Hatchery planning and management

Hatchery design

Hatchery types
Industrial

Hatchery types

Small scale

Intensive larval rearing systems

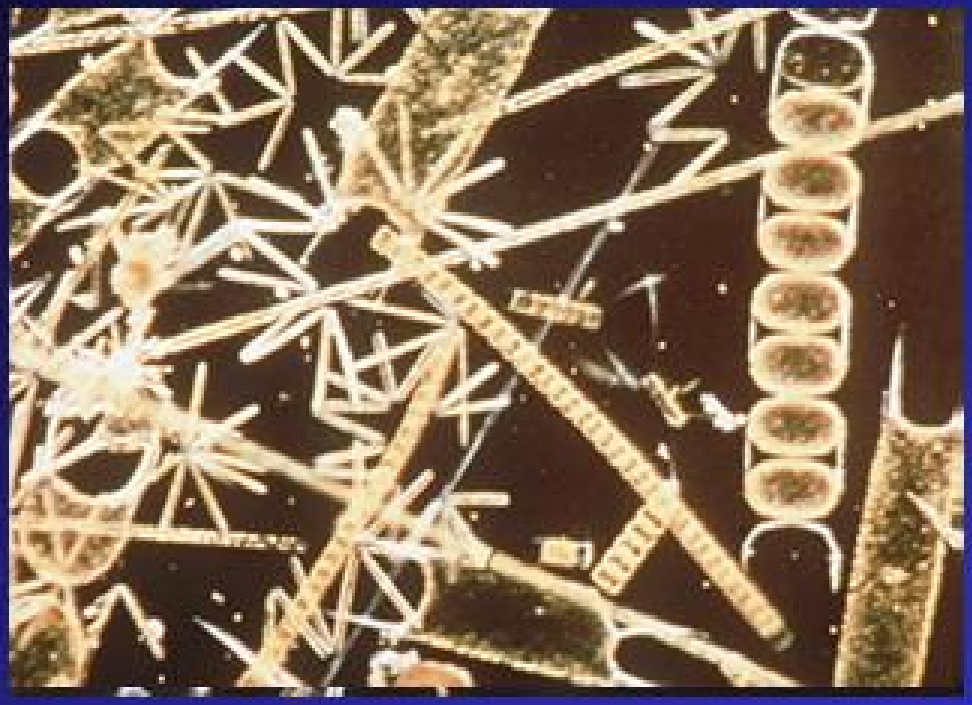
- Variable structures
- Sloping floors
- Open drainage
- Capped pipelines for ease of cleaning
- Ease of operation

- **Variable salinity**
- **Heated and cooled water**
- **Aeration**
- **Oxygen**
- **Individual tank lighting**
- **Individual tank cleaning equipment**

Hatchery types
mesocosm tanks

Nutrition

Food source in natural environment



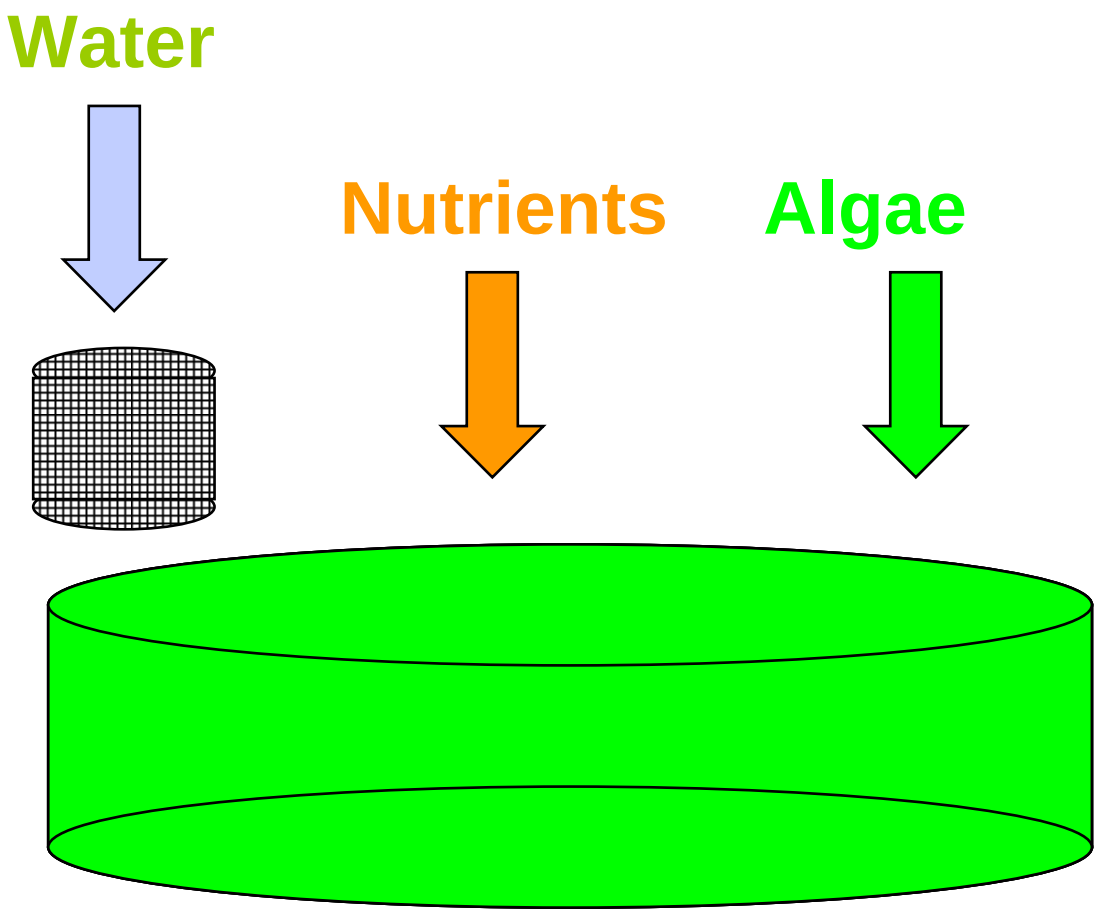
maximum chances for meeting all nutritional requirements

Theory of Mesocosm fry production

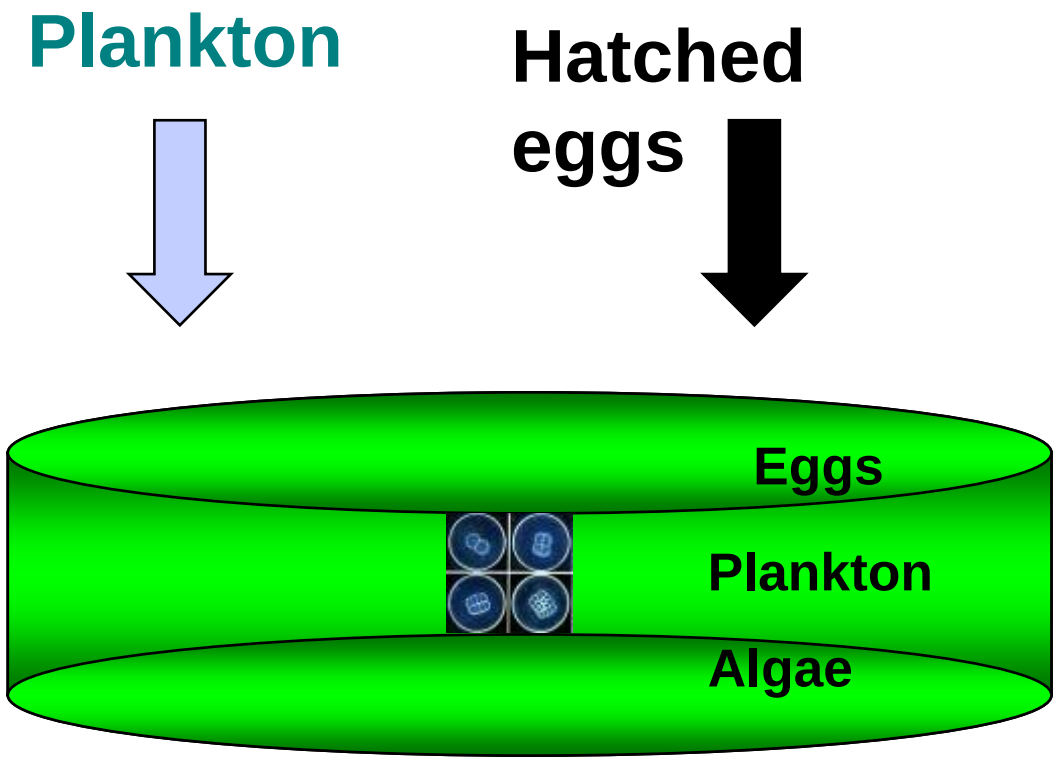
Mesocosms are controlled blooms of phyto and zooplankton to allow the necessary supply of zooplankton with the necessary nutritional qualities and of a particle size small enough for the larvae to ingest.

- However, the zooplankton in mesocosms soon become depleted by the larvae.
- Therefore additional enriched rotifers and Artemia are added to supplement the feed requirement.
- When larvae are of a sufficient size, then inert feeds can be added and the fry weaned from live to dry feeds.

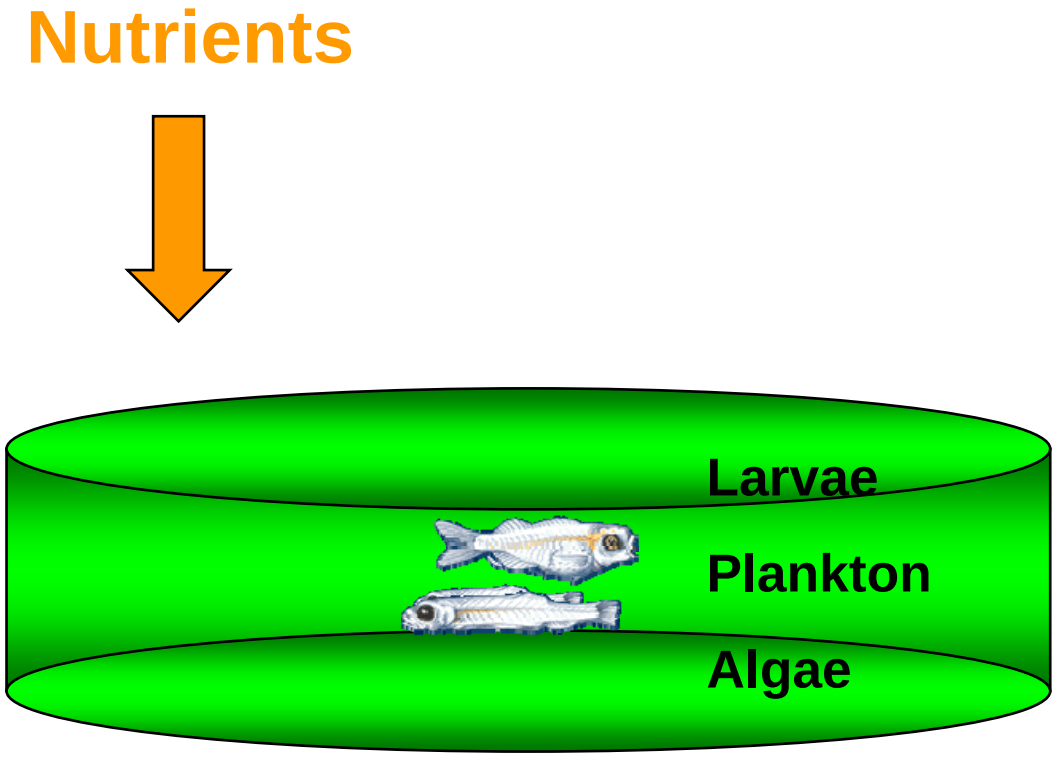
Theory of Mesocosm



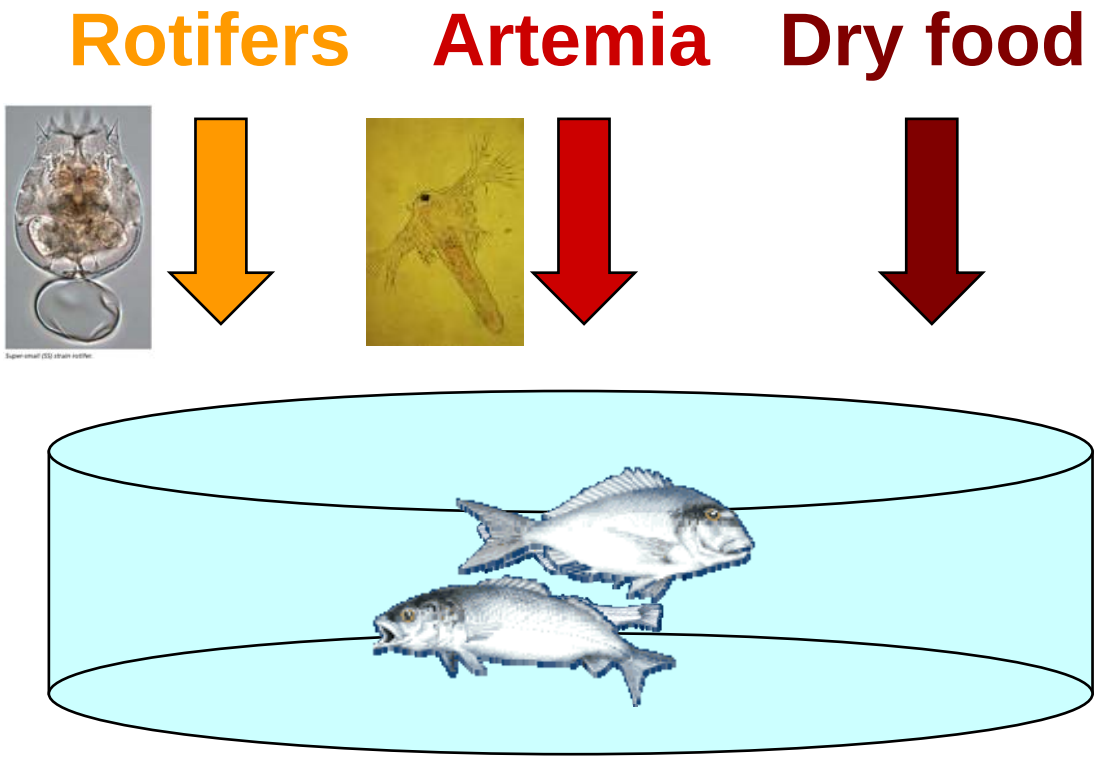
Theory of Mesocosm



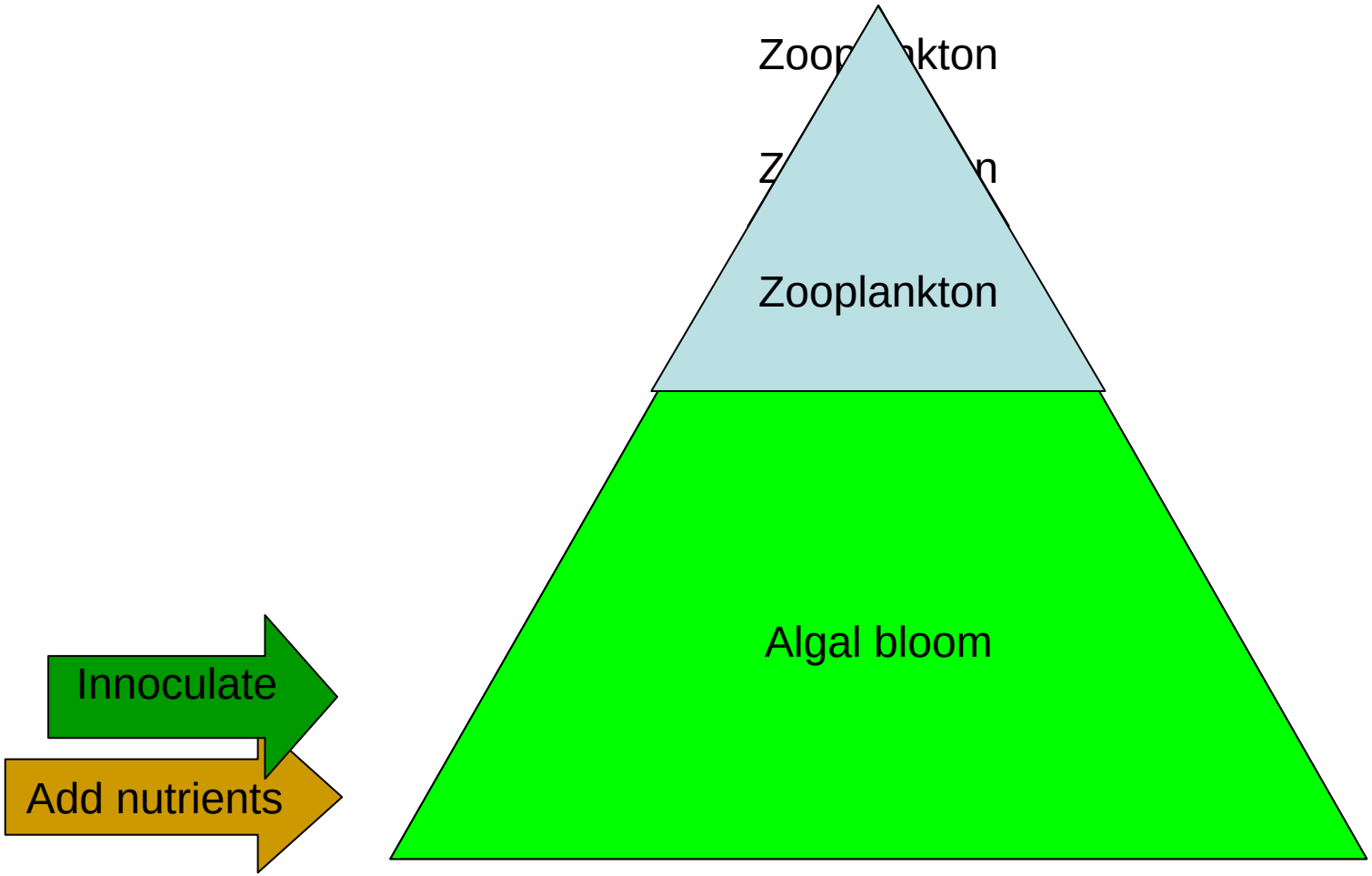
Theory of Mesocosm



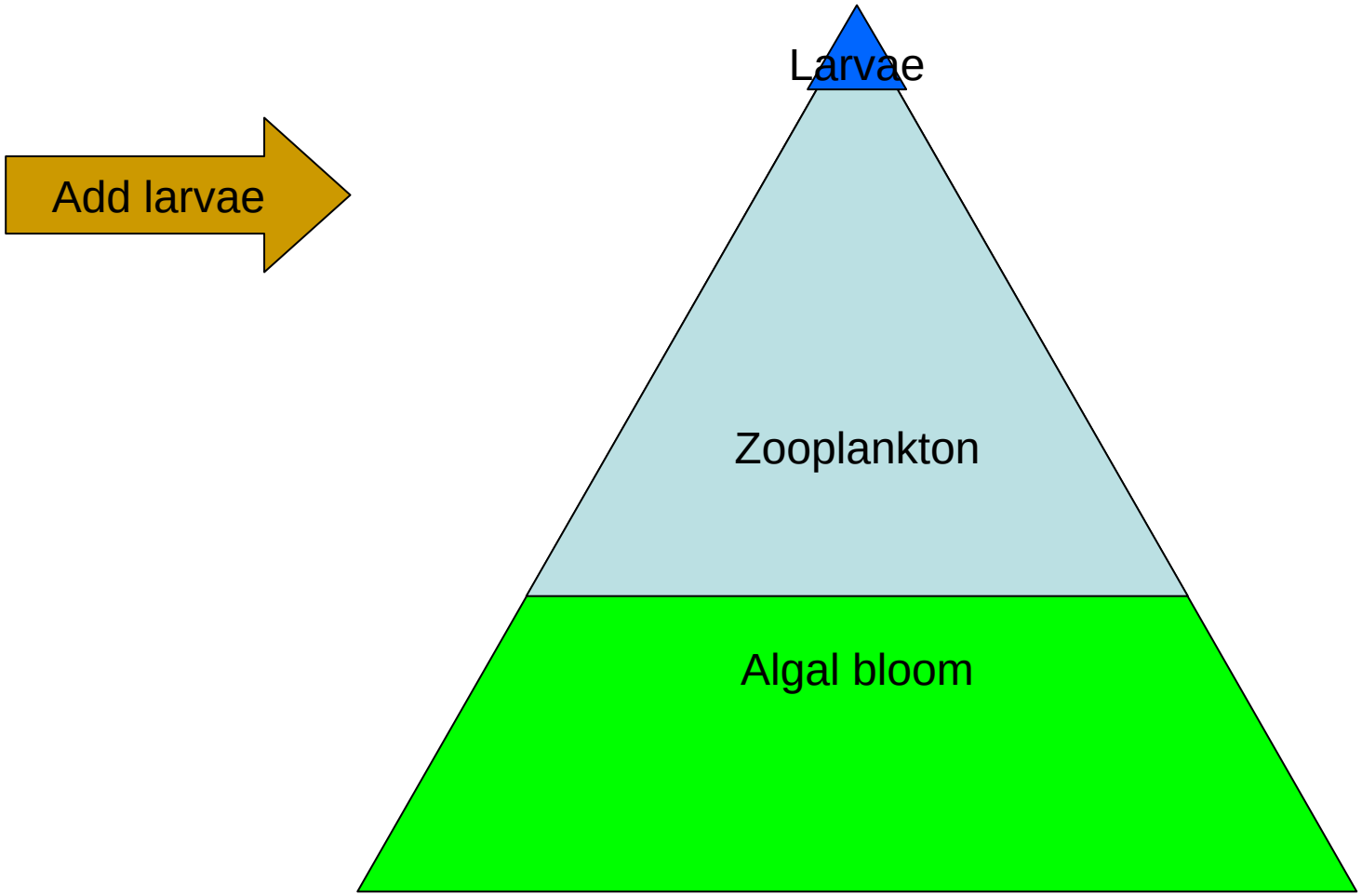
Theory of Mesocosm



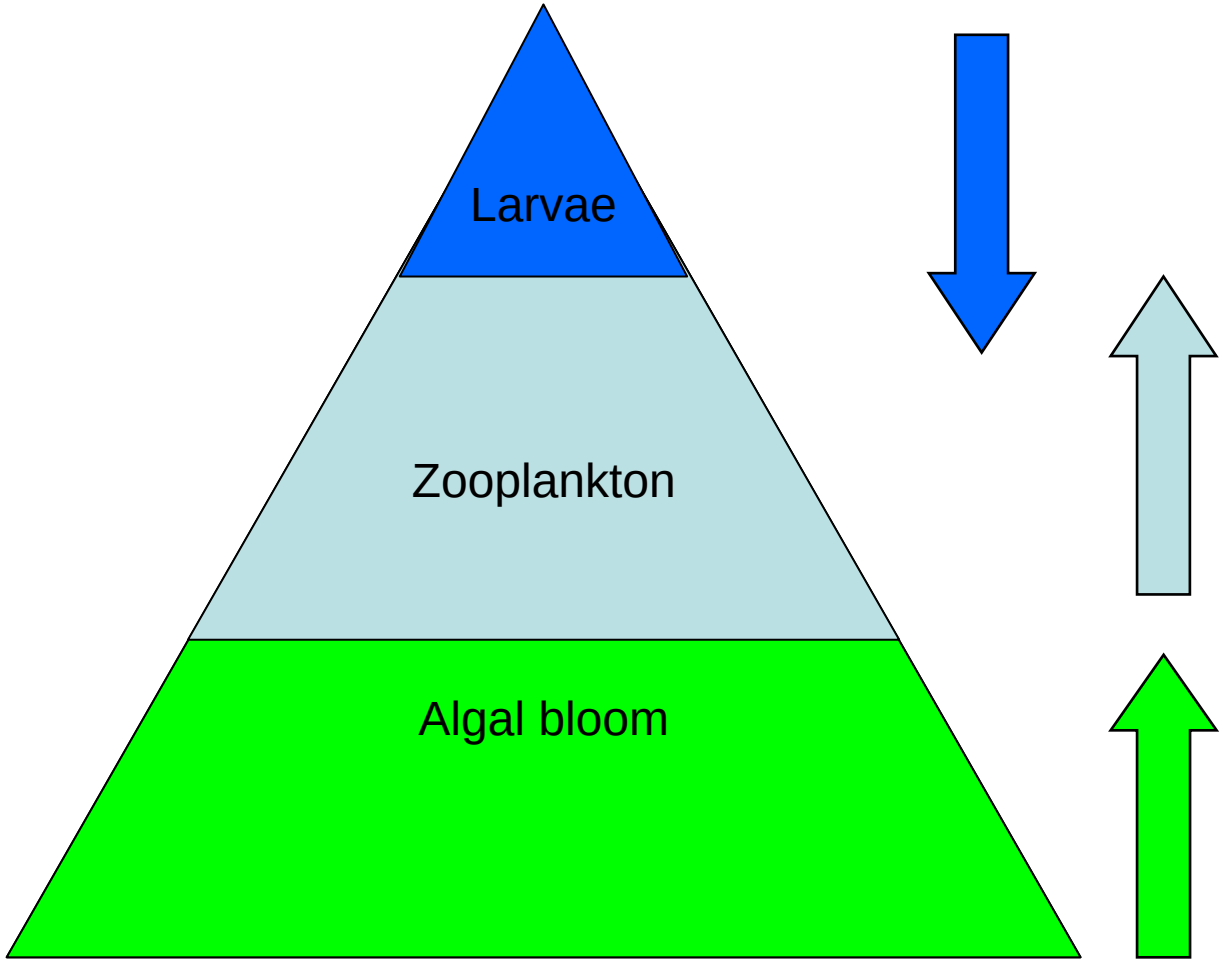
Mesocosm start-up Day -8 to +2



Mesocosm start-up Day +2

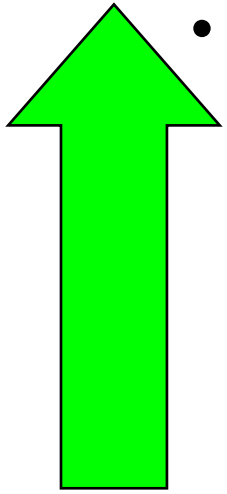


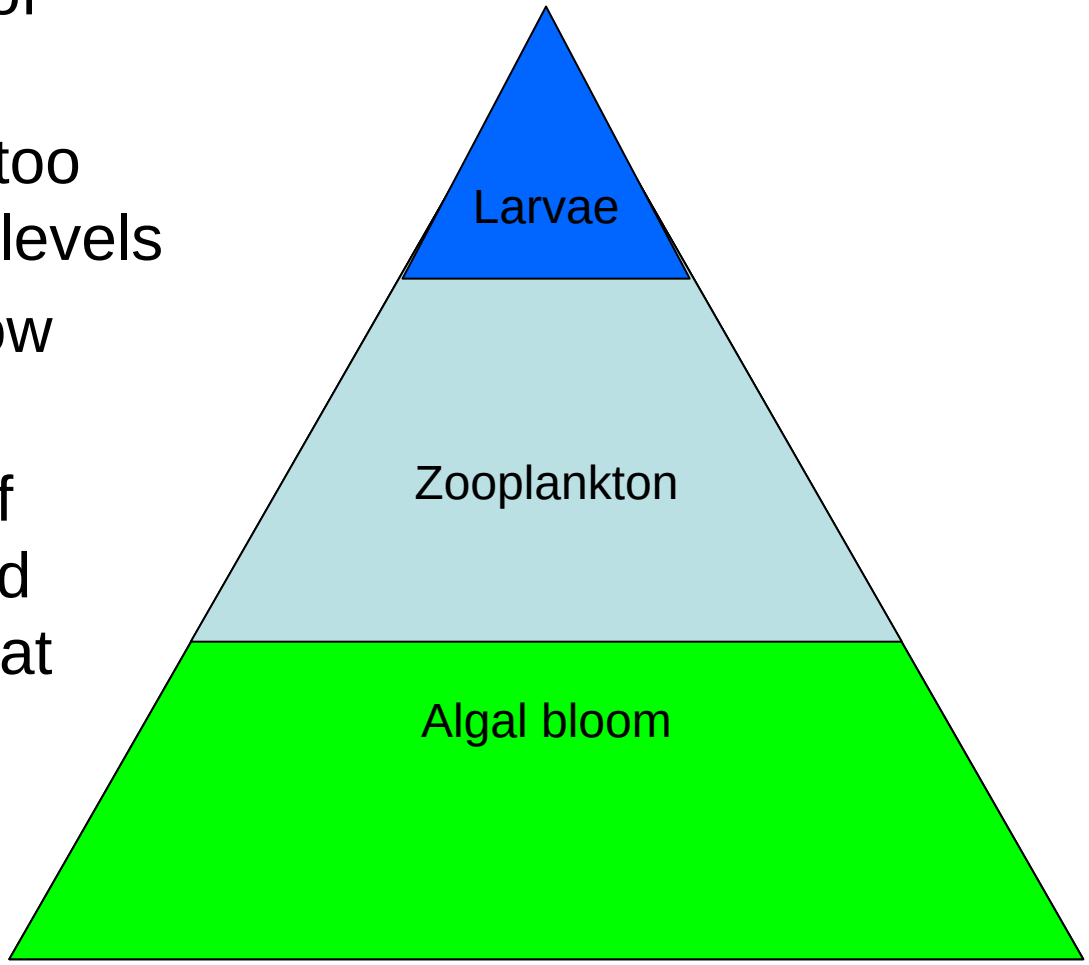
Mesocosm operation - stasis



Mesocosm control – algae increase

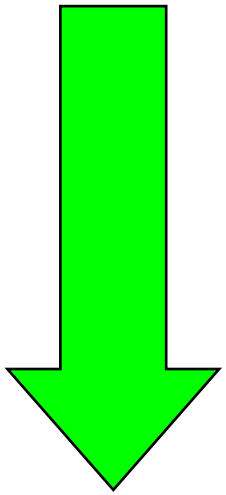
- Low density of zooplankton
- High but not too high nutrient levels
- Low water flow rates
- High levels of sunshine (and artificial light at night).

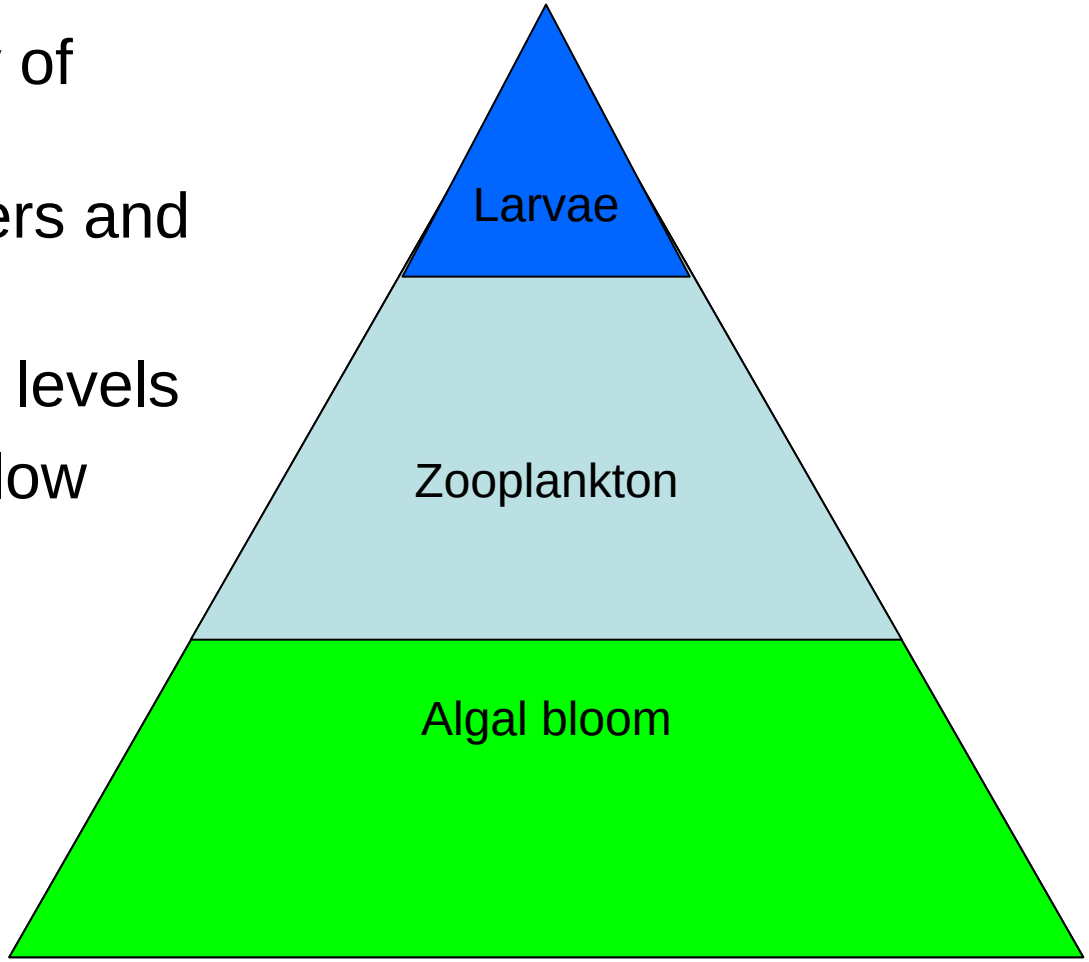




Mesocosm control – algae decrease

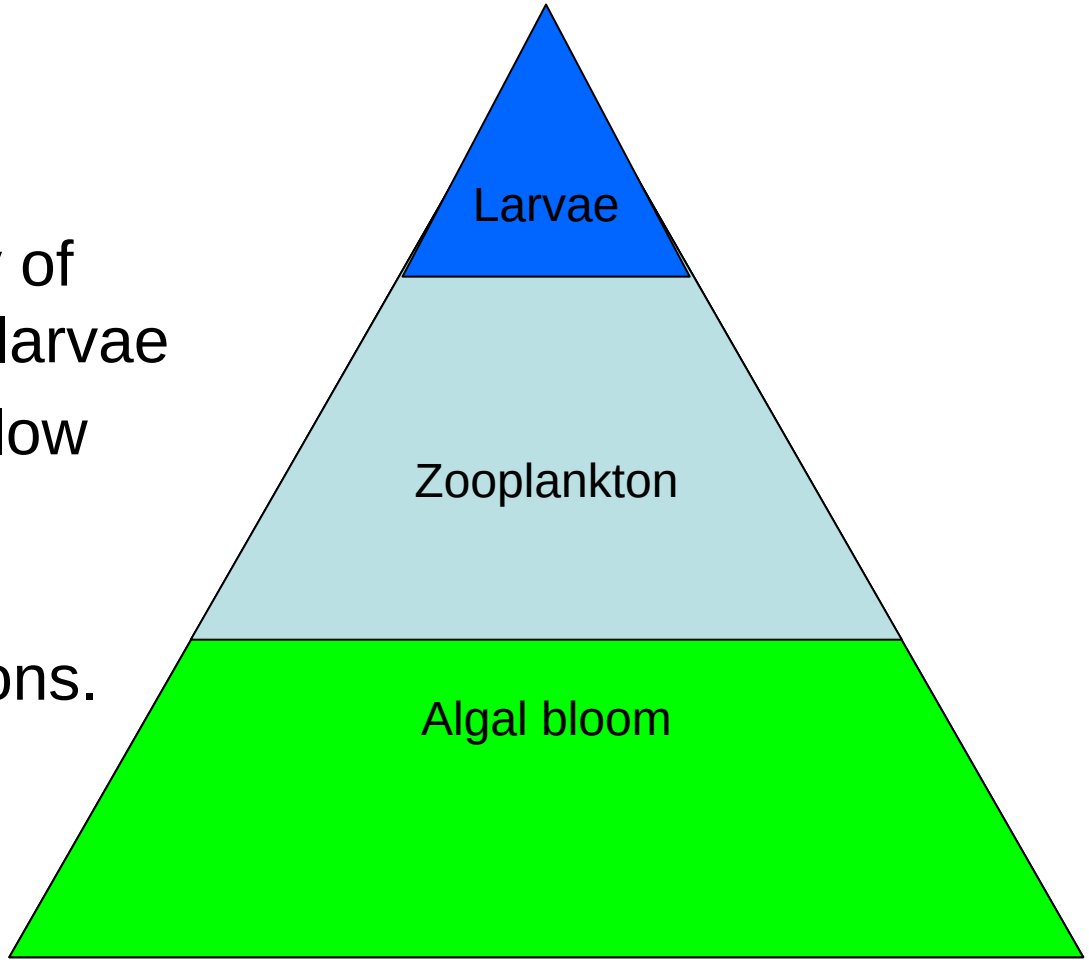
- High density of zooplankton (and/or rotifers and *Artemia*)
- Low nutrient levels
- High water flow rates
- Shading.





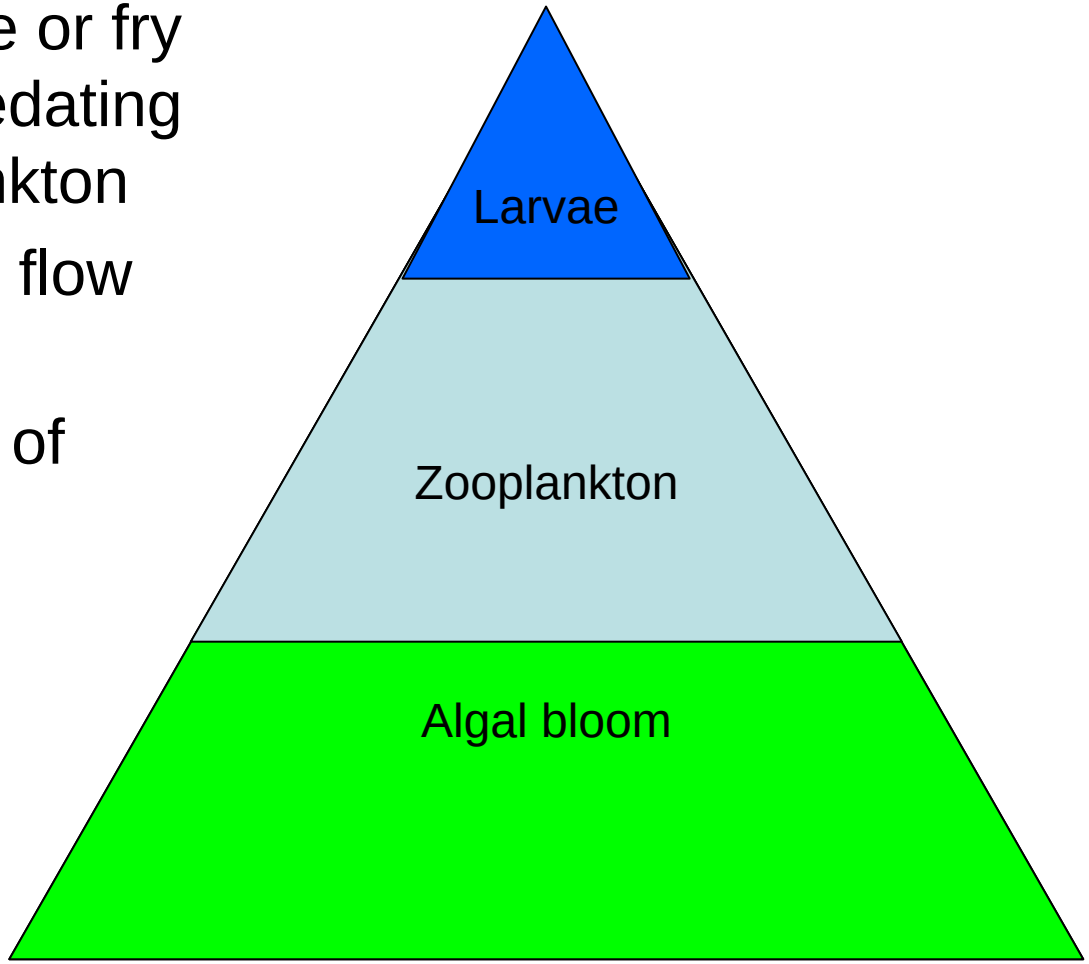
Mesocosm control – plankton increase

- Low density of marine fish larvae
- Low water flow rates
- High algal concentrations.

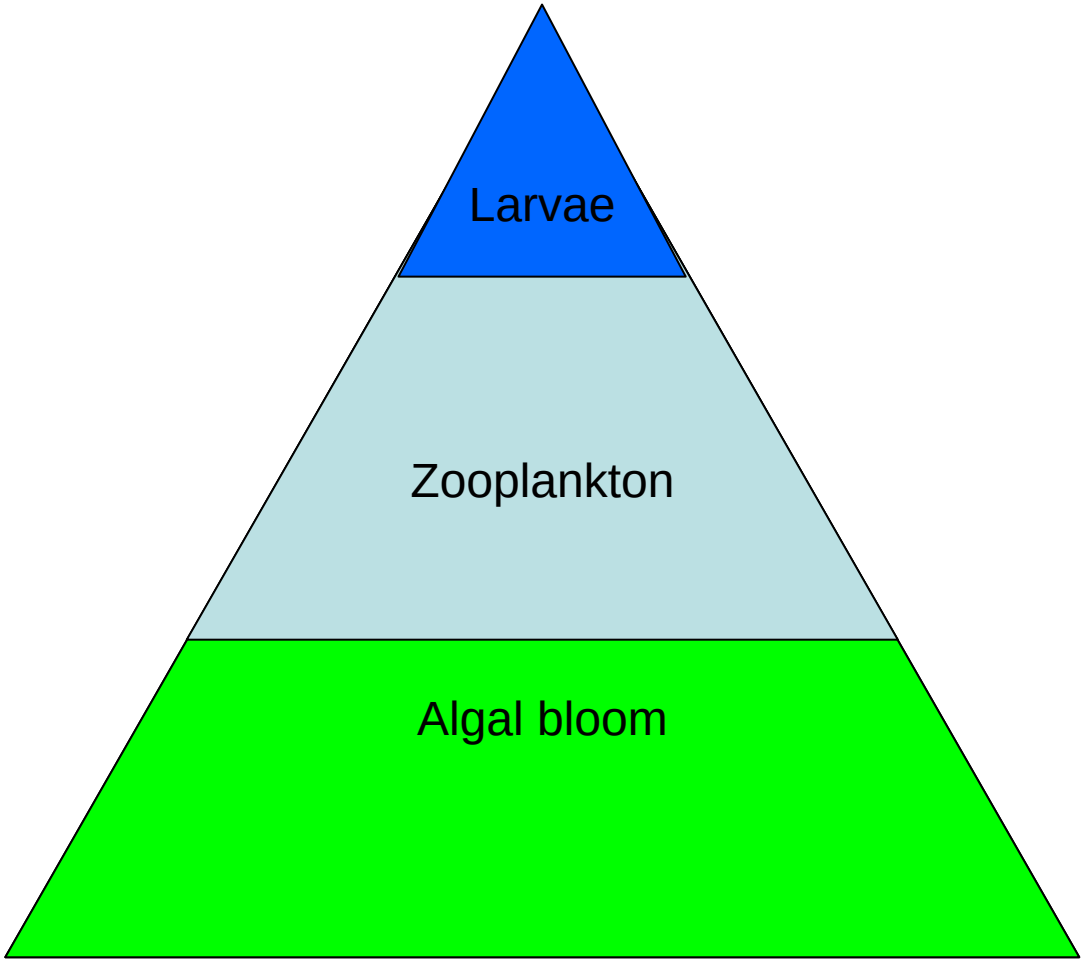


Mesocosm control – plankton decrease

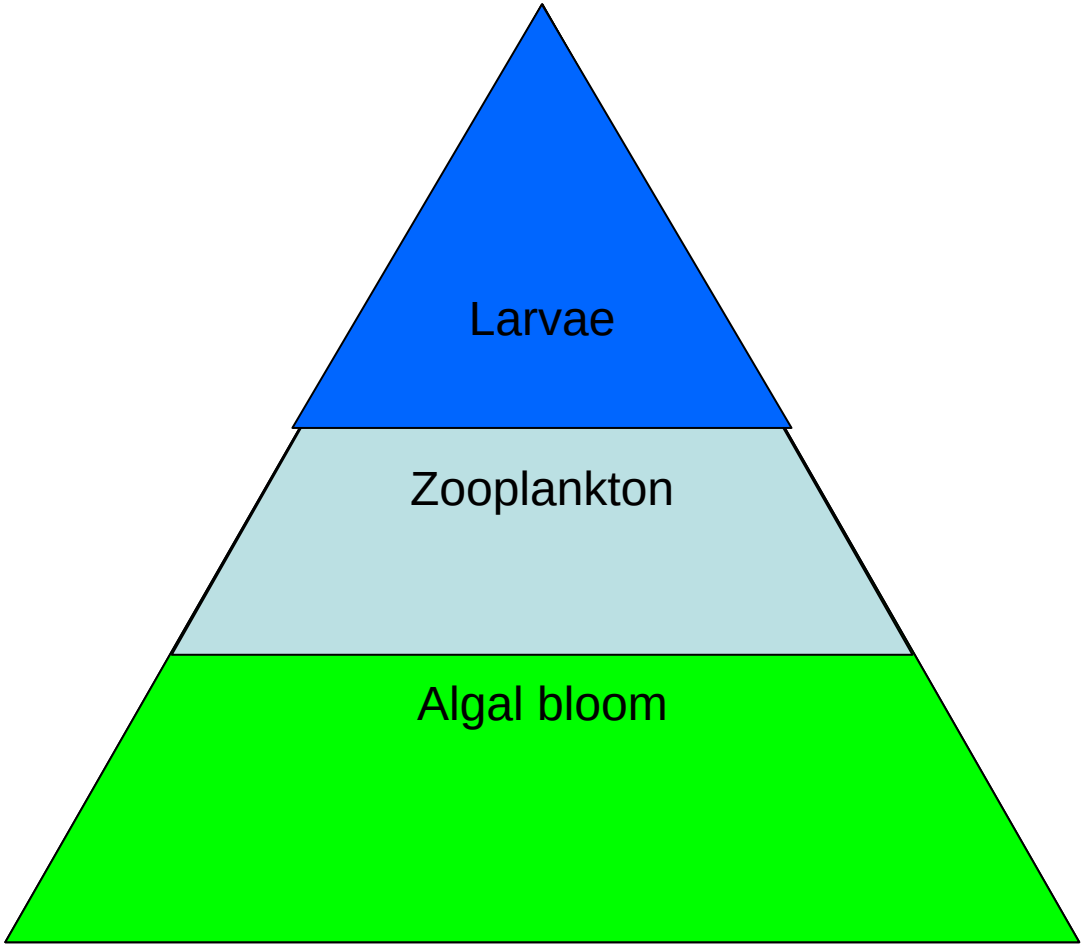
- High larvae or fry density predating on zooplankton
- High water flow rates
- Low levels of algae.



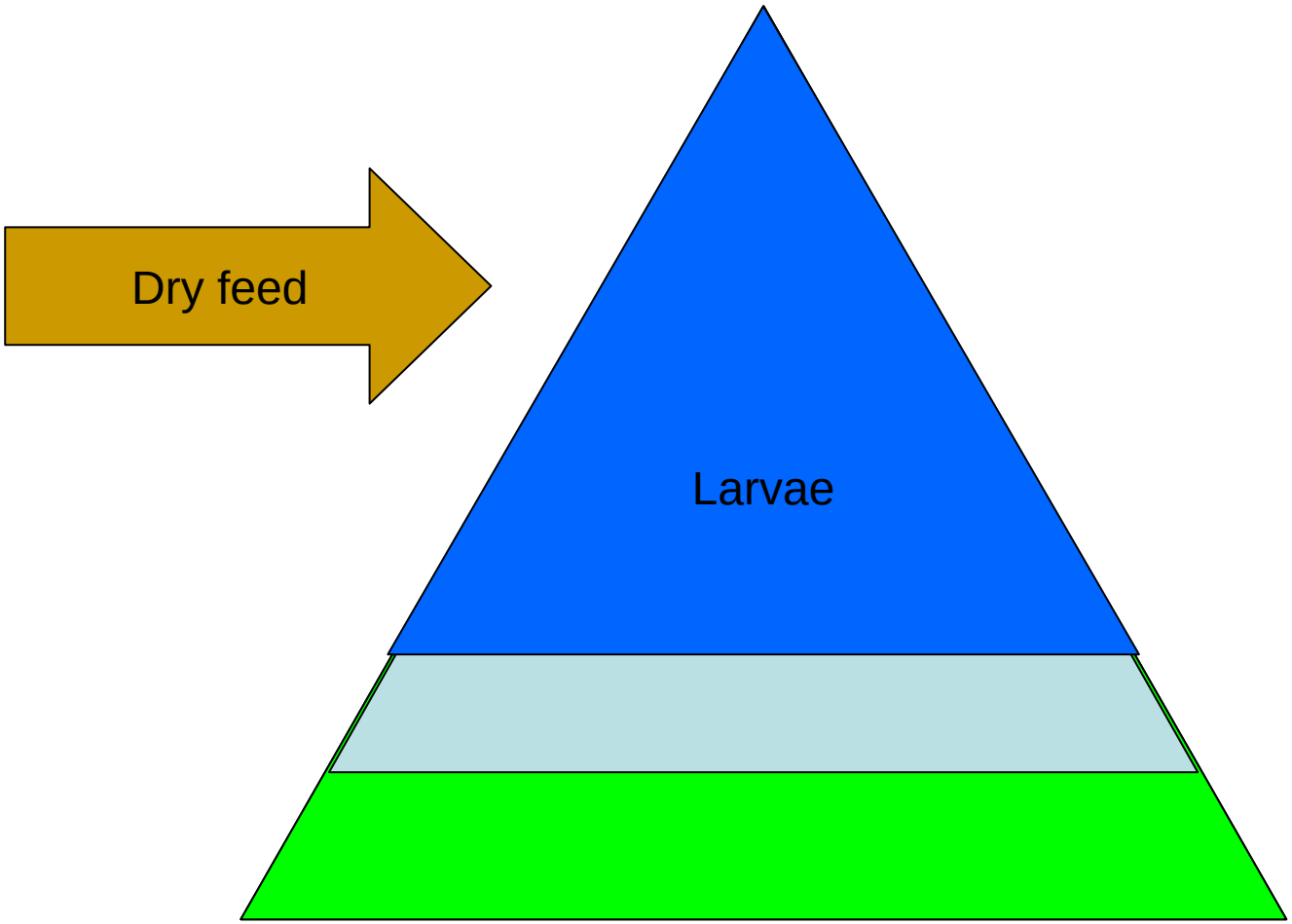
Mesocosm operation



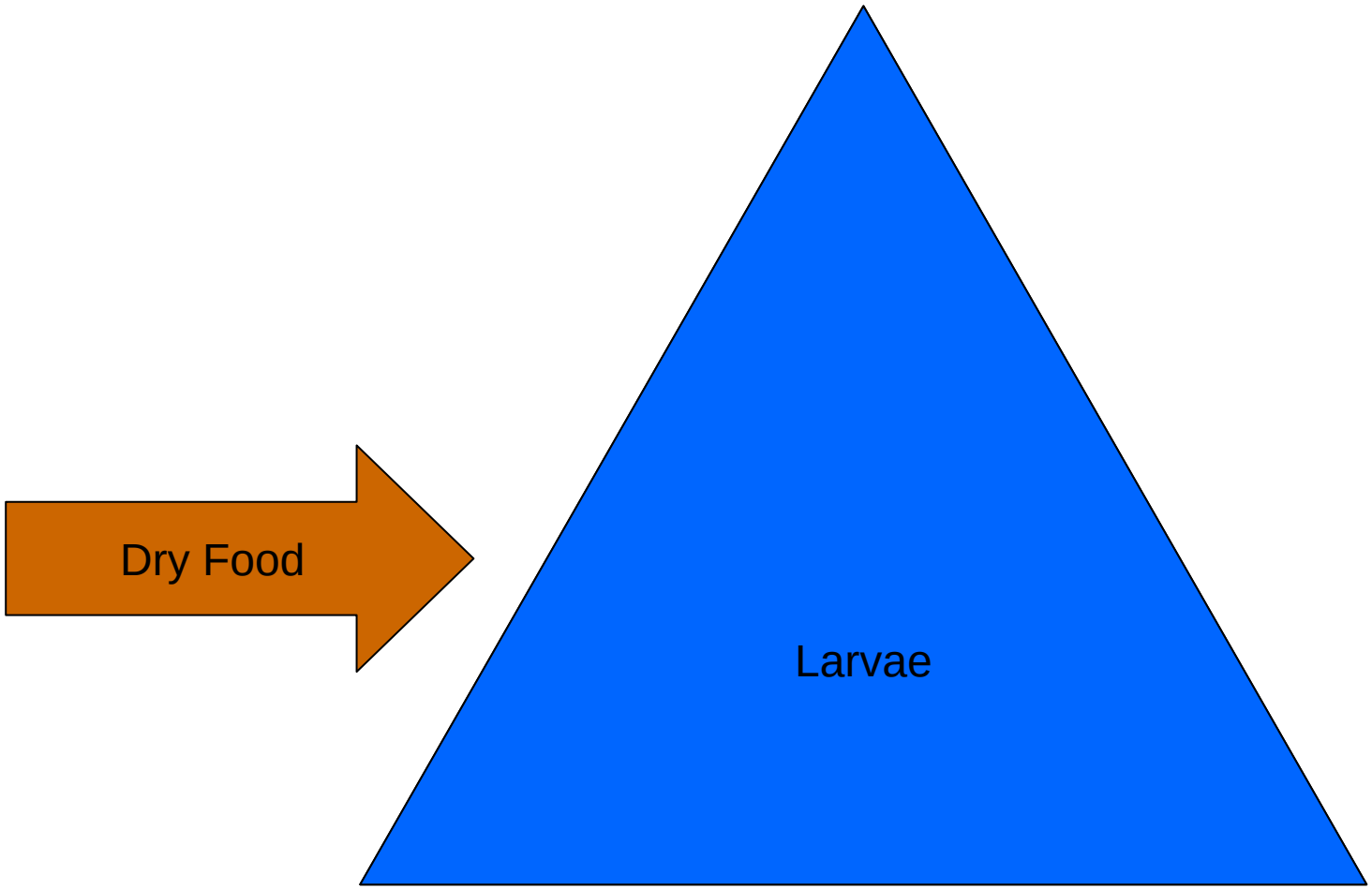
Mesocosm operation - time



Mesocosm operation - time



Intensive operation - weaning



Monitoring and control

Sustaining the phytoplankton and zooplankton bloom will be undertaken by

- Monitoring
- algal concentration and type
- zooplankton concentration
- larvae and fry density
- Nutrient levels
- Oxygen levels

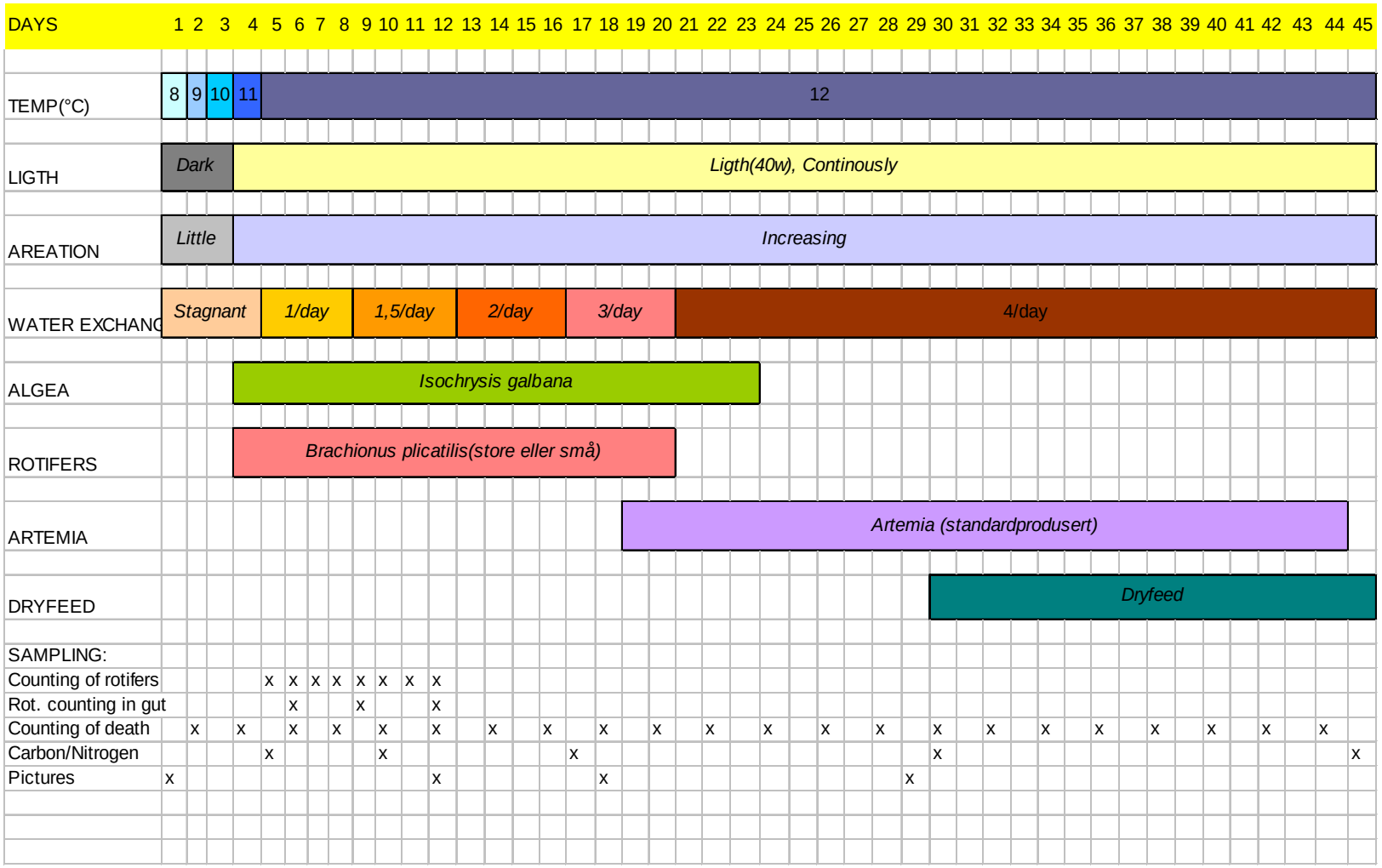
Monitoring and control

Controlling sustained blooms of algae and zooplankton will be undertaken by

- Addition of specific nutrients
- Shading
- Artificial light (at night)
- Water flow
- Addition of enriched rotifers and Artemia
- Addition of dry feed
- Cropping of fry

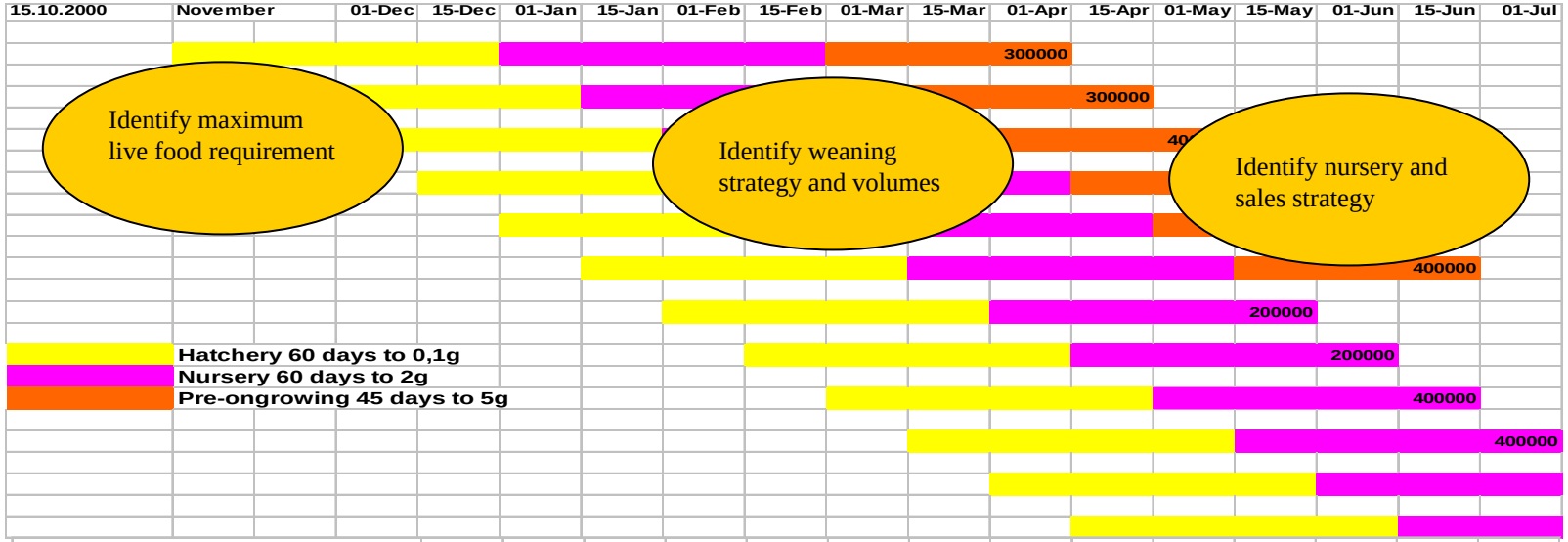
Production cycle planning

Production protocol



Daily feeding regime

- Larval status determines food requirement and feding schedule
- 0800 - Tank inspection and cleaning.
- Tank by tank feeding requirement – feeding sheets.
- 0930 Larval inspection for live food diet uptake and remaining feed levels.
- Repeat above at 3 hourly intervals until 2300 hrs



Juvenile biomass in kg by category			0,1-0,9g	200		460		450		385		405		520		185
			1,0-1,9g	0		480		1140		1125		990		1035		1335
			2,0-5,0g	0		0		1085		3570		4935		4550		3500
				200		940		2675		5080		6330		6105		5020
No. of juveniles in millions by category			0,1-0,9g	0.4		0.92		0.9		0.77		0.81		1.04		0.37
			1,0-1,9g			0.32		0.76		0.75		0.66		0.69		0.89
			2,0-5,0g					0.31		1.02		1.41		1.3		1
Total no of juveniles (in millions)				0.4		1.24		1.97		2.54		2.88		3.03		2.26
Max stocking density		1.5	0,1-0,9g	133		307		300		257		270		347		123
by category kg/m3		5	1,0-1,9g	0		96		228		225		198		207		267
		7.5	2,0-5,0g	0		0		145		476		658		607		467
Final tank volume required m3				133		403		673		958		1,126		1,160		857
No of tanks required by category		25	0,1-0,9g	5.3		12.3		12.0		10.3		10.8		13.9		4.9
M3		25	1,0-1,9g	0.0		3.8		9.1		9.0		7.9		8.3		10.7
		25	2,0-5,0g	0.0		0.0		5.8		19.0		26.3		24.3		18.7
Total no of 20m3 tanks required				5		16		27		38		45		46		34

Production scheduling

1.10.00	15.10.00	1.11.00	15.11.00	1.12.00	15.12.00	1.1.01	15.1.01	1.2.01	15.2.01	1.3.01	15.3.01	1.4.01	15.4.01	1.5.01
Live food														
			5kg - 5 tanks											
				5kg - 5 tanks										
					5kg - 5 tanks									
						5kg - 5 tanks								
			No of fish				0,5@0,1g		0,4@1g					
									0,45@0,5g					
									0,5@0,1g					
			No of kg fish per category			0,1-0,9g	50		275					
						1,0-1,9g			400					
						2-5g								
			No of million fish per catergory				0,5							
			Maximum stocking density											
			No of tanks required											

Staff management

Impact of poor management strategies

Frequent problems encountered

- Inappropriate human resource management poor skills
- Lack of communication
- Lack of anticipation
- Lack of priorities
- Poorly identified departments activities and responsibilities
- Low personal motivation
- Resignation of key personnel and high staff turnover

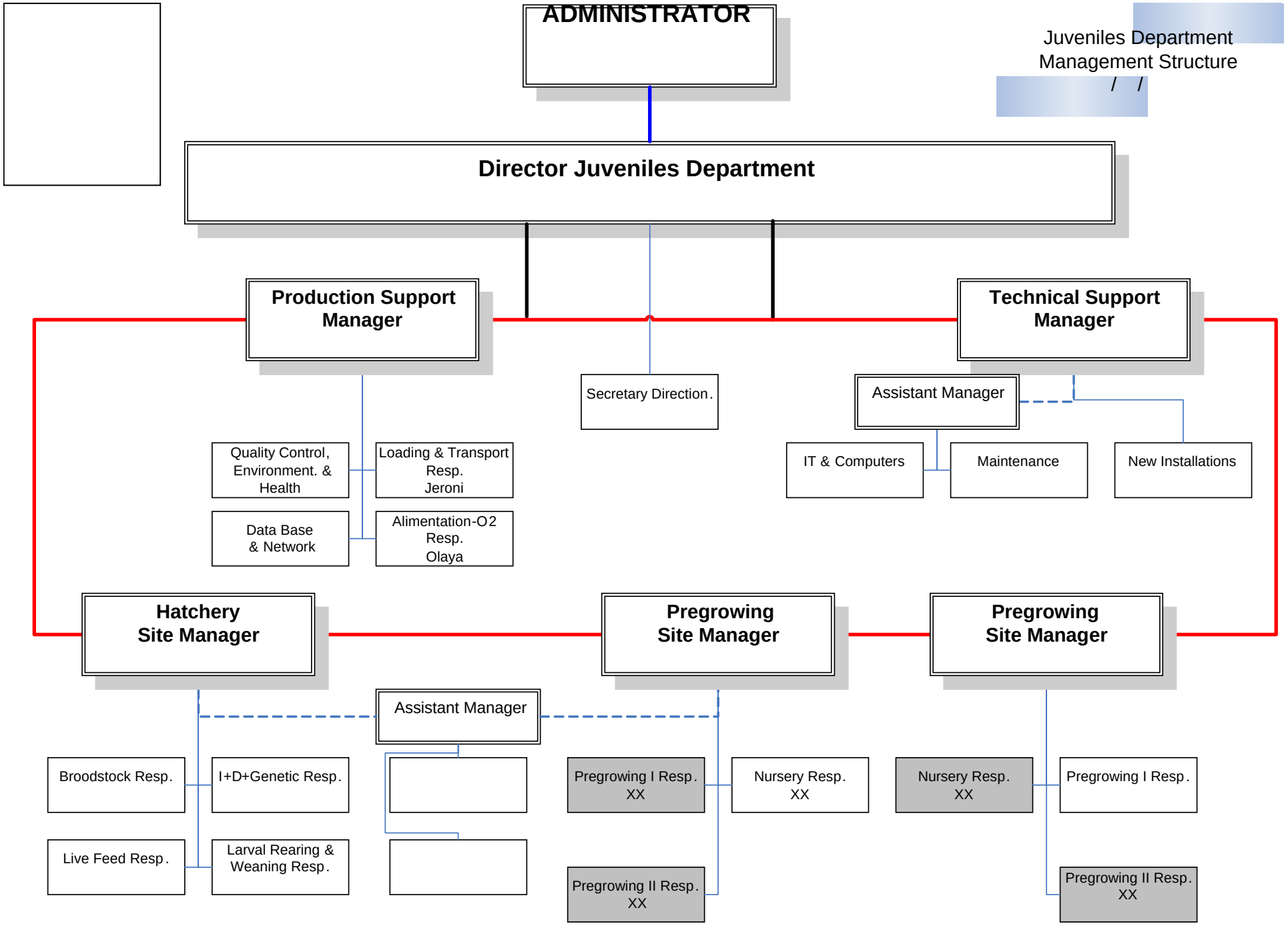
How does this impact production ?

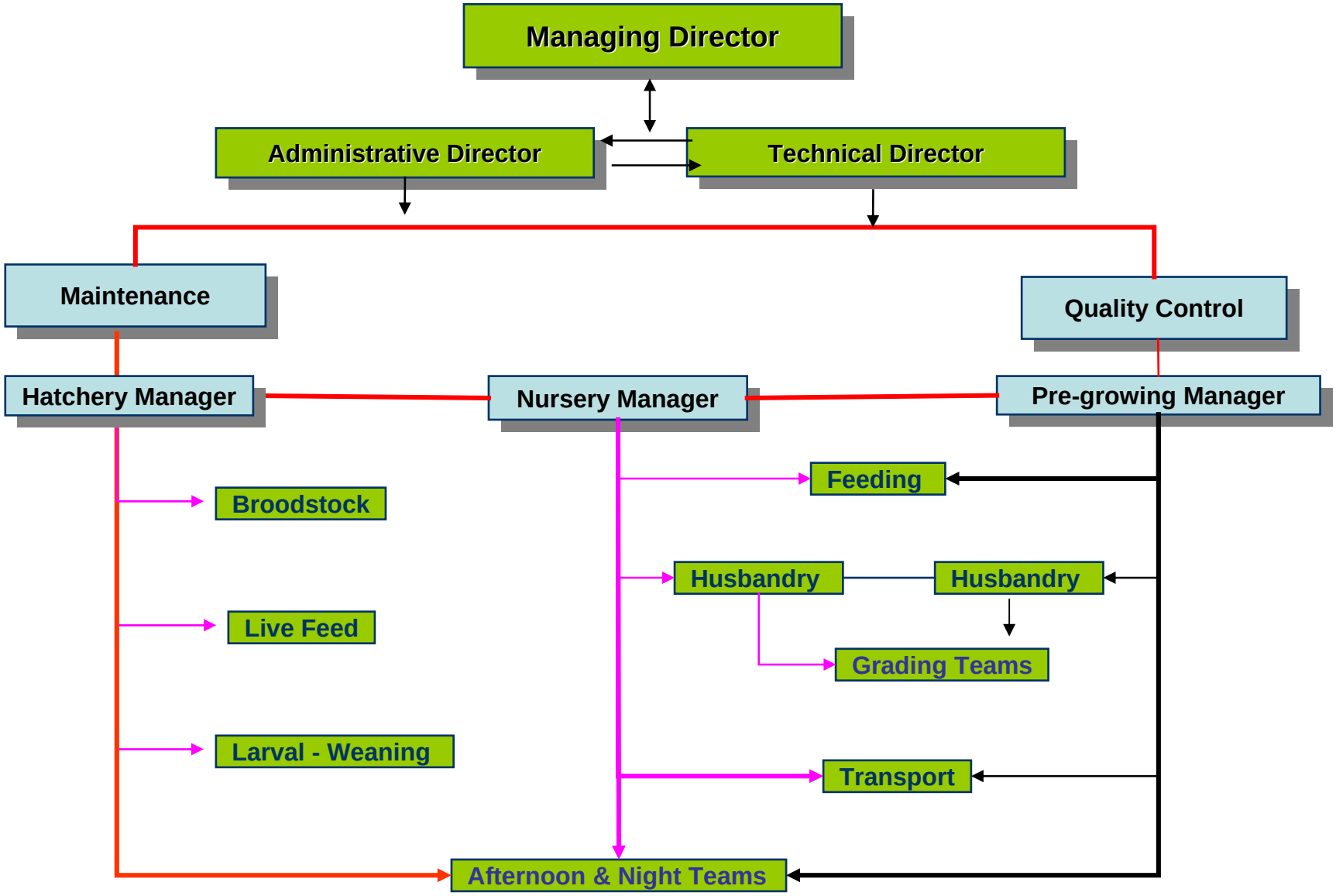
- Ineffective staff performance
- ➢ Delays in hatchery production, scheduling and productivity
- ➢ Lack of accountability
- ➢ Deviation from procedures and protocols
- ➢ In consistent and variable stocking rates, feeding strategies, survival rates and quality parameters

Result:- Poor and variable survivals, low productivity, higher costs and periodic production failures - unsatisfied customers

Defining Management structures

- Review Organogram **(Does it suit the philosophy of the company, flat or pyramid etc.)**
- Define clear job description,matrix of responsibilities and reporting systems **(Clear, simple and easy to check and follow up)**
- Preparing production plan, organizing delivery plan for fish and stock hatchery accordingly **(Focus targets, long term goals and identify resource requirements)**
- Carry individual interview with the Personal **(Capabilities and suitability, commitment)**
- Organize weekly meeting with the Production Management Team **(Improve communication, set and assess short term goals, problem identification and solving)**
- Reviewing Protocols and Developing the Operation Manual **(Update technology and establish agreed standard operational protocols)**
- Giving specific personal training per each department as required **(Innovation through education)**


ADMINISTRATOR
Juveniles Department
Management Structure
/ /
Director Juveniles Department
Production Support Manager
Technical Support Manager
Secretary Direction.
Assistant Manager
Quality Control, Environment. & Health
Loading & Transport Resp. Jeroni
Data Base & Network
Alimentation-O2 Resp. Olaya
IT & Computers
Maintenance
New Installations
Hatchery Site Manager
Pregrowing Site Manager
Pregrowing Site Manager
Assistant Manager
Broodstock Resp.
I+D+Genetic Resp.
Live Feed Resp.
Larval Rearing & Weaning Resp.
Pregrowing I Resp. XX
Nursery Resp. XX
Pregrowing II Resp. XX
Nursery Resp. XX
Pregrowing I Resp.
Pregrowing II Resp. XX


Managing Director
Administrative Director
Technical Director
Maintenance
Quality Control
Hatchery Manager
Nursery Manager
Pre-growing Manager
Feeding
Broodstock
Husbandry
Husbandry
Live Feed
Grading Teams
Larval - Weaning
Transport
Afternoon & Night Teams

Tasks

- Elaborate yearly production planning, budgets and capital investments required
- Manage, support and actively lead the Production Management Team
- Identify and organise resources required in time
- Organise recruitment, training programmes and develop team spirit within group ethic
- Develop and implement new strategies and technologies

Competencies

- Strong collaboration and communication with the Administrative Director and Head office
- Chair weekly Production Management Meeting
- Leadeship qualities and team builder

Technical Director

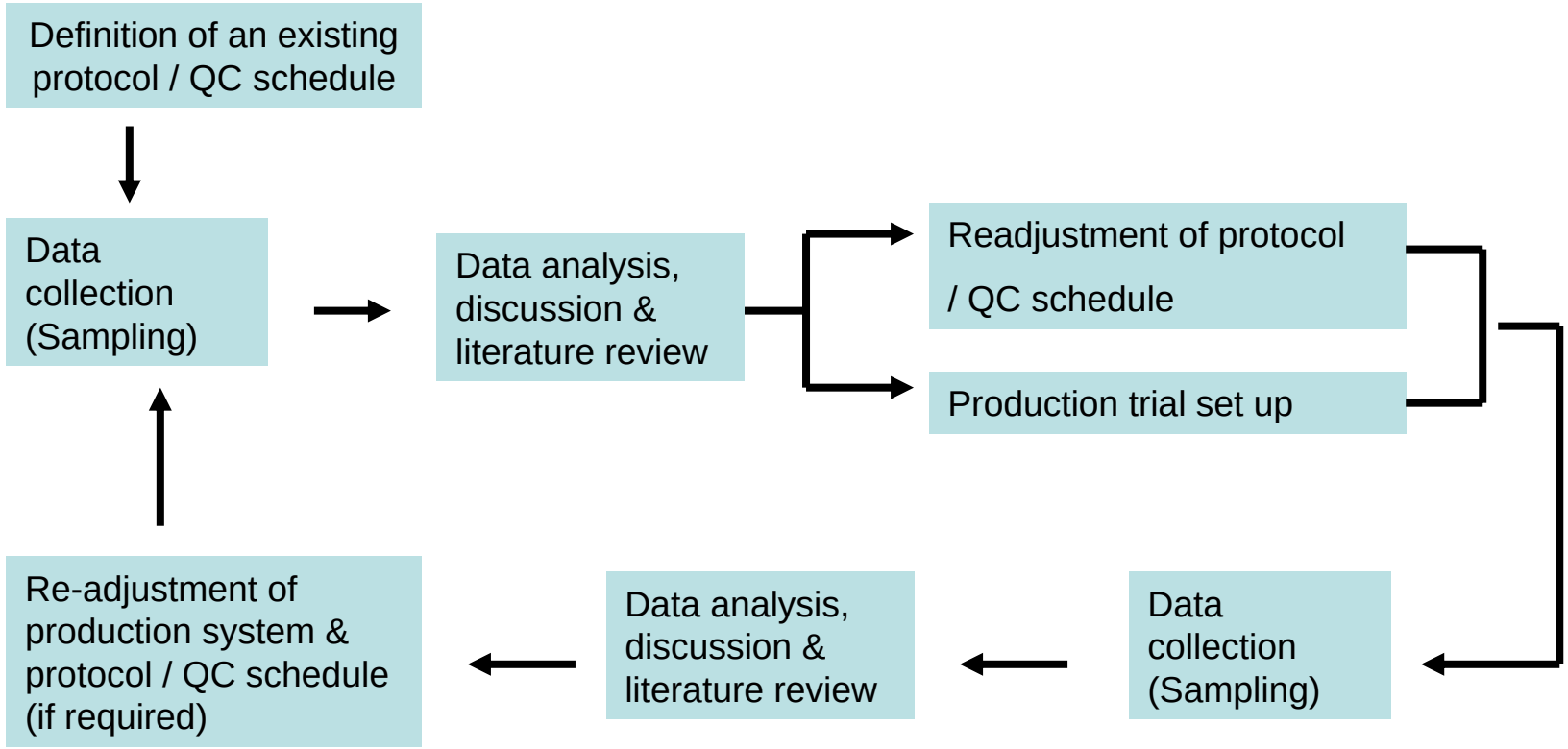
Responsibilities

- Planning, direction and control of the daily operations of the company
- Control and optimise production costs
- Continuously develop and control correct application of production protocols
- Elaborate Monthly Production Report, analyse and implement solutions and improvements
- Report to Administrator and Head office

Qualifications

- Post-graduated in Aquaculture Management
- 10 years experience and proven track record of projects, production and human resources Management
- Wide professional network
- High orgasitional skills and efficient
- High comunication and computer skills

Problem identification and resolution strategy for SOP & QC



Management of fry production

- Provide feed for larvae
  - Correct size
  - Correct nutritional quality
  - Correct frequency
  - Correct amount
  - Correct distribution
- To maximizing survival and growth.
  - Water quality
  - Biosecurity
  - hygiene
- To produce fry in a cost efficient manner

Management requirements of the hatchery

- All departments to work in in close cooperation with each other to:-
- Organize production schedules and define targets for the hatchery concerning the future stocking programme for larvae.
- Organise
  - Staff working schedules and holidays
  - Ordering feed and materials
  - Ordering new equipment
  - repairs and renewals.
- Develop annual and monthly budgets for the above
- Provide daily and weekly production schedules for the operation.
- Supervise operations and undertake quality control.
- Keep records stock lists and organize product supply.
- Provide monthly reporting on the above to the management with reference to the agreed budget.
- Supervise.

Definition of a good hatchery manager

- Organizational ability
- Attention to detail
- Tidy and clean working procedures
- Ability to follow detailed protocols
- Innovative crisis management ability
- Never leaves anything until tomorrow

Production cost estimation

Larval survival

- Collection of good eggs - 80% (60 to 100%)
- incubation of eggs - 65% (50 to 80%)
- Hatched larvae to 8 mm - 45% (30 to 60%)
- Weaning 8 to 14 mm - 30% (10 to 50%)
- Nursery 14 to 40 mm - 65% (60 to 70%)

Total survival from stocked egg to 40 mm 8%

Estimated product requirements, delivery times and logistics

Item	Bream	Bream	Total order	Feed delivery details										
	Quan/million	Quan./ 6 million	quantity	1.10	1.11	1.12	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
CS3000	50	300	300	50	50	50	50	50	50					
DHA PS	40	240	240	40	40	40	40	40	40					
AF/BE	4	24	24		10	10	5							
EG	105	630	630		52,5	105	105	105	105	105	105			
A1Selco	35	210	210		18	36	36	36	36	36	36			
A1 DHA Selco	35	210	210		18	36	36	36	36	36	36			
A1 Super Selco	0	0	0											
Hatch controller	5	30	30		4,5	9		9		9				
Proton 1	10	60	60		15	15	15	15						
Proton 2	30	180	180		30	40	40	40	40					
Proton 3	90	540	540			100	100	100	100	100	50			
Proton 4	180	1080	1080			100	200	200	200	200	200			
NRD4/6	300	1800	1800				300	300	400	400	400			
NRD 5/8	600	3600	3600					600	600	600	600	600	600	
Alfa 3	1000	6000	6000					500	1000	1000	1000	1000	1000	500
Breed	350	2100	2100	300	300	300	300	300	300	300				
Ongrowing diet	2000	12000	12000							500	500	500	500	500

Sensitivity analysis

Larval feeding – day sheet

HATCHERY DAILY FEEDING SHEET											DAY																		
Tank	Age	SB	Alg				Rot								AF							EG						
		%	L	Rotifers			Tot	Artemia AF							Tot	Artemia EG						Tot	Proton 1					
1																													
2																													
3																													
4																													
5																													
6																													
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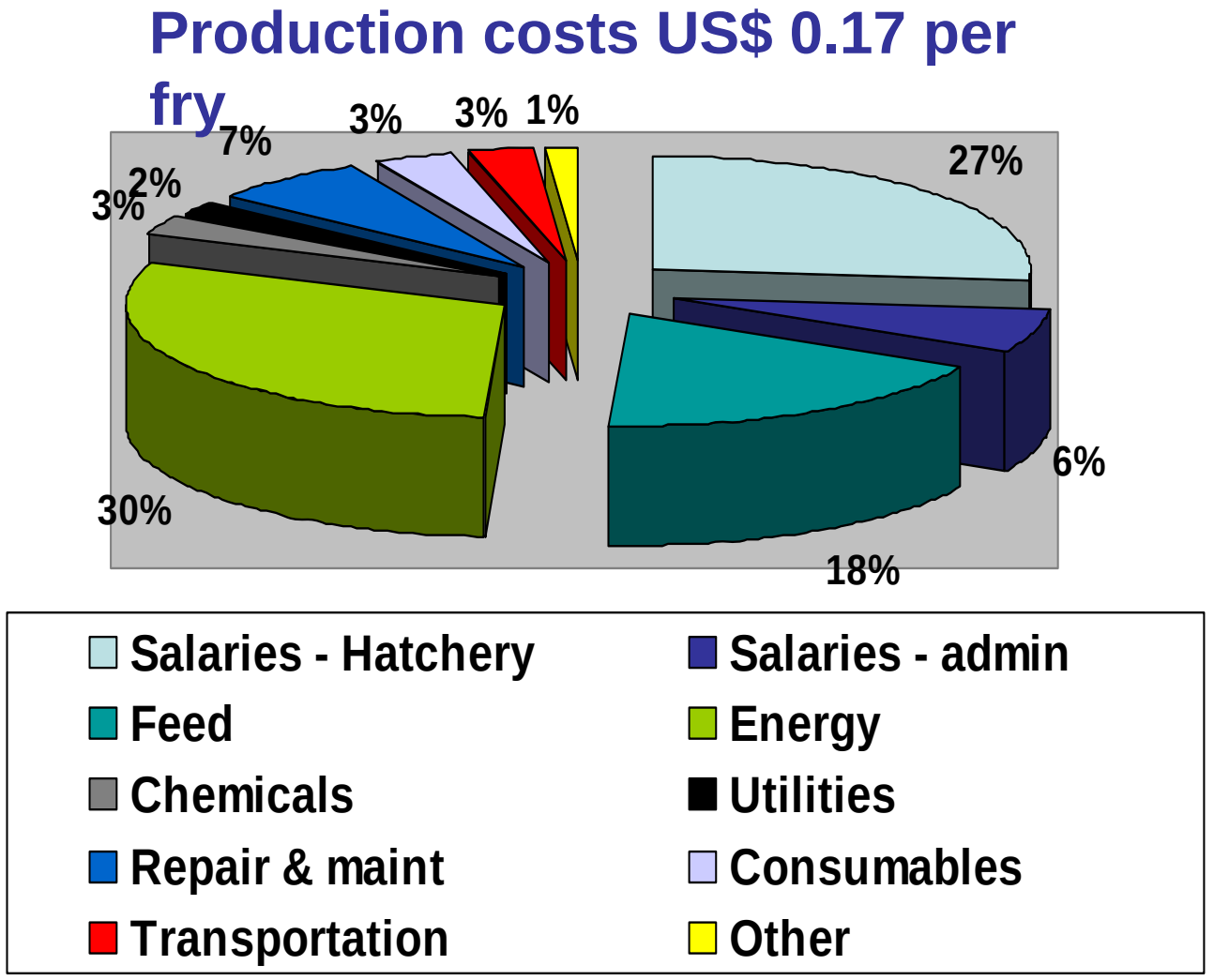
Cause and cure

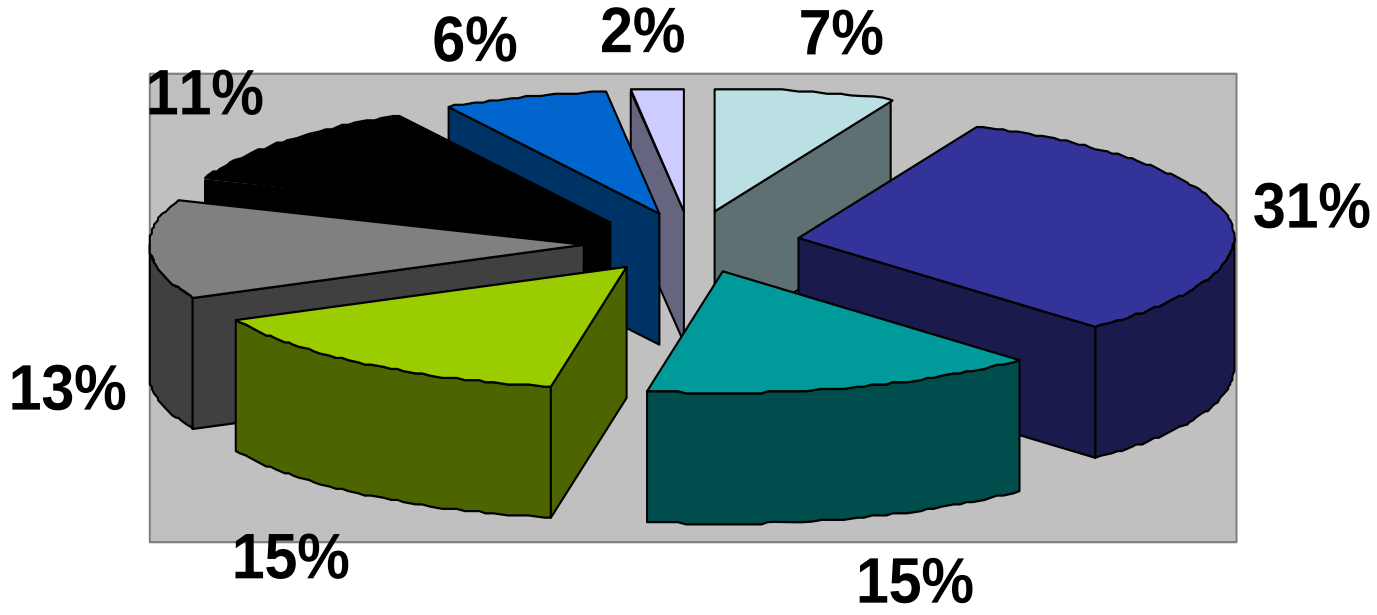
- Human error
- Mechanical error
- System overload and failure
- Third party problems (Electrical failure to sabotage)
- Management structures
- Maintenance, repairs and renewals
- Incorrect production programming
- Various

Costs of production – intensive marine fry production



Investment – intensive hatchery

Capital costs US$ 100,000 to 200,000 per million fry per year



Profitability

Sales price US$ 0.25 per fry with 5 cents profit