

## Overview of MRIP Sampling and Estimation Designs

The Marine Recreational Information Program (MRIP) is a nationwide program to estimate marine recreational fishing effort and catch. The survey methods described here will be implemented in states with coastline along the Atlantic Ocean and Gulf of Mexico, excluding Texas. The program utilizes a complemented surveys approach that includes offsite mail surveys of residential addresses to estimate fishing effort (number of angler trips) and onsite intercept surveys of completed fishing trips to estimate catch per trip by species. Estimates of angler trips and catch per trip are combined to estimate catch by species.

### 1. MRIP Fishing Effort Survey

The MRIP Fishing Effort Survey (MFES) is bi-monthly (wave), cross-sectional mail survey designed to estimate the total number of individuals who participate in marine recreational fishing and the total number of private boat and shore-based recreational fishing trips taken by anglers in the Atlantic and Gulf Coast states.

#### a. Sample Design

The survey employs a dual-frame design that samples from the USPS Computerized Delivery Sequence File (CDS) and state databases of licensed saltwater anglers. Sampling procedures are different for “resident” and “non-resident” anglers. A resident angler is one who fishes within his or her state of residence. By default, these are all coastal states. A non-resident angler is one who fishes in a state other than his or her state of residence. An angler who resides in a coastal state and fishes in more than one state can be both a resident and non-resident angler and can be sampled as each.

#### i. Resident Anglers

Within coastal states, the survey utilizes a stratified, dual-frame design with screening prior to data collection<sup>1</sup>. Each state is stratified into coastal and non-coastal strata defined by geographic proximity to the coast; counties with a border that is within 25-miles of the coast comprise the coastal stratum and all other counties comprise the non-coastal stratum.

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<sup>1</sup> Lohr, S. (2009). Multiple Frame Surveys. Chapter 4 in Pfeffermann, D. (Ed.) *Handbook of Statistics: Sample Surveys Design, Methods and Applications* (vol. 29A). Elsevier, Amsterdam.

For each coastal state and wave, a sample of 6,300 addresses is selected from the CDS. Within a state, sampled addresses are augmented by matching the addresses to that state's database of licensed anglers. This matching comprises the screening prior to data collection and identifies households with at least one resident who is licensed to participate in saltwater fishing within the state. Sample is distributed among strata by optimum allocation to maximize the efficiency of sampling in terms of precision and cost. Fishing activity within the state of residence, including zero-trip data, are collected from all occupants of the sampled addresses.

ii. **Non-resident anglers**

Non-resident anglers are sampled directly from state license databases. The sample frame for each coastal state consists of anglers who were licensed to fish in the state (license state) during the wave but reside in another state. For each license state and wave, a simple random sample of 285 licensed anglers is selected, and sampled anglers are asked to provide details about saltwater fishing activity that occurred within the license state.

**b. Effort estimation**

i. **Base weights**

For resident anglers, the base weight for each sampled address within a stratum is equal to the inverse of the selection probability. Every person who resides at the sample address has the same base weight.

Base weights for non-resident anglers, who are sampled directly from state license databases, are equal to the inverse of the selection probability.

ii. **Nonresponse weights**

For both the resident and non-resident samples, the base weights of the respondents are adjusted to account for unit nonresponse by transferring the base weights of the nonrespondents to the respondents. Specifically, the base weights of responding units are adjusted upwards by the inverse of the response rate within nonresponse adjustment cells. Nonresponse adjustment cells are defined such that respondents are likely to be similar to nonrespondents in terms of fishing activity and propensity to respond to the survey. Possible criteria for defining nonresponse adjustment cells include state (license state or state of residence), geographic stratum (coastal/non-coastal), and frame matching status (matched or unmatched

to license database). Other potential adjustment criteria are examined after each wave of data collection but may include the type of fishing license and household or individual demographic characteristics.

### iii. **Total effort estimates**

Estimates of the total number of individuals who fished within a coastal state during the reference period are calculated by summing final weights across all sample units who reported fishing during the period. Weighted estimates of total fishing effort within a state (number of boat trips shore trips) are calculated by multiplying the characteristic of interest (e.g. number of shore fishing trips) for each sample unit by the nonresponse weight and summing the products over all responding units in the sample.

## 2. **Access-Point Angler Intercept Survey (APAIS)**

The Access-Point Angler Intercept Survey (APAIS) is a bi-monthly survey of completed recreational fishing trips designed to estimate catch-per-trip by species. Each wave approximately 20,000 completed fishing trips are sampled, and anglers are surveyed to collect information about the composition and disposition of catch (harvested or released), areas where fishing took place and amount of time spent fishing.

The APAIS is a probability sample based upon a stratified, multi-stage cluster design. Sample are selected from a comprehensive, spatio-temporal list of site-days, constructed by crossing a list of publicly-accessible fishing sites/landing sites with a list of available sampling days within a two-month wave.

### a. **Sample Design**

The primary sampling unit (PSU) is a site-day that comprises a combination of a selected fishing site with a selected day. A sample of site-days is selected by a probability proportional to size without replacement sampling scheme where the size measure for a given PSU is a prediction of the mean number of angler fishing trips that an assigned interviewer would encounter.

The number of stages of sampling in the APAIS is dependent on the type of fishing activity. Sampling of boat fishing activity occurs in three stages in which the secondary sampling unit (SSU) is boat trips within the selected site-day (PSU) and the tertiary sampling unit (TSU) is angler trips within the intercepted boat trip (SSU). Sampling of shore fishing activities occurs in two stages in which the SSU is angler trip within the selected site-day (PSU).

For each wave, sampling of PSU's is stratified by state, month, kind of day (weekend or weekday), six-hour time interval and fishing mode<sup>2</sup>. Stratum variables were selected to maximize sampling efficiency while ensuring adequate sampling coverage and sample size among geographic regions, seasons and time intervals.

#### **b. Estimation/Weighting**

The base weight for each PSU is equal to the inverse of its selection probability. Where a census is achieved at the 2<sup>nd</sup> and/or 3<sup>rd</sup> stage of sampling, the final weights for each intercepted trip are equal to the PSU weight. When a census is not possible, sample weights are adjusted by 2<sup>nd</sup>/3<sup>rd</sup> stage selection probabilities.

Estimates of catch-per-trip, by species, are calculated as weighted means of counts of fish reported per intercepted trip using the final sampling weights.

### **3. Catch Estimation**

The MRIP Fishing Effort Survey and the Access-Point Angler Intercept Survey estimate the total number of marine recreational fishing trips by mode and the average catch per recreational fishing trip by mode and species, respectively. Estimates of catch for each species are the product of these estimates (catch = trips \* catch / trip). For each species, estimates are generated for three catch categories, harvested catch (removals), released catch (discards) and total catch.

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<sup>2</sup> Fishing modes, or types of fishing activity, include shore fishing, charter boat fishing, and fishing on a privately-owned or personal fishing vessel.