



Coeur d'Alene, Idaho
31 March – 4 April, 2003

*A Procedure to
Determine the
Biological Gradient of
Macroinvertebrates
to Stream Temperature*

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Purpose of this Project

- Determine a biological gradient for common macroinvertebrate taxa in response to stream temperature.
- Develop a metric to indicate the temperature regime of a stream.

Number of BURP sites with both Macroinvertebrate and temperature data	2607
Total taxa in database	1163
Taxa that occur in >2% of the samples	289
Taxa that appear to have a temperature response	137

Method for Determining Optimum and Tolerance

➤ Weighted Average

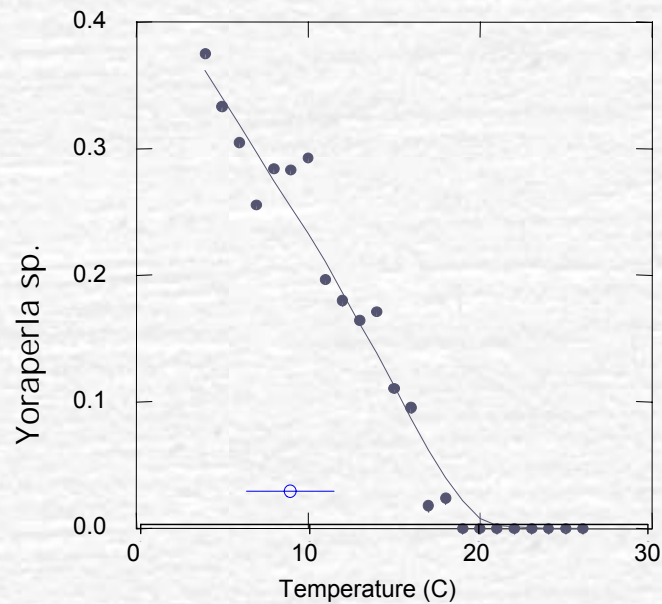
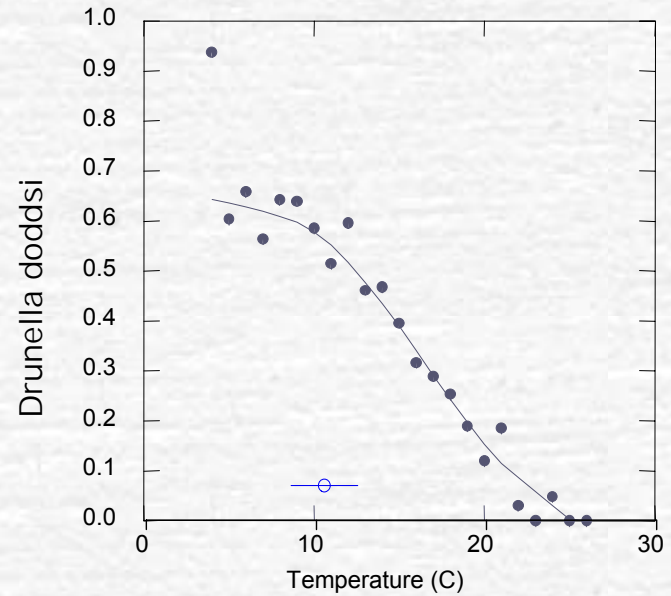
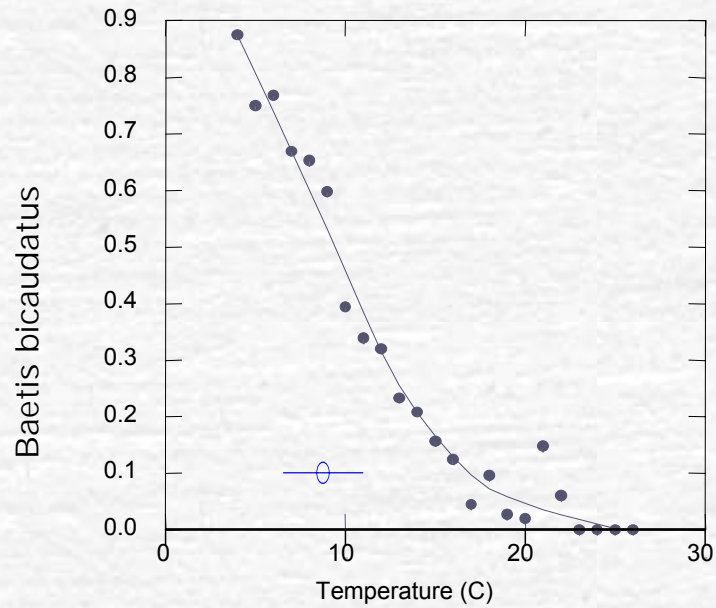
$$T_{\text{opt}} = \frac{\text{Temp} * \text{Proportion of time present}}{\Sigma \text{Proportion of time present}}$$

➤ Weighted Standard Deviation

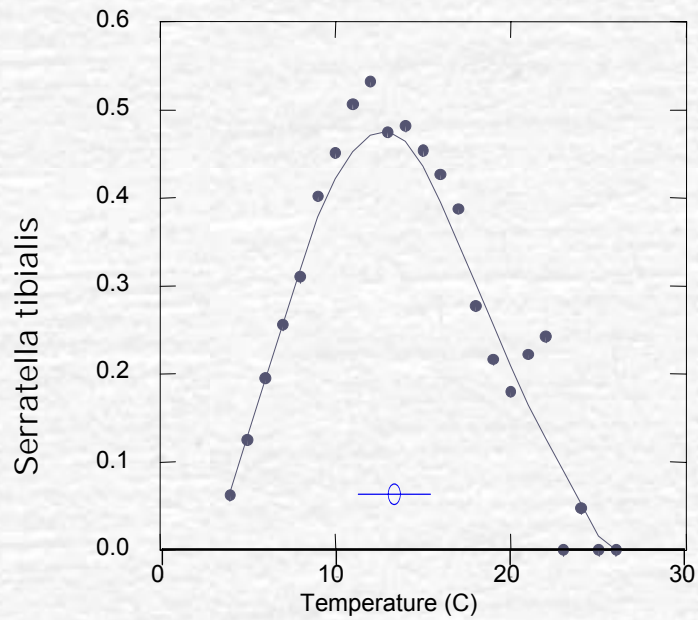
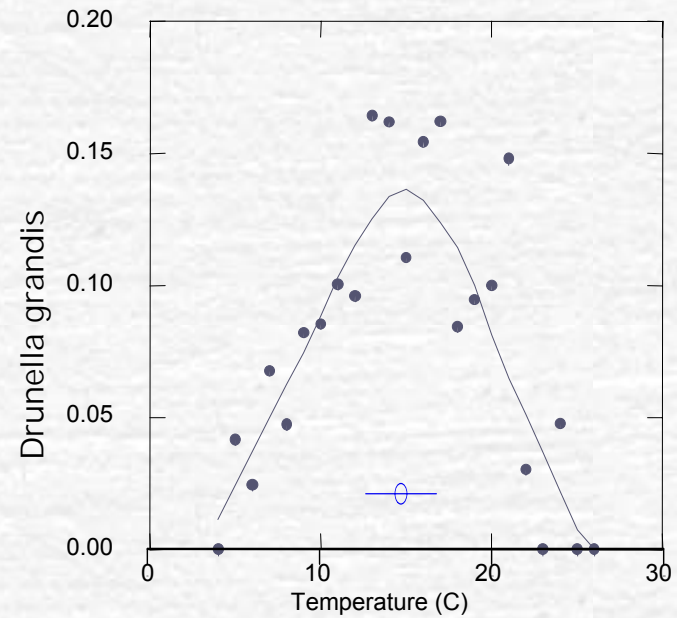
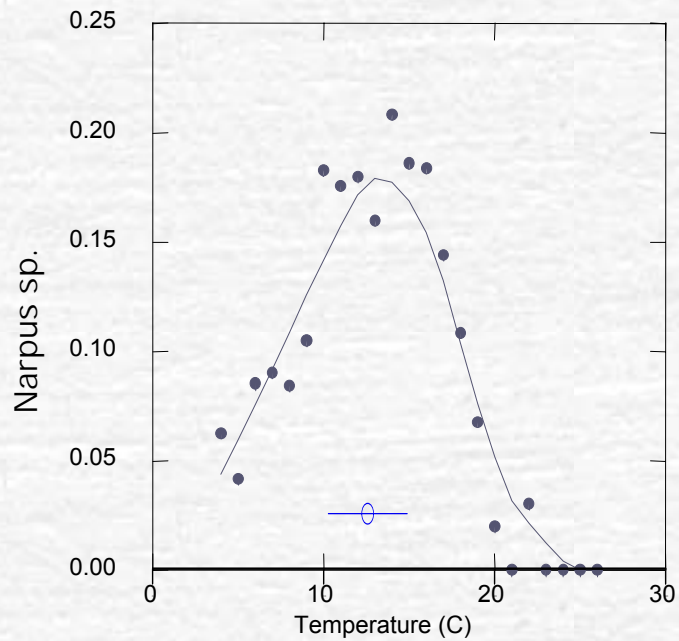
Method for Determination of Temperature Preference for individual taxa

Water Temperature	Ameletus sp.	Baetis bicaudatus	Baetis tricaudatus
4	0.19	0.88	0.25
5	0.44	0.75	0.48
6	0.27	0.77	0.43
7	0.30	0.67	0.53
8	0.31	0.65	0.58
9	0.28	0.60	0.71
10	0.26	0.39	0.80
11	0.28	0.34	0.83
12	0.26	0.32	0.88
13	0.31	0.23	0.85
14	0.25	0.21	0.91
15	0.21	0.16	0.94
16	0.23	0.13	0.89
17	0.20	0.05	0.88
18	0.14	0.10	0.86
19	0.14	0.03	0.78
20	0.06	0.02	0.82
21	0.07	0.15	0.89
22	0.09	0.06	0.76
23	0.00	0.00	0.89
24	0.10	0.00	0.71
25	0.00	0.00	0.70
26	0.00	0.00	1.00
Weighted Mean	11.50	8.76	16.04

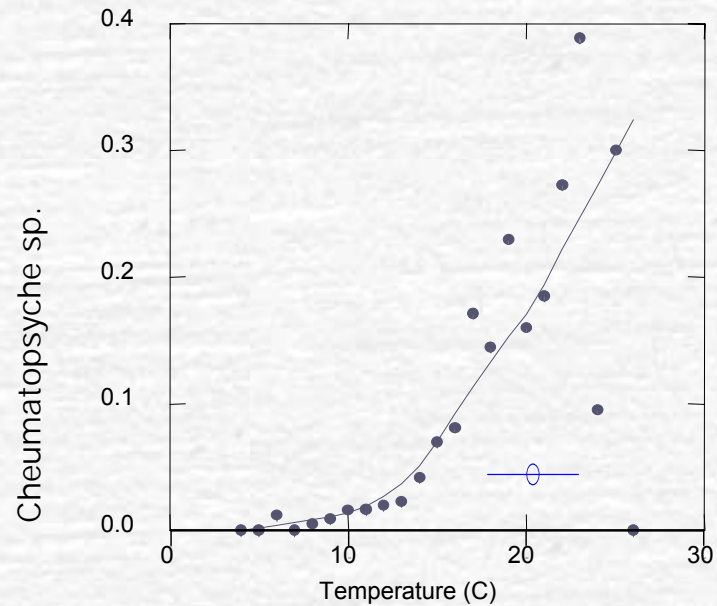
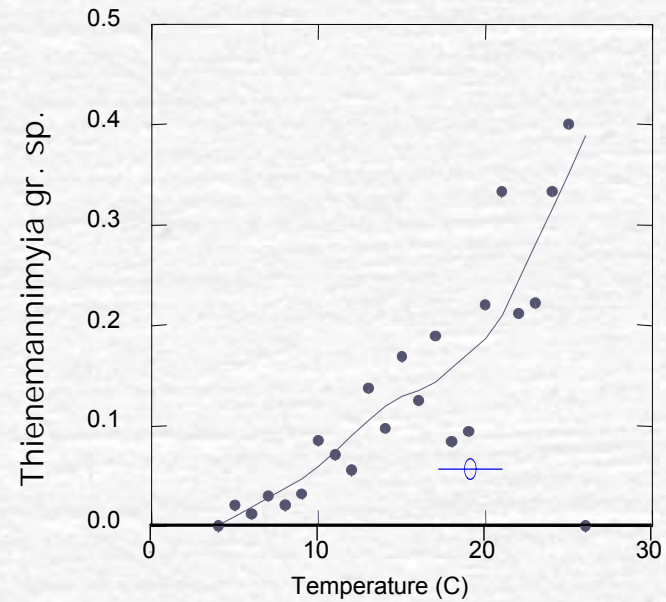
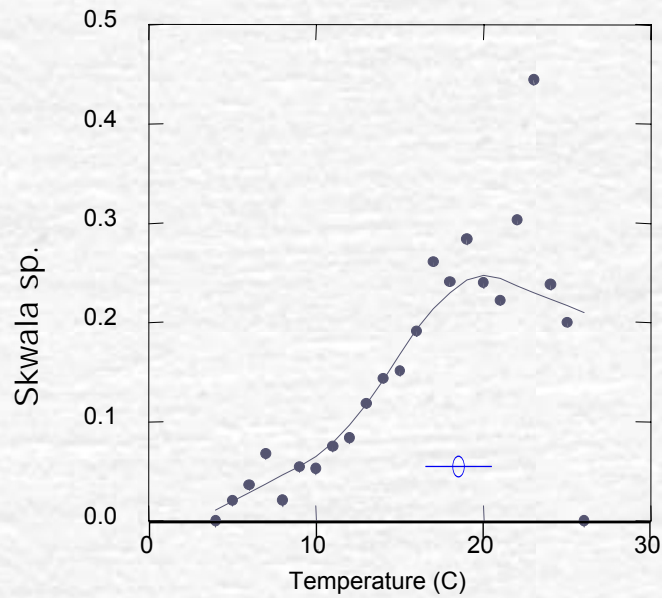
Examples of Taxa that Exhibit a Preference for Cold Water



Examples of Taxa that Exhibit a Preference for Cool Water



Examples of Taxa that Exhibit a Preference for Warm Water



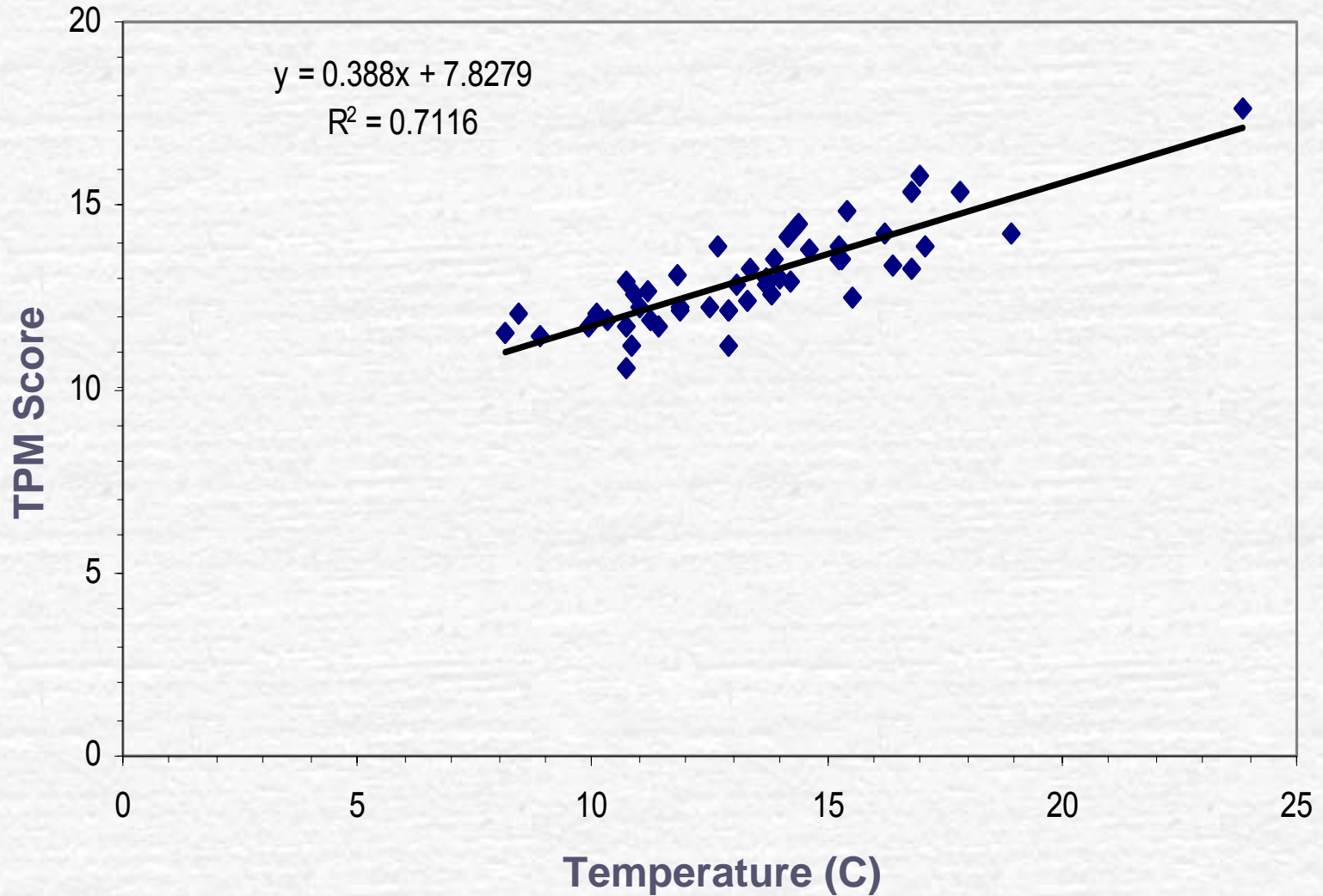
Final Products

- Temperature optimums and tolerance values for 137 macroinvertebrate taxa.
- An additional use of this information is the development of macroinvertebrate temperature preference metric that can be used to indicate the thermal regime of a stream when no other data exists.

Metric Development Process

- Site or stream scores are determined by calculating the average of the weighted mean values for the taxa present in the macroinvertebrate sample.

TPM vs. Avg. July/Aug Temp for 50 Oregon Streams



Application of the Information

- Idaho DEQ has developed an obligate cold water indicator taxa, and a warm water indicator taxa list.
 - These lists can be used to determine if the stream's macroinvertebrate community is composed of the taxa expected for streams of different temperature classifications.