

Applications and characteristics of angler diary programmes in Ontario, Canada

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Abstract Angler diary programmes ($n = 46$, 1979–1997) implemented in Ontario by the Ontario Ministry of Natural Resources are reviewed, and the different uses of angler diary programmes, levels of participation and differences in programme design are reported. In Ontario, angler diary use is common, but successful application is limited. This review revealed a variety of uses and approaches for administering angler diary programmes. Problems arise when programmes are initiated without the complete commitment of the administrators and agency, or when there is no regular review so adaptive changes can be made. If administrators realize the potential biases and problems associated with diaries, and design programmes to control them, angler diaries can provide favourable cost-effective results. With reduced funding and staffing constraints, angler diary programmes could become the primary method of data collection for specialized and remote fisheries.

KEYWORDS: administration, angler diary, assessment, logbook, Ontario, relative abundance.

Introduction

Angler diary programmes and logbooks are generally accepted as the most economic method of collecting angler provided data (Pollock, Jones & Brown 1994). The term angler diary is applied loosely to all methods by which anglers personally record information about an angling event. Pollock *et al.* (1994) suggested that angler diary

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programmes should be used only when all other sampling techniques are impractical, and even then with great circumspection. Large biases are inherent in angler diaries because the data are self-reported. Anglers may exaggerate their catches (prestige bias), misidentify fish species, misreport lengths and weights of fish, and misunderstand questions (Essig & Holliday 1991). High non-response rates, avidity biases and conditioning bias are also recognized as common problems with this angler survey method (Pollock *et al.* 1994). Administrators must also be aware of the biases associated with using data provided by different types of anglers, particularly those who are members of sports clubs (Bryan 1977).

Despite these biases, angler diaries have been used frequently to obtain information on catch, effort and harvest (e.g. Anderson & Thompson 1991; Sztramko, Dunlop, Powell & Sutherland 1991). They have also been used to examine fish consumption, participation and expenditures (Connelly & Brown 1996), assess management actions (MacLennan 1996), and determine angler satisfaction (Bray 1997). Numerous researchers have concluded that angler diaries offer potential for indexing long-term trends in relative abundance of target species (Carlander, DiCostanzo & Jessen 1958; Green 1985; Stanley 1989; Sztramko *et al.* 1991; Kerr 1996; MacLennan 1996). The reliability of angler diary programmes for providing biological data has been demonstrated by Ebbers (1987).

Published accounts of inland angler diary programmes have been limited to large-scale projects that often involve several hundred anglers and are repeated for several seasons or years (e.g. Green, Schonhoff & Youngs 1986; Anderson & Thompson 1991; Sztramko *et al.* 1991). Many fisheries agencies regularly administer angler diary programmes, although few of the results appear in the primary literature.

The most widespread users of angler diary programmes are regional fisheries biologists who design and implement small-scale projects to achieve specific objectives. Such attempts are often unsuccessful due to insufficient agency support, ineffective implementation and poor angler participation. Data from these programmes are rarely compiled into formal reports. Instead, results are summarized and circulated as memos or internal reports and used anecdotally. In some instances, however, programmes evolve and develop into important long-term monitoring projects and are published as refereed articles (e.g. Sztramko *et al.* 1991).

Here, the different uses, designs and methods of implementation of angler diary programmes are reported as they relate to levels of angler participation and achievement of programme objectives in Ontario, Canada. Ways to collect and use angler-reported data are recommended. This information will be useful for fisheries biologists and managers designing and implementing angler diary programmes. It may also be useful to anyone involved in documenting, managing, or providing advice on artisanal and subsistence fisheries.

Materials and methods

The uses of unpublished angler diary programmes in Ontario by the Ontario Ministry of Natural Resources (OMNR) and Conservation Authorities were reviewed to identify the

range of applications of angler diary programmes in the province, the degree to which programme objectives were achieved and influential factors. Reports and memos summarizing angler diary programmes ($n = 46$) from 1979 to 1997 were solicited. Electronic messages were forwarded to all OMNR fisheries personnel. Searches were conducted at the OMNR Library and all Science and Technology Transfer Units. When necessary, telephone interviews were conducted to gather additional information about unsummarized programmes. Data from the long-term monitoring project on Lake Erie were excluded from analysis as this information has been summarized elsewhere (see Sztramko *et al.* 1991). Data from each programme were assigned to appropriate categories under the groupings of programme objectives, spatial scale, type of data collected, point of contact, target group, frequency of contact and incentive for participation.

Characteristics of angler diary programmes which lead to successes or failures were identified. Success was measured on the ability of a programme to meet the original objectives as judged by the programme administrator. In some cases, this was evident in reports, but more frequently administrator interviews were required. Each programme was then described as successful, partially successful, a failure or no comment. This method of determining the relative success or failure of a programme may produce biases, however, it was not possible to use criteria such as the number of participants or participation rates as these numbers can be independent of the ability of a programme to achieve the desired objectives.

Results

Programme objectives, spatial scale and data collection

Fisheries managers have initiated angler diary programmes in Ontario for a variety of reasons (see Table 1). The most commonly reported in Ontario were collection of data on effort, catch and harvest (78%) and biological statistics (74%). The objectives of the remaining programmes ranged from assessing different management strategies to promotion of diverse angling objectives. Angler diary programmes were administered on a variety of spatial scales, including regional/district (28%), watershed (9%), individual waterbody (43%), or a part of a lake (20%).

The types of data collected by individual programmes were determined by the objectives of the programmes (see Table 2). Every diary programme reviewed collected the basic information required to calculate catch per unit effort (CPUE) and harvest rates, including duration of trip, catch, harvest, and number of anglers/rods. Only 46% of programmes requested target species to be identified. In some cases (29%), this was due to the objective of the project in that only information on one fish species was required, usually for specialized fisheries (i.e. muskellunge, *Esox masquinongy* Mitchill, lake trout, *Salvelinus namaycush* Walbaum). Programmes also collected data on fish meristics ranging from simple size measurements to more involved scale collection or gender determination. In lake systems, depth and temperature were often recorded. Half of the programmes requested information on fin clips or required tag returns; several

programmes solicited information on habitats, vegetation type, and substrate composition, usually for specialized fisheries.

Target group and recruitment of participants

None of the angler diary programmes in Ontario were built on statistical sampling schemes, so participants were not randomly chosen from, for example, a resident license panel. In Ontario, the most frequently reported target group was anyone that angled (28%), followed by individuals who target specific species. Some studies called for anglers with already developed expertise; angling club members have been specifically targeted in Ontario. Additional target groups were used infrequently (Table 3).

The point of contact for participants (see Table 4) depended on the target group, which in turn was determined by the aims of the study. Outdoor shows, tackle shops, government offices and conservation areas were infrequently used. The numbers of participants generated through these contact opportunities were low; however, since potential participants must initiate the contact, their interest and resulting efforts were usually high. Conservation officers and creel survey clerks offer an alternative means of contact.

Table 1. Range of objectives for angler diary programmes reviewed in Ontario

Objectives	% of angler diary programmes reviewed ($n = 46$)
Collection of data on CPUE/harvest	78
Collection of biological data	74
Collection of baseline information on fish distributions – presence/absence	15
Supplement creel survey data on lakes with low absolute fishing pressure	15
Encouragement of angler involvement in monitoring fisheries	13
Document seasonal fish movements	9
Assessment of stocking programmes	7
No clear objectives	7
Plan review	7
Calibration of creel surveys-temporal and spatial stratification	4
Estimate populations using tag returns	4
Assessment of habitat enhancement or restoration	2
Assessment of special angling regulations	2
Document areas of potential overharvest/underutilization	2
Promotion of diverse angling opportunities	2

Table 2. Type of data collected by angler diary programmes reviewed in Ontario

Type of data collected	% of angler diary programmes reviewed ($n = 46$)
CPUE (catch and trip duration)	100
Harvest	100
Length/weight	87
Presence of fin clips or tags	50
Target species	46
Precise location of effort	29
Scale sample	24
Water temperature	11
Origin of angler	11
Fish gender	9
Habitat (depth, substrate, vegetation)	7
Number of other anglers or boats observed	4
Stomach contents	2

Frequency and type of contact/follow-up

Programme administrators have varied in their approach to distributing and collecting reminders (see Table 5). Many programmes (33%) in Ontario did not follow up with phone calls or letters but relied on anglers to return the diaries. Administrators who keep track of who was issued (given/mailed) angler diaries are able to send them reminder notes and make follow-up contacts. Registration cards and self-addressed stamped envelopes have been distributed by creel clerks in order to effect this. Only in a few instances were diarists provided with participation reminders during the study. However, those diary programmes that were able to use letters and phone calls as follow-ups to delinquent diarists, improved return rates. The media has rarely been used and was only moderately successful in encouraging returns. When the onus to return the diary at the end of the season rests solely on the angler, return rates have been low, unless the diarists were particularly conscientious reporters or avid anglers.

Table 3. Angler diary programme target participants from programmes reviewed in Ontario

Angler diary target group	% of angler diary programmes reviewed ($n = 46$)
All anglers	28
Individuals who target specific species	22
Cottagers/residents	17
Club members	17
Charter boat operators	13
Anglers with developed expertise	13
Outpost anglers	7
Ice-hut owners	7
Park users	2

Table 4. Point of contact for participants in the angler diary programmes reviewed in Ontario

Point of contact	% of angler diary programmes reviewed (<i>n</i> = 46)
Angling clubs	33
Creel survey clerks	28
Cottage associations	20
Ice-hut/charter boat operators	20
Conservation Officer	20
Government offices	13
Tourist outfitters/resorts	11
Parks and Conservation Areas	7
Media	7
License lists	7
Outdoor shows	7
Display at access point	4
Tackle shops	4

Incentives

Incentives were frequently used to encourage participation and return of completed diaries. The most common and appreciated incentive was a data summary (57%) and the return of the diary to the participant (17%; see Table 6). Many angler diary programmes stress the benefits of the programme to the angler (33%). Various other incentives have also been used, including hats, patches, and boat stickers. The more substantial items such as framed certificates signed by an appropriate senior resource manager were often reserved for individuals who have participated for numerous years and show continued commitment to the project. In addition, draw prizes were effective incentives to promote the timely return of angler diaries at the end of the season. Seven percent of the programmes did not use incentives to encourage participation.

Diary design

Design and layout of the diary are important to assist data entry and avoid confusion. Diaries can take several forms. Booklets/logbooks were the most common (63%); single pamphlet log sheets (26%) were the least expensive. Although log sheets can be distributed en masse, return rates are generally poor with such programmes. Single sheets are easily lost or damaged, and there is little room for diarists to record additional information. In some cases, these log sheets have been enlarged and left inside ice-huts where anglers record the information (7%). Occasionally (4%), creel cards were left at access points for anglers to complete at the end of their trips. Booklet-style diaries (63%) were the most expensive to produce and mail, however, they were the most durable.

Participation rates

The problem most commonly reported by angler diary administrators was a poor participation rate. The number of diaries distributed for the programmes reviewed ranged from 13 to 8000, with the median being 50. The percentage of anglers submitting completed diaries ranged from 0 to 56.5%, with the median being 21.8%.

Angler diary successes and failures

Few programmes were completely successful (30%). Most had some success (37%), and a few were failures. Many programmes or programme administrators did not comment on their success. When the characteristics of programmes that succeeded (30%, $n = 14$) and those that failed (9%, $n = 4$) were examined, several emergent characteristics were found. Of the four reported failures, three programmes had no clear objectives and there was no clear indication of the angler target group, although three of the four failed attempts were directed at all anglers. The other failed attempt targeted club members. The method of soliciting participants influenced the success of the programme. In successful programmes, the most frequently used method to solicit participants was through angling clubs. Working through tourist outfitters and conservation officers was rarely successful, and resulted in all but one of the failures.

The clearest factor associated with angler diary programme success was frequency of contact with participants. All failed diary programmes relied solely on participants for diary submission, whereas all successful programmes included some form of reminder. The most common reminder was in written form, sent when data were due for collection. Several successful programmes employed telephone reminders. Frequent reminders throughout the duration of the study, however, were not viewed as important to the success of the programmes. The provision of an incentive was likewise not essential to ensuring the success of a programme. Only one of the successful programmes actually provided a material incentive. Data summaries and the benefits of the programme to the angler were used as incentives in both successful and failed attempts. Angler diary design also influenced success. Logbook style diaries tended to be most successful, although two of the failures were in logbook form and two in pamphlet form.

Table 5. Frequency of participant contact for angler diary programmes reviewed in Ontario. This analysis excludes the angler diary programmes where creel cards are left in a display at an access point

Frequency of contact	% of angler diary programmes reviewed ($n = 44$)
Distribution and collection only	35
Distribution only	33
Distribution and collection with phone follow up	15
Throughout the duration of the study in written reminders	13
Throughout the duration of the study via the media	2

Table 6. Participation incentives used by angler diary programmes reviewed in Ontario

Incentives to participate	% of angler diary programmes reviewed (<i>n</i> = 46)
Data summary	57
Benefits to angler	33
Patch, hat or lapel pin	30
Return of diary	17
Draw prize entry	7
None	7
Boat sticker	2
Mandatory	2

Discussion

Angler diary applications – diffuse fisheries

Angler diary programmes are an effective way to monitor spatially diffuse (scattered with low effort) or dynamic fisheries and to indicate where underutilized and overfished areas may be more likely to occur. Since fisheries are often managed on a watershed basis, demand is growing for watershed-based angler information. Watershed-based angler diary programmes are useful for documenting changes in the distribution of fish species on a watershed scale and providing baseline data on waters about which nothing is currently known. By providing anglers with the choice of fishing locations and target species, it may be possible to determine shifts in angler preference, invading species, or other aspects of community structure. This offers advantages over a local creel survey. In Ontario, Schraeder (1989) used angler log sheets to collect information on year-round fishing activity, and Cooke & Gurr (1996) used diaries to collect baseline information on fish distributions and CPUE on a watershed scale. One diary programme was implemented to gauge the effectiveness of stream restoration efforts on small southern Ontario streams (J. Colonnello, personal communication).

In northern Ontario, angler diary programmes have focused on providing CPUE and biological data on lakes with low absolute fishing pressure. Since remote lakes are impractical for implementing creel surveys, angler diaries are the most effective monitoring tool. In these cases, the number of participants is usually low and often comprises cottagers or tourists. A programme administered in Quetico Provincial Park used diaries distributed to overnight campers to obtain information on angler use patterns (M. Fruetel, personal communication). This information was useful in temporally and spatially stratifying more intensive creel surveys. The diary included all 298 named lakes and rivers in the 4758 km² park boundary. In Killarney Provincial Park, diaries were given to park visitors in order to collect information on three specific lake trout lakes that did not acidify. However, the diaries requested information on all park lakes so as not to draw undue attention those specific lakes (E. Snucins, personal communication). Angler diaries have also been used to determine resource allocation on newly accessible

lakes or to reconcile allocation issues between tourist outfitters and resorts in northern Ontario (M. Fruetel, personal communication).

Angler diary applications – specialized fisheries

In specialized recreational fisheries where catch rates are generally low, angler diaries can be particularly effective. For example, standard creel surveys do not usually provide sufficient information about muskellunge fisheries because of catch-and-release practices (Younk & Cook 1992; Kerr 1996). Kerr (1996) used a regional diary programme to obtain information on muskellunge angling in Ontario. The data were collected by members of Muskies Canada Incorporated on 77 Ontario waters during a 16-yr period (1979–1994). Three hundred and eighty-nine anglers recorded information on their fishing activities and characteristics of angled muskellunge, providing valuable information on a highly specialized resource. The best use of these data was in documenting trends in relative abundance over time. The success of this project was largely attributed to the enthusiasm and commitment of the participants. In another Ontario study, MacLennan (1996) implemented a muskellunge sport diary programme on Lake St Clair to monitor the status of muskellunge stocks and the effect of a change in minimum size limit. He concluded that the study made a valuable contribution to muskellunge management by providing comprehensive, cost-effective stock monitoring data with remarkable consistency and resolution. Angler diaries typically provide the majority of the data for fisheries management for such specialized fisheries in Ontario.

Establishing active participant pools

One of the biggest dilemmas in participant recruiting lies in attempting to involve as many anglers as possible while at the same time screening out those unlikely to submit their diaries. In Ontario and elsewhere, ice-hut operators, resort owners (Thompson, Anderson & Ellison 1988), park staff and tourist outfitters have been effective in helping to solicit participants, however, the response often depends on the emphasis placed on the programme by the individuals and organizations. Cooke & Gurr (1996) reported that the most faithful diarists were club members or anglers who initiated the contact themselves. Club meetings provide opportunities to distribute diaries, review instructions and present summaries of the findings.

Marine researchers (Calhoun 1949; Baxter & Young 1953; Chadwick 1962; Jensen 1964) have provided logbooks to licensed charter boat operators. These researchers concluded that logbooks used in this manner were an inexpensive method of data collection. Fewer successful examples of logbooks being maintained by inland charter boat operators exist (e.g. Allen 1989; Sztramko *et al.* 1991; Stronks 1994; MacLennan 1996). Experience on Lake St Clair found charter boat operators were uncommitted and, hence, unreliable (MacLennan 1996). Some jurisdictions have legislated that licensed charter boat operators must complete angling logs since managers have classified them as commercial fishing operations. This obliges them to submit complete and accurate effort

and catch reports. On lakes that have cottages or year-round dwellings, the cottagers or residents are often invited to be participants. However, the sample frame may be incomplete and unrepresentative if the lake residents fish elsewhere and if a significant portion of the anglers who fish the lake do not reside there. Identification of participants in a fishery and how they access the fishery is useful for identifying an appropriate target sample frame and the best ways to contact them.

All but one of the programmes reviewed in Ontario were voluntary. Mandatory diary reporting was a requirement for individuals receiving tags to catch lake trout on Clearwater Bay, Lake of the Woods. Anglers were required to submit completed diaries if they wanted to maintain eligibility to participate in the draw for tags in subsequent years. Even with that approach, participation rates were low (B. Corbett, personal communication).

Maintaining active participation

Placing the burden to record information on the participants is the greatest disadvantage of angler diary programmes (Connelly & Brown 1996). Despite these limitations, several programmes have developed into long-term data collection projects. For example, Sztramko *et al.* (1991) reported that increases in participation from 15 in 1984 to 161 in 1989 were brought about by recognizing volunteer contributions, informing anglers about use of the data, and fostering among them a sense of resource stewardship and public involvement in fisheries management. In Minnesota, Younk & Cook (1992) reported that initial return rates of diaries were low, which could indicate a lack of commitment by volunteer anglers and poor communication links between diarists and the programme administrator. They reported that many anglers were reluctant to take part due to concerns about confidentiality. One angler diary programme in Ontario, that was instigated on the basis of angling club perception that stocks were declining, had no diary returns. There was confusion and misinterpretation that the results would be made public (A. Liskauskus, personal communication). To minimize such concerns, programmes should always be administered at arms-length from clubs so that diarists do not feel that their own successes/failures and secret fishing holes will be obtained by their peers.

Because enthusiasm declines between seasons, constant recruitment of new participants is necessary (Younk & Cook 1992). It may take several years to build a programme, given the difficulties in recruiting individuals who will provide accurate, complete and reliable data (Allen 1989). Where there was poor participation, however, those that submitted diaries prided themselves in providing complete and accurate data on a consistent basis (Cooke & Gurr 1996). To generate enthusiasm, Younk & Cook (1992) appointed club coordinators who assisted in distributing information. Too often, programmes are terminated prior to diarist 'bases' being established.

The use of reminders for increasing participation has provided interesting results. Connelly & Brown (1996) reported that postcards intended as reminders were of little value for retaining participants. The researchers suggested that the real value of re-

mindings should be seen in reducing recording errors, not in maintaining higher participation rates. Younk & Cook (1992) reported that follow-up letters to volunteers who failed to return diaries was time consuming and usually unproductive. In this review, reminders to submit diary materials were not used in unsuccessful programmes, but were common in those that were successful. This indicates that reminders may be helpful in stimulating returns or at least in achieving the objectives.

Data summary, dissemination and programme evaluation

Annual summaries are often produced prior to the next fishing season as a courtesy to anglers. Results from the previous year are then available for reference before the next angling season begins. This also ensures data are available for 'real-time' application by managers. The individual diaries and summary data are recognized and treated as the anglers' personal and confidential property. The administrator must remember that the diary constitutes a contract with participants in which they are required to report back to participants. Local media or townhall meetings can serve as vehicles to disseminate information if producing and distributing reports proves too costly. Administrators need to recognize the importance of data management and programme review by explicitly identifying annual summarization and reporting of diary data and reviewing their implementation plans of human and fiscal resources. Formal summaries for management purposes should characterize the participants and either include a complete methodology or a concise outline and reference to its documentation. Very few of the programmes reviewed in Ontario had complete methodologies and even fewer commented on the successes and failures of the project, or made recommendations for future applications.

In some cases, administrators interviewed suggested that if more time had been devoted to the angler diary programme objectives, design and communication, the participation rate would have been likely to improve. The majority of diary programmes that were discontinued or considered failures were the result of poor programme methodology and lack of communication, resulting in poor participation or the collection of useless data. Only when the objectives of an angler diary programme are clearly defined, and it is implemented in a manner best able to meet the objectives, is it likely to be effective. Poorly designed and administered studies have led to a reluctance to initiate or continue angler diary programmes in Ontario. A critical review of all diary programmes should be completed regularly, ideally annually, and be based upon comments from participants and on the ability of this survey method to achieve the desired objectives.

Costs

All but two of the programmes reviewed failed to discuss the costs of the project. Although the cost of implementing an angler diary programme varies, MacLennan (1996) reported that angler diaries cost approximately 15% of an OMNR implemented or contracted on-water creel survey. This calculation includes aerial survey costs necessary to obtain information on angler effort every 4 years. For three large lakes in the

Muskoka District of Ontario, costs are approximately 5% of traditional roving creel survey costs for a winter lake trout fishery (W. Dunlop, unpublished data). One advantage of a diary programme, though, is that additional lakes can be added to the survey without any significant increase in operation costs. Green *et al.* (1986) reported that angler diary cooperators in New York collected information on black bass (*Micropterus* spp.) populations of the quality and quantity required to provide all or a substantial portion of the information necessary for making management decisions. The costs were significantly less than more traditional methods of data collection.

The future of angler diary programmes

Possibilities exist for developing Internet sites that allow anglers to log information on angling trips. This methodology could reduce costs and allow for ease of programme administration at the provincial or state level. In addition, it could expedite access to angler diary data to the point of accessing 'real time data' on which survey and management decisions could be made on an 'interactive' basis. Angler diarists surveyed about their willingness to enter data from angling trips into world wide web (www) sites were divided (S.J. Cooke, unpublished data). Lack of www access and the prospects of not having the diary returned were the most common concerns of diarists. Administrative concerns include increased recall error when diaries are not completed immediately following angling, increased effort required by the diarist to record and enter the data themselves, and availability of hardware, which could lead to reduced participation. The administrator may also forgo the opportunity to obtain direct angler contacts and feedback at angler diary presentations. Such technology is still rather elitist in our society and would likely preclude many anglers from providing data. An alternative to reducing data entry requirements and transcription errors could be based upon scannable data capture. This has considerable potential with the recent rapid development of computer software and hardware for reliable access to optical character recognition technology.

Conclusions and recommendations

By studying methods used in successful diary programmes and the shortcomings of unsatisfactory efforts, it is possible to provide recommendations for administrators who have or are considering implementing angler diary programmes. The foremost recommendation is the setting of specific and realistic objectives, and then considering which assessment methodology is most appropriate. When considering angler diaries, the researcher must realize the numerous biases associated with this type of collection method, and weigh these with the costs and benefits of other methods. Prior to initiating a programme, the administrator must ensure that there are appropriate resources and support to effectively manage the study, including support for summarizing and reporting the results. If angler diaries are the method of choice, the layout should be in booklet format, with vibrant cover and water-resistant paper. This ensures that it can be easily located and it provides a pleasurable momento for the diarist after the data have been

extracted. The diary should contain simple, concise instructions, a contact person, calendar, map, and an example entry. The participants should reflect the objective that is attempting to be met and should be solicited using a method that permits interaction between the diarist and the administrator. Reminders are useful for reinforcing the importance of accurate data, and for encouraging the submission of completed diaries.

The review of angler diary programmes over a large spatial scale is a novel approach to gaining insight into the design and administration of angler diary programmes. Important long-term monitoring data can be created either as a continuous series or a sequence of intermittent programmes. Both depend on some knowledge of the angler participant sample frame, comprehensive and consistent implementation methods and data to support long-term analysis. If the angler diary programme is not administered in a dedicated manner and reviewed regularly, the programme will likely fail, contributing to the notion held by many that angler diaries are poor methods of data collection. If the administrator realizes the potential biases and problems associated with diaries, and attempts to design a programme which best controls them, angler diaries will provide favourable results in a cost-effective manner. With reduced funding and staffing constraints, and for specialized or remote fisheries, angler diary programmes are becoming, in some cases, the primary method of data collection. The information presented in this paper should help fisheries biologists and managers design and implement more successful angler diary programmes.

There is a clear parallel between angler diary programmes and studies designed to understand the importance of artisanal and subsistence fisheries. Normal reporting procedures applied to commercial fisheries either cannot be administered or are not appropriate. Yet these fisheries are often essential to the communities they serve and harvests are high enough to engender biological responses in local fish stocks requiring management decisions. In northern Canada and Alaska, post-harvest 'recall' questionnaires are the commonest method of collecting data (e.g. Gamble 1984; Walker, Andrews, Anderson & Shishido 1989; Berkes 1990; Hopper & Power 1991). These questionnaires are now often replaced by calendar-diaries to encourage daily reporting of catches and effort. The methodology converges on that applied to angler activities and there is much to be gained by comparing the results, shortcomings and biases of the two approaches. The results of the Ontario angler diary review can be further extrapolated to other types of fisheries in other jurisdictions around the world.

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