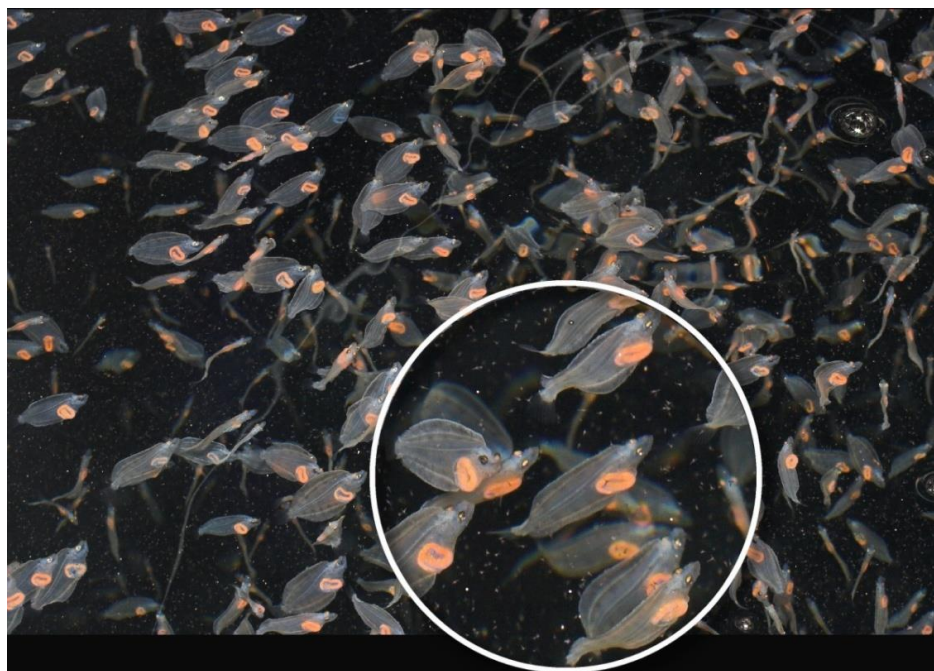




RECIRCULATION (RAS) VS FLOW THROUGH (FT) SYSTEMS DURING YOLK SAC AND FIRST FEEDING STAGES: EFFECTS ON REARING SYSTEM BACTERIOLOGY, SURVIVAL, QUALITY AND GROWTH OF ATLANTIC HALIBUT (*HIPPOGLOSSUS HIPPOGLOSSUS*) LARVAE.

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Nina Sandlund, Øivind Bergh and Birgitta Norberg.



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Background:

The commercial production of halibut fry is currently carried out in flow through systems (FT), while there is a growing consensus that a recirculation system (RAS) would offer more stable environmental and chemical water parameters that would lead to improved larval performance.

At the Institute of Marine Research (IMR) it is standard practice to treat the larvae with antibiotics the first three days of the start feeding period, in case of dropping appetite during this period. To avoid use of antibiotics, establish a microbial environment with probiotic effects, and potentially decrease mortality, use of RAS was tested during yolk sac incubation and first feeding.

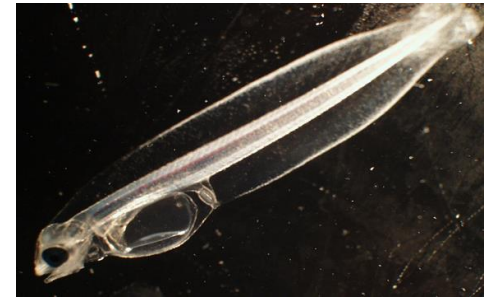
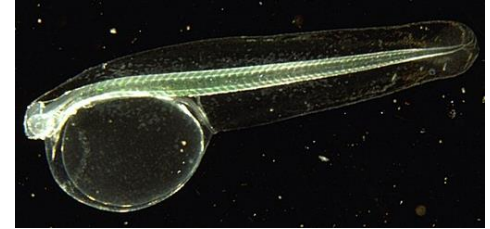
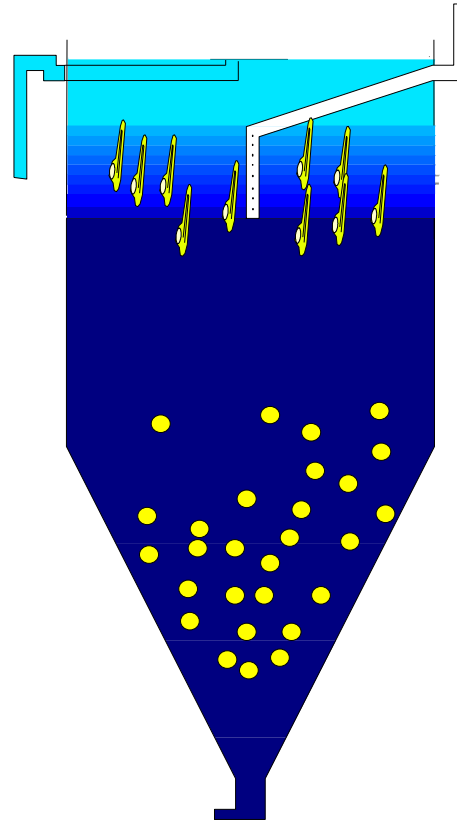
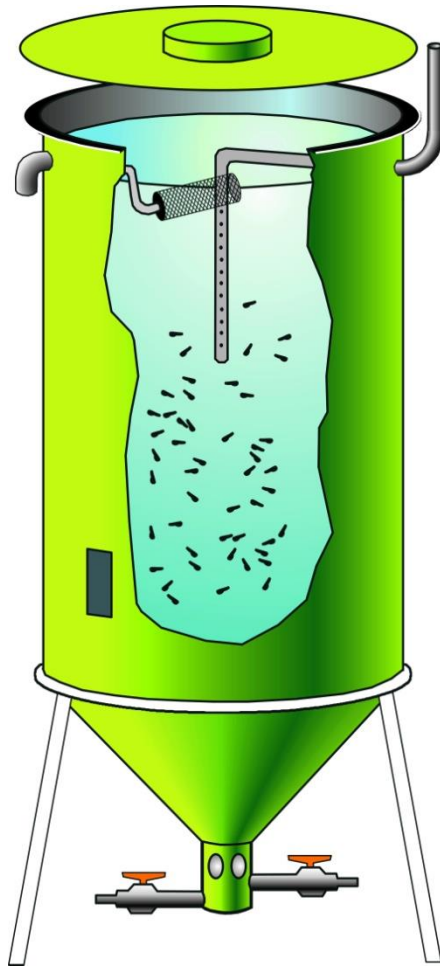
Probiotics is a way of improving survival of fish larvae, which is presently gaining increased interest. It is not clear whether the intestinal microflora of halibut larvae is determined by the feed or by water quality.



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Yolksac stage

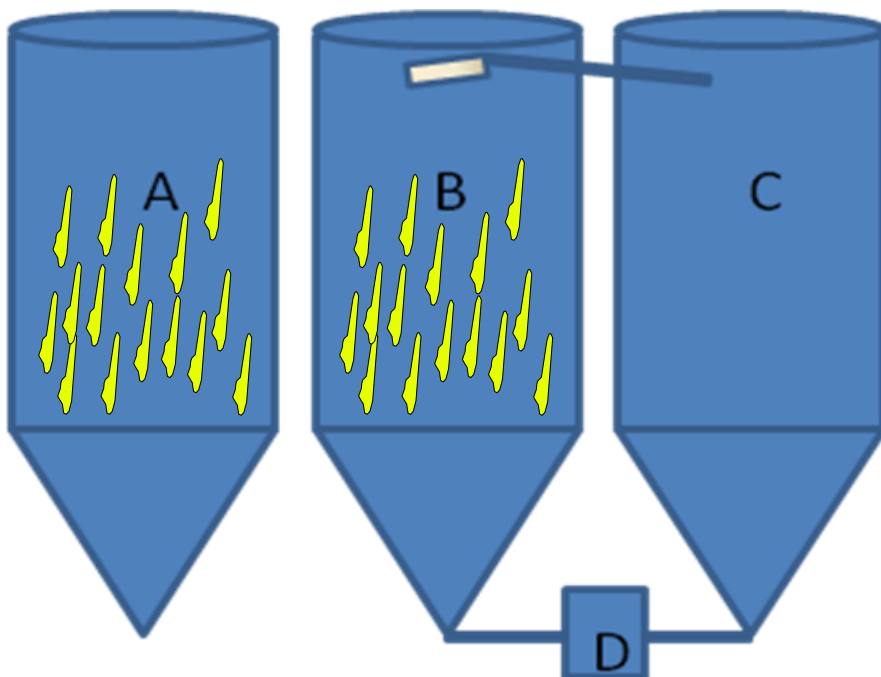


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Control



2015:
Water temperature
Adjustment between
the siloes.

2017:
Water temperature
adjustment in silo C.

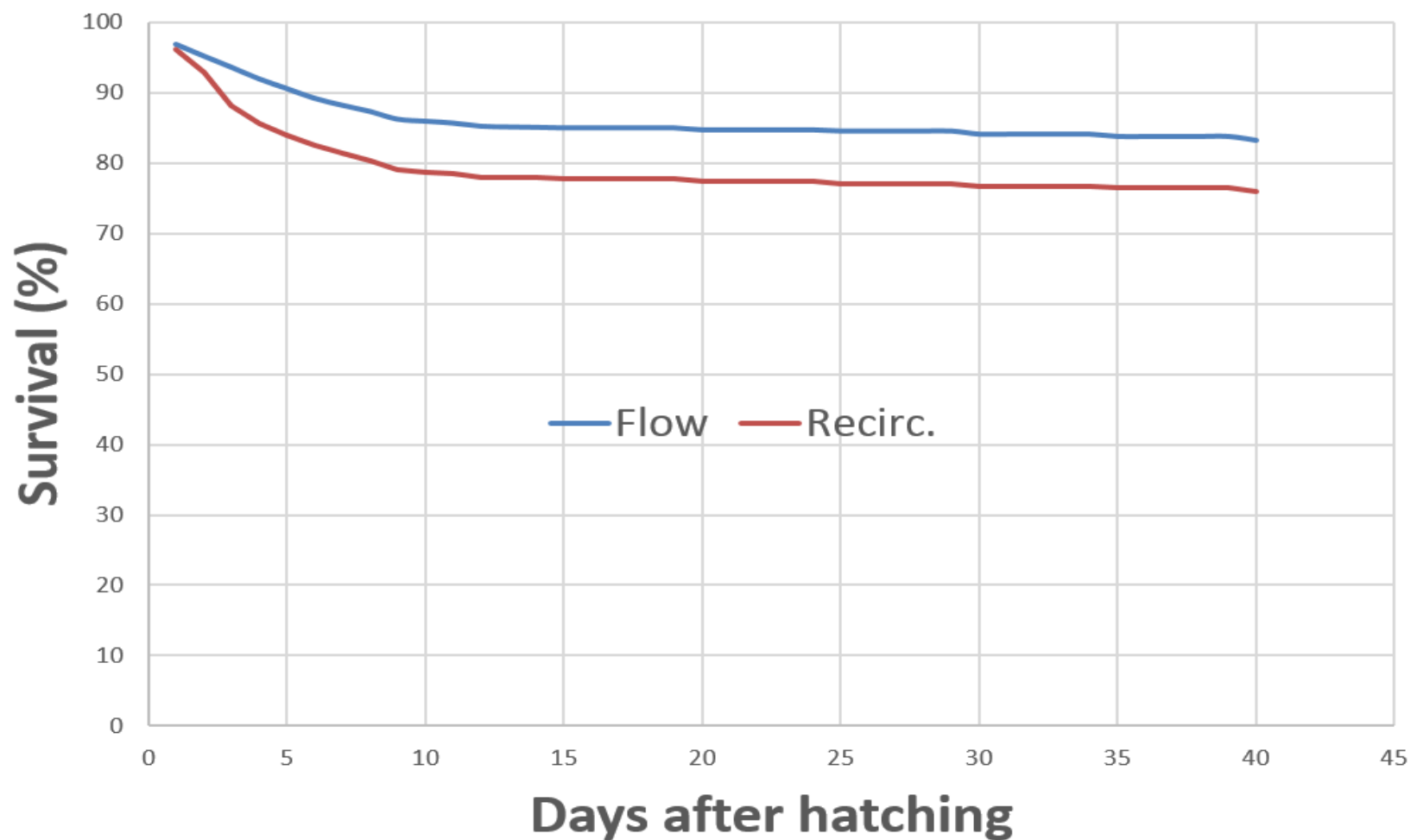


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Yolksac stage 2015

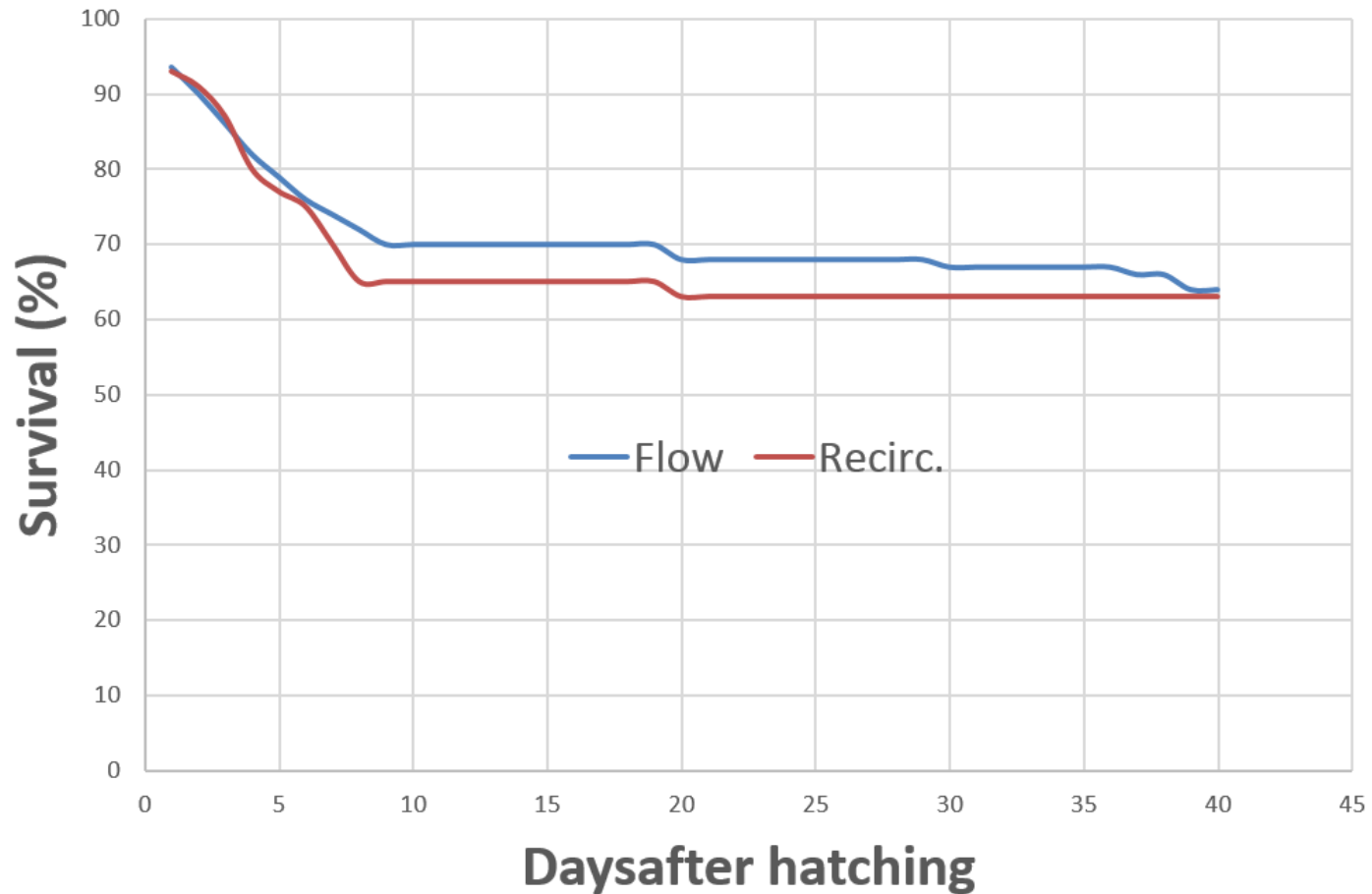


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Yolksac stage 2017

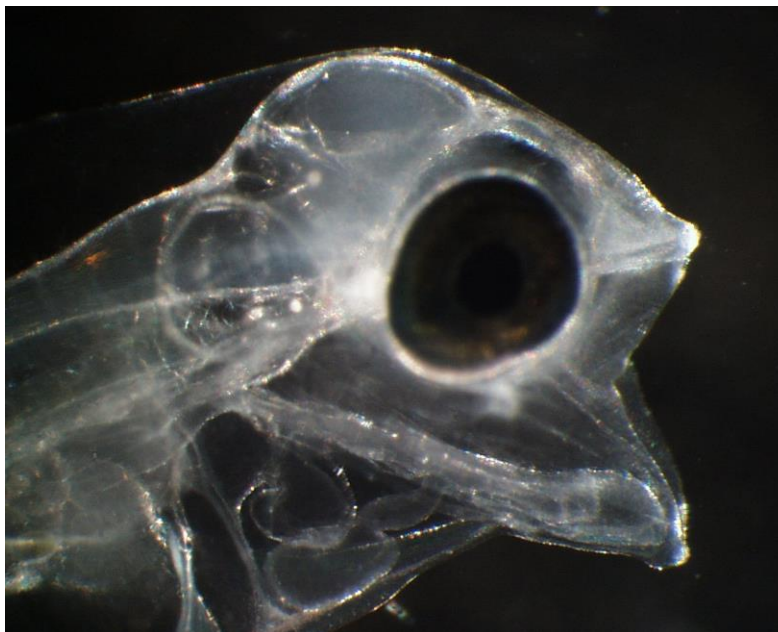


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Jaw deformed larvae



	Recirc.	Flow.
2015:	14%	9%
2017:	11%	17%



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First feeding:



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Tropical Marine centre



- Reservoir (650 liter) (1)
- Filter bags (2)
- Sand filter (3)
- Re-gassing / Trickling biofilter (4)
- Protein skimmer (5)
- UV (6)

Parallel-construction,
Not in-line.



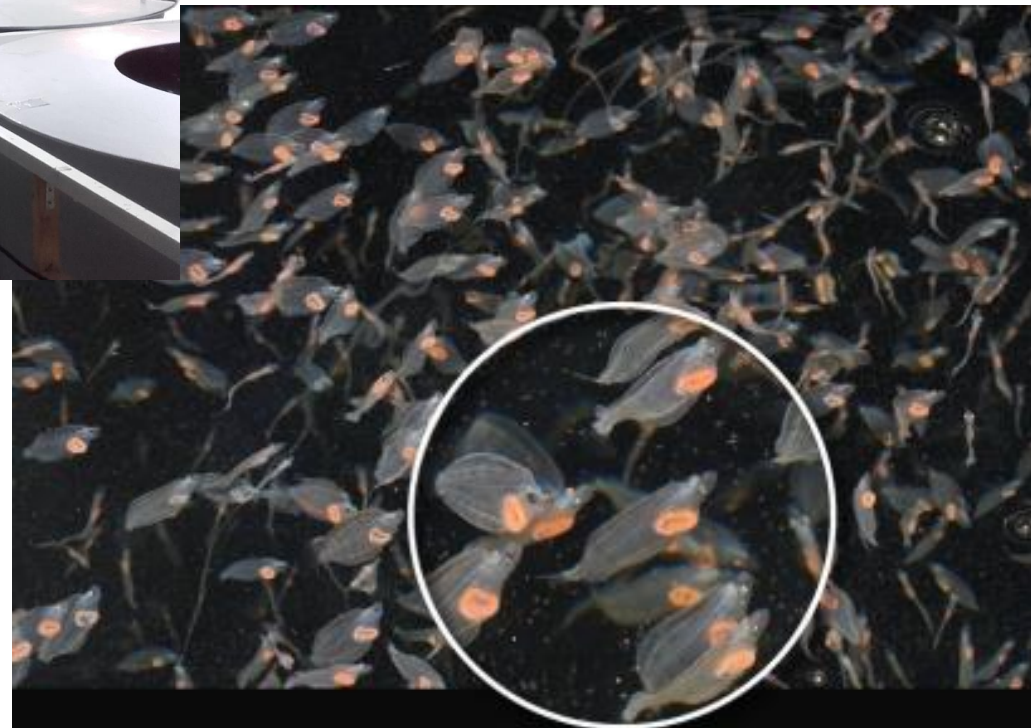
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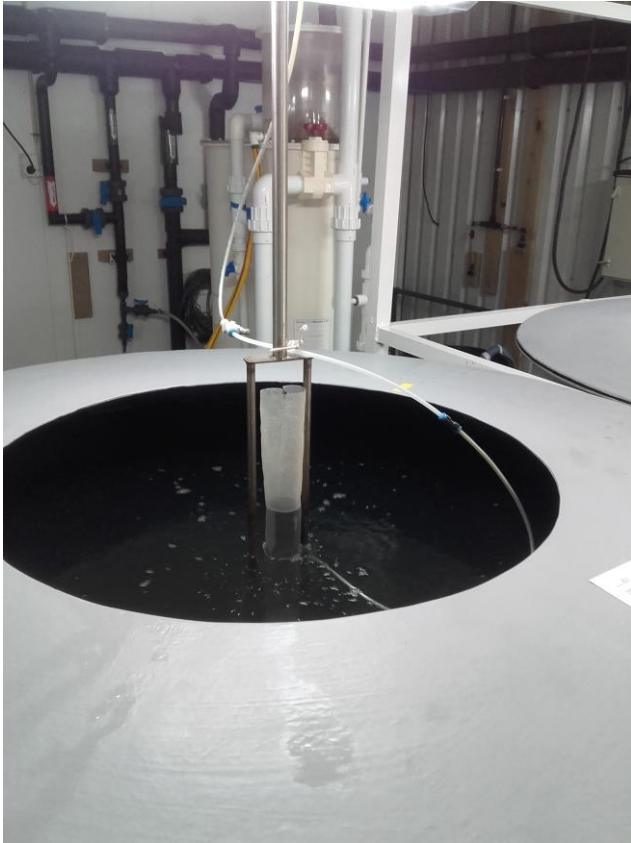


Triplicate tanks

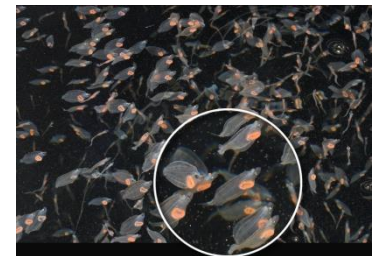


Artemia





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“grey water” technique



Photo: IMR

Distinct meals of Artemia



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Paste



Clay



Photo: IMR

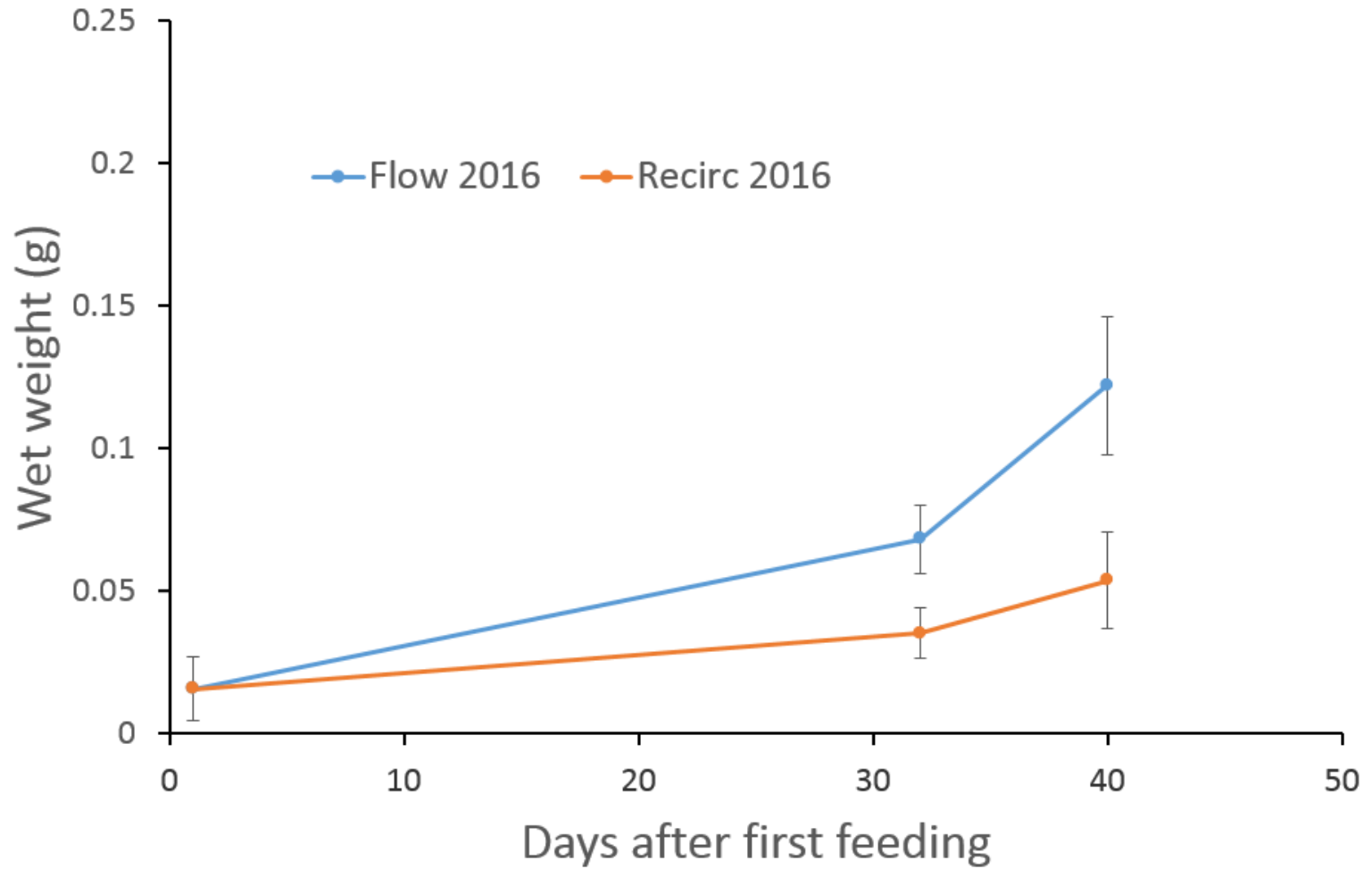


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Larval growth

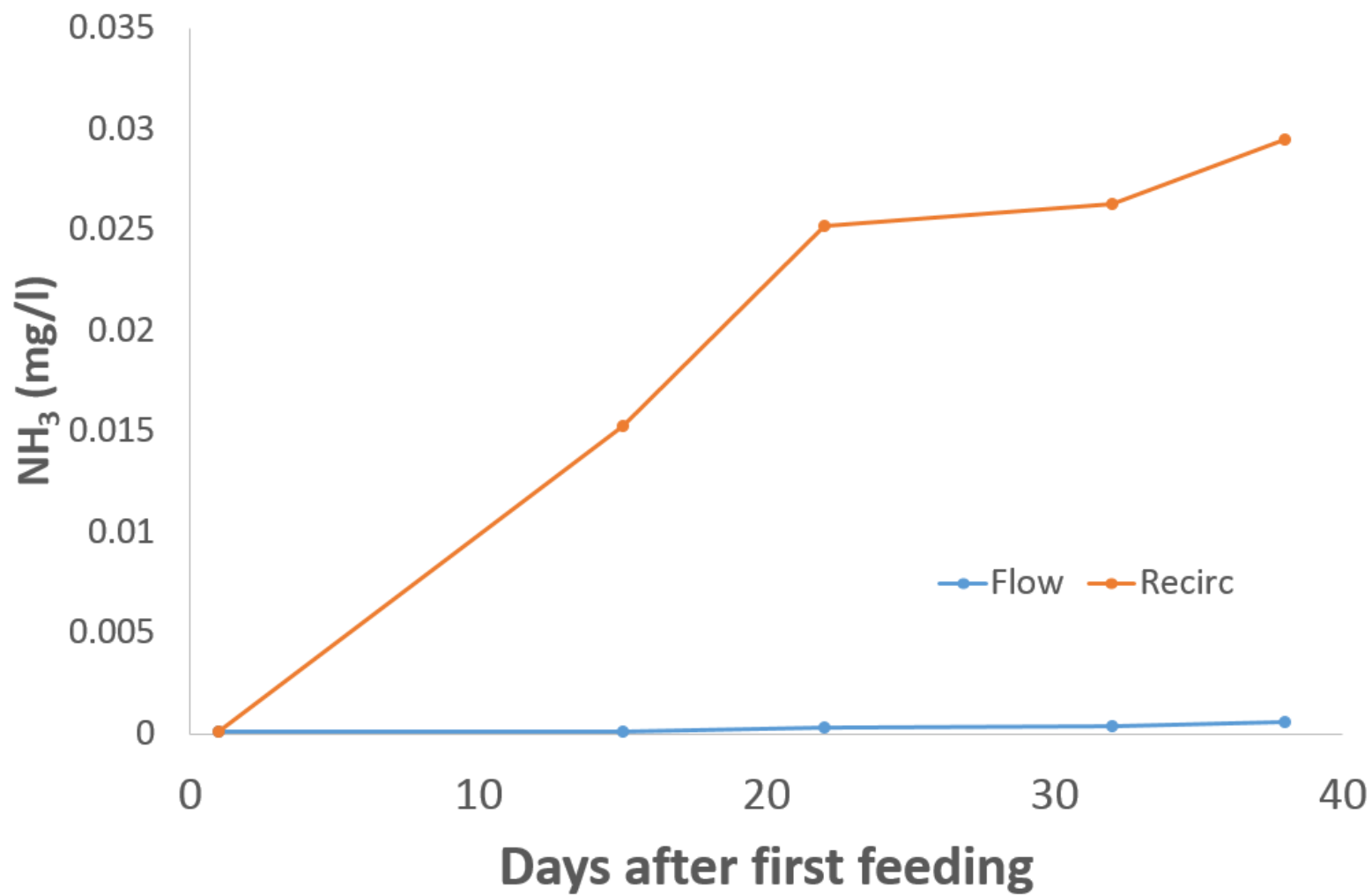


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Un-ionized ammonia 2016

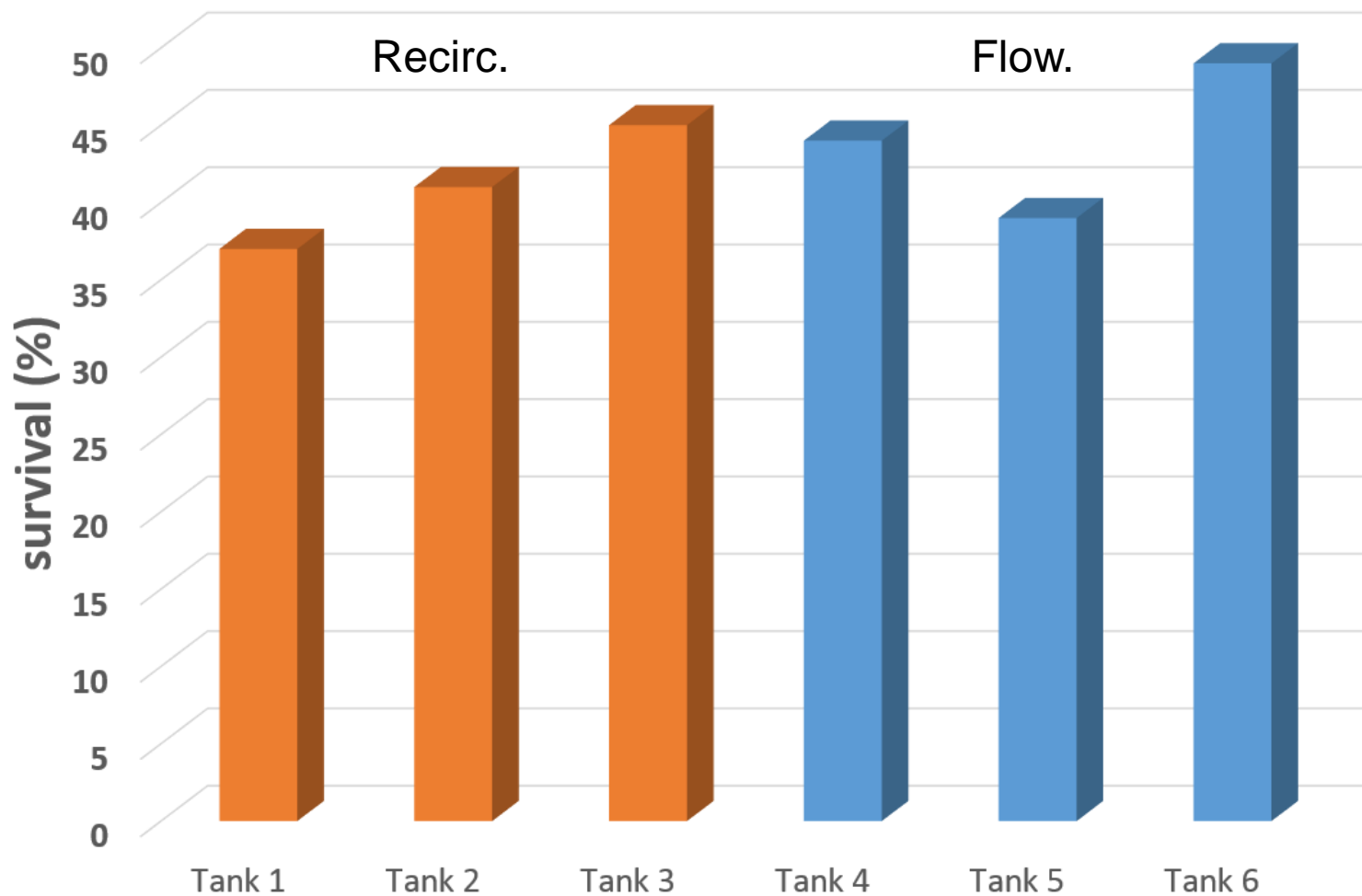


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Survival during first feeding 2016

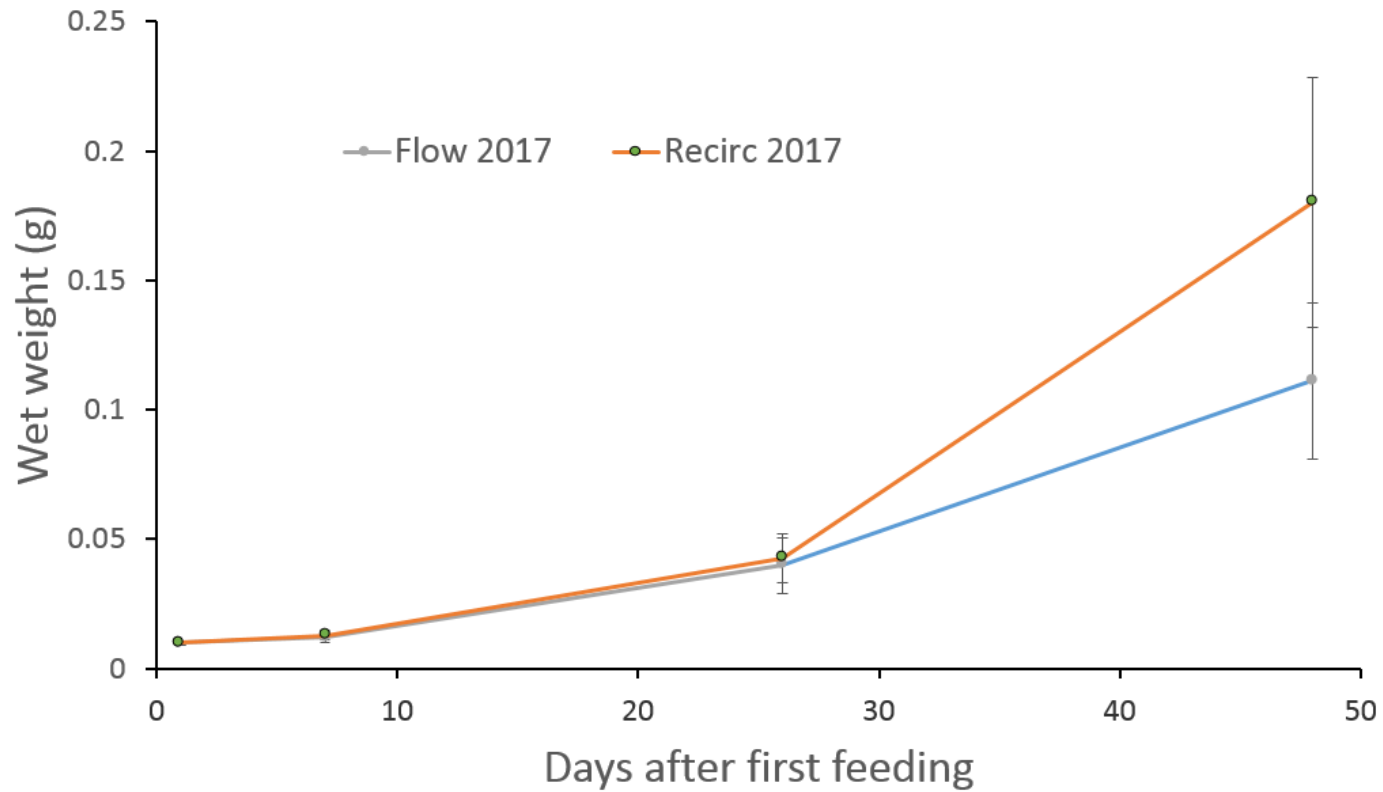


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Larval growth

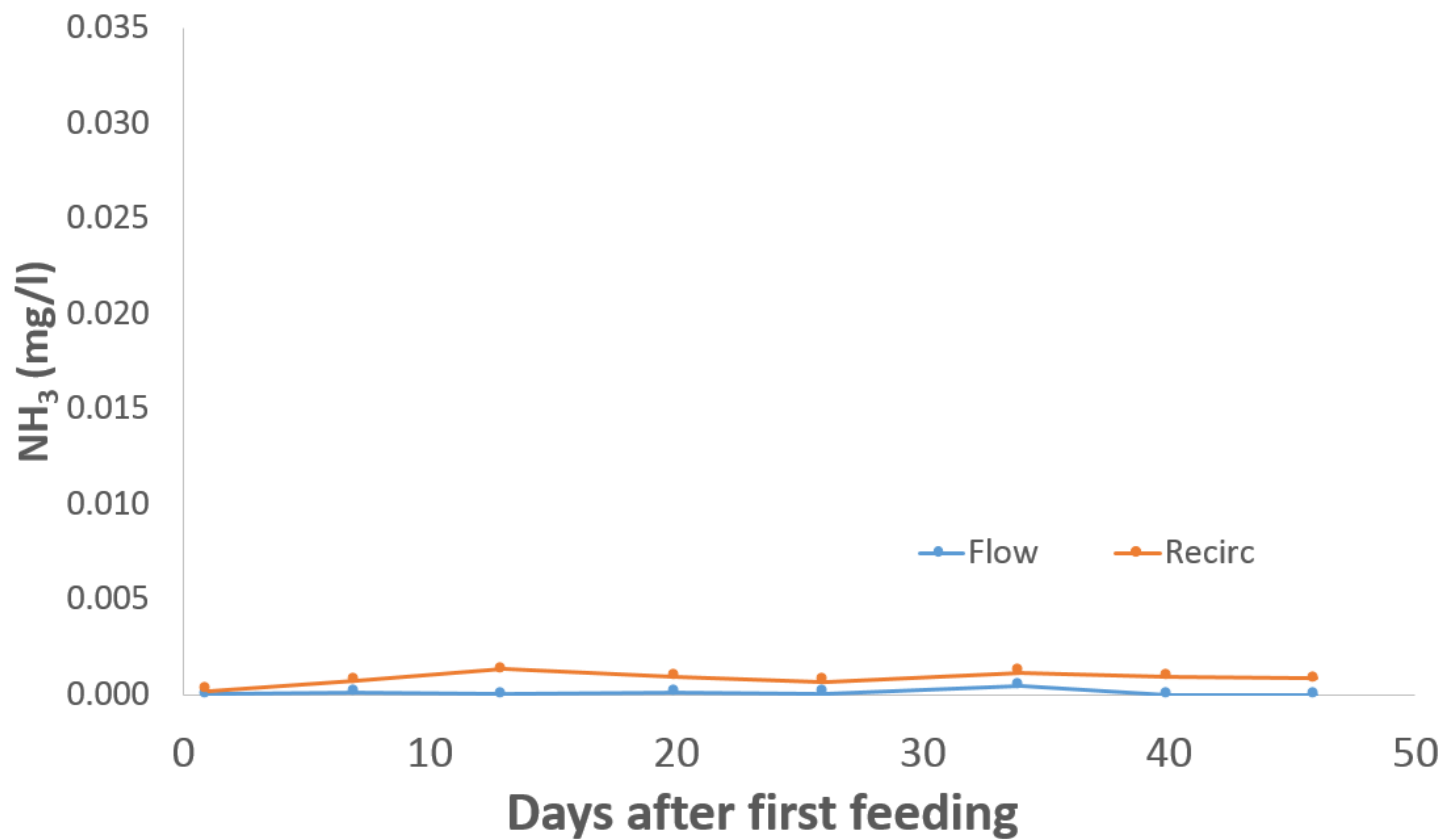


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Un-ionized ammonia 2017

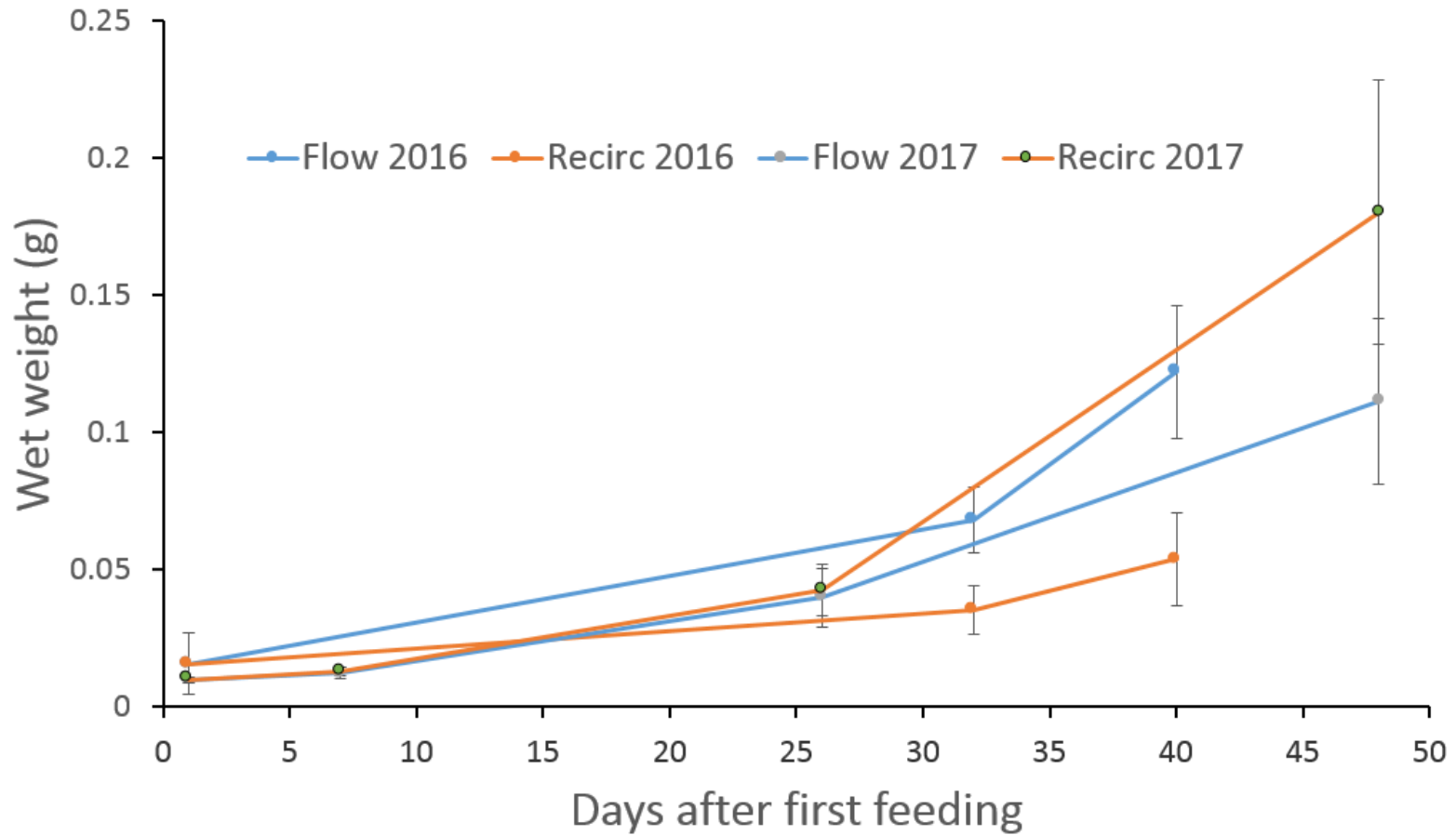


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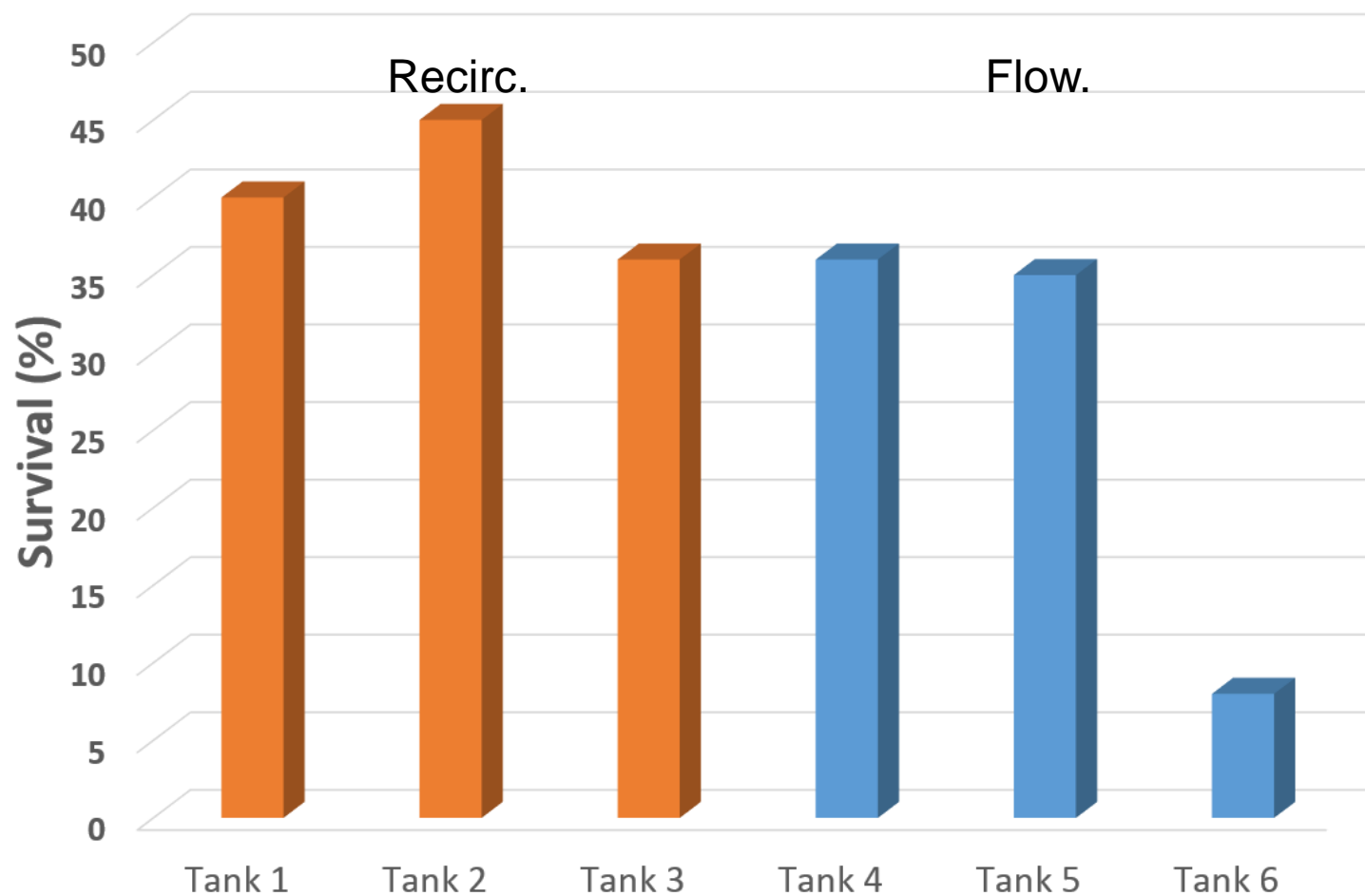


Larval growth





Survival during first feeding 2017



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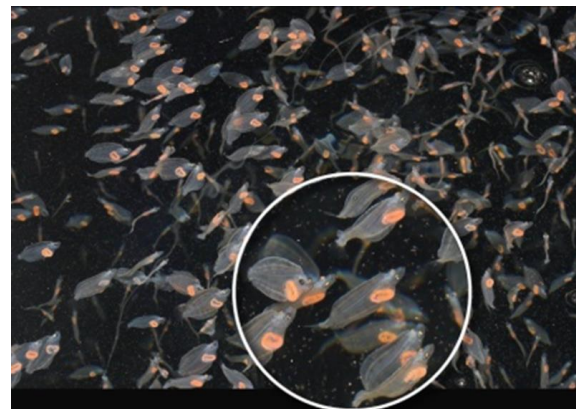
Microbiome characterization:

Bacteriological samples were taken through the experimental periods:

- from yolk-sac and first-feeding larvae
- from all incubation and first-feeding systems

DNA has been isolated

Sequence analyses (HiSeq) are underway



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