

**CSIRO Marine Laboratories
Report 199**

**An Annotated Bibliography of
Japanese Literature on the
Tuna (excluding Southern
Bluefin Tuna) and Billfishes of
the Coral and Tasman Seas**

Ron Green



CSIRO
AUSTRALIA

1988

National Library of Australia Cataloguing-in-Publication Entry

Green, Ron.

Bibliography of Japanese literature on the tuna (excluding southern bluefin tuna) and billfishes of the Coral and Tasman seas.

ISSN 0725-4598

ISBN 0 643 04825 1.

1. Tuna fisheries - Coral Sea - Bibliography. 2. Tuna fishes - Tasman Sea - Bibliography. 3. Billfish fisheries - Coral Sea - Bibliography. 4. Billfish fisheries - Tasman Sea - Bibliography.
I. Commonwealth Scientific and Industrial Research Organisation (Australia). Marine Laboratories. II Title. (Series : Report Commonwealth Scientific and Industrial Research Organisation (Australia). Marine Laboratories; 199)).

016.6393'758'091647

**An Annotated Bibliography of
Japanese Literature on the Tuna
(excluding Southern Bluefin Tuna)
and Billfishes of the Coral and
Tasman Seas**

Ron Green

CSIRO Division of Fisheries
Marine Laboratories
GPO Box 1538
Hobart, Tas. 7001
Australia

CSIRO Marine Laboratories Report No. 199

Abstract This bibliography covers Japanese literature on yellowfin tuna, albacore tuna, bigeye tuna, striped tuna, black marlin, blue marlin, striped marlin, broadbill swordfish, sailfish and spearfish in the eastern Australian Fishing Zone. The 81 references, including technical reports and cruise reports, are briefly annotated. A subject index is included.

Contents

Introduction	1
List of publications reviewed	2
Bilingual list of tuna and billfish species	4
Bibliography	5
Keyword index	18

Introduction

A new Australian longline fishery for yellowfin tuna, with a bycatch of other tunas and marlins, has recently begun to operate off the coasts of New South Wales and Queensland. This has raised several management problems, which has led to an urgent call for technical information on the tuna and billfish resources of the region. In the past, Australian research on these species has been as limited as the national fishery for them. In contrast, the Japanese have long fished for all of these species in the Coral and Tasman seas, and their research, training and commercial vessels have been gathering data in this area since the early 1950s. The results of their work must, necessarily, form the basis of any technical advice to fisheries managers in the next few years. Those results should also be carefully considered when planning future Australian research into this resource. However, few of the Japanese reports are readily available to Australian scientists, either because they were published in Japanese or simply because their very existence has escaped notice.

This bibliography was prepared as a first step to making the information acquired by the Japanese available to Australians. It is intended not simply as a listing of published items but also as a catalogue of material awaiting translation. Consequently, we have aimed to supply enough information on each item for non-Japanese readers to judge whether the expense of translation is justified.

The bibliography is confined to material published in Japan and held in Australian libraries. It was prepared from a manual search of the materials held in the CSIRO Marine Laboratories library (Hobart), the Australian Fisheries Service library and the National Library of Australia. All the papers and reports that mention tuna (excluding southern bluefin tuna, for which see CSIRO Marine Laboratories Report No. 185) or billfish in the Coral or Tasman Seas (10°–15° S, 140°–170° E) are included, regardless of their language of publication. Unfortunately, however, there still appear to be many relevant articles that are not available in Australia. Many of these articles are in series (such as the cruise reports of training and research vessels), which are probably only available from the National Diet Library in Japan. A complete search for such material was not practicable, and has not, therefore, been attempted.

The bibliography is arranged by first author's name (in alphabetic order) and is indexed according to the ASFIS keyword system. A list of the publication

Acknowledgments

This bibliography was prepared with funding from the Fishing Industry Research Trust Account as part of project 1986/127. I wish to thank Phillip Stewart and Albert Caton, Bureau of Rural Resources and Dr Trevor Kenchington, CSIRO Division of Fisheries Research for their contributions to the bibliography. The comments of Dr Vivienne Mawson, Scientific Editor, CSIRO Marine Laboratories are also greatly appreciated.

Japanese Publications Reviewed to Compile Bibliography

- Annotationes Zoologicae Japonenses, 1961-1983
- Annual Report of Effort and Catch Statistics by Area on the Japanese Skipjack Baitboat Fishery, 1968-1979. Research Division, Fisheries Agency of Japan
- Annual Report of Effort and Catch Statistics by Area on the Japanese Tuna Longline Fishery, 1962-1980. Research Division, Fisheries Agency of Japan
- Annual Report of the Japan Sea Regional Fisheries Research Laboratory, 1958-1960
- Bulletin of the Ehime Prefectural Experimental Fisheries Station, 1977-1978
- Bulletin of the Faculty of Fisheries, Hokkaido University, 1950-1986
- Bulletin of the Faculty of Fisheries, Mie University, 1974-1985
- Bulletin of the Faculty of Fisheries, Nagasaki University, 1959-1986
- Bulletin of the Far Seas Fisheries Research Laboratory, 1969-1986
- Bulletin of the Fisheries Experimental Station, Okayama Prefecture, 1967-1984
- Bulletin of the Hiroshima Fisheries Experimental Station, 1972-1986
- Bulletin of the Hokkaido Regional Fisheries Research Laboratory, 1951-1985
- Bulletin of the Japan Sea Regional Fisheries Research Laboratory, Fisheries Agency, 1957-1986
- Bulletin of the Japanese Society of Scientific Fisheries, 1932-1986
- Bulletin of the Japanese Society of Fisheries Oceanography, 1978-1986
- Bulletin of the Kanagawa Prefectural Fishery Experimental Station, 1979-1984
- Bulletin of the Kobe Marine Observatory, 1960-1986
- Bulletin of the Marine Biological Station of Asamushi, Tohoku University, 1949-1962
- Bulletin of the Misaki Marine Biological Institute, Kyoto University, 1962-1968
- Bulletin of the Nankai Regional Fisheries Research Laboratory, 1952-1967
- Bulletin of the Nansei Regional Fisheries Research Laboratory, 1969-1984
- Bulletin of the Ocean Research Institute University of Tokyo, 1967-1986
- Bulletin of the Seikai Regional Fisheries Research Laboratory, 1960-1986
- Bulletin of the Tohoku Regional Fisheries Research Laboratory, 1952-1986
- Bulletin of the Tokai Regional Fisheries Research Laboratory, 1950-1986
- Collected Reprints of the Aitsu Marine Biological Station, Kumamoto University, 1954-1983
- * Collected Reprints from the School of Fisheries Science, Kitasato University, 1972-1977, 1984-1985
- Collected Reprints of Contributions from the Okayama Fisheries Experimental Station, 1967, 1970
- Collected Reprints of the Department of Marine Science University of the Ryukyus, 1978
- Collected Reprints of the Faculty of Marine Science and Technology, Tokai University, 1960-1986
- Collected Reprints of the Tokai Regional Fisheries Research Laboratory, 1956-1983
- Collected Reprints of the University of Tokyo Ocean Research Institute, 1962-1971
- Contributions of the Amakusa Marine Biological Laboratory, 1957-1983
- Cruise Records of the Training Ships, 1977 (1) - 1979 (3). Faculty of Fisheries, Nagasaki University
- Cruise Reports of the Kaiyo Maru, Australian and Norfolk Island Waters, Fisheries Agency of Japan
- Cruise Report. The 34th Cruise of the Umitaka Maru, October 1967 - February 1968. Tokyo University of Fisheries
- Data of Oceanographic Observations and Exploratory Fishing, Shimonoseki University of Fisheries, 1965-1985
- Data Records of the Oceanographic Observations and Exploratory Fishing, Hokkaido University, 1957-1986
- Datum Collection of the Tokai Regional Fisheries Research Laboratory, 1967-1980
- Japan Marine Fisheries Resource Center, Report Numbers 18, 19, 22, 23
- Journal of the Faculty of Fisheries and Animal Husbandry, Hiroshima University, 1955-1985
- Journal of the Faculty of Fisheries, Prefectural University of Mie, 1950-1974
- Journal of the Faculty of Marine Science and Technology, Tokai University, 1966-1986
- Journal of the Fisheries Bureau, 10: 1901
- Journal of Fisheries, Hokkaido University, 1949

J = Japanese text; *J/E* = Japanese text, English abstract; *E* = English text

Abe, S. and Dotsu, Y. (1977). Research report of the T.S. 'Kakuyo Maru', Nagasaki University.
1. A note on yellowfin tuna fishing with handline in the northwestern Coral Sea in October, 1976. *Bulletin of the Japanese Society of Fisheries Oceanography* 31, 7-11.

A short report on a handline operation at 14°-18°S, 148°E, using live goby as bait. Temperature and salinity data from 0-450 m for five stations within the handlining fishery area. J/E (A translation of this paper is held by the CSIRO Marine Laboratories Library.)

Faculty of Fisheries, Nagasaki University (1977). 1976 cruise of the 'Kakuyo Maru' to the southwest Pacific Ocean. *Cruise Records of the Training Ships* 1, 1-15.

Detailed tabulations of meteorological, oceanographic, temperature and salinity data. Details of sightings of birds, fishes and marine mammals. Data on ichthyoplankton collections. E

Faculty of Fisheries, Nagasaki University (1978). 1977 Cruise of the 'Kakuyo Maru' to the southwest Pacific Ocean. *Cruise Records of the Training Ships* 2, 25-28.

Detailed tabulations of meteorological and oceanographic data, including temperature and salinity measurements. Details of sightings of birds, fishes and marine mammals. E

Far Seas Fisheries Research Laboratory (1965-1985). Maguro Gyogyo Kenkyu Kyogikai Gijiroku. FSFRL, Shimizu.

Cruise reports and articles on tuna and billfish. The cruise reports are not indexed; however, there appear to be many reports from training vessels that have operated in the Coral Sea. The reports include data on species composition of the catch, gonad index, operating area and water temperature. The series would be useful for establishing a data base on catch statistics of tuna and billfish in the Coral Sea. The articles are on such topics as sports fishing in Australia and the marlin resource of the Coral Sea. The series has been published since 1957; however, only the volumes published since 1964 are available at the National Library, Canberra, Australia. J

Fisheries Agency of Japan. Annual report of effort and catch statistics by area on the Japanese tuna longline fishery. 1962-1980. Fisheries Research Division.

Monthly estimates by 5 degree square areas of hooks set and global catch in numbers for the important tuna and billfish. Annual summaries of fishing effort in the major fishing grounds are included, together with summary maps of global distribution of annual effort, distribution of global catch in numbers by species and distribution of quarterly global catch rate by species. J/E

Fisheries Agency of Japan. Annual report of effort and catch statistics by area on the Japanese skipjack baitboat fishery. 1968-1979. Fisheries Research Division.

Detailed tabulations by area of the total catch and number of hooks set. J

Fisheries Agency of Japan (1976). Cruise Report of 'Kaiyo Maru'. Australian and Norfolk Island waters. 1-239.

Report on the 1975 cruise to the eastern, southern and western coasts of Australia. Oceanographic data includes temperature, depth and salinity measurements. E

Fisheries Agency of Japan (1981). Report on the 1981 Research Cruise of the R/V 'Shoyo Maru'. Vertical distribution of tunas and billfish in the western equatorial Pacific, 1981. Fisheries Research Division.

Detailed oceanographic measurements including air temperature, surface temperature and water temperature to 1000 m at stations along the eastern perimeter of the Coral Sea. Biological records on yellowfin, bigeye, blue marlin, sailfish and swordfish caught during the survey are listed. J

J = Japanese text; *J/E* = Japanese text, English abstract; *E* = English text

Fujino, K. (1975). Subpopulation identification of skipjack tuna. *Collected Reprints from the School of Fisheries Science, Kitasato University* 1, 11-23.

Also in Biochemical Identification of Fish Stocks, Fisheries Series 9, 105-117 (1975). A review article on the classification of skipjack tuna populations by genetic differentiation. J

Fujino, K. (1976). Subpopulation identification of skipjack tuna specimens from the southwestern Pacific Ocean. *Bulletin of the Japanese Society of Scientific Fisheries* 42 (11), 1229-1235.

Genetic studies on skipjack tuna from the southwestern Pacific Ocean indicate that there are two separate subpopulations of skipjack and that the boundary between the ranges of the two subpopulations remains within the Tasman Sea year round. E

Fujino, K., Sasaki, K. and Okumura, S. (1981). Genetic diversity of skipjack tuna in the Atlantic, Indian and Pacific Oceans. *Bulletin of the Japanese Society of Scientific Fisheries* 47 (2), 215-222.

Comparison of genetic data of skipjack tuna from the Atlantic, Indian and Pacific Oceans indicate that fish from the Indian Ocean are distinguishable from those collected from the Atlantic and western Pacific Oceans. Some fish used in the study were caught in the Coral and Tasman Seas. E

Hamada, M. and Inamasu, Y. (1977). On mercury and selenium in tuna fish tissues. V. A mathematical approach to the mechanism of mercury accumulation. *Journal of the Shimonoseki University of Fisheries* 26 (1), 79-88.

The mechanism of mercury uptake in fish is examined by studying the relationship between growth and mercury content. J/E

Hamada, M., Inamasu, Y. and Ueda, T. (1977). On the mercury and selenium in tuna fish tissue. III. Mercury distribution in yellowfin tuna. *Journal of the Shimonoseki University of Fisheries* 25 (3), 213-220.

The distribution of mercury in the muscle skin and scales of yellowfin tuna is investigated. One of the samples is from the Coral Sea area. J/E

Hanamoto, E. (1977a). Fishery oceanography of striped marlin. I. Fishing season, fishing ground and movement pattern of the fish in the southern Coral Sea. *Bulletin of the Japanese Society of Scientific Fisheries* 43 (6), 649-657.

Movement patterns of striped marlin in the Coral Sea are determined from tuna longline fishery data. Results indicate that the fishing season peaks between November and December. The area of the fishery is 20°-30° S, 154°-160° E. J/E

Hanamoto, E. (1977b). Fishery oceanography of striped marlin. II. Spawning activity of the fish in the southern Coral Sea. *Bulletin of the Japanese Society of Scientific Fisheries* 43 (11), 1279-1286.

Weight and appearance of the gonads of the female striped marlin caught in the Coral Sea between 1966 and 1975 indicate that the ovaries mature in September/October. Mature fish are rare in October south of 20° S. In the area 20°-30° S, 154°-160° E, the spawning season is between November and December. J/E

J = Japanese text; *J/E* = Japanese text, English abstract; *E* = English text

Hanamoto, E. (1978). Fishery oceanography of striped marlin. III. Relation between fishing ground of striped marlin and submarine topography in the southern Coral Sea. *Bulletin of the Japanese Society of Fisheries Oceanography* 32, 19–26.

Catch rates of striped marlin in 1972–1975 relative to submarine topography indicate that catch rates from September to October are higher around submarine elevations, but from November to December no such effect is observed. On the Continental Slope, where catch rates of yellowfin are high, striped marlin are less abundant. J/E

Hanamoto, E. (1979). Fishery oceanography of striped marlin. IV. Swimming layer in the tuna longline fishing ground. *Bulletin of the Japanese Society of Scientific Fisheries* 45 (6), 687–690.

Different hooks in a basket of longline gear fish at different depths. A study of the proportion of the catch by position of hook (including data from the Coral Sea) indicates that the swimming depth of striped marlin is 60–90m. J/E

Hirayama, N. (1976). Study on predation damage to hooked tuna by shark in a longline fishery. *Journal of the Tokyo University of Fisheries* 62 (2), 125–136.

This paper reports shark predation damage rate for tuna, by sea area, for the tuna longline fishing grounds. A theoretical relationship is established between damage rate by sharks and the number of hooked sharks. J/E

Hisada, K. (1973). Investigations on tuna hand-line fishing ground and some biological observations on yellowfin and bigeye tunas caught in the northwestern Coral Sea. *Bulletin of the Far Seas Fisheries Research Laboratory* 8, 35–69.

A detailed descriptive treatment of catch rates, length-frequencies and gonad indices of yellowfin and bigeye caught in Japanese handline, longline and pole-and-line fisheries in the Coral Sea. Regional, seasonal and between-years comparisons are given. The results of examination of some preliminary data are illustrated. They show that the handline fishery has a very small area of operation (14°–18°S, 145°–148°E) and lasts only 13–39 days, beginning in October or November. It is hypothesised that mature yellowfin are confined to water warmer than 26° C and that the duration of the handline fishing season is controlled by the temperature regime in the area. J/E (A translation of this paper has been published as CSIRO Marine laboratories Report 194 (1988), 39 pp.)

Hokkaido University (1966). The 'Hokusei Maru' cruise 17 to the sea area adjacent to the Fiji Islands, South Pacific, in October–December 1964. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 10.

(see annotation below) E

Hokkaido University (1967a). The 'Hokusei Maru' cruise 19 to the sea area adjacent to the Fiji Islands, South Pacific, November 1965–January 1966. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 11.

(see annotation below) E

Hokkaido University (1967b). The 'Oshoro Maru' cruise 16 to the Great Australian Bight—November 1965–February 1966, partly participating in CSK. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 11.

(see annotation below) E

J = Japanese text; *J/E* = Japanese text, English abstract; *E* = English text

Hokkaido University (1968). The 'Hokusei Maru' cruise 21 to the sea area adjacent to the Fiji Islands, South Pacific, in October–December 1966. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 12.

(see annotation below) *E*

Hokkaido University (1969). The 'Hokusei Maru' cruise 26 to the sea area adjacent to the Fiji Islands, South Pacific, in October–December 1968. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 13.

(see annotation below) *E*

Hokkaido University (1973). The 'Hokusei Maru' cruise 32 to the sea area adjacent to the Fiji Islands, South Pacific, in October–December 1970. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 16.

(see annotation below) *E*

Hokkaido University (1975). The 'Hokusei Maru' cruise 40 to the sea area adjacent to the Fiji Islands, the southwest Pacific Ocean, in October–December 1973. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 18.

(see annotation below) *E*

Hokkaido University (1979). The 'Hokusei Maru' cruise 4 to the sea areas adjacent to the New Hebrides Islands and the areas north of the Tasman Sea in January–March 1978. *Data Records of Oceanographic Observations and Exploratory Fishing* No. 22.

Each of the above Hokkaido University reports contains detailed lists of hydrographic measurements conducted by the training ships. Temperature measurements and water samples for salinity determination cover depths from the surface to 1000 m.

Experimental tuna longline fishing sets were conducted; fork length, body weight and gonad weight of captured fish are included. *E*

Honma, M. and Kamimura, T. (1957). Studies on the albacore. V. The fishing conditions and size of albacore taken in the south Pacific Ocean. *Report of the Nankai Regional Fisheries Research Laboratory* 6, 84–90.

The albacore fishing grounds of the South Pacific are discussed in relation to the hook rates and length-frequency measurements of the catch from 1952 to 1955. *J/E*

Honma, M., Warashina, Y. and Suzuki, Z. (1973). Identification of young yellowfin and bigeye tunas in the western Pacific Ocean. Examination of practical standards based on external characteristics and the reliability in field survey. *Bulletin of the Far Seas Fisheries Research Laboratory* 8, 1–23.

A statistical survey of young bigeye and yellowfin from the western Pacific suggests that regression coefficients of five morphometric measurements are suitable for identification of young bigeye and yellowfin. Differences in lateral stripes, lateral view and liver can be used as practical keys for identifying young tunas from 20 to 70 cm body length.

Morphometric measurements are included, together with details of gear type, fishing ground and dates of catch in 1971. *J/E*

J= Japanese text; J/E= Japanese text, English abstract; E= English text

Imai, T. (1972). Studies on the raw fish baits in a tuna longline fishery. I. Some results of comparative bait experiments using for baits saury, round scad, mackerel and squid for hooking tuna, marlin and swordfish. *Memoirs of the Faculty of Fisheries, Kagoshima University* 21 (1), 45-50.

A report based on an experimental longlining operation by the training ship 'Kagoshima Maru' in 1970 in an area at the western perimeter of the Coral Sea. The hook rate was highest with frozen saury and round scad. Frozen squid and mackerel were relatively poor baits. J/E

Imai, T. and Shirakawa, O. (1972). Studies on the raw fish baits in a tuna longline fishery. II. Some results of comparative fish bait experiments using for baits frozen saury, round scad and mackerel for hooking tuna, marlin and swordfish. *Memoirs of the Faculty of Fisheries, Kagoshima University* 21 (1), 51-62.

Experimental longlining by the training vessel 'Kagoshima Maru' in the Coral Sea in May and June of 1971 recorded high tuna hook rates when frozen saury was used as bait. J/E

Inoue, M. (1969). Perspective on exploration of fishing grounds for skipjack and young yellowfin tuna in the western tropical Pacific. *Collected Reprints of the Faculty of Marine Science and Technology, Tokai University* 4, 103-110.

A review of the south Pacific skipjack and yellowfin tuna fishery. J/E

Inoue, M. and Ishi, K. (1956). Some notes on the ovary of albacore *Germo germo* taken from the Coral Sea. *Bulletin of the Japanese Society of Scientific Fisheries* 22 (2), 89-93.

On the basis of descriptions of a ripe ovary and unripe ovary from albacore tuna caught in the Coral Sea in 1954, the authors conclude that the Coral Sea is an albacore spawning area. J/E

Kamimura, T. and Honma, M. (1962). Distribution of yellowfin in the longline fishing ground in the Pacific Ocean, especially on the regional variation of the density in each size group (Preliminary report). *Occasional Report of the Nankai Regional Fisheries Research Laboratory* No. 1, 9-13.

A preliminary report on the mechanism of migration and the population structures of Pacific yellowfin tunas, based on data collected by experimental training vessels operating in the Pacific Ocean between 1954 and 1959. Results indicate that there is good relationship between body length and fish distribution. Generally, small fish are found in the west, while bigger fish are more numerous towards the east. E

Kamimura, T. and Honma, M. (1963). Distribution of the yellowfin tuna *Neothunnus macropterus* (Temminck and Schlegel) in the tuna longline fishing grounds of the Pacific Ocean. *Report of the Nankai Regional Fisheries Research Laboratory* No. 17, 31-53.

From a study of the variation of hook rates in the Pacific Ocean, the authors draw several conclusions on the factors affecting yellowfin tuna distribution. They suggest that young yellowfin occur in higher densities near land than in the open ocean.

The authors postulate that the equatorial Pacific population of yellowfin does not consist of either a single, well-mixed, homogenous population or of two or more independent groups, but is intermediate between the two. J/E

Kanagawa Prefectural Fisheries Station (1961). Analysis of hook rate of pelagic tuna fishing boats in Japan, 1958. *Report of the Kanagawa Prefectural Fisheries Experimental Station.*

Detailed tabulations by area of water temperature, number of operations, hook rate of yellowfin, bigeye, albacore, bluefin, black marlin, striped marlin and broadbill swordfish. J

J = Japanese text; *J/E* = Japanese text, English abstract; *E* = English text

- Kato, M. (1967). A fishing research in Australian waters. I. Fishing ground and species encountered. *Bulletin of the Japan Sea Regional Fisheries Research Laboratory* 17, 127-139.

A report on the species encountered in a survey of Australian waters by the Japanese research vessel Suruga Maru No. 1 during the period 1-20 September 1965. Areas surveyed extended from Bass Strait through the Great Australian Bight and the coasts of western and northern Australia to the Gulf of Carpentaria. E

- Kikawa, S. (1959). Notes on the regional difference of the spawning season of Pacific yellowfin tuna. *Report of the Nankai Regional Fisheries Research Laboratory* No. 11, 59-77.

Regional differences in spawning activity of yellowfin tuna are discussed, on the basis of gonad index data collected by tuna longline cruises and training vessels between 1950 and 1959. The spawning season in the Coral Sea area is from November to February. J/E

- Kikawa, S. (1962). Studies on the spawning activity of the Pacific tunas, *Parathunnus mebachi* and *Neothunnus macropterus*, by gonad index examination. *Occasional Report of the Nankai Regional Fisheries Research Laboratory* No. 1, 43-56.

The mean gonad index of fish caught by area and by season was determined to delineate spawning localities of deep-swimming yellowfin and bigeye. Results indicate that the spawning season of yellowfin varies with latitude; in the Coral Sea it occurs during the summer months.

Data on the percentage of mature female bigeye and yellowfin in the catch by size, by area and by season are tabulated. Figures on the gonad indexes of bigeye and yellowfin by area and by season are also presented. E

- Kikawa, S. (1966). The distribution of maturing bigeye and yellowfin and an evaluation of their spawning potential in different areas in the tuna longline grounds in the Pacific. *Report of the Nankai Regional Fisheries Research Laboratory* No. 23, 131-308.

The spawning potential of fish from eight sub-areas of the Pacific is determined from the distribution of maturing females in the catch.

The spawning potential of bigeye in the Coral Sea sub-area is very small compared to that in sub-areas in the central and eastern equatorial Pacific. The spawning potential does not show such a significant difference in the east-west direction. The spawning potential in the Coral Sea is at a maximum in the summer months and a minimum in the winter months. It appears that the rate of maturity is strongly influenced by the changes in water temperature. J/E

- Koga, S. (1962). Studies on the fluctuation in catch of the tuna fishing fleet. X. Variability of hook rates for tunas and marlins in the western and south Pacific Ocean during four months from August to November 1960. *Bulletin of the Faculty of Fisheries, Nagasaki University* 12, 1-11.

One of a series of comprehensive papers by the author on the area 0°-30°S, 170°-180°E. In this paper, however, hook rates of yellowfin, bigeye albacore, southern bluefin, swordfish, striped marlin at 10°-15°S, 165°-180°W are recorded. J/E

- Koga, S. (1966). The relationship between length and weight of tunas and striped marlin in the south Pacific Ocean. *Bulletin of the Faculty of Fisheries, Nagasaki University* 21, 23-31.

Data, mainly from the Fiji area are used for development of a length/weight relationship for albacore and striped marlin, incorporating the effect of location and season. The length data includes measurements of albacore taken from the Coral Sea region. J/E

J=Japanese text; J/E= Japanese text, English abstract; E= English text

Koga, S. (1967). Studies on the fishery biology of the tuna and marlin in the Indian Ocean and the south Pacific Ocean. *Journal of the Shimonoseki University of Fisheries* 15 (2), 1-208.

A comprehensive review of the distribution patterns of yellowfin, bigeye, albacore, southern bluefin, blue marlin, black marlin, striped marlin and shortbill spearfish in the Indian and Pacific Oceans. For each species a study is made on length/weight relationship, maturity stage and feeding condition by fishing ground. Data for this report was compiled from fishing statistics between 1955 and 1959. J/E

Koga, S. (1968). A study of the fishing conditions of the tuna and marlin in the Tasman Sea. *Journal of the Shimonoseki University of Fisheries* 16 (2,3), 51-70.

Hook rate, length composition, gonad index and stomach contents data from fish caught by the 'Koyo Maru' in 1966 are examined.

In the summer, albacore is the most densely distributed fish; good catches of bigeye occur north of 30° S and southern bluefin are distributed south of 30° S.

Catch statistics indicate that fish distribution is controlled by the structure of, and the relationship between water masses.

A conversion equation for length-frequency data and weight-frequency data for albacore and bigeye is proposed. J/E

Koga, S., Imanashi, H. and Tawara, S. (1972). The fishing conditions of the tuna and marlin in the central south Pacific. *Journal of the Shimonoseki University of Fisheries* 20 (3), 79-99.

Hook rate, size composition, gonad index and stomach contents of tuna and marlin caught in the Coral Sea by the training vessel 'Koyo Maru' are examined.

A good correlation is found between the state of the fishery and oceanographic conditions. Generally the species caught south of 20° S are albacore and striped marlin, while north of 20° S, the catch consists mainly of blue marlin and sailfish; in this latter area the fish are generally at or near the spawning stage.

Stomach contents of the catch reveals that the large fish feed on crustaceans and cephalopods. J/E

Koto, T. (1966). Studies on the albacore. XI. Distribution of albacore in the tuna longlining fishing grounds of the south Pacific Ocean. *Report of the Nankai Regional Fisheries Research Laboratory* No. 23, 43-53.

The distribution pattern of albacore in the south Pacific, based on longline catch records between 1950 and 1961, is described.

The greatest hook rate of albacore occurs between 10° S and 30° S. In the Coral Sea area, the hook rate increases in winter and decreases in summer. For the Tasman Sea area the hook rate increases in summer and decreases in winter. J/E

Koto, T. and Hisada, K. (1967). Studies on the albacore. XIII. Size composition of south Pacific albacore caught by longline. *Report of the Nankai Regional Fisheries Research Laboratory* No. 25, 37-47.

The south Pacific Ocean is divided into sub-areas according to the length-frequency data of the longline catch.

The Coral Sea catch consists of fish mainly 90-100 cm in length, while the Tasman Sea catch consists of smaller fish (70-80 cm in length). The number of smaller fish increases towards the west. There is no observed change in the size range of fish in each sub-area throughout the year. J/E

J = Japanese text; *J/E* = Japanese text, English abstract; *E* = English text

Kume, S. (1967). Distribution and migration of bigeye tuna in the Pacific Ocean. *Report of the Nankai Regional Fisheries Research Laboratory* No. 25, 75–80.

Seasonal distribution of hook rates and body length of the bigeye catch suggests that there are two zonal bands in the east–west direction: a feeding group in the north Pacific Ocean, and a spawning group in the equatorial area. There is a high concentration of fish towards the eastern half of the Pacific. A study of the distribution of bigeye tuna by age suggests that the fish migrate eastwards. E

Kume, S. (1969). Ecological studies on bigeye tuna. VI. A review on distribution and size composition of bigeye tuna in the equatorial and south Pacific Ocean. *Bulletin of the Far Seas Fisheries Research Laboratory* 1, 77–114.

Ecological and biological data, including hook rates and seasonal fluctuations of length-frequency distribution, gonad index, frequency distribution, sex ratio of catch and fork length, are used to develop an assessment of stock structure for bigeye tuna. Reference is made to data from the Coral Sea hand-line fishery in 1965 and 1966. J/E

Kume, S. and Shiohama, T. (1965). Ecological studies on bigeye. II. Distribution and size composition of bigeye tuna *Parathunnus sibi* in the equatorial Pacific. *Report of Nankai Regional Fisheries Research Laboratory* No. 22, 71–84.

Hook-rate data collected before 1961 are used to review the distribution of bigeye tuna in the Pacific. Results indicate that the highest density of fish is in the eastern Pacific. In the western Pacific, the highest densities are north of the equator. Large fish are more abundant in the eastern Pacific. J/E

Maeda, H., Minami, S. and Nishino, M. (1968). A preliminary report of hauling speed of tuna longline. *Bulletin of the Japanese Society of Scientific Fisheries* 34, 1009–1014.

The longline fishery vessel 'Koyo-maru' was used to study the effect of variation of hauling speed on the daily catch in the area 31°–35°S, 161°–179°E. Catch consisted of yellowfin, bigeye and marlin species. E

Ministry of Agriculture Fisheries and Forestry, Department of Statistics and Survey. Report of the statistical survey on longline tuna fishing by fishing ground, April–September 1961.

Detailed tabulations of the number of operations, number of hooks used, catch by species, by month and by fishing area of bluefin, albacore, bigeye, yellowfin, striped marlin, black marlin, blue marlin and broadbill swordfish. J

Naganuma, A. (1979). On spawning activities of skipjack tuna in the western Pacific Ocean. *Bulletin of the Tohoku Regional Fisheries Research Laboratory* 40, 1–4.

A study was made of the relationship between gonad index, body length and geographical distribution of skipjack in the area 40°N to 35°S, 120°E to 180°E. Results indicate that the larger the size of the fish the earlier the spawning season. The small fish spawn in the summer in the southern hemisphere and the large fish spawn in the summer of the northern hemisphere. J/E

Nakagome, J. (1958). Seasonal variation of hook rate and mean fork length and the relationship between hook rate, mean fork length, sex and migration of black marlin, *Makaira mazara*, in the western Pacific Ocean. *Bulletin of the Japanese Society of Scientific Fisheries* 23, 525–528.

*Hook rate, fork length and ratio of males to females of blue marlin by sub-area for the region 30°N–35°S, 130°–160°E are examined. (The marlin referred to is known as "kurokajiki" (literally "black marlin") to Japanese fishermen; sportfishermen call it "blue marlin". The fish called "black marlin" (*Makaira indica*) by sportfishermen is "shirokajiki" (literally "white marlin") to Japanese fishermen). J/E*

J= Japanese text; J/E= Japanese text, English abstract; E= English text

Suda, A. and Kume, S. (1967). Survival and recruit of bigeye tuna in the Pacific Ocean, estimated by the data of tuna longline catch. *Report of the Nankai Regional Fisheries Research Laboratory* No. 25, 91-103.

The natural mortality coefficient, and catchability for longline gear, are calculated by sub-area from 1957-1964 data. J/E

Suda, A., Kume, S. and Shiohama, T. (1969). An indicative note on a role of permanent thermocline as a factor controlling the longline fishing ground for bigeye tuna. *Bulletin of the Far Seas Fisheries Research Laboratory* 1, 99-114.

A hypothesis on the effect of a permanent thermocline on bigeye longline catch is developed; it is proposed that longline hook rates for bigeye will depend on whether hooks actually reach the level of permanent thermocline at 100-150m deep. In temperate waters, which do not have a permanent thermocline, hook rates seem to be related to current systems. On the basis of the hypothesis on the permanent thermocline, the occurrence of bigeye in waters from 17°-22° C, and the increase in size composition of catch from west to east is explained. Differences in concentration of bigeye and yellowfin in the "surface mixing layer" is shown to correspond to the depth of the level of primary productivity and the presence of a permanent thermocline. J/E

Takeda, M., Inamasu, Y., Koshikawa, T., Ueda, T., Nakano, M., Tomida, T. and Hamada, M. (1976). On the mercury and selenium contained in tuna fish tissues. II. Total mercury level in muscles and viscera of yellowfin tuna. *Journal of Shimonoseki University of Fisheries* 25 (1), 47-65.

Total mercury level and lipid content of 39 yellowfin tuna are examined. Specimens caught in the Coral Sea area are included in the survey. Food sources such as squid, sardine, horse mackerel and shrimp are screened as possible sources of mercury,; however, only low mercury levels are recorded. Data on body weight, fork length, and body width of each specimen are listed. J/E

Tawara, S., Sakurai, G., Fujiishi, A. and Omura, K. (1968). Echo-survey of tuna fishing ground in the western Pacific Ocean. I. Analysis of echo-sounder records of the Deep Scattering Layer, Scattering Layer and tuna traces. *Journal of Shimonoseki University of Fisheries* 16 (2,3), 70-80.

A survey of the fishing grounds in the western Pacific Ocean was conducted, using a fish finder. The results of the investigation show that there are periodic diurnal changes in the level of the Deep Scattering Layer. No correlation was found between the Scattering Layer, water temperature, salinity and oxygen level. Tuna schools were detected at 150-200 m depth. J/E

Tokyo University of Fisheries (1968). Cruise report of the 34th cruise of the 'Umitaka Maru', October 1967-February 1968, 130-194.

Report on the oceanographic observations and exploratory tuna longline fishing by 'Umitaka Maru' in the Coral and Tasman Seas in 1967. E

Tuna Fishing, 1953-1969:

Volumes 1-84, 1953-1961

New Series 1-12, 1962-1963

New Series 1-83, 1962-1969

New Series 1- , 1970-

An informal report published by the Federation of the Japan Tuna Fishing Co-operatives and the Association of the Japanese Tuna Fishermen. All volumes contain catch tables, and comments on the state of the fishery, sea conditions and fishing prospects by area. J

J= Japanese text; J/E= Japanese text, English abstract; E= English text

- Ueyanagai, S. (1969). Observations on the distribution of tuna larvae in the Indo-Pacific Ocean with emphasis on the delineation of the spawning areas of albacore *Thunnus alalunga*. *Bulletin of the Far Seas Fisheries Research Laboratory* 2, 177-256.

The delineation of spawning areas of the main species of tuna, with particular reference to albacore. On the basis of surface and subsurface net tows, the vertical distribution of larvae of each of the tuna species is discussed; the effect of day/night net hauls on larval distribution records is included. The geographical distribution of larvae is described. It is concluded that albacore larvae are concentrated in subtropical areas, yellowfin and bigeye in tropical waters, skipjack where temperatures exceed 24°C, southern bluefin tuna in the northeast Indian Ocean and bluefin in Japanese coastal waters. Oceanographic characteristics of albacore spawning areas are outlined. J/E

- Uno, M. (1965). On the periodicity of tuna migration in the South Pacific. *Journal of the Faculty of Fisheries Prefectural University of Mie* 6 (3), 341-349.

A general review of the migratory patterns of albacore, bigeye, yellowfin and bluefin in the South Pacific. The yearly and monthly changes in hook rate, the effect of water temperature on hook rate, and seasonal variations of the centre of the fishing grounds from 1956-1960 for these four species of tuna are discussed. J/E

- Yabe, H. and Ueyangi, S. (1962). Contributions to the study of the early life history of the tunas. *Occasional Reports of the Nankai Regional Fisheries Research Laboratory* No. 1, 57-74.

The morphology and distribution of larvae of tuna in the Indo-Pacific Oceans are determined from an examination of the stomach contents of adult fish, ichthyoplankton-net towing and dip-net catches. E

- Yabuta, Y., Yukinawa, M. and Warashina, Y. (1960). Growth and age determination of yellowfin tuna. II. Age determination (scale method). *Report of the Nankai Regional Fisheries Research Laboratory* No. 12, 63-74.

Scales are examined to determine the age and growth of yellowfin tuna. The results compare favourably with determinations of age by length-frequency and tagging methods. J/E

- Yamanaka, H. (1956). Vertical structure of the ocean in relation to fishing conditions for albacore adjacent to 10°S in the western south Pacific. *Bulletin of the Japanese Society of Scientific Fisheries* 21, 1187-1193.

A study of the relationship between vertical temperature and salinity structure of the ocean and fishing conditions for albacore, based on temperature and salinity recordings taken in 1928, 1951 and 1955 for the area 10°N-20°S, 150°E-150°W. The data suggest the presence of a discontinuity layer from east to west at 10°S; albacore are caught south of 10°S. J/E

- Yamanaka, H. and Anraku, N. (1962). Relation between the distribution of tunas and water types of the north and south Pacific Oceans west of 160°W. *Occasional Report of the Nankai Regional Fisheries Research Laboratory* No. 1, 23-34.

Water west of 160°W is classified by temperature, and the distribution of water types and current systems is established. A previously established relationship between the distribution of tunas and current systems is used to examine the relationship between distribution of tunas and water type. E

J = Japanese text; J/E = Japanese text, English abstract; E = English text

Yamanaka, H., Kurohiji, Y. and Morita, J. (1966). General results of the investigation in the south-western Pacific Ocean by the fish-finder. *Report of the Nankai Regional Fisheries Research Laboratory* No. 24, 115-127.

A survey of the eastern perimeter of the Coral Sea was conducted by the research vessel 'Shunyo Maru' in 1966. The depth of the Deep Scattering Layer, Scattering Layer and vertical temperature gradient was measured. An echo sounder was used to study the movement of yellowfin and skipjack tuna.
J/E

Yamanaka, H., Morita, J. and Anraku, N. (1969). Relation between the distribution of tunas and water types of the north and south Pacific Ocean. *Bulletin of the Far Seas Fisheries Research Laboratory* 2, 257-273.

Locations with the same temperature/chlorinity curve are grouped as the same "water type", and the distribution of yellowfin, bigeye, albacore and bluefin by water type is examined. The author proposes that the centres of the distribution of tunas are segregated by water type. However, this principle is found to be applicable only to bluefin and albacore. J/E

Keyword Index

Albacore

Honma and Kamimura, 1957
 Inoue and Ishi, 1956
 Koga, 1962; 1966; 1967; 1968
 Koga et al. 1972
 Koto, 1966
 Koto and Hisada, 1967
 Nakagome, 1959a; 1964; 1969
 Nakagome and Isobe, 1968a; 1968b
 Sato et al. 1964
 Suda, 1971
 Ueyanagi, 1969
 Uno, 1965
 Yamanaka, 1956
 Yamanaka et al. 1969

Bait

Abe and Dotsu, 1977
 Imai, 1972
 Imai and Shirakawa, 1972

Bigeye

Hamada and Inamasu, 1977
 Hisada, 1973
 Honma et al. 1973
 Kikawa, 1962; 1966
 Koga, 1962; 1967; 1968
 Kume, 1967; 1969
 Kume and Shiohama, 1965
 Maeda et al. 1968
 Suda, 1971
 Suda and Kume, 1967
 Suda et al. 1969
 Ueyanagi, 1969
 Uno, 1965
 Yamanaka et al. 1969

Biological Data

Far Seas Fisheries Research Laboratory,
 1965-1985
 Fisheries Agency of Japan, 1981
 Hanamoto, 1977b
 Hisada, 1973
 Honma and Kamimura, 1957
 Honma et al. 1973
 Inoue and Ishi, 1956
 Kamimura and Honma, 1962
 Kikawa, 1959; 1962; 1966
 Koga, 1966; 1967; 1968
 Koga et al. 1972
 Kume, 1967; 1969
 Kume and Shiohama, 1965
 Naganuma, 1979
 Nakagome, 1958
 Nakagome and Isobe, 1968b
 Suda, 1971; 1973
 Takeda et al. 1976

Black marlin

Koga, 1967
 Nakagome, 1959b
 Sato et al. 1964.

Blue marlin

Koga, 1967
 Koga et al. 1972
 Nakagome, 1958
 Nakamura, 1962
 Sato et al. 1964

Catch/Effort

Far Seas Fisheries Research Laboratory,
 1965-1985
 Fisheries Agency of Japan, 1962-1980;
 1968-1979
 Hanamoto, 1978
 Hisada, 1973
 Honma and Kamimura, 1957
 Honma et al. 1973
 Imai, 1972
 Imai and Shirakawa, 1972
 Kamimura and Honma, 1963
 Kikawa, 1962
 Koga, 1962; 1968
 Koga et al. 1972
 Koto, 1966
 Koto and Hisada, 1967
 Kume, 1967; 1969
 Kume and Shiohama, 1965
 Nakagome, 1958; 1959a; 1959b; 1961; 1964
 Ministry of Agriculture Fisheries and Forestry,
 1961
 Nakagome and Isobe, 1968a; 1968b
 Nakamura, 1962
 Suda, 1971; 1973
 Suda and Kume, 1967
 Uno, 1965

Cruise Reports

Faculty of Fisheries, Nagasaki University, 1977;
 1978
 Far Seas Fisheries Research Laboratory,
 1965-1985
 Fisheries Agency of Japan, 1976; 1981
 Hokkaido University, 1967-1969; 1973; 1975;
 1979
 Kato, 1967
 Tokyo University of Fisheries, 1968
 Tuna fishing, 1953-1969

Dogtooth tuna

Okiyama and Ueyanagi, 1977

Handlining

Abe and Dotsu, 1977
 Hisada, 1973
 Kume, 1969

Heavy Metals

Hamada and Inamasu, 1977
 Hamada et al. 1977
 Takeda et al. 1976

Larvae

Okiyama and Ueyanagi, 1977
 Ueyanagi, 1969
 Yabe and Ueyanagi, 1962

Longlining

Hanamoto, 1979
 Hirayama, 1976
 Hisada, 1973
 Imai, 1972
 Imai and Shirakawa, 1972
 Kamimura and Honma, 1962
 Koto, 1966
 Koto and Hisada, 1967
 Maeda et al. 1968
 Ministry of Agriculture Fisheries and Forestry,
 1961
 Suda et al. 1969
 Tokyo University of Fisheries, 1968

Oceanographic Data

Faculty of Fisheries, Nagasaki University, 1977;
 1981
 Fisheries Agency of Japan, 1976; 1981
 Hisada, 1973
 Hokkaido University, 1967-1969; 1973; 1975;
 1979
 Kanagawa Prefectural Fisheries station, 1961
 Tokyo University of Fisheries, 1968
(see also Temperature Data and Salinity Data)

Population distribution

Fujino, 1975; 1976
 Fujino et al. 1981
 Hanamoto, 1977a
 Kamimura and Honma, 1962; 1963
 Koga, 1967
 Koto, 1966
 Kume, 1967
 Kume and Shiohama, 1965
 Nakagome, 1959a; 1961
 Sato et al. 1964
 Ueyanagi, 1969
 Uno, 1965
 Yamanaka, 1956
 Yamanaka and Anraku, 1962

Population Genetics

Fujino, 1975; 1976
 Fujino et al. 1981

Purse Seining

Osawa et al. 1975

Salinity Data

Abe and Dotsu, 1977
 Faculty of Fisheries, Nagasaki University, 1978
 Fisheries Agency of Japan, 1976
 Hokkaido University, 1966-1969; 1973; 1975;
 1979
 Tawara et al. 1968
 Yamanaka, 1956

Shark Damage

Hirayama, 1976

Skipjack tuna

Fujino, 1976
 Fujino et al. 1981
 Inoue, 1969
 Naganuma, 1979
 Osawa et al. 1975
 Ueyanagi, 1969
 Yabe and Ueyanagi, 1962
 Yamanaka et al. 1966

Slender tuna

Nakamura and Mori, 1966

Striped marlin

Hanamoto, 1977a; 1977b; 1978; 1979
 Hisada, 1973
 Koga, 1962; 1966; 1967
 Koga et al. 1972
 Nakagome, 1964
 Nakamura, 1962

Swimming Depth

Fisheries Agency of Japan, 1981
 Hanamoto, 1979
 Hisada, 1973
 Nakagome, 1961
 Suda et al. 1969
 Tawara et al. 1968

Swordfish/Sailfish/Spearfish

Hisada, 1973
 Koga, 1962; 1967
 Koga et al. 1972

Spawning season

Hanamoto, 1977b
 Kikawa, 1959; 1962; 1966
 Naganuma, 1979
 Ueyanagi, 1969

Temperature Data

Abe and Dotsu, 1977
 Faculty of Fisheries, Nagasaki University, 1977;
 1978
 Far Seas Fisheries Research Laboratory,
 1965-1985
 Fisheries Agency of Japan, 1981
 Hokkaido University, 1967-1969; 1973; 1975;
 1979
 Hisada, 1973
 Nakagome, 1969
 Nakagome and Isobe, 1968b
 Suda et al. 1969
 Tawara et al. 1968
 Uno, 1965
 Yamanaka, 1956

Yellowfin

Abe and Dotsu, 1977
 Hamada and Inamasu, 1977
 Hamada et al. 1977
 Hisada, 1973
 Honma et al. 1973
 Inoue, 1969

Kamimura and Honma, 1962; 1963
Kikawa, 1959; 1962; 1966
Koga, 1962; 1967
Koga et al. 1972
Maeda et al. 1968
Nakagome, 1961; 1964
Sato et al. 1964
Suda, 1971; 1973;
Suda et al. 1969
Takeda et al. 1976
Ueyangi, 1969
Uno, 1965
Yabe and Ueyanagi, 1962
Yabuta et al. 1960
Yamanaka et al. 1966
Yamanaka et al. 1969

CSIRO Marine Laboratories
comprise

Division of Oceanography
Division of Fisheries

Headquarters

Castray Esplanade, Hobart, Tasmania
GPO Box 1538, Hobart, Tas 7001, Australia

Queensland Laboratory

133 Middle Street, Cleveland, Qld
PO Box 120, Cleveland, Qld 4163

Western Australian Laboratory

Leach Street, Marmion, WA
PO Box 20, North Beach, WA 6020



CSIRO
AUSTRALIA

ISBN 0 643 04825 1.