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successful implementation, depends upon the interaction of resource managers, affected interest groups and whatever public sector groups define abalone resource issues as relevant to their goals. To better understand the way these different parties define the issues and express their preferences for problem solutions, Chapter 3 concentrated upon data gathered from interviews with all segments of the industry, recreational users, resource managers and relevant public sector groups. There is a reasonably high degree of consensus on problem definition, but, as to be expected there are several differences when management preferences are stated. Reflecting the process of compromise that produced AB 2224, we found considerable support for the limited entry thrust of that recently passed law. It also appears that resource augmentation is something of a motherhood issue. Everyone wants to increase the supply of abalones; finding the money and scientific knowledge necessary to make a resource augmentation program successful may be a very different and difficult matter.

It is interesting to note that by the time the new legislation (AB 2224) was heard by relevant legislative committees, the process of compromise had managed to include only those features in the bill that would not receive strong opposition. Indeed, there was no visible opposition at all. With respect to future abalone management policy, there are some very clear areas of agreement and disagreement between the interested parties as well as some mixed reactions on a few possible policies. For those subjects of agreement -- such as the widely shared desire for resource augmentation -- the political process "simply" requires a coordinated campaign to secure the necessary money and talent. However, where there is disagreement over future policy -- such as the use of area rotation or containment of the sea otter -- the end result

will be determined by the relative political effectiveness of the affected parties. The role adopted by DFG in those policy areas where there is disagreement will be crucial. DFG is both affected by its clientele and in turn the Department has important impact on its clientele. It is often very hard to know the net impact of DFG as a result of this two-way interactive process, but it is obvious that DFG's policy position will play a very important role in legislative considerations and the deliberations of the Fish and Game Commission. DFG is moving into a relatively new role as it becomes a more active, aggressive marine resource manager. As it moves into these uncharted waters it will automatically become embroiled in increasing political controversy as affected interests seek their own best position and also seek DFG's support.

To conclude this brief summary, it may be helpful to recount the current (as of January 1, 1977) status of abalone management in California. Although there is no need to repeat the details of AB 2224, some of its major provisions and intended effects should be remembered. The new law limits the number of commercial abalone divers by only granting renewed diving permits to those who currently hold a permit and to a very small number of new divers. By limiting the number of "permanent" commercial divers, and presumably making it difficult for part-time divers to satisfy minimum landing requirements, the anticipated decrease in picking pressure and bar-cutting mortality from inexperienced divers is intended to stabilize the declining resource base. In the sport sector, the open season has been reduced as has the daily bag limit. The north coast, the sea otter, area rotation and quotas are among the major issues left unresolved.

Another unresolved question is posed by legislative provisions for ad-

justing the total number of commercial abalone diving permits to the capacity of the resource. AB2224 and AB2880 provide a mechanism for limiting the number of commercial divers beyond the provisional target of 200 permits. The Fish and Game Commission is delegated responsibility for establishing the number of commercial permits to be issued at such time as the (then) current permits are reduced to 200, or in any event, no later than January 1, 1981 (at which time all of the limited entry provisions of AB2224 and AB2880 automatically expire, unless further legislation is forthcoming prior to 1981). A literal reading of both AB2224 and AB2880 indicates that if the number of then current commercial permits is either greater than or less than the number justified by the status of the resource, as determined by the Commission, then all commercial divers must take their chances in a drawing of qualified applicants, with qualification to be determined by either prior experience or passing a proficiency test. Requiring existing permit holders to compete in a drawing will undoubtedly generate considerable controversy. If it were not the intent of the legislature to require existing permit holders to be involved in the drawings (as has been suggested to us), then additional legislation seems necessary. This situation opens the possibility that the delicate balancing of interests that produced both pieces of legislation may slip into debate and disagreement.

Conclusions

The implementation of a limited entry program does not preclude additional measures for managing the abalone fishery, but the need for such measures hinges in part on the effects of limited entry. It is therefore important to obtain base-line data that are as free as possible of controversy over factual premises. These data should refer to both the resource and

its users, including:

- 1) The designation of representative beds for a "before and after" census of abalone populations in the immediate sublegal size class;
- 2) The compilation of accurate records of effort and take by both species and area, perhaps employing a log-book system for commercial divers and a tag or report-card system for sport divers;
- 3) The collection of socio-economic data on commercial divers who fail to renew their permits after AB 2224 takes effect, in order to determine the size of their annual catch, how much time they spent diving, and why they dropped out.

While the impact of limited entry will provide a new frame of reference for assessing such management options as landing quotas and shortened seasons, there are other proposals that are largely independent of efforts to limit entry, including intensified seeding programs, opening the north coast to commercial diving, and containing the sea otter. These proposals are presently marked by varying degrees of controversy, but just as the prospects for avoiding controversy over the impact of limited entry will be affected by the quality and the extent of agreement on the data, prospects for reducing controversy over the latter proposals will depend heavily on opportunities for reducing uncertainty about the factual premises on which those proposals are based.

There appears to be little disagreement over the desirability of augmenting abalone resources through intensified seeding efforts, but it is by no means certain that such efforts will prove to be feasible under conditions that are mutually acceptable to commercial divers, sport divers, and the Department of Fish and Game and at the same time meet all legal requirements.

DFG officials do not foresee major gains from seeding efforts that are not accompanied by some form of controlled access, such as bottom land leases. Unless this position is reinforced by supporting evidence, consensus on the general policy is almost certain to give way to controversy over its specific implementation.

There is considerable scientific research as well as old-fashioned trial and error that will be necessary before seeding becomes a reality. It behooves DFG to make its position clear: Will it invest its resources in a large-scale seeding effort? Will DFG support only small-scale experimental efforts? Will DFG refuse to participate at all? The industry and the sport sector should get an answer so that they may proceed accordingly.

If more specific information may be needed to preserve agreement on the desirability of abalone seeding, it is certainly required to break down barriers to the serious consideration of proposals to open the north coast. But where a present consensus supports efforts to obtain better data with respect to seeding, the expectation of vigorous opposition to opening the north coast has precisely the opposite effect. Even the most tentative and experimental proposals for commercial diving north of Point Lobos will not reach the public policy agenda until they are supported by some evidence that conditions have changed significantly since that possibility was last rejected in the mid-1950's. But the issue is perceived to be so politically volatile that DFG is reluctant to initiate the necessary research.

As indicated by DFG's efforts to determine the feasibility of arresting the southward migration of the sea otter, that agency is prepared to undertake politically sensitive research if it perceives a serious threat to a resource. While much remains to be learned about the complex interrelation-

ship of abalones, sea otters, sea urchins and kelp beds, the Department does not appear to be overreaching the available evidence in assuming the incompatibility of sea otters and extensive abalone populations. It may be true that -- within the historic range of the sea otter -- abalone stocks would not have reached commercial numbers in the first place if the otter population had not been nearly extinguished, but it may also be true that the resurgence and spread of the sea otter contributed to the depletion of abalone stocks. For the time being, it appears that the formulation of appropriate public policy for dealing with this problem would be advanced if all of the contending interests would simply stipulate the impossibility of sustaining both an uncontrolled otter population and a viable commercial abalone fishery. The important question is not one of ascribing responsibility for this situation, but of determining what adjustment of more narrowly defined interests best represents the broader public interest.

Pending an estimate of the impact of limited entry and the clarification of factual premises about the feasibility of resource augmentation, of controlled commercial access to the north coast, and of stabilizing the perimeters of the sea otter's range, any assessment of political and administrative considerations is uncomfortably speculative. Having noted this substantial qualification, the range of public policy options may be summarized as follows:

- 1) What adjustment of competing interests can be achieved with nominal administrative and political costs? Here the answer appears to have been provided by the unopposed adoption of AB2224 and the nearly self-enforcing principle of limited entry that it embodies;

- 2) What further adjustment of competing interests might be achieved if

increased administrative and political costs were accepted? Here the range of alternatives appears to extend from substantial acceleration of abalone seeding projects through the rotation of open and closed diving areas to selective opening of the north coast to commercial diving;

3) What trade-offs, or mutually exclusive choices, may have to be considered if it proves to be practically infeasible to further reconcile competing interests, or if management agencies are unprepared -- for whatever reasons -- to assume responsibility for more intensive management of the abalone fishery?

The first possibility is most clearly illustrated by the conflicting objectives of the Friends of the Sea Otter and of commercial and sport abalone divers. Even if DFG experiments demonstrate the feasibility of containing the sea otter through capture and relocation, such a program would conflict with the stated intent of environmental groups to assure that the sea otter is allowed to roam freely throughout its natural range. And if it proves to be infeasible to capture and relocate the sea otter, then it appears that a hard choice will have to be made between the systematic elimination of migrating sea otters or tolerance of their progressive depletion of abalone stocks. A second, somewhat "softer" example of such trade-offs would be entailed in bottom land leases designed to preserve a commercial abalone fishery by substituting farming for hunting. If not precluded or made impractical by constitutional restrictions, this step would significantly alter the life style that has attracted so many divers to the commercial fishery.

We would be remiss if we failed to acknowledge the possibility that public policymakers may ultimately conclude that the political and administrative costs of attempting to adjust competing claims to the abalone resource

exceed the benefits to be derived therefrom by society as a whole, and that the Department of Fish and Game should restrict its activities to controls on access designed to preserve the resource (e.g. shorter seasons and more extensive area closures) without regard to their consequences for abalone divers. This would mean that, by default, there would be some winners (environmental groups) and some losers (commercial divers and processors, that segment of the retail market that could not be satisfied with Mexican imports, and to a lesser extent, sport divers), but it would not necessarily mean that policymakers had determined that the winners had a greater claim on the resource. Rather, it would reflect their conclusion that the "public interest" in adjusting competing claims did not justify the intensive management programs that would be required to achieve the adjustment.

One can make a prima facie argument that the state ought to adopt a laissez-faire approach to abalone management. This position advocates a hands-off policy which would result in a new balance being struck between commercial and sport divers and the resource. There would probably be fewer divers, smaller total harvest and more areas picked clean of abalone, but the species would survive because of its natural habits and the habits divers would acquire to protect the resource: "Let's keep government out of the picture and let the market place and condition of the resource determine how many divers and how many abalone will survive. In the end the result will be approximately the same and we would have been spared the expense and turmoil of arbitrarily imposed government standards."

Our answer to the above argument takes several tacks, all of which guide us to the same end -- we reject the laissez-faire approach for this industry at this time. First we conclude that the data base from

which the Department of Fish and Game works is incomplete but probably adequate as long as efforts to improve the data base are continued. Second, the Department of Fish and Game is charged with the responsibility of both protecting and enhancing the state's fish and wildlife resources. It has been argued that the result of a hands-off approach would be the elimination of the abalone industry and a drastic reduction in the sports take. While this position may be too extreme, it does suggest the possible severity of a government policy of doing nothing. For the Department to do nothing would probably require express legislative direction for inaction; it will not be forthcoming. Third, in extensive contacts with all segments of the industry, sports groups, administrative officials, and legislative personnel, only a handful even suggest the desirability of no action. It seems reasonable to us that the state continue its intervention in what has been essentially an unregulated industry. The important questions are, what action should be taken and by whom?

Immediate Policy Options

If we reject the extreme alternative of a laissez-faire approach, but at the same time acknowledge DFG's present lack of funds and manpower to do many of the things that various affected interests would like to see it do, what courses of action should be explored pending an assessment of the impact of limited entry?

Our answer to this question begins with a set of assumptions derived from the preceding analysis:

- 1) Both commercial interests and sport diving associations have volunteered to assist DFG in conducting further studies of the status of abalone resources;

2) Especially on the north coast, sport divers seek more rigorous enforcement of existing regulations;

3) There is strong support among both commercial and sport divers for a program of area rotation;

4) Virtually every group concerned with the status of the abalone fishery supports intensified seeding efforts.

On the basis of these assumptions, the following policy options merit serious consideration. Because they are nevertheless subject to some important contingencies, they are presented in the form of "if..., then..." propositions.

1) If supported by careful scientific surveys of abalone stocks on the north coast in areas jointly agreed to by sport divers, industry and DFG, and if selective openings thereof were accompanied by close DFG supervision of both open and closed areas, then sport divers might be prepared to accept a carefully delimited opening of the north coast to commercial diving. DFG supervision of the opened areas might include both overall landing quotas for specified beds and individual quotas for eligible commercial divers, with eligibility to be determined by drawing;

2) If carefully controlled openings of the north coast afford an alternative source of supply, then the commercial sector may welcome an area rotation program south of Point Lobos;

3) If funding problems can be resolved through some combination of tax surcharges on the commercial take, stamp or tag fees on the sport take, and county contributions from their share of license fee receipts, then the replenishment of closed beds south of Point Lobos could be accelerated through intensified seeding programs.

Specific Recommendations

As indicated by the many "ifs" that qualify the preceding discussion, there are no self-evident solutions to the problems confronting the abalone fishery. However, there appear to be some promising opportunities for policy innovation if steps are taken now to anticipate future problems, and to explore the feasibility of present policy options. We therefore submit the following recommendations:

- 1) As of this time the Department of Fish and Game should be prepared to begin collecting the base-line data that will permit a reliable assessment of the impact of limited entry. These data should include a census of representative abalone beds, the compilation of accurate records of effort and take, and the collection of socio-economic information about commercial divers who fail to renew their permits after AB2224 takes effect.
- 2) Within two to three years, arrangements should be made for a careful appraisal of the impact of AB2224 on the resource itself and on commercial and recreational users of the resource.
- 3) Prompt consideration should be given to the manner in which Section 8306.3 of the Fish and Game Code will be implemented. This is the provision requiring the Commission to determine the number of commercial diving permits, and this is the section that specifies the use of drawings after the Commission has determined the number of permits to be issued.
- 4) In conjunction with representatives of both the commercial sector and sport diving associations, research should be undertaken to determine the present capacity of the north coast to sustain a limited and carefully supervised commercial fishery. If possible, this research effort should include the designation of selected areas for experimental commercial diving,

with subsequent evaluation of its implications for the resource, for sport diving opportunities, and for profitable commercial activity.

5) Since the success of any program of area rotation and rehabilitation will depend equally upon voluntary cooperation by the majority of abalone divers and the ability of enforcement officers to apprehend the minority who do not cooperate, a joint project should be set in motion to determine the feasibility of distinguishing open and closed areas on the south coast, and the period for which closures should remain in effect. Participants in this project should include commercial and sport divers, abalone mariculture experts, and enforcement personnel from the Department of Fish and Game. In this regard, the already closed areas off the Los Angeles and Orange County coast would provide a good location for data collection, possibly for exploration of the biological feasibility, costs, and yield of abalone farming techniques similar to those that would accompany bottom land leases.

6) While we recognize the need to offer a recommendation with respect to the dispute over the sea otter, we must candidly admit our inability to present a very specific proposal. It does seem that one of the roles DFG might serve is as a mediator between the contending factions. Discussion, debate and research do not necessarily produce answers, but we must conclude that in the case of the sea otter's relationship to the abalone resource these will do no harm and might lead to better information and a narrowing of the gap between the positions taken by the factions involved. If DFG is to assume the role of mediator it must find a way of neutralizing its image with some of its constituents.

Certain of our recommendations call for cooperative undertakings. While these would by no means assure agreement on specific policies, they should

help to minimize factual differences, and perhaps serve to reduce discrepancies between the expectations of abalone resource users and the present capacities -- or disposition -- of abalone resource managers.

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APPENDICES

Appendix A - Methodology

Appendix B - Commercial Fishermen Questionnaire

Appendix C - Sport Diver Questionnaire

Appendix D - Abalone Drop-Out Diver Questionnaire

Appendix E - Limited Entry and Fisheries Management

APPENDIX A - Methodology

Sampling

Sampling Plan for Active Commercial Divers

The purpose for drawing this sample was to determine the characteristics (e.g. demographic, occupational and recruitment patterns, etc.) of active commercial abalone divers. We also sought their attitudes toward abalone fishery problems and alternatives for regulation, as well as their opinions of principal actors involved in managing this fishery.

The universe consisted of 383 divers licensed for 1975. A mail questionnaire to the entire universe was a possibility. However, while diver characteristics and reported behavior measures could easily have been collected by means of a mail questionnaire, our need for data on diver attitudes and perceptions of problems and solutions (on which little prior knowledge was available) recommended a personal interview approach combining closed-end responses with open-ended probes to maximize freedom of expression in diver responses.

Time constraints and economic considerations did not allow personal interviews with the entire universe; thus, a representative sample of 50 respondents was drawn using proportionate stratified random sample procedures. This sampling method, as Legee and Francis put it, offers the following advantages:

...1) as a stratified sample it is a highly efficient procedure, yielding less variance and permitting smaller sample sizes; 2) since the sample is proportionate to the universe within each stratum, the sample is highly representative; 3) ... and generalizations can be made about characteristics of the universe without the cumbersome procedure of weighting the values for each stratum... and; 4) since estimates of means, variances, and so on for each stratum are easily calculated, the design lends itself well to elaborated analysis of strata and subclasses.¹

Identification of possible independent variables on the basis of which the strata would be established was accomplished by relying on the advice of knowledgeable informants. The most important variable identified by these informants was "years of diving experience"; we were repeatedly told to expect very important differences in the attitudes and behavior of divers with different years of diving experience. Divers were thus divided into different strata according to the number of years they had been diving. Using Department of Fish and Game records, the universe of 383 licensed commercial divers were divided into the following three strata:

- Stratum #1: Divers with one to two years experience. This group accounted for 175 divers or 45.69% of the universe. Stratum sample size was therefore 45.69% of the universe, that is, 23 divers.
- Stratum #2: Divers with three to five years experience. This group accounted for 102 divers or 26.63% of the universe, yielding a stratum sample size of 13 divers.
- Stratum #3: Divers with six or more years experience. This accounted for 106 divers or 27.68% of the universe, yielding a stratum sample of 14 divers.

Respondents from each stratum were selected using a table of random numbers. Alternates were selected likewise.

Sampling Plan for Commercial Divers Dropping Out in 1974

The primary purpose for drawing this sample was to determine the reasons why divers leave the industry. This universe consisted of 262 divers and tenders who were licensed to dive or tend in 1974, but whose names did not appear on DFG lists of license holders for 1975.

Since the universe was small and the necessity for open-ended questions minimal, a mail questionnaire was sent to the entire universe.

Sampling Plan for Processors

A unique view of the character and problems of the fishery was expected to be expressed by abalone processors. Moreover, we had a special interest in determining this group's assessment of the political feasibility of alternative regulatory schemes. The universe consisted of 17 licensed processors of very diverse characteristics; sampling thus was not a consideration. One Santa Barbara processor alone accounted for approximately 55 per cent of all abalone processing and also for most of this group's political activity. This processor and two other processors located in the Santa Barbara area process approximately 80 per cent of the annual catch. Of the next four largest companies, three were located in San Diego and the fourth in Morro Bay. Owners or managers of these seven largest companies were personally interviewed using an open-ended format. All the remaining ten processors were restaurants processing for themselves or divers processing for a restaurant. Their activities were judged to be of marginal significance to the study; hence, these were not interviewed.

Sampling Plan for Sport Diver Groups

In addition to their special perspective on the abalone fishery, sport divers were expected to be an especially important political factor in abalone fishery regulation. The universe consisted of a large and not easily identifiable number of sport dive club members and nonaffiliated sport divers throughout California (anyone holding a California sport fishing license is entitled to dive for abalone).

Given the difficulties involved in reaching this population of sport divers, we opted instead for tapping the attitudes and opinions of the lead-

ership of organized sport diver clubs. Four regional councils of dive clubs which geographically encompass most of California were identified. These councils had a membership of 116 individual clubs. Sampling was confined to the leadership of these clubs. As geographic dispersion and cost considerations prohibited personal interviews, a mail questionnaire, primarily utilizing a closed-end format, was sent to the presidents of all 116 clubs in the four councils.

Sampling Plan for Environmental Groups

Preliminary inquiries uncovered only two environmental groups exhibiting any awareness or interest in the abalone fishery, and that only from the narrow perspective of its relationship with the sea otter. These two groups, Friends of the Sea Otter and the Sierra Club, probably constitute the universe of relevant environmental groups. Personal interviews were conducted with leaders of both of these groups.

Sampling Plan for Legislators and Administrators

Reflections upon all of our evaluative criteria were desired from members of these groups. The universes consisted of legislators or aides of legislators who sponsor fishery regulation or sit upon relevant committees, and administrators of enforcement, marine research, statistics and policy formulation in the California Department of Fish and Game. Elite personal interviewing techniques requiring open-ended and largely unstructured questions were utilized.² As no generalizing about these groups was intended, respondents were selected according to their position in the relevant legislative and administrative hierarchies and, to some extent, according to their availability. All relevant administrators and legislators (or their aides) were interviewed.

Field Work

Commercial Divers

Selection and Training of Interviewers. The interviews of active commercial divers were completed by Sea Grant Trainees working on this project -- two graduate students in political science, one in economics and one in anthropology -- aided by two additional research staff members.

Prior to engaging in any field work all of those assigned to administer the commercial diver questionnaire went through several interviewer training sessions which stressed practical procedures and approaches. Additionally, all interviewers participated in administering a pre-test of the survey instrument.

Procedure for Completing Interviews. As it was expected that it would be difficult to reach this population (e.g. because of days spent at sea, instability of residence, lack of telephone, etc.), a variety of methods were utilized to promote a maximum response rate. First, an introductory letter, accompanied by a pre-addressed and stamped post card, was sent to the commercial diver sample. The post card requested the diver's current address, his or her phone number, and the easiest way to get in touch with the diver. Of the original sample of fifty to whom the introductory letter and post card were sent, thirty-one eventually returned the card complete with the requested information. This information was used to update the information garnered from the license lists maintained by DFG.

For local divers (i.e., the Santa Barbara area) having telephones, the interviewers were instructed to make at least three attempts to contact the divers by phone. The attempts to make phone contact were carried out at various times of the day and on different days. If the phone calls proved

fruitless, the interviewer would visit the residence of the prospective interviewee. If the diver was not at home, the interviewer was instructed to leave a note either with the diver's spouse/roommate or on the door of the residence. The note requested that the diver contact the interviewer via telephone. If, after repeating this procedure twice, no response was obtained, attempts at reaching the diver directly at his/her residence were abandoned.³

For local divers having no phone, interviewers made at least three attempts to contact the diver in person at his/her residence. If after three visits, made on different days and at various times of the day, no personal contact had been made with the prospective interviewee, the note procedure described above was followed.

Having been unsuccessful in contacting a diver at his/her place of residence, the interviewers would then try to contact the diver through processors or through other divers. If the processors or divers could not provide further information on how to contact the diver, that diver was removed from the sample and replaced with the first person on the alternates list. (See Sampling Plan for description of alternates selection.)

In the event that the processors or other divers could provide other information on the diver in question, the interviewer would follow-up on the new lead twice. If the interviewee still remained uncontacted, then that diver was replaced by the next diver from the alternate list.

For divers not living in the Santa Barbara area, the following procedure was followed. Prior to any trip to a distant locale, attempts were made to at least have three interviews scheduled. This was done by telephone. When an interviewer had at least three interviews arranged, then the trip was taken.

In the event that a distant diver did not have a telephone, the interviewer would make two visits to the individual's home. If contact was not established after the second visit, the interviewer was instructed to begin asking about the diver in question with other divers contacted and with processors in the area. If this did not produce results, i.e., an interview, then attempts at reaching the diver were postponed until a second trip to the area.

For divers still not contacted, and any divers added to the list as a result of replacement, a second trip was made to distant areas. The second trip was made by a different interviewer,⁴ and the same procedure as on the initial trip was followed. If after the second trip, a diver remained uncontacted, that diver was removed from the sample and replaced by the next diver from the alternate sample.

Response Rate for Commercial Diver Interviews. Response rates for the sample of commercial divers are abstracted in Table A.1 below.

Table A.1
Response Rates for Commercial Divers

A. Original Sample Drawn:	50
B. Replacement: [*]	24
C. Total sample (A+B):	<u>74</u>
D. Interviewed:	44
E. Not interviewed (C-D):	30
Reason for non-interviews:	
F. No longer diving	12
G. Deceased/left no forwarding address/not located	7
H. Inability to coordinate interview ^{**}	10
I. Refused interview	1
Net sample (C-F-G):	55
Response rates	
Total sample:	59.5%
Net sample:	80.0%

* All those divers who were no longer diving for abalone or whom we could not contact were replaced. From our original sample, one individual had died and several had left the area (for the merchant marine, the Fiji Islands, for the Philippines, for Hawaii, etc.), and many had left the fishery (one person was operating a fish market, some had become divers for other commercial enterprises, e.g., on oil rigs, etc.). Six of the original 50 were just untraceable -- they left no forwarding addresses and no one associated with the fishery could provide any information on their whereabouts.

** We were unable to interview these 10 divers for various reasons. Some of the divers were living on their boats off San Clemente Island and were delivering their abalone to a pick-up boat; they rarely came to port. Others had no permanent address and were therefore difficult to reach. Several of the divers failed to keep appointments.

Sport Divers

Field work. As explained above (see Sampling Plan), a mail questionnaire was sent to the presidents of 116 sport diving clubs. Included with each questionnaire was an introductory letter, a stamped, self-addressed envelope for returning the completed questionnaire, and a card for the respondent to fill out and return when they had completed the questionnaire. A second follow-up questionnaire was sent to those not responding.

Response Rate. Response rates for the sport divers mail questionnaire are abstracted in Table A.2 below.

Table A.2
Sport Diver Response Rates

A. Total sample:	116
B. Incorrect address:	6
C. Net sample (A-B):	110
D. Questionnaire forms completed and returned:	63
Response rates:	
Total sample (D÷A) =	54.3%
Net sample (D÷C) =	57.3%

Commercial Drop-out Divers

Field work. A questionnaire was sent to a sample of 262 ex-divers. (See description of Sampling Plan above.) Included with the questionnaire was a stamped envelope for returning the questionnaire and an introductory letter.

After a period of three weeks, we sent an additional questionnaire packet to all those drop-outs whose initial mailing had not been returned because of an incorrect address. In this second letter the drop-out was

asked to ignore the second mailing if he had responded to the first mailing. The second letter stressed the importance of input from affected publics.

Table A.3
Drop-out Response Rates

A. Total sample:	262
B. Incorrect address:	103
C. Net sample:	<u>159</u>
D. Questionnaire forms completed and returned:	47
Response rates:	
Total sample (D÷A) =	17.9%
Net sample (D÷C) =	29.5%

Footnotes - Appendix A

- 1 David C. Leege and Wayne L. Francis, Political Research (New York: Basic Books, 1974), p. 126.
- 2 See Lewis A. Dexter, Elite and Specialized Interviewing (Evanston, Illinois: Northwestern University Press, 1970).
- 3 The process used for contacting divers was a composite of the methods reported in several survey methods books. E.g. Ibid.; Charles Backstrom and Gerald Hursh, Survey Research (Evanston: Northwestern University Press, 1963); and Earl Babbie, Survey Research Methods (Belmont: Wadsworth Publishing, 1973).
- 4 This was done to prevent bias entering into the data collection process as the result of one interviewer being responsible for administering all interviews in a distinct geographical region. See Babbie, op. cit., p. 182, for a discussion of this method.

Appendix B:

Commercial Fishermen Questionnaire

University of California, Santa Barbara

1976

Case # _____

Date _____

Time Start _____ Time Finish _____ Time Elapsed _____

Interviewer _____

Respondent's Name _____

Address _____ Telephone _____

We appreciate the cooperation and the time that you are giving us. As I explained earlier, we are doing a study of the abalone industry. As a commercial fisherman, we are interested in your opinions on problems and issues related to the abalone fishery. All your answers will be kept strictly confidential. The responses will be compiled statistically and no names or other personal information will appear in the final study. We really appreciate your cooperation.

Our questions cover several different kinds of things. It is not a test and there are no right nor wrong answers. Please feel free to stop and ask me questions at any time. I would like to start by asking you a few questions about your experiences as a fisherman.

COMMERCIAL FISHERMEN QUESTIONNAIRE

1. Are you now a diver?

1. Yes _____

5. No _____

8. DK _____

9. NR _____

(IF NO) A. Why not?

2. About how long have you been abalone diving?

_____ Years _____ Months

3. How did you originally get involved in the abalone industry?

(PROBE IF NECESSARY)

Through family? friends?

4. What were your expectations when you originally got involved in the abalone industry?

(PROBE IF NECESSARY)

Good living? exciting job?, etc.

5. Approximately how many days per year do you dive?

_____ Days

6. About how many days per year do you spend on abalone-related activities other than diving?

_____ Days

7. Do you usually work from: (READ CHOICES)

1. a company boat _____
2. boats belonging to other divers _____
3. your own boat _____
7. other _____
8. DK _____
9. NR _____

(IF OWNS BOAT, ASK A. AND B. AND GO TO Q. 9; IF NOT, SKIP TO Q. 8)

- A. What type and length of boat is that?

_____ Type _____ Length

- B. What is the approximate value of your boat?

_____ Value

8. What type and length of boat is that?

_____ Type _____ Length

9. What is the approximate present value of your abalone diving equipment?

(PROBE IF NECESSARY)

Wetsuits, hose, compressor, bags?

_____ Value

10. What kind of relationship do you have with the processors, that is, do you: sell to one processor only, sell to more than one processor, or what?

- 1. sell to one processor only _____
- 2. sell to more than one processor _____
- 7. other (SPECIFY) _____
- 8. DK _____
- 9. NR _____

A. Why do you have this relationship?

11. In your opinion, are there any problems in the abalone fishery?

- 1. Yes _____
- 5. No _____
- 8. DK _____
- 9. NR _____

(IF YES) A. Which do you feel are the most pressing?

12. Here is a list of problems that have been suggested by other people associated with the abalone industry (HAND PROBLEM CARD). As I read each one, would you please first tell me whether you think it is (HAND CHOICE CARD) 1) a very serious problem, 2) a serious problem, 3) somewhat of a problem, 4) a minor problem, or 5) not a problem at all. Next, I would like to know who do you think should be responsible for solving this problem: individual fishermen, state government, fishermen's associations, processors, or some other group.

(READ EACH PROBLEM CHOICE. ASCERTAIN EXTENT OF PROBLEM, AND THEN ASK RESPONSIBILITY)

(READ ALTERNATIVES)

PROBLEM CHOICES	Very Serious	Serious	Somewhat	Minor	Not at all	DK	NR	Individuals	State	Associations	Processors	Other (SPECIFY)	DK	NR
1. Too many commercial divers	1	2	3	4	5	8	9	1	2	3	4		8	9
2. Too many inexperienced commercial divers	1	2	3	4	5	8	9	1	2	3	4		8	9
3. Competition from sport divers	1	2	3	4	5	8	9	1	2	3	4		8	9
4. The taking of shorts	1	2	3	4	5	8	9	1	2	3	4		8	9
5. Sea otters	1	2	3	4	5	8	9	1	2	3	4		8	9
6. Pollution	1	2	3	4	5	8	9	1	2	3	4		8	9
7. Legal size is too small	1	2	3	4	5	8	9	1	2	3	4		8	9
8. Legal size is too large	1	2	3	4	5	8	9	1	2	3	4		8	9
9. The 20-foot law	1	2	3	4	5	8	9	1	2	3	4		8	9
10. Inadequate supply of abalone	1	2	3	4	5	8	9	1	2	3	4		8	9
11. Poaching	1	2	3	4	5	8	9	1	2	3	4		8	9
12. Other (SPECIFY) _____	1	2	3	4	5	8	9	1	2	3	4		8	9

13. Assume for the moment that it becomes necessary for state government to establish a management program to solve problems in the abalone industry, are you aware of any proposals that might be suggested?

1. Yes _____
5. No _____
8. DK _____
9. NR _____

(IF YES) A. Can you tell me what they are?

14. Assume again that it was necessary to create some management program to solve problems in the abalone industry. If you could make up such a program, what would you include in it?

A. Why do you say that?

15. Here is a list of things that some people think should be done to solve problems in the abalone industry. (HAND RESPONDENT ALTERNATIVES CARD)
As I read them, would you please tell me, for each one, whether you have heard of it or not, and then how you feel about it.
(AS YOU READ EACH ALTERNATIVE, ASK THE FOLLOWING QUESTIONS AND ENTER IN CHART BELOW)

A. Have you ever heard of this proposal?

(IF NO, GO TO NEXT ALTERNATIVE, IF YES, ASK B, THEN C)

B. How do you feel about this proposal, that is, do you strongly agree with it, moderately agree, are you neutral about it, moderately disagree, strongly disagree or what?
(HAND CHOICE CARD)

C. Why do you say that?

15. (cont.)	HEARD OF:				OPINION:							
	Yes	No	DK	NR	Strongly	Moderately	Neutral	Moderately	Strongly	DK	NR	
	1	5	8	9	Agree 1	Agree 2	3	Disagree 4	Disagree 5	8	9	
1. Limiting the number of licensed divers.	1	5	8	9	1	2	3	4	5	8	9	Why?
2. Limiting the number of vessels.	1	5	8	9	1	2	3	4	5	8	9	
3. Limiting the size of vessels.	1	5	8	9	1	2	3	4	5	8	9	
4. Increasing the license fee.	1	5	8	9	1	2	3	4	5	8	9	
5. Placing a quota on the amount of abs taken by any diver.	1	5	8	9	1	2	3	4	5	8	9	
6. Placing a quota on the number of abs taken by the industry as a whole.	1	5	8	9	1	2	3	4	5	8	9	
7. Requiring new divers to serve a probationary period as apprentices.	1	5	8	9	1	2	3	4	5	8	9	
8. Rotation of open and closed (fishable areas).	1	5	8	9	1	2	3	4	5	8	9	
9. Placing a tax on number of abalone taken.	1	5	8	9	1	2	3	4	5	8	9	
10. Longer closed seasons.	1	5	8	9	1	2	3	4	5	8	9	
11. No change in present regulations.	1	5	8	9	1	2	3	4	5	8	9	
12. Other _____	1	5	8	9	1	2	3	4	5	8	9	

16. There are various ways of limiting the number of fishermen involved in a fishery. I will read you a list of these alternatives. (HAND ALTERNATIVE CARD) Would you please tell me which of these alternatives you would most favor if a program limiting the number of divers was created for the abalone fishery?

1. licenses allocated by chance through a lottery _____
2. licenses auctioned to the highest bidder _____
3. licenses given out according to a ranking system which takes into account such factors as years in the industry, proportion of income from abalone taking, investment in equipment, etc. _____
4. licenses given out only to those divers now holding them _____
7. Other (SPECIFY) _____
8. DK _____
9. NR _____

17. Those people favoring some type of ranking system to limit the number of fishermen suggest several factors by which applicants should be ranked. If some type of ranking system were to be instituted here, would you please tell me whether you agree or disagree with the use of the following factors in ranking applicants for abalone diving permits. (READ ALTERNATIVES, FOR EACH ONE. ASK: DO YOU HAVE AN OPINION ON THIS BEING A FACTOR? IF YES, ASK IF THEY 1) STRONGLY AGREE, 2) AGREE, 3) INDIFFERENT, 4) DISAGREE, 5) STRONGLY DISAGREE.)

	No Opinion	Strongly Agree	Agree	Indifferent	Disagree	Strongly Disagree
a) number of years in industry	0	1	2	3	4	5
b) % of income derived from industry	0	1	2	3	4	5
c) economic hardship	0	1	2	3	4	5
d) investment in equipment	0	1	2	3	4	5
e) where you live	0	1	2	3	4	5
f) size of total catch	0	1	2	3	4	5

(ASK A)

A. Can you think of any other factors that would be important for a ranking system in the abalone industry?

1. Yes _____

5. No _____

8. DK _____

9. NR _____

B. (IF YES) What are they?

18. Have you ever discussed abalone regulations or management with anyone?

1. Yes _____

5. No _____

8. DK _____

9. NR _____

(IF YES) A. With whom?

19. Have you ever discussed abalone regulations or management with a member of the Department of Fish and Game?

1. Yes _____

5. No _____

8. DK _____

9. NR _____

(IF YES) A. Who was that? (PROBE FOR POSITION - warden?, biologist?)

20. Have you ever attended a meeting of a group or organization where problems in the abalone industry were discussed?

1. Yes _____
 5. No _____
 8. DK _____
 9. NR _____

(IF YES) A. Could you tell me who sponsored the meeting and what were the general problems discussed?

_____	Sponsor	_____	Issues
_____		_____	
_____		_____	
_____		_____	

21. Have you ever brought problems concerning the abalone industry, either in person or by letter to the attention of any elected or appointed public officials?

1. Yes _____
 5. No _____
 8. DK _____
 9. NR _____

(IF YES) A. Who was that? (PROBE FOR TITLE)

22. If some important changes were suggested for the abalone industry, would you express your opinion on those changes to others?

1. Yes _____
 5. No _____
 8. DK _____
 9. NR _____

(IF YES) A. To whom?

23. Would you contribute money to support efforts to change abalone regulations by organizations such as the California Abalone Association?

1. Yes _____
 5. No _____
 8. DK _____
 9. NR _____

(IF YES) Approximately how much would you be willing to contribute to such an effort? (READ \$ ALTERNATIVES).

1) \$0-\$50 _____ 2) \$51-\$150 _____ 3) \$151-\$250 _____ 4) \$251-\$350 _____
 5) \$351-\$450 _____ 6) \$451+ _____
 8) DK _____
 9) NR _____

24. Would you contribute some of your time to support efforts to change abalone regulations by organizations such as the California Abalone Association?

1. Yes _____
 5. No _____
 8. DK _____
 9. NR _____

25. Would you be willing to pay additional fees for your license if the money were to go into a program for the seeding of abalone?

1. Yes _____
 5. No _____
 8. DK _____
 9. NR _____

(IF YES) Approximately how much would you be willing to pay for such a program? (READ ALTERNATIVES)

1) \$0-\$25 _____ 2) \$26-\$75 _____ 3) \$76-\$150 _____
 4) \$151-\$250 _____ 5) \$251-\$500 _____ 6) \$501+ _____
 8) DK _____
 9) NR _____

26. What are your total annual expenses associated with the taking of abalone?

(NOTE SPECIFIC FIGURES GIVEN: Fuel, maintenance, etc.)

27. Looking at this card (HAND INCOME CARD), could you please tell me what your gross annual income from the taking of abalone was last year before subtracting any expenses? Just tell me the number under which your income falls, we don't need the exact figure.

(SEE ATTACHED SHEET)

28. Now thinking about your net income, about what % of your total net income comes from the taking of abalone? (EMPHASIZE NET)

_____ %

(IF LESS THAN 100%) A. What other sources of income do you have?

(SUGGEST SOME ALTERNATIVES: other job, investments, etc.)

29. Approximately what was your total abalone catch for last year?

_____ (dozen)

- A. We are interested in the makeup of your catch. As I read each species, can you tell me approximately what proportion of your catch was made up of that species?

- 1) Red _____
- 2) Pink _____
- 3) Black _____
- 4) Green _____
- 5) White _____
- 8) DK _____
- 9) NR _____

ATTACHED INCOME CARD

1. Under \$1,000 a year
2. \$ 1,000 to \$ 1,499 a year
3. 1,500 to 1,999 a year
4. 2,000 to 2,999 a year
5. 3,000 to 3,999 a year
6. 4,000 to 4,999 a year
7. 5,000 to 5,999 a year
8. 6,000 to 6,999 a year
9. 7,000 to 7,999 a year
10. 8,000 to 8,999 a year
11. 9,000 to 9,999 a year
12. 10,000 to 10,999 a year
13. 11,000 to 11,999 a year
14. 12,000 to 12,999 a year
15. 13,000 to 13,999 a year
16. 14,000 to 14,999 a year
17. 15,000 and over a year

30. Have you ever considered leaving the abalone industry?

- 1. Yes _____
- 5. No _____
- 8. DK _____
- 9. NR _____

(IF YES, ASK A AND B. IF NO, ASK ONLY B)

A. Why have you considered leaving?

B. If you were unable to continue as an abalone diver, for whatever reason, what do you think you would do for a living?

31. How low would your income have to go before you would leave the abalone industry?

32. Would you characterize the present management of the abalone industry by the Department of Fish and Game as: (READ CHOICES)

- a. excellent _____
- b. good _____
- c. adequate _____
- d. poor _____
- e. very poor _____

A. Why do you say that?

33. Some people say that the Department of Fish and Game is uniform in the enforcement of abalone regulations. Others complain that regulations are enforced selectively, favoring some individuals and groups. And others have not arrived at an opinion on this. How about you? Do you have an opinion on this?

- 1. Yes _____
- 5. No _____
- 8. DK _____
- 9. NR _____

(IF YES) A. Is enforcement uniform or selective?

- 1. Uniform _____
- 2. Selective _____
- 5. DK _____

(IF SELECTIVE, B & C) B. Who are those not uniformly treated?

C. Why do you say that?

34. Do you feel that most commercial abalone fishermen follow the Department of Fish and Game Code: (READ CHOICES)

- 1. always _____
- 2. most of the time _____
- 3. some of the time _____
- 4. hardly ever _____
- 5. never _____
- 8. DK _____
- 9. NR _____

Finally, I'd like to ask you a few questions about the way you feel towards state government -- the government that runs things in Sacramento.

35. About how much effect do you think that the activities of the state government have on your day-to-day life? Do they have a great effect, some effect, or none?

- 1. great effect _____
- 2. some effect _____
- 5. none _____
- 8. DK _____
- 9. NR _____

36. In general, do you think your state government is run the way it should be or not run the way it should be, or is it somewhere in between?

- 1. run the way it should be (ASK A) _____
- 3. in between (ASK A) _____
- 5. not run the way it should be (ASK A) _____
- 8. DK _____
- 9. NR _____

A. Why do you feel that way?

37. Some people tell us that there is nothing they can do to affect what the state government does. Other people say they can influence what gets decided in this state if they want to. Still others say that sometimes they can affect what gets decided in this state. How about you? Do you feel that you can affect what the state government does, or not?

- 1. Yes, can affect (ASK A) _____
- 3. Sometimes, depends (ASK A) _____
- 5. No, can't affect (ASK B) _____
- 8. DK _____
- 9. NR _____

A. How can you have this effect?

B. Why not?

Appendix C

Sport Diver Questionnaire

First of all, here are a few questions about your diving club.

1. How many members are there in your club? _____
2. In what year was your club founded? _____
3. In your estimate, about how many "limits" of abalone did the average member of your club take last year? _____

Turning now to you personally:

4. How many years have you been diving? _____
5. On the average, how many times a month do you dive for abalone? _____
6. About how many "limits" of abalone did you take last year? _____
7. Have you ever considered becoming a commercial abalone diver?
 1. Yes _____
 2. No _____
8. In your opinion, are there any problems with the abalone resource?
 1. Yes _____
 2. No _____

(IF YES) A. Which do you feel are the most pressing?

9. Some people say that the list below represents the problems with the abalone resource. Could you please circle the number after each problem that indicates how serious (if at all) you think the problem is?

PROBLEM CHOICES	very serious	serious	somewhat	minor	not at all	don't know
1. Commercial divers taking too many abalone	1	2	3	4	5	8
2. Sport divers taking too many abalone	1	2	3	4	5	8
3. Overfishing some specific areas	1	2	3	4	5	8
4. The taking of shorts	1	2	3	4	5	8
5. Sea Otters	1	2	3	4	5	8
6. Pollution	1	2	3	4	5	8

(9 continued)

PROBLEM	very serious	serious	somewhat	minor	not at all	don't know
7. Sport size is too small	1	2	3	4	5	8
8. Sport size is too large	1	2	3	4	5	8
9. Commercial divers violating the 20-foot law	1	2	3	4	5	8
10. Inadequate supply of abalone	1	2	3	4	5	8
11. Poaching	1	2	3	4	5	8

A. Are there any other problems that you might have heard of?

10. Do you have any suggestions for dealing with any of the problems just indicated in the previous question?

11. Do you think the other members of your club feel the same about these problems as you do?

1. Yes _____
2. No _____
3. Don't know _____

12. Some people have suggested that the area north of Pt. Lobos should be opened to commercial abalone divers. Others say that the area should remain off limits for commercial abalone divers. What's your opinion?

1. Keep area north of Pt. Lobos closed to commercial abalone divers _____
2. Open area north of Pt. Lobos to commercial abalone divers _____
3. Open area north of Pt. Lobos to commercial abalone divers under certain conditions _____

(Under what conditions?)

13. As you may know, sport divers diving for abalone north of Pt. Lobos may not use scuba gear. Do you feel this restriction should be maintained?

1. Yes _____
 2. No _____
 3. Don't know _____

(IF YES OR NO) Why is that?

14. Have you discussed problems with the abalone resource with:

yes no

1. other sport divers	_____	_____
2. commercial divers	_____	_____
3. member of Department of Fish and Game	_____	_____
4. other _____	_____	_____

15. Have you ever talked to or written to an elected public official about problems with the abalone resource?

1. Yes _____
 2. No _____

(IF YES) To whom?

16. If there were changes proposed in abalone regulations about which your club members felt strongly, do you believe the club would be willing to contribute money to the effort supporting your position?

1. Yes _____
 2. No _____
 3. Don't know _____

17. If there were changes proposed in abalone regulations about which your club members felt strongly, do you believe the club would be willing to contribute time to the effort supporting your position?

1. Yes _____
 2. No _____
 3. Don't know _____

18. Would you support a licensing plan which required a special abalone stamp if the money were to be used for improving the abalone resource through a seeding (artificial spawning) program?

1. Yes _____
 2. No _____
 3. Don't know _____

19. Some people have proposed that the state lease certain beds to commercial divers from which sport divers would be prohibited from entering to take abalone. What is your feeling about this idea?

1. I support such an idea _____
 2. I oppose such an idea _____
 3. I am not sure _____
 4. Other _____

20. Has your diving club ever been involved (as an organization) in political activity regarding regulations affecting sport diving?

1. Yes _____
 2. No _____
 3. Don't know _____

21. Would you characterize the present management of the abalone resource by the Department of Fish and Game as:

1. excellent _____
 2. good _____
 3. adequate _____
 4. poor _____
 5. very poor _____

Why do you say that?

22. Some people say that the Department of Fish and Game is uniform in the enforcement of abalone regulations. Others complain that regulations are enforced selectively, favoring some individuals and groups. What do you think about this? Is enforcement uniform or selective?

1. uniform _____
 2. depends _____
 3. selective _____
 4. Don't know _____

(IF "SELECTIVE," please answer A and B; IF "DEPENDS," please answer C)

A. Who are those not uniformly treated?

B. Why is that?

C. What does it depend on?

23. Do you feel that most sport divers who take abalone follow the Department of Fish and Game Regulations?

1. always _____
2. most of the time _____
3. some of the time _____
4. hardly ever _____
5. never _____
6. Don't know _____

In conclusion, we would like to ask a few questions about yourself. As we said in the cover letter, this information will be treated confidentially and will be used for statistical purposes only.

24. In what year were you born? _____

25. Where do you live? _____ city

26. What is the last grade or year in school which you completed?

1. no schooling _____
2. finished grammar or elementary (1 to 8) _____
3. some high school (9 to 11) _____
4. completed high school (12) _____
5. some college _____
6. college graduate _____
7. postgraduate college _____

27. Would you please tell us what your approximate income is. Please circle the number of the category which shows your income for last year.

- | | |
|---------------------|-----------------------|
| 1. \$ 0 to \$ 4,999 | 6. \$13,000 to 14,999 |
| 2. 5,000 to 6,999 | 7. 15,000 to 17,499 |
| 3. 7,000 to 8,999 | 8. 17,500 to 19,999 |
| 4. 9,000 to 10,999 | 9. OVER \$20,000 |
| 5. 11,000 to 12,999 | |

Thank you very much for your help. Please return the questionnaire in the enclosed, stamped, self-addressed envelope.

Appendix D

Abalone Diver Questionnaire

1. When did you last dive for abalone?
_____ month _____ year
2. How long had you been diving before that?
_____ months _____ years
3. On the average, about how many days per year did you dive?
_____ days
4. When you were diving, did you usually dive from:
 1. a company boat _____
 2. boats belonging to other divers _____
 3. your own boat _____
 4. other _____
5. When you were diving, what kind of relationship did you have with the processors? That is, did you usually sell to one processor only, usually sell to more than one processor, or what?
 1. usually sell to one processor only _____
 2. usually sell to more than one processor _____
 3. other (SPECIFY) _____
6. Thinking about the last year you were diving, do you remember what was your total abalone catch for that year?
_____ dozen

7. What was your net income from the taking of abalone for the last year that you were diving?

1. Under \$1,000 per year _____
2. \$ 1,000 to \$ 1,499 _____
3. 1,500 to 1,999 _____
4. 2,000 to 2,999 _____
5. 3,000 to 3,999 _____
6. 4,000 to 4,999 _____
7. 5,000 to 5,999 _____
8. 6,000 to 6,999 _____
9. 7,000 to 7,999 _____
10. 8,000 to 8,999 _____
11. 9,000 to 9,999 _____
12. 10,000 to 10,999 _____
13. 11,000 to 11,999 _____
14. 12,000 to 12,999 _____
15. 13,000 to 13,999 _____
16. 14,000 to 14,999 _____
17. 15,000 to 17,499 _____
18. 17,500 to 19,999 _____
19. 20,000 or more per year _____

8. What were the major reasons why you stopped diving? (i.e., for health reasons? economic reasons? etc.) (PLEASE ELABORATE BELOW)

9. What are you doing for a living now?

(PLEASE BE SPECIFIC)

10. Is this a full-time or part-time job?

1. full-time _____
2. part-time _____

11. Approximately what is your net income from your current job?

1. Under \$1,000 per year _____
2. \$ 1,000 to \$ 1,499 _____
3. 1,500 to 1,999 _____
4. 2,000 to 2,999 _____
5. 3,000 to 3,999 _____
6. 4,000 to 4,999 _____
7. 5,000 to 5,999 _____
8. 6,000 to 6,999 _____
9. 7,000 to 7,999 _____
10. 8,000 to 8,999 _____
11. 9,000 to 9,999 _____
12. 10,000 to 10,999 _____
13. 11,000 to 11,999 _____
14. 12,000 to 12,999 _____
15. 13,000 to 13,999 _____
16. 14,000 to 14,999 _____
17. 15,000 to 17,499 _____
18. 17,500 to 19,999 _____
19. \$20,000 or more per year _____

12. Have you thought about going back to abalone diving?

1. Yes _____
2. No _____

(IF YOUR ANSWER WAS YES):

A. Are you planning on getting a new license in 1976?

1. Yes _____
2. No _____

(IF YOUR ANSWER WAS NO):

B. Why not?

C. Is there anything that would make you go back to abalone diving?

1. Yes _____ (PLEASE SPECIFY WHAT THAT IS) _____
2. No _____

In conclusion, we would like to ask a few questions about yourself. As we said in the cover letter, this information will be treated confidentially and will be used for statistical purposes only.

13. In what year were you born?

_____ year

14. What is your marital status?

- 1. single _____
- 2. married _____
- 3. separated _____
- 4. divorced _____
- 5. other _____

(IF MARRIED):

A. Do you have any children?

- 1. Yes _____
- 2. No _____

(IF YES):

B. How many? _____

15. Where do you live?

_____ town

16. What is the last grade or year in school which you completed?

- 1. no schooling _____
- 2. finished grammar or elementary (1 to 8) _____
- 3. some high school _____
- 4. completed high school _____
- 5. some college _____
- 6. college graduate _____
- 7. postgraduate college _____

17. Is there anything else that you would like to tell us?

Thank you very much for your time and cooperation.

APPENDIX E

Limited Entry and Fisheries Management

Of the major methods of fishery management, limited entry has recently received the most attention, and has elicited the most controversy. While there are various reasons for this controversy, one major element is the fact that limited entry represents an effort to restrict freedom of entry into an occupation noted for its strong tradition of independence.

This appendix focuses on limited-entry programs (and other ancillary management efforts) that have been adopted in different parts of the United States and in Australia, Canada, Mexico and New Zealand during the last few years. The discussion of limited entry provides a useful introduction to the overall problems of fishery management, and it bears particular relevance to the California abalone fishery in which a limited-entry program has been recently enacted. Working within limitations imposed by the available evidence, the effects of limited-entry programs throughout the world will be estimated in terms of their biological effectiveness, socioeconomic impact, administrative costs, and legal and political implications. Not all of these factors can be evaluated in all cases. In a concluding section we will identify some of the considerations and data requirements common to all of the programs that we have examined and discuss their relevance to future management planning.

Most observers agree that the root cause of fishery conservation problems lies in the common property nature of fishery resources. Large numbers of fishermen compete for shares of a fish stock which everyone owns, and yet which no one in particular owns. As Copes states, "No individual fisherman has the power to manage the resource and no one has a direct inducement to conserve the resource... Thus, unbridled competition among fishermen inevitably leads to excessive exploitation of the stock."¹ Open access to the exploitation of this common property resource tends to result in "a long-run tendency for fishermen to achieve no more than a marginal income. Good incomes are obtained usually only during the initial development phase of the industry. In a mature open entry fishery only the man with exceptional skills or exceptional luck does noticeably well."²

Limited entry has often been proposed as a major method to solve these problems of unbridled competition for a common property resource. De facto, limited entry practices have actually been employed for a long time to restrict competition in fisheries. As Herrington aptly points out,

There are innumerable situations both international and domestic where limitations on entry have been attempted... to reduce competition between the fishermen of different countries, or between different regions or ports of the same country. The attempts of Great Britain, the Netherlands, and others, to secure control of the North Sea herring fishery, are national examples. The 200-mile plus claims of some countries are moves to limit international entry...³

De jure efforts to limit entry into fisheries are of much more recent vintage. With the exception of Japan (1893) and South Africa (1953), it has actually been only in the last 15 years that limited-entry programs have been enacted in various parts of the U.S. and abroad.⁴ Starting with the limiting of entry into the Australian rock lobster industry (1963), other limited-entry programs have been enacted in Canada (1968), Michigan (1970), Mexico (1972), Alaska (1973), Washington (1974), California (1974), Ohio (1974), and New Zealand (pending in 1976).⁵

Unfortunately, few empirical, evaluative data appear to be available on these limited-entry experiences. A search of the relevant literature produces mostly descriptive accounts of the programs established and summaries of relevant legislation. The few evaluations of limited entry that have been performed rely for the most part upon impressions of administrators and key industry spokesmen. By and large, few systematic data collection efforts have taken place.

The lack of adequate evaluative data is unfortunate, particularly in view of the fact that the Regional Fishery Management Councils (currently being established under the Fishery Conservation and Management Act of 1976) will have to enact management plans (which may include limited-entry provisions) for fisheries threatened with resource depletion. Empirical evaluation of the consequences of limited-entry programs already in effect would, of course, be of great value for the councils. The lack of evaluative empirical studies is due, in part, to the recent enactment of most existing limited-entry programs. Yet, it is also our impression that no systematic evaluative component has been built into most of these programs and that very limited baseline data -- on the basis of which future changes may be

judged -- have been established.⁶ We expand on this point at the end of the appendix after a brief description of existing limited-entry programs. These programs are discussed in chronological order of implementation.

Australia

Entry into a number of Australian fisheries has been limited for some time. License limitations were first introduced in the Western Australia rock lobster fishery in 1963 and have since been applied in the rock lobster fisheries in South Australia, Victoria, and Tasmania, the prawn fisheries in Western Australia, South Australia, and Southeastern Queensland, and the abalone fisheries in Victoria, Tasmania, and South Australia.⁷

Notwithstanding the relatively long-term existence of these limited-entry regulations, it does not appear that they form part of a coherent management framework for regulating Australian fisheries. In fact, most authors tend to view these license limitations as interim measures pending research and investigation into alternative methods of management.⁸ Discussions of fishery management methods and their consequences currently pervade the Australian fishery journals.⁹ Extensive debate and meetings among all segments of the industry have highlighted the need to establish coherent management programs.¹⁰

The major method employed to limit entry in Australian fisheries has been the freezing of the number of licenses. In regard to the abalone fisheries (on which most of our information on limited entry in Australia is based) the initial allocation of permits was accomplished by "grandfathering" all divers engaged in the abalone fishery. (That is, allocating licenses only to those who had already been diving.)¹¹ It would appear that these measures have been successful in reducing the number of divers exploiting

abalone. "In South Australia, for example, where the number of divers was 80 when license limitations initially were imposed, as divers left the industry or became incapacitated, this number was reduced to 35. The same process seems to be operative in Victoria and Tasmania."¹²

Determining methods for the subsequent allocation of licenses (after initial license freezes) has proved to be a problem in the abalone fisheries as well as in other fisheries in which licenses have been limited. This is, in fact, the major topic of concern in current fishery management discussions in Australia -- one in which deep cleavages among different segments of the industry are evident.¹³ In South Australia, a system of relief abalone divers has been introduced to replace any licensed diver who is too sick to dive. This has allowed the gradual introduction of new divers into the industry when new licenses become available. "In 1974, for example, a decision was made to admit 10 new divers into the fishery. A notice was published and this drew 90 applications. New permit holders were chosen on the basis of criteria such as previous experience and local residence. A similar process is also followed in Victoria."¹⁴

In Victoria, New South Wales, and South Australia, personal licenses are issued to divers and are not transferable. In Tasmania, on the other hand, permit holders are allowed to sell their licenses (current price appears to be approximately \$8,000 Australian dollars). It should be mentioned that the question of license transferability is also a highly divisive issue among different segments of the Australian fisheries; some sectors of the industry are seeking the adoption of salable licenses in other states as a means of revitalizing the industry.

Besides limited entry, other management methods used to regulate abalone

fisheries in various Australian states include the assignment of licenses to specified fishing zones, relatively high prices for annual licenses (\$200-250), medical examinations, and size or combined size and weight limitations.

Evaluation of effects. Unfortunately, data on the effects of limited entry into different Australian fisheries are largely unavailable. As a recent Green Paper on the status of South Australian fisheries suggests, "Research in the areas of economics and resource management in the Fisheries Department has been almost non-existent...new systems of data collection need to be introduced, tapping information directly from industry, as well as from internal administrative units..."¹⁵

The few evaluative references to limited entry which may be found in the literature suggest that while license freezes may serve to stabilize the fishery in the short run, in the long run, license limitations must be accompanied by other, complementary methods. As T. F. Meany reports:

A decision to introduce license limitation has the effect of freezing the number of licenses at a given level. The result...is to introduce a period of stability to the fishery particularly in fisheries where the number of boats has been building up rapidly...

Introduction of license limitations can lead to a period of profitable operation for those boats that are already in the fishery. This happened in the Western Australian rock lobster fishery. Between 1962-63 (when license limitation was first introduced) and 1968-69 the average gross income for boats increased by about 12 per cent a year while average costs increased by only about 5 per cent a year. This was achieved simply because of rising rock lobster prices and despite an overall drop in the average catch per boat. Had license limitation not been introduced, the profitability of the fishery would have attracted a greatly increased number of boats and the profitability would have been considerably reduced.

It was largely the apparent success of license limitation in this particular fishery which led to its adoption in other fully exploited fisheries in Australia. But in none of these fisheries has its success been as evident as in the Western Australian rock lobster fishery.¹⁶

Meany goes on to warn that a license freeze in the long run, though, may

not prevent an increase in fishing effort from occurring. This is simply because there may be continuing innovations (e.g., electronic gear) which will make the operation of individual boats more efficient. Thus, a limited-license scheme may in the long run have the same results as an open-entry scheme in that any potential profit might be lost due to over capitalization. A possible solution could be to so restrict the fishery that no changes at all can occur, that is, no replacement of boats, no innovation of gear, etc.

"Where this has been tried, though, it has resulted in the grandfathering system" whereby the end result is a "fishery of old boats crewed by old men." Meany thus advocates that "there must be some mechanism for continually reducing the number of boats in a fishery as efficiency increases. It is also evident that in a limited license system few fishermen will withdraw voluntarily. The solution therefore is to either force them out or to buy them out."¹⁷ He concludes by advocating the establishment of a management system stressing "buy-back" provisions and the imposition of royalty fees on the fish catch.

The inadequacy of the license limitation method when it is unaccompanied by other management provisions is also forcibly stressed by other segments of the industry, such as the fishermen themselves. In the words of Mr. Stanistreet, (manager of the Mallacoota Abalone Fishermen's Cooperative) "...a management policy which does not provide any avenue for fishermen to get out of a fishery except by way of going broke, with loss of boats, experience, and capital to the industry, is no management at all; it takes no account of people as human beings but only as numbers in some kind of management chess game..."¹⁸

In conclusion, if any lesson may be gleaned from the Australian experi-

ence -- taking into account, of course, the dearth of evaluative data -- it would be the need to establish coherent, flexible, and comprehensive fishery management plans which address all aspects as well as all stages of fishery management. It is obvious from this limited-entry experience (as well as from others) that any license limitation plan -- while possibly successful at the outset -- must be constantly monitored and evaluated, and, possibly, supplemented with other methods. Establishing proper data-monitoring techniques must thus be an eminent concern. The Australians themselves are now examining comprehensive fishery management options through extensive discussion and debate among all segments of the industry. It would behoove American fishery management experts to closely follow the current Australian debate for several features of the Australian case make it relevant to the U.S. As in the U.S., management solutions in Australia must address the type of problems peculiar to a federal system, e.g., fishery management practices in Australia vary greatly from state to state, there are serious problems in defining state vs. federal jurisdiction, and fishermen must hold both federal and state licenses to fish in particular areas.¹⁹ Additionally, problems of competition between professional and "amateur" fishermen appear to be particularly acute in Australia,²⁰ as is the case in many American fisheries. Thus, for example, novel methods of involving all segments of a fishery in the formulation of management policy being developed in Australia could possibly serve as a model for institutionalizing the representation of different types of fishery participants in U.S. regional fishery management councils (e.g., the 1975 Amendment to the Fisheries Act in Victoria which calls for the direct representation of commercial fishermen and fish marketers).²¹

Canada²²

Canada has two major limited-entry programs in effect; one controlling entry into the salmon fishery in British Columbia, the other controlling entry into the lobster fishery in the Atlantic Coast Maritime Provinces.²³ The former is by far the larger and more important.

The Canadian "Salmon Vessel Licence Control Program" (enacted in 1968 in British Columbia) is a somewhat unusual method of limiting entry in that limits are being placed on the number of vessels rather than on fishermen. The program was implemented in four phases:

1) Phase 1: in 1969 the number of vessels fishing for salmon was limited basically to those vessels which had:

-- fished for salmon in 1967 or before September 1968.

-- or were under construction before September 1968.

Moreover, vessels were separated into 2 categories; "A" category vessels were those landing more than 10,000 lbs. of salmon, "B" category vessels were those landing less than 10,000 lbs. of salmon. The provision was made that only "A" category vessels could be retired and then replaced with new vessels. This plan met with a great deal of opposition from fishermen's associations (e.g., the United Fishermen and Allied Worker's Union), who favored control on the number of fishermen rather than on the number of vessels. Opposition from other commercial fishermen (fishing for species other than salmon) was successful in changing the plan so that a vessel participating in any fishery in 1967 or 1968 was entitled to obtain a salmon vessel license in 1969.

2) Phase 2 of the program implemented in 1970 contained four basic features:

a. Salmon vessel fees were increased (to \$100 for vessels under 10 tons

and to \$200 for vessels over 10 tons).

- b. "B" category licenses were given a maximum license of 10 years.
- c. Vessels owned by fish processing companies were frozen in number to a fixed percentage of the total fleet.
- d. Money from increased Salmon license fees was used to buy-back category "A" Salmon vessels out of the industry.

Provisions for less expensive licenses and special buy-back provisions were made in 1971 for native Indians threatened with exclusion from the fishery because some fish processing companies decided not to finance a number of fishermen, many of them Indian.

The government program of buying back certain vessels was administered by a special committee composed of members of the Department of Fisheries and industry representatives. A major problem faced in the buy-back program resulted from vessels being offered for sale to the government which were not salmon vessels but which had been given the privilege of purchasing salmon licenses because they fished commercially for other species. Once the vessels were sold, the selling fishermen were able to build new fishing vessels for other than salmon fishing under a boat building subsidy plan which provided for 35% of the total cost of building. Thus a buy-back program designed to help salmon fishermen was being used for financial gain by non-salmon fishermen who wanted government aid to build a new boat. As this became a major problem, the method of appraising non-salmon vessels was changed by deducting the amount it would cost to convert and equip the vessel for salmon from its estimated appraised value.

In 1973, as the price of salmon licenses escalated, the cost of the boats became prohibitive and a moratorium was placed on the buy-back program. Dur-

ing the three years the program was in effect, 361 vessels were purchased at a cost of 5.6 million dollars.²⁴ (These vessels were sold at auctions with the stipulation that they could not be used in any fishery in British Columbia; many of these vessels ended up in U.S. fisheries.)

3) Phase 3 of the program, started in 1970, called for establishing a set of minimum quality standards on salmon vessels. Although the quality standards established were quite low, a high proportion of vessels failed to comply when inspected. Because of this high failure rate, coupled with the physical difficulty of inspecting, the actual enforcement of the regulation on quality standards was delayed until 1973.

4) Phase 4 of the program -- which began in 1973 -- concerns the incorporation of other management methods used in conjunction with the vessel license limitations. These include gear and area regulations as well as efforts to augment the species through the construction of salmon hatcheries and spawning channels.

Evaluation of effects. The primary consequences of the vessel limitation program appears to be a reduction in the number of vessels and an increase in their total value, as data in Table E.1 indicate.

It is not clear, however, that the reduction in the number of vessels has been accompanied by a reduction in fishing effort. In fact, there appears to have been an increase in overall tonnage and use of sophisticated fishing technology. This has probably increased rather than decreased fishing effort. Attrition has not occurred in active, high capacity vessels, but among part-time, sportsmen, and marginal commercial participants.²⁵ A basic problem here has been that small gillnet or troll vessels have been bought and retired from the fishery and replaced or "pyramided" into larger

purse seiners. As Chris H. B. Newton (Department of the Environment, Vancouver) puts it, "If no action were taken and economic forces were allowed to continue in the fishery, then perhaps within 10 or 15 years, the fleet would consist mainly of purse seiners using a technology far beyond comprehension today and probably resembling the San Diego tuna fleet."²⁶

Table E.1
Number of Salmon Licenses Issued,
Compared to Number and Capitalization of Vessels That Fished
(British Columbia)

Year	Number of ¹ Vessels Licensed for Salmon	Number of Vessels Fishing Salmon	Value of Vessels Fishing Salmon (\$,000)	Per cent of total value of vessels attributed to increase in license value compared to 1967 (%)
1966		6,575	60,643	
1967	7,639 ²	6,639	68,068	
1968	7,548 ²	6,603	73,466	1.9
1969	6,931	6,157	80,110	6.9
1970	6,601	6,201	89,193	10.1
1971	6,285	5,900-	90,000-	
		6,000 Est.	91,000 Est.	14.4
1973 ³	5,594	5,222	n.d.	n.d.

SOURCE: Proceedings, Marine Fisheries Resources Conference, December 1971, p. 109.

¹Includes many vessels that take out salmon licenses but do not fish salmon.

²These vessels did not all take out salmon licenses in 1967 or 1968, but under control regulation, if fished any species of fish, were eligible for salmon license after 1960.

³Data reported in J. Carl Mundt, ed. Limited Entry Into Commercial Fisheries (Seattle: Institute for Marine Studies, University of Washington, 1974).

The following comment by Maury P. Houghton (Department of the Interior, Vancouver) describes some of the economic effects of the program:

The average annual gross earnings of the fleet up until 1972 varied between \$35 and \$45 million. In 1972 we had a record of \$52 million; in 1973 the gross production to the salmon

fishermen in British Columbia jumped to \$130 million. Overnight many fishermen were making big money and the mad rush was on for capital investment. The number of new and expensive boats that entered the fishery and are in the throes of entering the fishery is fantastic. The capital involvement in 1968 was \$93 million or \$94 million, I would say in 1968 dollars it would now be almost double that amount.

In addition, the value of the licenses started to escalate. In the beginning of 1974 I stated that the value of the license was \$1,000 per ton. At the end of the year it was somewhere between \$5,000 and \$6,000 per ton. If you owned a 20-ton seine boat, that would put the value of the license at \$100,000.

If you want to buy into the fishery now, you have to pay for the boat and you have to pay that additional cost for the license as well. Those fishermen who are in the fishery who still have retained their original boats would object strenuously to any action to remove the value of this license. It is a capital gain for them. One would have to pass some type of legislation that would stop this tremendous escalation in the price of the ticket of entry. It is just impossible for a young person to get into the fishery today. It really is a rich man's game.²⁷

The increase in fishermen incomes occasioned by the limitation program also appears to have had some detrimental spillover consequences in other fisheries. As Newton states,

The initial objective of the program was to raise the average incomes of fishermen to the regional average. In 1973, this objective was over-accomplished. In fact, some of the incomes generated in 1973 have been so spectacular that other fisheries have been severely dislocated in terms of obtaining crews. Nobody wants to go halibut fishing in the Bering Sea when incomes for three months on a salmon purse seiner are five times greater.²⁸

Native Indian fishermen, too, appear to have been detrimentally affected by the limited entry regulations. While some of the Indians understand the program well and fully participate in its objectives, others have difficulty in understanding the concept.

The temptation to sell a non-operating fishing boat for a price that does not reflect the value per ton of license for that vessel is too much. The Indian is selling his license and privilege

to fish, mistakenly thinking it is only his boat that has been sold. To deny him his only means of livelihood when he has sold his license, creates a hardship.²⁹

In an attempt to prevent the loss of native Indians from the fishing fleet, the government has set up a special fund to maintain Indian participation at the level it was prior to the implementation of the program (Indians comprised 15% of the fleet in 1968 and less than 10% in 1974).

A final problem besetting Canada's limited entry program concerns the increased control of the fishing fleet by the processing companies. While the government attempted to confine processors' ownership to 12% of the fleet at the outset of the program, the increased value of the salmon license privilege has caused the fishermen to turn to the companies for financing as a means of buying an "A" license. It is estimated that processing companies now hold more than 43% of the catch via mortgages, financing, employment of fishermen and boats.³⁰

In summary, then, while it is difficult to make any definitive conclusions about the effects of limiting entry in Canada (a comprehensive report has not yet been prepared),³¹ preliminary observations suggest that a number of unintended consequences may be taking place. In regards to biological preservation, it does not appear that the program has been effective inasmuch as fishing effort has not been decreased. In terms of socio-economic impact, while it is clear that the regulations have been advantageous for those already in the industry, they may have been detrimental for individuals in other fisheries and for some in the Indian sectors. The Canadian case thus points to the need for considering the interconnection among fisheries whenever limited entry schemes are contemplated. Data on interfishery mobility patterns is thus essential to monitor potential spillover consequences

in other fisheries. Furthermore, the equity of creating a tremendous capital gain for license holders through the imposition of limited-entry needs very careful assessment.

Michigan

Beginning in the 1820's and continuing until the mid-1960's, the Great Lakes fisheries resources were aggressively pursued and exploited by generations of commercial fishermen.³² In the early 1960's approximately 900-1,000 commercial fishing licenses were issued annually. By the middle 1960's, it became obvious that the popular use of non-selective gear (i.e., gillnets) by the commercial fisherman was having a profoundly detrimental effect on the fishery resources of the delicate Great Lakes habitat; by 1967, stocks of coregonoid fishes such as whitefish, chubs, and herring were fast becoming depleted, and perch, walleyes, and sturgeon were seriously threatened. Thus, legislation was enacted in 1968 granting authority to the Director of the Department of Natural Resources to limit the number of commercial fishermen and to apply direct controls over the harvest of fish from that part of the Great Lakes in Michigan jurisdiction. In 1970, a number of management methods was adopted, including limited entry, and a Zone Management Plan which applied direct controls over the areas and depths that could be fished, species that could be caught, and type of fishing gear permissible for use.

In regard to the limited-entry program, a ceiling was first put on the number of licenses that could be issued by considering the number of persons already holding licenses, the number of licenses required to harvest the fish known to be harvestable, the capacity of boats being used, and the number of people who could economically and profitably engage in commercial fishing. License allocation criteria were determined primarily on the basis of the

fisherman's past fishing history (years of 1967, 1968, and 1969); the fisherman must have fished a required number of days, dependent upon gear type, in at least two of these three years. Additional criteria considered were the kind, nature, and condition of boats and gear, and the quantity and kind of fish catch. When the program was initiated, all those who could meet the minimum requirements of the criteria were grandfathered into the permit system. These limited-entry provisions were successful in reducing the number of commercial fishermen from a total of 300 in 1969 to 188 in 1970.³³ Between 1970 and 1974 another 20 fishermen dropped out, some as a result of the 1970 closure due to mercury in fish, and some due to financial problems. In 1976, because of the significant decline in the chub stocks in Lake Michigan, chub fishing was closed, resulting in 25 chub fishermen being put out of business. The current number of commercial fishermen licensed to fish in Michigan waters now stands at 143.

The limited-entry provisions and other aspects of Michigan's fishery management practices have met with a great deal of opposition from commercial fishermen.

Opposition to these controls has crystallized in the form of court challenges to the Director's authority, flagrant violations of rules, and undying dispute of the biological data supporting the controls. This opposition has met with equal resistance on the part of the biologists in their efforts to effect meaningful controls over harvest. As a consequence, administrative and management commitments by the regulatory authority have been out of all proportions to the benefits derived from commercial fishing.³⁴

Evaluation of effects. According to data provided by the Michigan Department of Natural Resources, the fishery management procedures introduced since 1970 have not been uniformly successful in reversing the depletion of valuable fish stocks. The controls have prevented further deterioration in

some stocks (e.g., whitefish) and have protected hatchery-planted salmonid fishes. Other stocks, however, have continued to decline and may not recover in the future; the lake herring, for example, is nearly extinct in lakes Huron and Michigan and herring production in Lake Superior has fallen from seven million pounds in 1961 to 700,000 pounds in 1971.³⁵ The chub fishery, as mentioned, was closed in 1976. In biological effectiveness terms, it thus appears that for some species management efforts may have been introduced too late or that factors other than overfishing (e.g., pollution) may have been causing the decline.

In terms of socio-economic impact, it would appear that limiting entry may have occasioned economic hardship and cultural dislocation among Michigan's commercial fishermen when one considers that the number of fishermen declined from 300 in 1969 to 143 in 1976. Unfortunately, data on the fate of these fishermen and their current patterns of income and employment do not appear to be readily available.

Additionally, the Michigan cases raise some equity questions as to who should properly bear the administrative costs of running and enforcing a regulatory program; costs are currently being shouldered by the state taxpayers. The costs of commercial fisheries management, administration, and law enforcement in Michigan currently exceed license revenues by 15 to 1. At the same time, nearly 75% of the fish that is caught in Michigan is exported out of the state. Thus, as Scott notes, "Citizens of Michigan are realizing only small returns for their large investment in commercial fisheries."³⁶

Mexico³⁷

The Mexican abalone fishery has been subject to regulation since 1972 as a result of resource depletion.³⁸ The abalone resource -- which is ex-

exploited by a number of authorized cooperatives -- is now managed through a variety of complementary methods:

1. Limited entry: There is a limited number of cooperatives authorized to dive for abalone in particular fishing zones. No new cooperatives have been authorized to exploit abalone since 1972.

2. Offseasons: In order to protect the abalone's spawning season, the offseason (which had been the winter months) now extends from July 1 to August 31.

3. Quotas: Maximum catch quotas were fixed in the fishing zones operated by each fishing cooperative; no cooperative can exceed the fishing limit recommended by the National Fishing Institute. With the yearly application of fishing quotas, the cooperatives have found themselves obliged to refrain from increasing the numbers of boats and divers which operate in their zones and have even reduced their numbers in some instances in order to guarantee the permanent employment of the fishermen for the duration of the fishing season.

4. Cultivation measures: Some experimental transplanting of young abalone has been accomplished in the laboratory. The total number until now has not exceeded 10,000 young.

5. Scientific monitoring: Statistical control of monthly fishing attempts has been initiated in each cooperative, which together with the catch figures, allows an approximation of the rate of catch per attempt. Additionally, a new system of monitoring samples from the abalone unloaded from commercial vessels in the principal fishing grounds has been in effect for three years. Its purpose is to gather monthly information as to the average size of the abalone caught and its distribution by species, sex, and other characteristics.

Evaluation of effects. Unfortunately, no evaluative data on the biological effectiveness and socio-economic impact of these management efforts appear to be available. A recent article on the status of Mexican abalone, however, suggests that authorities may be having problems in enforcing these regulations.³⁹ According to this report, almost 40% of the abalone currently harvested in one of Baja California's most productive abalone grounds are below the legal size. This situation is exacerbated by the Mexican fisherman's tradition of shelling abalone at sea in order to transport more of the meat in their small boats. This makes scientific monitoring and enforcement exceedingly difficult; as one Mexican biologist stated, "...to try to control the size of harvested abalone by the size of its meat is like attempting to infer the length of a fish by weighing its filets."⁴⁰

Alaska⁴¹

The Alaskan experience with limited entry is of great interest to other states considering limited entry efforts for at least three reasons: 1) the complexity of the system established to allocate a limited number of licenses to individual fishermen, 2) the comprehensive data-gathering efforts which were made prior to the establishment of license limitations, and 3) the political and legal conflicts which have surrounded this fishery management effort, and which are still not totally resolved to date.

The Alaskan limited entry law was passed in April 1973 and established the Commercial Fisheries Entry Commission -- a quasi-judicial body empowered to monitor all of the commercial fisheries of the state. Its mission is to stabilize the fishing effort at an optimum level for proper fisheries management and still allow fishermen to realize a reasonable economic return. To date, 19 salmon fisheries throughout the state have been brought under

the limited-entry program. The Commission is now in the process of limiting the five remaining net fisheries in the Arctic, Yukon, Kuskokwim areas. All other fisheries of the state are being monitored and limitation will be implemented in those fisheries when indicated.⁴²

Eight of the salmon fisheries brought within the restrictions of the limited entry program have been designated as "distressed" fisheries, and the remaining 11 as "other designated fisheries." In both types of fisheries, a limit has been put on the maximum number of fishery participants. For the "distressed" fisheries, however, there is also a reduction scheme in effect in the form of a voluntary buy-back system somewhat similar to Canada's. The number of licenses to be issued in both types of fisheries has been set equal to the highest number of licenses that landed fish in the fishery in any year between 1969 and 1972.

Perhaps the most interesting aspect of the Alaskan limited-entry program is the method utilized to allocate the limited number of licenses. Allocation of licenses is made on the basis of a 40-point system which takes into account two basic criteria: 1) the individual's economic dependence upon the fishery, and 2) the extent of his past participation in the fishery. Economic dependence is determined by consideration of: a) percentage of income derived from fishing, b) reliance on alternative occupations and availability of alternative occupations, and c) investment in vessels and gear. (1971 and 1972 were chosen as the base years to measure a fisherman's eligibility in terms of economic dependence.) Past participation was determined on the basis of the number of weeks that were fished in the years 1969 to 1972, with a small bonus for participation in 1965 through 1968. Also, points were awarded for crew membership and provisions were made for military

service, illness and other unusual circumstances. It should be mentioned, in addition, that after initial allocation licenses are transferable to other individuals -- Alaskan as well as non-Alaskan -- at a price that is determined by buyer and seller without governmental involvement. (The issue of transferability, it is reported, was the biggest stumbling block in getting the legislation enacted; fishermen supported the program providing that there was absolutely free transferability.)⁴³

The establishment of this complex license allocation system in Alaska was accomplished after what appears to be a very thorough research effort, one unequaled in the other limited-entry cases that we have examined. A variety of different types of data was collected and analyzed to establish maximum and optimum levels of gear and to assess the potential effects of alternative methods of allocating licenses.⁴⁴ The maximum number of entry permits in each fishery, for example, was determined by synthesizing the following types of information: "fishery profiles" (which collated all existing research on each fishery), computer runs on fish ticket counts by gear card number and Alaska Department of Fish and Game number, license registration figures, and the informed opinions of biologists in the field. To determine the level of optimum numbers for each fishery, officials also conducted a survey of operating costs, in addition to studying biological data. About 520 commercial fishermen were sampled to determine how well they were doing in the fishery. One of the conclusions of this study was that the average operator in 15 of the 18 salmon fisheries sampled made less than \$5,250 adjusted gross income per year. This is below the federally defined poverty level.

Additionally, efforts were made to assess the effects of using alterna-

tive criteria for allocating licenses. To analyze the effects of the income dependence standard, for example, officials developed a fisherman's history file based on an analysis of fish tickets between 1969 and 1972 and, moreover, conducted a survey in cooperation with the Internal Revenue Service in which 1,500 tax returns from relevant fishermen were examined for the years 1971 and 1972.⁴⁵ This summary information by fishery provided a range of income for each fishery which could be compared to non-fishing occupational income. Information on investment in vessels and gear (another criterion of economic dependence) was obtained from Coast Guard tapes on vessel ownership, while availability of alternative occupational opportunities was derived from appropriate census data. The type of data described above were then combined and analyzed to determine more systematically the different weights and points that should be assigned to different allocation criteria.

The kinds of data collection and analysis techniques utilized in the Alaska case thus appear to be much more thorough and comprehensive than those used in other cases, even though some of the necessary evaluative information still seems to be lacking (e.g. data on interfishery mobility). Moreover, efforts are currently being made to monitor the level of activity and the level of effort in fisheries not currently subject to license limitations so that trends can be identified and "with some luck and skill a limit applied to the number of units of gear when it is appropriate and needed and not when it gets out of hand so that we would face excess gear and a buy-back situation."⁴⁶

The Alaskan case exemplifies some of the political and legal conflicts which may accompany efforts of limiting entry into fisheries. Previous efforts to limit entry in Alaska failed to pass constitutionality tests in the

courts, primarily because they discriminated against non-residents.⁴⁷ Subsequently, in 1970, the Alaska Constitution was altered by initiative to allow for limited-entry legislation. This measure passed by a three-to-one vote, which gives some indication that people in Alaska were more than willing to support the proposition. In 1972 the Legislature appropriated funds for a comprehensive study of alternative methods of limiting entry. The limited-entry law passed in April of 1973 incorporated the main findings of this study commission. This law has met both legal and political challenge. To date, the law has been challenged and upheld in the State Superior Court. That ruling has been appealed to the State Supreme Court and written briefs for both sides have been filed.⁴⁸ Additionally, an initiative petition calling for repeal of the limited-entry law has resulted in the issue being placed on the November (1976) ballot.

Groups backing the continued application of limited-entry provisions and thus opposing the initiative (e.g. the Alaska Federation of Natives' Human Resources Committee, the Kodiak Area Native Association) have emphasized the need for limited entry because of the "depleted nature of the salmon fisheries," and "the low family income prevalent in most of Alaska's salmon fisheries (below federal poverty level)." These groups also point to the "Boldt decision" (which awarded 50% of the Washington salmon harvest to native Indians signatory to an 1857 treaty) and the claims that it "will affect literally hundreds of Washington fishermen who will look north to Alaska's already unhealthy fisheries -- if limited entry is lifted."⁴⁹ Groups leading the opposition to the limited-entry program, on the other hand, have emphasized their protest against government's intrusion into economic affairs. The following comments in a letter to the editor from a Kodiak

fisherman exemplify this view:

...Many of us opposed to limited entry believe the government has no business regulating the Economics of the fishing industry by limiting the number of boats so fishermen can be "guaranteed" a good income. There are no guarantees in the fishing business -- if a fisherman wants a guarantee, he's ready for a beach job and a time clock. If there is a poor run of fish, then we all probably have to rely on another fishery or alternate job, but if there is a fair season then the good fisherman and the average fisherman who works hard will make a living, and the poor fisherman will drop out, just like in most other businesses. That's where the free enterprise system must remain. We fish year-round in Kodiak, and we need the freedom and the flexibility to move from fishery to fishery -- that's our security. We don't want to get boxed in by expensive permits and red tape. This summer in Alaska, for example, some areas are facing poor salmon predictions, but those fishermen no longer have the option of shifting to more productive areas...⁵⁰

Despite the election in November 1976, the ultimate resolution of this political conflict probably does not rest solely with the Alaskan voters, but also will depend on the policy actions of the North Pacific Regional Fishery Management Council currently being created following the mandate of the Fishery Conservation and Management Act.

Evaluation of effects. Given the recency of the Alaskan limited-entry program (enacted in April 1973 and actually implemented in 1974), no comprehensive evaluative data are available on the extent of success of this management effort. However, informal evaluation by Roy A. Rickey, Chairman of the Commercial Fisheries Entry Commission, suggests a guarded optimism. He says,

Alaska's limited entry program has been successful in the salmon fisheries in stabilizing the amount of gear at approximately the 1970 level. (The maximum number of units of gear in each fishery was set at the highest gear level year between 1969 and 1972, depending on the fishery.) The limited entry program has prevented increasing numbers of units of gear from causing the economic and biological situation to worsen. It will not necessarily better either situation until such time that the gear levels can be reduced from the maximum level to the optimum or desired level. This will be done through a voluntary buy-back system which may take several years before a benefit is realized.⁵¹

Washington

While the State of Washington has had experience with limited-entry programs in a number of smaller fisheries,⁵² it has only been very recently that limitations have been imposed in the very valuable salmon fisheries. In 1974, a moratorium on salmon vessel licenses was imposed as an interim measure until a full limited-entry system (currently being developed) is implemented by January 1977. These limitations were finally passed in 1974, after they had been introduced and defeated yearly in the legislature since 1965. The Boldt decision earlier that year (U.S. v. Washington), which held that treaty Indians must be allowed unrestricted access to 50% of all the state's harvestable salmon, played a major role in legislative approval. For the first time, commercial fishermen did not mount any real campaign against limited entry.⁵³

This interim program has two basic features: 1) a moratorium on salmon vessel licenses, and 2) a buy-back program. Between 1975 and 1977, only those salmon vessels that had held licenses and had actually made salmon landings between 1970 and 1974 would receive licenses (with the exception of vessels built or bought between 1973 and the date of the Act). Provisions are also made for the allocation of special permits to allow vessels to make a single landing in Washington of salmon caught outside of Washington's waters.

In addition to the moratorium, the State has also implemented a federally financed buy-back of excess vessels and gear. To date, 56 small boats -- almost all of them gillnetters -- have been bought for a total of \$758,000. These boats were recently sold at an auction returning a total of \$364,000 to the state. A condition for these sales was that none of these vessels could ever be used again for commercial fishing of any kind in Washington

waters. It was expected prior to the auction that Treaty Indians would buy the boats and refuse to sign the pledge not to use the auctioned craft in Washington; this potential confrontation, however, did not take place.⁵⁴

Evaluation of effects. The moratorium limitations are so recent that no data are readily available on the current level of effort in the industry. Moreover, a true and comprehensive limited-entry program has yet to be established. The potential enactment of limited-entry regulations (either by state action in 1977 or by the newly created Regional Fishery Management Councils) will have to address several factors or problems peculiar to the Washington case. Given Washington's location and the nature of the salmon fisheries, it is difficult to define to what extent and over what salmon stocks the State of Washington can exercise control. In terms of state jurisdiction, there is, first of all, an interstate compact with Oregon which effectively prevents the state from taking unilateral action over the fisheries on the Columbia River. Secondly, the International Pacific Salmon Fisheries manages the pink and sockeye salmon for a good share of the season. Thirdly, the Boldt decision leaves the management of a portion of the fishery up to the Indian tribes themselves. In addition, legislation enacted at the time the Pacific Marine Fisheries Commission was created provides that the State of Washington (unlike Oregon, for example), cannot regulate its citizens in offshore waters more rigorously than citizens of other states. Thus, the state has no control over the fair share of the resources which is harvested beyond three miles of Washington's shores.

Limited-entry regulations in Washington will also have to address problems peculiar to the salmon fisheries, in particular, the importance of the large and ever-increasing sports catch, and the wide variation present in

fishing seasons according to the type of gear used.

California

Limited-entry regulations were enacted in October 1974 as emergency protective measures in two small California fisheries -- the herring fishery and the herring roe fishery.⁵⁵ A maximum number of permits has been established in both fisheries in order to prevent overharvesting. The process of allocating licenses in the herring fishery is somewhat unusual as it involves a lottery procedure. All qualified fishermen (i.e., who own a boat and gear capable of taking herring, who have been inspected by the Department of Fish and Game, and who have an agreement with the processor to buy the herring) are entitled to have their names included in a lottery for the available permits. Issuance of a permit for one year, though, does not in any way ensure that the permittee will receive a permit the following year; every herring fisherman must undergo the lottery procedure yearly. In the herring roe fishery (where the roe is harvested from seaweed), all qualified fishermen are allowed to submit sealed bids on the royalty per ton they are willing to pay for the taking of herring roe. Although permits have consistently been awarded to the highest bidders, the Fish and Game Commission is empowered to take account of other factors in making its selection. As in the herring fishery, fishermen must go through this allocation process each year. In both fisheries, the permits are revocable and non-transferable.

In addition to limiting entry, the herring fishery is also managed by a quota system which sets a maximum tonnage which may be taken each year. This is monitored by the Department of Fish and Game which keeps daily catch logs. Once the maximum has been reached, the fishery is closed. Permits are also valid in specific areas only (Tomales, Humboldt, and San Francisco