An Index of Biotic Integrity (IBI) for Perennial Streams in California's Central Valley

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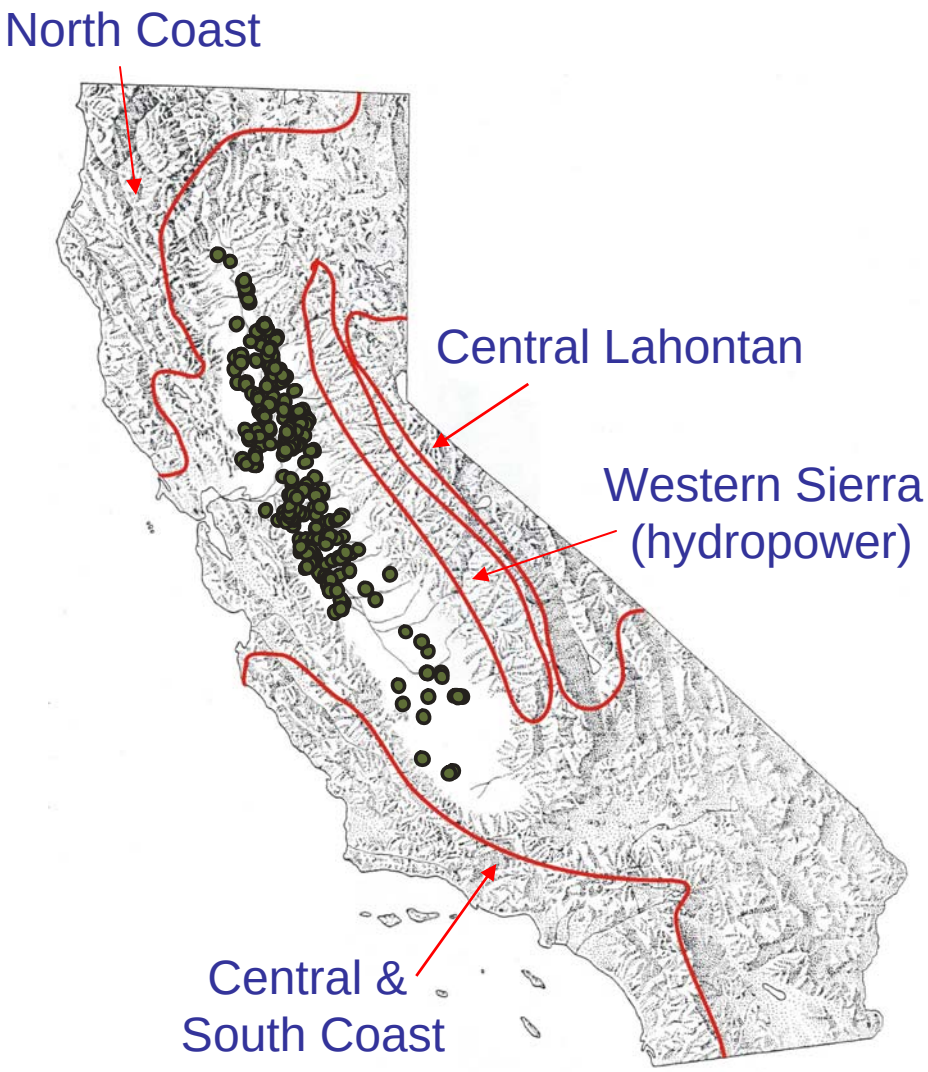
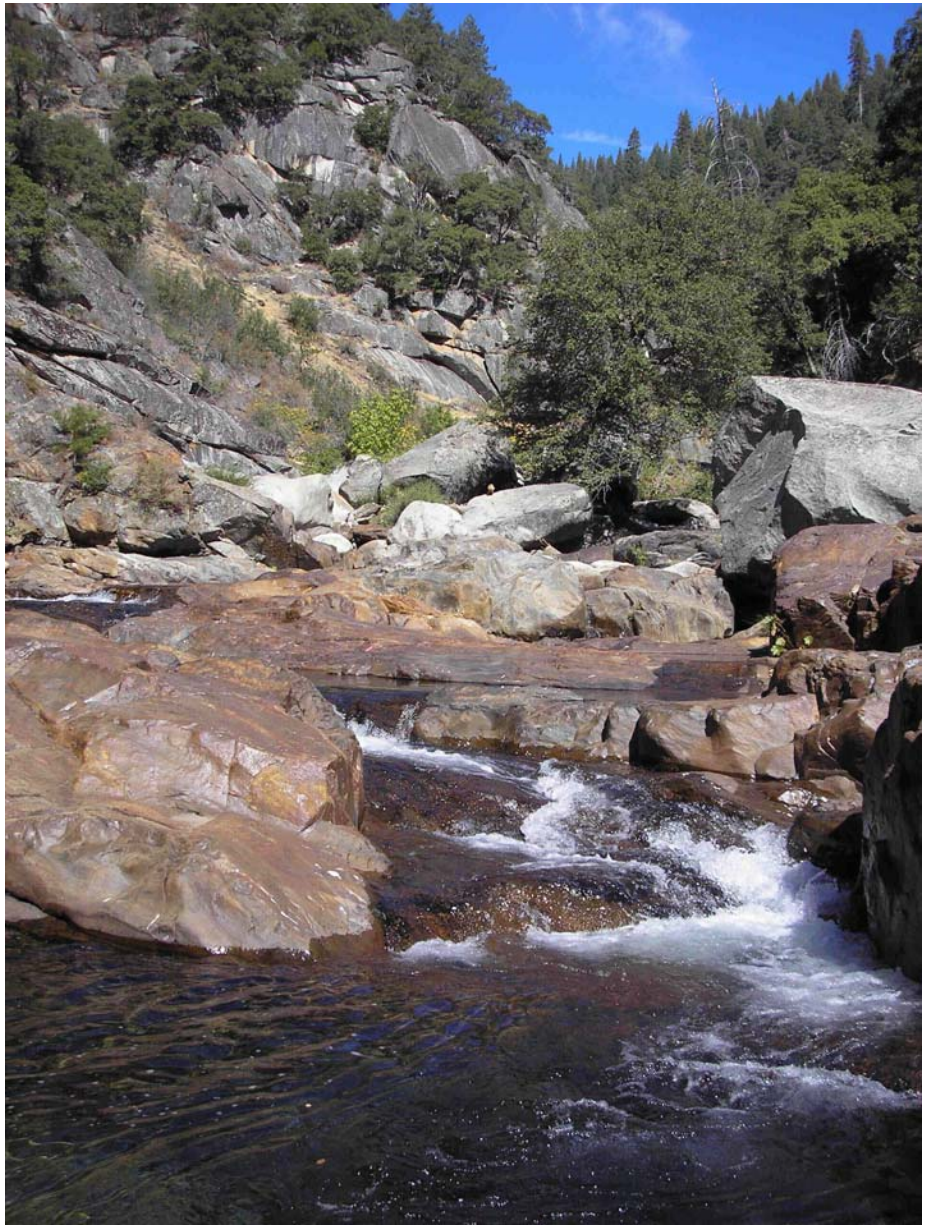
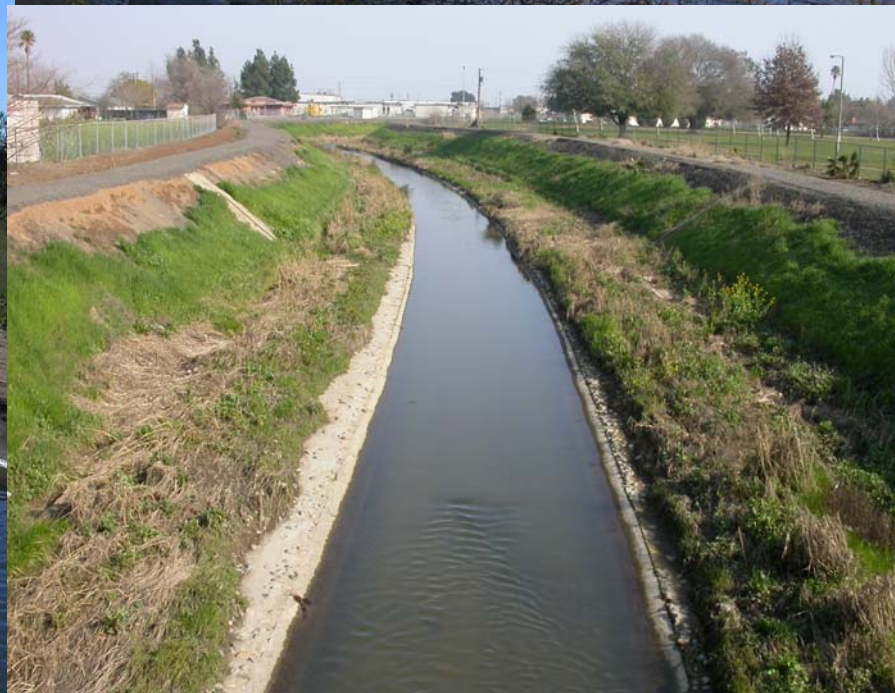
IBIs in California:







Objectives:

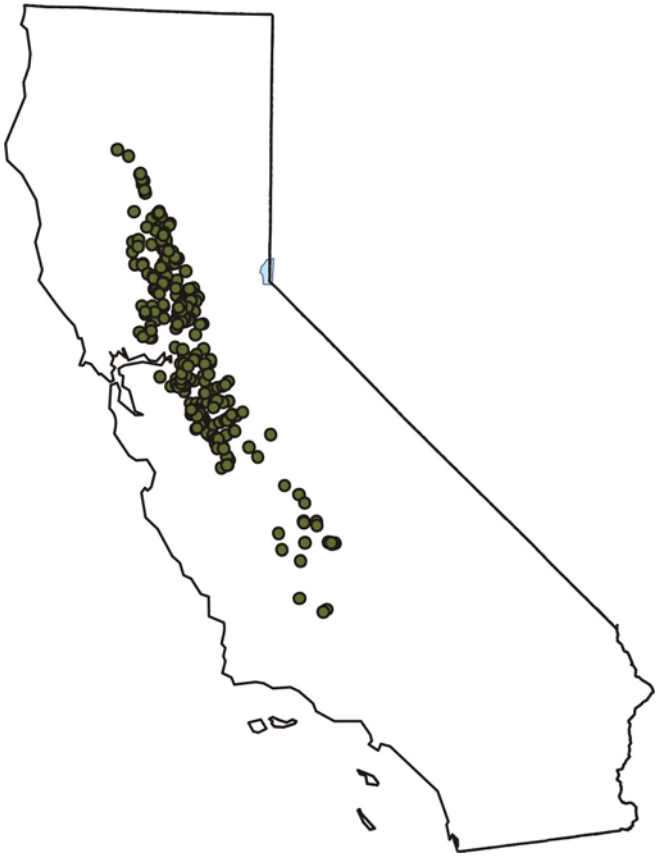
1. Compile existing BMI data sets from Central Valley streams to determine if data were sufficient to develop an IBI.

2. If data were found to be sufficient, develop an IBI.

3. Evaluate relationships between IBI scores and component metrics with human stressor gradients.

Several agencies have sampled streams on the Central Valley floor since 1994:

- EPA (Central Valley REMAP and EMAP)
- University of Maryland
- UC Davis Aquatic Toxicology Lab
- UC Davis Aquatic Ecosystems Analysis Lab
- Dept. of Pesticide Regulation
- Fish & Game ABL (including Sac Valley Reference Study)



From an initial total of 740 samples from 314 sites....

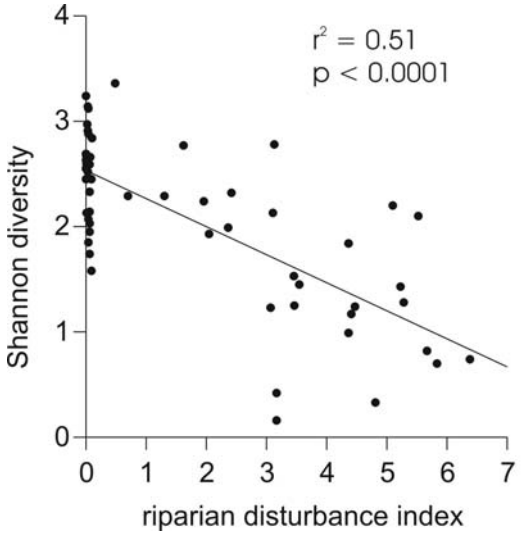
...168 samples from 141 sites were selected for inclusion in the IBI.

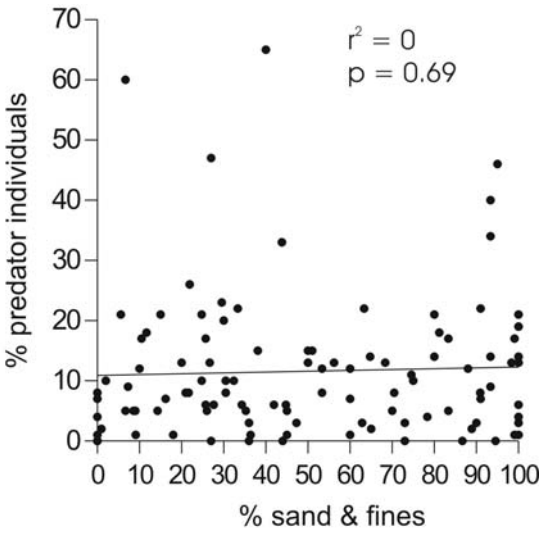
Data were not collected consistently by various programs:

- BMI sampling methods varied among projects
  - all were kick-net methods
  - counts standardized at 500
- Water chemistry varied
  - *in situ* vs. detailed lab analyses
- Physical habitat measures varied
  - Rapid (qualitative) protocols vs. quantitative EMAP-style

Defining reference criteria.

Metric responsiveness:

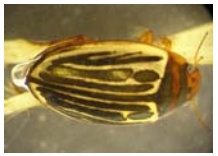




5 metrics were selected and scored for the final IBI:

- collector richness


- predator richness

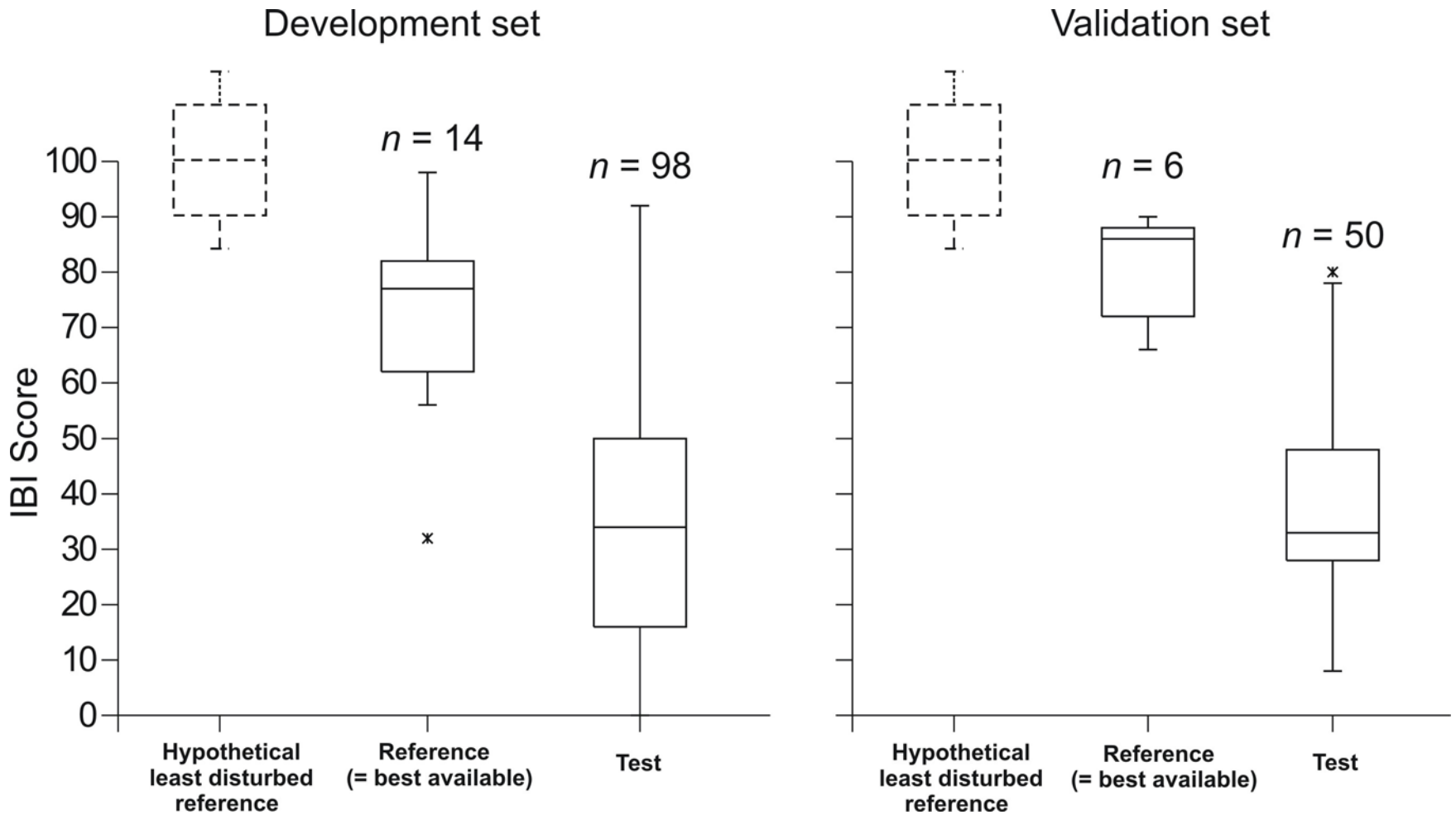



- % EPT taxa

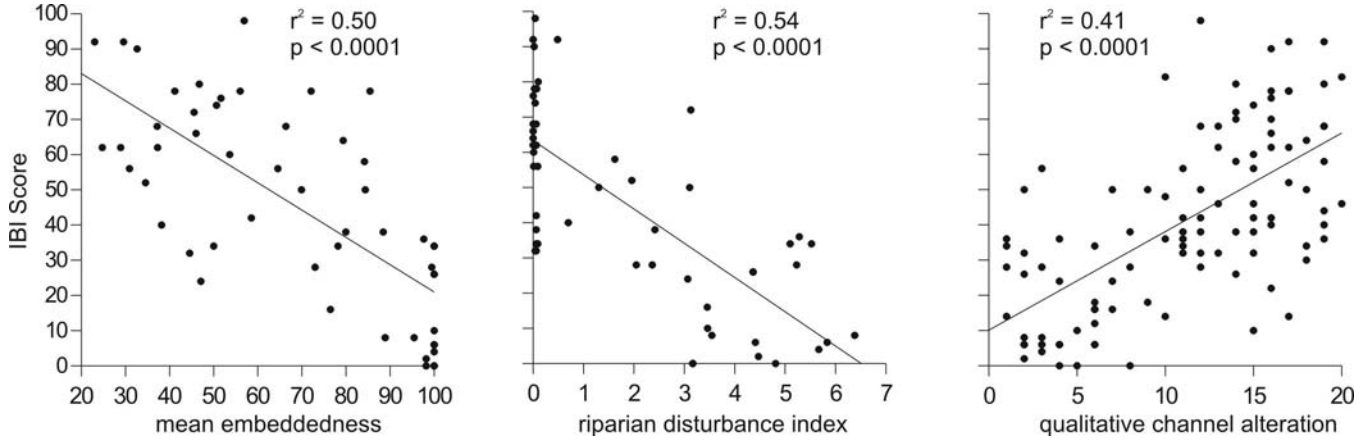


- % clinger taxa

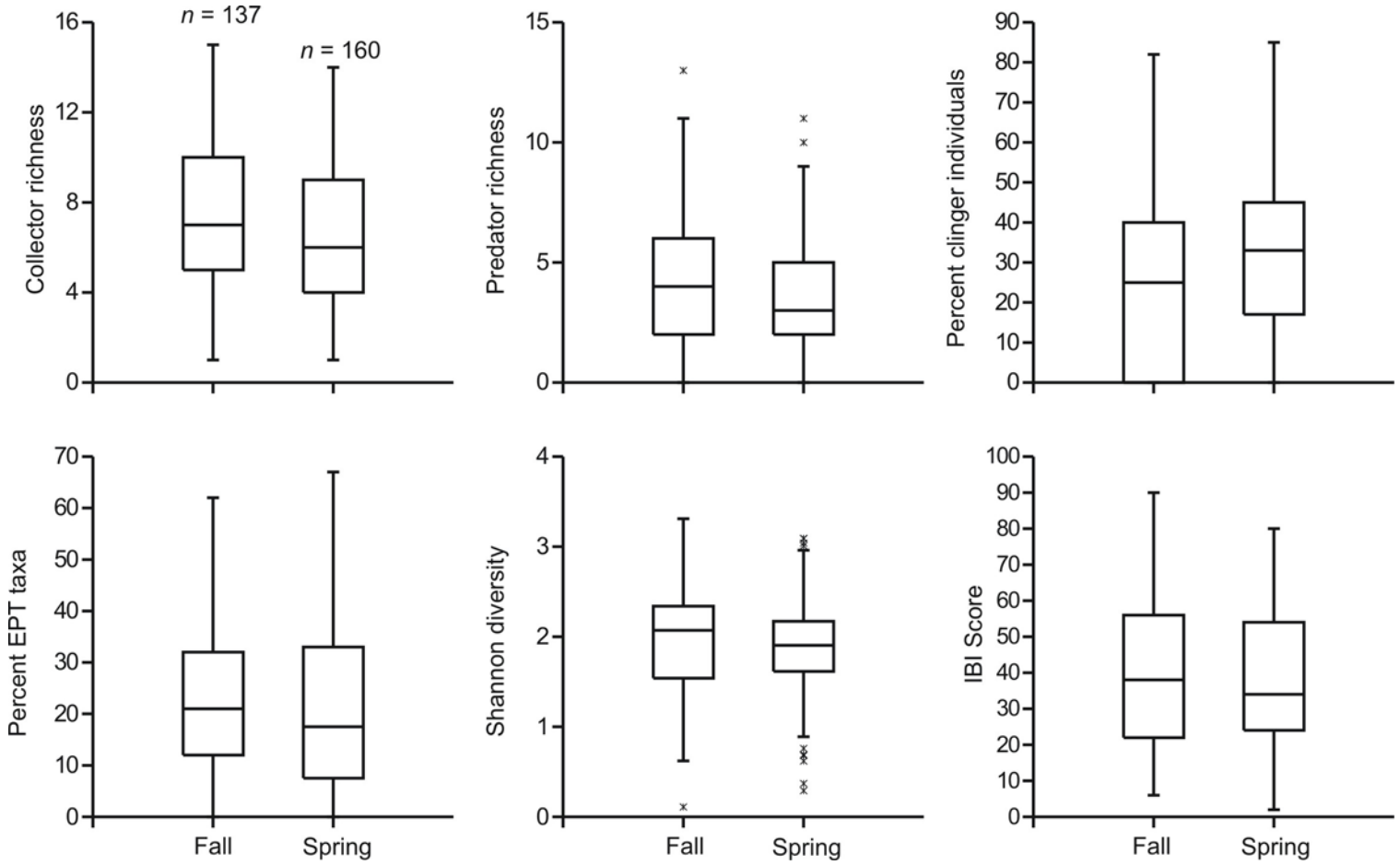

- Shannon diversity


Development set
Validation set
IBI Score
100
90
80
70
60
50
40
30
20
10
0
n = 14
n = 98
n = 6
n = 50
Hypothetical least disturbed reference
Reference (= best available)
Test
Hypothetical least disturbed reference
Reference (= best available)
Test

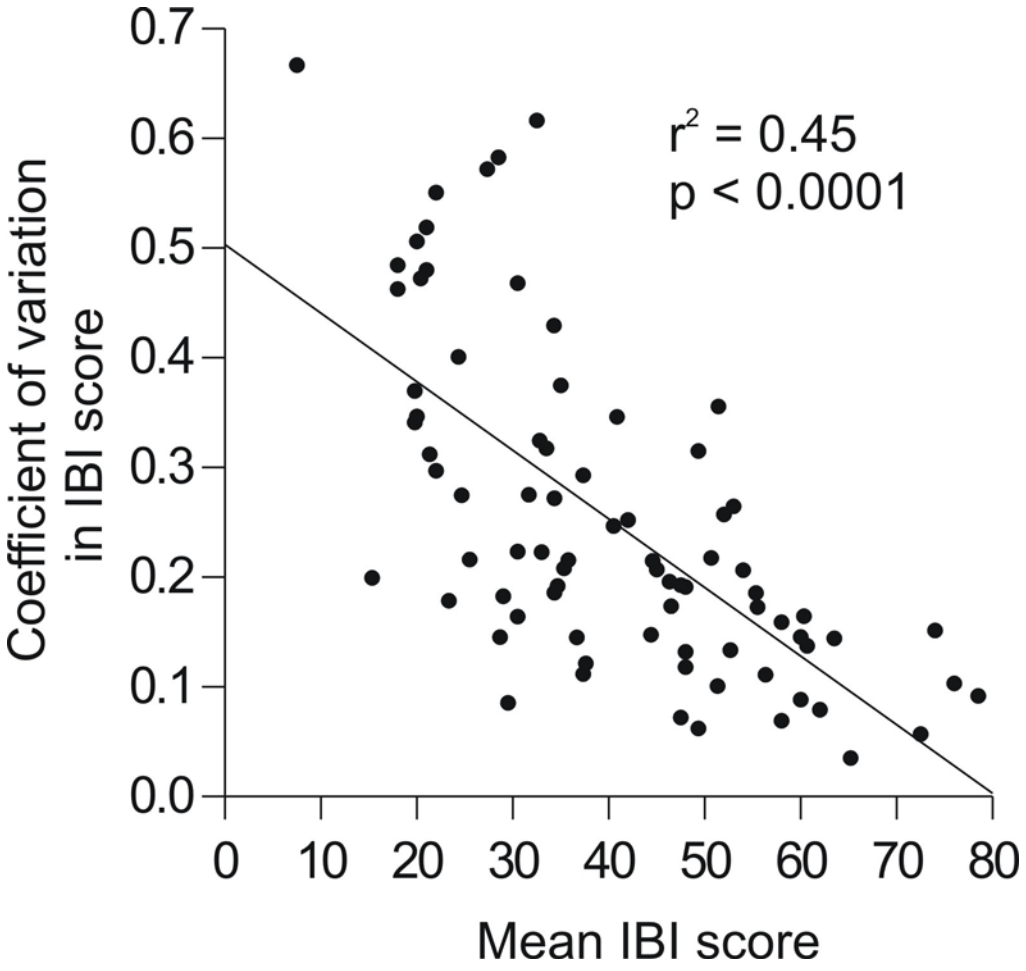
IBI responded strongly to local PHAB variables:



Follow-up analyses: Spring vs. Fall samples



Follow-up analyses: inter-annual variance



Conclusions and recommendations:

1. Despite data gaps that were less than ideal for indicator development, this study is the first to set expectations for Central Valley BMI assemblages based on best-available reference sites.

2. Future bioassessments in the Central Valley should collect quantitative physical habitat and water chemistry at all sites.

3. The IBI responded more strongly to local physical habitat condition than to qualitative land use rankings.

4. There was no evidence of seasonal (Spring vs. Fall) differences in IBI performance.

5. Sites with lower IBI scores also had more variable IBI scores between years and need to be sampled repeatedly before being listed as “impaired” in a regulatory framework.