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Pilot surveys to improve monitoring of marine recreational fisheries in Hawai'i

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ABSTRACT

Marine recreational fishing from shore and from private boats in Hawai'i is monitored via the Hawai'i Marine Recreational Fishing Survey (HMRFS), using an access point intercept survey to collect catch rate information, and the Coastal Household Telephone Survey (CHTS) to collect fishing effort data. In response to a recent HMRFS review, roving surveys of shoreline fishing effort and catch rate, an aerial fishing effort survey, and a mail survey of fishing effort were tested simultaneously on one of the main Hawaiian Islands (O'ahu) and compared with the current HMRFS approach for producing shoreline fishing estimates. The pilot roving surveys were stratified by region (rural vs urban), shift (three 4-h periods during the day), and day type (weekday vs weekend). A pilot access point survey of private boat fishing was also conducted on O'ahu, using an alternate sampling design created by NOAA Fisheries' Marine Recreational Information Program (MRIP). Three overlapping 6-h time blocks and site clusters with unequal inclusion probabilities were used to cover daytime fishing. Group catch was recorded for an entire vessel rather than individual catch, which is the current standard for MRIP intercept surveys. Although catch estimates from the pilot private boat survey were comparable to the current HMRFS catch estimates, the catch estimates from the pilot roving survey were lower than the HMRFS estimates. HMRFS uses effort data from the CHTS, which includes both day and night fishing in all areas, to estimate total catch, whereas effort data from the roving shoreline survey covered only daytime fishing from publicly accessible areas. We therefore suggest that a roving survey conducted during the day should have complementary surveys to include night fishing and fishing in remote and private/restricted areas. Results from these pilot studies will be used to improve the current surveys of marine recreational fishing activities in Hawai'i.

1. Introduction

The design of the Hawai'i Marine Recreational Fishing Survey (HMRFS) was originally modeled after the Marine Recreational Fisheries Statistics Survey (MRFSS) with two complementary surveys: an access point angler intercept survey (APAIS) to estimate catch rate and the coastal household telephone survey (CHTS) to estimate fishing effort. The National Research Council's review of MRFSS provided recommendations for improving both intercept and telephone surveys (NRC, 2006). In response to the NRC recommendations for improving the fishing effort survey, NOAA Fisheries developed the National Saltwater Angler Registry (NSAR) to provide a more efficient sampling frame. Most U.S. coastal states (and U.S. territories, commonwealths, etc.) have applied for an exemption to the NSAR based on pre-existing angler registries, newly created licensing programs, or other alternative databases.

The State of Hawai'i does not currently require a saltwater fishing license or registration for most recreational fishermen. Only commercial fishers, defined as those who sell any part of their catch, are required to obtain a commercial marine license and report their fishing trips and catch. Hawai'i has a Federal permit requirement for non-commercial bottom fishing, but this only applies to a relatively small number of fishers. As a result, Hawai'i is now the only state where recreational fishermen fishing in Federal waters (more than 3 miles from shore) are required to register with the NSAR. Although the federal registration requirement under NSAR applies to anglers catching ocean

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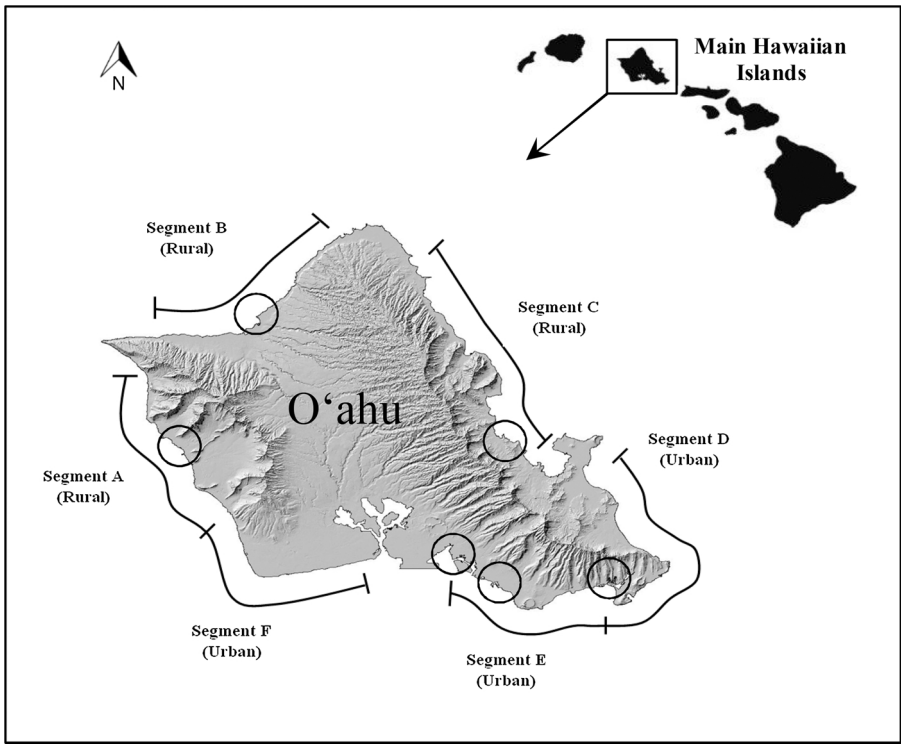

Fig. 1. Roving-survey coastal segments on O‘ahu. Segments A–C are in the rural region and segments D–F in the urban region. Circles represent major public boat ramps (harbors) on O‘ahu which were used for a pilot boat fishing survey (see Section 2.3).

fish in Federal waters and those that move from Federal waters through state waters to breed in fresh water (anadromous fish), Hawai‘i shoreline and boat-based fishers who fish solely within 3 miles of shore (state waters) are not required to register with the NSAR since there are no anadromous fish in Hawai‘i. Therefore, the NSAR from Hawai‘i is an incomplete sampling frame that excludes a substantial number of fishers.

During a review of HMRFS in 2012, the fishing effort data collection by the CHTS was identified as insufficient due to the decreasing number of landline telephones in use and thus increasing undercoverage through time (Breidt et al., 2012; Ma et al., 2013). Undercoverage may result in serious bias if the uncovered part of the population differs systematically from the covered portion of the population. A pilot study was necessary to investigate alternative methods of surveying shore-based fishing effort. A roving survey was proposed to capture shoreline fishing catch and effort during daytime. Supplementary surveys, including a mail survey and an aerial survey, were recommended to estimate the proportion of fishing activity not covered by the roving survey such as night fishing and fishing in remote areas (Ma et al., 2014). Roving surveys are often used to estimate fishing effort, catch rate, and other parameters when access to a fishery occurs at too many points to accommodate in a traditional access point design (Pollock et al., 1994). Roving surveys are currently used, in addition to access point surveys at boat ramps, to monitor inshore fisheries in the U.S. territories in the Western Pacific (Lowe et al., 2013). Two types of surveys are conducted, one for fishing effort and the other for catch rate. While traversing the accessible coastline by road, surveyors count the fishermen and units of gear engaged in fishing during the roving effort survey on Guam (Amesbury et al., 1991). Similar roving effort surveys are conducted by counting fishermen and fishing gears on accessible coastal segments (entire shoreline not always accessible) in American Samoa and the Commonwealth of the Northern Mariana Islands. The counts are used to estimate fishing effort in terms of gear hours or fisher hours.

To address the National Research Council’s concerns about catch data collection protocols and temporal sampling coverage in MRFSS, the MRIP Design and Analysis Workgroup (2012) developed a new sampling design for the intercept survey. The new design has been implemented in the U.S. mainland since 2013. Under the new design, surveyors are assigned to a survey site on a predetermined schedule (with fixed start time and duration). Surveyors are not allowed to conduct interviews solely at peak fishing times, which was practiced under MRFSS to increase the number of interviews. This change eliminates a potential bias when mean catch rates differ between peak and off-peak periods of fishing activity (MRIP Design and Analysis Workgroup, 2012). It was recommended to modify the new design, as used in the Atlantic and Gulf of Mexico states, and to test it for a private boat fishing survey in Hawai‘i. The modifications include 1) different units used for the fishing effort survey, 2) different cluster methods for fishing access sites, and 3) different survey schedules. If the state vessel registry is used as a sampling frame for a private-boat fishing effort survey in Hawai‘i, fishing effort may be measured as vessel trips rather than angler trips and the corresponding catch rate would be evaluated as catch per vessel trip.

Two workshops were held in Honolulu to discuss survey designs for shoreline fishing and private-boat fishing (Ma et al., 2014, 2017b). The pilot surveys were tested in the field in 2015 and 2016. This contribution describes the Hawai‘i pilot survey designs, outlines results from the pilot surveys, compares these with current HMRFS surveys, and provides recommendations on future directions for the Hawai‘i Marine Recreational Fishing Survey.

2. Materials and methods

2.1. Roving survey for shore fishing

The roving survey was conducted on the island of O‘ahu during daylight hours from January to April 2015. Two surveys were conducted independently, one to collect fishing gear counts (effort survey), the other to collect interview data on catch rate (catch survey). Both