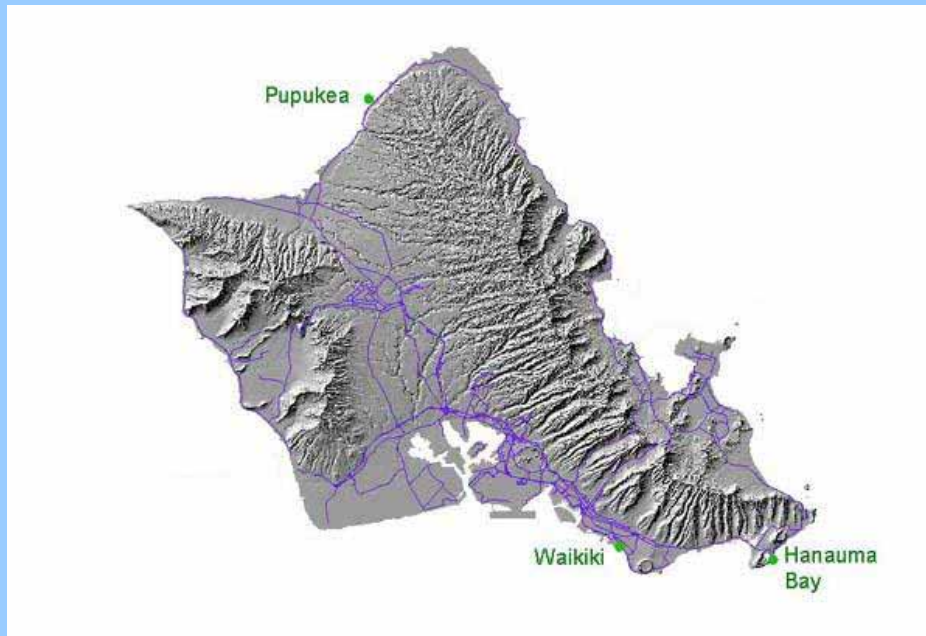


HCRI-RP



Dr. Ivor Williams
HCRI-RP/DAR Data Analyst
Marine Managed Areas of Oahu

Marine Managed Areas of Oahu



Hanauma Bay MLCD

- Established 1967
- All fishing prohibited

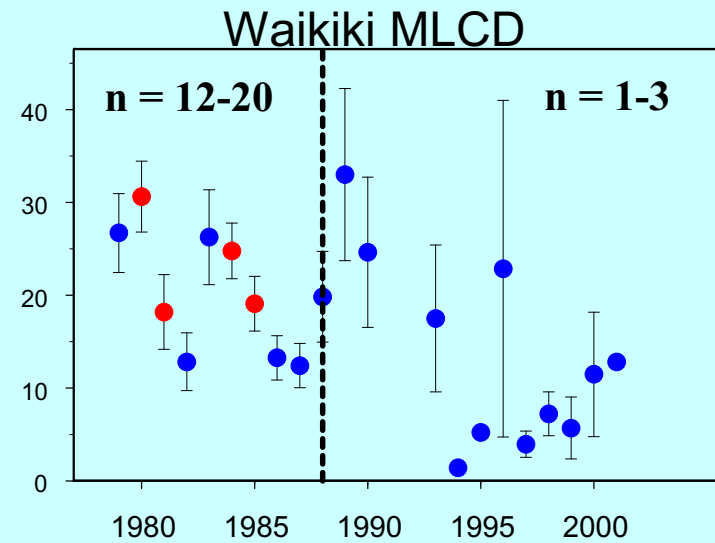
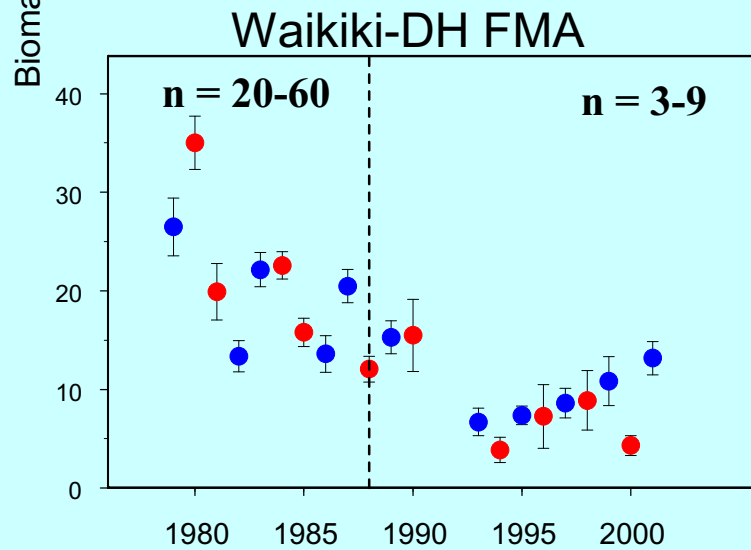
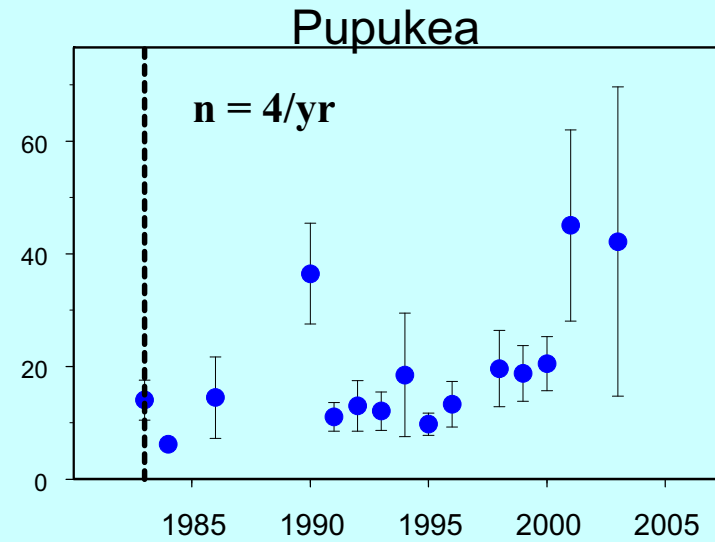
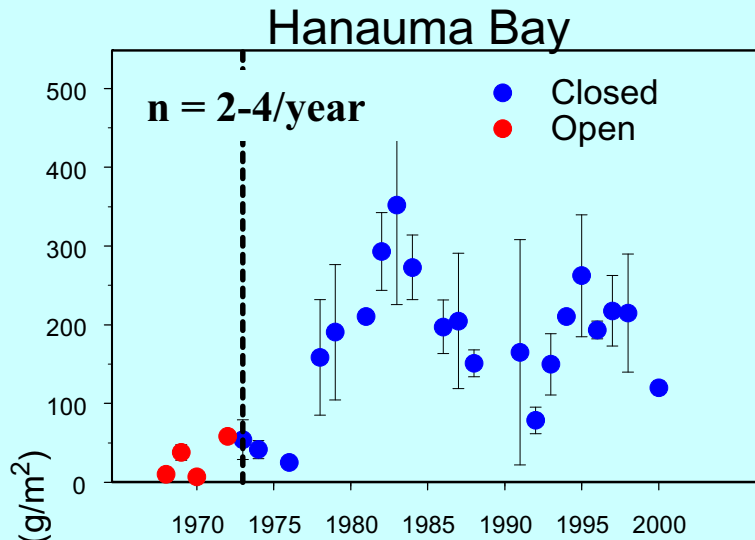
Waikiki-DH FMA & Waikiki MLCD

- FMA established 1978
- Rotational closure
- Waikiki MLCD established 1988

Pupukeya MLCD

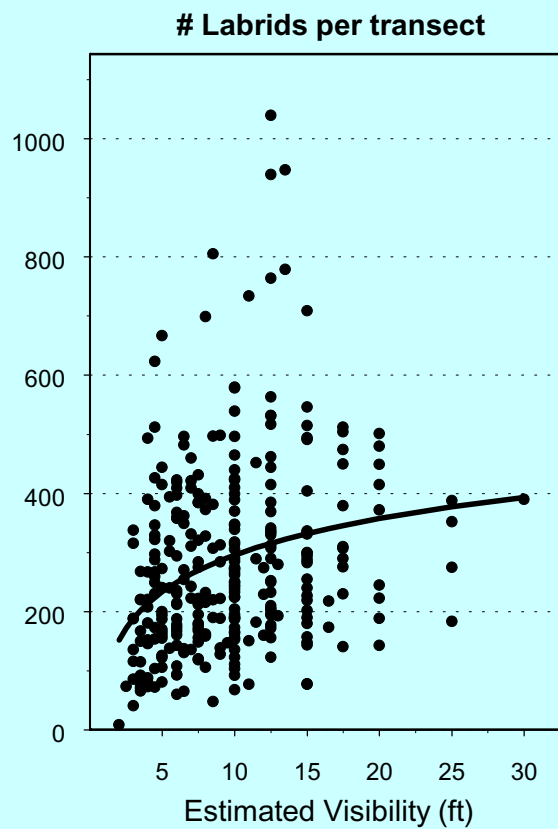
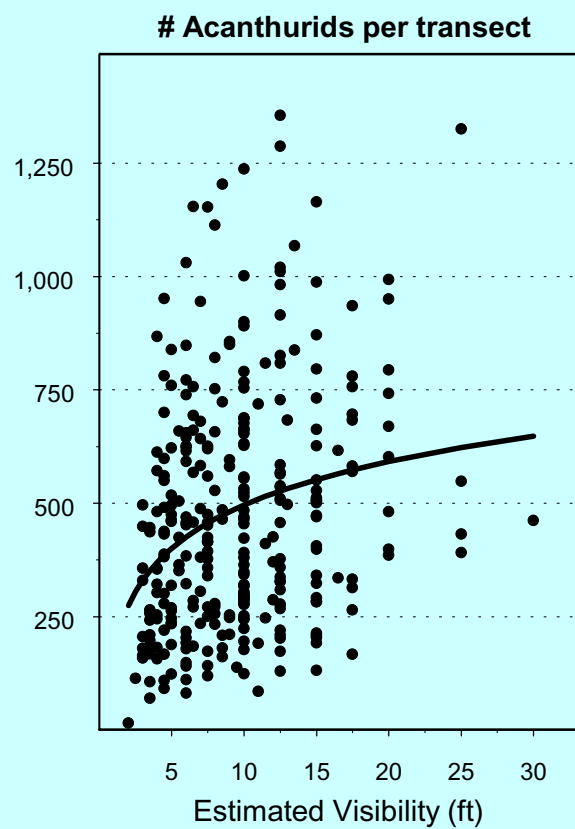
- Established 1983
- Pole-and-line fishing permitted until 2001

Time-Series of 'Resource Fish' Biomass



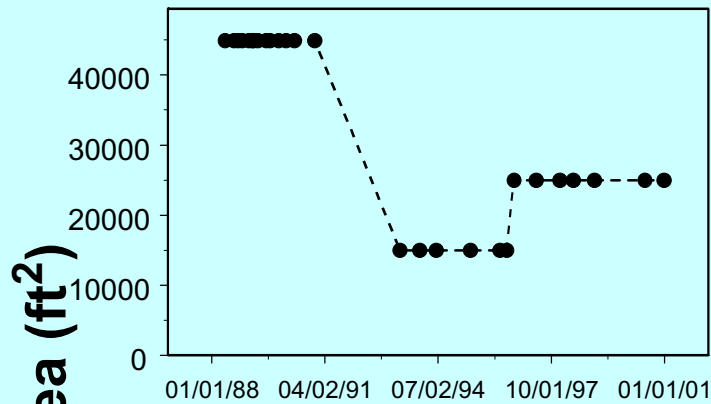
Influence of water clarity on fish counts

Waikiki-DH FMA 1979 to 1983

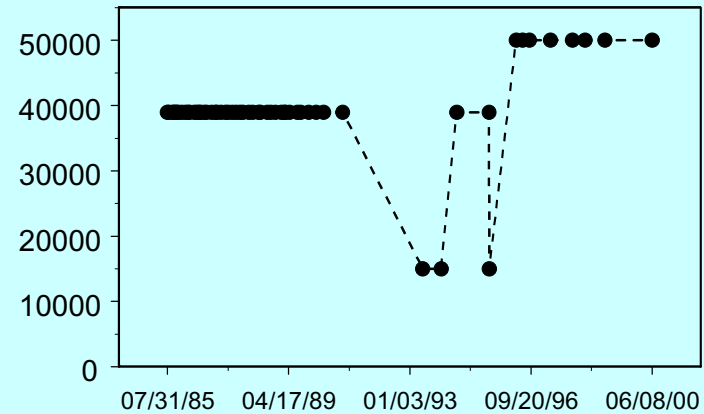


Variable Survey Area

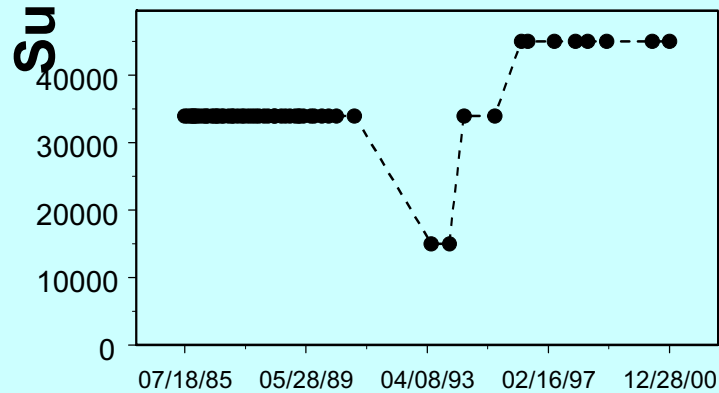
Waikiki MLCD



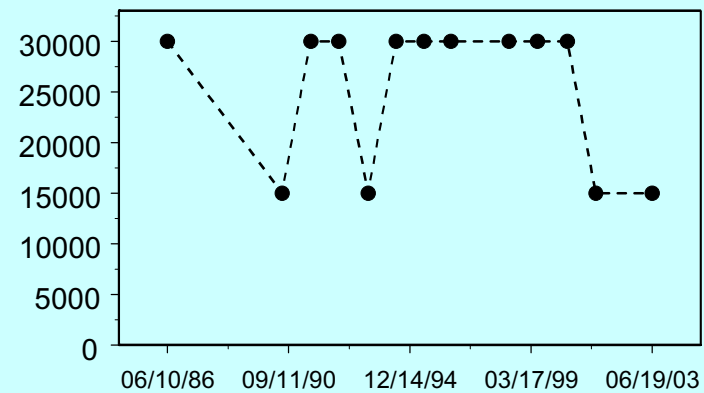
Waikiki FMA - Transect 1



Waikiki FMA - Transect 2



Pupukea - Transect 4

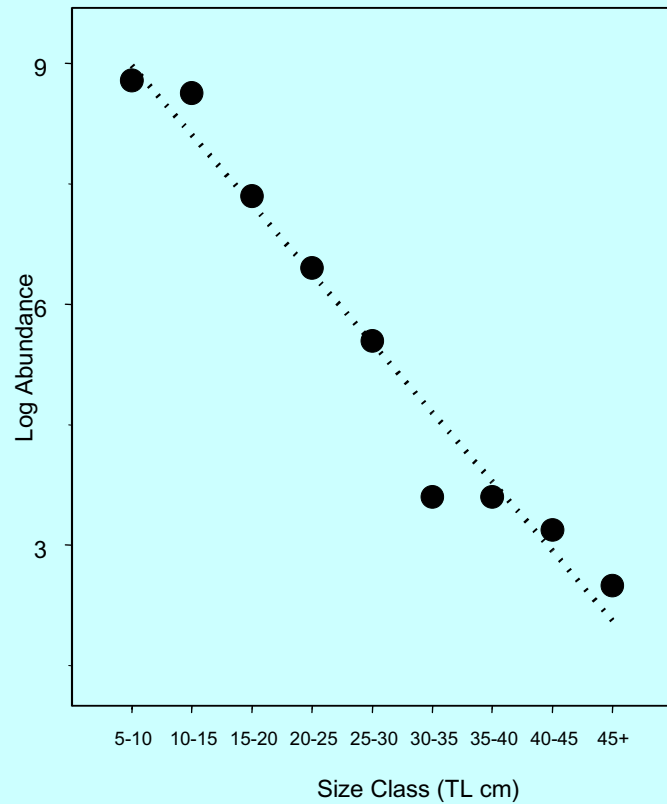


Biomass/abundance unit area unreliable - alternative approach?

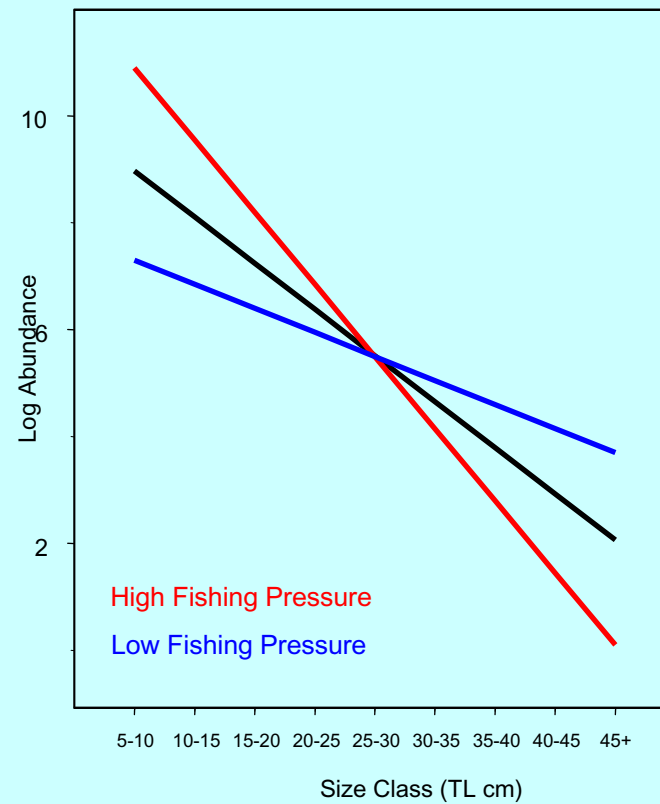
Size-spectra analysis

Regression of community size frequency distribution

Community size-frequency distribution



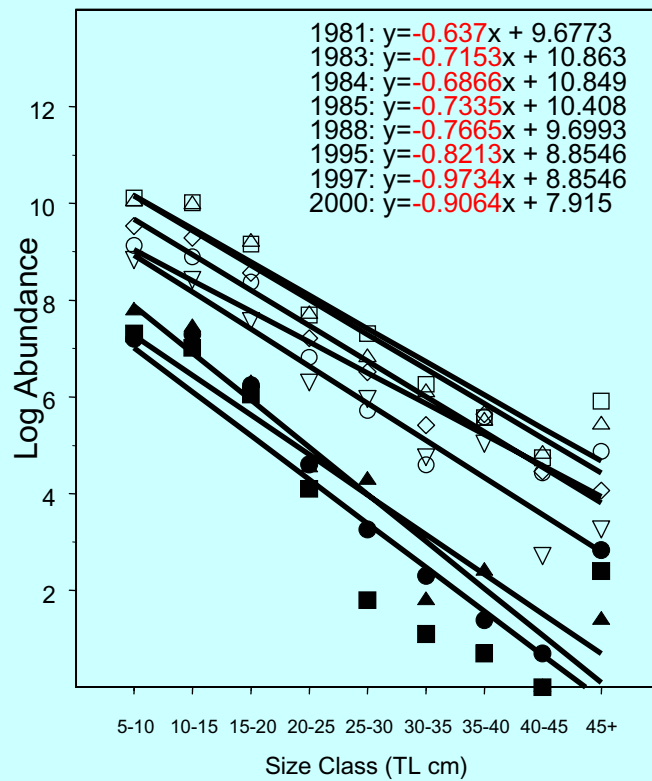
Effects of Fishing



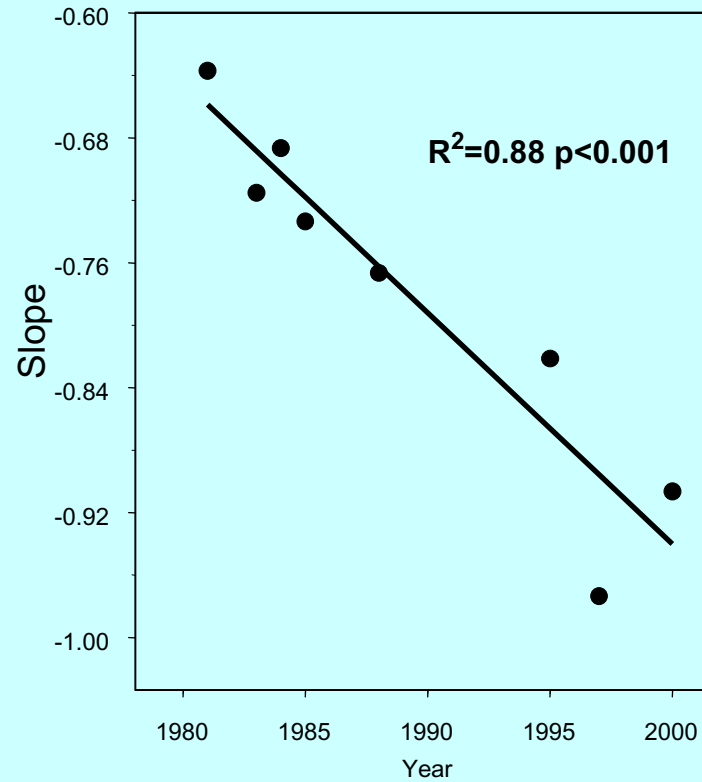
Shifts in size-structure indicative of changes in fishing intensity

Size-spectra analysis - Example

Community Size Structure - Calculating Slopes

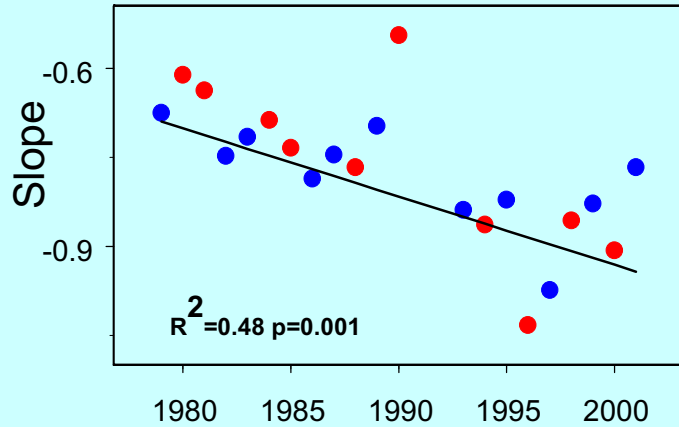


Size spectra analysis

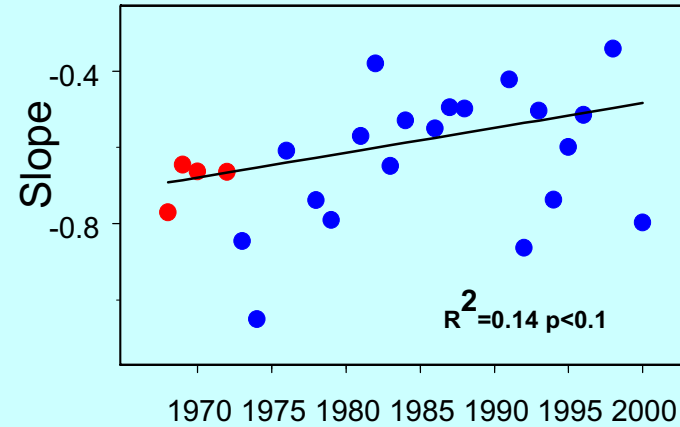


Size-spectra Results

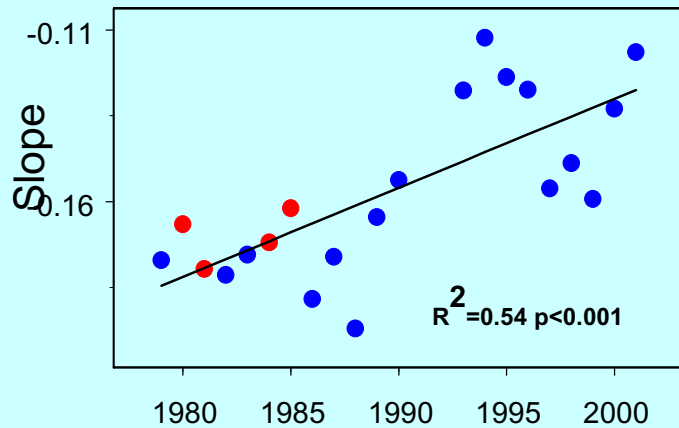
Waikiki-DH FMA



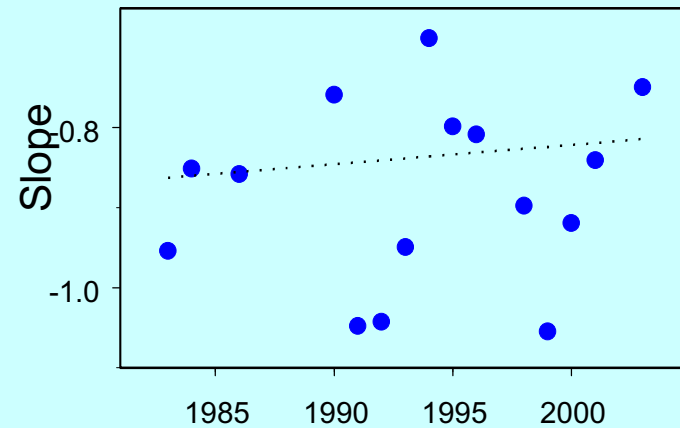
Hanauma Bay MLCD



Waikiki MLCD



Pupukea MLCD



Overall Conclusions

Methodological

- Some problems with data incl. limited replication at most sites
- Analysis of pooled data yields strong patterns
 - Size-spectra analysis highly promising
 - Others?

Trends in Oahu's managed marine areas

- Full closure MLCDs: (Hanauma Bay, Waikiki)
 - large increase in relative abundance of large fishes
- Partial closure MLCD: Pupukea MLCD,
 - essentially flat
- Rotational Closure FMA: Waikiki-DH FMA
 - Steep decline in total biomass and relative abundance of large fishes