Outline

HMRFS design, data collection, and estimation
(intercept survey and telephone survey)

Catch estimates for major pelagic species

Reef-fish catch estimation

Ongoing/future analyses
Hawaii Marine Recreational Fishing Survey (HMRFS)

- Onsite intercept survey for catch rate (catch/trip)
- Telephone survey for fishing effort (angler trips)
Access Point Angler Intercept Survey (APAIS) - Design

- Targeted population is specified by wave (2 month) and mode (fishing from shoreline or private boats)

- Sampling frame (matrix of sites registry and calendar month-days) is stratified by month and county

- Primary sampling unit is site-day and site-days are sampled with probability proportional to the expected # of angler trips
Intercept Survey (APAIS) - Data

- Angler information (residence, type of fishermen, avidity)
- Trip information (fishing methods/gears, fishing area, # of anglers on a boat trip)
- Catch (species, angler reported catch, observed catch, weight/length)
Access Point Angler Intercept Survey (APAIS) – Estimation

\[ \bar{y}_{maj} = \frac{\sum_k y_{majk}}{\sum_k x_{mak}} = \frac{\sum_k y_{majk}/K_{ma}}{\sum_k x_{mak}/K_{ma}} = \frac{\bar{y}_{maj}}{\bar{x}_{ma}} \]

- CPUE for type A fish (observed, for individual fishermen or fishing groups)

\[ \bar{y}_{maj} = \sum_i y_{maji}/n_{ma} \]
- CPUE for type B fish (reported, only for individual fishermen)

\( y \) - # of fish, \( x \) - # of contributing trips, \( n \) - # of trips
\( m \) - mode, \( a \) - area, \( j \) - species, \( k \) - fishing group, \( i \) - angler trip
Coastal Household Telephone Survey (CHTS) – Design and Data

- Sampling frame (coastal full-time residential households with telephone) is stratified by county
- Household information (# of anglers)
- Angler information (# of fishing trips)
- Trip information (mode, date, and time of return)
Coastal Household Telephone Survey (CHTS) – Estimation

Mean # of fishing trips /household

\[ \bar{t}_m = \sum_c w_c \times \bar{t}_{cm} \]

Expansion (\( \theta = \# \text{ of households} \))

\[ T_{1wt,m} = \theta \times \bar{t}_m \]

Adjustment (for out-of-frame)

\[ T_m = T_{1m} + T_{2m} + T_{3m} = (1 + \alpha_{2m} + \alpha_{3m})T_{1m} \]

(for households w/o phone, not in coastal counties or not in Hawaii)

Partition (into different fishing areas)

\[ T_{ma} = T_m \times a \]
Catch and effort estimates have been produced by MRFSS/MRIP since 2003 at
http://www.st.nmfs.noaa.gov/recreational-fisheries/

In individual waves, fishing efforts are estimated for two modes and three areas.

For species $j$ in mode $m$ (shore or boat fishing) from area $a$ (inland, $<=$ 3 miles, $>$ 3 miles), the catch is

$$\bar{y}_{maj} \text{ (CPUE)} \times T_{ma} \text{ (effort)}$$
Catch estimates for major pelagic species – catch number
Catch weight estimates (lbs) for major pelagic species

Annual landing in weight

Mean weight
Catch separated by record types: reported (B1) and observed (A)
Fishing effort estimates

Angler trips (boat fishing)
Catch estimates for reef fish
(Williams and Ma, in review)

• Large number of species encountered (>100 species/taxa)

• Weight measurements were not adequate or lacking for some species/taxa

• More than 50% of the catch number records had missing catch weight estimation
Length-to-weight regression

- **Acanthurus triostegus**
- **Ctenochaetus strigosus**
- **Kyphosus cinerascens**
- **Lutjanus fulvus**
- **Naso unicornis**
- **Mulloidichthys flavolineatus**
Catch estimates updated for reef fish

- Significant changes in the updated estimates

<table>
<thead>
<tr>
<th>Family</th>
<th>MRIP</th>
<th>MRIP Re-Assessment</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthuridae (Surgeonfishes)</td>
<td>64,439</td>
<td>245,333</td>
<td>3.8</td>
</tr>
<tr>
<td>Scaridae (Parrotfishes)</td>
<td>6,019</td>
<td>82,075</td>
<td>13.6</td>
</tr>
<tr>
<td>Mullidae (Goatfishes)</td>
<td>100,144</td>
<td>216,472</td>
<td>2.2</td>
</tr>
<tr>
<td>Holocentridae (Soldierfishes)</td>
<td>5,578</td>
<td>18,856</td>
<td>3.4</td>
</tr>
<tr>
<td>Kyphosidae (Chubs)</td>
<td>3,200</td>
<td>61,068</td>
<td>19.1</td>
</tr>
</tbody>
</table>

2004-2011 mean annual catch (lb)
Ongoing analyses: catch of different dispositions

- Eaten/plan to eat (3), sold/plan to sell (5), used for bait (4)…

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**2012 HMRFS / MRIP Intercept Survey Form**

**Q24. UNAVAILABLE CATCH.** Did you land any fish that are not here for me to look at? For example, any that you do not want to complete Type 2 record for this individual fisherman, not group catch. Note: Fillets are reported on separate page.

**DISPOSITION CODES FOR Q24**

1. Thrown back alive / legal
2. Thrown back alive / not legal / legality refused
3. Eaten / plan to eat
4. Used for bait / plan to use for bait
5. Sold / plan to sell
6. Thrown back alive / legal
7. Some other
8. Don’t know
9. Refused
0. Exchange

**TYPE 2 RECORDS:** (INDIVIDUAL CATCH NOT AVAILABLE IN WHOLE FORM)

<table>
<thead>
<tr>
<th>SPECIES NAME</th>
<th>SPECIES CODE</th>
<th># OF FISH</th>
<th>DISP</th>
<th>SPECIES NAME</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
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<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6.</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>7.</td>
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</tbody>
</table>
Catch from different kind of fishermen

- Pure recreational (do not sell catch)
- Recreational expense (sell to cover fishing expense)
- Commercial (sell for income): part-time & full-time

19. Do you ever sell any of the fish you catch?
   1 [ ] Yes  2 [ ] No - Go to Q20

19a. When you sell your fish, do you consider yourself a commercial fisherman, making some income or do you sell only to cover your fishing expenses?
   1 [ ] For Income  2 [ ] Trip Costs Only - Go to Q20

19b. Do you consider yourself a full-time commercial fisherman?
   1 [ ] Yes  2 [ ] No
Proportion of catch to be sold or from non pure recreational fishermen (2006)
Summary

- The HMRFS design and estimation (2003-now) were/are provided by MRFSS/MRIP – current default catch estimates should be examined/evaluated before they are used.

- For less encountered groups (e.g., reef fish) mean weight substitution is needed and the overlap between HMRFS catch estimates and commercial fishing reports can be significant for some pelagic and bottom fish species.

- HMRFS is evolving (Hawaii MRIP projects on improving intercept survey, reviewing HMRFS, and designing effort surveys for shoreline fishing).
HMRFS catch estimates vs commercial landing in 2006 (for Q&A)