Review of NSW recreational fishing tournament-based monitoring methods and datasets

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EXECUTIVE SUMMARY

The Anglers Catch Research Program, more recently known as the Angling Research and Tournament Monitoring Project (ARTMP), has been ongoing for several years. This project was originally based upon the 'Basscatch' project based in freshwater systems. The project was expanded to monitor and assess saltwater fishing tournaments and incorporate an existing tournament-based monitoring program (the Gamefish Tournament Monitoring Program).

This report provides an assessment of the ARTMP since the inception of the program. This document includes: the first thorough documentation of all of the recreational fishing tournament-based monitoring datasets held by New South Wales Department of Primary Industries; the history of the collection of these data; and the resulting issues associated with the use of these data to meet scientific and managerial objectives.

The outcomes of the evaluation of the data and methods presented in this document were used to provide recommendations on the use of these data and any future application of these methods. In particular, the report identifies which components of the project are valuable for scientific objectives – as required by the funding proposal to the Recreational Fishing Trusts (2006/07 fiscal year).

The importance of tournament-based data are highlighted as it provides a cost-effective source of information on recreational fisheries in New South Wales (NSW) over large spatial and long temporal scales. For some fisheries, such as the Australian bass fishery, these data present one of very few existing sources of information with a long-time series. The recreational-only nature of the Australian bass fishery highlights that, without this source of information, fisheries scientists and managers would have little information to support decisions. A similar case is presented for recreational-only gamefish species such as blue and black marlin.

Overall, the majority of tournament-based monitoring methods were evaluated as 'potentially' or 'moderately' useful – provided changes are implemented in future sampling programs. This is in contrast to the majority of the datasets, which were evaluated to be of minimal value in meeting the three scientific objectives identified: resource assessment; assessing the impacts of fishing tournaments; and, assessing the success of fish stocking regimes.

These conclusions are due, in part, to an ad-hoc approach to sampling triggered by design difficulties associated with recreational fishing tournaments and the lack of probability-based survey designs. Also, attempts were made to simultaneously meet the needs of science and management. For example, extensive stakeholder engagement occurred during the collection of data for the expanded monitoring program, this expanded program caused a significant impact on the quality of that data.

Three options were developed to overcome data-related issues with the tournament-based monitoring program in NSW. These are:

1. reduce the scale of data collection to a level that corresponds with available resources, allows for timely reporting and allows additional effort to be

expended on improving data quality and, therefore, improve the scientific outcomes of the project;
2. develop more efficient systems by which managerial and scientific objectives can be simultaneously achieved and a larger number of events can be sampled with no loss of outcomes for either management or science; or
3. increase the resources allocated to the program and separate the various tournament types into distinct but coordinated projects.

Of these three options, the first option (i.e., reduce tournament monitoring to a manageable level given existing resources) is the recommended approach. However, this approach will result in minimal coverage of tournaments in NSW and hence not achieve all of the objectives previously identified for such programs. This approach would maintain the components of tournament monitoring that require the least amount of change or straightforward improvements (such as Basscatch and Gamefish monitoring) and would be solely focused on scientific objectives, in particular, for collecting data that are useful for resource assessment.

In contrast to option one, option two would provide a system that could maintain managerial and scientific objectives simultaneously whilst collecting data over wide spatial scales. There would need to be multiple tiers of data, i.e., some data would be used solely for the purposes of management and would be relatively straightforward, whilst other data would be used for scientific purposes and would need to be more comprehensive. This approach would require the same level of staffing, but a greater degree of operating resources than option one. Implementation of option two would require the replacement of some of the labour intensive tasks with database and web-based technologies. For example, the timely reporting or 'feed-back' to anglers and tournament organisers could be made systematic through the development and implementation of a secure (i.e., not publicly available) web site. Implementation of more efficient electronic systems to collect and report information is the only strategy that has the ability to constrain the costs of monitoring tournaments over wide spatial scales, whilst enabling the collection of data that have the ability to meet both scientific and managerial objectives. Although this option has some very beneficial elements, it is not recommended because it will be too expensive for the outcomes that will likely be achieved.

Option three would require even more resources than option two, including a number of additional scientists and technicians. This approach would provide a large amount of quality data (covering wide spatial scales), timely reporting, and an appropriate concentration of effort towards improving data validation. This option is also not recommended on the basis of cost-benefit. Such significant resources would be better allocated to alternative survey methods of recreational fisheries in NSW.

This review should be considered a stepping stone for the continuation of tournament monitoring in NSW. Once the recommended improvements to the protocols are implemented, applications of tournament data can be enhanced through more timely and thorough reporting. Data quality issues do, however, need to be an ongoing focus of any program.

1. INTRODUCTION

The Anglers Catch Research Program has been ongoing for several years. This project was based upon on the 'Basscatch' project (based in freshwater systems) and was expanded to assess other inland-freshwater and saltwater fishing tournaments. This project was also combined with the existing Gamefish Tournament Monitoring Program in the year 2000 to be collectively known as the Angling Research and Tournament Monitoring Project (ARTMP). Initiation of all tournament-based monitoring programs was considered important as a means of collecting data in a cost-effective manner to support resource assessments and management of these fisheries.

Varying expectations developed over time amongst the stakeholders associated with tournament monitoring i.e., fisheries scientists, fisheries managers, tournament organisers and anglers. Fisheries scientists, for example, focus on the collection of unbiased and statistically defensible data whereas fisheries managers focus on the need to collect data to support their policies and management initiatives. Following these apparent divergences regarding the project's objectives, the Program was split into two distinct, but connected and coordinated, modules: namely the Recreational Fishing Tournament Management Project (hereafter the management project) and the Recreational Fishing Tournament Assessment Project (hereafter the assessment project). The management project focused on developing strategies to improve the practices associated with competition fishing, whereas the assessment project focused on reviewing tournament monitoring for its prospective utility in the collection of catch, effort and biological information (to meet scientific objectives).

1.1. Review objectives

The strategies associated with the management project are not provided as part of this review. The aim of this review is to meet the objectives of the assessment project, which include:

1. Evaluate the scientific value of data derived from fishing tournaments in assessing the status of fish stocks, the impact of fishing tournaments and the success of fish stocking regimes.
2. If fishing tournament data are deemed valuable as per objective (1), then identify tournaments that can provide long-term information on species composition, fish size, catch and effort, and environmental variables of scientific value and of use to resource assessment and management.
3. Provide a cost-effective strategy to assess fishing tournaments identified in (2).

1.2. Values of tournament monitoring

Fishery-dependent data, such as that provided through tournament-based monitoring, provides information relevant to the quality of the recreational fishery and provides that data at relatively low cost. With such information, fisheries scientists and managers are able to monitor the quality of select recreational fisheries. In NSW, the *Fisheries Management Act 1994* includes an object (Part 1.3) to promote quality recreational fishing opportunities to anglers (whilst promoting ecologically sustainable development and conserving fish stocks, key fish habitats and threatened species, populations and ecological communities). Monitoring recreational fishing quality provides an approach to measure the success of achieving this legislative object in NSW.

There are some issues, however, that tournament-based monitoring cannot wholly address. For example, freshwater and saltwater tournament-based monitoring cannot estimate state-wide recreational-based fish harvest as the sampling frame is not complete. These fraternities are unorganised in nature due to multiple associations, organisations and businesses that manage these events. This lack of unity results in an incomplete list of events, which make any expansion calculations to the state-wide level statistically questionable. The club-based gamefish fraternity is, however, more organised in nature with clear identified rules and a complete list of events available. This complete list enables state-wide expansion estimates to be calculated for tournament-based gamefishing if sampling from that frame is undertaken using a specific survey design.

Tournament-based monitoring, when compared to large on-site recreational fishing surveys, can provide fishery-dependent data over large spatial scales in a cost-effective manner. Data obtained through tournament monitoring in NSW is unique, and for some species it is one source of very few long-term recreational-fishery data that are available. This is especially the case for species such as blue and black marlin and Australian bass. These attributes support managerial objectives such as: the formation of partnerships between anglers, tournament organisers, fisheries scientists and managers; and, the facilitation of involvement of anglers in science and management of their fishery. These datasets support scientific objectives such as the collection of data for resource assessments, and for the club-based gamefish fishery provides one of very few datasets to enable harvest estimates to be calculated for this fishery. Although these data are incomplete for the gamefish fishery overall, they have become increasingly important in recent times for negotiations between the gamefish fraternity, the commercial longline fishery and the Commonwealth regarding resource allocation.

2. METHODS

2.1. Category-based evaluation method

A strategy was required to identify the scientific value of existing methods and datasets. A category-based method was selected and this is presented in Figure 1. Each method and dataset had several different attributes, for example, valid size composition data obtainable or biases such as that from non-responses. These attributes are evaluated for their scientific validity and/or value. Results for each attribute will be combined to provide an overall result for each method and dataset.

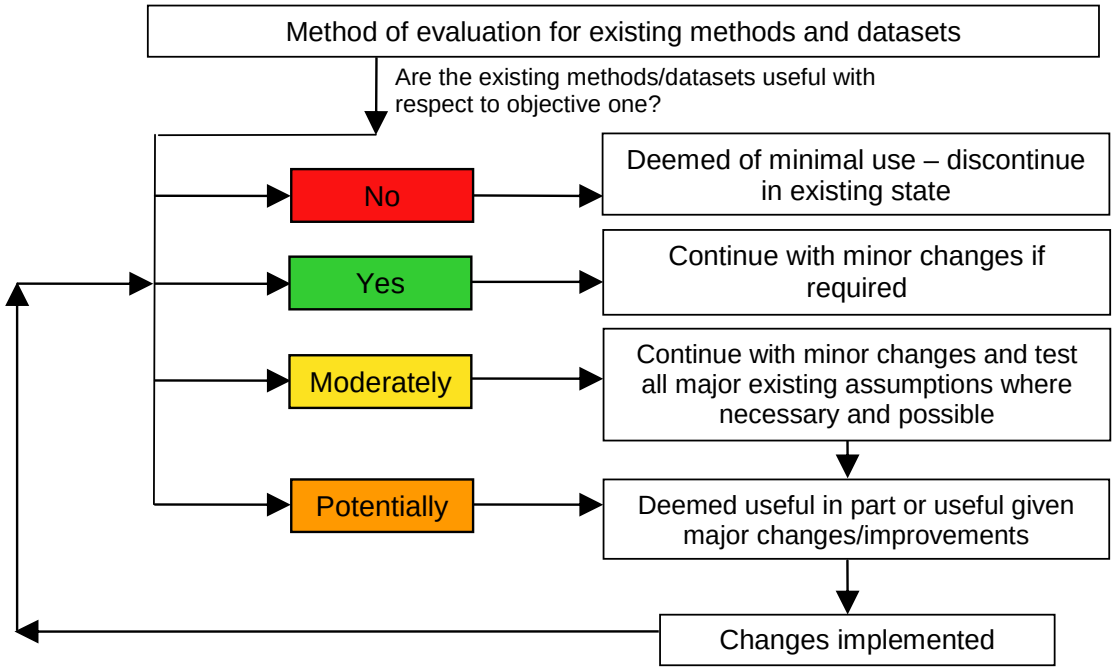

Figure 1. Category-based method for evaluating existing methods and datasets.

2.2. Scientific requirements

2.2.1. A broad perspective

There are two, intrinsically related, scientific approaches applied to issues in fisheries: hypothesis testing and statistical estimation. For some problems, hypothesis testing is the logical method to resolve an issue, for example does a particular modification to a fishing hook actually reduce the catch of under-sized fish. For other issues, the problem is about statistical estimation, for example what is an estimate of the state-wide recreational catch of yellowfin bream in 2000. Both scientific approaches make extensive use of very similar statistical tools.

The data that need to be collected for testing hypotheses or statistical estimation are likely to be very different. For example, testing the hypothesis that fish populations are not impacted for more than six months after a tournament requires a very different project than one that is attempting to estimate the total number of fish caught by that type of

tournament. Data collection protocols should be determined by the objectives of the scientific study. If the objectives are not clearly stated, or have been allowed to shift over time, then the data are not likely to be appropriate for the problem at hand. Hypothesis testing requires an 'experimental design' and statistical estimation requires a 'survey design'.

For the three scientific objectives discussed below (resource assessment, impacts of fishing tournaments and success of fish stocking), hypothesis testing and statistical estimation methods are used in a range of ways. In very general terms, resource assessment requires estimates of catch, catch rates and length composition (i.e., statistical estimation) and research on the impacts of fishing tournaments requires hypothesis testing. Understanding the success of fish stocking would likely involve an application of both types of method. The potential role of tournament monitoring in contributing to meeting these three scientific objectives is discussed below.

2.2.2. Assessing the status of fish stocks (resource assessment)

Resource assessment can be defined as a process of collection and evaluation of biological and fishery data that results in a determination of the status of a fish stock or population. Resource assessments can be produced to varying levels of detail depending on the fisheries harvesting the resource and the amount of information available (Anon. 2006).

Through the process of completing an Environmental Impact Statement (EIS) for all NSW commercial fisheries, NSW DPI has identified important commercial species that require their status to be determined on a regular basis. Many species that have been identified as key commercial species are also important recreational species. In particular, common estuarine fish species (bream, flathead and whiting) that were found in The National Recreational and Indigenous Fishing Survey to be harvested in greater numbers by recreational fishers than commercial fishers (Henry and Lyle 2003; Maganov *et al.* 2003). In addition to the species recognised through the EIS process, there are a number of other species that are either predominantly or solely recreational species, including all freshwater endemic finfish species and saltwater species such as tailor, rock blackfish, eastern blue groper and blue and black marlin.

Species caught predominantly by recreational anglers are the most difficult to monitor due to a lack of data from commercial fisheries (which are usually long-term). This can make the task of determining status difficult without fishery independent surveys. To date, the monitoring of recreational-only species, in particular, freshwater endemic species has predominately relied on expensive independent surveys (using methods such as electrofishing).

Two types of indicators enable assessments of the status of fish in NSW. These include: indicators of abundance such as catch and effort data; and, indicators of population structure such as age and length compositions. A combination of these indicators currently provide 'best practice' resource assessment and management reporting in NSW (Scandol 2004). Therefore, indicators that are useful and obtainable from recreational fishing-based data include total harvest estimates, indices of abundance such as catch per unit effort (CPUE) and age and size compositions.

Particular caution is always placed on the use of CPUE as an index of abundance. Many studies have shown that CPUE indicators are not proportional to population abundance. For example, abundance may be decreasing while the CPUE is stable (i.e., hyperstability is observed) hence the use of CPUE as an index of abundance involves risks (Crecco and Overholtz 1990; Harley *et al.* 2001; Hilborn and Walters 1992; Maunder and Punt 2004; Maunder *et al.* 2006; Peterman and Steer 1981; Swain and Sinclair 1994; Walters 2003).

There are, however, a number of ways that CPUE data can be standardised (Maunder and Punt 2004) to provide benefits over raw CPUE data. For example, if method and targeting information is collected from anglers, directed catch rates can be calculated by method i.e., one group of anglers in a tournament target billfish species and another group of anglers target shark species. The data collected from the two groups of anglers would be partitioned and a directed catch rate can be calculated. A catch rate for marlin species would be calculated from the data collected from those anglers that were targeting billfish and the same would be calculated for the anglers targeting sharks. Partitioning the catch rates from the two groups of anglers is basically removing the influence of method on catch rate and therefore provides a superior catch rate estimator when assessing abundance and fishing quality. There are also other factors such as angler dynamics, vessel specifications and environmental variables that are likely to affect catch rates and hence these can be used in catch rate standardisations.

There is no guarantee, however, that these methods (i.e., the calculation of standardised or directed catch rates) will provide an index of abundance that is proportional to CPUE especially for pelagic species such as billfish, tunas and large sharks. The migratory nature of these species combined with a spatially-restricted recreational fishing fleet (due to factors such as vessel size, fishing times and tournament rules) increases the chances of, for example, finding a high CPUE when the true abundance is actually low or a low CPUE when the true abundance is actually high. Any decision-making process associated with resource assessment should take the risks associated with using catch rates as indices of abundance into consideration. The use of these indices would be enhanced when used collaboratively with indices calculated from alternative sources of data.

Catch rates (non-directed), however, calculated from recreational fishing data are particularly useful to resource assessment as they provide the relevant data to calculate harvest estimates (when total effort data are also collected). Harvest estimates assist scientists and managers in prioritising assessment of important species caught by recreational anglers. Harvest estimates are also particularly important to recreational fishing associations, commercial fishers and governing agencies. These estimates provide the capacity for recreational fishing representatives to negotiate their rights to a fishery, especially when dealing with issues such as: resource sharing between recreational and commercial fishers; and, marine parks.

2.2.3. Assessing the impacts of fishing tournaments

Fishing tournaments (particularly those that are large) are characterised by high concentrations of fishing effort over short periods of time. These events generate positive economic benefits for local communities due to increased visitor numbers and can also lead to increased fishing activity and exploitation of the stocks found there. If fishing tournaments are not managed in an effective manner, then they have the potential for a negative impact on regional communities. For example, if fishing practices caused a

localised depletion of primary target species, then the quality of fishing in that area would presumably decline. A decline in recreational fishing quality could lead to a decrease in the number of visitors to the area, until stocks had a chance to recover and the previous levels of fishing quality returned. The information required to ensure that the impact from fishing tournaments is sustainable includes harvest rates, total harvest estimates and recovery times. Usually these questions would be put as explicit tests of specific hypotheses.

To detect a direct impact from a fishing tournament, data are required that isolate the tournament impact from other impacts (such as commercial fishing practices or environmental influences). Collecting quantitative data that have the ability to detect an impact should therefore include an on-site access-point survey based on a Before/After and Control/Impact (BACI) sampling design (Underwood, 1992). A recreational fishing survey using the BACI design would involve replicated sampling before, during and after a tournament period at the tournament location and other control locations.

To enhance an impact study, measures of post-release mortality should also be considered. There has been a noticeable shift over the past ten years, particularly in freshwater fisheries, from 'catch and kill' to 'catch and release'. The majority of freshwater tournaments now promote one-hundred percent catch and release fishing and the number of freshwater and saltwater events that promote at least a proportion of their event as being 'catch and release' is apparently on the rise. For tournaments that promote catch and release fishing, information relative to post-release mortality such as anatomical hook location and fishing gear used would inform any assessment of impact.

2.2.4. Assessing the success of fish stocking regimes

The success of a fish stocking regime should be measured against the objectives for that particular fish stocking program. There are various reasons why fish stocking is undertaken in NSW (Anon. 2005; Simpson *et al.* 2002). Reasons include: harvest stocking for enhancing fishing for recreational and/or cultural purposes; and, conservation stocking for rebuilding depleted native fish populations (Anon. 2005).

Data for assessing the success of stocking for the purpose of harvest should include measures of fishing quality over time such as CPUE (which would require accurate measures of catch and fishing effort), species composition, size composition and the proportion of stocked fish in the catch.

On the other hand, data useful for assessing the success of conservation stocking for enhancement of natural diversity would include species and size composition for all species in the riverine environment – including those that are not targeted or caught by anglers. Angler data are therefore most useful for assessing the success of fish stocking regimes when the objective is to enhance recreational fisheries. For this reason, references made to the success of fish stocking regimes will be referring to the success of fish stocking for the purpose of harvest to enhance recreational fisheries only.

The success of fish stocking regimes would ideally be measured by a combination of independent and fishery-dependent surveys such as those presented in Faragher *et al.* (2007). Independent surveys, using methods such as electrofishing, netting and trapping can provide indices of abundance, species composition, size and age composition and the proportion of stocked versus non-stocked fish.

Fishery-dependent surveys can provide data useful to calculating harvest estimates and catch rates (CPUE), measures of fishing quality, size composition and, in some cases, the proportion of stocked versus non-stocked fish. Furthermore, if length and weight information is collected, fish condition factors could be calculated (Barnham and Baxter 1998). Condition factors could be used in combination with catch rate indices and species/size composition data to assess the fishery in the area being stocked by comparing the levels of fishing quality through time.

In general, length composition data obtainable from fishery-dependent methods would be very useful in decision-making processes. Length data provide indications of the presence or absence of newly recruited fish – i.e., naturally spawned fish (if a particular location has not been stocked for a period of time) – and can, in some circumstances, allow a particular cohort (of stocked fish) to be followed through time to indicate the survival of that cohort.

3. RESULTS

3.1. History of tournament monitoring

Tournament monitoring was initiated in the late 1980's following a strong interest from angling groups to participate in fisheries science and management. The Basscatch project began as a pilot study in 1988 and was developed as a method by which recreational anglers could collect catch and effort data for Australian bass to provide direct support to the management of their fishery. This method was deemed a success for anglers, fisheries managers and scientists, and was subsequently expanded to include several different groups in eastern drainage systems. Then in 1993, this method was trialled in Lake Mulwala to include the targeted recreational species Murray cod. Freshwater tournament monitoring then saw a significant growth over time from one Basscatch event in 1988 to over seventy freshwater events in 2006. Meanwhile, gamefish tournament monitoring was initiated in the 1993/94 financial year and covered up to 25 events per year. In 2000, all tournament monitoring including freshwater and gamefish was incorporated into a single project and saltwater tournament monitoring (excluding gamefish) was initiated to start in 2001. As a combined project, a minimum of 65 and maximum of 167 events have been monitored per financial year (up to 2005/06) (Figure 1).

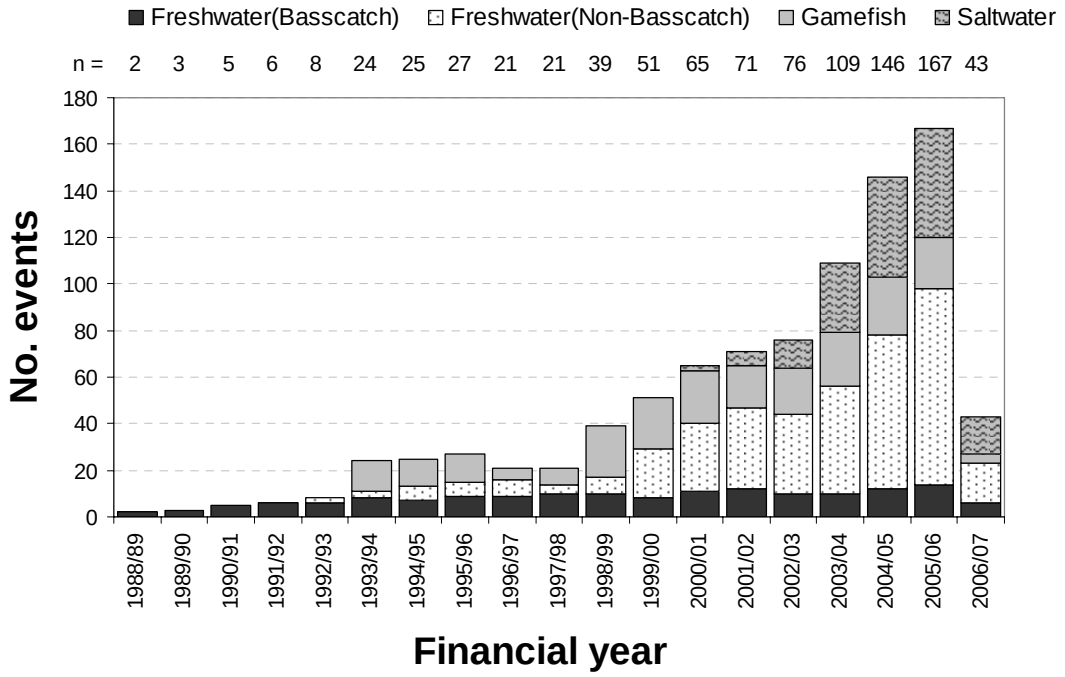

Figure 2. Number of tournament events monitored over time (*n* = the number of events monitored each financial year). These data only include those collected prior to January 2007. Over this time period, data have been collected from a total of 909 tournament events.

3.2. Existing methods

3.2.1. Catch-Card Angler Return System (CARS)

CARS is defined as a self-reported catch-card angler return system that relies on the voluntary recording of fishing effort, catch and fish size information by competition anglers. This system was first utilised by the Basscatch project in 1988. The use of this method was considered important as a means of collecting data in a cost-effective manner to support assessments of relative changes in population structure and density. Basscatch events were, therefore, organised to collect data for within-river-temporal-trend analysis and among-river-spatial analysis (Harris, 2007, pers. com.).

Apparent 100% return rates were recorded and hence a supposed census of information was collected. In 1993, the Basscatch project extended sampling to include two freshwater events held on Lake Mulwala to collect like information on Murray cod (*Maccullochella peelii peelii*). Other events were incorporated over time using this system including existing freshwater fishing tournaments (not part of the original Basscatch project) and for saltwater fishing tournaments (excluding gamefish events).

Prior to the start of each fishing competition, usually at the point of registration, each angler is issued with a kit, which includes a catch card, pencil, vinyl measuring tape and ancillary fisheries information on regulations and/or promotional material. Anglers are requested to record their catch information throughout the day and hand in the card once fishing in that tournament has ceased.

Catch cards provided to the various tournaments have varied in their design and have been tailored in most cases to meet the needs of the individual tournament (see Appendix 1 for an example). In general, the cards included three sections: 1) a section where the anglers record their personal information such as name, address and phone number; 2) a section where the anglers record their fishing times from start to finish excluding breaks such as for lunch and overnight rest between tournament days (effort component); and, 3) a section where anglers record the fish they catch (including discarded undersized and non-competition species in most tournaments) with a common species name specified, the day of capture (when multiple fishing sessions within a day or over several days are fished) and a corresponding length (catch component). In some cases, additional information was requested on the cards, such as specific locations or defined reaches that were fished, the time of capture or method used (e.g., bait, lure or fly).

Pollock *et al.* (1994) stated that the strength of a catch-card system is that it is relatively inexpensive and is simple to administer compared with most other survey methods. However, Essig and Holliday (1991) reported that there are many potential errors (sampling, response and non-response errors) that can be associated with a self-reported system. Potential errors can include: improper sample selection, non-coverage and avidity bias (sampling errors); misinterpretations or non-reporting of questions on the cards, the exaggeration of the number or size of fish caught (prestige bias), intentional misreporting or under-reporting the number or size of fish caught, the possible misidentification of species and incorrect measuring of fish (response errors); or, refusal to return the card (non-response error)(Essig and Holliday 1991).

Non-response (namely a non-response bias) by means of either not handing in a catch card at the cessation of a tournament or not completing all parts of the catch card is the overriding problem with the use of the CARS system. Most tournaments have an associated non-response bias or an unknown non-response rate due to missing information on the number of registered anglers. There are 157 events with a known number of registered anglers and of these 113 have a non-response bias, which is 23% of the total 678 events. Out of the total 678 events, 521 (77%) have an unknown non-response rate. In some cases, due to the tournament structure, accurate information about the number of anglers fishing would be very difficult to obtain without using on-site survey methods (such as a boat count).

The CARS system, in its previous and current use at Basscatch competitions, was characterised by an apparent 100% return rate, low proportion of incomplete cards (6.9%) and hence a low non-response bias. Therefore, the CARS system as used at Basscatch competitions is considered a method that has provided useful baseline catch rate and size composition data for Australian bass in NSW. However, due to the self-reported nature of CARS, there are still potentially biases such as those outlined in Essig and Holliday (1991). The adoption of this system to most other tournament types has, to date, been ineffective in obtaining standardised and hence valid catch rate information. Size composition data collected from these 'other' tournaments may however be valuable for resource assessment, provided that the length measure used is known (i.e., whether the fork or total length was measured).

In an attempt to improve the catch-card-angler-return system by enabling future investigations of biases associated with its use (in particular, from *non-response*), a catch-card identification system was trialled at a selection of freshwater events between February and May 2007. Full details, including the results of this trial, are presented in Appendix 2.

3.2.2. Post-fishing interviews at fresh and saltwater tournaments

There are a number of tournaments, particularly saltwater events that are large and diverse in nature. These tournaments involve high concentrations of fishing effort over relatively short-time periods and involve an array of fishing methods and areas (e.g., beach, rock, estuary and deep-sea fishing). In general, these large-type tournaments provide the highest non-response rates using the CARS system (Appendix 27). It was proposed in 2004 that a creel-type survey component be initiated at these events to capture a higher proportion of anglers' fishing effort and catch information. A creel-type survey should involve a combination of on-site interviews (for the collection of baseline catch and effort data) with the collection of information on the total number of anglers fishing (to provide a total effort estimate). The combination of catch and effort data with total effort information provides the size of the population being sampled and the size of the sample fraction. This information allows baseline catch and effort data to be expanded to the total population. The 2004 proposal, however, did not incorporate the collection of total effort data (i.e., the total number of anglers fishing) and therefore can not be considered a true on-site survey.

On-site interviews were, however, conducted for the purpose of collecting information from a higher proportion of anglers at two freshwater and seven saltwater fishing tournaments during the period March 2005 to July 2006. Interview questions at the freshwater events included: registration name (boat, angler or skipper); anglers home postcode; number of anglers fishing (male, female and juniors); time start and stop fishing;

fishing method used (bait, lure and/or fly); number of fish kept by species; and, number of fish released by species. Interview questions at the saltwater events were similar to those at freshwater events however, due to the diversity of targeting behaviour at these events, an additional question was asked regarding the species targeted (bream, flathead, whiting, snapper, luderick, tailor, kingfish, mulloway, teraglin, anything and/or other) and location of fishing (deep sea, beach, rock, estuary and/or Marine Park, when applicable). Interview staff at both fresh and saltwater events did not measure the lengths of harvested fish. During freshwater interviews, interview staff witnessed the measuring of fish lengths in approximately half of the cases, otherwise the fish lengths were self-reported by the angler. Fish lengths/weights recorded during saltwater interviews were either: estimated by the interview staff; self-reported by the anglers; or not recorded at all. Appendix 3 includes examples of the interview forms used.

3.2.3. Utilisation of the gamefish fishery framework ('Scheds')

The gamefish fishery is highly organised in nature and is run according to a strict set of rules. One of those rules includes a mandatory radio reporting system for all gamefishing tournaments affiliated with the New South Wales Gamefishing Association. Each tournament is required to operate these mandatory radio schedules (hereafter referred to as *scheds*) at regular intervals (in general, every two hours) on each tournament day, primarily as a safety measure to enable vessels to be located quickly in the case of an emergency.

Scheds provide the only cost-effective means of obtaining accurate data on fishing effort for tournament gamefishing in NSW. To collect equivalent information from other recreational-tournament fisheries, methods such as boat counts are required. In comparison, boats counted at an observation site provide an estimate of fishing effort, whilst scheds provide an accurate account of the number of boat trips completed as part of a tournament day. Accurate fishing effort information provides the capability of calculating total harvest estimates for the gamefish-tournament fishery when combined with post-fishing interviews from a sub-sample of fishing trips. Sched data are particularly useful in debates over resource allocation between commercial and recreational fisheries for billfish, tuna and shark species as they provide an account of the fishing effort and catch during tournaments at a spatial resolution of 2 – 3 nautical miles.

Information collected during scheds most commonly includes boat name, number of persons on board, location of fishing as a grid reference (each tournament has their own grid reference map in an alpha-numeric form), method of fishing (trolling, drifting or anchored) and catch in the form of '0-0-0' i.e., the number of strikes, number of hook-ups and number of each species kept or tagged and released. Catch information in the form of '0-0-0' has been used by Park (2007) to compare strike rates and hook-up rates with catch rates to determine overall frequency of interaction of anglers with fish. These comparisons could potentially provide some measure of fishing quality for gamefish species. They could also assist with interpretation of catch rate indices. See Appendix 4 for an example of a sched recording sheet.

Since the inception of the Gamefish Tournament Monitoring Program in 1994, scheds have been used to collect baseline catch and effort information from the gamefish fishery. Every attempt has been made since the inception of the program to collect a copy of the sched reports from each gamefishing tournament held in New South Wales.

The use of sched data has provided accurate information on fishing effort (as the number of boats fishing on each tournament day) and information on 'reported' catch. However, due to competition rules and structures, generally catch of non-point-score species and sometimes low-point-score species (that may be kept for food as opposed to entered into the tournament) are not reported (hereafter referred to as *non-reported catch*). Furthermore, scheds do not include accurate information about fish size and are self reported hence the possibility of a number of biases arises. Also, in some cases fishing method information (i.e., trolling, drifting, anchored or bait fishing), to allow the partitioning of effort in the calculation of catch rate indices, is collected intermittently throughout a tournament or tournament day as a result of anglers non-reporting and radio base operators not demanding the information from those that do not report.

3.2.4. Post-fishing interviews at gamefish tournaments

Pepperell and Henry (1999) recognised that catch information derived from scheds does not include a complete account of fish caught during gamefish events and hence post-fishing interviews were undertaken whenever possible. It was reported that for all tournaments where interviewers were assigned, at least half the fishing fleet was able to be interviewed at the completion of their fishing day. These interviews were undertaken from the programs inception to 1997 and were primarily designed to estimate the *non-reported catch* (i.e., fish caught but not reported on scheds) but were also used to validate certain data from the scheds. The information collected from these interviews included: boat name and tournament registration number; fishing method (trolling; drifting; anchored; and/or, bait); time start and stop fishing; number of fish weighed; number of fish tagged; the number of fish not weighed (i.e., non-point-score fish); and the weight of each fish weighed.

Staffing constraints resulted in the cessation of interviewing during the 1997/1998 fishing season. An interview component was included again in the 1998/1999 fishing season (September to May) and then from 2001 to present. The later interviews from 2001 to present included the collection of additional information such as fish caught and free released, time spent bait fishing each for jigging methods (targeting bait species such as blue mackerel and yellowtail scad) and trolling methods (targeting bait species such as skipjack tuna and bonito), bait type (lure; live bait; dead bait) used for each fish caught and fish size information. See Appendix 5 for an example of a gamefish-tournament post-fishing interview.

For all tournaments where interviews were to be carried out, research technicians attended to conduct interviews of fishing parties at the completion of their fishing day at access points (boat ramps; weigh stations; and, marinas) utilised by competitors. Access points were selected to enable the collection of a representative sample of the target population (i.e., fishing parties registered in the tournament). It was assumed that the fishing activities of angling parties interviewed at the selected access points was representative of all angling parties participating in the tournament. At the selected access points, every attempt was made to interview each fishing party upon their return. Also, interviews were undertaken for a considerable duration after the completion of the fishing day in an attempt to sample the target population representatively. Excluding the tournaments held out of Port Stephens, there were generally only two to three access points used by competing fishing parties and hence in most cases, research technicians were able to conduct

interviews at each site. However, at many events, there were only sufficient resources for one technician to attend and hence only two access points could be covered (typically one boat ramp and the marina or weigh station).

In all circumstances to date, there are a number of assumptions that have to be made when analysing these data. These assumptions include, for example, that the angling parties accessible for interviewing at the completion of a fishing day provide a representative sample of the population and that the tournaments where interviews are conducted are representative of the catch across all NSW tournaments. There is potential for assumptions such as these to be causing significant biases in these data and hence these assumptions need to be tested to estimate the reliability of these data.

3.3. Existing datasets

There are three distinct datasets associated with the sampling methods described above. Following is a description of each dataset, including information about the temporal and spatial extent, the methods used to collect each dataset, and the type and quantity of records.

3.3.1. Freshwater dataset

Data collected from freshwater systems in NSW have been categorised by waterway type and spatial zone. The three waterway types include eastern drainage, western drainage and impoundments. The categorisation of each tournament into these waterway types was considered important due to the differing management issues and variation in species caught. Species of importance to the program in western drainage waterways included the threatened trout cod (*Maccullochella maquariensis*), Macquarie perch (*Maquaria australasica*) and silver perch as well as the highly prized Murray cod and golden perch (*Maquaria ambigua*). Monitoring the catch of introduced pest species such as European carp (*Cyprinus carpio*), goldfish (*Carassius auratus*) and redfin (*Perca fluviatilis*) was also considered important, particularly in the endangered ecological community of the Lower Murray catchment. Eastern drainage species of interest included the endangered eastern freshwater cod (*Maccullochella ikei*) and the 'recreational only' Australian bass (*Macquaria novermaculeata*) and estuary perch (*Macquaria colonorum*). Impoundments are treated separately to the drainage areas as they are predominately stocked to maintain populations and hence the associated management issues tend to be focussed on stocking regimes.

The spatial frame used, including eleven zones, was adopted from the National Recreational and Indigenous Fishing Survey and is presented in Appendix 6. Where possible, every attempt was made to collect data from tournaments held in each of the eleven zones. Tournaments to monitor, however, have been selected on an ad-hoc basis. Priority was given to tournaments that maintained a long-time series of data.

All baseline data in the freshwater dataset, representing over 57,000 angler fishing trips, have been collected using the CARS system. Data have been collected from 525 freshwater events, representing 98 tournaments between October 1988 and December 2006 covering all spatial zones except Coffs Harbour (six) and the Far South Coast (eleven). There are no known freshwater events held in these zones. The project has collected data from 14 Western Drainage fishing events, at least one in each of the major river systems, including

one on the Cudgegong, Gwydir, Lachlan and Wakool Rivers, two on the Darling and Edwards Rivers and three on the Murrumbidgee and Murray Rivers. Data have also been collected from a fishing event held out of Armidale, however this event apparently utilises several fishing bodies including Western and Eastern Drainage areas. Data have been collected from 26 Eastern Drainage events including one on each of the Clyde, Hastings, Lane Cove, Macleay, Manning, Richmond and Shoalhaven Rivers, two on the Myall and Patterson Rivers, three on the Nepean and Williams Rivers, four on the Clarence River and five on the Hawkesbury River. Data have also been collected from 24 different impoundments covering all spatial zones except number six (see Appendix 7). In addition to the impoundment data reported in this document and as part of the Snowy Mountains Trout Strategy, data were also collected from anglers fishing during the Easter period and as part of the Trout Festival between 1997 and 2004. These data were collected using the same methods as presented in this document, however were entered into a separate database and hence are not reported on here. Refer to Faragher *et al.* (2007) for a summary of these data. Appendix 7 includes a graphical representation of the spatial coverage and Appendix 8 provides a full list of freshwater events for which data have been collected over the period October 1988 to December 2006.

In addition to CARS-based data, there is post-fishing interview information for two freshwater events representing 232 angler fishing trips from 100 fishing party interviews. Post-fishing interviews were conducted at the Snowy Mountains Trout Festival in 2005 and the Deniliquin Fishing Classic in 2006. Appendix 10 includes a summary of post-fishing interviews conducted for freshwater systems.

3.3.2. Saltwater dataset

The spatial sampling frame used for saltwater events has, like freshwater events, been adopted from the National Recreational and Indigenous Fishing Survey (Appendix 6). The zones relevant to saltwater events include coastal zones five to ten.

The collection of data from saltwater tournaments in NSW was initiated in 2001. However, it was not until 2004 that at least one event was covered from each of the six zones. To date, data have been collected from 58 different tournaments (156 events) from as far south as Narooma north to Tweed Heads. A list of saltwater events at which data have been collected is presented in Appendix 9. In general tournaments have been selected for monitoring haphazardly although every attempt was made to monitor at least one tournament from each zone.

All baseline data in the saltwater dataset, representing over 17000 angler fishing trips, has been collected using the CARS system. In addition to CARS-based data, there is post-fishing interview information for seven saltwater events representing 1121 angler fishing trips from 440 fishing party interviews. Post-fishing interviews were conducted at the: Coffs Harbour Easter Classic in 2005; Evans Head Fishing Classic in 2005 and 2006; Laurieton Family Fishing Bonanza in 2006; Putt Bennett Family Fishing Festival (Bellinger River) in 2006 and the Port Stephens Trailer-boat Tournament in 2005 and 2006. Appendix 10 includes a summary of the post-fishing interviews conducted.

3.3.3. Gamefish dataset

Existing project reports and publications (Lowry and Murphy 2003; Lowry *et al.* 2006; Murphy *et al.* 2002; Park 2007) provide detailed descriptions and analyses of the gamefish dataset from the inception of monitoring in the 1993/94 fishing season to the 2004/05 fishing season. In summary, the dataset over this period includes two components (as described above) – sched and post-fishing interview data. These data were collected from 16 New South Wales ports, with between 4 and 15 of these ports monitored in any one fishing season. Over this period, the dataset represents up to 22 different tournaments (including events within tournaments such as Ladies' Days) covering up to 57 days in a season representing a total of 192 tournaments comprising 469 tournament days. Post-fishing interviews were conducted at 69 events between July 1998 and June 2005 representing 4312 angling-party interviews. The collection of sched and post-fishing interview data has continued from the 2004/05 fishing season to present (as has been previously undertaken).

In addition to the post-fishing interview data reported in Park (2007), Murphy *et al.* (2002) and Lowry & Murphy (2003), there is also post-fishing interview data available from the project's inception to 1997 (as described in section *3.2.4 Post-fishing interviews at gamefishing tournaments*). These interview data were collected from 37 events representing 95 tournament days and 3667 angling party interviews and have not previously been analysed.

3.4. Category-based evaluation of existing methods and datasets

Following are the results of the category-based evaluation of existing methods and datasets. The overall evaluation results have been presented in Tables 1 and 2 as a summary of the combination of evaluation results for each attribute for each method and dataset by each of the values identified for objective one, i.e., ability to assess the status of fish stocks, the impacts of fishing tournaments and the success of fish stocking regimes. Evaluation results for each attribute of each existing method and dataset by each value (as per objective one) are presented in Appendices 13 to 33 to provide the rationale for each overall result (Tables 1 and 2). The key outcomes and recommendations from the results are also presented in Appendices 13 to 33.

3.4.1. Evaluation of existing methods

Table 1. Overall result of the evaluation of existing methods identifying their value and ability in assessing the status of fish stocks (value to resource assessment), the impacts of fishing tournaments and the success of fish stocking regimes. Each cell corresponds to a justification table in Appendices 13 to 22. Each cell colour corresponds to the evaluation result: green = yes; yellow = moderately; orange = potentially; and, red = no as per category-based evaluation method presented in Figure 1.

Value to: / Method	Resource assessment	Impacts of fishing tournaments	Success of fish stocking regimes
CARS	Appendix 13	Appendix 14	Appendix 15
Post-fishing interviews (excl. gamefishing)	Appendix 16	Appendix 17	Appendix 18
Scheduled Radio Reports (gamefishing)	Appendix 19	Appendix 20	–
Post-fishing interviews (gamefishing)	Appendix 21	Appendix 22	–

3.4.2. Evaluation of existing datasets

Table 2. Overall result for the evaluation of existing datasets identifying their value and ability in assessing the status of fish stocks (value to resource assessment), the impacts of fishing tournaments and the success of fish stocking regimes. Each cell corresponds to a justification table in Appendices 23 to 33. Each cell colour corresponds to the evaluation result: green = yes; yellow = moderately; orange = potentially; and, red = no as per category-based evaluation method presented in Figure 1.

Value to: / **Existing dataset**	**Resource assessment**	**Impacts of fishing tournaments**	**Success of fish stocking regimes**
Basscatch	Appendix 23	Appendix 24	Appendix 25
Freshwater (excl. Basscatch)	Appendix 26	Appendix 27	Appendix 28
Saltwater (excl. gamefish)	Appendix 29	Appendix 30	Appendix 31
Gamefish	Appendix 32	Appendix 33	–

4. DISCUSSION

4.1. Overview of the evaluation

This review has documented all of the recreational fishing tournament-based monitoring datasets held by New South Wales Department of Primary Industries and the methods that have been used to collect these data. A number of issues associated with these datasets and methods have been raised using an evaluation with respect to three scientific objectives: usefulness to resource assessment; usefulness in assessing the impacts of fishing tournaments; and, usefulness in assessing the success of fish stocking regimes. The importance of these data are highlighted as they provide one of few cost-effective sources of information on recreational fisheries in New South Wales over large spatial and long temporal scales. For some fisheries such as the Australian bass fishery, these data present one of very few existing sources of data over a long period of time.

Methods have been evaluated on the basis of past and existing use, combined with recommendations upon how each method could be improved. Datasets, in contrast, have been evaluated only on the basis of their past and existing use. Changes to existing methods recommended as part of this review are intended to improve data collection in the future and hence improve the applicability of each dataset and method (given the implementation of changes where necessary).

The majority of methods were evaluated as ‘potentially’ or ‘moderately’ useful provided that changes are implemented for prospective sampling. In contrast, the majority of the current datasets were evaluated to be of ‘minimal’ use in meeting the three scientific objectives. These results are due, in part, to an ad-hoc approach to sampling caused by the design difficulties associated with the structure of tournament fisheries and the issues associated with ambiguous objectives.

4.2. Overcoming issues associated with meeting managerial and scientific objectives simultaneously

Stakeholder engagement has played a major role in tournament monitoring and has become important not only to fisheries managers but to tournament organisers and anglers. Many tournament organisers rely on staff from the tournament monitoring project for support by means of guidance, material items and reporting. Tournament monitoring provides a vehicle for the average angler to contribute to fisheries science and management in NSW. There are, however, problems associated with meeting managerial objectives (such as wide-scale stakeholder engagement) simultaneously with scientific objectives. Attempting to do so has resulted in one sampling approach being applied to multiple objectives. To fulfil the managerial objective, two courses of action are required: linkages with a large number of anglers via self-reported angler data collection over large spatial scales; and, timely feed-back to the anglers that provide the data.

A greater than ten-fold increase in the number of events covered by tournament monitoring has achieved the first course of action (i.e., linkages with a large number of anglers) over long temporal and large spatial scales. However, in doing so, the second course of action (i.e., appropriate timely reporting back to anglers) has become impractical given the available resources. Furthermore, the expansion of this project in aid of this managerial

objective (in part), has lead to science objectives being compromised. Compromised data causes difficulties for reporting. In particular, reporting the purpose and usefulness of these data to anglers and tournament organisers. This in turn has a negative effect on good stakeholder engagement and management outcomes from the project, for example, the extensive stakeholder engagement that occurred during the collection of data for the expanded monitoring program caused a significant impact on the quality of that data.

Three options have been developed to overcome these data-related issues with the tournament-based monitoring program in NSW. These include:

1. Reduce the scale of data collection to a level that corresponds with available resources, allows for timely reporting and allows additional effort to be expended on improving data quality and, therefore, improve the scientific outcomes of the project.
2. Develop more efficient systems by which managerial and scientific objectives can be simultaneously achieved and a larger number of events can be sampled with no loss of outcomes for either management or science; or
3. Increase the resources allocated to the program and separate the various tournament types into distinct but coordinated projects.

Of these three options, the first option (i.e., reduce tournament monitoring to a manageable level given existing resources) is the recommended approach. However, this approach will result in minimal coverage of tournaments in NSW and hence not achieve all of the objectives previously identified for such programs. This approach would maintain the components of tournament monitoring that require the least amount of change or straightforward improvements (such as Basscatch and Gamefish monitoring) and would be solely focussed on scientific objectives, in particular, for collecting data that are useful for resource assessment.

The evaluation presented in this review indicates that this recommended approach (option one) should focus on Basscatch and Gamefish events, as these are the two longer-term datasets that are least compromised with design and bias issues for resource assessment (Appendices 23, 25 and 32). These two tournament types also present the most cost-effective components of tournament monitoring because they have already been developed, organised structures exist and the spatial scales are defined. This is in contrast to other tournament types, such as western drainage freshwater events and saltwater events (excluding gamefish). For these events, there is no exhaustive list of the tournaments that exist in NSW or no single fishing body that controls or governs these events. Hence, a meaningful frame from which sampling can be drawn is not available.

In contrast to option one, option two would provide a system that could maintain managerial and scientific objectives simultaneously whilst collecting data over large spatial scales. There would need to be multiple tiers of data, i.e., some data would be used solely for the purposes of management and would be relatively straightforward, whilst other data would be used for scientific purposes and would need to be more comprehensive. This approach would require the same level of staffing, but a greater degree of operating resources than option one. Implementation of option two would require the replacement of some of the labour intensive tasks with database and web-based technologies. For example, the timely reporting or ‘feed-back’ to anglers and tournament organisers could be made systematic through the development and implementation of a secure (i.e., not publicly available) web site.

The development of a web-based system would provide participating anglers and tournament organisers with access to results based on the information they provide to NSW DPI. At the completion of a tournament, forms and/or tournament data would be sent to NSW DPI, the data would then be entered and become available within an appropriate timescale (such as three weeks) to tournament organisers and participating anglers as a standardised report that can be viewed via a secure (i.e., not publicly available) web site. The standardised report could include information such as size composition, species composition, fishing effort and catch per unit effort depending on the type of data provided. The system would also enable tournament organisers to order forms and ancillary material to support the accurate recording of tournament information. The system would provide information relevant to the recording of tournament data such as the different options for collecting data as recommended by NSW DPI.

Implementation of more efficient electronic systems to collect and report information is the only strategy that has the ability to constrain the costs of monitoring tournaments over large spatial scales, whilst enabling the collection of data that have the ability to meet both scientific and managerial objectives. Although this option has some very beneficial elements, it is not recommended because it will be too expensive for the outcomes that will likely be achieved.

Option three would also require significant resources, including a number of scientists and technicians assigned to one of several tournament monitoring projects. The different projects would most likely include Basscatch, Gamefish, Western drainage freshwater events (broken into two regions), saltwater estuary, beach and rock events and saltwater offshore events (excluding gamefish). This approach would provide: a large amount of quality data (covering wide spatial scales); timely reporting; and, an appropriate concentration of effort towards improving data validation. This option does not, however, present the most cost-effective solution and hence is not recommended. Such significant resources would be better allocated to alternative survey methods of recreational fisheries in NSW.

4.3. Overcoming data-related issues

4.3.1. Tournament monitoring (excluding gamefish)

The catch-card-angler-return system (CARS) was considered to be potentially useful for the purposes of resource assessment and for assessing the success of fish stocking regimes, yet the method requires changes. Pollock *et al.* (1994) noted that this type of system is relatively easy to maintain and cost-effective. There are, however, a number of biases that need to be accounted for including those associated with *non-response* (a bias arising when people refuse or are unable to answer a survey question; Pollock *et al.* 1994). The existing system assumes that bias from *non-response* remains unchanged across survey scales and that it will not affect indicators such as catch rates.

Through the evaluation of existing datasets it was clear that *non-response* bias needed to be accounted for to ensure that indicators such as catch rates were more standardised across survey scales. Implementation of an improved CARS, which incorporates a catch-card-identification system, is recommended to overcome this bias and provide for better standardisation of data through time. A description of the catch-card-identification system is provided in Appendix 2. In summary, the implementation of this additional recording of

information provides: a) a full list of anglers registered in each tournament; b) a validated proportion of registered anglers that do not return a catch card; and c) the ability to obtain further information from anglers that either do not return or do not complete all fields on their catch card.

This system, which was trialled at a number of freshwater events (Appendix 2), will require further testing but preliminary results indicate that this approach provides a means by which the collection of information on the total number of anglers registered or fishing in an event can be recorded and standardised. This approach also provides a way for tournament organisers to easily identify anglers (during the event) that did not return their catch card and follow-up on these anglers where possible. These preliminary results showed that catch-card-return rates can be increased using this system and that contact information can be collected for anglers that do not return their catch card. Having contact information for anglers that do not return their catch cards allows for post-fishing phone surveys to be conducted for the purpose of testing assumptions and hence accounting for biases such as *non-response*.

A system, alike to this, has been successfully used in an Angler Diary Monitoring Program for Great Bear Lake in Canada and enabled *non-response* and *recall* biases to be accounted for (Anderson and Thompson 1991). Anderson and Thompson (1991) found that supportive lodge managers (assigned to conduct the day-to-day administration of the program) had the highest response rates and indifferent managers (who did not promote the Program correctly and just left the diaries out for guests to collect) had the lowest response rates. Similar differences have been found in NSW fishing tournaments amongst the various tournament organisers and hence, the quality of data obtained and the ability for this type of system to be successful in NSW will depend on the support received from tournament organisers. To improve the outcomes of this system in NSW, the collection of personal information from anglers (such as a contact phone number) will require additional on-site effort from technical staff at some events and could incorporate assistance from Fishcare Volunteers.

An increase in on-site technical assistance, which was provided on a standard basis as part of the original Basscatch project, is recommended to successfully implement an improved catch-card system. This will assist validation of tournament data and improve relations between project staff and anglers, resulting in greater use of these data for scientific and managerial purposes.

The evaluation presented in this document indicated that, even with the implementation of an improved catch-card system, there will still be a number of tournaments where the quality of data can be compromised. Certain types of point-score systems and tournament structures were not well suited to the CARS, which resulted in uncertainty in these data. This included events based on a ‘marshal-based’ point-score system, a ‘largest-fish’ point-score system or events spread over large spatial scales.

Marshal-based systems are simplified for operational purposes and do not include records of fishing effort or unwanted or undersized fish. Anglers participating in marshal-based tournaments are therefore less likely to accurately report data on their catch cards, as these data do not have implications to their score. Angler-provided data from events with ‘largest-fish’ point-score systems present similar problems as their anglers are less likely to report all the fish caught (i.e., those that do not have direct implications for their score). This bias is particularly apparent at saltwater events and western drainage freshwater events.

These point-score systems are dissimilar to mystery-length and honour-based systems, which have been used more successfully in combination with the CARS. All mystery-length and honour-based systems involve anglers completing their catch cards, returning them at the cessation of fishing and their point scores calculated based on the information they provide. For tournaments that use a mystery-length point-score system, a length is randomly selected and the angler with the closest length measure to the mystery length takes the tournament prize. Tournaments that use an honour-based system do not usually provide prizes of any monetary value. They would normally, for example, present a make-shift trophy to encourage the anglers not to provide false data.

Events spread over large spatial scales make the return of catch cards by anglers logistically difficult, most commonly a result of anglers accommodating themselves away from the event's central assembly location. Tournament structures such as these are characterised by very low catch-card return rates and a high probability of missing the many unsuccessful reports.

These data issues, were overcome (in part) by Faragher *et al.* (2007) for the purpose of assessing the stocking regime in the Snowy Lakes region. Although not validated, Faragher *et al.* (2007) utilised the existing tournament-angler data to compare changes in catch rates. In an attempt to remove non-response bias from catch rate data, all data with a reported zero catch were removed from the analysis. This elimination will result in inflated catch rate indices (i.e., higher mean catch rates than experienced by anglers). The angler catch rate data were also analysed in combination with independent survey information, including trapping, electrofishing and biological data. These analyses concluded that the existing stocking regime in the NSW Snowy Lakes region required no immediate management changes. Both the rainbow and brown trout populations were found to be in an excellent condition and the catch rates stable over time. Although the tournament-angler data were used as part of an assessment of the success of fish stocking regimes, the angler data were not validated and were not able to provide accurate measures of harvest or catch rate. Future assessments should focus on collecting accurate angler catch and effort data as opposed to using inflated catch rate indices as presented in Faragher *et al.* (2007).

In general, there are a number of ways that data-related issues can be overcome. These include: a) cease sampling problematic events for use in meeting scientific objectives and continue the collection of information on a more simplified level for managerial objectives only; b) negotiate changes to these events with tournament organisers, in particular, a change in the point-score system used to favour the collection of data suitable to meet scientific objectives; or, c) implement alternate methods (such as an on-site access-point survey) if data are absolutely necessary from these events to meet a specific scientific objective.

Ideally all of the three approaches above should be incorporated into the future of tournament monitoring, particularly if systems are developed by which managerial and scientific objectives can be met simultaneously and a larger number of events can be sampled with no loss of outcomes for either management or science over large spatial scales (Section 4.2, Option 2).

To collect tournament data over large spatial scales in a cost-effective manner, a method by which events can be prioritised, against each of the scientific objectives, should be applied.

Once a full list of events or a sampling frame is formed, each event should be prioritised against each scientific objective. The best method then needs to be identified. The method may include any one of the three options identified above or may simply include the continuation of data collection as has been previously undertaken if the existing data quality is at an acceptable level.

The following criteria could be used to assess each event: size (i.e., number of participants); usefulness and uniqueness of the data; suitability of the existing tournament structure and point-score system to the CARS; and, the legacy of the existing dataset. Once each event is assessed against these criteria, they would be given a score against each of the scientific objectives. The highest-scoring events would then be sampled.

The most cost-effective method to obtain quality data for each of the prioritised events should be applied. For example, if the event was suited to the CARS then the use of this method would continue, whereas, if an event was not suited to the CARS and was of high priority (such as a very large event that needed to be assessed for the effectiveness of stocking) then an appropriate survey method (such as an on-site access-point survey) should be applied. The lowest-scoring events should be incorporated into managerial objectives only and should focus on the collection of simple information such as the event location and date, target species, number of registered anglers and the total number of fish recorded to be caught and/or released.

4.3.2. Gamefish tournament monitoring

The existing program does not routinely randomise the collection of post-fishing interview data across all events. Instead, post-fishing interviews are undertaken with a haphazard approach covering as many events as possible. This haphazard approach has major ramifications to survey design and has the potential to result in biases in the data, inhibiting the accurate estimation of catch rate indices and total harvest. The randomisation of events (where possible and applicable) to undertake post-fishing interviews, along with a number of additional improvements to gamefish monitoring, will result in the collection of catch and effort data that enable estimation of total harvest from tournament events. This has ramifications for resource-sharing issues and will support the long-term and high quality gamefishing opportunities for anglers. Sampling also needs to streamline the collection of ‘sched’ data by providing additional assistance, support and guidance to tournament organisers.

For these outcomes to be realised, the following changes to gamefish monitoring should be implemented: 1) randomised selection of gamefish events for collection of post-fishing interview data; 2) implementation of measuring fish harvested by anglers and present during post-fishing interviews; 3) implementation of new post-fishing interview forms to standardise the collection of catch and effort data to reduce interviewer-based biases and enhance directed effort data; 4) stream-lining of sched data by implementation of a generic sched-reporting form to be used by all gamefishing clubs in NSW; and 5) the design and implementation of a new database, which also incorporates data entry via scanning technologies in use by NSW DPI.

These changes will improve the project’s design, data quality and cost-effectiveness. These changes will also enable the calculation of estimates of total harvest from competition gamefishing using a combination of sched and post-fishing-interview data. For this purpose,

sched data will be used to calculate the total effort component and post-fishing interview data will be used to calculate catch rates. These two components will be used to estimate the total number of fish caught for the NSW tournament-gamefish fishery on an annual basis. Furthermore, with the collection of fish lengths the total weight of fish could be estimated.

A recommended extension of this project is the annual collection of catch data from all twenty-two NSW affiliated gamefishing clubs. This could include the collection of annual reports (from clubs that produce them) or a list of all fish included in point score (if that club does not produce an annual report). This information most commonly includes: date of capture or release; angler and boat name; species; actual weight (captured fish only); tag card number (tagged fish only); line class the fish was caught on; and, area or location of capture.

Annual reports have been routinely collected by Dr Julian Pepperell (Pepperell Research and Consulting Pty Ltd) from clubs that produce them. Data from these reports, in combination with data from the NSW DPI Gamefish Tag and Release Database, have been used for student-based projects under Dr Pepperell's co-supervision on sharks (Chan 2001), dolphin fish (Bennett 2001), yellowfin tuna (Williams 2002) and black marlin (Bridge 2006). Most of the student projects have been required to manually extract these data from annual reports for the chosen species, a process which is particularly inefficient. Consolidation of these reports into a central database will secure the data electronically and would provide support to the gamefish fishery, NSW DPI and other researchers.

Consolidation of these data into a central NSW DPI database would assist scientists and angler-representative associations by providing additional data to enable state-wide catch of the primary gamefish species to be estimated for the NSW club-based sector of this fishery. Devoid of an existing state-wide survey in NSW (along with the lack of a like survey to cover the eastern seaboard of Australia) to specifically address the issue of determining the harvest of gamefish species, the need for more accurate harvest data for the club-based sector increases. This information can provide support to resource assessments and resource-sharing negotiations between commercial and recreational sectors and can assist in the promotion of sustainable recreational fishing opportunities.

4.4. Developing reliable measures of fishing quality

Developing reliable measures of recreational fishing quality should be a key component of all surveys and monitoring programs including tournament monitoring. This could include the development of benchmarks of good recreational fishing quality that could be monitored through time. Monitoring fishing quality would contribute to fisheries management outcomes by providing information relevant to the promotion of quality recreational fishing opportunities and the sustainability of these opportunities.

Indicators of fishing quality such as directed catch or harvest rates, length-based metrics and relative species composition could be used within the development of these measures for recreational fisheries in NSW. Recent NSW DPI recreational fishing survey analyses (Steffe *et al.* 2005a; Steffe *et al.* 2005b; Steffe and Chapman 2003) have included the development of simple fishing quality indicators such as recreational harvest rates, size-frequency distributions and the proportion of unsuccessful fishing parties. These indicators have been used to compare differences through space and/or time, for example, the differences before and after the introduction of a Recreational Fishing Haven.

Tournament-based datasets cover wide spatial scales and include various components, such as length-frequency distributions and catch-rate data. These components would be useful for developing measures of fishing quality. Development of these measures could be incorporated into assessment processes, particularly for recreational species of which there is a lack of alternative information.

4.5. Concluding remarks

This document includes: the first thorough documentation of all of the recreational fishing tournament-based monitoring datasets held by New South Wales Department of Primary Industries; the history of the collection of these data; and the resulting issues associated with the use of these data to meet scientific and managerial objectives. Outcomes of this evaluation were used to recommend directions for these projects.

Whilst completing this review, it became evident that the history of many datasets of this program provided significant momentum for the continuation of tournament-based monitoring. However, continuance of tournament-based monitoring of recreational fisheries solely on the basis of history is not enough. Tournament-based monitoring should continue as there are many constructive uses of these data and it is considered a cost-effective method to collect data due to the large concentrations of fishing effort expended over short periods of time.

The complexities of fishery-dependent sampling are increased in tournament monitoring as a result of the additional factors associated with fitting an appropriate survey design over an existing structure. These complexities, combined with a lack of attempt to incorporate probability-based survey designs, have resulted in the collection of ad-hoc data. Every effort should be made to improve the sampling methods used for tournament-based monitoring to enhance the usefulness of these data types. Investigations into alternate methods of collecting like data or data of greater use should also be considered. Alternate methods could include: organised fishing events (based on experimental designs) using, for example standard fishing gears; the coordination of before and after fishing events to address issues associated with the impacts of fishing tournaments; angler diary surveys; telephone surveys; and/or, incorporating bus route designs to cover multiple access sites used within a tournament without increasing the costs of sampling.

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6. APPENDICES

APPENDIX 1

Example of catch-card design used for the collection of catch and effort data at freshwater fishing tournaments.

Please record your fishing sessions in each river reach even if you do not catch any fish.

Saturday or Sunday	River Reach	Start Time	Finish Time	No. Caught

ANGLING RESEARCH

XXXX XXXXX
Basscatch

FISHING REPORT FORM

Dates:

CERT NO:

Name:_____

Address:_____

Phone No:_____

Please return to:
XXXXXXX (Basscatch Officer)
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Please measure and record all fish caught including untargeted species

Caught Set or Sun	River reach	Fish species	Fork Length (mm)	Spin, Troll or Fly	Witness Signature
		1			
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
		16			
		17			
		18			
		19			
		20			
		21			
		22			
		23			
		24			
		25			
		26			
		27			
		28			
		29			
		30			
		31			

Caught Set or Sun	River reach	Fish species	Fork Length (mm)	Spin, Troll or Fly	Witness Signature
		32			
		33			
		34			
		35			
		36			
		37			
		38			
		39			
		40			
		41			
		42			
		43			
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		60			
		61			
		62			
		63			
		64			
		65			
		67			

APPENDIX 2

Identification system on catch cards trial.

Introduction

In an attempt to improve the catch-card-angler-return system to enable future investigations of biases associated with its use (in particular, from *non-response*), a catch-card identification system was trialled at a selection of freshwater events between February and May 2007. The objective of this trial was to investigate the likelihood of collecting information that would provide: a) a full list of anglers registered in each tournament; b) a validated proportion of registered anglers that do not return a catch card; and c) the ability to obtain further information from anglers that either do not return or do not complete all fields on their catch card.

Methods

Prior to each event, the tournament organisers were provided with an additional form to fill out, which included the following fields: catch-card number; angler name; and, angler contact number(s). Tournament organisers were requested to fill out this form during the registration phase of the event whilst recording the relevant catch-card number on each catch card before providing them to the registered anglers.

This system was trialled at freshwater events of varied sizes and location and included the: Bidgee Interclub (Murrumbidgee River, Berembed Weir); Native Fish Challenge (Murray River, Yarrawonga, Lake Mulwala); Hawkesbury-Nepean River Basscatch; Hawkesbury-Nepean Bass Interclub Challenge; and, Bidgee Classic (Murrumbidgee River, Gogeldrie Weir).

Results and discussion

The system was partially unsuccessful at the largest event trialled (Bidgee Classic). This was attributed to: 1) an already-existing registration process that was unable to be altered in time for the trial; 2) difficulties associated with the tournament organisers recording a catch-card number on a large number of forms; and 3) varied willingness of anglers to provide contact information such as a phone number. However, due to the already-existing registration process at this event, some of the required information was still obtained and recorded. This included a full list of anglers registered to fish in the event (463 anglers) and of these, 175 (37.8%) anglers provided a contact phone number through the official registration process. A further 59 (12.7%) anglers provided their phone number on their catch card, which meant that phone numbers were received from a total of 234 (50.5%) anglers.

In total, 120 (25.9%) anglers returned and 343 (74.1%) did not return a catch card for this event. Of the anglers that did return a catch card, only 2 (1.6%) anglers did not provide their phone numbers either through registration or by filling out this information on their catch card. Of the remaining 343 anglers that did not return a catch card, 227 (66.2%) anglers did not provide their phone numbers through the registration process.

The catch-card identification system was successful at all of the other events that it was trialled. For all events, a full list of anglers was recorded prior to fishing and a validated

proportion of both returned forms and anglers not fishing were obtained. For all but one event, 100% of anglers provided a contact phone number. The one event at which only 52.7% of anglers provided their phone numbers did record a 100% catch-card return rate by using this system. It was reported from this event that the presence of a project representative to record registration information or to at least provide an explanation of the use of phone numbers would have significantly increased the proportion of anglers that provided their phone numbers. It was also reported that this system gave the tournament organisers an easy way of following up on anglers that had not returned their forms at the completion of each fishing day, which was reported to have improved the running of the event.

The results of this trial demonstrated that the introduction of a catch-card identification system can, in most cases, provide the required information to assess the potential biases associated with *non-response* from registered anglers. The collection of this information should be a minimum requirement for all monitored events. If baseline registration information can not be obtained from an event to enable *non-response bias* to be accounted for, the resulting information can not reliably be used as the biases are potentially too large. If these data can not be reliably used, the monitoring of these events should be discontinued.

APPENDIX 3

Examples of the interview forms used at freshwater and saltwater tournaments for the collection of on-site angler, catch and effort data.

Events:

Location:

Interviewers Initials:

Date:

INTERVIEW ONE

Number of Anglers

Males	Females	Juniors

Boat Name, Registration or Skippers Surname:

Home Postcode:

Time Started:

Time Finished:

Method (circle): Bait Lure Fly

Fish Kept

Species	Length	Species	Length	Species	Length
1		6		11	
2		7		12	
3		8		13	
4		9		14	
5		10		15	

Golden Perch (GP), Murray Cod (MC), Silver Perch (SP)

Number Of Fish Released and Estimated Lengths

Golden Perch:

Murray Cod:

Silver Perch:

Other:

INTERVIEW TWO

Number of Anglers

Males	Females	Juniors

Boat Name, Registration or Skippers Surname:

Home Postcode:

Time Started:

Time Finished:

Method (circle): Bait Lure Fly

Fish Kept

Species	Length	Species	Length	Species	Length
1		6		11	
2		7		12	
3		8		13	
4		9		14	
5		10		15	

Golden Perch (GP), Murray Cod (MC), Silver Perch (SP)

Number Of Fish Released and Estimated Lengths

Golden Perch:

Murray Cod:

Silver Perch:

Other:

Appendix 3 (cont.)

INTERVIEW FORM

Evans Head Fishing Classic

INITIALS	DATE	LOCATION	REGO NO. or BOAT NAME
	/ /		

What time did you start fishing?	What time did you stop fishing?	NO. ANGLERS IN PARTY
HOURS : MINS	HOURS : MINS	MALE : FEMALE

What were your main target species?

Bream		Luderick		Teraglin	
Flathead		Tailor		Anything	
Whiting		Kingfish		.....	
Snapper		Jewfish		.....	

Where did you fish today?

Deep Sea		Estuary	
Beach		Marine Park	
Rock			

SPECIES	NO. KEPT	NO. RELEASED	FORK LENGTHS (nearest cm)				

HOME POSTCODE		COMMENTS

APPENDIX 4

Example of a gamefishing tournament radio 'sched' recording sheet.

BATEMANS BAY GAME FISHING CLUB INC.

ENTERED

Tollgate Islands Classic

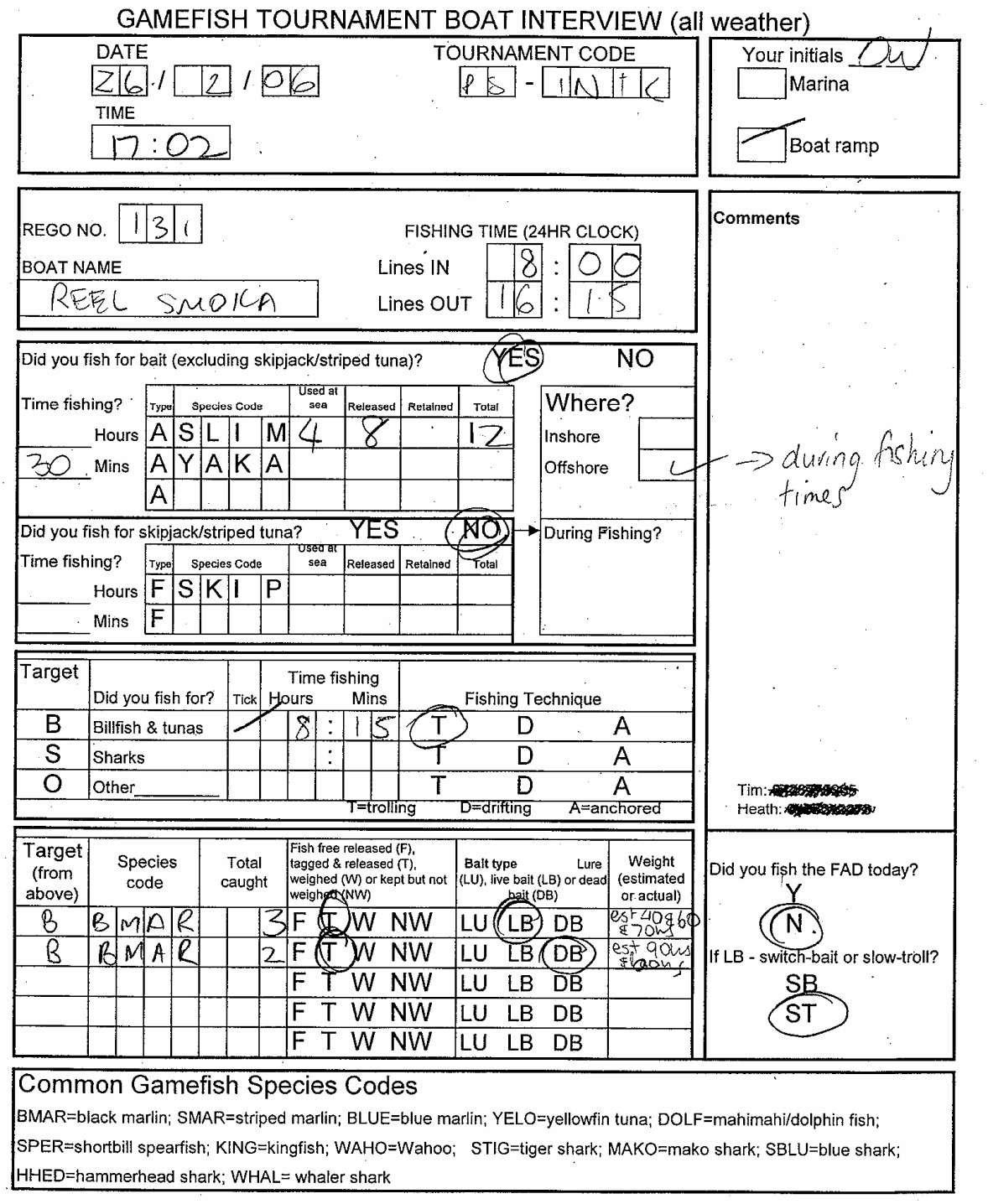
SUNDAY, JANUARY 21

① Lure - 41 Spaniard ② lure 6 Foot loose ③ Lure 42 Black Horse

	VESSEL	SKIPPER	SIGN ON	SIGN OFF	POB	09:10 RESULT	11:10 RESULT	13:10 RESULT	15:10 RESULT	16:25 RESULT
1	Opportunatee	Brett	0505	1542	4	H 3 22 2 + TR-YF mark 0955 TR-YF Nathan 0958	E9 4 2 3 TR/YF Nathan 1028 TR/YF Mark 1012	F9 111 TR/An Nathan	F5 - - - T	
2	Shot Gun	Mathew	0526	1531	4	E9 - - - T	F10 - - - +	F8 - - - +	T9 F4	
3	Reel Tension	Keith	0505	1548	3	D9 - - - +	17 - - - +	97 111 + TR/YF Keith	F4	
4	Hook 'Em	~~Shane~~ Daniel Deeur	0554	1520	2	F7 - - - +	H7 - - - T	97 - - - T	T9 H/Home F4	
5	Gemini	Steve	0611	1624	6	17 - - - T	F9 - - - +	H8 - - - +	96 - - -	
6	Foot loose	Alec/Sean/Stehn	0618	1710	6	98 - - - +	16 - - - +	17 - - - T	96 - - -	
7	Lady Eugenia	Chris/Paul	0655	1644	3	16 - - - T	17 - - - +	16 - - - +	H5 11 - +	
8	Bartender	Chris	0648	0902	2	——	——	——	——	
9	Dads boat	craig	0748	1336	5	C wide - - - +	J.B canyons H/home AN	J.B canyons N/home	——	
10	Moruya 44	Rodney	0602	1602	4	L6 - - - +	J.6 - - - T	14 - - - T	~~F5~~ 95	
11	Bill Collector	Bill/Liam	0633	1622	6	J6 - - - T	L5 11! TR/SM Wh Bowmont	Tuross L5 heading back	16	
12	Toona	Bob	——	——	——	——	——	——	——	
13	Team Dominator	Mick	0640	1520	4	[redacted]	J6 - - - D	H6 - - - T	T9 F4	
14	Reseraction	Jamie	0650	1525	3	17 11 D TR/SM Run Tait 0827	J6 - - - +	1711 - T marlin lost	Bay IN	
15	Reel Sport	Justin	0630		3	Heading home North Shs C9 - - - T	B10 - - - +	J.B canyons AN	off Durras waiting all OK AN	
16	Deceiver	Terry	0537	1336	4	C10 - - - +	North Blide wide J.B. canyons AN	——	—— IN	
17	the Skog	Ron/John	0800	1415	4	E6/7 - - - +	E6 - - - +	E6 - - - +	——	
18	On the Mark	Mark	0605	1002	3	T9 F4	——	——	——	

APPENDIX 5

Example of a post-fishing interview form used at a gamefishing tournament to collect catch and effort data.



GAMEFISH TOURNAMENT BOAT INTERVIEW (all weather)

DATE: 26 / 12 / 06 — TOURNAMENT CODE: BS - INTC — TIME: 17:02

Your initials: DW — Marina ☐ — Boat ramp ☑

REGO NO. 131 — BOAT NAME: REEL SMOKA

FISHING TIME (24HR CLOCK): Lines IN 08:00 — Lines OUT 16:15

Comments: → during fishing times

Did you fish for bait (excluding skipjack/striped tuna)? YES (NO)

Time fishing?	Type	Species Code	Used at sea	Released	Retained	Total
Hours	A	SLIM	4	8		12
30 Mins	A	YAKA				
	A					

Where? Inshore ☐ Offshore ☑

Did you fish for skipjack/striped tuna? YES (NO) → During Fishing?

Time fishing?	Type	Species Code	Used at sea	Released	Retained	Total
Hours	F	SKIP				
Mins	F					

Target	Did you fish for?	Tick	Time fishing Hours	Mins	Fishing Technique
B	Billfish & tunas	✓	8	15	(T) D A
S	Sharks				T D A
O	Other_____				T D A

T=trolling D=drifting A=anchored

Tim: [redacted]
Heath: [redacted]

Target (from above)	Species code	Total caught	Fish free released (F), tagged & released (T), weighed (W) or kept but not weighed (NW)	Bait type (LU), live bait (LB) or dead bait (DB) Lure	Weight (estimated or actual)
B	BMAR	3	F (T) W NW	LU (LB) DB	est 40@60 & 70ish
B	BMAR	2	F (T) W NW	LU LB (DB)	est 90lbs & 100ish
			F T W NW	LU LB DB	
			F T W NW	LU LB DB	
			F T W NW	LU LB DB	

Did you fish the FAD today? Y (N)

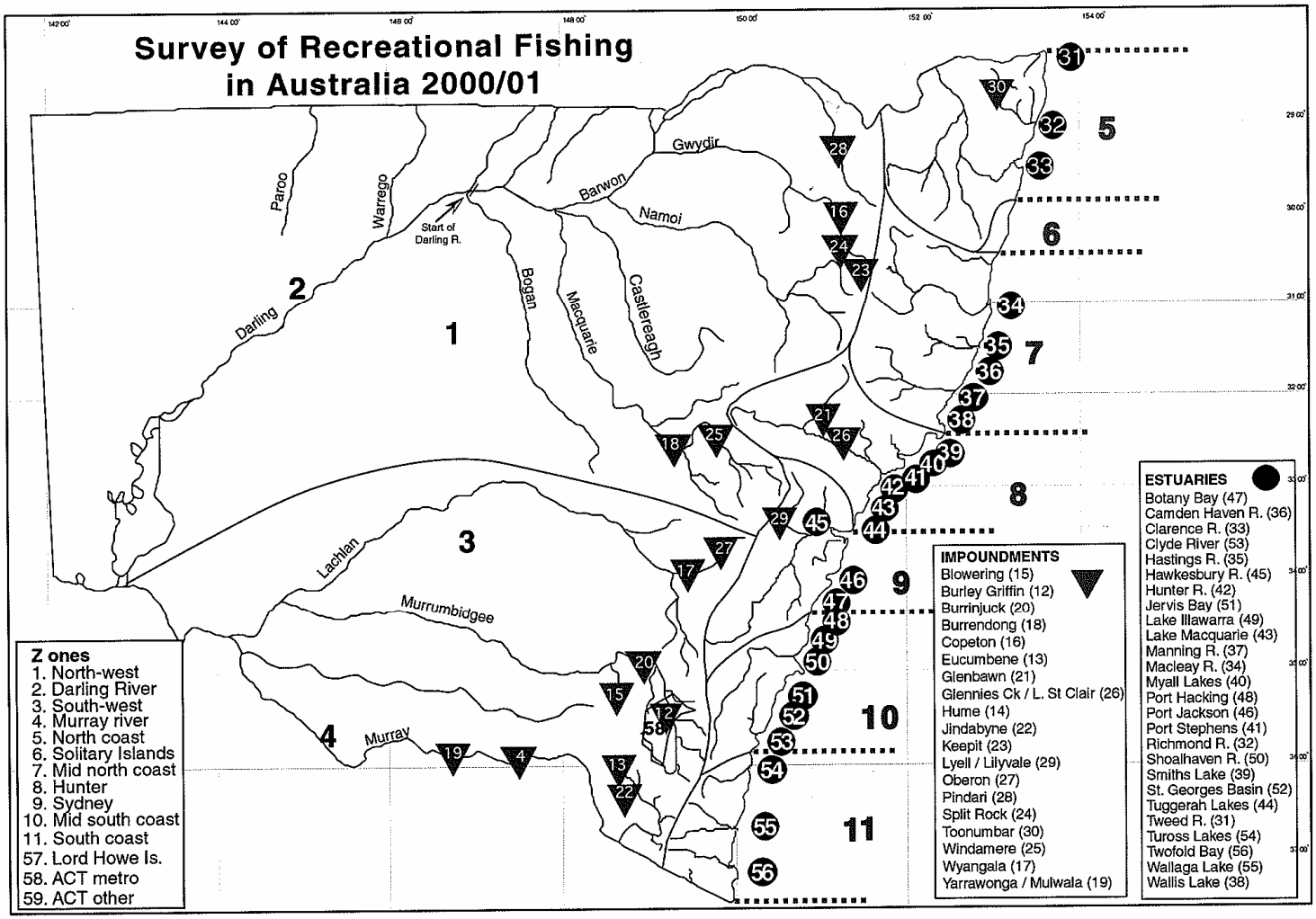
If LB - switch-bait or slow-troll? SB (ST)

Common Gamefish Species Codes

BMAR=black marlin; SMAR=striped marlin; BLUE=blue marlin; YELO=yellowfin tuna; DOLF=mahimahi/dolphin fish; SPER=shortbill spearfish; KING=kingfish; WAHO=Wahoo; STIG=tiger shark; MAKO=mako shark; SBLU=blue shark; HHED=hammerhead shark; WHAL= whaler shark

APPENDIX 6

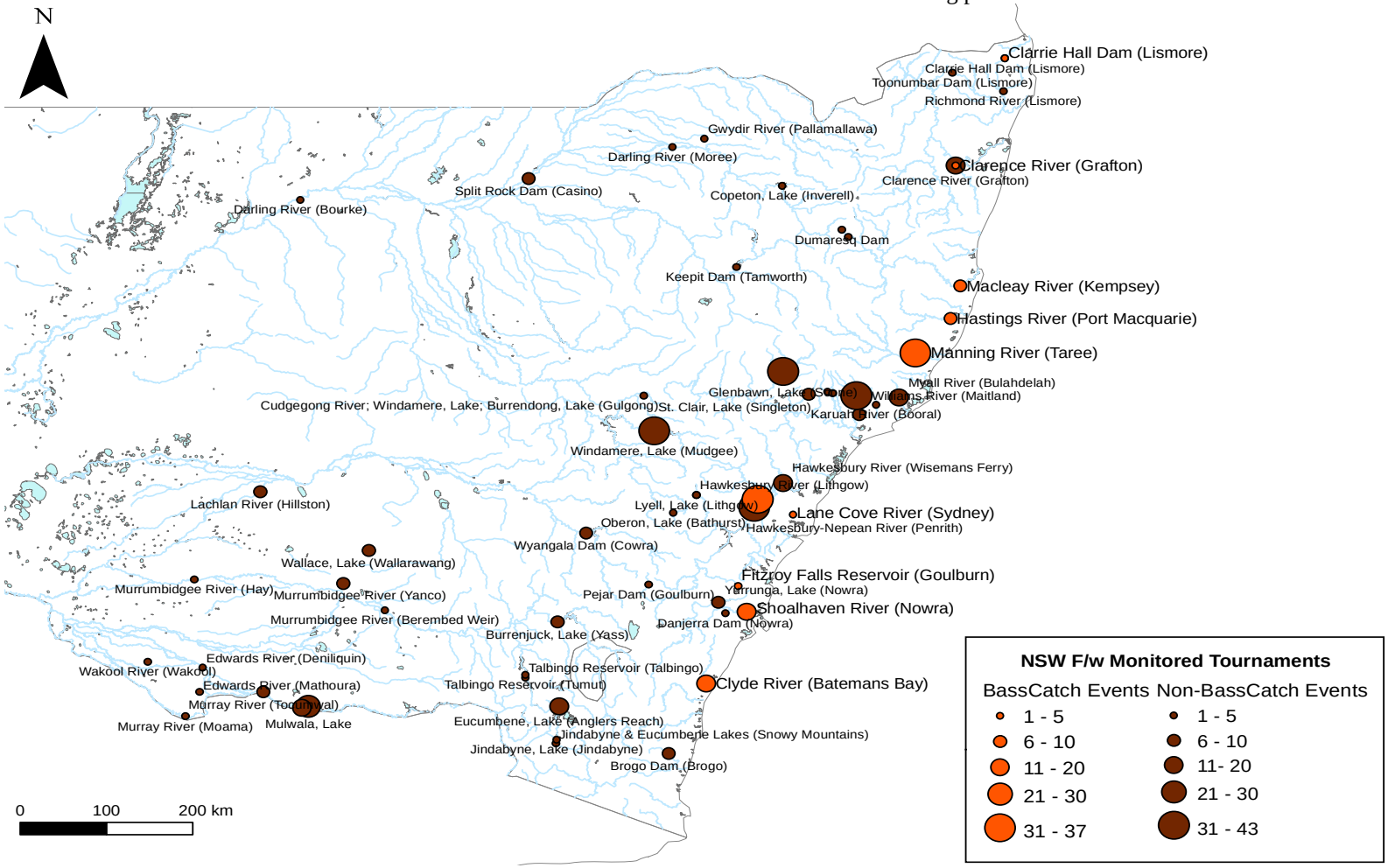
The National Recreational and Indigenous Fishing Survey 2000/2001 New South Wales regional boundaries map.



APPENDIX 7

Freshwater Tournament events covered.

Basscatch events represent monitoring from 1988 – 2006. Freshwater events (Excluding Basscatch – Non-Basscatch Events) represent monitoring from 1993 – 2006. Numbers equal the total number of events that data have been received for over the total duration of the monitoring period.



APPENDIX 8

Freshwater tournaments for which data have been collected over the monitoring period (1988 – 2006) and recorded in the Anglers Catch Research Database.

Information for each event includes: the waterway fished; location of tournament base; drainage type (I = impoundment; W = western drainage; and E = eastern drainage); Region (as per the map in Appendix 6); the number of events held per tournament each year; and the total number of angler fishing trips for which data were collected. (note: The majority of the Basscatch events hold two events each year).

								Number of events (number of angler fishing trips)																			
Event ID	Event name	Host	Waterway	Location	Drainage type	BassCatch YN	Region	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
SKF	St Kilda Fisharama	St. Kilda Fishing Club	Armidale	Armidale	All?	N	1																	1(19)	1(138)	1(170)	4(327)
COPE	Copeton Dam Fishing Competition	Oxford Inland Fishing Club	Copeton, Lake	Inverell	I	N	1													1(176)	1(255)	1(465)					1(896)
GIFF	Great Inland Fishing Festival	Inverell Times	Copeton, Lake	Inverell	I	N	1																1(121)	1(143)			3(264)
DDKD	Dumaresq Dam Kids Day		Dumaresq Dam		I	N	1																		1(17)		2(17)
LKFFC	Lake Keepit Open Fishing Competition	Lake Keepit Family Fishing Club	Keepit Dam	Tamworth	I	N	1														1(99)						2(99)
GRS	The Glennriddle Shield Fishing Comp	Last years winning club	Split Rock Dam	Casino	I	N	1														1(160)	1(78)	1(73)		1(71)	1(243)	6(625)
SPLR	Freshwater Lure Classic	Unknown	Split Rock Dam	Casino	I	N	1													1(75)							2(75)
FMW	Freshwater Fishing Masters	Oar-Gee Lures	Windamere, Lake	Mudgee	I	N	1												1(50)	1(60)	1(66)	1(72)	1(80)	1(76)	1(75)	1(76)	9(555)
GC	Golden Catch	Unknown	Windamere, Lake	Mudgee	I	N	1																			1(56)	2(56)
RKW	Rylstone/Kandos Fishing Competition	Rylstone/Kandos Fishing Club	Windamere, Lake	Mudgee	I	N	1																1(70)	3(297)	5(232)	4(271)	14(870)
TFC	Tri-Fish Challenge	Rob Lononey	Windamere, Lake	Mudgee	I	N	1														1(65)		1(44)	1(15)			4(124)
WIN	Golden Classic	Sportfish.com	Windamere, Lake	Mudgee	I	N	1								1(126)	1(159)	1(205)I	1(139)	1(183)	1(164)	1(137)	1(206)	1(424)	1(278)	1(398)		12(2419)
GEFC	Gulgong Easter Fishing Competition	Gulgong Amateur Fishing Club	Cudgegong River; Windamere, Lake; Burrendong, Lake	Gulgong	I & W	N	1																			1(45)	2(45)
MOR	Hardman Marine Weekend Fishing Challenge	Moree Fishing Club	Mehi/Gwydir Rivers?	Moree	W	N	1															1(116)					2(116)
GG	Golden Grain	Golden Grain Hotel FC	Gwydir River	Pallamallawa	W	N	1																1(426)	1(357)	1(329)	1(301)	5(1413)
OFC	Outback Fishing Challenge	Bourke Chambers of Commerce	Darling River	Bourke	W	N	2															1(111)		1(203)	1(25)		5(339)
BUR	ANSA Burrinjuck Convention	Canberra Fishermans Club	Burrenjuck, Lake	Yass	I	N	3														1(185)	1(239)	1(231)	1(141)	1(86)	1(63)	9(945)
VFCE	Eucumbene Fishing Weekend	Vikings Fishing Club	Eucumbene, Lake	Anglers Reach	I	N	3																3(130)	5(211)	1(37)	12(378)
SMES*	Snowy Mountains Easter Fishing Survey	NSW DPI	Jindabyne & Eucumbene Lakes	Snowy Mountains	I	N	3																	1(439)	1(284)	5(723)
SMTC	Snowy Mountains Trout Challenge	Snowy Mountains Chamber of Commerce	Jindabyne & Eucumbene Lakes	Snowy Mountains	I	N	3																1(152)		1(87)		5(239)
SMTF*	Snowy Mountains Trout Festival	Alpine Angler	Jindabyne & Eucumbene Lakes	Snowy Mountains	I	N	3																		1(1215)		4(1215)
VFCJ	VFC Fishing Weekend	Viking Fishing Club	Jindabyne, Lake	Jindabyne	I	N	3																		1(57)	2(145)	6(202)
CABC	Catch A Brown Classic	Sydney Fly Rodders	Oberon, Lake	Bathurst	I	N	3																			1(21)	4(21)
ANSATD	ANSA Talbingo Convention	Wagga Wagga Boat Anglers Club	Talbingo Reservoir	Tumut	I	N	3														1(150)		1(135)	1(120)	1(142)	1(117)	8(664)
VFCT	VFC Fishing Weekend	Vikings Fishing Club	Talbingo Reservoir	Talbingo	I	N	3																		1(36)	1(14)	5(50)
GRA	Grabine Classic	Grabine Fishing Tournament Inc.	Wyangala Dam	Cowra	I	N	3													1(398)	1(597)	1(456)	1(404)	1(217)	1(207)	1(146)	10(2425)
WSC	Wyangala South Coast Freshwater	South Coast Anglers	Wyangala Dam	Cowra	I	N	3																			1(56)	4(56)
WYG	Grabine Mid-State Convention	Grabine Freshwater Fishing Tournament Inc.	Wyangala Dam	Cowra	I	N	3														1(46)						4(46)
HILLS	Hook, Line and Sinker Fishing Festival	Hillston Chamber of Commerce	Lachlan River	Hillston	W	N	3														1(151)	1(496)	1(316)	1(487)	1(447)	1(510)	9(2407)
BID	Bidgee Classic	Leeton Tourism	Murrumbidgee River	Yanco	W	N	3														1(269)	1(422)	1(370)	1(251)	1(250)	1(341)	9(1903)
BIDIC	Bidgee Interclub	Leeton Hotel & Ganmain Anglers Club	Murrumbidgee River	Berembed Weir	W	N	3																		1(112)	1(140)	5(252)
HAY	Hay Lions Football Fishing Club Competition	Hay Lions Football Fishing Club	Murrumbidgee River	Hay	W	N	3																			1(300)	4(300)
LETE	Lake Eucumbene Trout Extravaganza	Sydney GFC	Eucumbene, Lake	Anglers Reach	I	N	4																	1(70)	1(74)	1(103)	7(247)
FMM	Freshwater Fishing Masters	Oar-Gee Lures	Mulwala, Lake	Yarrawonga	I	N	4												1(79)	1(66)	1(72)	1(81)	1(78)		1(65)	1(72)	11(513)
MUL	Mulwala Classic	Wagga Wagga Fishing World	Mulwala, Lake	Yarrawonga	I	N	4						1(107)	1(188)	1(275)	1(220)	1(256)	1(255)	1(255)	1(257)	1(268)	1(255)	1(239)	1(178)	1(253)	1(188)	18(3194)
MUMC	Mulwala Mercury Classic	Lake Mulwala Angling Club	Mulwala, Lake	Yarrawonga	I	N	4																		1(269)	1(158)	6(447)
PFM	Triton Boats Pro Fish Tournament	Australian Fishing Network?	Mulwala, Lake	Yarrawonga	I	N	4																			1(52)	5(52)
VFCM	VFC Fishing Weekend	Vikings Fishing Club	Mulwala, Lake	Yarrawonga	I	N	4																		1(22)	1(38)	6(60)
DEN	Deni Fishing Classic	Deniliquin RSL Fishing Club	Edwards River	Deniliquin	W	N	4															1(489)	1(287)	1(267)	1(315)	1(517)	9(1875)
MAT	Mathoura Fishing Classic	Chamber of Commerce	Edwards River	Mathoura	W	N	4															1(366)	1(243)	1(401)	1(275)	1(359)	9(1644)
EMC	Echuca Moama Fishing Classic	Echuca\Moama RSL Ltd	Murray River	Moama	W	N	4																	1(413)	1(229)	1(377)	7(1019)
NFC	Native Fish Challenge	Native Fish Australia	Murray River	Yarrawonga	W	N	4								1(190)	1(139)	1(115)	1(151)	1(221)	1(127)	1(135)	1(150)	1(100)	1(90)	1(124)	1(123)	16(1665)
TOC	Tocumwal Classic	Tocumwal Angling Club Inc	Murray River	Tocumwal	W	N	4														1(414)	1(794)	1(392)	1(447)	1(618)	1(375)	10(3040)
WFC	Wakool Fishing Classic	Wakool Fishing Club	Wakool River	Wakool	W	N	4																		1(169)	1(347)	6(516)
CLR	Bridge to Bridge Bass Classic	Big River Bass Fly-Fishing Club	Clarence River	Grafton	E	N	5													2(166)	1(94)	1(155)	1(24)	1(36)	1(28)		12(503)
COP	Copmanhurst Bass Invitational	Fishing Tackle Australia	Clarence River	Grafton	E	N	5														1(60)	1(35)	1(110)	1(106)	1(76)		10(387)
GBC	Grafton Basscatch Classic		Clarence River	Grafton	E	Y	5																			1(145)	6(145)

Appendix 8 (cont.)

								Number of events (number of angler fishing trips)																				
Event ID	Event name	Host	Waterway	Location	Drainage type	BassCatch YN	Region	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
NSWCL	NSW Pro-Bass	NSW Pro-Bass, Chris Craig	Clarence River	Grafton	E	N	5																	1(70)			8(70)
RVSFC	RVSFC Bass Classic	Richmond Valley Sport Fishing Club	Richmond River	Lismore	E	N	5													1(71)	1(73)						7(144)
ABTCH	ABT Pro Bass	Australian Bass Tournaments (ABT)	Clarrie Hall Dam	Lismore	I	N	5																		1(24)	2(36)	8(60)
CHB	Clarrie Hall Basscatch	Australian Bass Association	Clarrie Hall Dam	Lismore	I	Y	5																	1(72)	2(161)	2(117)	10(360)
ABTTD	ABT Pro Bass	Australian Bass Tournaments (ABT)	Toonumbar Dam	Lismore	I	N	5																	1(17)	1(8)	2(29)	9(54)
HAS	Hastings River Bass Catch	Mid North Coast Fly Rodders	Hastings River	Port Macquarie	E	Y	7														1(17)	1(14)	1(15)	1(15)	2(16)	1(21)	14(98)
MLY	Macleay River Basscatch	Bass Kempsey	Macleay River	Kempsey	E	Y	7													1(129)	1(177)	1(167)	1(159)	1(138)	1(143)	1(122)	14(1035)
MAN	Manning River Bass Catch	Wingham Anglers	Manning River	Taree	E	Y	7				1(44)	2(60)	2(80)	2(70)	3(63)	2(82)	2(66)	3(54)	1(32)	2(37)	2(45)	2(80)	2(41)	2(36)	2(41)	2(44)	39(875)
CCFR	Central Coast Fly Rodders Outing	Central Coast Fly Rodders	Karuah River	Booral	E	N	8																			1(16)	9(16)
BUL	Bulahdelah Bass Bash	Bulahdelah Bass Anglers	Myall River	Bulahdelah	E	N	8														2(121)	1(130)	1(92)		1(57)	1(194)	14(594)
MYA	Myall Crawford	Bulahdelah Bowling Club FC	Myall River	Bulahdelah	E	N	8						1(18)	2(74)	2(118)				1(34)	1(69)							15(313)
HVPB	Hunter Valley Pro-Bass	NSW Pro-Bass, Chris Craig	Patterson River	Morpeth	E	N	8															1(99)					9(99)
NSWP	NSW Pro-Bass	NSW Pro-Bass, Chris Craig	Patterson River	Morpeth	E	N	8																1(157)	1(141)	1(83)	1(119)	12(500)
NSMT	Noel Shelton Memorial Trophy	Clarence Town Fishing Club	Williams River	Clarence Town	E	N	8																1(136)		1(115)		10(251)
NSWWI	NSW Pro-Bass	NSW Pro-Bass, Chris Craig	Williams River	Clarence Town	E	N	8															1(115)	1(157)	1(117)	1(126)	1(42)	13(557)
WIL	Williams River	Hunter Bass	Williams River	Maitland	E	N	8			1(54)	2(62)	2(70)	2(120)	2(159)	2(168)	2(138)	2(117)	2(73)	2(56)	3(81)	2(98)	2(85)	2(60)	2(29)	2(81)	2(67)	42(1518)
ABTGL	ABT Pro Bass	Australian Bass Tournaments (ABT)	Glenbawn, Lake	Scone	I	N	8													1(117)	1(81)		1(35)	1(83)			12(316)
ANSALG	ANSA Catch & Release Competition	Newcastle Sportfishing Club	Glenbawn, Lake	Scone	I	N	8																1(228)	1(204)	1(185)	1(202)	12(819)
BGG	Barrington/Gloucester Bass Comp	Barrington/Gloucester Fishing Club	Glenbawn, Lake	Scone	I	N	8													1(24)	1(99)	1(83)	1(78)				12(284)
FMG	Freshwater Fishing Masters	Dar-Gee Lures	Glenbawn, Lake	Scone	I	N	8												1(66)	1(63)	1(65)	1(76)	1(81)	1(88)	1(82)	1(70)	16(593)
FTG	Fred Trudgett Memorial Trophy	Nepean SFC, Bankstown BW & West. Districts	Glenbawn, Lake	Scone	I	N	8																	1(34)	1(47)	1(28)	11(109)
GLE	Glenbawn Classic	Aberdeen Bowling Club Fishing Club	Glenbawn, Lake	Scone	I	N	8								1(413)	1(408)			1(463)	2(439)	1(494)	1(328)	1(322)	1(225)	1(235)		18(3327)
GLEGB	Going Bush Invitational	Going Bush Fishing Tackle	Glenbawn, Lake	Scone	I	N	8													1(65)							9(65)
HVC	Hunter Valley Classic	Reel Women	Glenbawn, Lake	Scone	I	N	8																		1(29)		9(29)
NSWGL	NSW Pro-Bass	NSW Pro-Bass, Chris Craig	Glenbawn, Lake	Scone	I	N	8															1(150)	1(164)	1(200)	1(127)	2(266)	14(907)
STGG	St George SFC Glenbawn Meet	St George Sportsfishing Club	Glenbawn, Lake	Scone	I	N	8																	1(77)	1(25)		10(102)
ABTLD	ABT Bass Electric	Australian Bass Tournaments (ABT)	Lostock Dam	Singleton	I	N	8																		1(18)	1(12)	10(30)
ABTSC	ABT Pro Bass	Australian Bass Tournaments (ABT)	St. Clair, Lake	Singleton	I	N	8																1(96)				9(96)
LSC	Lake St. Clair Shoot-out	Hawkesbury-Nepean Bass Anglers	St. Clair, Lake	Singleton	I	N	8												1(4)								9(4)
NSWSC	NSW Pro-Bass	NSW Pro-Bass, Chris Craig	St. Clair, Lake	Singleton	I	N	8															1(146)	1(160)	1(86)	3(329)	2(240)	16(961)
LHA	Hawkesbury River Bass Invitational	Walkers Beach Sports Club	Hawkesbury River	Wisemans Ferry	E	N	9						1(67)	1(91)	1(135)	1(241)	1(245)	1(249)	1(187)	1(176)	1(207)	1(199)	1(172)	1(151)			21(2120)
NSWHC	NSW Pro-Bass	NSW Pro-Bass, Chris Craig	Hawkesbury River	Lower Portland	E	N	9																1(124)	1(100)		1(92)	12(316)
HAW	Hawkesbury Basscatch	Bass Sydney	Hawkesbury-Nepean River	Penrith	E	Y	9	1(43)	2(118)	2(108)	2(90)	2(98)	3(143)	2(115)	2(107)	2(106)	2(123)	2(90)	2(113)	2(106)	2(93)	2(54)	2(50)	1(29)	2(75)	2(32)	46(1693)
HNBA	Hawkesbury-Nepean Bass Anglers	Hawkesbury-Nepean Bass Anglers Association	Hawkesbury-Nepean River	Penrith	E	N	9																		1(2)		10(2)
HNBAI	Hawkesbury-Nepean Bass Interclub Challenge	Hawkesbury-Nepean Bass Anglers Association	Hawkesbury-Nepean River	Penrith	E	N	9														1(90)	1(103)	1(156)	3(140)	2(82)	1(119)	18(690)
HNBAM	Hawkesbury-Nepean Monthly Pointscore	Hawkesbury-Nepean Bass Anglers Association	Hawkesbury-Nepean River	Penrith	E	N	9																	1(16)	10(119)	3(61)	23(196)
NEP	Nepean River	Hawkesbury-Nepean Bass Anglers Association	Hawkesbury-Nepean River	Penrith	E	N	9									1(27)			4(102)	6(126)							20(255)
POL	NSW Police Games	Hawkesbury-Nepean River	Penrith	E	N	9																		1(15)			10(15)
LAN	Lane Cove River Basscatch	Bass Sydney	Lane Cove River	Sydney	E	Y	9														1(8)						10(8)
FEST	Penrith Panthers Fishfest	Penrith Panthers Fishing Club	Nepean River	Penrith	E	N	9														1(57)		1(134)	1(89)	1(179)	1(190)	14(649)
LLY	Lake Lyell Shoot-out	Hawkesbury-Nepean Bass Anglers	Hawkesbury River	Lithgow	I	N	9													1(12)	1(62)						11(74)
KFCL	Kurnell Fishing Club Lostock Outing	Kurnell Fishing Club	Lyell, Lake	Lithgow	I	N	9																		1(28)	1(21)	11(49)
WLLY	Lake Lyell	Windsor RSL Fishing Club	Lyell, Lake	Lithgow	I	N	9														1(27)						10(27)
PEJ	Pejar Dam Classic	Tully Park Sportfishing Club of Goulburn Inc.	Pejar Dam	Goulburn	I	N	9														1(50)						10(50)
SFR	Institute of Freshwater Anglers Meet	Sydney Fly Rodders & IFA	Wallace, Lake	Wallarawang	I	N	9														2(107)	1(63)	2(37)	2(45)	1(34)	1(59)	18(345)
CLY	Clyde River Bass Catch	Kurnell Caltex Refinery FC	Clyde River	Batemans Bay	E	Y	10			1(16)	1(59)			1(32)	1(48)	1(40)	1(26)	1(31)	1(24)	1(33)	1(43)	1(38)	1(29)	1(20)	1(37)	1(29)	25(505)
SHO	Shoalhaven Basscatch	Southern Bass	Shoalhaven River	Nowra	E	Y	10									2(153)	2(171)	1(83)	2(42)	1(19)	1(5)				1(39)	1(54)	21(566)
ABTDD	ABT Pro Bass	Australian Bass Tournaments (ABT)	Danjerra Dam	Nowra	I	N	10																	1(39)	2(61)	2(77)	15(177)
FITZ	Fitzroy Fall Bass Catch	Cambelltown City SFC	Fitzroy Falls Reservoir	Goulburn	I	Y	10														1(9)						11(9)
YAR	Yarrunga Invitational	Southern Bass	Yurrunga, Lake	Nowra	I	N	10											1(114)	1(152)	1(116)	1(94)	1(169)	1(148)	1(127)	1(158)		18(1078)
BRO	Brogo Bass Bash	South Coast Bass Stocking Association	Brogo Dam	Brogo	I	N	11												1(84)	1(116)	1(73)	1(117)	1(156)	1(145)	1(161)	1(151)	19(1003)
							Total	1(43)	2(118)	4(178)	6(255)	8(228)	10(535)	11(729)	15(1643)	15(1713)	13(1324)	14(1239)	24(2149)	38(3288)	47(5418)	40(7202)	50(7306)	61(7290)	91 (10018)	76(8700)	521

APPENDIX 9

Saltwater tournaments for which data have been collected over the monitoring period (2001 – 2006) and entered into the Anglers Catch Research Database.

Information for each event includes: the waterway; location of tournament base; tournament type (E = estuary or U = unrestricted fishing i.e., anglers can fish in any location – estuary, ocean, beach, rock, etc.); Region (as per the map in Appendix 6); the number of events for which data were collected per tournament per year; and the number of angler fishing trips for which data were collected per tournament per year.

						Number of events (Number of angler fishing trips)						
Event ID	Event name	Waterway	Location	Tournament type	Region ID	2001	2002	2003	2004	2005	2006	Total
DIZCL	Clarence River Bream Shootout	Clarence River	Iluka	E	5				1(16)			1(16)
ABTCL	ABT Bream Series	Clarence River	Yamba	E	5				1(122)	1(278)		2(400)
NSWCL	NSW Pro Bream Series	Clarence River	Yamba	E	5				1(70)			1(70)
EHFC	Evans Head Fishing Classic	Evans River	Evans Head	U	5			1(1040)	1(903)	1(891)	1(595)	4(3429)
EHJC	Evans Head Junior Competition	Evans River	Evans Head	U	5			1(103)	1(167)	1(111)	1(158)	4(539)
BFC	Ballina Fishing Classic	Richmond River	Ballina	E	5				1(150)	1(71)		2(221)
GTC	Greenback Tailor Charity Comp	Tweed River	Casuarina	E	5				1(285)			1(285)
TRBC	Tweed River Bream Challenge	Tweed River	Tweed Heads	E	5					1(208)		1(208)
TRC	Tweed River Classic	Tweed River	Tweed Heads	E	5			1(260)			1(260)	
CHEC	Easter Classic	Coffs Harbour	Coffs Harbour	U	6			1(183)	1(184)	1(94)	1(32)	4(493)
PBFFF	Putt Bennett Family Fishing Festival	Bellinger River	Mylstom	E	7					1(500)	1(339)	2(839)
FFB	Family Fishing Bonanza	Camden Haven River	Laurieton	E	7					1(229)	1(100)	2(329)
LJC	Laurieton Junior Competition	Camden Haven River	Laurieton	E	7					1(35)		1(35)
SUN	Sundowner Bream Classic	Hastings River		E	7					1(124)		1(124)
ABTPM	ABT Bream Series	Hastings River	Port Macquarie	E	7				1(160)			1(160)
BSF	Bream Social Fish	Hastings River	Port Macquarie	E	7				1(18)			1(18)
PMCPR	Port Macquarie CPR Classic	Hastings River	Port Macquarie	E	7					1(79)	1(65)	2(144)
ABTT	ABT Bream Series	Manning River	Taree	E	7			1(56)	1(210)	1(104)		3(370)
NSWT	NSW Pro Flathead	Manning River	Taree	E	7						1(46)	1(46)
TAR	Bream Grand Final	Manning River	Taree	E	7		1(48)					1(48)
TFC	Toyota Fishing Classic	South West Rocks Creek	South West Rocks	E	7				1(236)			1(236)
ABTF	Abt Megabucks	Wallis Lake	Forster	E	7				1(58)	1(110)		2(168)
FBC	Forster Bream Challenge	Wallis Lake	Forster	E	7	1(67)	1(64)	1(42)	1(90)			4(263)
NSWF	NSW Pro Bream Series	Wallis Lake	Forster	E	7				1(126)	2(134)	1(84)	4(344)
NSWB	NSW Pro Bream Series	Brisbane Waters		E	8						1(56)	1(56)
NSWBW	NSW Pro Flathead	Brisbane Waters		E	8						1(37)	1(37)
NSWNH	NSW Pro Flathead	Hunter River	Newcastle Harbour	E	8						1(51)	1(51)
NSWS	NSW Pro Flathead	Lake Macquarie	Swansea	E	8				1(37)	1(35)	3(147)	5(219)
NSWLM	NSW Pro Bream Series	Lake Macquarie	Wangi	E	8			1(118)	1(205)	2(230)	1(122)	5(675)
TBT	Trailer Boat Tournament	Port Stephens	Nelson Bay	E	8		1(546)	1(165)	1(329)	1(691)	1(471)	5(2202)
NSWPS	NSW Pro Bream Series	Port Stephens	Soldier's Point	E	8			1(119)	2(160)	1(72)		4(351)
BBRC	Botany Bay Research Challenge	Botany Bay	Kurnell	E	9				1(218)			1(218)
ANSAS	ANSA Christmas Party Convention	Botany Bay	Matraville	U	9				1(54)			1(54)
NSWBB	NSW Pro Bream Series	Botany Bay	Sydney	E	9						1(57)	1(57)
POL	NSW Police Games	Hawkesbury River		E	9					1(34)	1(34)	2(68)
ABTHR	ABT Bream Series	Hawkesbury River	Brooklyn	E	9				1(13)			1(13)
HAWPT	Pitt Town F.C. Hawkesbury Classic	Hawkesbury River	Pitt Town	E	9		1(647)	1(409)	1(313)	1(337)	1(347)	5(2053)
NSWHR	NSW Pro Bream Series	Hawkesbury River	Spencer	E	9			1(126)	1(180)	2(196)	2(206)	6(708)
HRFC	Hawkesbury River Fishing Classic	Hawkesbury River	Wiseman's Ferry	E	9				1(84)			1(84)
HNB	Hawkesbury Nepean Bass Anglers Association	Parramatta River	Sydney	E	9						2(32)	2(32)
ABTSY	ABT Bream Australian Open	Port Jackson	Drummoyne	E	9					1(180)		1(180)
ANSAB	ANSA Sydney Sportfishing Tournament	Port Jackson	Sydney	U	9					1(165)		1(165)
NSWSH	NSW Pro Bream Series	Port Jackson	Sydney	E	9					1(165)	1(52)	2(217)
ABTBB	ABT Pro Bream Series	Batemans Bay	Batemans Bay	E	10					1(34)		1(34)
ABTCR	ABT Bream Series	Clyde River	Batemans Bay	E	10			3(104)				3(104)

Appendix 9 (cont.)

						Number of events (Number of angler fishing trips)						
Event ID	Event name	Waterway	Location	Tournament type	Region ID	2001	2002	2003	2004	2005	2006	Total
LCCR	Catch & Release Tournament	Lake Conjola	Lake Conjola	E	10	1(33)						1(33)
LCI	Lake Conjola Interclub	Lake Conjola	Lake Conjola	E	10					1(38)	1(76)	2(114)
LCR	Renegade Lure & Fly Classic	Lake Conjola	Lake Conjola	E	10	1(125)		1(135)	1(21)	1(136)	1(127)	5(544)
LCB	Leisure Coast Bream Competition	Lake Illawarra	Windang	E	10			1(10)	1(35)	1(13)	1(5)	4(63)
LIFC	Lake Illawarra Flathead Classic	Lake Illawarra	Windang	E	10	1(63)		1(54)	1(45)	1(58)	1(36)	5(256)
ANSAJB	ANSA Nowra Convention	Shoalhaven River	Nowra	U	10					1(114)	1(17)	2(131)
SBC	Shoalhaven Bream Challenge	Shoalhaven River	Nowra	E	10	1(45)	1(52)					2(97)
SGBCC	St. Georges Basin Campbelltown Meet	St Georges Basin	St Georges Basin	E	10				1(33)			1(33)
SGBFC	St. Georges Basin Flathead Classic	St Georges Basin	St Georges Basin	E	10					2(122)		2(122)
SGBLF	St. Georges Basin Lure & Fly	St Georges Basin	St Georges Basin	E	10			1(8)	7(139)	11(225)	11(276)	30(648)
ABTSI	ABT Bream Series	Sussex Inlet	Sussex Inlet	E	10					1(100)		1(100)
SIFFC	Sussex Inlet Family Fishing Carnival	Sussex Inlet	Sussex Inlet	E	10					1(562)	1(480)	2(1042)
ANSAN	ANSA Narooma Convention	Wagonga Lake	Narooma	U	11				1(10)	1(61)		2(71)
					TOTAL	5(333)	5(1357)	17(2672)	39(4931	49(6536)	41(4048)	156(19877)

APPENDIX 10

Post-fishing interview data summary.

Information for each event includes: water type (SW = saltwater; FW = freshwater); waterway; location of tournament base; interview dates; location of interview; fishing location (saltwater only – estuary; deep sea; beach; rock; or unknown); number of interviews conducted; number of female, male and juniors interviewed; total number of anglers interviewed; and the number of anglers registered to fish each event. The number of registered anglers for the Evans Head Fishing Classic is an estimate based on the angler registration numbers provided by anglers when interviewed.

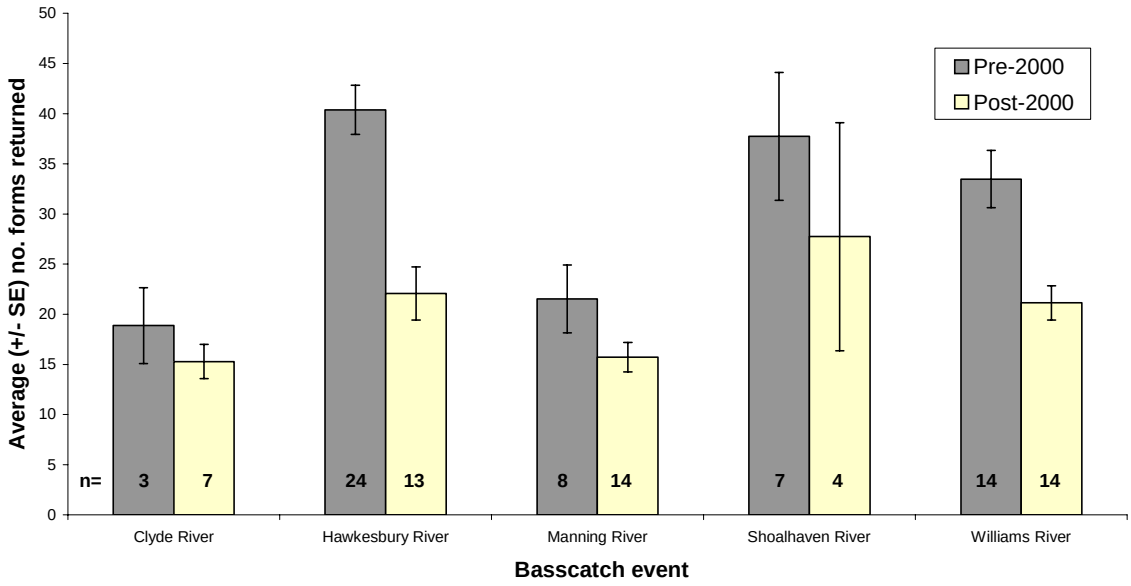
Event ID	Fresh/ saltwater	Event name	Waterway	Location	Date	Interviews location	Fishing location type	No. interviews	No. males	No. females	No. juniors	Total no. anglers	No. anglers registered in event
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	25-Mar-05	Coffs Harbour Boat Ramp	Deep sea	20	44	9	-	53	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	25-Mar-05	Coffs Harbour Boat Ramp	Estuary	1	2	0	-	2	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	26-Mar-05	Weigh Station	Unknown	2	4	0	-	4	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	26-Mar-05	Weigh Station	Beach	1	1	0	-	1	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	26-Mar-05	Weigh Station	Deep sea	12	24	1	-	25	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	26-Mar-05	Weigh Station	Estuary	4	6	1	-	7	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	26-Mar-05	Weigh Station	Rock	1	1	0	-	1	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	27-Mar-05	Weigh Station	Unknown	1	3	0	-	3	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	27-Mar-05	Weigh Station	Deep sea	22	41	2	-	43	
CHEC	SW	Easter Classic	Coffs Harbour	Coffs Harbour	27-Mar-05	Weigh Station	Estuary	1	1	0	-	1	
							TOTAL	65	127	13	-	140	unknown
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	09-Jul-05	Boat Ramp	Deep sea	10	27	0	-	27	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	09-Jul-05	Unknown	Deep sea	5	15	1	-	16	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	09-Jul-05	Unknown	Estuary	1	2	0	-	2	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	10-Jul-05	Boat Ramp	Unknown	3	8	1	-	9	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	10-Jul-05	Boat Ramp	Deep sea	5	14	1	-	15	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	10-Jul-05	Boat Ramp	Estuary	3	8	4	-	12	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-05	Boat Ramp	Estuary	17	35	10	-	45	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-05	Boat Ramp	Rock	1	4	1	-	5	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-05	Richmond	Estuary	1	4	0	-	4	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-05	Boat Ramp	Unknown	2	5	0	-	5	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-05	Boat Ramp	Deep sea	44	116	6	-	122	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-05	Boat Ramp	Estuary	3	8	1	-	9	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-05	Richmond	Estuary	1	4	0	-	4	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	14-Jul-05	Boat Ramp	Unknown	1	2	0	-	2	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	14-Jul-05	Boat Ramp	Beach	1	4	0	-	4	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	14-Jul-05	Boat Ramp	Deep sea	57	141	10	-	151	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	14-Jul-05	Boat Ramp	Estuary	7	12	3	-	15	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	14-Jul-05	Richmond	Estuary	1	3	0	-	3	
							TOTAL	163	412	38	-	450	>1000
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	11-Jul-06	Unknown	Unknown	1	4	0	-	4	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-06	Boat Ramp	Unknown	4	9	0	-	9	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-06	Boat Ramp	Deep sea	2	4	0	-	4	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-06	Boat Ramp	Estuary	2	3	0	-	3	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-06	Unknown	Unknown	4	11	1	-	12	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-06	Unknown	Deep sea	15	41	1	-	42	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	12-Jul-06	Unknown	Estuary	2	3	1	-	4	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-06	Boat Ramp	Unknown	6	13	1	-	14	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-06	Boat Ramp	Deep sea	1	2	0	-	2	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-06	Boat Ramp	Estuary	2	5	0	-	5	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	13-Jul-06	Unknown	Unknown	1	2	0	-	2	
EHFC	SW	Evans Head Fishing Classic	Evans River	Evans Head	14-Jul-06	Boat Ramp	Estuary	2	1	0	-	1	
							TOTAL	42	98	4	-	102	>1000
FFB	SW	Family Fishing Bonanza	Camden Haven River	Laurieton	08-Jan-06	Laurieton	Estuary	7	5	1	1	7	
FFB	SW	Family Fishing Bonanza	Camden Haven River	Laurieton	08-Jan-06	North Haven	Estuary	16	15	5	11	31	
FFB	SW	Family Fishing Bonanza	Camden Haven River	Laurieton	08-Jan-06	Stingray Creek	Estuary	2	1	0	0	1	
							TOTAL	25	21	6	12	39	unknown

Appendix 10 (cont.)

Event ID	Fresh/ saltwater	Event name	Waterway	Location	Date	Interviews location	Fishing location type	No. interviews	No. males	No. females	No. juniors	Total no. anglers	No. anglers registered in event
PBFFF	SW	Putt Bennett Family Fishing Festival	Bellinger River	Mylstom	07-Jan-06	Unknown	Estuary	15	24	6	7	37	
							TOTAL	15	24	6	7	37	unknown
TBT	SW	Trailer Boat Tournament	Port Stephens	Nelson Bay	19-Mar-05	Little Beach Boat Ramp	Unknown	30	74	11	-	85	
TBT	SW	Trailer Boat Tournament	Port Stephens	Nelson Bay	19-Mar-05	Salamander Boat Ramp	Unknown	16	38	1	-	39	
TBT	SW	Trailer Boat Tournament	Port Stephens	Nelson Bay	19-Mar-05	Weigh Station	Unknown	6	17	2	-	19	
TBT	SW	Trailer Boat Tournament	Port Stephens	Nelson Bay	20-Mar-05	Little Beach Boat Ramp	Unknown	26	71	0	-	71	
TBT	SW	Trailer Boat Tournament	Port Stephens	Nelson Bay	20-Mar-05	Weigh Station	Unknown	2	7	0	-	7	
							TOTAL	80	207	14	-	221	1280
TBT	SW	Trailer Boat Tournament	Port Stephens	Nelson Bay	08-Apr-06	D'Albora Marina	Unknown	16	37	0	4	41	
TBT	SW	Trailer Boat Tournament	Port Stephens	Nelson Bay	09-Apr-06	Nelson Ramp	Unknown	34	89	0	2	91	
							TOTAL	50	126	0	6	132	unknown
DEN	FW	Deni Fishing Classic	Edwards River	Deniliquin	06-Jan-06	4 Posts	-	2	4	0	0	4	
DEN	FW	Deni Fishing Classic	Edwards River	Deniliquin	07-Jan-06	Unknown	-	6	8	1	0	9	
DEN	FW	Deni Fishing Classic	Edwards River	Deniliquin	07-Jan-06	4 Posts	-	5	7	1	1	9	
DEN	FW	Deni Fishing Classic	Edwards River	Deniliquin	07-Jan-06	Syphon	-	5	8	1	0	9	
							TOTAL	18	27	3	1	31	834
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	28-Oct-05	Eucumbene	-	5	9	1	0	10	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	29-Oct-05	Eucumbene	-	4	14	4	0	18	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	29-Oct-05	Jindabyne	-	8	16	1	2	19	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	30-Oct-05	Eucumbene	-	6	30	4	0	34	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	30-Oct-05	Jindabyne	-	4	8	0	0	8	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	31-Oct-05	Eucumbene	-	4	17	3	0	20	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	31-Oct-05	Jindabyne	-	8	10	2	0	12	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	31-Oct-05	Other	-	1	0	0	0	0	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	01-Nov-05	Eucumbene	-	1	2	0	0	2	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	01-Nov-05	Jindabyne	-	11	13	2	0	15	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	02-Nov-05	Eucumbene	-	7	9	4	2	15	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	02-Nov-05	Jindabyne	-	14	24	4	2	30	
SMTF	FW	Snowy Mountains Trout Festival	Jindabyne & Eucumbene Lakes	Snowy Mountains	03-Nov-05	Jindabyne	-	9	12	6	0	18	
							TOTAL	82	164	31	6	201	496

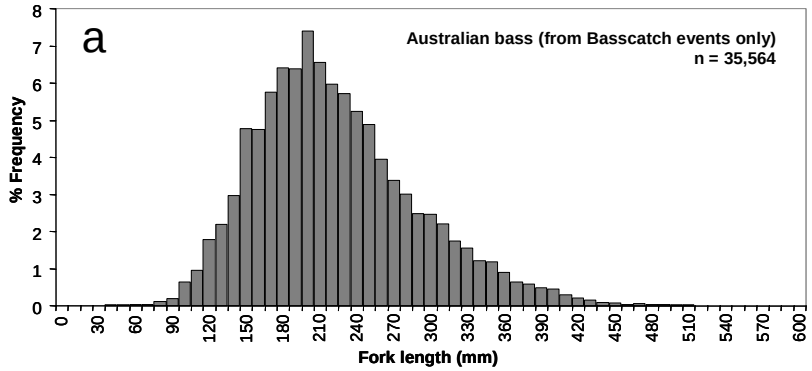
APPENDIX 11

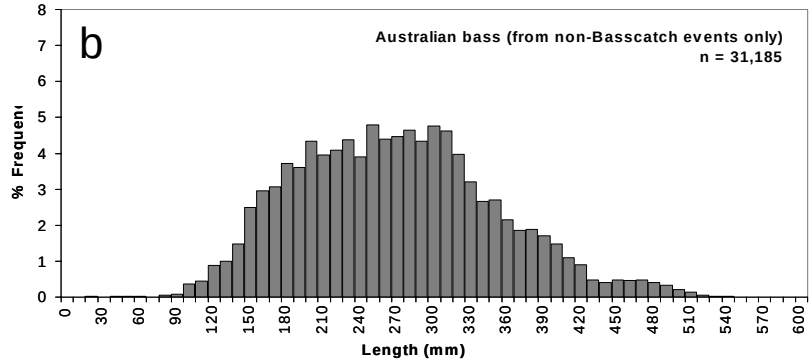
Angler participation in Basscatch events prior compared with after the inception of the Anglers Catch Research Program in 2000.

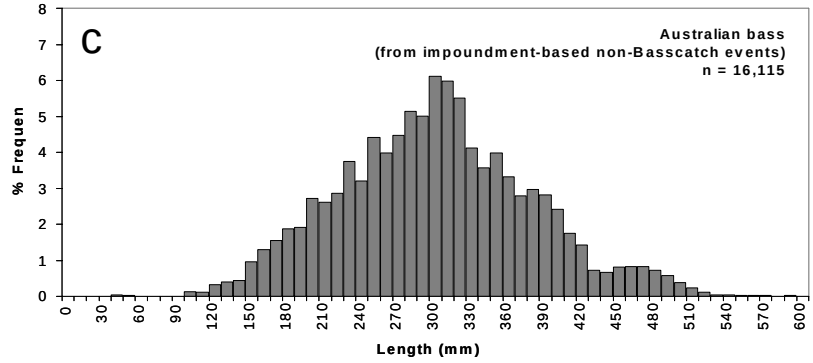


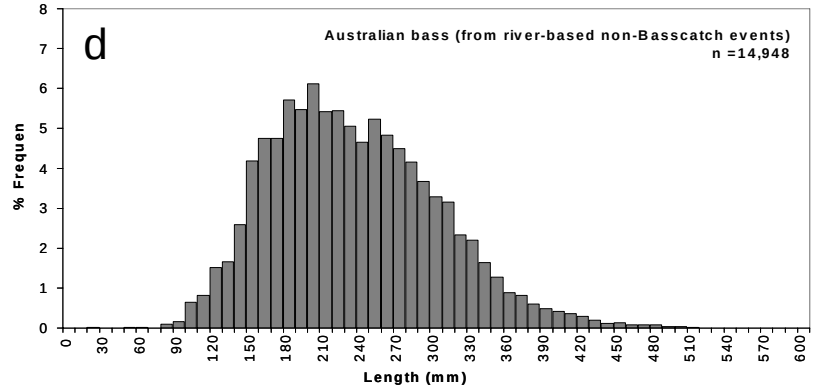
APPENDIX 12

Length composition graphs collected for different species from different tournament types: a) Australian bass from Basscatch events; b) Australian bass from non-Basscatch events; c) Australian bass from river-based non-Basscatch events; d) Australian bass from impoundment-based Non-Basscatch events; e) golden perch from all western drainage and impoundment freshwater events; f) Murray cod from all western drainage and impoundment freshwater events; g) snapper from all saltwater events; and, h) bream (yellowfin and black) from all saltwater events. Note for graphs b, c, d, g and h the type of length is not specified as lengths are presumed to be a mixture of fork and total lengths.

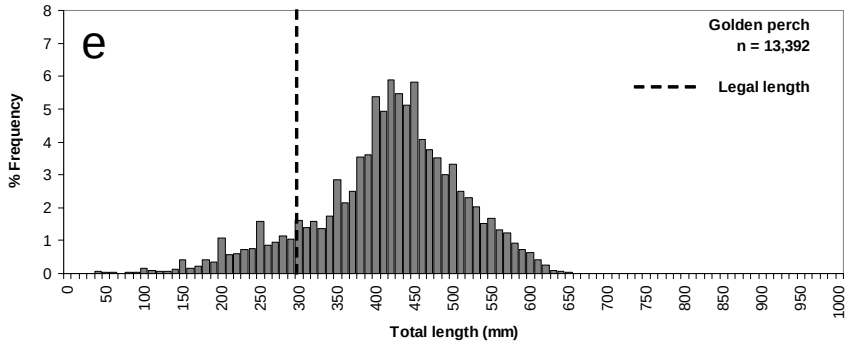


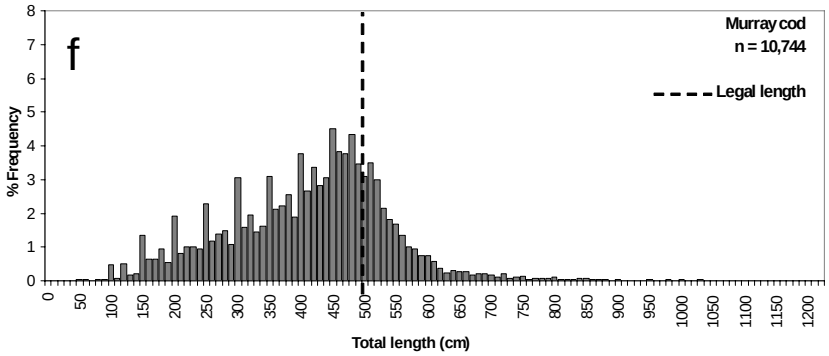


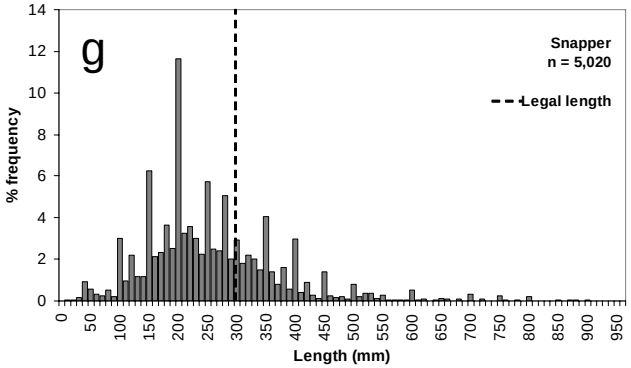


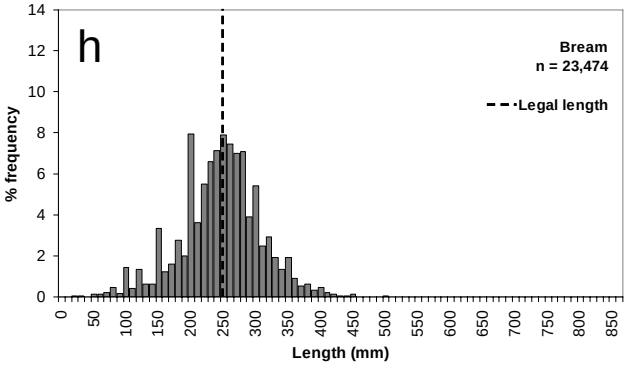


Appendix 12 (cont.)









APPENDIX 13

Justification of evaluation result for the Catch-Card Angler Return System (CARS) – usefulness in assessing the status of fish stocks/value to resource assessment.

<table>
<tr><th>Attribute</th><th>Evaluation</th><th>Justification notes</th></tr>
<tr><td>Valid species composition data obtainable</td><td rowspan="3"></td><td rowspan="3">Valid data obtainable with the use of catch cards, particularly for tournaments that:
were created as a result of this project;
use the NSW DPI provided catch cards for their point score; and/or
use a point-score system based on either: a witness system where anglers report their catch and a ‘buddy’ or witness is used to verify; or, a ‘mystery-length’ system.</td></tr>
<tr><td>Valid size composition data obtainable</td></tr>
<tr><td>Valid catch & effort (catch rate) data obtainable</td></tr>
<tr><td>Data reliability influenced by point-score system</td><td></td><td>Marshal-based point-score systems are simplified for ease of running and do not include the recording of fishing effort or unwanted or undersized fish. Anglers participating in marshal-based tournaments are therefore less likely to report data accurately on their catch cards as the data they provide does not have direct implications to their point score. Angler provided data from events with ‘largest-fish-type’ point-score systems present similar problems as marshal-based events as their anglers are less likely to report all the fish they catch This was particularly evident at saltwater events.</td></tr>
<tr><td>Biases associated with self-reported data</td><td></td><td>Predominately non-standardised catch rates due mainly to a lack of account for bias (missing zero catches and under-reporting of catches) – there are some events where bias is considered to be low. Provided that bias (particularly from non-responses) is accounted for, this method is repeatable across survey scales and can therefore provide standardised catch rates and other measures of fishing quality.</td></tr>
<tr><td colspan="3">Recommendations
The introduction of a catch-card identification system combined with on-site briefings and checks (see discussion) would alleviate these issues.
A significant reduction in the number of events covered is required to allow more time to be spent on reporting and accounting for bias by on-site surveys/checks, on-site technical assistance and post-tournament phone follow-up interviews.
The CARS is not suited to all events – care needs to be taken with the use of this system to ensure usefulness and validity of the data for scientific and managerial purposes.</td></tr>
<tr><td colspan="3">Overall result of evaluation – potential (useful but requires change)</td></tr>
</table>

APPENDIX 14

Justification of evaluation result for the Catch-Card Angler Return System (CARS) – usefulness in assessing the impacts of fishing tournaments.

<table>
<tr><th>Attribute</th><th>Evaluation</th><th>Justification notes</th></tr>
<tr><td>Valid species composition data obtainable</td><td></td><td rowspan="4">Although valid data are obtainable with the use of catch cards (under the circumstances described in Appendix 13), this information alone would not provide the relevant data to assess the impacts of a fishing tournament.

Data derived from the use of the CARS does not meet the requirements of a BACI design required to detect any apparent impact from a fishing tournament. These data would enable the calculation of catch rates and a harvest/total catch estimate for some events. However, this method does not provide a valid means of collecting data before or after a tournament or at control locations outside the tournament area.</td></tr>
<tr><td>Valid size composition data obtainable</td><td></td></tr>
<tr><td>Valid catch & effort (catch rate) data obtainable</td><td></td></tr>
<tr><td>Catch-card derived data does not meet the requirements of a BACI design</td><td></td></tr>
<tr><td colspan="3">Recommendations
• An on-site access-point survey based on the BACI design would be required to enable the possibility of detecting an impact of a fishing event. Use of the CARS is not recommended if the objective is to assess the impacts of a fishing tournament.
• Due to the cost involved in undertaking an impact survey of an appropriate design, this type of survey is only recommended for events considered to be of concern, particularly those that are large i.e., > 500 anglers with a significant component of the event being ‘catch and kill’.</td></tr>
<tr><td colspan="3">Overall evaluation result – no (not useful for this purpose)</td></tr>
</table>

APPENDIX 15

Justification of evaluation result for the Catch-card Angler Return System (CARS) – usefulness in assessing the success of fish stocking regimes.

<table>
<tr><th>Attribute</th><th>Evaluation</th><th>Justification notes</th></tr>
<tr><td>Valid species composition data obtainable</td><td rowspan="4"></td><td rowspan="4">Valid data are obtainable with the use of catch cards (under the circumstances and following the recommendations described in Appendix 13).
The combination of these data would be particularly useful in developing robust measures of fishing quality (other than catch rate) that can be monitored through time to assess the status of each recreational fishery that is subject to a fish stocking regime.</td></tr>
<tr><td>Valid size composition data obtainable</td></tr>
<tr><td>Valid catch & effort (catch rate & harvest) data obtainable</td></tr>
<tr><td>Measures of fishing quality obtainable</td></tr>
<tr><td colspan="3">Recommendations
• If the recommendations described in Appendix 13 are followed, measures of fishing quality could be developed from catch-card data (in areas and for events where this method is applicable) to enable an assessment of the status of each recreational fishery that is subject to a fish stocking regime.</td></tr>
<tr><td colspan="3">Overall evaluation result – potential (useful but requires change)</td></tr>
</table>

APPENDIX 16

Justification of evaluation result for post-fishing interviews (excluding gamefish) – usefulness in assessing the status of fish stocks/value to resource assessment.

Attribute	Evaluation	Justification notes
Valid species composition data obtainable		Accurate measures of catch (kept and released), fishing effort, size composition (lengths and, if possible, weights) and species composition are obtainable from post-fishing interviews if sampling is appropriately designed. This information allows the calculation of accurate catch rates, measures of fishing quality, and when combined with some measure of total effort (for example, from a boat count), the total catch or harvest from an event.
Valid size composition data obtainable		
Valid catch & effort (catch rate) data obtainable		
Representative sampling with appropriate replication and design required		So far, undertaken on an ad-hoc basis with minimal resources in both salt and fresh water. This has resulted in: either low replication (i.e., small number of interviews conducted compared with the total number of registered anglers) or unrepresentative sampling; and/or a lack of total effort data. These short-falls in survey design have ramifications for data accuracy, resulting in minimal ability to meet objectives. Some of these short-falls are due to issues associated with the feasibility of sampling at tournaments (these issues are described in 2.2.1; p11).
Total effort data (i.e., total number of anglers fishing on any one tournament day) required for total catch to be estimated		Total effort counts provide the necessary data needed to estimate total catch from an event. These data are currently lacking and may require additional methods of data collection such as boat or exit counts following the methods described in Pollock *et al.* (1994) (to accompany post-fishing interview data).

Recommendations

- This method need only be used for prospective tournament monitoring if: data are required from an event where the use of catch cards is inappropriate or expected to provide biased results; or, to randomly test the results obtained by catch cards at a random selection of events.
- Data collection from tournaments is cost-effective and as a result tournament data are sometimes the only long-term fishery data available. If the catch-card system is not appropriate and there are no other valid data available on a particular component (such as a specific location or for a certain species) of a fishery, the use of post-fishing interviews (as part of a well-designed tournament-based fishing survey) should be considered if sufficient funds are available.

Overall evaluation result – potential (useful but requires change)

APPENDIX 17

Justification of evaluation result for post-fishing interviews (excluding gamefish) – usefulness in assessing the impacts of fishing tournaments.

Attribute	Evaluation	Justification notes
Valid species composition data obtainable		Accurate data obtainable (under the circumstances described in Appendix 16). Accurate size composition data, which has not been collected during post-fishing interviews to date, is particularly important as it enables the estimation of total catch in weight.
Valid size composition data obtainable		
Valid catch & effort (catch rate) data obtainable		
Representative sampling with appropriate sample size and design required		So far, post-fishing interviews have been undertaken on an ad-hoc basis with minimal resources in both salt and fresh water. Design issues (like those described in Appendix 16) will need to be addressed before proceeding with any future sampling using this method and will need to be catered specifically for an impacts survey.
Total effort data (i.e., total number of anglers fishing on any one tournament day) required for total catch to be estimated		These data are currently lacking and may require additional methods of data collection such as boat or exit counts following the methods described in Pollock *et al.* (1994) (to accompany post-fishing interview data).Total effort counts provide the necessary data needed to estimate total catch from an event, which is particularly important for any impacts survey.

Recommendations

- Existing survey methods (i.e., post-fishing interviews conducted thus far) do not meet the requirements of a survey that has the ability to detect the impact from a fishing tournament. Any impact assessment undertaken in the future needs to follow the BACI design using on-site access-point survey methodologies to collect valid data that has the power and ability to meet this objective.
- Due to the cost involved in undertaking an impact survey of an appropriate design, this type of survey is only recommended for events considered to be of concern or interest, particularly those that are large i.e., > 500 anglers with a significant component of the event being ‘catch and kill’
- For catch and release components of tournament fishing, additional questions related to post-release mortality are recommended for any impact survey. This could include the collection of additional information during post-fishing interviews such as: anatomical hook location; fishing gear used; and fight time.

Overall evaluation result – potential (useful but requires change)

APPENDIX 18

Justification of evaluation result for post-fishing interviews (excluding gamefish) – usefulness in assessing the success of fish stocking regimes.

Attribute	Evaluation	Justification notes
Valid species composition data obtainable		Accurate data obtainable (under the circumstances described in Appendix 16). In addition to that described in Appendix 16, the collection of fish length and weight should be incorporated into survey designs to improve stocking assessments. This will allow fish condition factors to be calculated, which can be monitored through time.
Valid size composition data obtainable		
Valid catch & effort (catch rate) data obtainable		
Representative sampling with appropriate sample size and design required		So far, undertaken on an ad-hoc basis with minimal resources in both salt and fresh water. Prospective sampling needs to be catered to specific objectives. There is however limitations with tournament-based surveys regarding experimental design that result in difficulties to detect whether the fishery is being enhanced directly as a result of the fish stocking regime or another factor such as environmental conditions.

Recommendations

- Provided the recommendations described in Appendix 16 are followed, measures of fishing quality could be developed from post-fishing interview data (in areas and for events where this method is applicable) to support assessments of the success of fish stocking regimes i.e., indicate whether or not the recreational fishery is enhanced as a result of fish stocking.
- However, without suitable control locations or before data (i.e., lack of data for comparable locations not stocked and no comparable data before fish stocking occurred), it would be difficult to imply whether or not the fishery is being enhanced directly as a result of fish stocking or not. If robust measures of fishing quality are developed and an appropriate level or benchmark is set, then the fishing quality can at least be measured against the benchmark level to indicate over time if the quality of the fishery is acceptable.

Overall evaluation result – potential (useful but requires change)

APPENDIX 19

Justification of evaluation result for scheduled radio reports or 'scheds' (gamefishing) – usefulness in assessing the status of fish stocks/value to resource assessment.

Attribute	Evaluation	Justification notes
Provides accurate total effort data for tournament gamefishing in NSW		Scheds provide a cost-effective means of obtaining long-term data on catch and fishing effort for tournament gamefishing in NSW. The effort data, in particular, when combined with interview data, provides the data necessary to calculate total catch estimates for this fishery. However, the reporting of catch on scheds relies on anglers self-reporting their catch throughout the fishing day on a one or two-hourly basis. Comparisons made between the catch reported during scheds and the catch reported for point score (by weighing a fish or handing in a tag and release card at the weigh station at the completion of the fishing day) show some discrepancies. These discrepancies are most commonly caused by anglers: 1) reporting the same fish over more than one sched during the day (due to misunderstandings of the sched rules or recall bias); 2) reporting less or more than what was actually caught (recall, intentional deception or prestige bias); 3) not reporting fish that do not meet the point score requirements and are either free released (i.e., voluntarily released without the deployment of a tag) or kept for food or bait. Fishing method data (i.e., trolling, drifting or anchored) allows for directed catch rates to be calculated, which can provide improved abundance indices.
Provides self-reported account of fish strikes, hook-ups and catches		
Biases associated with self-reporting		
Provides targeting behaviour information to allow the partitioning of effort in catch rate calculations		
Provides data for recreational-only species (blue and black marlin)		Data derived from scheds provides invaluable long-term data on the recreational-only species blue and black marlin on the east coast of Australia.

Recommendations

- At times, staffing constraints restricted the gamefish tournament monitoring project to the collection of sched data only without post-fishing interviews. Also, there are many events where post-fishing interviews are difficult or impractical. Therefore, scheds currently provide the only means of calculating catch rate indices on a long-term basis that are representative of the entire sampling frame. However, to calculate the most accurate total catch estimates with the available data, post-fishing interview data must be used to calculate catch rates and sched data must be used as a measure of total effort. The use of interview data to calculate catch rates for expansion of catch requires the assumption that the interviews conducted are representative of the whole sampling frame, which includes tournaments where post-fishing interviews can not be conducted. This assumption should be tested using post-tournament phone interviews.
- Expansion in the use of scheds to include club point-score days (days other than specified interclub tournament days) would be worthwhile in the future as these additional data would cover wider spatial and temporal scales and are routinely collected by the majority of gamefishing clubs north of Ulladulla.
- It would also be useful to standardise the design of sched sheets and develop a system to improve the return of these data from tournament organisers, such as an electronic-based system.

Overall evaluation result – Moderately (continue with minor changes and test existing assumptions where possible and feasible) and could be expanded.

APPENDIX 20

Justification of evaluation result for scheduled radio reports or 'scheds' (gamefishing) – usefulness in assessing the impacts of fishing tournaments.

Attribute	Evaluation	Justification notes
Predominately a catch and release fishery		Equally to resource assessment, scheds provide an accurate estimate of total fishing effort for gamefish tournament fishing in NSW. When combined with post-fishing interview data, total harvest can be estimated. This information can be of use in assessing the impacts of fishing tournaments. However, due to a high percentage (over 88%; Murphy *et al.* 2002) of fish tagged and released, the importance of assessing the impacts of gamefish tournaments is low. The importance of information on post-release mortality becomes eminent due to the high percentage of catch and release fishing. However, data collected from scheds does not provide any information relevant to post-release mortality. Therefore, sched data are of minimal use in assessing the impacts of fishing tournaments. Furthermore, the spatial scale of the gamefish fishery inflicts survey design constraints that make any assessment of impact difficult and impractical.
Provides accurate total effort data for tournament gamefishing in NSW		
Inability to provide post-release mortality-specific information		
Sched-derived data do not meet the requirements of BACI design		Due to the lack of organised fishing before or after or simultaneously at reference sites, scheds are unable to provide data to meet the requirements of a BACI design (see 2.2.3; p13).

Recommendations

- Any impact assessment undertaken in the future needs to follow the BACI design using on-site access-point survey methodologies to collect valid data that has the power and ability to meet this objective. However, due to the offshore and widely dispersed nature of this fishery, there are major experimental design constraints (such as no true unfished areas to sample as a control site) and hence the chance of detecting an impact is low.
- Due to the high rate of 'catch and release' in gamefishing, the design constraints presented and the high cost of undertaking a survey with the ability to detect an impact, this type of survey for gamefishing is considered of minimal use and at high risk of not providing the desired outcomes.

Overall evaluation result – no (considered of minimal use for this purpose)

APPENDIX 21

Justification of evaluation result for post-fishing interviews (gamefishing) – usefulness in assessing the status of fish stocks/value to resource assessment.

Attribute	Evaluation	Justification notes
Provides data on catch and effort for primary gamefish and baitfish species		Post-fishing interviews undertaken provide valuable additional information useful to resource assessment that includes: • catch and fishing effort data (for the calculation of more accurate catch rate indices and harvest estimates for baitfish and gamefish species); • bait type data (useful in assessing post-release mortality and in the standardisation of catch rates). Accurate collection of size composition data are lacking. The only accurate weights that are recorded are those of fish weighed for entry into the tournament. Fish kept but not weighed in tournaments have never been measured during post-fishing interviews. There are a number of design difficulties associated with the structure of tournament gamefishing and a lack in any probabilistic sample selection processes, which has resulted in an ad-hoc selection of tournaments at which to undertake interviews. The data provides additional information on recreational-only species blue and black marlin. There is a lack of quality long-term catch and effort data on these species from other sources (due to their recreational-only status).
Provides data on 'unreported catch' i.e., that not reported during 'scheds'		
Majority of data are self-reported due to a high 'tag and release' rate		
Possible biases associated with self-reporting		
Lack of accurate size composition data		
Selection of events for post-fishing interviews ad-hoc		
Provides more accurate fishing method information in support of directed catch rate indices		
Provides post-release mortality-related information		
Provides data for recreational-only species (blue and black marlin)		

Recommendations

- Further work is required in the future to improve catch rate standardisation and to investigate the biases associated with these data. The majority of this work can be done through additional analysis of existing data.
- Prospective project protocols need to be defined, implemented and tested to improve project outcomes for resource assessment purposes and to overcome design difficulties associated with the structure of tournament gamefishing. Some necessary improvements should include: the introduction of a probability-based sampling schedule including the randomisation of tournament selection for post-fishing interviews; new data collection forms; and, the measuring of all available fish kept but not weighed during interviews.
- The collection of additional information such as anatomical hook location could be added to post-fishing interviews to improve assessments of post-release mortality however, there have been recent developments in the Gamefish Tagging Program, which now collects this type of information for each tagged fish. Data collected as part of the Gamefish Tagging Program should be incorporated into tournament monitoring results. Post-release mortality-related information has direct implications for the calculation of accurate harvest estimates, which are considered important in resource assessments and particularly for addressing resource sharing issues between recreational and commercial fishers.

Overall evaluation result – Moderately (Continue with minor changes and test all existing assumptions where necessary and feasible)

APPENDIX 22

Justification of evaluation result for post-fishing interviews (gamefishing) – usefulness in assessing the impacts of fishing tournaments.

Attribute	Evaluation	Justification notes
Provides valid data on catch and effort for primary gamefish and baitfish species		Post-fishing interviews undertaken at gamefishing tournaments provide valuable additional information that would provide a good basis for assessing the impacts of fishing tournaments. However, due to high 'catch and release' rates and the offshore and widely dispersed nature of this fishery, there are major experimental design constraints (for example, no true 'unfished' or non-tournament areas to use as a control site for sampling during the gamefish tournament season) and hence the chance of detecting an impact is low.
Predominately a catch and release fishery		
Major design constraints associated with the gamefish fishery		

Recommendations

- Due to the high rate of 'catch and release' in gamefishing, the design constraints presented and the high cost of undertaking a survey with the ability to detect an impact, an impacts survey for gamefishing is considered of minimal use and at high risk of not providing the desired outcomes.
- Data provided by this method are able to provide accurate measures of harvest, which fits more-so within the requirements of data for resource assessment purposes rather than assessing the impacts of fishing tournaments.

Overall evaluation result – no (considered of minimal use for this purpose)

APPENDIX 23

Justification of evaluation result for the Basscatch dataset – usefulness to resource assessment.

Attribute	Evaluation	Justification notes
Decrease in angler participation		Overall decrease in the number of forms returned (Appendix 11). Caused by either: the same numbers of anglers participating with fewer anglers returning their forms; or, simply fewer anglers fishing these events. The later is probably true. This can not be confirmed due to a lack of validated information on total angler numbers per event.
Catch-card return rates – ramifications for the validity of collected data		151 Basscatch events monitored – only 20 with the number of registered anglers recorded. Out of these there are 9 events with a return rate of less than 100%. These return rates range from 69.2% to 98.1%.
		Events without registered angler information recorded are assumed to have apparent 100% return rates.
		Low percentage (1.8%) of returned catch cards missing information such as fishing effort (based on the 7 Basscatch locations of which long-term datasets of greater than 5 years have been collected).
		Overall 11 Basscatch locations, 6.9% of catch cards returned are missing fishing effort information (three only provided data for one year and one provided data for the past three years).
Valid length composition data		Considered accurate, particularly when compared with the length composition data collected by other tournament types (see Appendix 12).
Catch & effort (catch rate) data		Although the majority of Basscatch events are considered to provide standardised catch rates (due to high catch-card returns), there remains a lack of validation.
Bias from non-response		Considered low for the majority of events (especially those that have maintained a long time series) due to results attributed to return rates
Unique long-term dataset		Basscatch events provide the only long-term recreational-fishery data for Australian Bass in NSW.

Recommendations

- Concern regarding the validity of a 100% return rate for the more recent events i.e., post-2000 due to: a lack of recent feed-back to Basscatch officers and anglers; and, a reduction in the attention given to these events as a result of greater than a 10-fold increase in the number of events covered overall by the project (Fig. 1) and the associated staffing constraints.
- A decrease in participation could compromise the accuracy and usefulness of the data.
- The recommendations described in Appendix 13 should be followed to improve the data collected from Basscatch events
- Lack of equivalent information on Australian bass in New South Wales highlights the importance and usefulness of this dataset and prospective sampling for use in resource assessment processes.

Overall evaluation result – potential (existing data useful but improvements are required)

APPENDIX 24

Justification of evaluation result for the Basscatch dataset – usefulness in assessing the impacts of fishing tournaments.

Attribute	Evaluation	Justification notes
'Catch and release' events with a small number of participating anglers		Basscatch events are characterised by a small number of anglers (average of approximately 50 anglers per event) and promote 100% catch and release.

Recommendations

- The impact of Basscatch events is considered minimal making the data of little value in assessing the impacts of fishing tournaments.

Overall evaluation result – no (considered of minimal use for this purpose)

APPENDIX 25

Justification of evaluation result for the Basscatch dataset – usefulness in assessing the success of fish stocking regimes.

Attribute	Evaluation	Justification notes
Valid catch and effort (catch rate) data		Although the majority of Basscatch events are considered to provide standardised catch rates (due to high catch-card returns), there remains a lack of validation.
Valid length composition data		Basscatch events provide accurate recordings of fish lengths (Appendix 12). Accurate length-based data provides the basis for identification of recruitment failure and successive analysis over time of certain cohorts available to the fishery. This has implications for fish stocking regimes.

Recommendations

- The recommendations in Appendices 13 and 23 should be followed to improve the catch and effort data collected from Basscatch events. The existing length-based data however are considered of high quality and one of the most useful components of this dataset to meet the requirements of assessing the success of fish stocking regimes. This factor has resulted in the overall assessment being classed as yes.
- These data should be considered for all future fish stocking assessments as it provides a fishery-dependent indication of the occurrence of certain cohorts and recruitment failures, which has implications to stocking regimes. The Manning River Basscatch data has been used for this purpose and instigated an experimental stocking in 1995 and a successive assessment of that stocking event (Barwick 1999).

Overall evaluation result – potential (useful in part)

APPENDIX 26

Justification of evaluation result for the freshwater tournament dataset (excluding Basscatch) – usefulness to resource assessment.

Attribute	Evaluation	Justification notes
Species composition data valid however, self-reported and may be biased		Self-reported-related biases may be associated with these data. For example, some anglers may not record the catch of unwanted species even though they are requested to. In general, these data provide indications of the presence of introduced pest and native species and are not considered to suffer from bias at the same level as catch and effort data.
Valid length composition data, however, some lengths recorded inaccurately due to estimation		Many fish lengths appear to have been rounded to the nearest 5cm (Appendix 12e & f) indicating that some anglers are estimating fish lengths. For Murray cod, estimation only appears to be occurring for fish under the MLL of 50cm suggesting that many anglers either choose to release the juveniles with minimal stress or do not count undersized fish of importance for points and hence do not accurately measure them. Australian bass lengths collected from non-Basscatch events appear to be collected accurately, however, there may be a mixture of fork and total lengths recorded (Appendix 12b, c and d). Although some of these data appear to have been estimated, they still provide indications of population structure, which are useful for resource assessment.
Lack of data on the total number of registered anglers per event		368 events (87 tournaments) with data – 261 (70.9%) events have no corresponding angler registration data; 37 (10.6%) events have apparent 100% return rates; 68 (18.5%) events have return rates between 7.2% – 99.2%. Average return rate over all 108 (29.3%) events with corresponding number of registered anglers recorded (that allowed a return rate to be calculated) was 72.4%.
Some low catch-card response rates		
No account for bias from non-response (i.e., missing zero catches)		Of the 39 events with 100% returns, there has been no system in place to cross-validate the data. In most cases, the total number of registered anglers was taken from the number of catch cards returned if the host club/organisation stated that all forms were returned. Anecdotally, this return rate would be true for a selection of tournaments but not for all.
Predominately non-standardised or biased catch rates		The biases associated with non-response and no account for bias has major ramifications for the calculation of standardised catch rate indices. Due to this lack of account for biases, existing data can not be compared with confidence across survey scales.
Lack of post-fishing interview data		**Post-fishing interview data are lacking at freshwater events and needs only to be implemented under the circumstances described in appendices 13 and 16 or for the purposes of testing the data derived from catch cards.**

Appendix 26 (cont.)

Recommendations

- If the CARS is to be utilised for prospective freshwater sampling, some form of validation needs to be undertaken to ensure the usefulness of data for resource assessment purposes. This could include post-fishing surveys aimed at testing catch-card derived data. The recommendations in appendix 13 should be followed.
- Large variations in the quality of data provided. In general, the data are characterised by high non-response rates, a lack of information on total number of registered anglers and no account for biases. These characteristics result in non-standardised catch rate indices, which make their reliability and usefulness to resource assessment minimal. However, there are some data in this dataset that are comparable in quality to the Basscatch data, which is why this dataset has been classed as potential versus no.
- Better promotion of the correct length measurement (i.e., fork length as opposed to total length) needs to be implemented for future events where incorrect scientific measuring is apparent.

Overall evaluation result – potential (useful in part but requires change)

APPENDIX 27

Justification of evaluation result for the freshwater tournament dataset (excluding Basscatch) – usefulness in assessing the impacts of fishing tournaments.

Attribute	Evaluation	Justification notes
Predominately a catch and release fishery		Predominately a catch and release fishery resulting in importance of assessing impact as low except for the few very large tournaments, which should be considered for their impact.
Some very large tournaments		There are some very large tournaments (i.e., greater than 500 anglers) that should be considered for their impact in the future. These tournaments bring high concentrations of fishing effort over small spatial scales and short periods of time.
Lack of data on the total number of registered anglers per event		There is registration data for seven very large tournaments (which includes twelve events). These events were all in 2005 and 2006. There is no registration data prior to 2005 that indicates the presence of very large tournaments however they are known to have occurred.
Very large tournaments characterised by low catch-card-return rates		The catch-card-return rates for these very large events are between 7.2% and 44.3% with an average return rate of 22.4% ± SE 3.0. It is highly likely that a large proportion of zero catches are being missed using the CARS to collect these data, resulting in the catch rates being biased and not standardised across survey scales.
Fishing mortality-related information		Data has been collected on the method used to catch each fish (i.e., bait, lure or fly). If information becomes available in the future indicating the survival rates of different species by method then the post-release mortality associated with these events could be inferred from these data, which would be a useful indicator for assessing the impact of a fishing tournament. Other information such as hook size or anatomical hook location would also be useful to calculating post-release mortality but is not currently collected. It should not be assumed that if an angler is fishing in a catch and release tournament that all fish are actually released. Anecdotal evidence suggests that some fishers keep their catch for culinary purposes whilst fishing in catch and release tournaments. Therefore, additional questions regarding whether a fish is kept or released would be invaluable to take account of the fishing mortality associated with very large events.
Does not meet the requirements of a BACI design		Existing data does not meet the requirements of a BACI design (see 2.2.3; p13) that have the ability to detect the impact of a fishing tournament.
Lack of post-fishing interview data		Post-fishing interview data are lacking for freshwater events and does not meet the requirements of an impact assessment.

Appendix 27 (cont.)

Recommendations

- As outlined in Appendix 26, there are a number of data-related issues with this dataset that need to be addressed (such as the lack of total effort data, high non-response rates and no account for biases in the data). The recommendations in Appendix 26 should be followed for all prospective tournament-based sampling.
- Any impact assessment undertaken in the future needs to follow a BACI design using on-site access-point survey methodologies to collect valid data that has the power and ability to meet this objective.

Overall evaluation result – no (existing data of minimal use for this purpose)

APPENDIX 28

Justification of evaluation result for the freshwater tournament dataset (excluding Basscatch) – usefulness in assessing the success of fish stocking regimes.

Attribute	Evaluation	Justification notes
Catch and effort data over large scales		Provides catch and effort data over large spatial and temporal scales in a cost-effective manner for stocked lakes and dams in NSW
Many length data recorded inaccurately		As indicated in Appendix 26, these data provide valid species compositions for recreationally-caught species and could potentially provide accurate length-based data. Many of the existing length data are however showing indications of being collected inaccurately. Despite concerns about the recording of accurate fish lengths, length compositions remain useful for this purpose. Length-based data combined with species composition data can provide indications of the presence of newly recruited fish i.e., naturally-spawned fish or the occurrence of recruitment failures. These data are also useful in following stocked fish through time, particularly in impoundment water bodies. Overall, this information is useful to fisheries managers in the review process of proposed stocking events (Anon. 2005).
Valid species composition data		
Other data-related issues		There are a number of other data-related issues associated with the existing freshwater dataset. These are described in Appendix 26. These issues have alike ramifications for assessing the success of fish stocking regimes as they do for their usefulness to resource assessment.

Recommendations

- Improvements are necessary in the future to ensure the usefulness of freshwater tournament data for supporting assessments of recreational fisheries subjected to fish stocking regimes. The recommendations described in Appendix 26 should be followed to improve the outcomes of these data for this purpose.
- These data are relatively inexpensive to collect and therefore have the potential to cover wide spatial and temporal scales. However, the data collection strategy undertaken as part of this project has resulted in quantity versus quality of data. Prospective sampling needs to concentrate on events that already provide good quality data and/or on the creation of events that will form under the same circumstances as Basscatch events (for impoundments where stocking regimes are of a high value).
- For events not suited to the catch-card system, on-site access-point surveys will be required to allow accurate data to be collected on fishing quality and length compositions to support the assessment of existing fish stocking regimes, particularly those that are of a high socioeconomic value.

Overall evaluation result – potential (dataset useful in part)

APPENDIX 29

Justification of evaluation result for the saltwater tournament dataset – usefulness to resource assessment.

Attribute	Evaluation	Justification notes
Quality of species composition data variable		Self-reported-related biases associated with these data. Anecdotally, many saltwater tournament anglers do not record the catch of unwanted fish i.e., fish that do not count towards their point score (undersized or unwanted species). This bias is thought to be variable by tournament with some events providing more accurate data than others. There is currently no system in place to account for this bias.
Many length data recorded inaccurately		In total, there are 75,371 catch records. Of these 67,930 (90.1%) records have a corresponding length. Some records have a length and weight recorded. Other records have neither weight nor length recorded. There is a clear difference evident in the length data collected by saltwater compared with freshwater anglers. For example, a large number of snapper and bream lengths appear to have been rounded to the nearest 5cm (Appendix 12g and h) indicating that many anglers are estimating fish lengths, whereas, the length composition of Australian bass (Appendix 12a) presents a distribution indicative of a fish population without frequency spikes at 5cm intervals. Although many saltwater tournament anglers appear to be estimating fish lengths, the data remains of use to resource assessment, particularly as it provides indications of the presence or absence of new recruits.
Highly variable catch-card non-response rates and registration data		In total, there are 157 events (58 tournaments) for which data are recorded – 127 (81.5%) events have no corresponding angler registration data; 4 (2.5%) events have apparent 100% return rates; 25 (9.7%) events have return rates between 5.9% – 98.6%. Average return rate over all 29 (18.5%) events with corresponding number of registered anglers recorded (that allowed a return rate to be calculated) was 58.8%.
No account for bias from non-response		For all events, there has been no system in place to validate the total number of anglers fishing on each tournament day. It is unknown whether or not the total number of registered anglers was taken from the number of catch cards returned if the host club/organisation stated that all forms were returned. There is, therefore, a lack of account for bias from non-response (in particular, missing zero catches).
Mostly non-standardised or biased catch rates		The lack of account for biases such as non-response has major ramifications for the calculation of accurate catch rate indices. Due to the lack of account for biases, existing data can not be compared with confidence across survey scales.

Appendix 29 (cont.)

Lack of post-fishing interview data		Existing data collected on an ad-hoc basis with minimal survey design considerations. These data are variable in quality but overall there was no attempt to collect accurate lengths, which if collected could have provided the basis for comparisons of the quality of length data provided by anglers and for one event (that has reasonable total effort data), accurate data to allow for the calculation of total catch in weight.

Recommendations

- Large variations in the quality of data. The data are characterised by high non-response rates, a lack of information on total number of anglers fishing and no account for biases. These characteristics result in non-standardised catch rate indices, which make their reliability and usefulness to resource assessment minimal. Furthermore, there are other research projects that collect information on the same species as that in tournament monitoring but of a much higher quality overall.
- Validation is needed to ensure the usefulness of data for resource assessment purposes. This could include post-fishing surveys aimed at testing catch-card derived data. The recommendations in Appendix 13 should also be followed.

Overall evaluation result – no (dataset of minimal use for this purpose)

APPENDIX 30

Justification of evaluation result for the saltwater tournament dataset – usefulness in assessing the impacts of fishing tournaments.

Attribute	Evaluation	Justification notes
Some very large tournaments		There is evidence of some very large tournaments (i.e., greater than 500 anglers) that should be considered for their impact in the future. These tournaments bring high concentrations of fishing effort over small temporal and spatial scales.
Lack of data on the total number of anglers fishing per event		There are registration data for two very large tournaments (which includes five events). There are other very large tournaments that are known to have occurred however, there is no registration data for these. There is also Coast Guard log data for the 11th Evans Head Fishing Classic held in 2006, which apparently includes the recording of all offshore fishing trips during that event. According to the rules of this event, every boat must log on to Coast Guard when leaving the river to fish offshore.
Very large tournaments characterised by low catch-card-return rates		The catch-card-return rates for these very large events are between 5.9% and 26.8% with an average return rate of 16.54% ± SE 3.9%. It is highly likely that a large proportion of zero catches are being missed using the CARS to collect these data, resulting in the catch rates being biased and not standardised across survey scales.
Does not meet the requirements of a BACI design		Existing data does not meet the requirements of a BACI design that has the ability to detect the impact of a fishing tournament.
Lack of post-fishing interview data		Post-fishing interview data are lacking for saltwater events and does not meet the requirements of an impact assessment.

Recommendations

- As outlined in Appendix 29, there are a number of data-related issues with this dataset (such as the lack of total effort data, high non-response rates and no account for biases in the data).
- Any impact assessment undertaken in the future needs to follow a BACI design using on-site access-point survey methods to collect valid data that has the power and ability to meet this objective.

Overall evaluation result – no (existing data of minimal use for this purpose)

APPENDIX 31

Justification of evaluation result for the saltwater tournament dataset – usefulness in assessing the success of fish stocking regimes.

Attribute	Evaluation	Justification notes
Lack in cross-over between fish stocking events and saltwater fishing tournaments		The stocking of mulloway has predominately occurred in the Georges River, Botany Bay and Smiths Lake and more recently or future stockings have or are occurring in the Manning, Tweed, Richmond and Clarence Rivers.
Recommendations • There is a lack of existing data on mulloway for these waterways and hence existing saltwater tournament data are of minimal use in assessing the success of fish stocking regimes.		
Overall evaluation result – no (existing data of minimal use for this purpose)		

APPENDIX 32

Justification of evaluation result for the gamefish tournament dataset – usefulness to resource assessment.

Attribute	Evaluation	Justification notes
Valid catch and effort data for primary gamefish and baitfish species, however, assumptions need testing		Data collected from gamefishing tournaments are invaluable to resource assessment as they provide detailed catch and effort information (as described in Appendices 19 and 21) on species for which other data are lacking. Refer to Appendices 19 and 21 for notes regarding the issues associated with the collection of data from gamefishing tournaments.
Majority of data are self-reported due to high 'tag and release' rates		
Possible biases associated with self-reporting		
Selection of events for post-fishing interviews ad-hoc		
Provides additional fishing method information in support of directed catch rate calculation		
Post-release mortality-related information		
Provides catch and effort data for recreational-only species (blue and black marlin) – information that is lacking via other data sources.		

Recommendations

- To improve the outcomes of this invaluable dataset, the recommendations described in Appendices 19 and 21 should be followed for all prospective sampling.
- Please refer to existing project reports and publications (Lowry and Murphy 2003; Lowry *et al.* 2006; Murphy *et al.* 2002; Park 2007; Pepperell and Henry 1999) for additional information on this dataset.

Overall evaluation result – Moderately (Continue with minor changes and test all existing assumptions where necessary and feasible)

APPENDIX 33

Justification of evaluation result for the gamefish tournament dataset – usefulness in assessing the impacts of fishing tournaments.

Attribute	Evaluation	Justification notes
Predominately a catch and release fishery		Refer to the justification notes in Appendices 20 and 22 for information regarding the constraints associated with gamefish tournament-based data for the purpose of assessing the impacts of fishing tournaments.
Provides valid catch and effort data but these data do not meet the requirements of a BACI design with the ability to detect an impact		
Recommendations • Due to the high rate of fish 'tagged and released' in gamefishing (over 88%; Murphy *et al.* 2002) and the design constraints presented in Appendices 20 and 22, the existing dataset is of minimal use in assessing the impacts of fishing tournaments.		
Overall evaluation result – no (dataset considered of minimal use for this purpose)		

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