

Review of California Recreational Fisheries Survey

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1 Introduction

During the three-day meeting in Los Alamitos, CA, on June 13–15, 2011, we met with California Department of Fish and Game (CDFG) staff to discuss CDFG’s recreational angler surveys. Prior to the meeting, we had been provided with a report entitled “California Recreational Fisheries Survey Methods,” which provided a thorough overview of the set of surveys that comprise the California Recreational Fisheries Survey (CRFS).

CRFS is a complex survey operation that includes at least three distinct components:

1. the Angler License Directory Telephone Survey (ALDTS),
2. an access point angler intercept survey, covering both private/rental boats and individual anglers and implemented using two different designs for high-priority and low-priority sites,
3. the Commercial Passenger Fishing Vessel (CPFV) effort survey, which is designed to check the compliance and correctness of the mandatory log reports provided by CPFVs.

The estimates for the various fisheries rely on the data collected through one or more of these component surveys, as further described in the method document mentioned above. The methods document proved invaluable in helping us understand these surveys and some of their complexities.

The California recreational angler population is very challenging to survey: California is a large state with a large population, its coastline is very long and very diverse, and a

significant fraction of the fishing activity takes place in locations that are either difficult to access or completely inaccessible. Compared to other states, California also has a number of advantages: the availability of an electronic angler license directory and the mandatory logbook requirement for the charter boats (CPFV).

We begin by briefly summarizing our overall reaction to CRFS: it is a well-designed and executed program. The program has a large and thorough sampling effort, with fine spatial and temporal stratification for on-site work. There is a high-quality license frame for effort measures. CRFS appears to have careful design in all of its aspects, and rigorous randomization. For the most part, there is also a clear and clean match between the sampling design and the estimation methods. The methodology is thoroughly documented, with assumptions explicitly listed. The consultants had very favorable reactions to all of these characteristics of CRFS.

In the remainder of this report, we outline our recommendations for possible extensions or improvements to CRFS, as well as a few suggestions for further study.

2 Angler License Directory Telephone Survey

2.1 Current data collection and analyses.

California made a transition to an automated licensing data system (ALDS) in 2010. This provided a tremendous improvement to conduct surveys of registered sport anglers in the state. This system has a number of excellent features including updating the directory daily, requiring anglers to update contact information if the license is valid for more than a year, and the requirement that anglers provide a telephone number for nearly all types of licenses sold. The one exception is for the one-day licenses sold at CPFV landings; a sample of one in 20 anglers rather than all anglers, are selected in this case. The ALDS provides an excellent frame to conduct surveys of registered anglers. Information on whether the angler is a salt or fresh water angler, or both, is not collected in the data system. Currently a stratified one-stage sampling design is used to select probability samples of anglers. The license holders are stratified by five license types: Annual Resident, Annual Non-resident, Ten-day, Two-day, and One-day. Four minor license types are included as part of the Annual Resident stratum. Not all anglers are required to purchase a license: anglers under age 16, anglers fishing from a public pier, and anglers fishing on one of two fishing days. Allocation to meet a yearly target of completed interviews is proportional to stratum size. Monthly estimates are made for a number of domains and weighted by an expansion factor.

2.2 Comments on the current approach.

2.2.1 Response rates.

The reported response rates seemed a bit low given the targeted list of anglers available from the list frame. Response rates for telephone, as well as other modes of data collection, are decreasing nationally. In order to maintain or improve response rates, other methods might be considered. For example, contact information, including addresses, is available from ALDS. A preliminary letter sent out a week before the telephone interview is scheduled has been shown in past research to be successful to improve cooperation rates in telephone surveys. The letter informs the angler that he/she will be called in the next few weeks and the reason they are being called is to collect the information on fishing habits, etc. The letter can also include the reason why this data is collected and the importance it has to maintain the health of the fishery. Both the envelope and letterhead for this introductory letter would include the return address for the California Department of Fish and Game to also alleviate any doubts to a potential respondent regarding the authenticity of the upcoming telephone call. This letter should be a relatively low cost for the increase in response rates that is expected.

2.2.2 Stratification.

Currently stratification is done proportionately by license types. It may be possible to find other stratifying variables to improve the efficiency of the estimates or consider other types of allocation of the sample to the strata. It did not appear that summaries were of interest by license type. Stratification that can more efficiently contact a saltwater angler may be useful. It is expected that more saltwater anglers live near the coast, for instance. By using geographic stratification, one could obtain more efficient samples of anglers by sampling counties near the coast at a higher frequency. The following are approaches to consider that may improve the sample selection of saltwater anglers and subsequent estimates.

- a. Addresses are currently collected in the ALDS. It may be possible to consider stratification using zip codes. Zip codes can also be combined to create counties. Coastal and non-coastal counties could be created and thus provide the capability to produce regional estimates. The geographic information would be helpful to allocate the sample into the strata. For example, in one approach, anglers living in the coastal regions could be sampled at a higher frequency proportionately to the population size of anglers. Another approach is to consider optimal allocation. This incorporates the different population sizes, different variances and different costs associated with sampling in each of the strata. Optimal allocation could be considered using any type of

strata where this information is available. In addition, the sample could be selected using the zip code information to assure an adequate sample size is obtained in specific areas of interest. This would avoid the need to pool over small areas to get estimates with reasonable levels of precision.

- b. Ideally, it would be efficient to sample only the saltwater anglers on the ADLS. On the license application, consider collecting whether the angler is only a saltwater angler, freshwater angler, or both. This could be used to stratify in order to get primarily saltwater anglers in the phone survey. The saltwater anglers would be sampled at a higher frequency. Samples would be also drawn from those anglers that selected both. However, anglers that intended to only fish in freshwater can be sampled at a lower frequency, just to assure that any anglers who changed their minds were captured in the sample.
- c. If the current stratification is desired. It should be possible to investigate which license strata are more variable. Using this information, optimal allocation could be studied to determine a different allocation, rather than proportional, to improve the overall survey estimates.
- d. It is unclear what number of out-of-state anglers is included in ALDS. One may consider this group as a separate stratum, if an approach using geographic stratification is adopted.

2.2.3 Post-stratification.

While the stratification improvements described above can only be applied going forward, it might be possible to improve the precision of estimates for data already collected as well, using post-stratification. The license frame does provide the zip code information to post-stratify. Therefore, it would be possible to use this information to hopefully improve the precision of the estimates by using post-stratification. As discussed above, the zip codes provided for each individual on the frame could be used to assign county of residence for each individual. For some variables, such as number of saltwater trips taken in the past month, the post-stratified estimates could have more precision than those estimates that are not incorporating the geographical component in the estimates.

2.2.4 Estimation.

The variance formula for the ratio of licensed to unlicensed wasn't the same in the CRFS Methods report and the presentation slides. It wasn't clear which is used.

2.2.5 Survey frequency.

Monthly surveys are conducted independently, allowing the possibility that an angler could be selected more than once during a calendar year. This repeated survey design is not necessarily optimal given the initial cost to find an angler willing to participate in the survey. It is advantageous to try to keep the same angler in the sample a few months. At the same time, one needs to be aware that only the more avid anglers may be agreeable to participate for more than one month. These considerations should be discussed if a change in the design will be evaluated. Survey designs that incorporate rotating panels may be useful in this study. Once an angler is agreeable to participate, he/she may participate for a few months, then rotate off the panel. A design could be also evaluated on whether the angler could rotate back into the panel after a few months off the panel. The amount of rotation and overlap should be discussed at the time of the survey design change. A pilot study evaluating the willingness of anglers to be part of such a panel sample could be considered.

2.2.6 Other thoughts.

- a. Missing from the ALDS are anglers at public pier fishing, anglers under 16 years old, and free fishing days. Are there estimates what percent of the angler population these represent? Since they are clearly part of the population of anglers, it would create a more complete frame if these individuals were somehow included in the sample frame. We realize that there might be major hurdles to implement in practice.
- b. Are there bilingual interviewers to improve response rates from non-English speakers? There was a comment at our meeting that there were language barriers in some interviews, including the license-frame telephone survey.

3 Sampling and estimation for low-priority sites

We will focus the discussion on the sampling of private and rental boats, but much of the discussion in this section will also apply to anglers on beaches and banks (BB) and man-made structures (MM). The publicly accessible boat launch facilities in the state are classified into high-priority (PR1) and low-priority (PR2) sites, with some sites “jumping” category at different times of the year. The sampling for PR1 sites is sufficiently intense that they are each visited multiple times each month, and estimates can be created at the site level. For PR2 sites, the sample sizes are substantially smaller, and the same approach leads to some issues.

PR2 sites are grouped into clusters (possibly together with MM sites) and each cluster is visited on two weekend days and one weekday every month. This spreads the sampling effort very thin and is quite expensive, i.e. requires large number of interviewers and large amount of traveling. It was not clear to us whether estimates are produced at the site level for PR2 sites for a given month. If that is the case, then the sample size of three visits per month will lead to highly variable estimates no matter what estimation method is applied. We would strongly recommend only creating estimates at higher levels of spatial or temporal resolution, for instance county (or district) and wave. If estimates are only produced for aggregations of sites, then we would also recommend considering designs that do not enforce multiple visits to each site each month. Not only would this allow for estimators that are likely to be more reliable, but it might lead to substantial cost saving. The key issue here will be to carefully evaluate the spatiotemporal level at which estimators are required by CDFG.

Under the current design, three days are selected in a systematic fashion for each cluster, with careful attention to “spreading out” the sampled days, times of day of visits and spatial distribution of the sites. As stated in the methods document: “The intent is to get a relatively even distribution of sampling effort throughout the month in terms of days of the month, time of day, and geography” (p.16). While the intention of obtaining a well-balanced sample is laudable, it is more akin to quota sampling than to random sampling. A major problem with this approach is that interpretation of the results becomes subjective, in the sense that there are no statistically valid measures of variability associated with such a design and hence one is left arguing about whether one has been successful in balancing all the important attributes of the target population. Using random sampling formulas for the estimation of the variance, as currently done by CDFG, is often done in practice but cannot be justified on statistical grounds. In contrast, truly random sampling uses the “power of randomization” to achieve approximate balance of the sample, while at the same time providing ways to estimate the variability of the estimates.

The current estimation method for PR2 sites is based on ideas borrowed from roving intercept surveys, where effort estimates are based on estimating the number of “trailer hours” in the day and the number of angler trips per trailer hour. It is still not totally clear to us that this is an effective way to estimate the total angler trips in a site/day. We presume that this more complicated estimator is used instead of a direct estimator based on estimating completed angler trips at the site, because the interviewer is only at the site for a short time. The currently on-going pilot project in North Carolina also uses clusters and produces estimates of the total number of anglers at a site based on observed angler counts. We would therefore recommend comparing notes with the North Carolina

pilot project to see whether their approach might be applicable here.

There is a justifiable concern about the lack of reliability of interviews conducted with anglers that are still fishing, and during the discussions, it appeared that interviewing protocols constrain the ratio of completed trips to incomplete ones. Because of the short time spent at individual sites, this constraint is in fact “binding,” in the sense that interviewers forego intercepting some of the observed anglers who did not finish their trips (note: this is mostly applicable to MM and BB sites). This problem could be reduced with longer times on site.

Finally, in addition to the issue that the quota sampling design is treated as equal-probability sampling for variance estimation purposes as mentioned above, there are other issues with the variance calculations for PR2 in the methods document on pp. 18–20. Firstly, the formula for $\widehat{V}(\widehat{a})$ is based on a fixed sum of independent a_i and only considers the variability of the a_i . In two-stage sampling as we have here (sites are selected first, and then trips within sites), the main contributor to the overall variance is the variability *between* the a_i , not that of the a_i themselves. To see this, compare the formula for $\widehat{V}(\widehat{a})$ with that of $\widehat{V}(\widehat{E})$ on p.13 (the latter is correct, assuming equal-probability sampling of sites). So this problem can be corrected by determining which is the first stage of sampling in each case, and applying the corresponding between-cluster variance estimator formula.

Secondly, the variance estimator currently used for an effort estimator for a sub-domain, \widehat{a}_2 , is based on the assumption that p and \widehat{a} are independent. If both are observed in the same survey (which is likely here), then this is not correct. The same issue applies to the variance of the estimator for total catch for all three types of sites, where \widehat{a}_2 and \widehat{c} are likely to be based on the same site visits and hence are correlated. If two estimators are correlated, the exact variance of the product is no longer available, but it can be approximated by using the Taylor linearization technique, after which it can be estimated by “plug-in” estimates. For the case of \widehat{a}_2 and \widehat{c} , the formula on p.20 needs to be replaced by

$$\widehat{V}(\widehat{C}) = (\widehat{c})^2\widehat{V}(\widehat{a}_2) + (\widehat{a}_2)^2\widehat{V}(\widehat{c}) + 2\widehat{c}\widehat{a}_2\widehat{Cov}(\widehat{c}, \widehat{a}_2).$$

The covariance term is readily estimated from the survey data, either by using formulas similar to those for the variance estimates in the report or by using survey-appropriate survey estimation software.

4 Commercial Passenger Fishing Vessels

4.1 CPFV effort estimation.

Effort estimates for commercial passenger fishing vessels (CPFV's) are derived from mandatory logs, with an adjustment to account for non-compliance. The consultants were struck by the seemingly low compliance fraction, estimated at about 81%. (We understand that CRFS is actively working to improve this rate.) It seemed that this estimate might be biased high or low due to selection effects. The CPFV operator might wonder “If I’ve been sampled, why should I fill out a log?” or “If I’ve been sampled, I’d better fill out a log.” It might be useful to draw a sample of non-compliers and use this sample to make inference about all non-compliers, and in particular whether the compliance estimate is high or low.

In any event, various methods could be used to try to increase compliance, including “soft encouragement” (reminder letters, publicity) or “hard encouragement” (do not renew licenses for non-compliers).

Three sources of information are used in estimating the compliance adjustment (p. 23):

- the CPFV effort survey
- other probability samples: “For example, a sampler could get information on the activity of other boats at a landing when he/she goes to a landing for an on-board/dockside sample or passes by the landing on his or her way to an assignment in another mode.”
- censuses in salmon ports in season: “. . . information is gathered on every CPFV at each landing every day of the salmon season.”

Of these sources of information, the second seems particularly informal and hard to weight appropriately. For example, landings that are on the way “from the office” to more sampling locations will have higher probabilities of selection than landings that are in less interesting directions from the office. Effort and compliance might be different at high-probability landings than at low-probability landings. Without appropriate weighting, compliance fractions will be biased.

If samplers could routinely get CPFV information during assignments in other modes, then this could be incorporated in a formal way by computing the inclusion probabilities, however complicated. But the current estimation method does not appear to take such considerations into account.

Further, the estimated variance of the estimated compliance ratio (p. 27) needs to account for all three sources of information, which is not currently the case.

A final comment on the compliance adjustment fractions is that it might be useful to do separate adjustments by CPFV type (e.g., 6-packs, dive boats, private charters, party boats). It seems possible that compliance rates vary among these types, and this is currently not incorporated in the estimation method.

4.2 CPFV catch estimation.

The description of the CPFV catch survey suggests that unequal probabilities of selection are being employed:

The selection of CPFV landing sites is based on past distribution of effort with adjustments for anticipated changes in effort. (CRFS Methods, p. 25.)

If strata equal district-months, and if the above quote means that different allocations are used across district-months, then approaches to point estimation and variance estimation based on stratified simple random sampling are appropriate. But if the above quote means that unequal probabilities of selection are being used *within* a district-month, then this needs to be reflected in weighted estimation.

A second issue is that statements for CPFV and elsewhere suggest that less-than-completely formal sampling methods are being used. For example, statements during the meeting that “samplers know to alternate” types of substitutions (like site, day, or trip type); that every district has different draw methods (based on past pressure checks, logbook data, gut feelings, etc.); and that they try to get all anglers if there are fewer than 30 anglers, suggest that samplers have considerable flexibility to adapt the design on the fly. This makes matching of the estimation routines to the design extremely difficult, because the design is not specified in a reproducible way. Such design-estimation mismatch can lead to bias. Our suggestion is that whenever possible, CRFS should formalize protocols and make them consistent statewide.

Another issue that arose during the meeting had to do with CPFV’s refusing access to on-board observers. This is a type of nonresponse, and it is important to track such refusals by type of CPFV, such as 6-pack, dive boats, private charters, and party boats. In standard survey nonresponse problems, groups formed for purposes of nonresponse adjustment are called *response homogeneity groups*, or RHGs. Ideally, refusal rates would be constant within RHG’s. After formation of the RHG’s, non-refusing CPFV’s in each class represent only that RHG. Making nonresponse adjustments within classes defined by type (as well as by size class, or by other available information) can lead to less bias than lumping all refusals together, provided refusal rates and catch characteristics vary across the groups.

5 Variance estimation for multi-stage designs

As noted in the last part of §3, not all of the current variance estimators properly account for two or more stages of sampling. As another example, in the CPFV catch estimates, there are three stages of selection:

- Stage I: select landing site-day (with probability proportional to past effort?)
- Stage II: select CPFV trip within the site-day
- Stage III: select anglers within the CPFV

But the variance estimator within strata is

$$\widehat{\text{Var}}(\bar{c}) = \frac{\sum (c_i - \bar{c})^2}{n(n-1)},$$

where i is the angler-trip index and n is the number of angler-trips sampled (page 28). This estimator would only be appropriate for stratified simple random sampling. It appears to ignore unequal probabilities of selection at stage I (though it was not entirely clear to us how the first stage of selection was actually done), and it ignores clustering within the site-day. Ignoring clustering within the site-day almost certainly results in underestimated variances or, equivalently, overestimated precision.

The variance estimator also ignores clustering at higher stages, *but this is actually not a problem*. It turns out that ignoring subsequent stages of selection, and treating estimates at the site-day level as if they were the true values, results in a nearly unbiased variance estimator. This is the standard variance estimator used in survey software, and is usually the default option. To obtain the standard variance estimator, one only needs to specify in the software the strata, clusters (or primary sampling units), and weights. The standard variance estimator does not require any information about stages of sampling beyond the first stage (like secondary sampling unit identifiers).

To correct the variance estimation procedures, it is necessary to put the current data into the framework of a dataset with the following elements:

- stratum identifiers (these can be collapsed strata for the purposes of variance estimation)
- primary sampling unit identifier: site-day (for proper two-stage variance estimation)
- sampling weight (reflecting unequal probabilities of selection, if these are being used at some stage)
- sampling fractions within strata (taking advantage of finite population corrections)

- response variables

Once the dataset is in this form, point and variance estimation can be conducted using existing statistical software, including the `survey` package in R or `proc surveymeans` in SAS, among others. Use of existing software eliminates the need for a new programming effort and ensures that well-documented best practices are being employed.

6 Accounting for domains

In surveys, “strata” are disjoint subpopulations that are identifiable prior to sampling, and from which independent samples are selected. Examples in CRFS would be district \times month \times kind of day. Sample sizes for strata are allocated in advance, and can be treated as known (modulo nonresponse issues).

A “domain” is any subpopulation of interest for producing estimates. A domain may or may not be a “stratum.” District, month, and kind of day are potential domains that are strata, while trip type and water area are potential domains that are not strata.

These distinctions are important when it comes to obtaining proper variance estimates for estimates of domain means and domain ratios. For domains that are not strata, the sample size is uncontrolled, and so estimates of domain means have a nonlinear (ratio) form due to the random sample size in the denominator. Similarly, estimates of domain ratios (like catch per trip within a domain) would have a random denominator (like estimated number of trips in the domain) and so would have a nonlinear form. Variance estimation needs to account for this nonlinear form. Standard survey software can account for such nonlinearity if strata and domains are clearly identified.

Estimates of domain totals do not have the nonlinear form because they do not have a random quantity in the denominator.

In the CRFS documentation, the variance estimates sometimes seem to account correctly for domain estimation (e.g., CPUE estimation on p. 14), and sometimes do not seem to account correctly for domain estimation (e.g., CPUE for CPFV on p. 28). These variance estimation procedures need to be carefully reviewed.

7 Model-assisted estimation ideas

There may be opportunities to include auxiliary information into the estimation procedures, to gain precision at almost no additional cost. For example, weather, bar conditions, ocean conditions, and (where relevant) river conditions may have some explanatory power for effort and catch, particularly in the off-season when other information may be difficult and costly to obtain. Note that even if regression relationships are imperfect, auxiliary

data may be very useful in producing more efficient estimators using “model-assisted estimation.” Like direct survey estimates, model-assisted estimators are design-unbiased or nearly so, and allow for consistent variance estimation and proper confidence interval construction (even if the regression model is imperfect). If the regression model has reasonable explanatory power, the model-assisted estimator has smaller variance and narrower confidence intervals than the direct estimator that ignores auxiliary data.

To make things concrete, fix attention on one particular domain and consider collecting data using the current stratified two-stage sample, but additionally recording (on the basis of weather and ocean conditions) whether the sampled day is a “good” or “bad” fishing day’. Denote the total number of good sampled days within the domain as d_{good} and the total number of bad sampled days as d_{bad} . Further, let D_{good} denote the total number of good days (sampled or unsampled) and D_{bad} the total number of bad days, obtained by looking at weather records over the entire sampling period. (If fishing was impossible on some days due to weather, then $D_{\text{good}} + D_{\text{bad}} < D = \text{total number of days.}$) Finally, let \hat{C}_{good} denote the estimated total catch on good days in the domain, and \hat{C}_{bad} denote the estimated total catch on bad days in the domain. Then the post-stratified estimator of total catch is

$$\hat{C} = D_{\text{good}} \frac{\hat{C}_{\text{good}}}{d_{\text{good}}} + D_{\text{bad}} \frac{\hat{C}_{\text{bad}}}{d_{\text{bad}}}.$$

This estimator is essentially unbiased whether or not catch on good days differs from catch on bad days. If the catch does differ, then the post-stratified estimator will have smaller variance than the estimator that ignores good versus bad. This post-stratified estimator is a special case of model-assisted estimation.

As another example, some relatively simple data \mathbf{x}_{ijk} could be collected from every angler k on selected boats j and site-days i . For example, \mathbf{x}_{ijk} could be a vector of catch counts within broad (and easily identified) species categories. Then, from each boat a sample of anglers would be selected for dockside interviews. From this sample, data y_{ijk} would be recorded.

Suppose that w_i is the weight from selected site-day i to all site-days within the stratum, B_i is the total number of boats on site-day i with $b_i \leq B_i$ the number selected; and A_{ij} is the total number of anglers on boat j , site-day i , with a_{ij} the number of anglers selected for dockside interview. Then the model-assisted estimator within each boat would be obtained by first regressing y_{ijk} on \mathbf{x}_{ijk} for all anglers with both types of data present,

$$\hat{\beta} = \left(\sum_i \sum_{j=1}^{b_i} \sum_{k=1}^{a_{ij}} w_i \frac{B_i A_{ij}}{b_i a_{ij}} \mathbf{x}_{ijk} \mathbf{x}_{ijk}^T \right)^{-1} \sum_i \sum_{j=1}^{b_i} \sum_{k=1}^{a_{ij}} w_i \frac{B_i A_{ij}}{b_i a_{ij}} \mathbf{x}_{ijk} y_{ijk}.$$

Next, the model-assisted estimator would be computed as

$$\sum_i \sum_{j=1}^{b_i} w_i \frac{B_i}{b_i} \left\{ \sum_{k=1}^{A_{ij}} \widehat{\boldsymbol{\beta}}^T \mathbf{x}_{ijk} + \frac{A_{ij}}{a_{ij}} \sum_{k=1}^{a_{ij}} (y_{ijk} - \widehat{\boldsymbol{\beta}}^T \mathbf{x}_{ijk}) \right\}.$$

This estimator is nearly unbiased for total catch across boats, but will be more efficient than an estimator based only on dockside interview data, y_{ijk} , provided \mathbf{x}_{ijk} has some predictive power for y_{ijk} .

8 Survey instruments

In closing, we have a few additional comments about the survey instruments we saw in the methodology document and during our visit.

8.1 California License-Frame Telephone Survey.

The introductory paragraph is extremely important to prevent refusals. These first few sentences of the telephone call should contain information on who is calling, why it is worth the time for the angler to respond to the survey, and what is being asked of them. The current paragraph does not explain what information the angler can provide that is so important and does not provide persuasive arguments to convince the angler to give their time to the survey. Also, consider including an approximate estimate of how many minutes the interview will take. Dillman (1978) states that providing an estimate of time gives the angler an idea of the size of the task before them, hopefully this fact may encourage them to respond. As discussed in Section 2, a letter sent prior to the telephone call is expected to improve data quality and hopefully improve cooperation rates. The preletter alerts the angler to the upcoming survey so the phone call is not unexpected. This can also provide the persuasive statements to explain how the usefulness of the data collected in the survey. Dillman (1978, *Mail and Telephone Surveys: The Total Design Method*, John Wiley & Sons) provides a number of advantages in the use of the preletter and gives an example of a preletter.

8.2 Angler form, and the PR1 form to a lesser extent.

These forms appear quite busy. Has any analysis been done for these data to determine if some questions show high levels of item nonresponse? Questions appear moving in both the horizontal and vertical directions. This could be confusing, particularly for new interviewers. The font size is quite small. Consider revamping this survey instrument to

improve the format for the interviewee. Survey methodologists with experience in survey design would be helpful for this effort.

8.3 Coordinating survey instruments.

In order to maximize the information that is collected in an efficient questionnaire, periodically review the questionnaires. Determine if any questions give an unusual high rate of nonresponse, or if some questions provide inaccurate results.

Survey Review Final Status
Marine Recreational Information Program

Provider Name: **Connie Ryan**

Survey: **California Recreational Fisheries Survey (CRFS)**

Date of Review: **9/30/11**

Date of Final Response: **1/12/12**

Provider Instructions: Read the review and provide feedback if desired. Feedback includes accuracy, usefulness, and potential to implement recommendations. Comments on the review process are also welcome.

1. Accept final report: Yes No

2. Submitted MRIP proposal(s) in response to review: Yes No

3. Formal Feedback Provided: Yes No
 - 3a. Type of formal feedback provided: Corrections Comments

 - 3b. Corrections incorporated in final report: Yes No

 - 3c. Comments attached: Yes No

Notes:

None