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MEETINGS

Project Review THURSDAY
2/14/85 1:30 PM
Room 328

Review of the SPC Tuna and Billfish Assessment Programme
by Richard S. Shomura

At the request of Mr. William Paupe, U.S. AID, U.S. Embassy, Suva, Fiji, I undertook a technical review of the South Pacific Commission (SPC) Tuna and Billfish Assessment Programme. The review was carried out on 9-11 August 1984 at the program headquarters of SPC in Noumea, New Caledonia.

Reviewer's qualifications

I have spent 34 years in marine fisheries research in the Pacific; 31 years were devoted as an active researcher and administrator of tuna-related research. Presently, I am the Laboratory Director of the Honolulu Laboratory of the Southwest Fisheries Center, National Marine Fisheries Service. I am familiar with the SPC tuna program, having participated in the early planning stages which led to the development of the Skipjack Survey and Assessment Programme. I participated in the first meeting of the "Expert Committee on Tropical Skipjack Tuna" which was established by SPC in 1974 to address the tuna problems of the region.

SKIPJACK SURVEY AND ASSESSMENT PROGRAMME

Before providing details of the Tuna and Billfish Assessment Programme it would be appropriate to review briefly the predecessor program, the Skipjack Survey and Assessment Programme. Although planning for the latter program began in 1973 it was not until 1977 when sufficient funds were secured from donor countries to implement the program. Initially the program was established as a 3-year field program (August 1977 to September 1980) plus an additional year for the analysis and write-up of results. Since SPC was unable to fund the project with its base funding, it was necessary to obtain funds from donor nations. Dr. Robert Kearney, the Program Coordinator, was successful in obtaining financial support from Australia, New Zealand, France, United Kingdom, Japan, and the U.S.A.

The skipjack tuna program has been considered one of the most comprehensive and successful of fish tagging programs conducted anywhere in the world. During the three years of field work 140,443 skipjack tuna and 9,596 yellowfin tuna were tagged. To date 7,000 skipjack tuna and 257 yellowfin tuna have been recovered. Using "state of art" assessment techniques, program scientists were able to utilize the tag-release-recovery data to estimate the standing stock of skipjack tuna in the SPC region as 3 million metric tons. SPC scientists further noted that although skipjack tuna catch in the western Pacific has increased markedly in recent years, the resource base is considered to be still underutilized.

TUNA AND BILLFISH ASSESSMENT PROGRAMME

Before the termination of the successful skipjack tuna program in September 1981, program scientists began developing a follow-up program, the Tuna and Billfish Assessment Programme, which was reviewed by the South Pacific Fisheries meeting and recommended to SPC for support. The focus of this new program was on the assessment of tuna species, other than skipjack

tuna, and the several species of billfishes. Additionally, the key objective of the new program was to develop a tuna statistical base which was incorporated into the HP computer system available to SPC. The duration of this new program was to be 3 years commencing on 1 October 1981. A recommendation was made in 1982 to extend the program for an additional two years.

The results of the review and assessment of the program are provided in the following sections:

SCIENTIFIC PROGRAM

Status. Appendix A lists the objectives of the Tuna and Billfish Assessment Programme. On the basis of preliminary analysis of the data and the recent developments of the tuna fishing industry in the western Pacific, the program coordinator submitted a revised program for the two year extension (Appendix B).

Evaluation and Assessment. The program staff has done an outstanding job in developing a regional statistical program. As originally envisaged the statistical program was to be used (1) to serve member countries by incorporating into the system fishery statistics obtained through access agreements with distant water fishing nations and (2) to conduct stock assessment studies of the various tuna and billfish species. The program has been successful in achieving objective 1 but not objective 2. The latter has not been possible due to an inability to obtain detailed catch and effort statistics from distant water fishing nations, which in turn has hampered progress in many of the activities listed in Appendix A. This has been especially true for activities 2, 3, 4, 8, 10 and 12. To a lesser extent activities 5 and 6 are dependent upon data from outside sources. Finally, activities 7, 9, 11 and 13 can be undertaken without information from outside sources.

As a result of current circumstances, program staff have devoted efforts toward (1) development of a statistical system, (2) working on theoretical and planning aspects of a major tagging program to address the interaction problem, (3) completion of several skipjack tuna reports and (4) conducting limited field work, e.g., baitfish studies in Fiji and Tuvalu.

From hindsight, it appears that the list of activities for the program may have been too extensive. Also, some of the activities would normally require commitments for funding that would extend beyond a 3-year period, e.g., activity 8 relating to fishery-oceanography relationships.

STAFFING

Status. Appendix C lists the program complement at the start of the program and its present status.

Evaluation and assessment. As noted in Appendix C, the program presently has a number of vacancies. Although the Program Coordinator

indicated that it has been difficult to recruit highly qualified scientists for the senior scientist positions, the current situation is more related to the uncertainty of program funding for the extension as well as beyond the 2-year period. The Program Coordinator pointed out that it was not difficult to fill the junior research position since it appears that the present supply of scientists with the necessary academic background exceeds the demand.

Despite the reported difficulties in recruiting highly qualified scientists, I was impressed with the quality of research carried out in the Skipjack Survey and Assessment Programme and the Tuna and Billfish Assessment Programme. The program scientists were able to apply new techniques to the tuna tagging data and make assessments on the size of the resource. To my knowledge this is considered as "state of the art" research and is being applied to tuna data for the first time. Traditionally tuna tagging data have been used to determine migratory pathways and mortality rates.

ADMINISTRATION

Status. As noted under the section on staffing, Dr. Robert Kearney left the program at the end of September 1984. His position, as well as the other vacancies, would need to be filled if the program expects to make any progress in the 2-year extension period.

Evaluation and assessment. Dr. Kearney was very candid in discussing administration of the program. He noted that the difficulties he had encountered in the past year with the Secretary-General was one of the factors which led to his decision to resign from the program. He expressed concern that the Secretary-General was interjecting his position in the administration of the tuna and billfish program to the detriment of the program. Examples noted were the Secretary-General's attempt to become involved in the selection of the individual for one of the senior scientists' vacancies.

I had an opportunity to meet with the Secretary-General, Francis Bugotu, in his office during the week. The Secretary-General expressed support of the tuna program. The only negative point he raised was his concern that the tuna program was still writing up the skipjack tuna country reports.

Much of the success of the skipjack tuna tagging program can be attributed to the strong leadership provided by Dr. Kearney. If the Secretary-General is taking an active role in the selection of senior staff, as well as Dr. Kearney's replacement, there is grave concern that the results may be detrimental to the program. I do not believe the Secretary-General has the background to evaluate the technical competence of applicants for any of the research positions. While recognizing that the new Program Coordinator will have to work under the overall leadership

of the Secretary-General, the program coordinator must have strong technical competence as well as proper administrative capabilities.

One factor which may be at the core of the difficulties that the tuna program appears to be having with the Secretary-General and presumably his immediate staff is the matter of differences in salaries between the tuna program personnel and the SPC Headquarters leadership. I was informed that Dr. Kearney's salary exceeded that of the Secretary-General. This may be a problem since the current salaries for senior positions with the standard SPC staff may not be sufficiently high to attract top level scientists to fill the positions of Program Coordinator or senior scientist in the tuna program.

BUDGET AND FUNDING

Status. The Tuna and Billfish Assessment Programme has received full funds promised by donor countries, including Australia, New Zealand, France, and the U.S.A., for the 3-year program.

For the additional 2-year period (October '84-September '86), Dr. Kearney indicated that he had received firm commitment only from the U.S.A. There was, however, a positive verbal commitment by Australia, New Zealand and France.

Dr. Kearney also commented that he was 70% confident that funds for the tuna tagging project would be forthcoming. He noted that the U.S.A. had indicated a possibility of a 1-million dollar contribution. Other possible donors included Canada and EEC.

Evaluation and assessment. Since the present program does not include extensive field work, the budget breakout for funds received as of 31 March 1984 appears to be reasonable (Appendix D). As indicated by the breakout, the major part of the funds is for salary and travel.

PUBLICATION

Status. Appendix E lists the publications issued by the program staff.

Evaluation and assessment. Although a number of the publications could be considered as status or data reports, I was impressed with the overall publication list.

One shortcoming I observed was that very few papers were published in outside journals; the few reports published in outside journals dealt mainly with descriptive accounts of the program. Since some of the research represent "state of the art" work, it would be highly desirable that this be published in outside journals which would be peer reviewed and have a wider audience than the SPC publications.

GENERAL COMMENTS

I agree with the present thinking of program staff that the fishery and resources interaction problems should be given high priority in future research. While the program staff is currently working towards obtaining financial support to undertake this tagging program, I should caution that the tagging program, if it is to be successful, will require full cooperation of the distant water fishing nations. This is so because the results would be totally dependent upon tags being returned with adequate data. Also needed would be detailed catch and effort data from the distant water fishing nations active in the region. Presently there is no assurance that these data and tags would be made available to SPC.

I was able to discuss the present Tuna and Billfish Assessment Programme with several fisheries officers during the SPC fisheries meeting. It appears that those island nations which have access agreements with distant water fishing nations appreciate the work of the Tuna and Billfish Assessment Programme. On the other hand, fisheries officers of island nations that do not have an active tuna program could not see the value of the SPC program. I believe there has been a lack of communication between the Tuna and Billfish Assessment Programme staff and the fisheries officers of the island governments, especially those without active tuna programs.

If the Tuna and Billfish Assessment Programme were to terminate, it is doubtful that SPC would be able to carry out the research required by the tuna program or to support the statistical program.

RECOMMENDATIONS

1. The program should continue to maintain the statistical system even if it is restricted to providing services to member countries who have access agreements with distant water fishing nations. The island governments presently do not have the capabilities of maintaining their own computer systems. With regard to obtaining data for stock assessment purposes, the program will need to await resolution of this matter on a broader international basis. It is my view that a treaty structure would be required to provide the mechanism for collection and access to the detailed catch and effort data needed for stock assessment analyses.
2. The program should strengthen its fishery development aspects. While this point is not identified in the list of objectives for the next two years, fishery development is essential to the needs of the island nations. Based on comments by several individuals, the type of work that Bob Gillette did on baitfish for Fiji and Tuvalu is much appreciated by the island governments. Possibly, more of this type of work could be integrated into the existing program.
3. Since data are not forthcoming for program staff to undertake stock assessment research, I would recommend that the program complete the theoretical and planning work of the tagging project to determine the interaction among fisheries and resources.

APPENDIX II

PRIORITY ITEMS IN THE EXISTING TUNA AND BILLFISH ASSESSMENT PROGRAMME
1 OCTOBER 1981 TO 30 SEPTEMBER 1984

- ✓1. Development of a regional statistical programme.
- ✓2. Estimation of the degree of interaction between pole-and-line and purse seine fisheries and assessment of each on tuna resources principally of skipjack and yellowfin tuna.
- ✓3. Assessment and monitoring of the levels of exploitation of the stocks of the commercially important billfish species, especially black marlin, blue marlin, striped marlin, sailfish and swordfish.
- ✓4. Continued analyses of the data generated by the Skipjack Programme and evaluation of the impact of this data on resource assessment.
- ✓5. Assessment and monitoring of the levels of exploitation of the stocks of the commercially important tuna species, especially yellowfin tuna, bigeye tuna and albacore.
6. Assessment of the biological information necessary for the study of population dynamics of the dominant species.
- ✓7. Studies of the biology and ecology of the most important baitfish species used for catching tunas.
- ✓8. Comparison of the biological data on major species with relevant oceanographic and environmental information, with a view to obtaining a description of the habitat available to each species, and hopefully predicting abundance in certain areas.
- ✓9. Evaluation of the use of anchored rafts as tuna aggregating devices.
- ✓10. Estimation of the degree of interaction between surface and longline gears exploiting yellowfin tuna, bigeye tuna and albacore, and assessment of optimal exploitation of each species by gear type.
- ✓11. Co-ordination of observer programmes on distant-water fishing vessels.
12. Assessment of the impact on the stocks of changes in the type of longline gear used especially the trend towards gear which fishes at greater depth.
- ✓13. Evaluation of alternative fish attraction devices.

APPENDIX III

PRIORITY ITEMS FOR THE TUNA AND BILLFISH ASSESSMENT PROGRAMME
1 OCTOBER 1984 TO 30 SEPTEMBER 1986

1. Collection and evaluation of catch and effort data

This includes the maintenance and updating of the regional statistical programme (previous priority item No.1) which has now been established. The data base will be improved by evaluating and upgrading the accuracy of the available statistics and by incorporating new catch, effort and biological data from catch sampling and observer programmes (previous priority item No.11).

2. Assessment of interaction between fisheries

This would include: assessment and monitoring of the levels of exploitation of the commercially important tuna species, especially yellowfin tuna, skipjack and bigeye tuna (previous priority items Nos.5 and 4); evaluation of interaction amongst the various types of fisheries for tuna within individual countries (i.e. subsistence, artisanal, local commercial or foreign operated); evaluation of interaction amongst tuna fisheries in different countries; evaluation of interaction amongst gear types, principally purse-seine, pole-and-line and longline (previous priority items Nos.2 and 10).

3. Assessment and monitoring of the levels of exploitation of the stocks of the commercial important billfish species (previous priority item No.3)

4. Comparison of the biological data on major species with relevant oceanographic and environmental information with a view to obtaining a description of the habitat available to each species, and possibly predicting abundance in certain areas (previous priority item No.8).

Collection of the oceanographic and environmental data is left to other interested organisations, such as ORSTOM and IATTC, and the Programme's involvement therefore entails provision of biological data and dissemination of the results to the countries and territories of the region.

5. Studies on the biology and ecology of the most important baitfish species used for catching tunas (previous priority item No.7)

Action on this item will remain in the form of responses to requests for assistance from individual countries.

6. Monitoring of the use of anchored rafts and/or other fish attractants as fish aggregation devices (previous priority items No.9 and 13)

SOUTH PACIFIC COMMISSION
TUNA AND BILLFISH ASSESSMENT PROGRAMME

<u>Position</u>	<u>Full Complement</u>	<u>Present</u>
Co-ordinator	R. E. Kearney	R. E. Kearney (departed)
Senior Scientist	A. W. Argue J. R. Sibert P. Kleiber	J. R. Sibert Vacant Vacant
Statistician	M. Williams	T. Polachek
Systems Manager	W. A. Smith	W. A. Smith (departed 9, (Vacant 1 October)
Research Scientist	R. D. Gillett J. P. Hallier T. Lawson C. P. Ellway	R. D. Gillett C. P. Ellway (departed 9 F. S. Farman Vacant
Research Assistant	S. Van Lopik V. van Kouwen	V. van Kouwen Vacant
Secretary	C. Moulin	C. Moulin
Data Entry Technician	C. Cecco H. Hnepeune	H. Hnepeune S. Tolikoli

APPENDIX D

	<u>Total to 31/3/84</u>	<u>Percent</u>
Salaries	1,006,769	84.7
Travel (appointment, leave)	75,080	6.3
Travel (duty)	63,381	5.3
Equipment/supplies	10,234	0.9
Computer	13,190	1.1
Miscellaneous	10,862	0.9
Biological samples	1,010	0.2
Tag recoveries	2,916	0.2
Money exchange	<u>4,935</u>	<u>0.4</u>
Total	1,188,377	100.0

PRELIMINARY COUNTRY REPORTS

- 1 KEARNEY, R.E. (1977). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Papua New Guinea (2 October-1 November 1977). Skipjack Survey and Assessment Programme Preliminary Country Report No.1, South Pacific Commission, Noumea, New Caledonia, 39 pp.
- 2 KEARNEY, R.E. and A.D. LEWIS (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the Solomon Islands (1 November-4 December 1977). Skipjack Survey and Assessment Programme Preliminary Country Report No.2, South Pacific Commission, Noumea, New Caledonia, 14 pp.
- 3 KEARNEY, R.E. and J.-P. HALLIER (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of New Caledonia (13 December 1977-19 January 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.3, South Pacific Commission, Noumea, New Caledonia, 20 pp.
- 4 KEARNEY, R.E., A.D. LEWIS and J.-P. HALLIER (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the New Hebrides (5-13 December 1977 and 20-23 January 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.4, South Pacific Commission, Noumea, New Caledonia, 16 pp.
- 5 KEARNEY, R.E. (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Fiji (26 January-18 February, 28 March-10 April 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.5, South Pacific Commission, Noumea, New Caledonia, 13 pp.
- 6 KEARNEY, R.E. and R.D. GILLET (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the Kingdom of Tonga (11 April-3 May 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.6, South Pacific Commission, Noumea, New Caledonia, 13 pp.
- 7 KEARNEY, R.E. and J.-P. HALLIER (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Wallis and Futuna Islands (4-31 May 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.7, South Pacific Commission, Noumea, New Caledonia, 12 pp.
- KEARNEY, R.E. and J.-P. HALLIER (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Western Samoa (6-14 June 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.8, South Pacific Commission, Noumea, New Caledonia, 10 pp.
- KEARNEY, R.E. and J.-P. HALLIER (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of American Samoa (31 May-5 June, 15-21 June 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.9, South Pacific Commission, Noumea, New Caledonia, 9 pp.

- 10 KEARNEY, R.E., J.-P. HALLIER and P. KLEIBER (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Tuvalu (25 June-4 July 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.10, South Pacific Commission, Noumea, New Caledonia, 9 pp.
- 11 KEARNEY, R.E. and R.D. GILLET (1978). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the Gilbert Islands (5-25 July 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.11, South Pacific Commission, Noumea, New Caledonia, 11 pp.
- 12 KEARNEY, R.E., R.D. GILLET and D. WHYMAN (1979). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the Trust Territory of the Pacific Islands and Guam (26 July-15 August, 2 October-15 November 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.12, South Pacific Commission, Noumea, New Caledonia, 14 pp.
- 13 KEARNEY, R.E. and R.D. GILLET (1979). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Tokelau (19-23 November 1978). Skipjack Survey and Assessment Programme Preliminary Country Report No.13, South Pacific Commission, Noumea, New Caledonia, 8 pp.
- 14 KEARNEY, R.E., J.-P. HALLIER and R.D. GILLET (1979). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of French Polynesia (6 December 1978-3 February 1979). Skipjack Survey and Assessment Programme Preliminary Country Report No.14, South Pacific Commission, Noumea, New Caledonia, 17 pp.
- 15 KEARNEY, R.E., R.D. GILLET and J.-P. HALLIER (1979). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the Cook Islands (24 November-5 December 1978, 4-11 February 1979). Skipjack Survey and Assessment Programme Preliminary Country Report No.15, South Pacific Commission, Noumea, New Caledonia, 9 pp.
- 16 KEARNEY, R.E. and J.-P. HALLIER (1979). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of New Zealand (17 February-27 March 1979). Skipjack Survey and Assessment Programme Preliminary Country Report No.16, South Pacific Commission, Noumea, New Caledonia, 17 pp.
- 17 KEARNEY, R.E. and R.D. GILLET (1979). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Australia (1 April-13 May 1979). Skipjack Survey and Assessment Programme Preliminary Country Report No.17, South Pacific Commission, Noumea, New Caledonia, 15 pp.
- 18 KEARNEY, R.E. and J.-P. HALLIER (1979). Second interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Papua New Guinea (14 May-2 July 1979). Skipjack Survey and Assessment Programme Preliminary Country Report No.18, South Pacific Commission, Noumea, New Caledonia, 13 pp.

- 19 KEARNEY, R.E. and J.-P. HALLIER (1980). Second interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the Trust Territory of the Pacific Islands (2-21 November 1979). Skipjack Survey and Assessment Programme Preliminary Country Report No.19, South Pacific Commission, Noumea, New Caledonia, 14 pp.
- 20 HALLIER, J.-P. and R.E. KEARNEY (1980). Second interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Kiribati (22 November-5 December 1979). Skipjack Survey and Assessment Programme Preliminary Country Report No.20, South Pacific Commission, Noumea, New Caledonia, 10 pp.
- 21 GILLETT, R.D. and R.E. KEARNEY (1980). Second interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of French Polynesia (13 December 1979-2 February 1980, 5-17 February 1980). Skipjack Survey and Assessment Programme Preliminary Country Report No.21, South Pacific Commission, Noumea, New Caledonia, 19 pp.
- 22 KEARNEY, R.E. and R.D. GILLETT (1980). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of the Pitcairn Islands (2-5 February 1980). Skipjack Survey and Assessment Programme Preliminary Country Report No.22, South Pacific Commission, Noumea, New Caledonia, 8 pp.
- 23 KEARNEY, R.E. and A.W. ARGUE (1980). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Niue (28 February-1 March 1980). Skipjack Survey and Assessment Programme Preliminary Country Report No.23, South Pacific Commission, Noumea, New Caledonia, 6 pp.
- 24 KEARNEY, R.E. and J.-P. HALLIER (1980). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Norfolk Island (26-30 March 1980). Skipjack Survey and Assessment Programme Preliminary Country Report No.24, South Pacific Commission, Noumea, New Caledonia, 9 pp.
- 25 KEARNEY, R.E. and J.-P. HALLIER (1980). Interim report of the activities of the Skipjack Survey and Assessment Programme in the waters of Nauru (12-15 July 1980). Skipjack Survey and Assessment Programme Preliminary Country Report No.25, South Pacific Commission, Noumea, New Caledonia, 5 pp.

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- 40 ANON (1980). Review of preliminary results from genetic analysis of skipjack blood samples collected by the Skipjack Survey and Assessment Programme. Skipjack Survey and Assessment Programme Technical Report No.1, South Pacific Commission, Noumea, New Caledonia, 22 pp.
- 41 SKIPJACK PROGRAMME (1980). Skipjack fishing effort and catch, 1972-1978, by the Japanese pole-and-line fleet within 200 miles of the countries in the area of the South Pacific Commission. Skipjack Survey and Assessment Programme Technical Report No.2, South Pacific Commission, Noumea, New Caledonia, 91 pp.
- 42 SKIPJACK PROGRAMME (1981). Fishing effort and catch by the longline fleets of Japan (1962-77) and Taiwan (1967-77) within 200 miles of the countries in the area of the South Pacific Commission. Skipjack Survey and Assessment Programme Technical Report No.3, South Pacific Commission, Noumea, New Caledonia, 249 pp.
- 43 KEARNEY, R.E. and M.L. RIVKIN (1981). An examination of the feasibility of baitfish culture for skipjack pole-and-line fishing in the South Pacific Commission area. Skipjack Survey and Assessment Programme Technical Report No.4, South Pacific Commission, Noumea, New Caledonia, 23 pp.
- 44 ELLWAY, C.P. and R.E. KEARNEY (1981). Changes in the Fijian baitfishery, 1974-1980. Skipjack Survey and Assessment Programme Technical Report No.5, South Pacific Commission, Noumea, New Caledonia, 24 pp.
- 45 ANON (1981). Report of the second Skipjack Survey and Assessment Programme workshop to review results from genetic analysis of skipjack blood samples. Skipjack Survey and Assessment Programme Technical Report No.6, South Pacific Commission, Noumea, New Caledonia, 39 pp.
- 46 KEARNEY, R.E. (Ed.) (1982). Methods used by the South Pacific Commission for the survey and assessment of skipjack and baitfish resources. Tuna and Billfish Assessment Programme Technical Report No.7, South Pacific Commission, Noumea, New Caledonia, v + 122 pp.
- 47 KEARNEY, R.E. (1982). Development and implementation of the Skipjack Survey and Assessment Programme. In Kearney, R.E. (Ed.). Methods used by the South Pacific Commission for the survey and assessment of skipjack and baitfish resources. Tuna and Billfish Assessment Programme Technical Report No.7, South Pacific Commission, Noumea, New Caledonia. pp 2-17.
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- 49 ARGUE, A.W. (1982). Methods used by the Skipjack Survey and Assessment

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- 50 HALLIER, J.-P., R.E. KEARNEY and R.D. GILLET (1982). Baitfishing methods used by the Skipjack Survey and Assessment Programme and recommendations on baitfishing techniques for the tropical Pacific. In Kearney, R.E. (Ed.). Methods used by the South Pacific Commission for the survey and assessment of skipjack and baitfish resources. Tuna and Billfish Assessment Programme Technical Report No.7, South Pacific Commission, Noumea, New Caledonia. pp 71-107.
- 51 KLEIBER, P. and C.A. MAYNARD (1982). Data processing procedures of the Skipjack Survey and Assessment Programme. In Kearney, R.E. (Ed.). Methods used by the South Pacific Commission for the survey and assessment of skipjack and baitfish resources. Tuna and Billfish Assessment Programme Technical Report No.7, South Pacific Commission, Noumea, New Caledonia. pp 109-122.
- 52 KLEIBER, P., A.W. ARGUE and R.E. KEARNEY (1983). Assessment of skipjack (Katsuwonus pelamis) resources in the central and western Pacific by estimating standing stock and components of population turnover from tagging data. Tuna and Billfish Assessment Programme Technical Report No.8, South Pacific Commission, Noumea, New Caledonia, vi + 38 pp.
- 53 ARGUE, A.W., F. CONAND and D. WHYMAN (1983). Spatial and temporal distributions of juvenile tunas from stomachs of tunas caught by pole-and-line gear in the central and western Pacific Ocean. Tuna and Billfish Assessment Programme Technical Report No.9, South Pacific Commission, Noumea, New Caledonia, vii + 47 pp.
- 54 SIBERT, J.R., R.E. KEARNEY and T.A. LAWSON (1983). Variation in growth increments of tagged skipjack (Katsuwonus pelamis). Tuna and Billfish Assessment Programme Technical Report No.10, South Pacific Commission, Noumea, New Caledonia, vii + 43 pp.
- 55 LAWSON, T.A., R.E. KEARNEY and J.R. SIBERT (1984). Estimates of length measurement errors for tagged skipjack (Katsuwonus pelamis) from the central and western Pacific Ocean. Tuna and Billfish Assessment Programme Technical Report No.11, South Pacific Commission, Noumea, New Caledonia, vi + 9 pp.

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- 60 KEARNEY, R.E. (1982). An assessment of the skipjack and baitfish resources of Fiji. Skipjack Survey and Assessment Programme Final Country Report No.1, South Pacific Commission, Noumea, New Caledonia, viii + 47 pp.
- 61 LAWSON, T.A. and R.E. KEARNEY (1982). An assessment of the skipjack and baitfish resources of the Cook Islands. Skipjack Survey and Assessment Programme Final Country Report No.2, South Pacific Commission, Noumea, New Caledonia, vii + 28 pp.
- 62 ARGUE, A.W. and R.E. KEARNEY (1982). An assessment of the skipjack and baitfish resources of Solomon Islands. Skipjack Survey and Assessment Programme Final Country Report No.3, South Pacific Commission, Noumea, New Caledonia, x + 73 pp.
- 63 ARGUE, A.W. and R.E. KEARNEY (1982). An assessment of the skipjack and baitfish resources of Pitcairn Islands. Skipjack Survey and Assessment Programme Final Country Report No.4, South Pacific Commission, Noumea, New Caledonia, vii + 39 pp.
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