

## Tadpole Husbandry

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## Tadpole requirements ?

We need to know the maximum, minimum and optimum values for these important variables for each species we keep:

Water Quality;  
 pH  
 Temperature  
 Nitrate  
 Nitrite  
 Ammonia  
 Minerals and trace elements

Diet  
 Stocking density  
 UV and visible light requirements

## Tadpole Husbandry

An Introduction

- General Biology and Ecology

### Husbandry Considerations

Water volume per tadpole;  
 (large filtered water body, or shallow and replaced ?)  
 Stocking density  
 Diet  
 UVB and visible light requirements

## The Tadpole Stage

- Can be just a few days
- As long as 2–3 years or even up to 5 years in some species (not Australian)
- Determining factors (other than phylogeny): food availability, temperatures, density of conspecifics, competitors, predators, drying out..



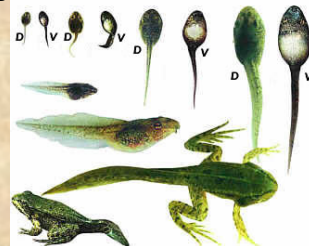
## Tadpole Habitats

- Benthic, midwater, surface feeders
- Burrow in substrate of streams
- Suctorial mouthparts, belly suckers



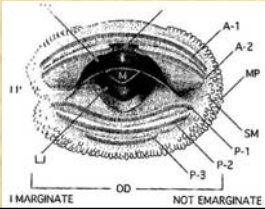
## Tadpole Morphology

- Front limbs appear relatively late in tadpole stage.
- Gills quickly covered with operculum (front legs develop behind operculum first).

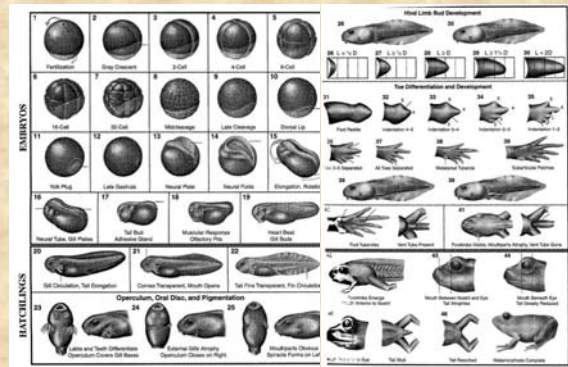


### Tadpole Mouthparts

- Oral disc (jaw sheaths, labial teeth, lobes and papillae)
- Keratinized mouthparts (jaw sheaths and labial teeth)
- Variable number of tooth rows & papillae



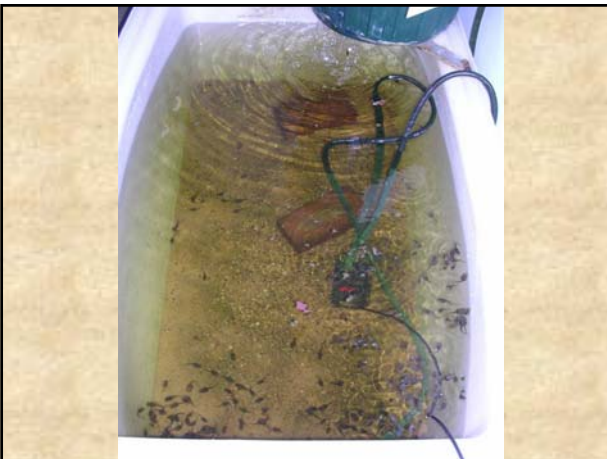
### Staging Tadpoles: Gosner stages



### Husbandry Considerations

#### Water volume per tadpole

- (1) Large volume of filtered water can hold 1 - 3 large *Litoria*
- (2) Shallow trays of regularly replaced water can hold 5 - 30 *Litoria* tadpoles per litre.





## Stocking Density Experiment Booroolong Frog Tadpoles

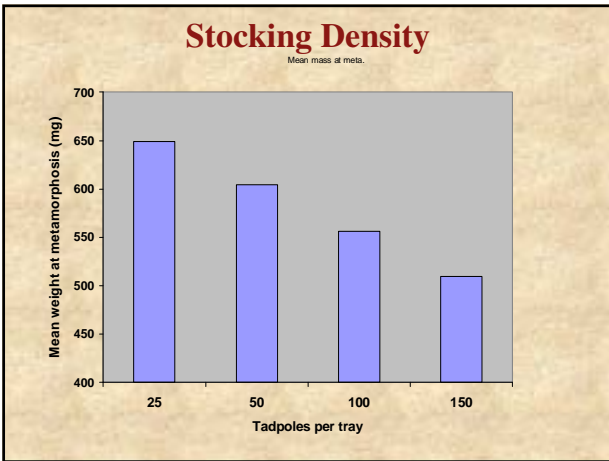
Five trays at each stocking density of:  
25, 50, 100 and 150 tadpoles

Weight of dry food      volume of water changed  
per day were adjusted to be the same *per tadpole*  
regardless of the stocking density.

(Frozen endive was present at all times)

Survivorship to metamorphoses was >95% in all trays





### Stocking Density



- Increased density will cause:
  - Increased tadpole-tadpole interaction and thus increased competition for food
  - Smaller metamorph size
  - Longer larval period

### Tadpole Diets in the wild

Said to be 'Herbivores', but most species are scavengers and opportunistic carnivores!  
 ('Carnivores in a vegetarian restaurant !')

Major feeding types are:

- Filter feeders
- Algae feeders
- Cannibalistic (e.g. *Lechriodus fletcheri*)
- Carnivorous (e.g. most large *Litoria*)

### Tadpole Diets in the captivity

- Largely dependant on the species.
- The diet should be varied if possible.
  - Commercial foods, including Sera micron, algal flakes, spirulina flakes, various fish flakes.
  - Frozen endive or lettuce.
  - Naturally growing algae.
  - For many species, frozen bloodworms and shrimp are a good source of non-fish protein.

### Tadpole Diets: Commercial foods

Feed daily only as much as they can eat in 4 - 6 hours



### Tadpole Diets: Eat your Greens !

Have a small amount of frozen endive available at all times



### UVB and visible light requirements

- No experimental data for any species !
- Some species clearly need UVB, others do not appear to ! Scoliosis most common problem if no UVB (at least in *Litoria aurea*).
- As a precaution we use UVB emitting fluorescent tubes 15 - 25 cm above the water (emitting ~ 3 - 10 UVB units ( $\mu\text{W}/\text{cm}^2$ ) at the water surface during daylight hours; full sun is ~ 250 - 350 units).
- Presumably much more important after metamorphosis.

### Water Temperature

- Attempt to replicate the temperature in the natural habitat of the species being raised.
- Need to investigate what is optimal temperature for each species (even cold water species can thermoregulate by selecting warm water in shallow, sunny areas)
- As a general rule:
  - ↑ temp = ↓ larval period, ↓ metamorph size
  - ↓ temp = ↑ larval period, ↑ metamorph size

### As metamorphosis approaches....

- Ensure that the tadpoles have a land area so that they can climb out of the water and not drown.
- And of course, make sure that the enclosure is escape-proof for the young frogs.



## Frogs: Metamorphosis

Metamorphosis is relatively abrupt

### Drastic morphological changes:

- Digestive gut shortens; stomach forms
- Tadpole mouthparts disappear; replaced by teeth, etc.
- Movable eyelids
- Lungs form
- Cartilaginous skeleton replaced
- Tail resorbed
- Limbs form



## Metamorphosis: Biochemical change

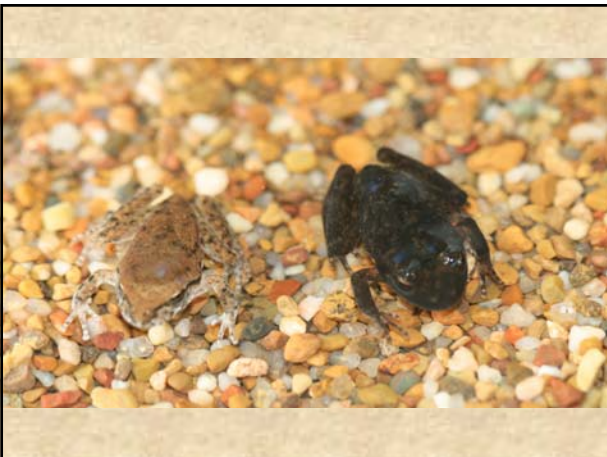
- Hormone systems change
- Blood: hemoglobin with higher O<sub>2</sub> affinity
- Liver: Ammonotelism > ureotelism
- Skin: Osmoregulation improves
- Eye: eye pigments change



## Metamorphosis: Morphological change

- **Skeleton:** e.g., development of limbs; increased ossification
- **Skin:** becomes thicker and less water permeable
- **Musculature:** e.g., degeneration of tail
- **Digestive system:** In frogs, drastic; metamorphs initially non-feeding
- **Urogenital system:** pronephric kidney > to adult (varies)
- **Sensory systems:** Lateral lines degenerate

## Be aware of substrate colour matching if frogs are for release!



## Green and Golden Bell Frog Tadpoles

Some environmental values easily tolerated, but optimum values still not known!

### Water Quality:

pH	4 - 9
Temperature	20°C - 28°C
Nitrate	< 20 mg/L
Nitrite	< 0.5 mg/L
Ammonia	< 0.5 mg/L
Minerals and trace elements	NaCl 1g per L

Stocking density 2 - 3 taddies per L (in filtered 1000L tank)

- |                                     |    |
|-------------------------------------|----|
| Diet                                | ?? |
| • UV and visible light requirements | ?? |

**Results of careless tadpole husbandry can be extreme !**

