual circumstances.

8 Health Requirements

8.1 Daily Health Checks

Observations of *M. splendens* should be done daily each morning from a distance. Preferably observe the bird from somewhere it cannot see you or is not bothered by your presence. Birds can be very good at masking illness. Each individual bird has different normal behaviour patterns and these need to be learnt to know what is abnormal for each individual. (Cannon, M.J., 2002)

A normal healthy bird should display the following:

- Bright and alert behaviour
- Feeding well
- Eyes should be wide open and clear with no swelling or discharges
- Both nostrils open and clear
- No darkening or stains on feathers near the nostrils
- Should respond to your approach and presence
- Standing erect with weight evenly spread on both feet
- Wings folded against body in usual position
- All feathers in good condition
- Singing normally
- Moving around freely
- Breathing is barely detectable
- Not overweight nor very thin
- No ragged or untidy feathers
- No abnormal swellings anywhere on the body (Cannon, M.J., 2002)

An unhealthy bird may show the general below signs:

- Weight loss
- Reduction in appetite or complete cessation of eating
- Inability to adequately swallow or manipulate food within the mouth
- Head held under wing
- Sitting low down on the perch
- Vomiting
- Fluffed feathers – huddled appearance
- Wet feathers around the head – especially nostrils or eyes
- Less active than normal – sleepy appearance
- Droopy wings
- Decrease in preening activity and maintenance of feathers
- Broken or untidy feathers
- A break in the bird's routine indicated by abnormal behaviour
- Allows you to come closer than normal before responding
- Cessation of vocalisation
- Change of voice

- Visible lumps or masses anywhere on the body
- Bleeding – always treat this as an emergency (Cannon, M.J., 2002)

With *M. splendens* being such a small bird, observations can be more difficult than with a larger species. However *M. splendens* can become a relatively quiet bird which will make observations easier once the animal becomes used to your presence.

8.2 Detailed Physical Examination

8.2.1 Chemical Restraint

Chemical Restraint is not applicable to *M. splendens*.

8.2.2 Physical Examination

Physical examination can sometimes create quite a task with *M. splendens* as they are such a small delicate bird. Handling should be very gentle not to stress or injure the bird. The bird can be held in one hand and examined with the other hand, a second person can be used to aid this if needed. A physical examination is not recommended to be done often as *M. splendens* can become stressed very easily. If showing any signs of illness a physical examination can be performed. (Steve Sass, pers. comm)

8.3 Routine Treatments

Worming treatment can be administered every 3 months to *M. splendens* in their water source. A brand such as Avitrol Plus can be used, it comes as a concentrated syrup which is diluted with water. This treats against a broad spectrum of worms. It controls thread, caecal, round, gape, gizzard, and tape worms. The syrup is diluted at the ratio 25:1000 or 25mL per litre of water. After the first treatment a second treatment 14 days later should be administered, this follow up treatment is aimed at any parasites that may have been unhatched eggs during the first dosage of treatment. A small amount of sugar is often added to the mixture to make it more palatable for the bird. See appendix VII for more detail on this product. (Bull G & L., ND)

Coccidiosis can be treated against using a product such as Baycox. It comes as a syrup which is diluted at the ratio 3:1000 or 3ml per litre of water. The two days before Baycox is administered, apple cider vinegar can be added to drinking water at 5:1000 or 5ml per litre. The reason for giving apple cider vinegar before Baycox is to acidify the bird's gut which enhances their natural resistance to a variety of possible bacterial and fungal infections. This is then followed with two days of Baycox and water solution at the ratio 3:1000 or 3ml per litre of water. This treatment should be given during/after extended wet and/or humid weather. See appendix VIII for more detail of this product. (Bull G & L., ND)

8.4 Known Health Problems

There are no specifically known health problems for *M. splendens*. Generally if an *M.*

splendens becomes unwell, the harsh reality of it is that there isn't a whole lot that can be done to bring the animal back to full health as they are such a small delicate species. If the bird is found on the ground, lethargic, fluffed up and heavily breathing it should be removed from the enclosure immediately and moved to a small treatment cage and placed under a heat lamp. The bird may recover with this treatment, but also may not. Birds are very good at disguising illness. Once they display signs of illness it may be too late for them to recover.

8.5 Quarantine Requirements

Quarantine can pose as a difficult task with *M. splendens* as most quarantine aviaries are very basic and are not designed to house *M. splendens*. A lot of aviculturists do not quarantine softbills such as *M. splendens* however it can be done and quarantine should always be done. If quarantine is bypassed you risk compromising your whole collections health. When quarantining *M. splendens* the aviary needs to be suitable, which means either a well planted aviary or lots of dry brush. If housed in a non-planted aviary, plenty of life food needs to be provided. (Steve Sass, pers. comm) The recommended quarantine period is 4 weeks for birds, but 6 weeks is preferable if possible. Birds should also be treated for worms twice while in quarantine, checked for lice or mites, and given a general health check. (Cannon, M.J., 2002)

9 Behaviour

9.1 Activity

M. splendens are active birds and are constantly on the move. Despite their cute chirpy look they are quite aggressive and territorial birds. In the wild they form family groups, and the whole family help raise the offspring. *M. splendens* roost side by side in dense cover. (Bird Care, 2008) They spend most of their time foraging for insects on both the ground and in shrubs. (Bird Life Australia, 2012) During spring and summer, *M. splendens* are active in bursts throughout the day and accompany their foraging with song. Insects are plentiful and easy to catch, this allows birds to rest between feeds. Family groups will often shelter and rest together during the heat of the day. Food is harder to find during the colder months of winter and birds are needed to spend the day foraging continuously.

9.2 Social Behaviour

M. splendens are very social birds. Groups of two to eight *M. splendens* remain in their territory and defend it year round. Territories average 11 acres in woodland heath areas. Size of territorial areas decrease with increasing density of vegetation and increases with the number of males in the group. The group consists of a breeding pair with one or more male or female helper birds, these birds may not be offspring of the main breeding pair. The females will be kicked from the group once they reach breeding age and will often take a few males (related or unrelated) to form a new group. The non-breeding pair birds are considered ‘helpers’ and help assist with the rearing of young.

All members of an *M. splendens* family group, or as little as two birds, can be seen mutually preening one another. They will sit closely together on a perch pressed side by side preening each other. They will also ‘leap frog’ over each other not wanting to be on the end of the line. (Hutton, R., 1991) In captive situations *M. splendens* housed together will also be seen mutually preening as they would in the wild.

9.3 Reproductive Behaviour

As mentioned above in **9.2 Social Behaviour**, *M. splendens* live in family groups. The family group co-operatively raises the young. The breeding female solely builds the nest on her own. With the male inspecting as she builds. She is the only member of the group to incubate the eggs. All members of the group feed the young. (Bird Life Australia, 2012)

To reduce the risk of predators finding a nest, all species of fairy-wren will deposit a “poo-packet”. The young in the nest will turn around and deposit their little “poo-packet” into the parent, uncles or aunties beak, whoever is around. The adult who collected it will then take it as far away from the nest as they can and drop it. This technique is used to deter predators away from the nest as the nest is built close to the ground. (Steve Sass, pers. comm) I have personally observed this with aviary birds, the father was taking food to the nest and he returned with a small white blob in his mouth, he then flew as far away as he could to the furthest corner of the aviary and dropped it. He then returned to busily

collecting food for his young.

Courting is a very extravagant series of calls, dancing, chasing, and much more. As detailed in Hutton's book '*Australian Softbill Management*' under the section 'Mating Calls and Displays' she writes:

"This section is numbered in the *usual* set sequence of events, but these can vary, sometimes some parts are left out depending on the seriousness of the pair; on other occasions different sequences may follow each other for various reasons, interruptions or interference by youngsters etc. However courtship display usually begins thus:

1. A loud burst of territorial call, by cock bird alone or by pair of unison
2. A chase begins, cock chases hen, in long rapid energetic flights from one end of aviary to the other, back and forth several times. Sustained flight for these birds normally labored because of their long tails, usually cocked high over the back, but when in flight it is held outstretched trailing behind them, appearing almost too heavy to pull.
3. They halt abruptly and turn facing each other, cock bird uttering a *harsh* rattling *chatter*, both with beaks wide open and feathers on top of heads fluffed out. Hen's response is a call almost the same as the *warning* call. If she does not turn and face the cock bird abruptly confronting him with the warning he may attack her.
4. The cock adopts a strange "lizard" like appearance, his head and crown fluffed out, his sky blue "wing" shaped ear coverts are fanned out, head and tail lowered, wings closed (this ruff around the neck makes him look like a Frill-necked lizard). He chatters his harsh call continuously, "zzzatt zzzatt zzzatt". Hen assumes a begging pose similar to that used by the young, head lowered, tail down and fanned out, wings outstretched and quivering, beak open, no sound is emitted.
5. Chase resumes again.
6. Cock bird breaks off chase to hunt for a flower petal, he picks it off, rolls it into a cylinder in his beak, holding it parallel. The colour can be pink, yellow, red, mauve or orange, in fact any colour which contrasts with his own body colour.
7. Cock then takes off in long, very slow flight, past his hen who usually perches motionless observing her mate. He utters a sort of "*buzzing*" sound, occasionally she will join him in this slow flight (this flight is almost a slow motion flight with tails outstretched behind them, wings fluttering producing an audible "fluttering" sound, this is a graceful sight indeed).
8. Cock alights near hen, they confront each other, hen with beak open, cock approaching her offering the petal. She usually takes it from him and eats it, at times drops it and sometimes will not accept it at all in which case the cock will just drop it.
9. Hen then leaves to hunt an insect, she then offers this to her mate. I have seen him accept and eat it, or accept then offer it back to his hen, she will always eat it. As mentioned many of these minor behaviours can vary or be deleted altogether, some cock birds never use a petal for attracting their mate. The call now changes to the more melodic *territorial* song interspersed with the *chattering* call.
10. Both birds then retire to a dense shrub where *copulation* takes place. This is brief and done in the usual "finch" style. I have witnessed this only six or eight times in many years of study

Occasionally a brief mating attempt will take place on the perch where the petal

was exchanged, on other occasions it will take place in or near a completed nest.

As stated previously, these sequences can change or some parts left out completely, often 1-5 are then followed by 10, leaving out 6-9 altogether occasionally 1-5 will be followed by 7 and 10, or many time 10 (copulation) will be excluded. Much of this behaviour is done to cement the pair bond and has no real significance as a preparation for mating.

Any of these sequences can be disturbed by interfering curious youngsters and this is treated with noted distaste by the pair, usually resulting in the young being chased vigorously from the area. This is a good warning sign of the need to remove the young if they are independent as the pair will not tolerate repeated interference of this kind.”

As read above, the courtship is a very extravagant series of events and can be simple or complicated depending on the individual pair.

M. splendens along with other species of fairy-wren are considered one of the most unfaithful birds. Both the male and female from the breeding pair will often disappear to neighbouring territories, the female may seek a male who recently gave her a flower and the male may disappear to court other females. This is a very common occurrence, resulting in up to three quarters of all fairy-wren broods being biologically another males. While fairy-wrens are unfaithful it does have benefits. The female laying eggs fertilised by different males can increase the genetic health of the fairy-wren population. (Northern Star, 2016)

9.4 Bathing

M. splendens will bathe in a shallow water dish in the normal fashion, but wrens prefer to utilize the fine spray mist or dew in the early morning on the outer soft tips of foliage and ground covers. They will flap and flutter about, almost rolling over in a tumbling movement downwards over the wet greenery. This is often done during a light shower of rain or when sprinklers are turned on in the aviary. (Hutton, R., 1991)

M. splendens will also enjoy sunbathing, they will sit closely packed together on a branch in a line, preening each other and fluffing out their feathers to allow the warm sun to reach their skin. This may be combined with a dust bath if the group choose a patch of dry soil in the sun. Another method of sunbathing performed by *M. splendens* is done alone, the bird will lie outstretched on the gravel in full sun with its wings and tail flared out, head flat down and feathers all fluffed up. They will stay like this for only a few moments, until jumping up and flying off in a flutter. (Hutton, R., 1991)

9.5 Behavioural Problems

Behavioural problems should not arise with *M. splendens*. Behavioural problems usually occur in bird species when the bird is hand reared and has no fear towards humans. Hand rearing rarely occurs with *M. splendens* so behavioural problems are rare. *M. splendens* tend to keep to themselves when in a mixed exhibit. They spend most of the day busily hunting live food. Spending most of their time hunting they will rarely become bored, and

usually not stressed.

9.6 Signs of Stress

M. splendens should be closely observed daily to ensure they don't begin showing signs of stress. Signs of stress in *M. splendens* is similar to that of other bird species. A general list of signs of stress in birds is outlined below:

- Depression
- Moodiness or irritability
- Excessive activity
- Feather picking
- Increased pecking
- Increased elimination
- Inactivity or sluggishness
- Lack of desire to socialise
- Abnormal vocalisation
- Ruffled feathers
- Sitting at the bottom of the enclosure (University of Minnesota, 2016)

While signs of stress in *M. splendens* may vary slightly the above list can be used as a general guide when watching for signs of stress.

9.7 Behavioural Enrichment

Enrichment is very important for captive birds. *M. splendens* spend most of the day foraging for food, so enrichment for this species would be based around food. Some enrichment that can be provided for *M. splendens* include:

- Providing fresh browse daily
- Providing a compost heap in the aviary to attract bugs
- Providing a tray of termites
- A section of the aviary floor (if substrate is soil) can be dug over to provide the bird a soft area of soil to dig and hunt for insects
- Installing a moth trap
- Installing a night light which will attract bugs in the aviary overnight

Enrichment is always about trial and error, don't be afraid to try new things for your birds. As long as the enrichment device cannot cause harm to the animal there is no harm in trying something new. If something doesn't work don't return to that enrichment strategy and try again with a different strategy.

9.8 Introductions and Removals

M. splendens being a very territorial bird, caution needs to be taken to ensure the pair do not kill each other when being introduced into an aviary together. If a bird has been

occupying a territory for a time, perhaps only a week or less, it will have made claim to that territory. If you add in another bird to be 'paired' with this bird, it isn't as simple as throwing in the new bird. The original bird should be removed from the aviary it is being held in, and then placed in a small carry box with the new bird for two or three hours. They can then be moved into a small holding cage or aviary (ensuring it is either planted or partly filled with dry brush for cover) to enable each bird to seek individual cover.

Holding the pair in a small unfamiliar territory will disorientate them, and reduce their natural territorial aggression. The two birds should be closely observed and one should be removed if behaviour becomes too aggressive. Plenty of live food must be supplied during this time, and in two separate places if possible. This will allow each bird to feed on their own. If successfully held like this for five to six days, or until harmony is definite, they can then be safely released into their new aviary as a true pair, both sharing the territory.

9.9 Intraspecific Compatibility

In captivity only a breeding pair can be kept in each aviary. When they breed their offspring will need to be removed once they are independent or at the first signs of aggression. Parents will kill their own young that they see as a threat. There has been success with housing a breeding pair, their offspring and then the hen going back down to nest again. In this situation the first nest of young have been observed assisting in feeding the young. An attempt can be made to house a subordinate male with the pair, but this is taken at your own risk as you may lose the subordinate or dominant male. Being able to house an extra male depends entirely on the individual birds and may work on some occasions but not on others. It is best to just house a pair to not risk losing a bird. (Steve Sass, pers. comm.)

9.10 Interspecific Compatibility

M. splendens can very easily and successfully be housed together with many other species of birds. *M. splendens* can become aggressive towards any birds they feel are a threat to territory or their food supply.

Most finch species are compatible, but it is best to avoid any finches with blue plumage as this may threaten the male wren and cause him to kill the finch(es). Finch species fond of live food should be avoided, such as Aurora, Melba, Cuban, etc. Ground birds tend to be compatible, such as quail or ground dwelling doves. Other softbills can be housed successfully with *M. splendens*. Dotterels, chats, and robins can also be housed successfully. (Hutton, R, 1991)

Other species of fairy-wrens should be avoided, due to the risk of aggressive behaviour and possible cross breeding. Different species of fairy-wren have been known to cross breed before. (Steve Sass, pers. comm.)

At On the Perch, a pair of *M. splendens* have been successfully housed for over a year with many different species such as:

- Princess Parrot
- Regent Parrot
- Cockatiel
- Red-winged parrot
- Budgerigar
- Scarlett Chested Parrot
- Bourke's Parrot
- Zebra Finch
- Double-barred Finch
- Long-tailed Finch
- Star Finch
- King Quail
- Diamond Dove
- Common Bronzewing
- Crested Pigeon
- Purple-crowned Lorikeet
- White-browed Scrubwren
- White-browed Woodswallow
- Banded Lapwing
- Bush-stone Curlew
- Crimson Chat
- Yellow-tufted Honeyeater
- Red-winged Parrot
- Bar-shouldered Dove
- Spinifex Pigeon

As seen at On the Perch, *M. splendens* can work well with many different species. There are no finches with blue plumage and while there are birds that eat live food, enough is supplied in the aviary for it not to be a problem.

When adding any new bird to an aviary it should be observed to ensure no aggression occurs towards it, or that it doesn't become aggressive towards others.

9.11 Suitability to Captivity

M. splendens are a very compatible species to captivity. They are a very popular bird in Private Australian Aviculture. If they are housed in an appropriately sized aviary, which is well planted, plenty of live food is provided, does not contain any incompatible species, and the pair of *M. splendens* are introduced correctly as outlined above in **9.8 Introductions and Removals**, no issues should arise when housing *M. splendens*.

10 Breeding

10.1 Mating System

M. splendens is considered a cooperative breeder. Details of their mating system can be found in section **9.3 Reproductive Behaviour**

10.2 Ease of Breeding

While *M. splendens* are not an easy species to breed due to unknown reasons, under the correct conditions and with an adequate food supply, there is no reason *M. splendens* should not breed. (Steve Sass, pers. comm)

10.3 Reproductive Condition

10.3.1 Females

M. splendens females do not change during breeding season.

10.3.2 Males

During breeding season the male *M. splendens* will be in nuptial plumage. For a description of the nuptial plumage and eclipse plumage, see **3.1.2 Sexual Dimorphism**. The male will lose his nuptial plumage around mid-April over a four to five week period. He will then be in his eclipse plumage. The amount of time the cock bird remains in this eclipse plumage will depend on his age. It can vary from as little as three weeks (for a five year old bird) to as long as five months (for a two year old bird). The older the bird, the less time he is in eclipse plumage. These molts are very physically challenging on the bird, especially with the possibility of two very close full molts. Older birds will often die during this time, but if a bird is in good condition and has access to a well-balanced nutritional diet, he should come through as a beautifully coloured bird ready for breeding season. (Hutton, R., 1991) The process of the male *M. splendens* molting from eclipse plumage to nuptial plumage can be seen below in figure 6, 7,8 and 9.



Figure 6: male *M. splendens* in full eclipse plumage. (Photograph by Holly Sass)



Figure 7: male *M. splendens* just beginning to molt into nuptial plumage. (Photograph by Holly Sass)



Figure 8: male *M. splendens* nearly fully molted into his nuptial plumage. (Photograph by Holly Sass)



Figure 9: male *M. splendens* fully in nuptial plumage. (Photograph by Holly Sass)

10.4 Techniques Used to Control Breeding

To stop *M. splendens* from breeding sexes need to be separated from each other.

10.5 Occurrence of Hybrids

All *Malurus* sp. have the potential ability to cross breed with each other. (Steve Sass, pers. comm.)

10.6 Timing of Breeding

The usual breeding season for *M. splendens* will begin in late August and continue through until mid-February. However this will depend on weather conditions. (Hutton, R., 1991)

10.7 Age at First Breeding and Last Breeding

M. splendens are able to breed the breeding season after they have fledged if in suitable conditions. It is unknown how long *M. splendens* are capable of breeding for, but with an estimated lifespan of 7-8 years we can make an educated guess they may breed to around 6 years of age. (Steve Sass, pers. comm.)

10.8 Ability to Breed Every Year

If *M. splendens* are sexually mature and are housed in the correct conditions for breeding, including food availability, there is no reason why they should not breed year after year.

10.9 Ability to Breed More than Once Per Year

M. splendens are a multi-brooding species. They will generally nest twice, however in some cases they are known to have up to four nests per breeding season. (Rowley, I., Brooker, M., & Russell, E., 1991) During the previous breeding season at On the Perch,

the breeding pair being held, bred three young and then bred another two young after the first nest had fledged.

10.10 Nesting, Hollow or Other Requirements

M. splendens nests are a dome shaped structure with a roof section being thinly woven. Materials used for construction vary. Materials vary between rootlets, fine grasses and fibres, to a final lining of soft plant down and feathers. Cobwebs are sometimes used to bind the materials together. (Hutton, R., 1991)

Fine nesting grasses such as swamp grass should be provided along with soft feathers such as duck, geese and/or emu feathers. These should be provided in a basket just off the ground to keep them dry until they are used. Nesting grass and nesting feathers can be purchased online from many different suppliers, and can also be purchased from aviculture suppliers. Cobwebs can be collected on the end of a small stick and then the whole stick can be placed inside the aviary, somewhere where the birds can get to it. The birds can then pull off the cobwebs and use them to complete their nest.

10.11 Breeding Diet

The breeding diet for *M. splendens* is essentially the same as the non-breeding diet, but it is increased. There needs to be a constant adequate supply of live food in order for *M. splendens* to breed and successfully raise young. During a non-breeding situation, approximately 20 mealworms would be fed per day, per bird. During breeding season this would be increased to 60 – 80 mealworms per day, per bird. (Hutton, R., 1991)

10.12 Incubation Period

Incubation is performed mostly by the hen. She will sit for short periods of about 15 minutes or so, then leave the nest to hunt, exercise, feed, and bathe if it is hot, all in a few minutes before returning back to the nest to incubate her eggs. Often the cock will inspect the nest while the hen is gone, and he will sometimes take her an insect during incubation. (Hutton, R., 1991). The incubation period for *M. splendens* is 14-15 days. (Rowley, I., Brooker, M., & Russell, E., 1991)

10.13 Clutch Size

For *M. splendens* the usual clutch size is three, occasionally she will lay only two eggs and other times she may lay four or five. The eggs are whitish in colour with brown speckles on the larger end. (Hutton, R., 1991)

10.14 Age at Fledging

M. splendens fledge very young, only staying in the nest for 10-12 days. (Hutton, R., 1991) Once the young have fledged, the parents will defend the young with great courage. See figure 10 below.



Figure 10: male *M. splendens* defending his young from a Budgerigar that got too close for his liking. (Photograph by Holly Sass)

10.15 Age of Removal from Parents

The age of removal from parents for *M. splendens* varies between individuals and depending on circumstances within the exhibit, ie. food and shelter availability. Keepers need to carefully monitor for any signs of aggression from the parents towards the young. At the first signs of aggression the juveniles must be removed. In my experience this can vary between 2-6 months.

10.16 Growth and Development

Hutton (1991) outlines the growth and development of *M. splendens* as follows:

- 10-12 days old – fledge from the nest. Grey fluffy feathers, enormously long spindly legs and very short tails. The parents keep the young in dense secluded bushes. See figure 11 below.
- 5-6 days after fledging – young begging calls become louder, following the parents everywhere, huge appetite. See figure 12 below.
- 3 weeks after fledging – parents will begin to teach young to tenderize and kill food they have caught for them, then to hunt and catch insects for themselves. This is the beginning of the weaning process.
- 4 weeks after fledging – fully independent.



Figure 11: juvenile *M. splendens* a day after leaving the nest. (Photograph by Holly Sass)



Figure 12: male *M. splendens* feeding a mealworm to his young. (Photograph by Holly Sass)

11 Artificial Rearing

11.1 Incubator Type

The type of incubator used for *M. splendens* needs to have certain components to allow for successful hatching. There are many brands of incubators on the market, the brand and price of the incubator will depend on each individual person's budget and preference.

The yolk in many softbill eggs make up less than 30% of the total egg mass. Small-yolked eggs require very high turning rates, up to 30-60 times a day. As well as a high turning rate it is equally important to incubate the egg horizontally, rather than vertically. Turning should be alternated between clockwise and counterclockwise to prevent twisting of the chalazae. With incubators that automatically turn, the chalazae can be protected by manually rotating the egg 180° along its horizontal axis, twice a day. (Vince, M, 1996)

11.2 Incubation Temperatures and Humidity

Temperature and humidity levels are very important for the successful hatching and growth of any avian species.

Research has found that eggs smaller than domestic chicken eggs and with an incubation period of less than twenty one days, generally require a dry-bulb temperature equal to, or greater than 37.5°C and a wet bulb temperature of 30°C – 31.1°C. The ideal relative humidity is 58%. (Vince, M, 1996)

11.3 Desired % Egg Mass Loss

During incubation an egg steadily loses weight. Charting weight loss on preferably a daily basis can significantly increase hatch rates. When an egg is due to hatch, it should have approximately lost 12% – 15% of its freshly laid weight. (Vince, M, 1996)

Sometimes an egg will lose weight too quickly or too slowly. If an egg is losing too much weight the level of humidity must be increased. If the egg is not losing enough weight the humidity must be decreased. (Vince, M, 1996)

11.4 Hatching Temperature and Humidity

Chicks become very vulnerable once they begin to hatch. Once the shell is broken, the membranes can quickly dry out if the air around them is not extremely humid. To avoid problems during hatching, the egg should be transferred into a separate hatching incubator once the chick has internally pipped. The egg should not be rotated at this point. The hatching incubator should be set to maximum humidity and can be a moving or still-air design. Small softbill eggs should be hatched at the same dry-bulb temperature used for their incubation. Often parent birds will communicate with the chick as it hatches to encourage hatching. It may be beneficial to play a recording of an adult *M. splendens* while hatching

is occurring. (Vince, M, 1996)

11.5 Normal Pip to Hatch Interval

The exact pip to hatch interval for *M. splendens* is unknown. However it can be monitored by candling the egg. Once the air cell size and shape has changed, this indicated internal pip. (Daniel Gowland, pers. comm) Once this stage is reached, the egg can be moved into a hatcher as detailed above in **Section 11.4**.

11.6 Brooder Types/Design

Small containers that are easy to clean and maintain correct temperature and humidity would be suitable as a brooder for *M. splendens*. The substrate should be something the chicks can grip onto to prevent foot or leg issues, such as wood shavings, hay, or some laid out nesting grass similar to what a nest would be built of. (Vince, M, 1996)

If the young are hatched in a nest and placed into care due to parents abandoning the nest, parents dying, or escaping. The nest can be used to house the chicks as they grow. They can be kept in the nest, within another container or small cage to keep them contained. (Adam FitzGerald, pers. comm)

11.7 Brooder Temperatures

Newly hatched chicks need to be kept in a brooder at 35° - 37.2°C. The humidity should be similar to what was used during incubation. Observations of the chicks gives a good indication as to whether the temperature is correct or not. A panting or restless chick is too hot, while a lethargic or shivering chick is too cold. Temperature of the brooder should gradually increase as the chick grows feather. Once the chick is fully feathered it should be comfortable at room temperature. (Vince, M, 1996)

11.8 Diet and Feeding Routine

Chicks should not be fed for the first 24 hours. (Vince, M, 1996)

Day 1 to 6 chicks should be fed equal parts of whole raw egg, pinkie mice, waxworms, cricket abdomens and papaya. This can all be mixed in a food processor with a multivitamin and mineral supplement added. This mixture can be fed using a syringe or eye dropper. (Vince, M, 1996)

From day 6 this food mixture should be thickened and sliced pinkie mice and chopped insects can be added. (Vince, M, 1996). Solid food should be offered to chicks using a pair of blunt nosed tweezer or forceps. Also at this point they can be fed crickets (with the antennae removed) small pretenderized mealworms (with the head precrushed), softfood mix and insectivore cake (Adam FitzGerald, pers. comm.). The insects can be also be dipped into water, and then dipped into a fine insectivorous food (Vince, M, 1996).

Before feeding, a normal feeding response from the chick should be given, otherwise food

is more likely to enter the wind pipe and be inhaled. Food should always be delivered over the tongue and the bird given an opportunity to swallow. (Vince, M, 1996).

As with any insectivorous softbill, feeding is required every 15 minutes or so during daylight hours. (Adam FitzGerald, pers.com).

11.9 Specific Requirements

There are no specific requirements for *M. splendens*.

11.10 Pinioning Requirements

M. splendens are not a suitable species to be pinioned.

11.11 Data Recording

Recording data is very important to ensure all eggs and chicks are progressing as they should be. You can never keep too many records, others are able to read over your notes and learn from your experiences. Data that should be recorded includes:

- Individual identifications
- Location of the animal
- Date and time egg begins incubation
- Weight of the egg or chick
- Temperatures of incubators or brooders
- Relative humidity of incubators or brooders
- Any movement of the chick or egg (ie, from the incubator to the brooder)
- Date and time egg hatches
- Times of feeds
- Amount of food being consumed by each chick
- What food is being consumed

11.12 Identification Methods

There are a few different methods for identification of *M. splendens*. A numbered closed ring can be placed on the bird's leg when they are only a few days old as the bones of the leg and feet are soft and easily manipulated. Open bands can be fitted onto birds once they are older, these come in all sorts of colors, numbered or unnumbered. The correct ring size is very important as to not cause injury to the bird (Vince, M, 1996). As mentioned in **Section 5.3** a 01 alloy leg ring is recommended for *M. splendens*.

Young birds can also be individually marked, each with a different colour of a non-toxic marker. This can be marked on the chins of each chick, just a little line or dot would suffice. This allows them to be easily told apart without rushing to get rings onto them. (Adam FitzGerald, pers. comm.)

When artificially rearing chicks, they should be given individual identifications early to ensure each chick is getting equal amount of food and progressing well.

11.13 Hygiene

Incubators should be disinfected at the end of each season to avoid bacteria growth. (Vince, M, 1996) Great care should be taken to ensure the chicks are kept in a clean environment and feeding utensils are sterile. When birds are young, their immune systems are very weak and undeveloped. Hands should be washed thoroughly before and after working with chicks and their food items.

As mentioned in **Section 9.3** *M. splendens* will deposit “poo-packets” for the parents to dispose of away from the nest. As you are the parents now, the chicks will turn around and drop their “poo-packet” for you to collect and dispose of. (Adam FitzGerald, pers. comm)

11.14 Behavioural Considerations

Due to the high feeding demands of *M. splendens* the risk of imprinting is high. Time should only be spent with and around the chicks when necessary. Chicks will need to learn to forage for food without your assistance. Once they have fledged, a few live insects can be left with them to discover and realise food doesn't just come from a pair of tweezers.

M. splendens are not considered companion animals such as parrot species etc. While they may become attached to the person hand raising them around the clock non-stop, once they are released into an aviary and become independent they should eventually learn people don't equal food. Once independent minimal contact should be made with the birds.

11.15 Use of Foster Species

A foster species is not applicable for *M. splendens* due to this species abandoning nests when they feel threatened by predators. To place the chicks into another Fairy-wrens nest they would know something was different, they'd smell you as a threat and they'd abandon the new young and their original young. If one or both parents of a nest die, the only option is to artificially rear them, or them not be reared at all. Artificially rearing *M. splendens* is a very labour intensive task and you must be 100% committed to the rearing of the chicks.

11.16 Weaning

Weaning of *M. splendens* can pose a difficult task due to them feeding so often. Weaning needs to occur at the own birds pace. Plenty of various live insects should be left with the young once fledged so they can discover the food for themselves and feeds should gradually be reducing. Naturally young are independent by 4 weeks after fledging, ideally hand raised *M. splendens* should also be independent by this point.

11.17 Rehabilitation and Release to the Wild Procedures

There are many important aspects relating to *M. splendens* which are due to be released into the wild. *M. splendens* are a very rare species to come into human care and they require constant care due to their high metabolism. Parents work around the clock to successfully fledge *M. splendens*.

M. splendens due to be released into the wild need to be capable of collecting food for themselves and not having the thought process of “humans mean food”. Once they are in the process of weaning, careers should not spend time with the birds except to place food in the enclosure and then leave. Careers should not feed the birds by hand once they know how to eat on their own. This will only encourage the thought of “humans mean food”

They will need to recognise their own species, which shouldn't be overly hard as they would generally come into care as a nest of multiple birds.

Birds due for release should have full capabilities of flying and moving freely. They should not have any issues with movement such as leg or wing issues.

A soft release technique may be best for the release of *M. splendens* into the wild.

12 Collection Management

12.1 Current Collection Census and Plan holdings

Order: Passeriformes Family: Maluridae
 Splendid Fairy-wren (*Malurus splendens musgravi*)

Alice Spring	2	1	2	2	2	4	Breed		Short term (1-2 years)
Doonside	1	1	0	2	2	4	Acquire	And breed	--
Lovedale	0	0	1	0	0	1	Maintain		Medium term
Total	3	2	3	4	4	9			

CITES: NA IUCN: NA VPC: NA
 TAG: Birds; ASMP: No Regional Program

TAG Notes: Different subspecies of this species will need to be maintained separately. Any institution wishing to acquire this species needs to ensure that all specimens are of the same subspecies.

Order: Passeriformes Family: Maluridae
 Splendid Fairy-wren (*Malurus splendens splendens*)

Cavershwp	3	2	0	3	3	0		
Perth	2	2	3	1	1	4	Maintain	For display/education/interpretation
Total	5	4	3	4	4	4		

CITES: NA IUCN: NA VPC: NA
 TAG: Birds; ASMP: No Regional Program

TAG Notes: Different subspecies of this species will need to be maintained separately. Any institution wishing to acquire this species needs to ensure that all specimens are of the same subspecies.

M. splendens has four subspecies:

M. s. splendens
M. s. musgravi
M. s. emmottorum
M. s. melanotus

Only two subspecies are recorded under the ZAA RC&P.

This husbandry manual refers to *M. splendens* as a whole as the care is the same for all four subspecies.

12.2 IUCN Category.

According to the RC&P they are not listed on the IUCN.
The IUCN states *M. splendens* are of least concern.

12.3 C.I.T.E.S. Appendix

M. splendens is not listed under CITES.

12.4 National Category

M. splendens is not listed under EPBC.

12.5 State or Territory Categories

M. splendens is not listed under TSC

12.6 Wild Population Management

There are no recovery plans for *M. splendens* as they are not threatened.

12.7 ASMP Category of management

M. splendens not a part of the ASMP.

12.8 Key Personnel

Key Personnel is not applicable to *M. splendens*.

12.9 Captive Management details

TAG Notes: Different subspecies of this species will need to be maintained separately.
Any institution wishing to acquire this species needs to ensure that all specimens are of the same subspecies.

12.10 Population Viability Assessment

PVA not applicable for *M. splendens*.

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15 Glossary

Cessation – the process of being brought to an end

Chalazae – in a birds egg, each of two twisted membranous strips joining the yolk to the ends of the shell

Copulation – sexual intercourse

Courting – a ritual performed by the male to get the female to allow him to breed with her

Eclipse Plumage – the plumage the male bird has outside of breeding season

Fledging – a young birds whose wings have developed to a point in which it can fly and leaves the nest

Incontinent – having no control of urination and defecation

Interspersed – scatter among or between other things

Membrane – a microscopic double layer of lipids and proteins forming the boundary of cells or organelles

Nuptial Plumage – the plumage of the male bird during breeding season

Pectoral Band – the band of black plumage found across the breast/chest area

Poo Packet – the young bird's faeces

16 Appendix

16.1 Appendix I

Breeding Gentles or Blowfly Maggots for Feeding to Birds (Hutton, R., 1991)

1. Meat can be used as a medium, anything from fish heads, sheep or ox hearts to a sheep's head. The meat can be hung with a tray of bran or pollard placed below to collect the mature maggots as they fall off. Fish heads can be placed in the sun until blown then wrapped in a damp newspaper and sealed in a container with a lid or even buried in the ground, until the maggots are mature.
2. Vegetable matter, peelings and scraps, sour milk with bran added, or cooked potatoes can all be used as a medium, in other words almost anything that's available when required, to allow the flies to blow and the maggots to feed on till mature.
3. Now comes the most essential part, regardless of how the maggots are bred they *must be properly cleaned*. Simply place them in a container of pollard or bran for at least two or three days, this allows the partly digested food in the larvae's tract to be consumed and passed through the body, this is very important as it can prove toxic to the birds if the maggots are not cleaned. It will also reduce the smell to a certain degree, the maggots should be totally white with no trace of the black line marking their digestive tract.
4. The mature maggots can be stored in quantity in the refrigerator or some can be allowed to chrysalize, these can be fed to the birds or a further quantity of these chrysalis can be placed in a jar containing 10cm of soil and covered with a flywire lid. Stored in a warm place the flies will soon hatch, if the jar is then placed in the refrigerator for two or three hours where the lower temperature will immobilize the flies, these can then be fed to the birds as they are easily caught while still only able to crawl out.

16.2 Appendix II

Breeding Mealworms for Feeding to Birds (Hutton, R., 1991)

To Prepare a Breeding Colony:

1. Select your containers and ensure they are clean, have ample ventilation and are escape proof.
2. Half fill the container with bran or the chosen medium.
3. On the surface place a square of hessian bag, almost covering the surface area of the medium. Use clean bagging, wash if necessary, do not use nylon or plastics, newspaper can be used but it will be eaten.
4. Cut a large carrot or potato in halves and place it on the bag.
5. Obtain fifty or so beetles, or the insect in any stage (beetles will multiply sooner) and

liberate into the bag.

6. Attach lid making sure it is well suited to allow for essential needs of being escape proof and allowing sufficient ventilation to flow over the colony.

7. Place in a dark, dry, well-ventilated position where, as near as possible, a constant temperature of 25° to 30°C can be maintained.

8. Disturb only to renew carrot or potato, weekly in summer and about three or four weeks is sufficient in winter.

9. To harvest or collect worms for feeding simply pick them off the bag as they will congregate thickly under the potato or carrot.

10. It is preferable to have as many colonies as you can store and maintain if you require large amounts of worms daily. Thirty or forty colonies is sometimes not enough to keep up a continual supply so think big! When a large number of colonies is established the harvesting can be carried out in conjunction with the annual renewal of the medium. Wait until all the worms in the colony are at their mature size then put the entire contents through a very large sieve, a square box of wood 10cm high with a fly wire bottom. As the 'eaten' bran falls through, now only a grey powder (actually the worms faeces) you will be left with all the worms in the sieve. These can be stored in readiness for feeding to the birds, keeping 50-100 to restart the colony in a new bran or medium.

11. *Storage* has proven successful by refrigerating the worms in bulk in the lower regions of the refrigerator or crisper section. The worms can be kept in a little sawdust or soft wood shavings for up to six months, however the lid must be removed and condensation wiped off the underside every two or three days, the lid must have a dozen or so holes punched in it or an insert of fly wire netting to allow adequate ventilation. It is also advisable to return the worms to room temperature one day a week, every week, to allow them to become active, they can be safely kept alive if this method is maintained.

Problems to Watch For:

1. Be very wary of the moisture content within the colonies, summer and winter conditions dictate different requirements, the stage of the insect's cycle must also be considered, e.g., chrysalis do not consume any food or moisture because they are dormant. Do not allow any condensation in the drums, if too much moisture builds up, especially in winter, your colony will die. Do not neglect to add vegetable matter regularly during summer as this is the only form of moisture the worms or beetles utilize, the failure to do so means your colony will die.

Flour mites are a possible problem during winter if containers are stored in damp or poorly ventilated area. These minute white mites which, although harmless to the birds, will destroy the eggs of the beetles and in severe infestations will eat the beetles and chrysalis.

2. Ventilation is of the utmost importance, good fresh airflow is the factor which controls problems of dampness and condensation etc.

3. If carrot, potato or vegetable matter should go mouldy or rot, remove immediately. The cause of this is the most likely poor ventilation in the colony or just a case of oversupply, the mealworms being unable to consume it all before it rots. If containers are checked regularly and consistently this is unlikely to occur.

4. Be wary when storing a large amount of mealworms in bulk in readiness for feeding, the worms generate a very high body temperature so always store with a little bran or wood shavings in a cool room or in the fridge. Even if these worms are only stored for several hours they will soon die if not kept cold.

5. *Egyptian moths* or small *weevils* are no problem unless they are in large quantities. If the moths build up the form layers or large lumps on the surface of the bran with their egg and pupae colonies, if this occurs just lift the lumps out and place them in the aviary shelter, as the moth's eggs hatch into pupae or the pupae into the moths birds will relish the harvest.

16.3 Appendix III

Collecting Termites (Steve Sass, pers. comm)

Collecting Termites:

1. Collect termites feeding trays from aviaries.
2. Use a wheelbarrow to transport the trays to the mound, don't carry them as you could cause injury.
3. Place a shovel in the wheelbarrow.
4. Push the wheelbarrow with the trays and shovel to the chosen termite mound.
5. Empty the old dirt material from the trays beside the mound.
6. Lay the feeding trays out on the ground
7. Scrape off the soft dirt from the termite mound with the shovel
8. Divide the termites and dirt between the trays.
9. Once a sufficient amount of termites are collected, place the trays and shovel back into the wheelbarrow.
10. Wheel the barrow back to the aviaries.
11. Return the feeding trays to aviaries and return the wheelbarrow and shovel.

Things to Keep in Mind:

1. The soft dirt is the section the termites build back. When you scrape off the soft dirt it should be riddled with termites, as they've just built that section back and are actively working.
2. Do not take too much of the mound, or the termites won't be able to rebuild the damage.
3. In hot weather the termites sometimes don't build back the mound, they just block it up. Termites need rain and moisture to build back the mound. To replicate rain to keep them active, a substantial amount of water can be tipped over the mound.
4. Termites should be replenished daily as they don't live very long once removed from the mound. In hot weather they will die quicker.
5. The dirt should be disturbed and moved around in the trays to disturb the termites for the birds to find.
6. About an inch of petroleum jelly can be applied to the outside border of the feeding tray to stop the termites escaping, and stop black ants from getting in and eating the termites.
7. Rotate through multiple mounds, but don't leave a mound untouched for more than about a week. If mounds are left for too long they aren't active on the surface, they go back underground. Don't use the same mound day after day though, as they will be overworked and stop building it back. Leave it for a few days before going back to a mound.

16.4 Appendix IV

Soft Bill Meat Mixture – Used at On the Perch.

750g – Kangaroo Mince
3 – Hard Boiled Eggs, Mashed
600g – Meat Chicken/Turkey Starter Crumbles
400g – Mild Cheddar Cheese, Finely Grated
1/2 cup – Wombaroo Insectivore Rearing Mix

Mix all ingredients in a large bowl until well combined.

Divide into airtight containers.

Store the mixture in the fridge for up to 2 days or the mixture can be frozen and defrosted in the fridge as needed. (DO NOT refreeze meat).

The mixture can be presented on a tray in the aviary, its best kept out of the sun to reduce how quick it will perish. The mixture should be replaced or removed after 24 hours.

16.5 Appendix V

Details on Wombaroo Insectivore Rearing Mix (Wombaroo/Passwell, 2014)

‘Wombaroo Insectivore Rearing Mix’ is a complete food for rearing and supplementing

insectivorous and carnivorous birds. These species require a high proportion of protein in their diet.

Key Features:

- Contains 52% protein, with the full complement of amino acids.
- Suitable for all insect or meat eating species including magpies, kookaburras, birds of prey, seabirds, waders, wrens & robins.
- Enriched with omega-3&6, carotenoids, vitamins and minerals to enhance feather condition and chick health.
- Can be used as an ideal live-food substitute or high protein boost for all birds.
- Contains added **taurine**, and essential nutrient for growing passerine chicks.

Ingredients:

Meat meal, fish meal, blood meal, whey protein, soy protein, mannan oligosaccharides, β -glucans, lysine, methionine, vegetable oils, omega-3 and omega-6 fatty acids (including EPA & DHA), carotenoids, taurine, vitamins A, B₁, B₂, B₆, B₁₂, C, D₃, E, K, nicotinamide, pantothenic acid, biotin, folic acid, choline, inositol, calcium, phosphorus, potassium, sodium, magnesium, zinc, iron, manganese, copper, iodine, selenium.

Analysis:

Protein (min)	52 %
Fat (min)	12 %
Carbohydrate	18 %
Fibre (max)	5 %
Calcium	2 %
Taurine	500mg/kg
Carotenoids	50mg/kg
Metabolisable Energy (ME)	16 MJ/kg

This product can be bought online in 1kg and 250g amounts from various websites. One website it can be purchased from is:

<http://www.vetnpetdirect.com.au/WOMBI>

This product can also be bought in bulk amounts from aviculture product suppliers.

16.6 Appendix VI

An automatic mealworm feeder designed for reptiles, which can be used during transport of *M. splendens*. This product can be bought online from:

<https://www.petcircle.com.au/product/zoo-med-hanging-mealworm-feeder>

16.7 Appendix VII

Details of the product Avitrol Plus used for worming *M. splendens* routinely to treat/prevent every 3 months. (Vet-n-Pet Direct, 2017) This product can be purchased online in 25mL, 100mL, and bulk 2.5mL from:

<http://www.vetnpetdirect.com.au/AVIT>

Details:

COMPOSITION: Levamisole hydrochloride 10 mg/mL, Praziquantel 2 mg/mL.

INDICATIONS: Threadworm (*Capillaria* sp.), Caecal worm (*Heterakis* sp.), Roundworm (*Ascaridia* sp.), gape worm (*Syngamus* sp.), gizzard worm (*Acuaria* sp.) and Tapeworm (*Raillietina* sp.) in ornamental cage birds.

CONTRAINDICATIONS: Administration to species or strains of birds known to be sensitive to the effects of levamisole. Not recommended for use in Gouldian finches.

PRECAUTIONS: Parrots appear to be less tolerant than pigeons to levamisole. Do not dose in extremely hot, dry weather or treat stressed birds, or birds that are feeding young.

WITHHOLDING PERIODS: Meat: 7 Days

ADVERSE REACTIONS: Side effects include regurgitation (which is not considered to be harmful), incoordination, leg and wing paresis; atropine has been used as an antidote. Deaths of birds up to 2 days after dosing have been attributed to obstruction from massive roundworm infestation.

DOSAGE AND ADMINISTRATION:

Dose guide for crop administration

Type of bird; Weight of Bird; Dose (drops of undiluted syrup)

Finch	15g	1.5
Budgerigar	30g	3.0
Budgerigar	50g	5.0
Cockatiel	80g	8.0
Cockatoo	500g	50.0

Make up dose to 1 to 5 mL with water in a syringe.

Crop administration. A crop needle or tube placed directly into the crop can be used to administer Avitrol Plus syrup by syringe. Do not administer any liquid into the crop unless you are confident that the crop needle or tube is correctly placed.

Diluted in drinking water: 0.5mL (12 drops) to 20mL of water or 25mL/L. Use this as the sole source of drinking water for 24 hours and feed only seed, then replace with fresh clean water. Solution should be freshly made up before dosing. Repeat in 14 days with fresh solution, or as directed by a veterinary surgeon. This provides a dose of 40mg/kg bodyweight based on an average bodyweight of 30g and consumption of 5mL/day. In summer the dose should be reduced to account for increased water consumption, which may be double or more.

For threadworm, caecal worm, gape worm and roundworm a dose of 0.025mg/g (25mg/kg) bodyweight has been found adequate. For gizzard worm a dose of 0.05mg/g (50mg/kg) is necessary.

Good husbandry practices: Zone control is important in the management of these worm parasites. To prevent re-infestation, practise good hygiene and sanitation, and eliminate dampness. Ideally the birds should be moved into a clean cage 48 hours after initial treatment, and the old cage thoroughly scrubbed and disinfected. To prevent infection from the outside, prevent bird's access to intermediate hosts, e.g. grasshoppers, cockroaches and earthworms. Wild birds can infect the aviary with their droppings.

16.8 Appendix VIII

Details on the product Baycox which can be used to routinely treat/prevent coccidiosis in *M. splendens*. (Farm Advisor, 2014) This product can be bought online by the litre from: http://www.vetproductsdirect.com.au/baycox-solution-poultry-1l?fee=8&fep=125&gclid=CjwKEAjwtgZrJBRDS38GH1Kv_vGYSJAD8j4DfR_cT15EW OluS_ej316Rx C8la5vxjLxGNV4QijWCu_hoCP3vw_wcB

Details:

Baycox is added to the drinking water of chickens for the treatment and control of coccidiosis caused by *Eimeria* species including: *Eimeria tenella*, *Eimeria necatrix*, *Eimeria acervulina* and *Eimeria maxima*. Begin treatment with Baycox as soon as coccidiosis confirmed.

Restraint: DO NOT treat replacement pullets more than twice.

Baycox is diluted at the rate of 3 litres per 1000 litres of drinking water (3:1000). It is administered on 2 consecutive days with an 8 hour treatment period on both days. Ensure full lighting conditions during treatment. Do not withhold feed during treatment. Add the required amount of Baycox to the amount of water consumed in an 8 hour period and stir thoroughly. Allow for varying water consumption during hot weather. Treat the birds for 8 hours each day for 2 days (2x8 hour treatments). No other source of drinking water should be available to birds during the 8 hour treatment period. If required, treatment may be repeated after 5 days.

Withholding Periods

MEAT: DO NOT USE less than 14 days before slaughter for human consumption

EGGS: DO NOT USE in laying hens. DO NOT USE in replacement pullets within 8 weeks of laying onset, where eggs are to be used or processed for human consumption.

Eggs laid during the withholding period MUST NOT BE USED or processed for human consumption.

16.9 Appendix IX

F10 Disinfectant.

MSDS sheets for the disinfectant F10 can be found via the link below:

<http://www.vetnpetdirect.com.au/core/media/media.nl/id.197681/c.1032112/.f?h=3f696eb050e2891de2ae>

16.10 Appendix X

Milton Disinfectant.

MSDS sheets for milton disinfectant can be found via the link below:

<https://www.ebosonline.com.au/images/product/documents/Antibacterial%20Solution%202011%20-%20PC55123,%20PC55139.pdf>

16.11 Appendix XI

Eucalyptus Disinfectant.

MSDS sheets for eucalyptus disinfectant can be found via the link below:

http://catalogue.mykis.com.au/site/Klenall_PC/filesystem/documents/MSDS/Eucalyptus%20Hospital%20Grade%20Disinfectant.pdf