



Using **D**ata **S**torage **T**ags to Study Fish Physiology and Behavior

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M.Sc. Proposal

Supervisor: Professor Kurt Gamperl



1. What are DSTs and their benefits?
2. Types of DSTs and their use.
3. How have DSTs been used in fish?
4. Validation of DST data.
 - Study 1 - Swim Tunnel
 - Study 2 – Free-Swimming Fish in Tank
5. Concluding Remarks

Who am I?



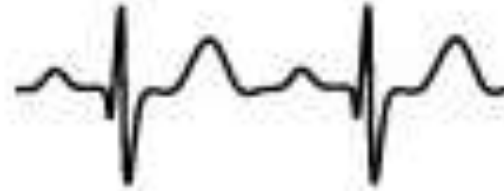
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What are DSTs?



Heart Rate DST



ECG

- Biologgers / archival tags
- Can be implanted internally or attached externally
- Tags with sensors that record physiological and / or environmental data
- Store data in the tag memory
- Best used when recapture is likely.....tag must be retrieved to download data

What are the Benefits of DSTs?






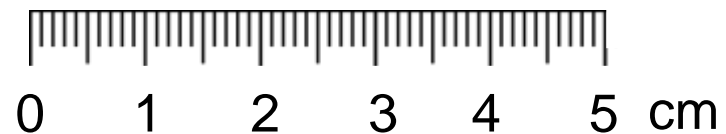
Compared to Other Methods:

- Short surgery time
- Record data continuously over long periods of time
- Adjustable measurement intervals
- Higher resolution data

Recently became smaller and less expensive, and now are more popular for use in fish.

Types of DSTs

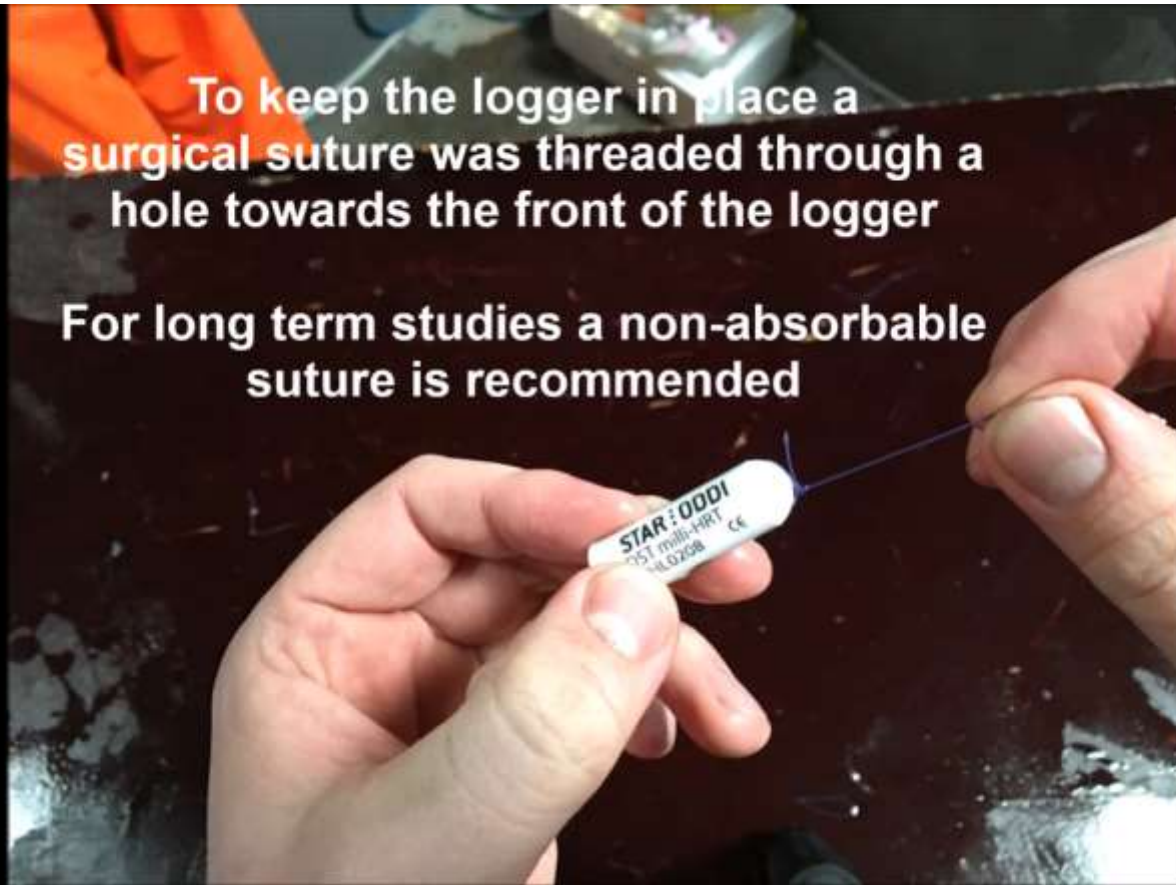
Name	Records	Attachment	
Centi-HRT ACT	<ul style="list-style-type: none"> heart rate acceleration body temperature 	<ul style="list-style-type: none"> internal 	
Micro-HRT	<ul style="list-style-type: none"> heart rate body temperature 	<ul style="list-style-type: none"> internal 	
Milli-F	<ul style="list-style-type: none"> depth water temperature 	<ul style="list-style-type: none"> internal or external 	

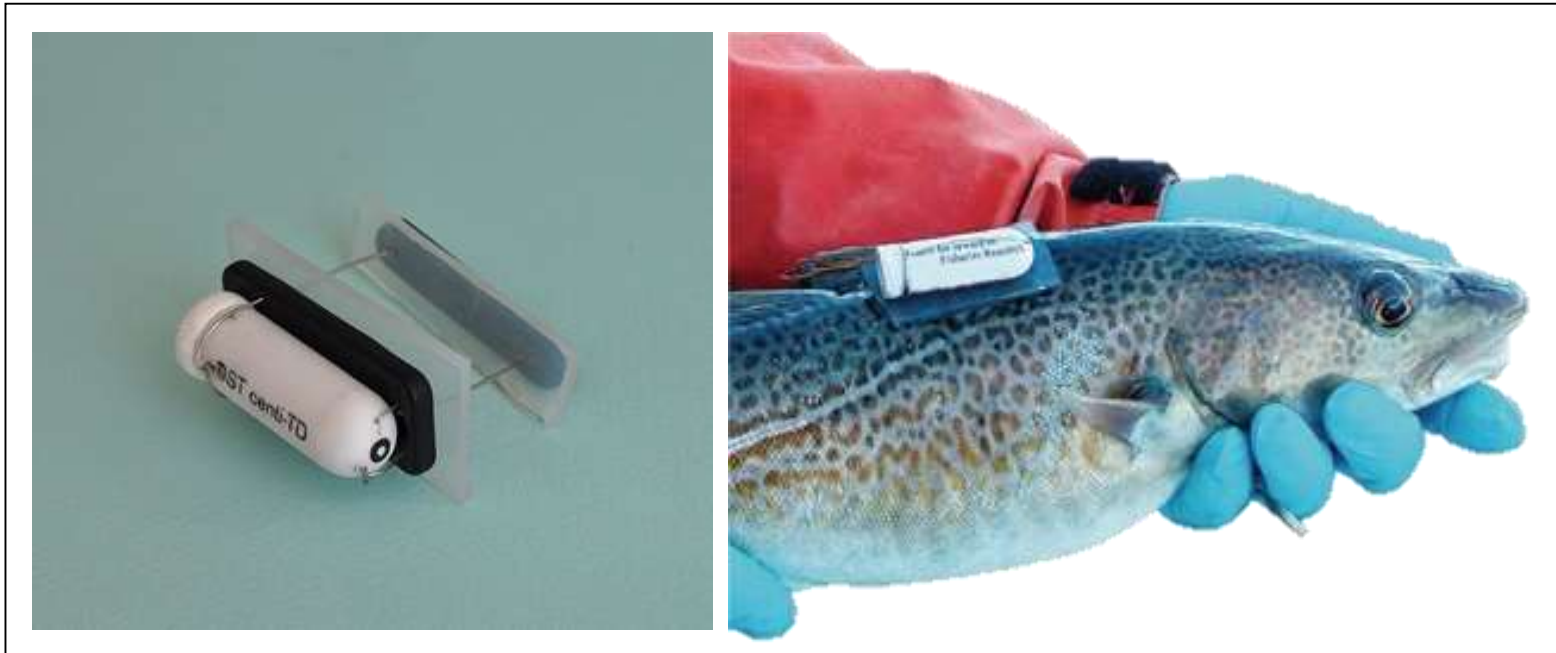


DST Implantation Into the Abdominal Cavity

To keep the logger in place a surgical suture was threaded through a hole towards the front of the logger

For long term studies a non-absorbable suture is recommended





External Tag Holder Kit

How have DSTs Been Used?

Conservation Physiology Volume 5 • 2017 10.1093/conphys/cox050

SEB Society for Experimental Biology

Research article

The influence of water temperature on sockeye salmon heart rate recovery following simulated fisheries interactions

Tanya S. Prystay^{1,2,*}, Erika J. Eliason³, Michael J. Lawrence², Melissa Dick², Jacob W. Brownscombe², David A. Patterson⁴, Glenn T. Crossin¹, Scott G. Hinch⁵ and Steven J. Cooke²

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²Fish Ecology and Conservation Physiology Laboratory, Department of Biology and Institute of Environmental Science, Carleton University, Ottawa K1S 5B6, Canada
³Department of Ecology, Evolution and Marine Biology, University of California, CA 93106, USA
⁴Fisheries and Oceans Canada, School of Resource and Environmental Management, Simon Fraser University, Burnaby V2R 5B6, Canada
⁵Department of Forest and Conservation Sciences, University of British Columbia, Vancouver V6T 1Z4, Canada



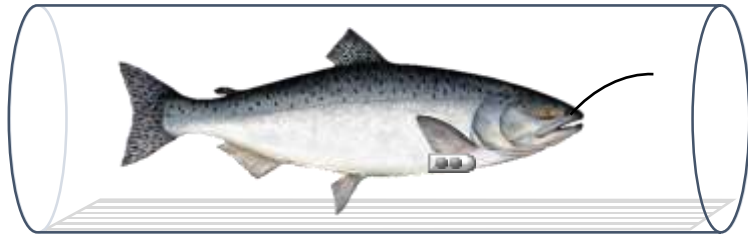
- How does temperature affect the recovery of fish following catch and release angling?
- Used DSTs to measure heart rate after a simulated angling event at different temperatures.
- Peak heart rate and energy required to recover increases with temperature... angling fish at higher temperatures is more stressful.



- Several benefits and uses
- Applicable to a wide range of research fields
- Few have assessed the validity and accuracy of data provided by DSTs
- No one has done this for Star-Oddi's new line of DSTs

Do DSTs provide physiologically-meaningful and accurate data?

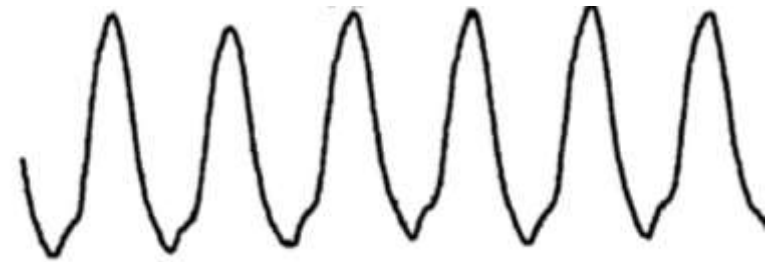
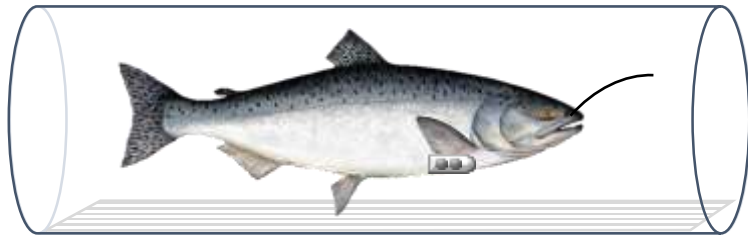
Swim Tunnel Respirometry



Methods:

- Implant heart rate / acceleration DSTs and dorsal aortic cannula (allows for measurement of blood pressure)
- Give 36 hours for recovery
- Record heart rate, blood pressure and acceleration at increasing swimming speeds (15-90 cm/s)

Swim Tunnel Respirometry

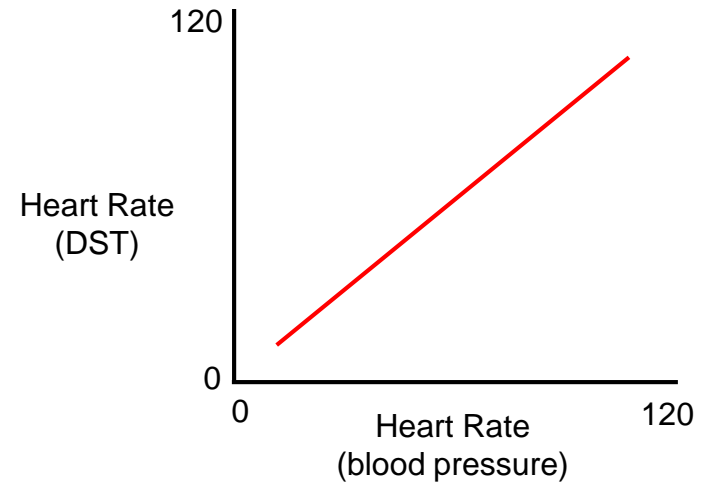
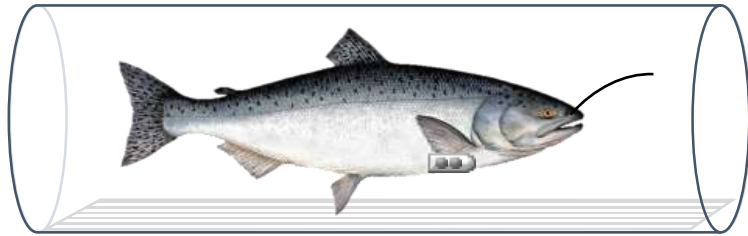


Blood Pressure Trace

Methods:

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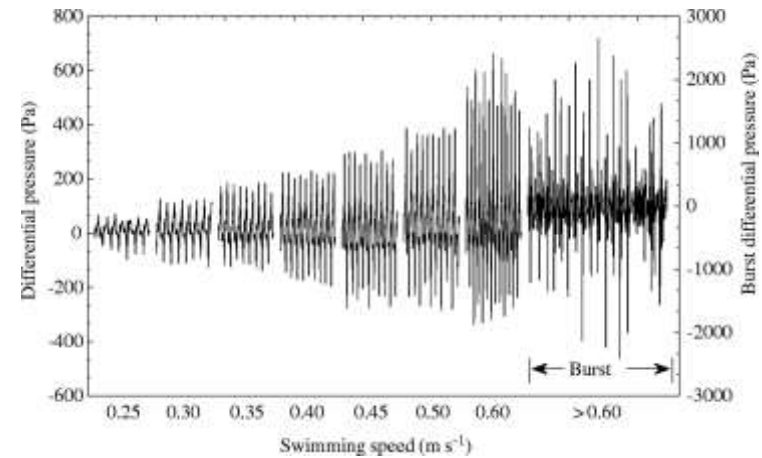
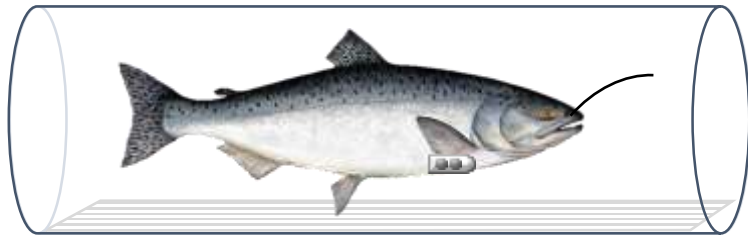
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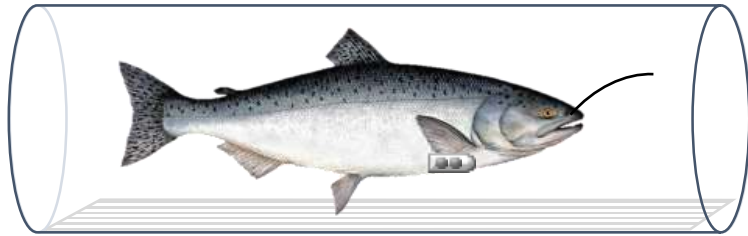
Swim Tunnel Respirometry



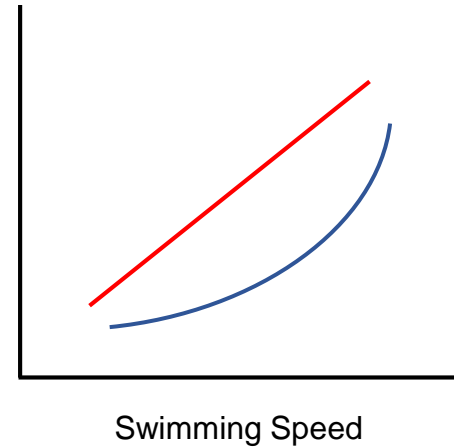
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Swim Tunnel Respirometry



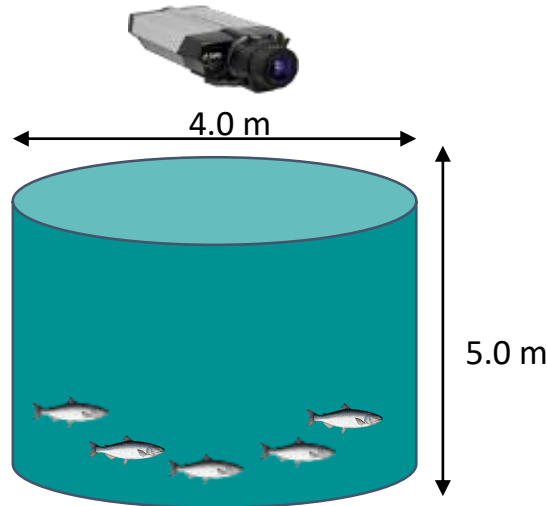
Acceleration



Methods:

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Tank-Based Experiment (Free-Swimming Fish)



Joe Brown Aquatic Research Building

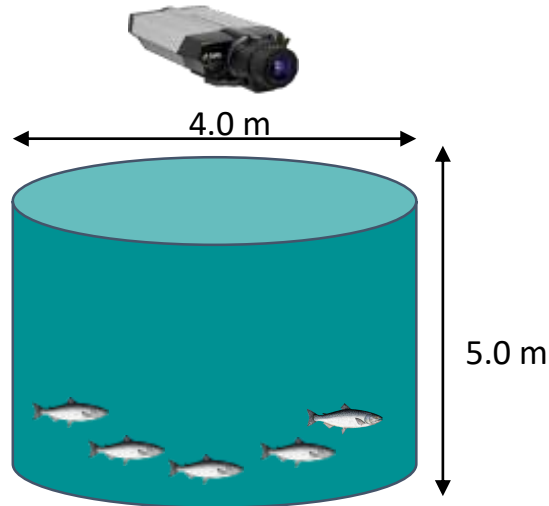


- Heart rate/acceleration
- Depth/temperature

Methods:

- Hold for in large tank for 4 weeks
- Record values during feeding and at different times of the day
- Record video with AXIS communication camera
- Euthanize in MS-222 to remove DSTs and recover data

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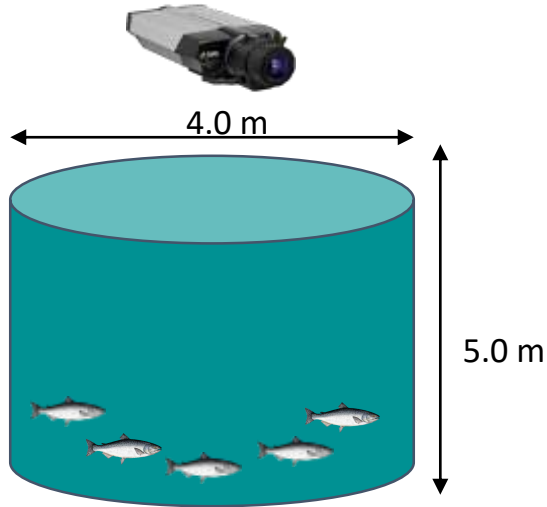


- Heart rate/acceleration
- Depth/temperature

Goals:

- Compare activity of tagged and non-tagged fish
- Compare activity recorded by video and DSTs
- Determine heart rate recovery time post-surgery

Tank-Based Experiment (Free-Swimming Fish)



- Heart rate/acceleration
- Depth/temperature

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Validation of DSTs as effective monitoring tools to study fish physiology and behaviour

