

Facility Management

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5th Annual International Zebrafish Husbandry Course
Buguggiate, Italy 2016

Overview of Topics

Managing the people

- Training
- SOP's
- Protocol drift
- Continuing education

Managing the space

- allocation of resources
- tank space
- reducing bottlenecks
- per diems
- cost recovery

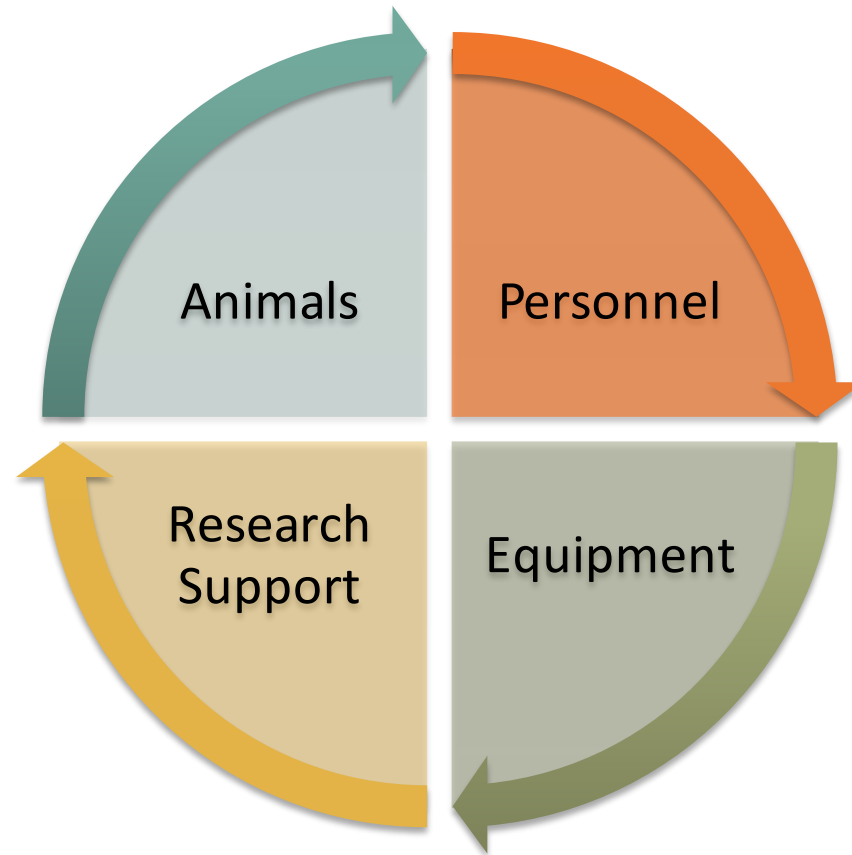
Managing the husbandry

- Feeding
- Spawning
- Sanitation

Facility Management - Scope

Facility Management

The integration of processes within an organization to maintain and develop agreed services which support and improve the effectiveness of its primary activities.



What Type of Facility do you have?



Laboratory Managed Facility

- small to medium in size
- little to no dedicated animal care staff
- researchers usually provide husbandry
- Lab manager



Core Facility

- Any size, often medium to large
- dedicated animal care staff
- researchers don't provide care, but do line maintenance
- PI and Facility manager



Closed Core Facility – Full Service

- Any size, often medium
- dedicated animal care staff
- researchers don't provide care and don't handle animals
- all in room operations are provided by the facility
- Facility manager and techs

User Groups

- Animal Technicians
- Research Assistants
- Cage Washing Techs
- Fish Technicians
- Facility Manager



Husbandry
Staff



Research
Staff



Facility
Services



Outside
Contractors



Zebrafish Facility

User Groups

- Post Docs
- Graduate Students
- Visiting Scientists
- Undergrad Assistants
- PI's



Husbandry
Staff



Research
Staff



Facility
Services



Outside
Contractors



Zebrafish Facility

User Groups

- Facility Services
- Electricians/
- Plumbers
- Janitorial
- Building managers
- HVAC
- Service Contracts (cage wash/CLS/racks)
- Construction
- Inspectors



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Research
Staff



Facility
Services



Outside
Contractors



Zebrafish Facility

User Groups

Each group can impact the health, welfare, and function of the facility

- Training
- Readily available SOP's
- Reinforcement with Postings
- Communication



Husbandry Staff



Research Staff



Facility Services



Outside Contractors

Zebrafish Facility

Training and Communication

Training is required for addition to Animal Care and Use Protocols

Theoretical

Animal handler training, lab safety, Zoonosis
(classes, quizzes, videos)
**Institutional*

Practical
Onsite

Hands on training for specific techniques, SOP's
(real world exposure and training)
**Facility Managers and lead techs*
***PI's and Lab Managers*



*

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Research Staff



Facility
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Outside
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Training and Communication

Specific training is usually not required to perform maintenance in animal rooms

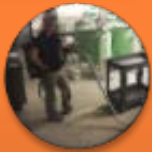
Proactive Approach

Facility manager and technicians must educate all maintenance personnel on all important aspects of being in a fish room

- environmental condition
- entry policies
- back up needs

**Facility operations manager*

***Project or building manager*



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Research Staff



Facility
Services

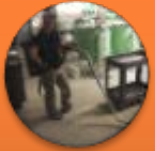
*



Outside
Contractors

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Training Records



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Research
Staff

Individual Training Records

- Log sheet with all tasks
- Trainer initials
- SOP reference
- Date of initial training
- Date of scheduled follow up
- Trainee initials

Employee:

Initial Training Date:

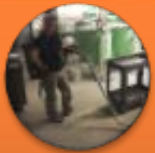
All employees are trained on the job. A task is marked complete when the employee shows sufficient competence to complete the task unsupervised. Employees may or may not be trained to complete all tasks listed below.

Initial Basic Training			
PROTOCOL	TRAINER(s)	Date	Initials
Biosecurity and Facility Access			
Zebrafish Euthanasia (Juvenile and Adult) and Carcass Disposal			
Facility Feeding Schedule and Instructions			
Fish Housing/Stocking Densities			
Tank Identification			
Room Sanitation			
Fish Room Daily Check and appropriate responses			
Daily Health Check and Tank Survey			
Quarantine Entrance Policy			
Quarantine Feeding, Health Checks, Sanitation			
PPE – Personal Protective Equipment			
Sharps Use and Disposal			
Potential Zoonotic Diseases			
Location of Safety Equipment			
Supplemental Training – Provided as Needed			
PROTOCOL	TRAINER (s)	Date	Initials
Food Production: Adult Flake and Juvenile Powder			
Food Production: Artemia (Brine Shrimp)			
Food Production: Artemia Decapsulation			
Food Inventory			
Zebrafish Line Maintenance			
Fish Spawning			
Tank and Equipment Sanitation			
Embryo Bleaching			
Zebrafish Anesthesia			
Monitoring Infectious Diseases (SPF testing) - Histology			
Monitoring Infectious Diseases (SPF testing) - PCR			
Shipping: Adult fish, Juvenile Fish, and Embryos			
3X Buffered Tricaine Solution Production			
Embryo Medium Production			
Anesthetized Procedure: Fin Clipping for Genotyping			
Water Quality Testing			
Water System Maintenance - All			
Water System Maintenance - FSI Filter change only			

Readily Available Information

SOP binders are available at facility entry point

-Check in sheets can help track entry in the event of a problem



Husbandry
Staff



Research Staff



Facility
Services



Outside
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- Facility entry guidelines
- All animal care SOP's
- Emergency contacts
- ACUP's

- Facility entry guidelines
 - what tools can come in?
- Facility maps
- Environmental conditions
- Emergency contacts

Standard Operating Procedure (SOP)

A **standard operating procedure**, or **SOP**, is a set of step-by-step instructions compiled by an organization to help workers carry out routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply to industry regulations. -wikipedia

Title

Purpose for the SOP

Materials needed to complete task

Methods: step by step instructions

Any pertinent archival information

EMBRYO BLEACHING PROTOCOL

Purpose: All embryos raised within the SPF facility must be bleached using this protocol prior to being introduced to the fish system.

Materials:

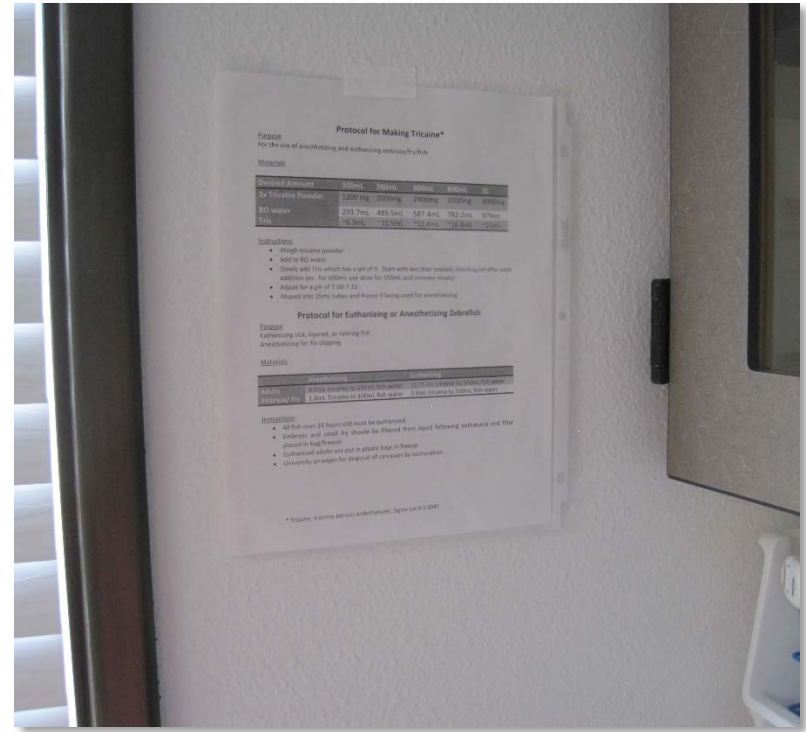
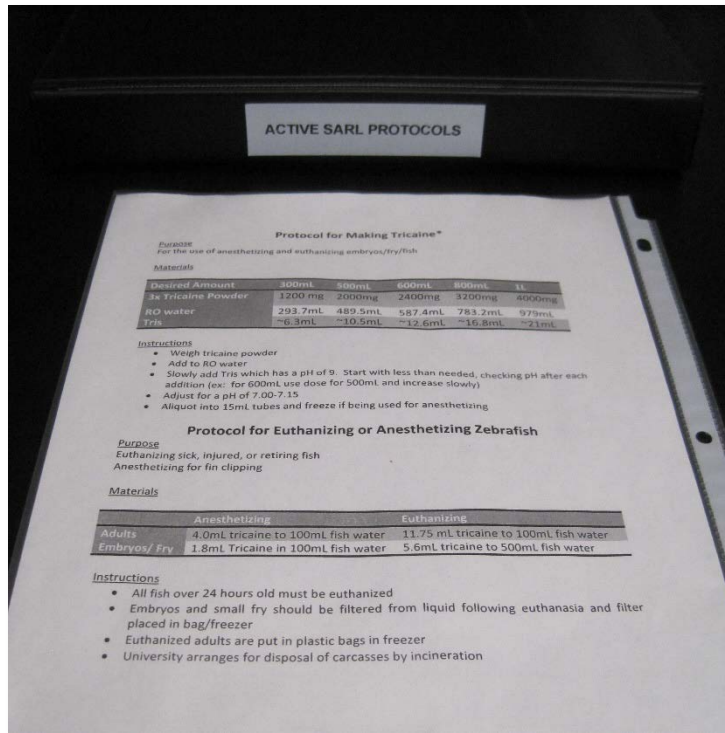
200mL fish water
700-1000 ml E2 Embryo Medium (w/o methylene blue) – for rinsing
500ml RO water, warmed (28°C)
3 one liter polycarbonate or glass dishes
Embryo bleaching strainer
225µL 5% sodium hypochlorite (J.T. Baker brand preferably)
Timer
E2 embryo medium + methylene blue (150ml/100 embryos bleached) + for post bleach embryo housing

Method:

- Fill dishes as listed below
 - Dish #1: fill with 200mL fish water
 - Dish #2: fill with 500mL RO; add 225µL 5% sodium hypochlorite
 - Dish #3: fill with 700-1000mL embryo media
- Place strainer in dish #1 and rinse embryos into it using fish water
- Place embryo strainer into dish #2 (containing bleach solution), simultaneously starting timer for a 5 minute exposure
- Gently swirl embryos in solution to ensure complete exposure to bleach
- After 5 minute exposure, place embryo strainer into dish #3 (E2 embryo media rinse)
- This rinse cycle should last for at least 5 minutes, gently swirl embryos to ensure removal of all bleach
- After rinse is complete, move embryos into Petri dishes with E2 embryo medium + methylene blue. Wait at least 15 minutes to evaluate viability after bleaching.
- Distribute embryos into Petri dishes with E2 embryo medium + methylene blue.
 - Density should not exceed 100 embryo per 150mm Petri dish, or 50 per 100mm Petri dish

SOP's - Technical

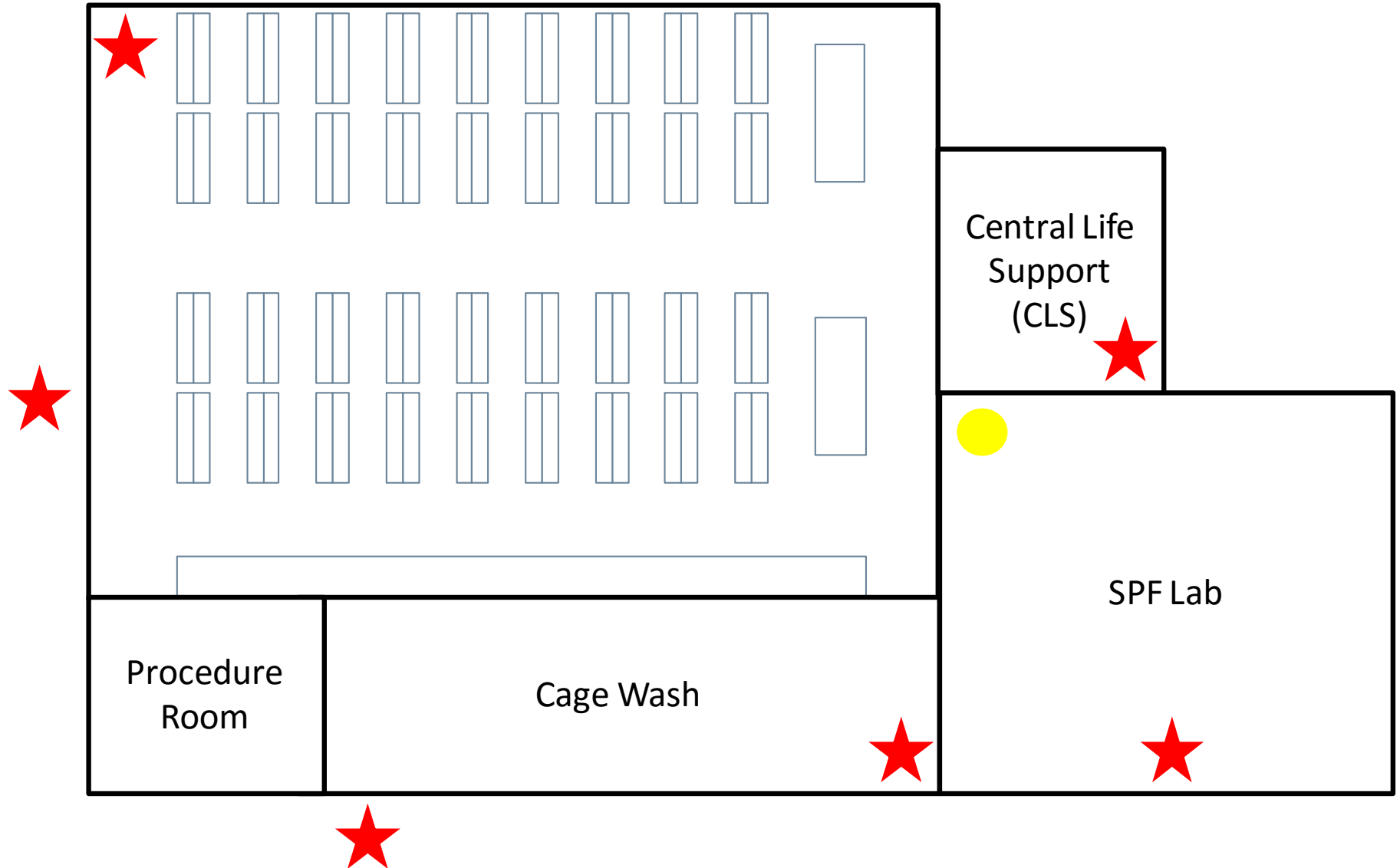
SOP's and Quick Reference Sheets



- Making Tricaine for euthanasia and anesthesia
 - How to euthanize or sedate fish
 - Laminated copies for use in the facility

Readily Available SOP's - Visual

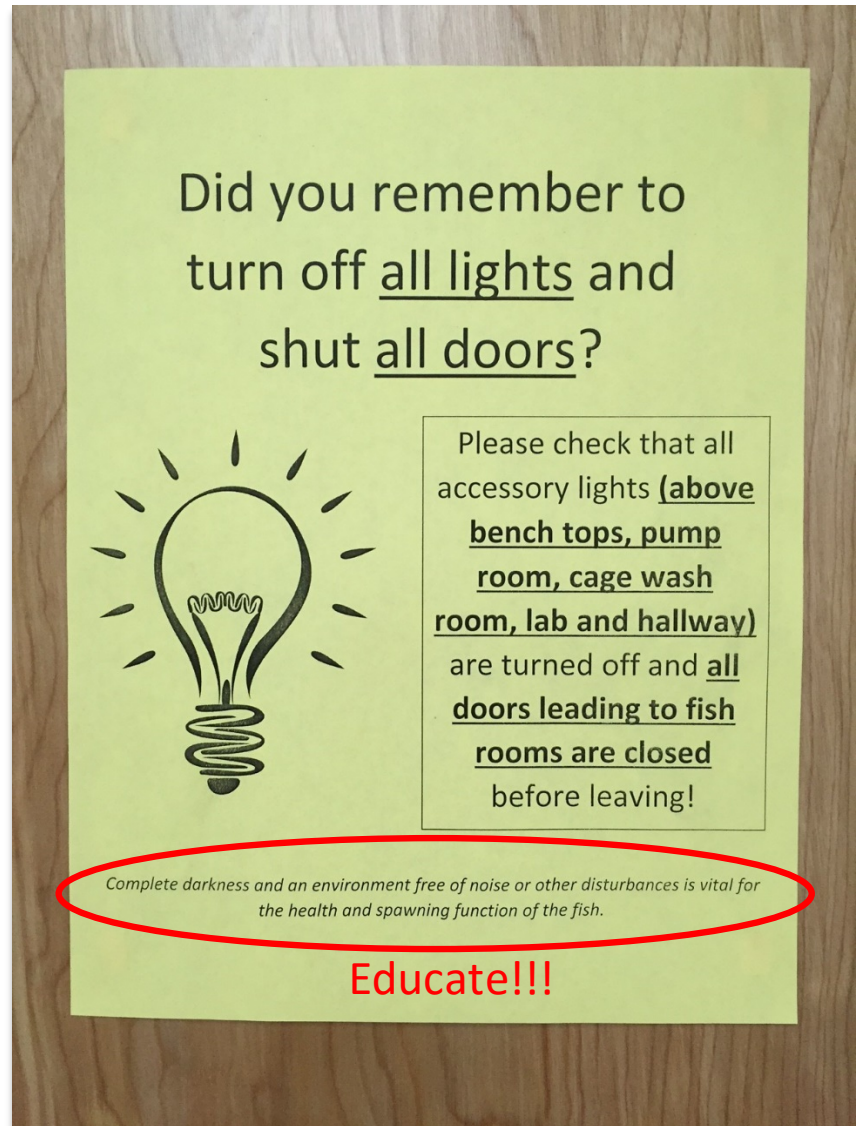
Facility Maps - HVAC



Reinforcement with Postings



Reinforcement with Postings



Protocol Drift

Protocol drift is the sometimes gradual change in how a protocol is performed, that ultimately results in an incorrect end result, or unfavorable side effects.

Often done with the intention of saving time or simplifying a process

Example: Technician A determines that it is faster to distribute dry feed when it is suspended in water and squirted into each tank with a bottle or pipette.

Outcome: Feed loses valuable nutrients before going into the tank, slowing growth rates and impacting larval survival.

Protocol drift can also occur when the training chain of command breaks down.



Protocol Drift – Correcting a Drift

Finding protocol drift

- observe tasks
- scheduled and spontaneous observation times

Avoiding protocol drift

- periodically review time given to do tasks – Is it realistic?
- regularly provide immediate feedback
- encourage open communication with and between staff members
- schedule time for training and retraining, and Q & A sessions
- accommodate different learning styles if needed
- provide tools to ensure compliance
- ensure all necessary equipment to do task correctly is present

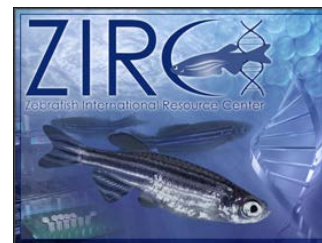
Husbandry Staff – Management Considerations

- **Create defined schedules that allow staff to self manage**
 - **Distribute tasks equitably between staff members**
- Provide opportunities for continuing education and growth
- Identify strengths and create specialty tasks within these areas
- Use less desirable work to create team building opportunities



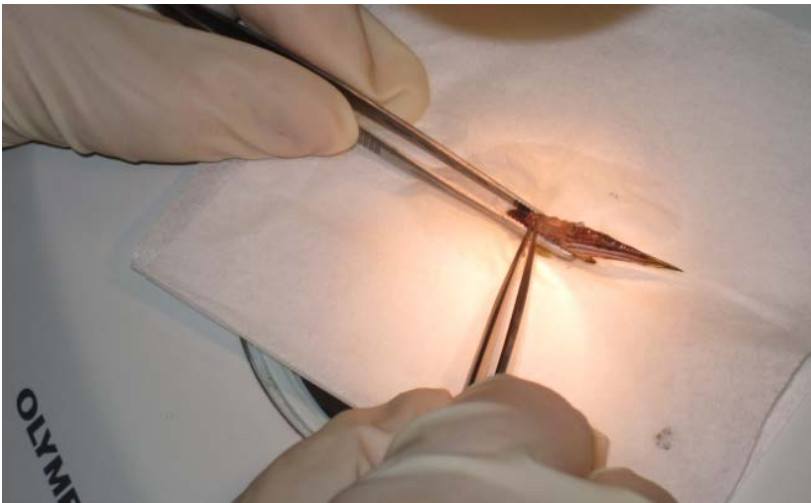
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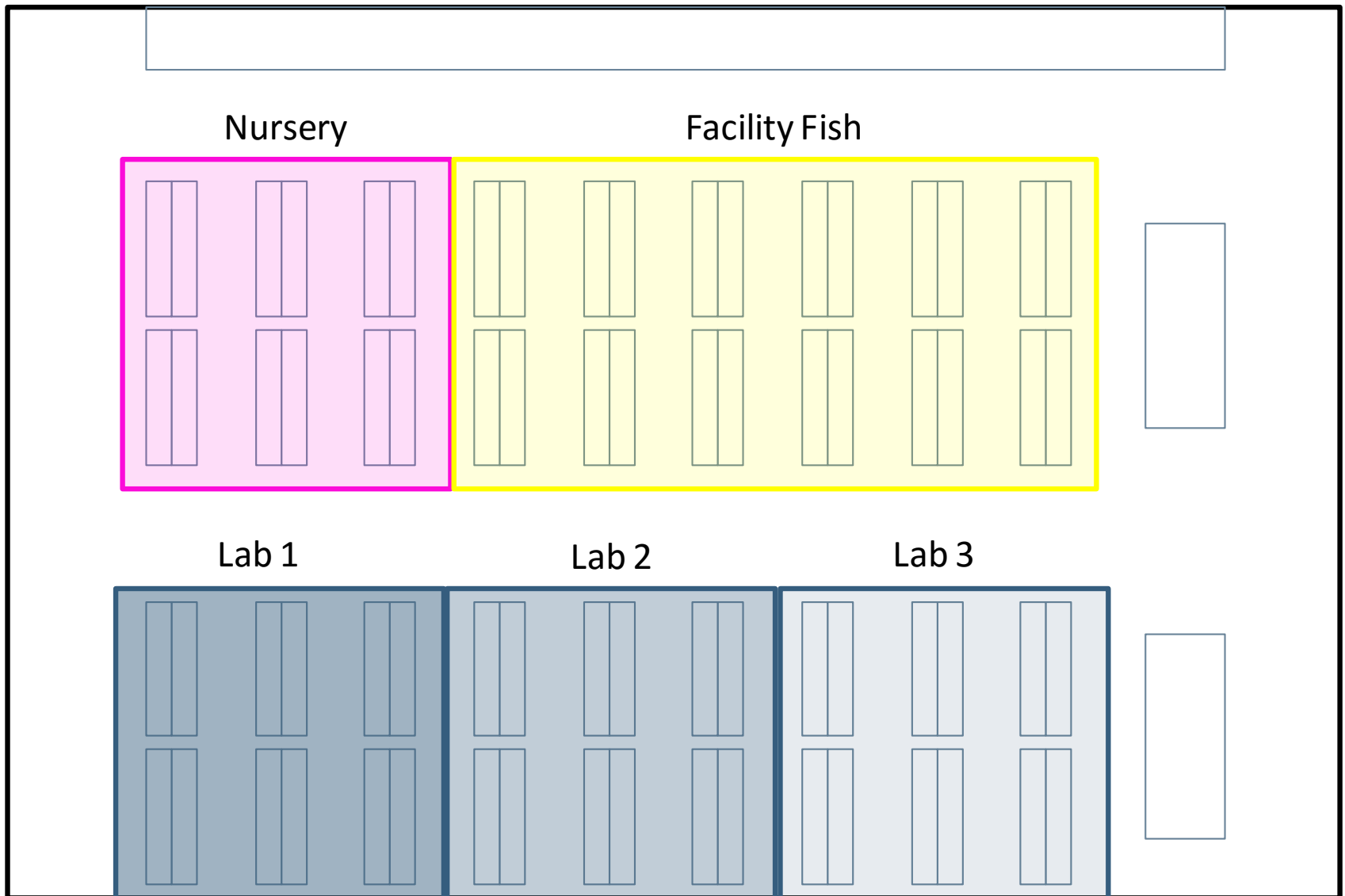


New techniques, project support, husbandry research

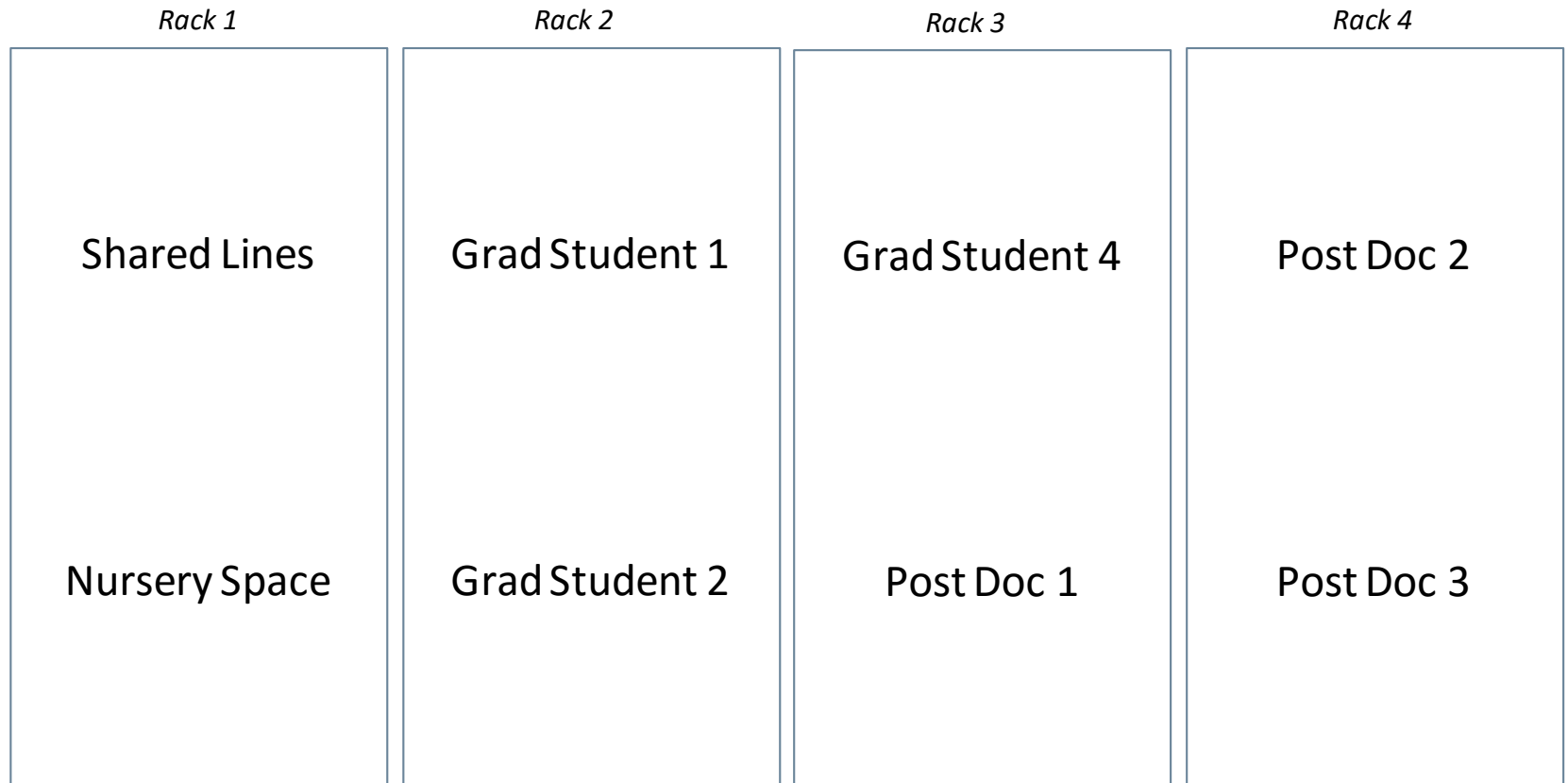


Ensure equitable contributions!
Don't let one employee carry the team!

Facility Organization – Space Allocation – Core Facilities



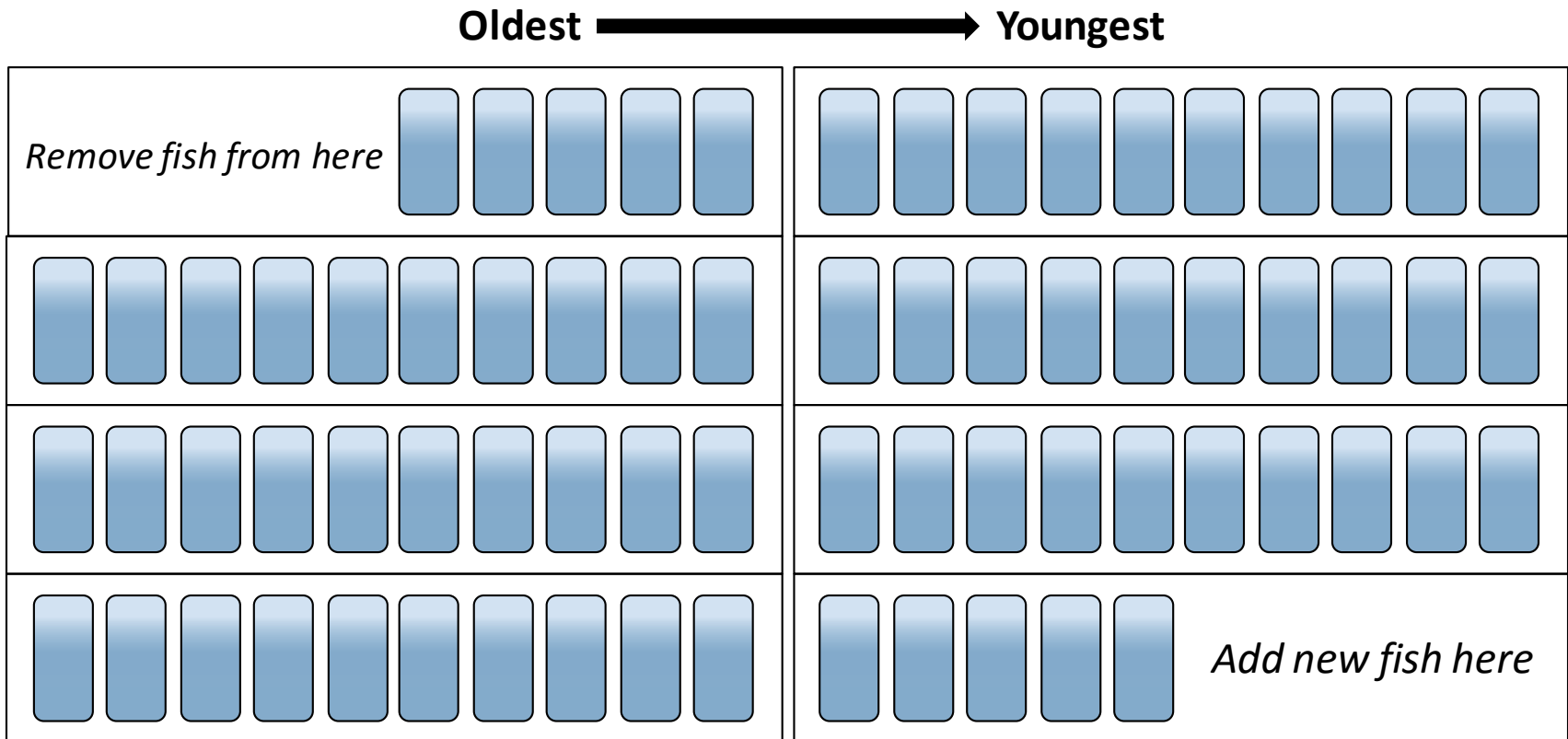
Facility Organization – Space Allocation – Lab Facility



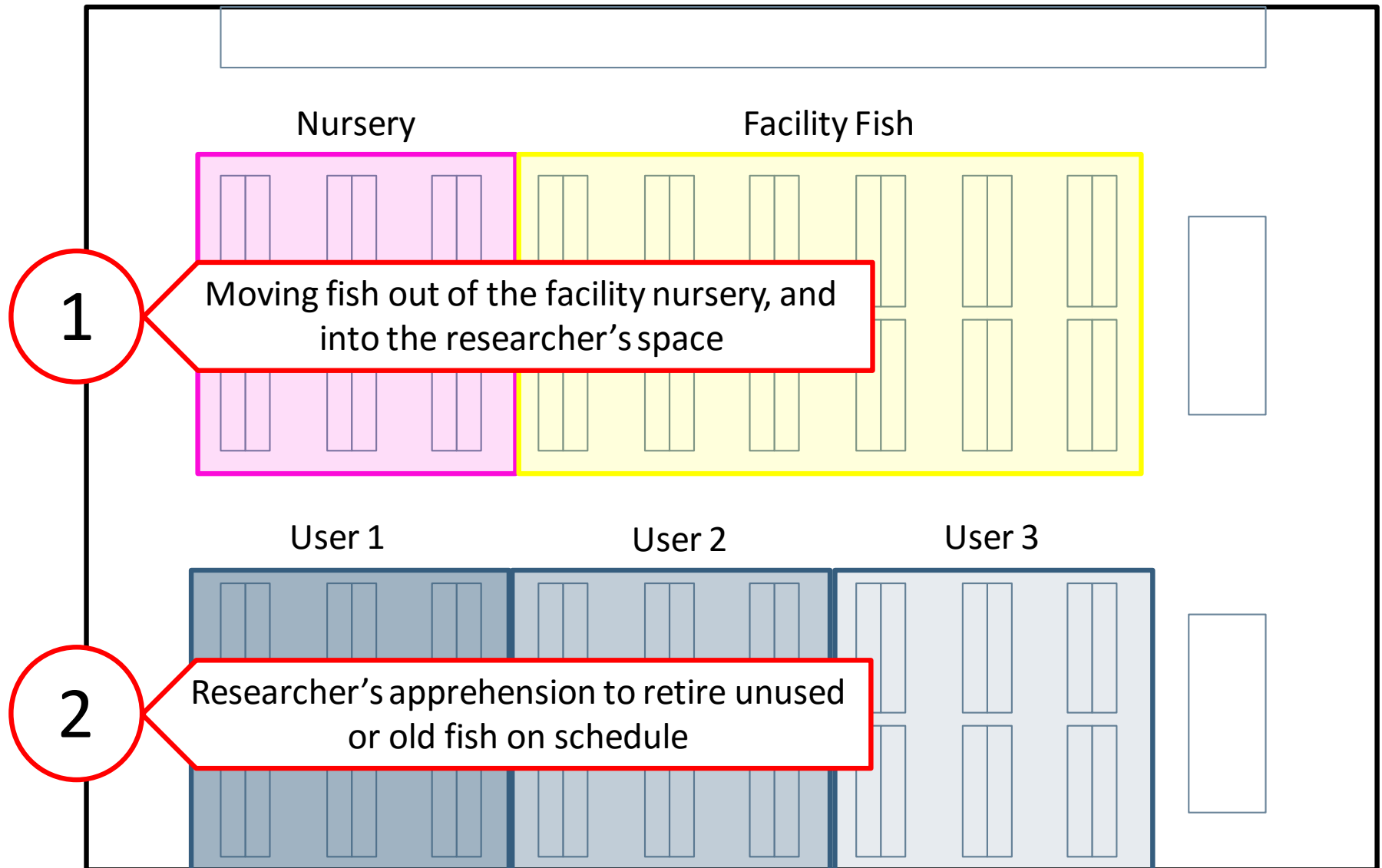
Facility Organization – Nursery

Create rotation system that:

- 1) allows researchers to know where to put fish
- 2) organizes the fish by age and ultimately feed size



Facility Organization – Bottlenecks



Facility Organization – Bottlenecks

An effective system to prevent bottlenecks related to tank space in the main facility is to:

- 1) Create a sign up and occupancy system that accounts for maximum capacity in both researcher space and nursery that has notifications for impending fish transfers
- 2) Impose increased per diem rates or penalties for non-compliance
- 3) Education users about the implications of elderly fish and the impact on whole colony health

Procedure Spaces

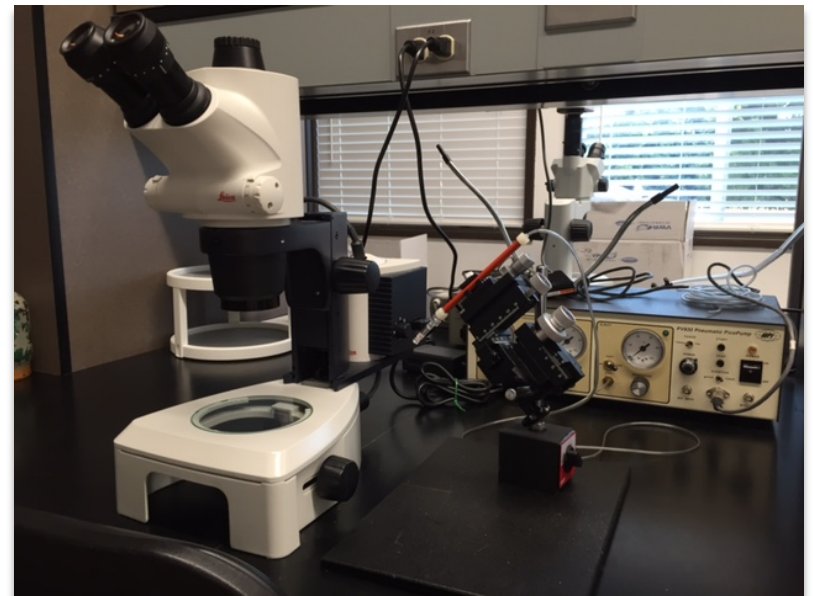
Create sign up system and log book

- help mitigate overlaps*
- track equipment usage*
- identify problems*

Determine who is responsible for equipment repair, consumables, and service contracts!

- Fee book system?*
- Rolled into per diem?*
- University core support?*

Ensure equitable system for all users



Facility Per Diem

Determine total operating expense per tank or per animal, at all stages within the facility.

- Nursery
- Grow out
- Adult tanks
- Quarantine
- Special services

Example:

Facility	Cost per tank (3.5L) Per day (Adult)	Cost per tank (3.5L) Per day (nursery)
WASHU-MCDS	\$0.1430	\$0.27

Typically within a per diem system, all other associated expenses are captured.

Fee Book Model

Tank charges similar to per diem system:

Fish housing/husbandry – tank rate or fish/embryo procurement

Operating expenses

Supplies

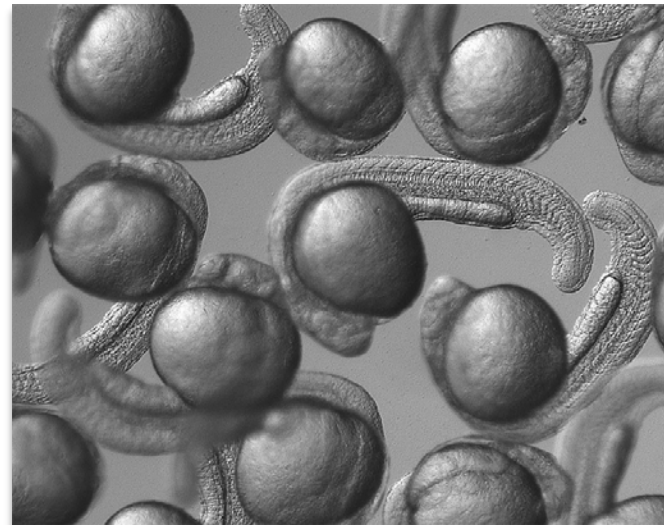
PPE

Independent fees for specific services:

Special procedure support (microinjections, mutant line maintenance, dissection

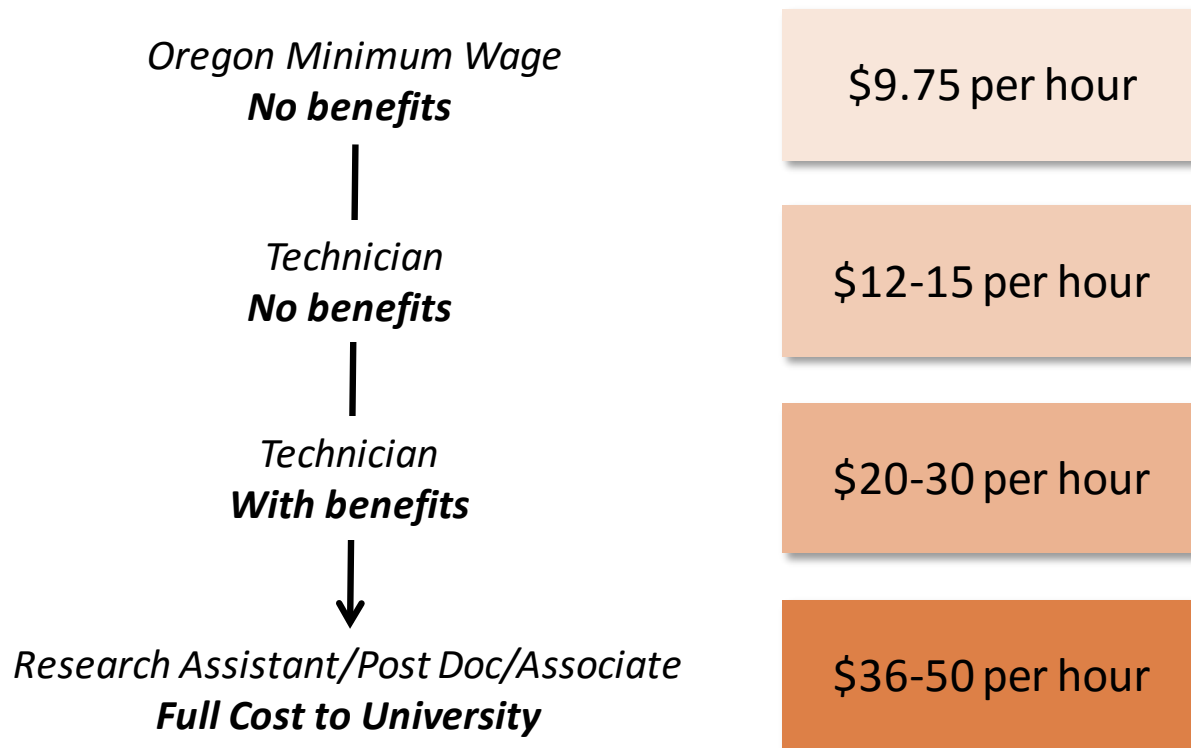
Equipment usage (microscopes, PCR equipment, etc)

*Good alternative for
facilities supporting a large
volume of labs exclusively
using embryos or offering
more technical support or
full service closed core
facilities*

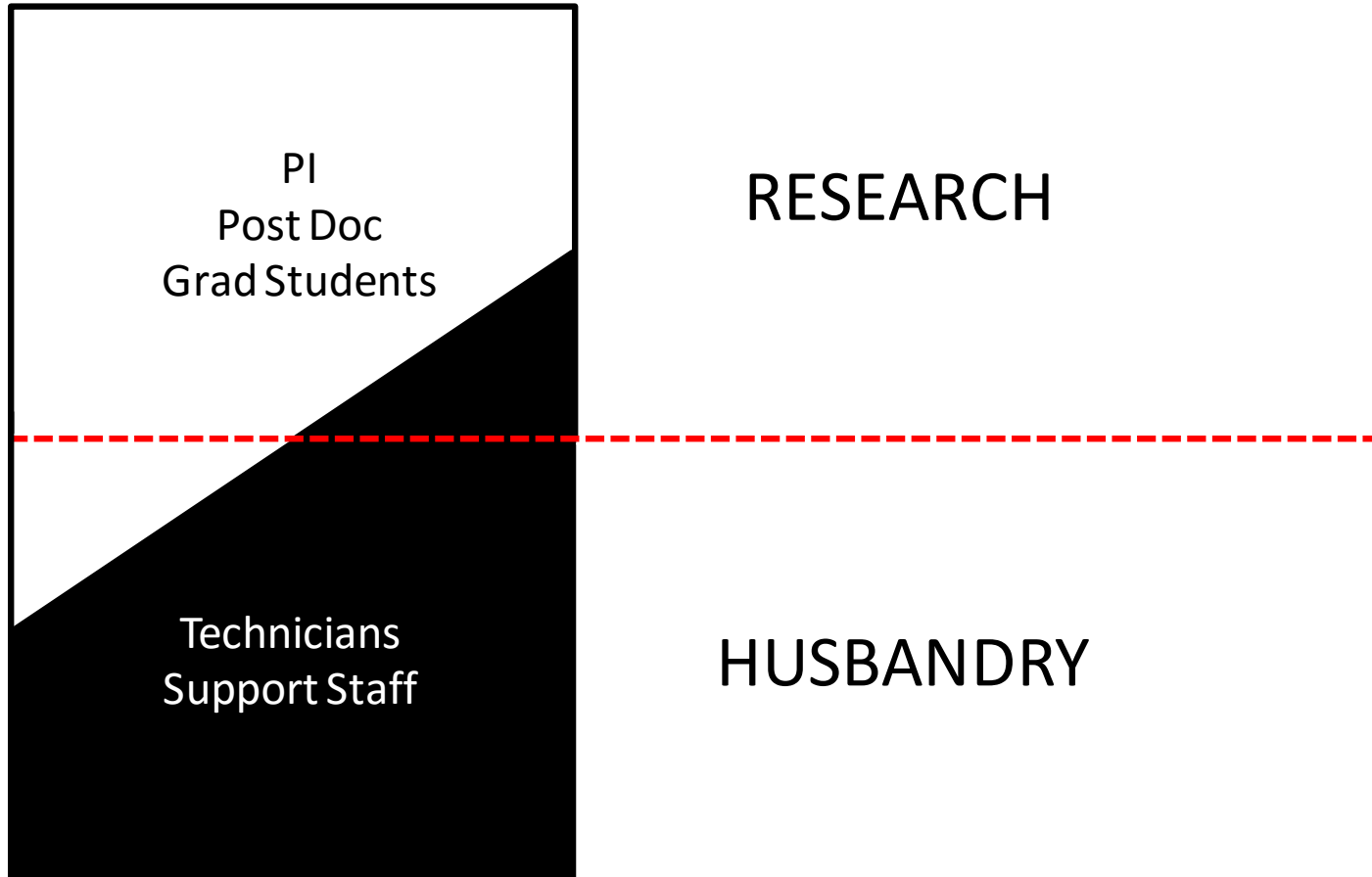


Labor Cost Assessment

Who does the labor in your facility or lab and what does it cost?



Cost Assessment



Most cost effective and productive approach is when everyone works within their specialty

Husbandry

Feeding



Spawning



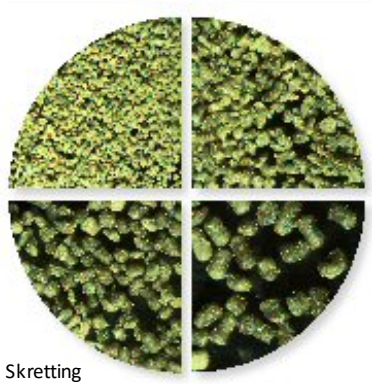
Sanitation



Feeding – Types of Feed

Determine food type (and size) for all life stages

Processed

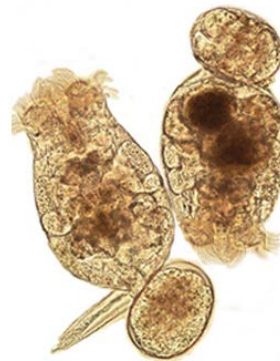


Skretting

Live Feeds



Reed Mariculture



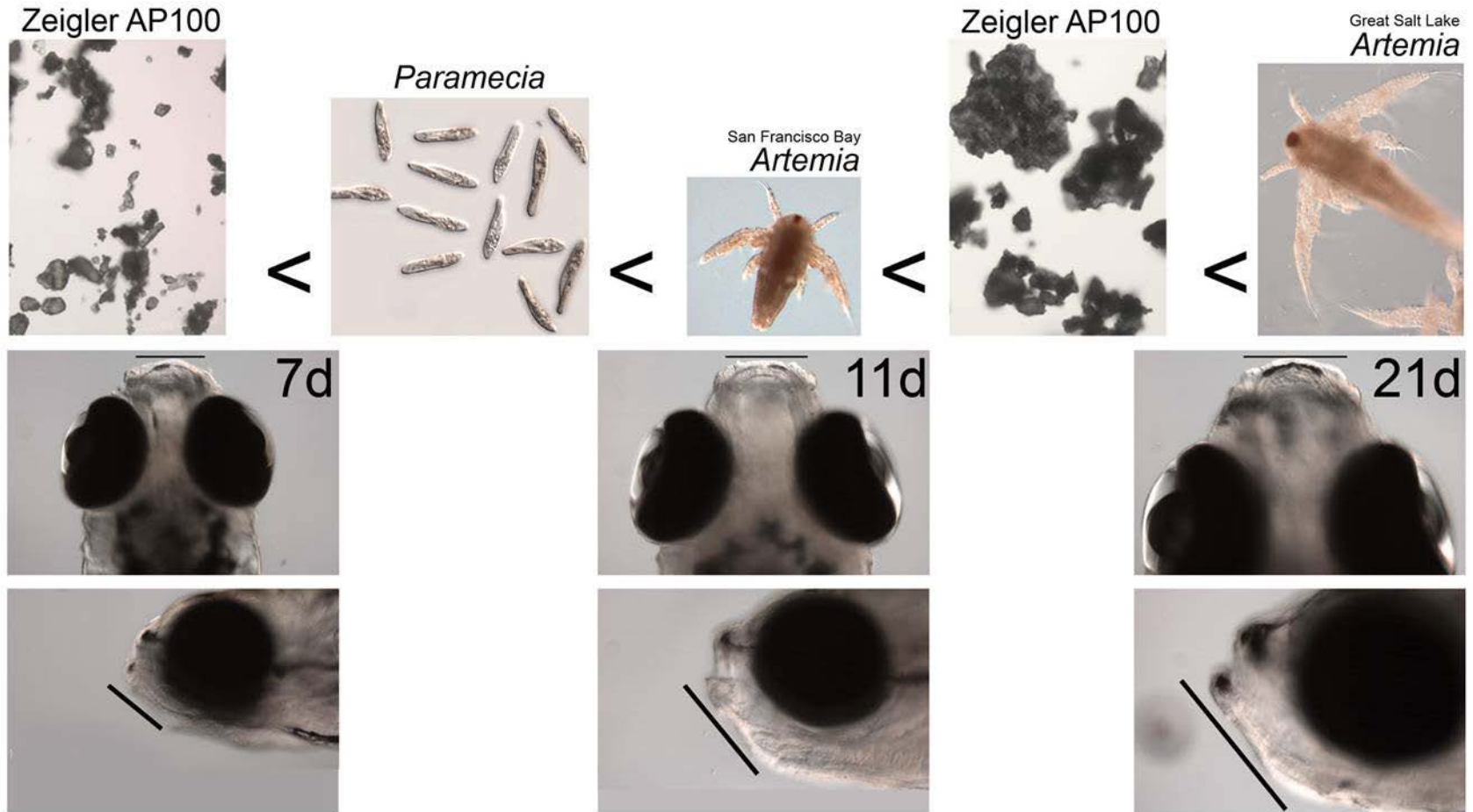
http://www.aquacare.de/produkte/pflege-zucht/e_kult_art.htm



Skretting

Match micron size to appropriate
size range of fish
-gape size
-width

Feeding – Gape Size vs Food Size

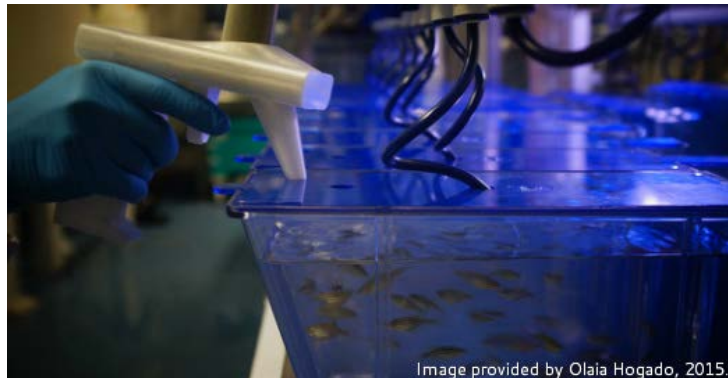


Feeding – Distribution to Tanks

From spoons to robots!
Feed delivery options are evolving

However.....
Limitations with each include:

- Lack of accuracy
- Limited adjustability
- Difficulty cleaning
- Residue on lids
- Proprietary nature
- Fragility

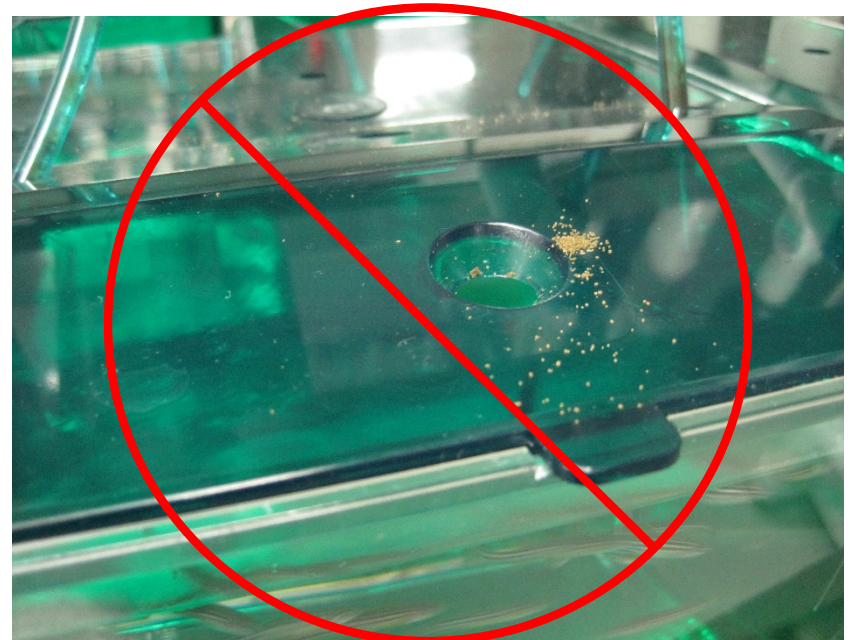


Feeding

Regardless of distribution tool, set expectation for delivery!

-emphasize precision over speed

-lid changes post feed can reinforce proper execution



Feeding

Develop color code for accurate and fast delivery

**75 micron
5-20dpf**

**150 micron
20-60dpf**

**300 micron
60dpf – Adult**

**500 micron
Brood Stock Tanks**

Label tanks, feed bags
and aliquots



Feeding

Set feeding schedule and reinforce system with easy to read postings

Include key points such as:

- Time range
- Feed type
- Portion per tank
- Delivery mechanism

Facility Feeding Quick Reference

AM Feeding: 8:00am-10:00am

Color	Size of Tank	Volume of Feed
Red	2.8 L	¼ scoop
Yellow	2.8 L	¼ scoop
	6 L	1 scoop
	9 L	2 scoops
Orange	2.8 L	¼ scoop
	6 L	1 scoop
	9 L	2 scoops
Purple	Bulk Tanks	Instruction on each tank
Special Diets	2.8 L	¼ scoop
	6 L	1 scoop
	9 L	2 scoops

Mid-day Feeding: 12:00pm-1:30pm

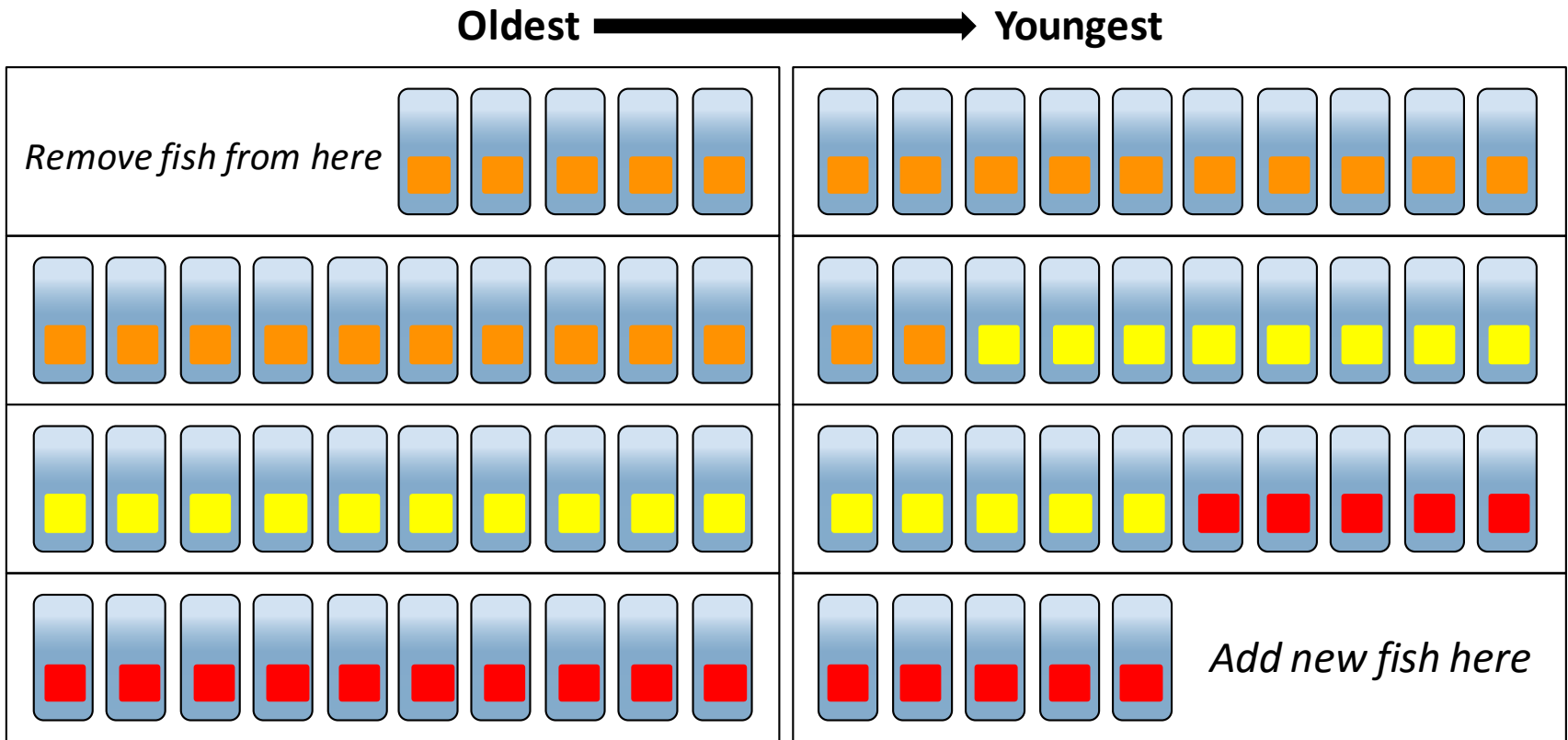
Color	Size of Tank	Volume of Feed
Red	2.8 L	¼ scoop
Yellow	2.8 L	¼ scoop
	6 L	1 scoop
	9 L	2 scoops

PM Feeding: 3:00pm-6:00pm

Color	Size of Tank	Volume of Feed
Red	2.8 L	¼ scoop
Yellow	2.8 L	¼ scoop
	6 L	1 scoop
	9 L	2 scoops
Orange	2.8 L	¼ scoop
	6 L	1 scoop
	9 L	2 scoops
Purple	Bulk Tanks	Instruction on each tank
Special Diets	2.8 L	¼ scoop
	6 L	1 scoop
	9 L	2 scoops

Feeding

In the room.....



Feeding

In the room.....



25.4mm Post It flag
-*inexpensive*
-*nonabsorbent*
-*repositionable*



Spawning Effects Fish Health!!

Rotation system benefits heavily and minimally used animals

- Color code on tank label is a visual cue of animal status
- Helps prevent over and under spawning
- Reduction of egg associated inflammation (egg bound)
- Works well for situations with multiple users
- Improved spawn success



Joerg Mayer, DVM, 2002



www.zebrafish.org

How does it work?

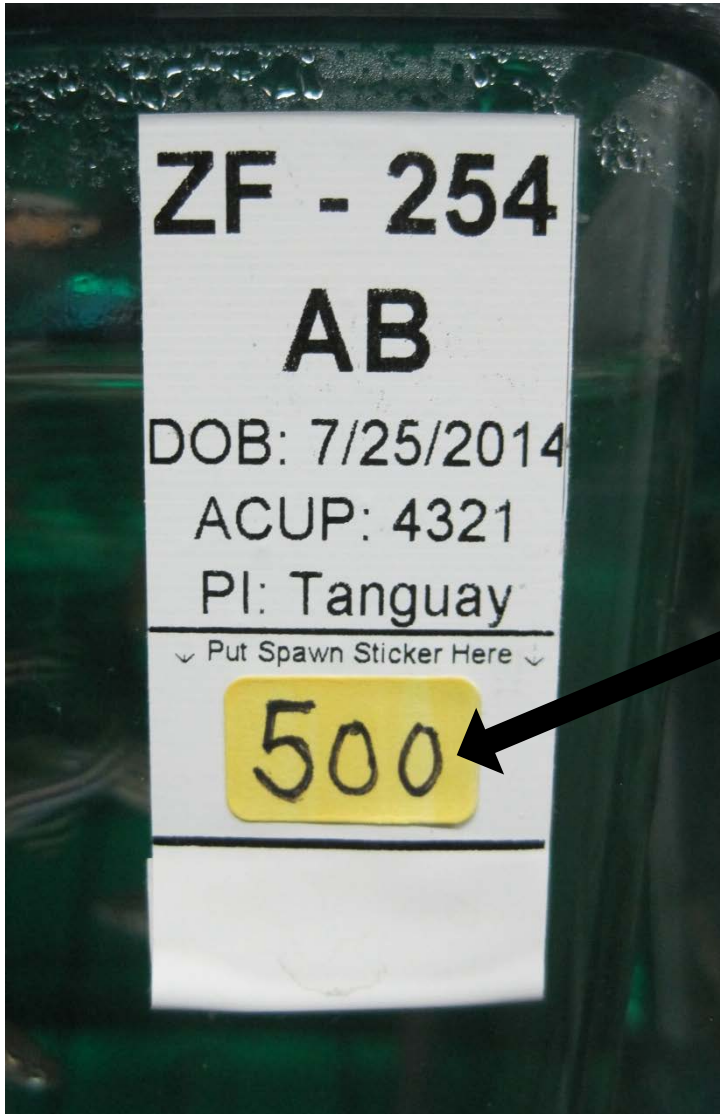
- Every tank is on a breeding rotation
- Maintenance spawns every 4-6 weeks
- Color coded chart in fish room dictates the rotation
- Tanks are flagged with color that matches week of spawn
- Researchers can see when their animals will be spawned
- Bulk spawning devices can help with larger stocks

In Room Chart

- All tanks spawned within the current week are tagged by affixing a small flag to their tank label.
- This color is used as an indicator of how long ago the tank was spawned.
- Researchers and staff can easily see when the tank was used last by matching the label color to the rotation chart.

Spawn Rotation	
This Week	current week
1 Week	1 week since spawn
2 Weeks	2 weeks since spawn
3 Weeks	3 weeks since spawn
4 Weeks	4 weeks since spawn
5 Weeks	5 weeks since spawn
Spawn NOW!	6 weeks since spawn

In Room Chart



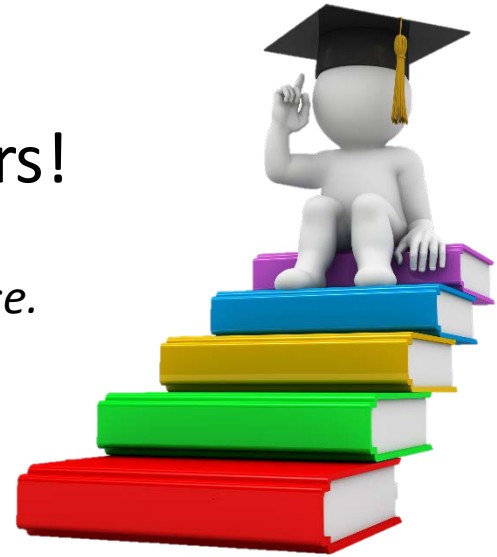
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This Week	current week
1 Week	1 week since spawn
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3 Weeks	3 weeks since spawn
4 Weeks	4 weeks since spawn
5 Weeks	5 weeks since spawn
Spawn NOW!	6 weeks since spawn

Spawning for Research Support

Lab spawned lines: Educate your users!

Don't just provide rules, explain why the rules are in place.



Points to Address:

- Reproductive cycle (spawn frequency based on oocyte production)
- Light cycles (gated spawns)
- Gender isolation and effect on reproduction
- Appropriate sex ratios
- Appropriate set up times

Room Sanitation

Carts – Counters - Benchtops

- Require all surfaces to be cleaned immediately after use
- All counters and benchtops cleaned at days end
- Carts: hosed down & sanitized (or cage washed) at days end

Education Users on Importance of Sanitation

- Ensure all users understand both human health and fish health implications of contaminated surfaces
- Incorporate these principals into your training program
- Provide information regarding environmental sampling



Room Sanitation

Floors – Trenches - Drains

- Some facilities opt to hose and squeegee daily and sanitize weekly
- Shoe covers/dedicated shoes/sticky mats help decrease excess dirt
- Plan major floor sanitation for low traffic times or weekends

How Often you Sanitize these areas will depend on:

- Amount of foot traffic (open vs. closed core)
- PPE requirements (street shoes vs dedicated shoes)
- Entry vestibule procedures
- How much tank waste ends up on the floor

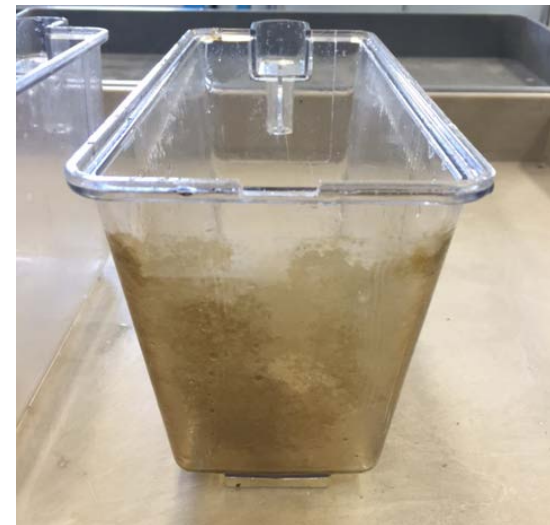


Tank Change Outs

When is a tank dirty?

- Algae
- Food debris (tank bottom, baffles, lids)
- Biofilm
- Bryozoans
- Fish waste

Determine baseline for what a dirty or clean tank looks like and inform all users of what is acceptable.



Tank Change Outs

Facility Wide Rotation



Pros

Creates a more even work load
No subjectivity

Cons

Preemptive change outs may occur
Potential disruption to research staff

VS. Tank cChanges as Needed



Pros

No excess tank changing
Little disruption to research staff

Cons

Subjective
Difficult to regulate work load



RACK MAINTENANCE NOTICE

This rack is schedule for routine maintenance and will be unavailable on the day and time listed below.

For questions contact the facility manager or lead technician on duty.

Date: _____

Time: _____

Work Being Done: _____

Questions?