Alternatives

Web Resources

Altimiras J, Larsen E (2000) **Non-invasive recording of heart rate and ventilation rate in rainbow trout during rest and swimming. Fish go wireless!** *Journal of Fish Biology* 57(1):197-20
NAL Call No. QL614 J68
Resting heart rates and ventilation rates in rainbow trout *Oncorhynchus mykiss* at 15°C are 31.8 plus or minus 1.8 beat/min and 53.1 plus or minus 3.7 breaths/min, respectively. The non-invasive recording system picked up the bioelectric potentials generated by the fish in the water and was based on an array of six silver-silver chloride electrodes covered with agar-gel, which provided a better signal-to-noise ratio than in previously described systems, and allowed the determination of heart rate and ventilation rates at different swimming speeds up to 2 l s super(-1). In concert with the lower rates, the scope for changes in heart rate and ventilation rate during swimming was also considerably larger than in earlier studies (2.4- and 2.0-fold, respectively). Two main conclusions result from this work: (i) short recovery times under 48 h after anaesthesia and surgery are unlikely to provide truly resting heart rates and ventilation rates in trout at 15°C; (ii) heart rate regulation during exercise is more important than previously thought and might account for a larger proportion of the increase in cardiac output observed in swimming trout.
Descriptors: biological surveys, respiration, swimming, fish physiology, heart, *Oncorhynchus mykiss*, rainbow trout, alternative, fish

Dawson VK, Meinertz JR, Schmidt LJ, Gingerich WH (2003) **A simple analytical procedure to replace HPLC for monitoring treatment concentrations of chloramine-T on fish culture facilities.** *Aquaculture –Amsterdam.* 217(1-4):61-72
NAL Call No. SH1 A6
Descriptors: monitoring, model, procedure, chloramines-T, measurement, fish, alternative

Decostere A, Turnbull JF, Ducatelle R, Haesebrouck F (2000) **Development of a gill perfusion apparatus for studying the interaction of fish pathogens with gill tissue.** *ATLA, Alternatives to Laboratory Animals.* 28 (1):53-61
NAL Call No. Z7994 L3A5
The association of gill pathogens with the branchial tissue was studied using an isolated perfused gill preparation. The gill preparation consisted of an excised branchial arch from common carp (*Cyprinus carpio* L., minimum weight 300 g), perfused via the afferent branchial artery. Filtered and heparinised Cortland solution was used as the perfusion fluid and infused by means of a

drip (3-litre bag). The average perfusion rate was 1.5 ml/min/arch/kg body weight. The outflowing perfusate was collected from a cannula in the efferent branchial artery. The individual gill arch was suspended in a circular organ chamber filled with Ringer solution, which was aerated and kept at a constant temperature of 20°C. Unperfused gill arches maintained in Ringer solution at the same temperature were controls. Cortland solution proved to be a satisfactory perfusion fluid, maintaining the perfused gills in a healthy condition for at least 4 h with no, or only slight, oedema after 90 min, and slight or moderate oedema after 4 h. The unperfused gill displayed excessive necrosis and loss of architecture after 4 h. It is concluded that the Cortland perfused gill apparatus could be an alternative ex vivo model for studying early interaction of gill associated pathogens with the branchial tissue.
Descriptors: gills, disease models, necrosis, oedema, in vitro, animal welfare, fish diseases, perfusion, carp, Cyprinus, fishes

Fiksen O, MacKenzie BR (2002) **Process-based models of feeding and prey selection in larval fish.** *Marine Ecology - Progress Series.* 243:151-164
NAL Call No. QH541.5 S3M32
Descriptors: model, fish, larvae, feeding, prey selection, alternative

Fredriksson DW, Swift MR, Irish JD, Tsukrov I, Celikkol B (2003) **Fish cage and mooring system dynamics using physical and numerical models with field measurements.** *Aquacultural Engineering.* 27(2):117-146
NAL Call No. SH1A66
Descriptors: model, fish, cage, mooring, field measurement, alternative

Hernandez Molejon OG, Alvarez-Lajonchere L (2003) **Culture experiments with *Oithona oculata* Farran, 1913 (Copepoda: Cyclopoida), and its advantages as food for marine fish larvae.** *Aquaculture –Amsterdam.* 219(1-4):471-483
NAL Call No. SH1A6
Descriptors: fish, nutrition, larvae, alternative food source

Iglesias R, Parama A, Alvarez MF, Leiro J, Aja C, Sanmartin ML (2003) **In vitro growth requirements for the fish pathogen *Philasterides dicentrarchi* (Ciliophora, Scuticociliatida).** *Veterinary Parasitology.* 111(1):19-30
NAL Call No. SF810 V4
Descriptors: vitro, fish, disease, *Philasterides dicentrarchi*, parasite, growth requirements, alternative

Li L, Yakupitiyage A (2003) **A model for food nutrient dynamics of semi-intensive**

pond fish culture. *Aquacultural Engineering.* 27(1):9-38
NAL Call No. SH1A66
Descriptors: model, fish, nutrition, aquaculture, nutrient dynamics, alternative

Naeve DA, Batty RS (1982) **A simple method for measuring fish larvae using silhouette photography.** *Aquaculture.* 29(1-2):165-168
NAL Call No. SH19 C53
A simple photographic technique for the rapid accurate measurement of fish larvae is described. It involves minimal handling of larvae and avoids the use of anaesthetic.
Descriptors: fish larvae, length, photography, equipment, measurement, methodology

Schmidtke LM, Carson J (2003) **Antigen recognition by rainbow trout (*Oncorhynchus mykiss*) of whole cell proteins expressed by *Lactococcus garvieae* when obtained directly from fish and under iron limited culture conditions.** *Veterinary Microbiology.* 93(1):63-71
NAL Call No. SF601 V44
Descriptors: antigen, immunologic response, *Lactococcus garvieae*, fish, iron, *Oncorhynchus mykiss*, rainbow trout

Sijm DTHM (1993) **Uptake of organic chemicals across fish gills: alternatives to the use of fish populations.** *Alternatives to Laboratory Animals.* 21 (4):453-456.
NAL Call No. Z7994.L3A5
In this study, the isolated perfused gills of rainbow trout (*Oncorhynchus mykiss*) provided a tool for fundamental research on the rate-limiting step in the uptake of organic hydrophobic chemicals. Data obtained using the isolated gills were comparable to those determined in vivo. Whereas several tens of fish need to be used to obtain statistically sound information on uptake rates in vivo, the isolated perfused gills method requires only three or four fish. A significant reduction in animal use is thus obtained.
Descriptors: rainbow trout, gills, animal welfare, animal testing alternatives, polychlorinated biphenyls, polycyclic hydrocarbons, chlorinated hydrocarbons

Suzuki K, Takagi T, Hiraishi T (2003) **Video analysis of fish schooling behavior in finite space using a mathematical model.** *Fisheries Research.* 60(1):3-10
NAL Call No. SH1F42
Descriptors: model, video, fish, schooling behavior, alternative

Zhao X, Ona E (2003) **Estimation and compensation models for the shadowing effect in dense fish aggregations.** *Ices Journal of Marine Science.* 60(1):155-163 ISSN: 1054-3139
Descriptors: model, fish, shadowing effect, alternative

Web Resources:

FADs for aquarium fish — an alternative capture method?
Lida Pet-Soede, Fini Lovita and Imam Musthofa Zainudin
http://www.spc.org.nc/coastfish/News/LRF/10/LRF10-12.htm

An Alternative Method For Sampling Small Benthic Fish In A Large Regulated River.
J.M. Howard and J.B. Layzer
http://www.benthos.org/meeting/nabs2000/nabstracts2000.cfm/id/436

Whole Effluent Toxicity (WET) Test Method Changes
Environmental Protection Agency
http://www.dnr.state.wi.us/org/water/wm/ww/biomon/Comments_on_EPA_Revisions.pdf

Sustainable Fish Farm at The Earth Centre (sustainable organic aquaculture)
http://www.fishace.demon.co.uk/index1.htm

Alternative Methods of Fish Disease Treatment
http://www.fishace.demon.co.uk/method4.htm#Alternative

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