Performance based feeding strategies

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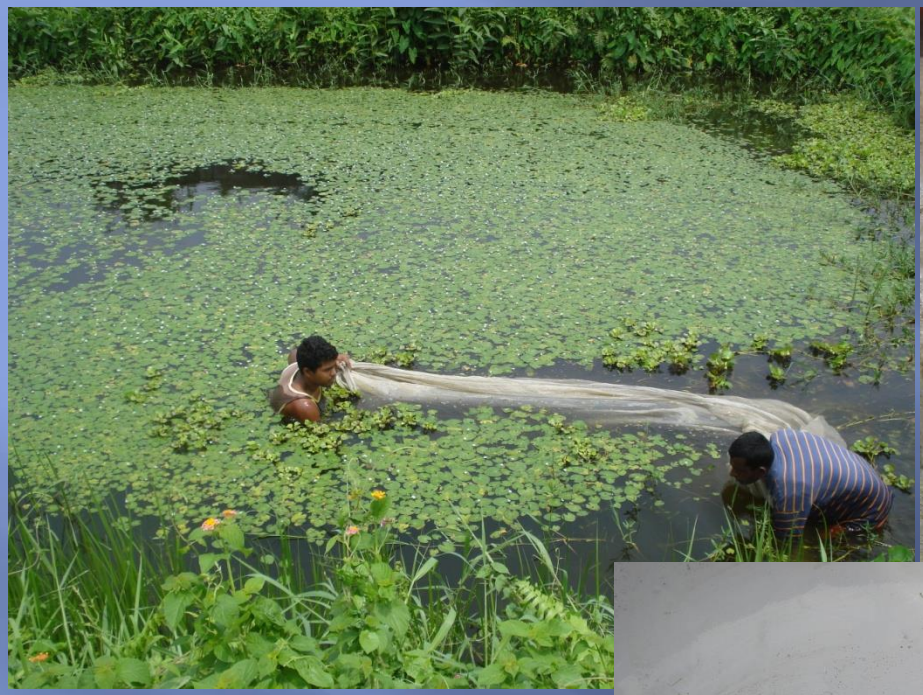
Natural History, physiology, niche-based approach

- natural conditions are often eutrophic, and rife with plankton
  - algae, rotifers, daphnia, chronomids, etc.
  - supply is abundant beyond our ability to replicate in the lab
  - maximize encounter rates
- agastric minnow
  - no stomach = fast passage
    - hydrolyzed protein
    - increased bio-availability is desirable, and mimics the benefits of eating zooplankton

Ponds and ditches were home to zebrafish



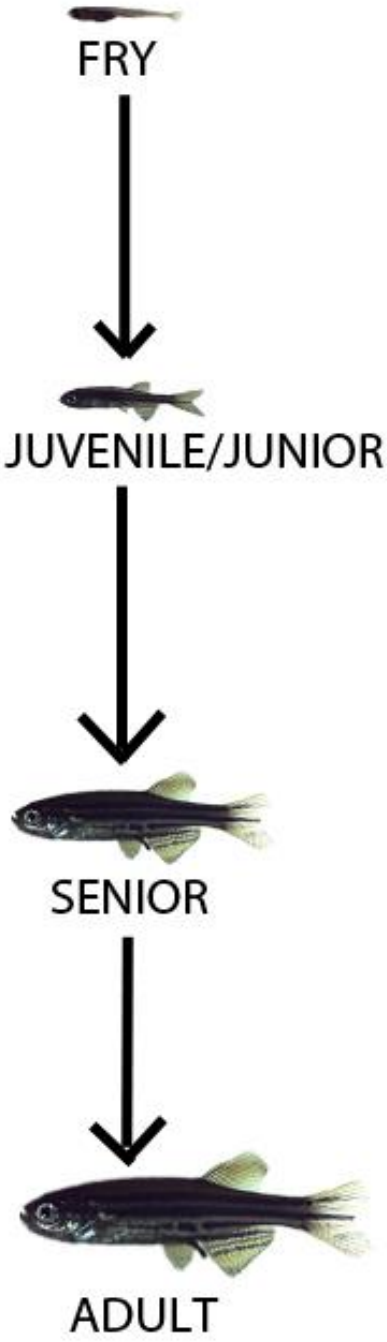
growth and transitions diets

- as soon as fry are big enough to eat the next diet you have to offer, give it to them!
- maintain this practice until max gape size

9-dpf

- 40-45dpf sexually mature fish are within your reach!

make and provide easy to understand and easy to use charts and visual aides permit staff to make decisions with higher confidence



Natural History, physiology, niche-based approach

- applying the near-constant feeding approach in the lab
  - easy to do with rotifers in static tanks
  - high-quality, stable diets (micro-encapsulated)
  - frequency and mass? of diet delivered increase with age
  - automation

- soiled and fouled tanks (micro-environment) will diminish feeding response in zebrafish!

Natural History, physiology, niche-based approach

- a large bolus of food, even delivered with high frequency, so that the fish become engorged (distended belly) solicits a feast/famine biological/physiological response from the fish
  - poor absorption/assimilation of diets
  - accelerated metabolism (poops)
  - increases competition/aggression

Natural History, physiology, niche-based approach

- ecological niche:
  - shoaling, opportunist, indiscriminant, co-evolved to specialize feeding on plankton and chironomid larvae/pupae
  - constant grazer
  - Crepuscular activity

Natural History, physiology, niche-based approach

– standard feeding regime (WASHU)

age range	food type	feed amt	feed freq.	food type	feed amt.	feed freq.
5-10dpf	rotifers	~(mg)	ad libitum	ROTIFERS		2 X
10-15dpf	gemma 150	40	4 X			
15-20dpf	gemma 300	60	6 X			
20-30dpf	gemma 300	80	8 X			
30-40dpf	gemma 300	100	10X			

Natural History, physiology, niche-based approach

- 40dpf data:
  - standard feeding regime (WASHU)

n = 95	length (mm) (snout to caudal peduncle)
min. length	14.63
ave. length	20.06
max. length	22.64

Natural History, physiology, niche-based approach

- 40dpf data:
  - express diet regime

time range	food type	feed freq.
5-10dpf	rotifers	ad libitum
10-15dpf	gemma 150	6 X
15-20dpf	gemma 300	10 X
20-30dpf	gemma 300	12 X
30-40dpf	gemma 300	16X

Natural History, physiology, niche-based approach

- 40dpf data:

Express diet results (40dpf)	
n = 79	length (mm)
min. length	19.33
ave. length	25.17
max. length	28.86

Natural History, physiology, niche-based approach

- 40dpf data:
- standard feeding regime (WASHU)
- express diet

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Natural History, physiology, niche-based approach

- 40dpf:
  - expres s diet

Natural History, physiology, niche-based approach

- 40dpf data:
  - express approach yields a size increase of ~25% over the same time period, sans artemia

Feeding Single/Pairs long-term

- Typical for fish:
  - awaiting genotyping results
  - Founders
- Should be avoided when possible
  - Less than 5-fish creates an environment where there is little competition stimulated feeding, poor enrichment for shoaling species
  - Add a few fish of a different sex or pigment pattern or fin morphology to increase total number of fish

Feeding Single/Pairs long-term

- Very difficult to maintain for long terms:
  - live foods only result in skinny fish that won't grow/breed
  - Prepared diets foul

Feeding Single/Pairs long-term

- How Much and How often?
  - At WASHU we have determined that
    - Prepared diet (Gemma Micro 300), 10mg/day (fed once per day) will maintain singles/pairs in good health, and will not foul tanks. This diet is supplemented with rotifers 1x/day (5mL at +1000 rotifers/mL)
    - Doubling this feeding to 10mg 2x/day can keep fish breeding, and tanks from fouling inside of 12-weeks

Feeding Regimes

- Restricted diet
  - For singles/pairs in a short-term situation
  - rotifers 1x/day (we no longer use artemia anywhere in the facility)
  - 60mg of prepared diet 1x/day for up to 5 fish
- maintenance diet-
  - used by those who simply need to keep the fish healthy and alive, but do not have immediate breeding needs
  - rotifers 1x/day
  - 60mg of prepared diet 2x/day for up to 5 fish (approx 5% of ABW)

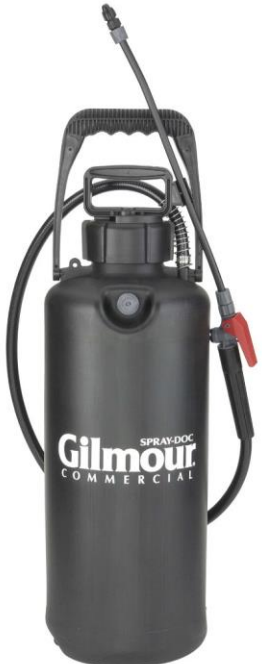
Feeding Regimes

- maintenance plus diet
  - used by those who will need to breed the fish with some regularity
  - rotifers 1x/day
  - 60mg of prepared diet per 10-fish 3x/day
- brood-stock diet
  - which is used for those fish who are bred every week
  - rotifers 1x/day
  - 60mg of prepared diet per 5x/day

mechanically assisted feeding

•Prepared/liquid foods: manual with mechanized assist (e.g. salt dispenser, squeeze bottles, pump sprayers)

• liquid foods: manual with mechanized assist (drencher



That's all Folks!