

DIVISION OF FISH AND GAME OF CALIFORNIA
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A Bibliography of The Tunas



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CUTTING UP THE TUNA

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1. INTRODUCTION

Because of the commercial importance of the tunas in southern California, scientific research has directed attention to questions of their life history and abundance. In this way a need was created for a full bibliography of the literature on the subject. The work of compilation was begun by Mr. W. F. Thompson in 1918, continued by Mrs. Ruth Miller Thompson, and completed by the present compiler after nearly two years of research in a number of libraries, that of the California State Fisheries Laboratory being the first. After consulting all available material there, the writer journeyed to the libraries of Stanford University, California Academy of Sciences, Division of Fish and Game of California in San Francisco, and University of California, both in Berkeley and in Los Angeles. In the winter of 1928-1929, the work was completed as far as facilities would permit, yet publication was postponed, because a trip to New York was being planned for the summer of 1929, and the added opportunities of consulting libraries there and in Washington were too valuable to miss. The library of the American Museum of Natural History yielded much valuable material which was augmented by consultation of the card continuation of Bashford Dean's "Bibliography of Fishes." Later, three very profitable weeks were spent in Washington, D. C., working in the following libraries: National Museum, United States Department of Agriculture, United States Bureau of Chemistry, Surgeon General's Library, Library of Congress, and the United States Bureau of Fisheries.

The goal striven for was to find all works written previous to the close of 1929, dealing in any way with the five large tunas: *Thynnus thynnus*, *Neothunnus macropterus*, *Germo alalunga*, *Euthynnus pelamis*, and *Sarda chiliensis*. As one would expect, other names and species have been included for reasons which are made clear by an examination of these papers. The rule followed in puzzling questions of synonymy in the index was this: when in doubt as to what fish was being considered, the exact name was used as given in the paper. The synonyms about which there was no doubt are all given a place in the index as "see also" references and all author citations are listed under the accepted name. However, it was thought best to retain the names and spelling used by each author in the résumé of each paper. The titles fall mainly into the following groups: systematic, morphologic, biologic, commercial, the latter concerned with local conditions of fisheries of the world, and with fishing methods and gear.

The writer consulted all papers listed with the exception of a very small number, and made a short résumé of the contents of each so that a really useful subject index could be compiled. Outside help was necessary in some instances when language difficulties were encountered, since nearly every important country has contributed something to the study of the tunas. A few papers could not be found in any of the dozen libraries consulted but were considered of sufficient importance to include because of title. Wherever possible some means was

employed for checking the accuracy of the citation, but where the individual paper was not consulted the fact is indicated by a dagger†. The important papers on a given subject are indicated by an asterisk* in the list of authors.

The author names are arranged alphabetically, and where there are several papers by one individual the arrangement is chronological. If an author published more than one paper in a given year, the fact is indicated thus: Roule, 1926.1, Roule, 1926.2, meaning the first and second papers published by Roule in 1926. For papers dealing only partially with tuna, paging is given for just that portion dealing with tuna.

Abbreviations for journals were chosen with full regard to clearness, but since confusion invariably arises in some cases, it seemed advisable to include a list of all journals cited, together with their place of publication. Geographic names have not been shortened, with but one exception: U. S. standing for United States. The list is alphabetized according to the abbreviations as an aid in finding the full names.

The hearty cooperation of all the librarians is most deeply appreciated. Especial thanks are due Dr. E. W. Gudger for his able assistance, not only in offering facilities at the American Museum of Natural History including the continuation of Dean's "Bibliography of Fishes," but in giving the writer letters of introduction to other libraries, thereby opening the way to the best service possible. Mr. J. T. Nichols, Curator of Recent Fishes at the American Museum of Natural History, very kindly rendered assistance in clearing up questions of synonymy. The various individuals who were called upon for help at the United States Bureau of Fisheries and the Library of Congress deserve the warmest praise for their skilled assistance. To Mr. William Radcliffe, of Upper Deal, Kent, England, author of "Fishing from the Earliest Times," appreciation is expressed for the gift of the electro-block from which the frontispiece was made. The members of the staff of the California State Fisheries Laboratory gave valuable assistance and encouragement as the work progressed, and for this service the writer wishes to convey grateful thanks.

One of the most interesting facts ascertained by the writer during this search for information about the tunas is that these fish have been important to the life of man from the earliest times. The frontispiece gives evidence that as early as the sixth century B. C., they were of enough significance to find a place in Greek art. The fact that they have kept their life habits so closely wrapped in mystery through the march of the centuries is an added incentive to research. Although freedom from error has been the shining goal constantly striven for, the writer is aware perfection has not been attained, yet this bibliography is submitted in the eager hope that it may prove in the nature of an organized list of clues that may help point the way to a solution of the mystery shrouding the life of the tunas.

December, 1929.

2. AUTHORS' LIST OF TITLES

NOTE.—The most important papers are marked thus: *. Those marked with a dagger † were not seen by the compiler but were included because they seemed important. Inconsistencies in the spelling of scientific names arise from the fact that the exact spelling was used as that found in the paper cited. The numbers in bold face type (such as: 6) indicate volume number.

2.1. A

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- Aflalo, F. G. 1904. British salt-water fishes with a chapter on the artificial culture of sea fish by R. B. Marston. London, p. 13, 271, 282–283. *Orcynus thynnus*, *O. germo*, *Thynnus pelamys*, listed as rare fishes in English waters; range.
- Agassiz, Louis. 1833. Recherches sur les poissons fossiles. Neuchatel, 1833–1843, 5, p. 55–60. Atlas pls. 23, 24, 27. Fossils of *Thynnus propterygius*, *T. bolcensis*, *Orcynus lanceolatus*, *O. latior*, from Monte Bolca, described.
- Aldrovandi, Ulisse. 1613. De piscibus libri V, et de cetis liber unus. Bononiae, bk. III, ch. 18, p. 307–324. *Thynnus thunnus* and *Orcynus rondel* figured; synonymy; description; distribution; natural history. Titles of chapters on tuna: age; methods of catch; uses as food; uses as medicine.
- Allen, Edward Johnson. 1926+. Current bibliography. Journ. Conseil, 1926, 1, no. 3, p. 300, no. 4, p. 382; 1927, 2, no. 1, p. 106, no. 2, p. 266, no. 3, p. 395; 1928, 3, no. 1, p. 130.
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- Amico, F. C. de. †1816. Osservazioni pratiche intorno la pesca, il corso, il cammino dei tonni. Messina. Practical observations about the Italian fishery, the migrations, and the route of the tuna.
- Angotzi, Francesco. †1905. L'industria delle tonnare in Sardegna. Bologna. Tuna industry in Sardinia.
- Anuario Estadístico de la Marina Mercante y de la Pesca Marítima. 1914. 1915. Madrid. Statistics.
- Apicius. 1542. In hoc opere contenta Apicii Caelii de opsoniis et condimentis, sive arte coquinaria libri X. Item. Gabriellis Humel bergii . . . annotationes. Tigvri, In officina Froschouiana. Ancient recipes for preparation as food.
- Argentier, Francesco. 1914. Étude d'ensemble sur les pêches de la sardine, du thon et des crustacés. VI Cong. Nat. Pêch. Marit. Tunis. Paris, 2, p. 105–127. *Thynnus vulgaris*; *T. thunina*; *T. alalonga*; fishery methods; boats; gear; value of fishery; canning; distribution of product.

- Aristotle. 1897. History of animals. Ten books. Translated by Richard Cresswell. London. Bk. 5, ch. 25, p. 3; bk. 6, ch. 16, p. 5; bk. 8, ch. 15, p. 5; bk. 8, ch. 17, p. 2, 3; bk. 8, ch. 20, p. 8, 9; bk. 9, ch. 3, p. 1. Parasites; reproduction; delights in warm weather; migrations governed by poor sight; goes into mud in winter; travels in schools.
- Årsberetning Vedkommende Norges Fiskerier. 1928. Fremme av støjefangsten. Åsber. Vedkom. Norges Fisk. [for 1927] no. 1, p. 89–90. Fishery in foreign countries.
- Artedi, Peter. 1738. Ichthyologia, sive opera omnia de piscibus scilicet. Pt. 1. Bibliotheca ichthyologica. Pt. 2. Philosophia ichthyologica. Pt. 3. Generum Piscium. Pt. 4. Synonymia specierum. Pt. 5. Descriptiones specierum. Lugduni Batavorum, Leyden. Pt. 1, p. 49–50: Thunnus, different spellings, references in literature. Pt. 3, p. 210–211: Thunnus, description, Pt. 4, p. 49: Thunnus thynnus, T. orcynus, T. belloni, synonymy.
- Atco Fisheries News. 1926. The tunas, albacores and bonitos. Acto Fish. News, 6, no. 4, p. 6. Short description and use of Germo macropterus, G. alalunga, and Thunnus thynnus; Germo alalunga figured.
- Athanassopoulos, G. 1923. Sur les thonidés en Grèce. C. R. Acad. Sci. Paris, 177, p. 501–502. *Also in* Pêch. Marit., 1923, 6, no. 283, p. 767–768. Migrations.
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1926. Notes sur la faune marine de la Grèce. Bull. Inst. Océanogr. Monaco, no. 480, p. 2–3. Migrations.
1927. La migration des thons. Pêch. Marit., 10, no. 452, p. 51.
- Aubertin, G. 1909.1. La pêche du thon en Méditerranée. V Cong. Nat. Pêch. Marit. Sables-d'Olonne, 1, p. 196–220. Methods of fishing in Mediterranean; statistics of fish caught by each method.
- 1909.2. La pêche du thon. Bull. Trim. Pêch. Marit., 14, p. 1129–1151. Methods of fishing and gear in Mediterranean; statistics.
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2.2. B

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- Barnhart, P. S. †1927. Pelagic fish eggs off La Jolla, California. Bull. Scripps Instn. Tech. Ser., 1, no. 8, p. 91. Sarda chiliensis, spawning season.

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- Belloc, G. 1927.1. Rapport sur le fonctionnement du laboratoire de La Rochelle. *Notes off. Pêch. Marit.*, no. 52, p. 23. Temperature of water governing migrations of *Thynnus alalonga*; expedition of Hébé extending researches.
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- 1860.1. Achtste bijdrage tot de kennis der vischfauna van Sumatra. Visschen van Benkoelen, Priaman, Tandjong, Palembang, en Djambi. Act. Soc. Sci. Indo-Neerlandicae, 8, p. 29. *Thynnus pelamys*, *T. thunnina* recorded from Dutch East Indies.
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- 1860.3. Over eenige vischsoorten van de Kaap de Goede Hoop. Nat. Tijdschr. Nederlandsch-Indië, 21, p. 53. *Thynnus pelamys* recorded from Cape of Good Hope.
- 1861.1. Mededeeling omtrent vischsoorten, nieuw voor de kennis der fauna van Singapoera. Versl. Akad. Amsterdam, 12, p. 52. *Thynnus thunnina*, *T. tonggol*, recorded from Singapore.
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- 1924.1. Ciclos de aumento y disminución del atún en Portugal. Bol. Pesca, 9, no. 90–91, p. 87. Periodical appearance of tuna in Portugal.
- 1924.2. Primeros resultados de la campaña internacional para el estudio del atún. Bol. Pesca, 9, no. 92–93, p. 139–141. Résumé of hydrographic conditions (temperature, salinity) affecting migrations.
- 1924.3. Reglamento para la pesca del atún con el arte de almadrabas. Bol. Pesca, 9, no. 95–96, p. 215–230. Laws regulating almadraba fishery of Spain.
- 1924.4. La pesca en Portugal. Proyecto de reglamento para la pesca del atún con artes fijos. Bol. Pesca, 9, no. 97–98–99, p. 277–307. Regulations protecting tuna fisheries in Portugal.
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- 1925.2. La pesca del atún en aguas atlánticas del sur de España. Bol. Pesca, 10, no. 102, p. 60–61. Fishery of Spain.
- 1925.3. Subasta de la almadraba Nuestra Señora de las Mercedes. Bol. Pesca, 10, no. 102, p. 63–67. Public sale of an almadraba fishery in Spain.
- 1925.4. La pesca del atún en Túnez (1924). Bol. Pesca, 10, no. 105, p. 179–180. Fishery in Tunis.
- 1925.5. Mala temporada en la pesca del atún. Bol. Pesca, 10, no. 106, p. 225. Fishery in Spain.
- 1925.6. Reglamento para el regimen de la pesca con el arte denominado de almadraba. Bol. Pesca, 10, no. 111, p. 351–379. Laws regulating almadraba fishery.
- 1926.1. Legislación sobre almadrabas. Bol. Pesca, 11, no. 113, p. 8; no. 114, p. 50; no. 115, p. 80–81; no. 119, p. 194–196. Legislation concerning almadraba fishery.
- 1926.2. El atún de Canarias. Bol. Pesca, 11, no. 113, p. 12. Fishery: note on total catch in the Canaries.
- 1926.3. El atún en los mares del Norte. El atún en los fjords noruegas. Bol. Pesca, 11, no. 113, p. 17, 18. Note on fisheries in Norway and North Sea.
- 1926.4. Subasta de la almadraba "Lances de Tarifa." Subasta de la almadraba "Rosita." Bol. Pesca, 11, no. 117, p. 150–153. Sale of two almadraba fisheries.
- 1926.5. El atún en Sicilia. Bol. Pesca, 11, no. 117, p. 168–172. Description of factory and industry in Sicily; illustrated.
- 1926.6. Almadrabas caladas en 1926 (Atlántico y lugares próximos). Almadraba "Calpe." Bol. Pesca, 11, no. 118, p. 177–178. Condition of fishery in Spain.
- 1926.7. La pesca del atún. Bol. Pesca, 11, no. 118, p. 188–190. Gig fishing described and illustrated.

- 1926.8. La pesca del atún y del bonito en el Cantábrico. Bol. Pescas, 11, no. 123, p. 304–305. The tuna and bonito fishery of Cantabrico.
- 1926.9. Almadrabas (Del primer negociado de la Dirección General de Pesca). Bol. Pescas, 11, no. 121, p. 236–238; no. 122, p. 262–263; no. 123, p. 298–300. Legislation concerning almadraba.
- 1926.10. Almadrabas (Del primer negociado, sección segunda). Bol. Pescas, 11, no. 124, p. 238–240. Statistics: returns from different almadraba fisheries in Spain.
- 1927.1. Asamblea de almadrabereros y taraferos. Bol. Pescas, 12, no. 125, p. 17–18. Meeting of almadraba fishermen, Spain.
- 1927.2. Almadrabas (Del primer negociado, sección segunda). Bol. Pescas, 12, no. 125, p. 19–21; no. 129, p. 148; no. 130, p. 162–163; no. 131, p. 204–205. Legislation concerning almadraba.
- 1927.3. La pesca del atún en el Sahara occidental español. Fernando de Buen, sobre biología del atún, su pesca y conservación de sus carnes. Bol. Pescas, 12, no. 128, p. 99, 108–110. Spawning off African coast; gear; migrations.
- 1927.4. La pesca de la sardina y del atún en aguas atlánticas del sur de España. Bol. Pescas, 12, no. 129, p. 148–151. Fishery of Spain.
- 1927.5. Almadrabas (Sección II, Negociado I). Bol. Pescas, 12, no. 132, p. 241; no. 136, p. 360–361. Regulations in regard to almadraba.
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- 1928.2. Escombridos de la región Balear. Bol. Pescas, 13, no. 138, p. 54–57. *Thunnus thynnus*, statistics of catch.
- 1928.3. Dirección General de Pesca. Consorcio entre el estado y los almadrabereros. Laboratorios costeros. Bol. Pescas, 13, no. 140, p. 117–125. Legislation about partnership between state and almadraba fishery; catch observations of laboratory of Baleares.
- 1928.4. La pesca del atún en Túnez. Bol. Pescas, 13, no. 140, p. 128–129. Fishery of Tunis.
- 1928.5. Consorcio almadrabetario. Bol. Pescas, 13, no. 143, p. 219. Partnership of almadraba fishermen.
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- 1928.2. La pesca del tonno in Tunisia del 1928. La pesca del tonno fra il mare del Nord ed il Baltico. Boll. Pesca, Piscicult. Idrobiol., 4, no. 4, p. 444–445. Fishery in Tunis; North Sea; Baltic.

1929. La pesca del tonno in Tripolitania nella campagna del 1928. *Boll. Pesca, Piscicoltura. Idrobiol.*, 5, no. 2, p. 290–294. Statistics.
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- Bonnaterre, (L'Abbé) Joseph P. 1788. Tableau encyclopédique et méthodique des trois règnes de la nature . . . Ichthyologie. Paris. *Scomber thynnus* = thon, *S. alalunga* = l'alalunga, *S. albacares* = l'albacore; description, size, distribution.
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2.22. V

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2.23. W

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2.24. Y

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2.25. Z

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3. ANONYMOUS TITLES

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†1883.2. Ulteriori osservazioni sul regime daziario dei tonni, ecc. Tipograf. Ricci, Firenze, 80 p. Observations pertaining to the tariff regulations on tuna in Italian fishery.

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4. LIST OF ABBREVIATIONS USED FOR PERIODICALS CITED

4.1. A

- Aarsber. Selsk. Norske Fish. Fremme.—Aarsberetning for Selskabet for de Norske Fiskeriers Fremme. Bergen.
- Abh. Akad. Wiss.—Abhandlungen. Akademie der Wissenschaften zu Berlin.
- Abh. K. Preussische Akad. Wiss.—Abhandlungen. K. Preussische Akademie der Wissenschaften. Berlin.
- Act. Soc. Sci. Indo-Neerlandicae.—Acta Societatis Scientiarum Indo-Neerlandicae. Batavia.
- Allg. FischZeitg.—Allgemeine Fischereizeitung. München.
- American Journ. Sci.—American Journal of Science. New Haven.
- An. Soc. Española Hist. Nat.—Anales de la Sociedad Española de Historia Natural. Madrid.
- Ann. Agric. Min. Agric. Ind. Comm.—Annali di Agricoltura. Ministero di Agricoltura, Industria e Commercio. Roma.
- Ann. Hydrogr. Paris.—Annales Hydrographiques. Paris.
- Ann. Inst. Océanogr. Monaco.—Annales de l'Institut Océanographique de Monaco. Monaco.
- Ann. Mag. Nat. Hist.—Annals and Magazine of Natural History. London.
- Ann. Micr. Paris.—Annales de Micrographie. Paris.
- Ann. Mus. Hist. Nat. Marseille.—Annales du Musée d'Histoire Naturelle de Marseille. Marseille.
- Ann. New York Acad. Sci.—Annals of the New York Academy of Sciences. New York.
- Ann. Rept. Comm. Inland Fish. Rhode Island.—Annual Report of the Commissioners of Inland Fisheries of the State of Rhode Island. Providence.
- Ann. Rept. Fish. Board Scotland.—Annual Report of the Fishery Board for Scotland. Edinburgh.
- Ann. Rept. Laguna Mar. Lab.—Annual Report of the Laguna Marine Laboratory. Claremont, California.
- Ann. Rept. New Jersey Mus.—Annual Report of the New Jersey State Museum. Trenton.
- Ann. Rept. New York Mus.—Annual Report of the New York State Museum of Natural History. Albany.
- Ann. Sci. Géol.—Annales des Sciences Géologiques, ou Archives de Géologie, de Minéralogie, de Paléontologie . . . Paris.
- Ann. Sci. Nat. Paris.—Annales des Sciences Naturelles. (a) Botanique. (b) Zoologie. Paris.
- Ann. Sci. Nat. Porto.—Annaes des Sciencias Naturaes. Porto.
- Ann. Scottish Nat. Hist.—Annals of Scottish Natural History. Edinburgh. *Cont'd* as Scottish Naturalist.
- Ann. South African Mus.—Annals of the South African Museum. Cape Town.
- Ann. Sta. Océanogr. Salammbô.—Annales. Station Océanographique de Salammbô. Tunis.
- Annu. Mus. Zool. Univ. Napoli.—Annuario R. Museo Zoologico della R. Università di Napoli. Napoli.
- Anu. Com. Perm. Pesca.—Anuario de la Comisión Permanente de Pesca. Madrid.
- Anu. Estadís. Pesca.—Anuario Estadístico de la Marina Mercante y de la Pesca Marítima. Madrid.
- Aquatic Life. Philadelphia.
- Arb. Zool. Inst. Wien.—Arbeiten aus dem Zoologischen Institut der Universität Wien, und der Zoologischen Station in Triest. Wien.
- Arch. Farmacol. Speriment.—Archivio di Farmacologia Sperimentale e Scienze Affini. Roma.
- Arch. Italiennes Biol.—Archives Italiennes de Biologie. Pise.
- Arch. Parasit.—Archives de Parasitologie. Paris.
- Arch. Sci. Phys. Nat.—Archives des Sciences Physiques et Naturelles. Genève, Lausanne, Paris.
- Årsber. Vedkom. Norges Fisk.—Årsberetning Vedkommende Norges Fiskerier. Bergen.
- Atco Fish. News.—Atco Fisheries News. New York.

Atti Accad. Gioenia Sci. Nat.—Atti della R. Accademia Gioenia di Scienze Naturali. Catania.
Atti Accad. Sci. Torino.—Atti R. Accademia delle Scienze di Torino. Turin.
Atti Cong. Assoc. Med. Italiana—Atti del Congresso. Associazione Medica Italiana.
Atti Min. Agric. Ind. Comm.—Atti Ministero di Agricoltura, Industrie e Commercio. Roma.
Atti Soc. Ligustica Sci. Nat. Geogr.—Atti della Società Ligustica di Scienze Naturali e Geografiche. Genova.

4.2. B

Bergens Mus. Aarb.—Bergens Museums Aarbok. Bergen.
Ber. Komm. Untersuch. Kiel.—Bericht der Kommission zur Untersuchung der Deutschen Meere in Kiel. Berlin.
Bienn. Rept. California Fish Game Comm.—Biennial Report. California Fish and Game Commission. Sacramento.
Bol. Pescas.—Boletín de Pescas. Instituto Español de Oceanografía. Madrid.
Bol. Rev. Geogr. Col. Merc. Madrid.—Boletín. Revista de Geografica Colonial y Mercantil. Sociedad Geografica. Madrid.
Boll. Bimest. Talasso. Italiano.—Bollettino Bimestrale R. Comitato Talassografico Italiano. Venezia. *Formerly* Bollettino del Comitato Talassografico. Roma.
Boll. Consoli.—Bollettino del Consoli. Roma.
Boll. Inform. Econ. Min. Colonie.—Bollettino di Informazioni Economiche del Ministero delle Colonie. Roma.
Boll. Min. Agric. Ind. Comm.—Bollettino Ufficiale del Ministero d'Agricoltura, Industria e Commercio. Roma.
Boll. Mus. Zool. Anat. Comp. Torino.—Bollettino dei Musei di Zoologia e di Anatomia Comparata della R. Università. Torino.
Boll. Notiz. Agrarie.—Bollettino di Notizie Agrarie. Roma.
Boll. Pesca Piscicult. Idrobiol.—Bollettino di Pesca, Piscicoltura e di Idrobiologia. Ministero dell'Economia Nazionale. Roma.
Boll. Sci. Mediche.—Bollettino delle Scienze Mediche. Bologna.
Boll. Soc. Geogr. Italiana.—Bollettino della Società Geografica Italiana. Roma.
Boll. Soc. Lombardo Pesca Aquicult.—Bollettino. Società Lombardo per la Pesca e l'Aquicoltura. *Formerly* Rivista Mensile di Pesca. Pavia.
Boll. Soc. Med. Prov. Bergamo.—Bollettino. Società Medica Provinciale di Bergamo. Bergamo.
Boll. Soc. Zool. Italiana.—Bollettino della Società Zoologica Italiana. Roma.
Boll. Talasso. Italiano.—Bollettino del Comitato Talassografico. Roma. *Cont'd as* Bollettino Bimestrale R. Comitato Talassografico Italiano. Venezia.
Bull. American Mus.—Bulletin of the American Museum of Natural History. New York.
Bull. Biol. France Belgique.—Bulletin Biologique de la France et de la Belgique. Paris. *Formerly* Bulletin Scientifique de la France et de la Belgique. Londres, Paris, Berlin.
Bull. Bishop Mus.—Bulletin. Bernice P. Bishop Museum. Honolulu.
Bull. Comm. Explor. Méditerranée.—Bulletin. Commission internationale pour l'Exploration Scientifique de la Mer Méditerranée. Monaco.
Bull. Inst. Océanogr. Monaco.—Bulletin de l'Institut Océanographique de Monaco. Monaco. *Formerly* Bulletin du Musée Océanographique de Monaco.
Bull. Méd. Vosges.—Bulletin Médical des Vosges. Rambervillers.
Bull. Mus. Hist. Nat. Paris.—Bulletin du Muséum d'Histoire Naturelle. Paris.
Bull. New York Mus.—Bulletin of the New York State Museum of Natural History. Albany.
Bull. New York Zool. Soc.—Bulletin of the New York Zoological Society. New York.
Bull. Sci. France Belgique.—Bulletin Scientifique de la France et de la Belgique. Londres, Paris, Berlin. *Cont'd as* Bulletin Biologique de la France et de la Belgique. Paris.
Bull. [*sic*] Sci. Mediche.—Bullettino delle Scienze Mediche. Bologna.
Bull. Scripps Instn.—Bulletin. Scripps Institution for Biological Research. University of California. Berkeley.
Bull. So. California Acad. Sci.—Bulletin of the Southern California Academy of Sciences. Los Angeles.

- Bull. Soc. Acclim. France.—Bulletin de la Société Nationale d'Acclimatation de France. Paris.
- Bull. Soc. Belge Géol. Paléont. Hydrol.—Bulletin de la Société Belge de Géologie, de Paléontologie et d'Hydrologie. Bruxelles.
- Bull. Soc. Centr. Aquicult. Pêch.—Bulletin de la Société Centrale d'Aquiculture et de Pêche. Paris.
- Bull. Soc. Hist. Nat. Afrique Nord.—Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord. Alger.
- Bull. Soc. Nat. Moscou.—Bulletin de la Société des Naturalistes de Moscou Moscou.
- Bull. Soc. Océanogr.—Bulletin de la Société d'Océanographique de France. Paris.
- Bull. Soc. Portugaise Sci. Nat.—Bulletin de la Société Portugaise des Sciences Naturelles. Lisbonne.
- Bull. Soc. Sci. Hist. Nat. Corse.—Bulletin de la Société des Sciences Historiques et Naturelles de la Corse. Bastia.
- Bull. Soc. Sci. Nat. Maroc.—Bulletin de la Société des Sciences Naturelles de Maroc. Maroc.
- Bull. Soc. Zool. France.—Bulletin de la Société Zoologique de France. Paris.
- Bull. Sta. Aquic. Pêch. Castiglione.—Bulletin des Travaux. Station d'Aquiculture et de Pêche de Castiglione. Alger.
- Bull. Sta. Océanogr. Salammbô. Bulletin. Station Océanographique de Salammbô. Tunis.
- Bull. Trim. Pêch. Marit.—Bulletin Trimestriel de l'Enseignement Professionnel et Technique des Pêches Maritimes. Orléans, Paris.
- Bull. U. S. Bur. Fish.—Bulletin of the [United States] Bureau of Fisheries. Washington. *Formerly* Bulletin of the United States Fish Commission. Washington.
- Bull. U. S. Fish Comm.—Bulletin of the United States Fish Commission, Washington. *Cont'd as* Bulletin of the [United States] Bureau of Fisheries.

4.3. C

- C. R. Acad. Sci. Paris.—Compte Rendu Hebdomadaire des Séances de l'Académie des Sciences. Paris.
- C. R. Assoc. Française Avanc. Sci.—Compte Rendu de l'Association Française pour l'Avancement des Sciences. Paris.
- C. R. Cong. Soc. Sav., Paris, Dijon.—Compte Rendu. Congrès des Sociétés Savantes de Paris, tenu à Dijon.
- C. R. Soc. Biol. Paris.—Compte Rendu Hebdomadaire des Séances et Mémoires de la Société de Biologie. Paris.
- California Fish.—California Fisheries. San Pedro, California. *Cont'd as* West Coast Fisheries.
- California Fish Game.—California Fish and Game. Sacramento.
- Canadian Fish.—Canadian Fisherman. Gardenvale.
- Commun. Acad. Mar. Paris.—Communications et Mémoires. Académie de Marine. Paris.
- Cong. Intern. Pêch. Marit.—Congrès International des Pêches Maritimes, d'Ostrèiculture, et d'Aquiculture Marine. Dieppe; *and* Paris.
- Cong. Nat. Pêch. Marit.—Congrès National des Pêches Maritimes tenu à Tunis; Orleans; *and* Sables d'Olonne. Paris.
- Contrib. Biol. Hopkins Lab.—Contributions to Biology from the Hopkins Seaside Laboratory of the Leland Stanford Jr. University. Palo Alto.
- Copeia. New York.
- Cosmos. Revue des Sciences et leurs Applications. Paris.

4.4. D

- Dir. Gen. Mar. Mer.—Direzione Generale della Marina Mercantile. Roma.

4.5. E

- Edinburgh Philos. Journ.—Edinburgh New Philosophical Journal. Edinburgh.

4.6. F

Fauna och Flora. Upsala.

Fischerbote.—Der Fischerbote. Hamburg.

Fischwirtschaft.—Die Fischwirtschaft. Wesermünde.

Fish. Bull. Div. Fish Game California.—Fish Bulletin. Division of Fish and Game of California. Sacramento.

Fish. Gaz. London.—Fishing Gazette. London.

Fish. Gaz. New York.—Fishing Gazette. New York.

Fish. News.—Fishing News. London.

Fish Oyster Repr.—Fish and Oyster Reporter. Tampa.

Fish Trades Gaz.—Fish Trades Gazette. London.

Fiskets Gang. Bergen.

Food. 'Round World.—Foodstuffs 'Round the World. Fishery News. Department of Commerce. Washington.

Forest Stream.—Forest and Stream. New York.

Förh. Svenska VetAkad.—Förhandlingar, Öfversigt af . . . Svenska Vetenskapsakademien. Stockholm.

Forh. VidSelsk. Kristiania.—Forhandlingar i Videnskabselskabet i Kristiania.

Forh. VidSelsk. Oslo.—Forhandlingar. Videnskabs-Selskab. Oslo.

4.7. G

Gaz. Italia.—Gazzetta d'Italia. Firenze.

4.8. H

Handb. Roy. Zool. Soc. New South Wales.—Handbook. Royal Zoological Society of New South Wales. Sydney.

Handb. Ser. American Mus.—Handbook Series. American Museum of Natural History. New York.

Handl. Göteborgs VetSamh.—Handlingar, Nya. Göteborgs Kungl. Vetenskaps-Vitterhetssamhalles. Göteborg.

4.9. I

Ind. Française Cons.—L'Industrie Française de la Conserve. Paris.

Intern. Fish. Exhib. Lit.—International Fisheries Exhibition Literature. London.

Intern. Fishery Cong.—Congresso Internazionale di Pesca. (International Fishery Congress.)

Intern. Revue Hydrobiol. Hydrogr.—Internationale Revue der Gesamten Hydrobiologie und Hydrographie. Leipzig.

Irish Naturalist. Dublin.

Iris.—Revue Consacrée à l'Histoire de la Science. Bruxelles.

4.10. J

Jahrb. Class. Phil.—Jahrbücher für Classische Philologie.

Jahresber. Deutsche Fisch.—Jahresbericht über die Deutschen Fischerei.

Jahresber. Wiss. Meeresuntersuch.—Jahresbericht Wissenschaftliche Meeresuntersuchungen. (Biologische Anstalt auf Helgoland; Kommission zur Wissenschaftlichen Untersuchung der Deutschen Meere in Kiel.) Berlin.

Journ. Biol. Chem.—Journal of Biological Chemistry. New York.

Journ. Bombay Nat. Hist. Soc.—Journal of the Bombay Natural History Society. Bombay.

Journ. Coll. Agric. Tokyo.—Journal of the College of Agriculture. Tokyo (Hokkaido) Imperial University. Sapporo.

Journ. Coll. Sci. Tokyo.—Journal of the College of Science. Imperial University of Tokyo. Tokyo.

Journ. Conseil.—Journal du Conseil. Conseil Permanent International pour l'Exploration de la Mer. Copenhagen.

Journ. Imp. Fish. Bur. Tokyo.—Journal of the Imperial Fisheries Bureau. Tokyo.

Journ. Mar. Biol. Assoc.—Journal of the Marine Biological Association of the United Kingdom. Plymouth.

Journ. Morph.—Journal of Morphology. Boston.

Journ. Mus. Godeffroy.—Journal des Museum Godeffroy. Hamburg.

Journ. Pan-Pacific Res. Instn.—Journal of the Pan-Pacific Research Institution. Honolulu.

Journ. Roy. Asiatic Soc.—Journal of the Royal Asiatic Society. London.

4.11. L

Lettura.—Revista Mensile Del Corriere della Sera. Milano.

4.12. M

Mem. Acad. R. Belgique.—Mémoires. Academie Royale de Belgique. Classe des Sciences. Série II. Bruxelles.
Formerly Mémoires de l'Academie Royale des Sciences, des Lettres et des Beaux-arts de Belgique. Bruxelles.

Mem. Accad. Lincei.—Memorie. Atti della R. Accademia Nazionale dei Lincei. Classe di scienze fisiche, matematiche e naturali. Roma.

Mem. American Acad. Arts Sci. Boston.—Memoirs of the American Academy of Arts and Sciences. Boston.

Mem. California Acad. Sci.—Memoirs. California Academy of Sciences. San Francisco.

Mem. Carnegie Mus.—Memoirs of the Carnegie Museum. Pittsburgh.

Mem. Ser. U. S. Bur. Fish.—Memorandum Series. United States Bureau of Fisheries. Washington.

Mém. (Sér. Spéc.) off. Pêch. Marit.—Mémoires. (Série Spéciale.) office Scientifique et Technique des Pêches Maritimes. Paris.

Mem. Soc. Hist. Nat. Paris.—Mémoires. Société d'Histoire Naturelle de Paris. Paris.

Mem. Talasso. Italiano.—Memoria. R. Comitato Talassografico Italiano. Venezia.

Merc. Trust Rev.—Mercantile Trust Review. San Francisco.

Miss. Italiana Esplor. Levante.—Missione Italiana per l'Esplorazione dei Mari di Levante. Venezia.

Mitt. Deutsch. SeefischVer.—Mitteilungen des Deutschen Seefischereivereins. Berlin.

4.13. N

Nat. Geneesk. Arch. Neêrland's-Indië.—Natuur- en Geneeskundig Archief voor Neêrland's-Indië. Batavia.

Nat. Geogr. Mag.—National Geographic Magazine. Washington.

Nat. Hist.—Natural History. American Museum of Natural History. New York.

Nat. Tijdschr. Nederlandsch-Indië.—Natuurkundig Tijdschrift voor Nederlandsch-Indië. Batavia.

NatHist. Tidsskr.—Naturhistorisk Tidsskrift. Kjøbenhavn.

Natura.—Milano.

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Neptunia. Venezia.

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Nya Handlingar. *See* Handlingar, Nya.

Nye Samling. *See* Samling, Nye.

4.14. O

Occ. Pap. California Acad. Sci.—Occasional Papers of the California Academy of Sciences. San Francisco.

Öfversigt af . . . Förhandlingar. *See* Förhandlingar, Öfversigt af.

4.15. P

Pacific Fish.—Pacific Fisherman. Seattle.

Pacific Fish. Yr. Bk.—Pacific Fisherman. Year Book. Seattle. *Cont'd. as* Pacific Fisherman. Statistical Number.

Pacific Fish. Stat. No.—Pacific Fisherman. Statistical Number. *Formerly* Pacific Fisherman. Year Book.

Pacific Mot. Boat.—Pacific Motor Boat. Seattle.

Pacific Sport.—Pacific Sportsman. San Francisco.

Pêch. Marit.—La Pêche Maritime. Paris.

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Proc. California Acad. Sci.—Proceedings of the California Academy of Sciences. San Francisco.

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Proc-Verb. Comm. Explor. Méditerranée.—Rapports et Procès-Verbaux. Commission International pour l'Exploration Scientifique de la Mer Méditerranée. Paris.

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4.16. R

Rec. South Australian Mus.—Records of the South Australian Museum. Adelaide.

Rend. Accad. Lincei.—Rendiconti. Atti della R. Accademia Nazionale dei Lincei. Classe di scienze fisiche, matematiche e naturali. Roma.

Rend. Ist. Lombardo.—Rendiconti dell'Istituto Lombardo di Scienze e Lettere. Milano.

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Res. Camp. Acuerd. Intern.—Resultado Campañas Realizadas por Acuerdos Internacionales bajo la Dirección del Prof. Odón de Buen. Madrid.

Rés. Camp. Sci. Monaco.—Résultats de Campagnes Scientifiques Accomplies par le Prince Albert I. Monaco.

Revist. Portugueza Colon. Marit.—Revista Portugueza Colonial e Maritima. Lisboa.

Revue Gén. Sci. Pur. Appl.—Revue Générale des Sciences Pures et Appliquées. Paris.

Revue Marit. Colon.—Revue Maritime et Coloniale. Paris.

Revue Sci. Nat. Ouest.—Revue des Sciences Naturelles de l'Ouest. (Institut International de Bibliographie Scientifique.) Paris.

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Revue Tunisienne Sci. Méd.—Revue Tunisienne des Sciences Médicales. (Société des Sciences Médicales de Tunis.) Tunis.
Rivist. Marit.—Rivista Marittima. Roma.
Rivist. Mens. Pesca.—Rivista Mensile di Pesca. Pavia. *Cont'd as* Bollettino Società Lombardo per la Pesca e l'Aquicoltura.
Rivist. Mens. Tour. Club Italiano.—Rivista Mensile del Touring Club Italiano. Milan.

4.17. S

Saml. Norske Vidensk. Selsk. Skrift.—Samling, Nye. Kongelige Norske Videnskabernes Skrifter. Trondhjem.
Sci. American.—Scientific American. New York.
Sci. Mon.—Scientific Monthly. New York.
Science. New York.
Scottish Naturalist. Edinburgh. *Formerly* Annals of Scottish Natural History.
Sec. Stat. Dept. Agric. Comm.—Section of Statistics. Department of Agriculture and Commerce. Tokyo.
Selsk. Norske Fisk. Fremme.—Selskapet for de Norske Fiskeriers Fremme. Bergen.
Serv. Reg. Announc.—Service and Regulatory Announcements. United States Department of Agriculture. Bureau of Chemistry. Washington.
SitzBer. Gesell. Naturf. Freunde Berlin.—Sitzungsberichte der Gesellschaft Naturforschender Freunde. Berlin.
Skr. Danske Vidensk. Selsk.—Skrifter. Kgl. Danske Videnskabernes Selskab. Kjøbenhavn.
Skr. Komm. Havundersøg.—Skrifter Udgivne af Kommissionen for Havundersøgelser. Kjøbenhavn.
Smithson. Misc. Coll.—Smithsonian Miscellaneous Collections. Washington.
Spec. Cat. Imp. Fish. Bur. Tokyo.—Special Catalogue. Imperial Fisheries Bureau. Tokyo.
Sporten. Helsingfors.
Stanford Univ. Publ.—Stanford University Publications. University Series. Biological Sciences. Palo Alto.
Staz. Sper. Agrarie Italiane.—Stazioni Sperimentali Agrarie Italiane. Turin.
Svensk FiskTid.—Svensk Fiskeritidskrift. Stockholm.

4.18. T

Tech. Educ. Ser. Tech. Mus. Sydney.—Technical Education Series. Technological Museum. Sydney.
Toil. Deep.—Toilers of the Deep. The Monthly Magazine of the Royal Mission to Deep Sea Fishermen. London.
Touring Topics. Los Angeles.
Trans. New Zealand Inst.—Transactions and Proceedings of the New Zealand Institute. Wellington.
Trans. Zool. Soc. London.—Transactions of the Zoological Society of London.
Trav. Sta. Biol. Lisbonne.—Travaux de la Station Biologie Maritime de Lisbonne. Lisboa.

4.19. U

Univ. California Publ. Zool.—University of California Publications in Zoology. Berkeley.

4.20. V

Verh. Batavia. Genoot. Kunst. Wetens.—Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen. Batavia.
Versl. Akad. Amsterdam.—Verslagen van de Gewone Vergaderingen der Wis en Natuurkundige Afdeeling. Konink Akademie van Wetenschappen. Amsterdam.

4.21. W

West Coast Fish.—West Coast Fisheries. San Pedro, California. *Formerly* California Fisheries.
West. Can. Pack.—Western Canner and Packer. San Francisco.

4.22. Z

Zool. Anz.—Zoologischer Anzeiger. Leipzig.

Zool. Gart.—Zoologische Garten. Frankfurt-am-Main. *Cont'd as* Zoologischer Beobachter.

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Dutch West Indies	+
Metzelaar, 1919.	+
Greece	+
Hoffman and Jordan, 1892.	+
Hawaii	+
Fowler and Ball, 1925.	+
Jordan and Evermann, 1905.	+
Jordan and Jordan, 1922.	+
India	+
Day, 1878, 1889.	+
Indo-Australian Archipelago	+
Weber, 1913.	+
Indo-China	+
Chabanaud, 1926.	+
Japan	+
Jordan, Tanaka and Snyder, 1913.	+
Kitahara, 1897.	+
Richardson, 1845.	+
Temminck and Schlegel, 1850.	+
Madagascar	+
Bleeker, 1875.	+
Sauvage, 1891.	+
Malay Archipelago	+
Cantor, 1850.	+
Mediterranean	+
Cuvier and Valenciennes, 1831.	+
Rafinesque-Schmaltz, 1810.1, 1810.2.	+
Risso, 1810, 1826.	+
Norway	+
Collett, 1882.	+
Red Sea	+
Klunzinger, 1884.	+
Scandinavia	+
Brunchorst, 1898.	+
Collett, 1882.	+
Fries, Ekstrom and Sundevall, 1893.	+
Nilsson, 1864.	+
Siam	+
Bleeker, 1865.	+
South Sea	+
Günther, 1876.	+
Straits Settlements	+
Bleeker, 1861.1.	+
United States, east coast	+
Baird, 1873.	+
Fowler, 1920.	+
Gill, 1873.	+
Goode, 1879, 1903.	+
Gudger, 1929.	+
Townsend, 1911.	+
West Indies	+
Jordan, 1887.	+
Reproduction	-
Ehrenbaum, 1924.	+
Fries, Ekstrom and Sundevall, 1893.	+
Goode, 1884.	+
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Navarro, 1928.	-
Synonymy	-
Carus, 1893.	+
Day, 1878, 1889.	+
Fries, Ekstrom and Sundevall, 1893.	+
Guichenot, 1850.	+
Günther, 1860, 1876.	+
Jordan and Evermann, 1905.	+
Jordan, Tanaka and Snyder, 1913.	+
La Blanchère, 1868.	+
Klunzinger, 1884.	+
Metzelaar, 1919.	+
Moreau, 1881.	+
Parona, 1919.	+
Richardson, 1845.	+
Weber, 1913.	+
Winther, 1879.	+
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Ehrenbaum, 1924.	+
Günther, 1880.	+
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Kishinouye, 1923.	-

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Lacépède, 1829.	*
Lilljeborg, 1891.	*
Canning	-
Cobb, 1919.1.	-
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Chemical analysis	-
Dill, 1921.1.	*
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Rüppel, 1835.	*
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Craig, 1929.	*
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Japan	-
Jordan, Tanaka and Snyder, 1913.	+
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Chabanaud, 1925.	*
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Jordan and Evermann, 1926.1.	+
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Coleman, 1923.	*
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Årsher, Vedkom. Norges Fisk., 1928.	*
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France	-
Ausland, 1861.	*
Bull. U. S. Fish. Comm., 1886.	*
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Grandbesançon, 1909.	*
Guemenez, 1912.	*
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In California	-
Pacific Fish. Yr. Bk., 1923.1.	+
In Mediterranean	-
Buen, F., 1925.	+
Gourret, 1894.5.	+
Meunier, 1868.	+
Parona, 1919.	+
Raveret-Watel, 1909.	+
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Value	-
Faber, 1883.	+
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California	-
California Fish Game, 1914.2, 1920.1, 1920.2, 1923.	+
Collins, 1924.	+
Japan Yr. Bk., 1918.	+
Smith, 1915.	+
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Leca, 1911.	+
Levi-Morenos, 1895.	+
Parona, 1919.	+
Pavesi, 1889.	+
Spain	-
Bellón Uriarte, 1926.	+
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Amico, 1816.	*
Anonymous, 1883.1.	*
Brydson, 1806.	*
Gamberini, 1918.	*
Hilgendorf, 1890.	*
Parona, 1898, 1919.	*
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Polidor, J., 1912. *
 Raggi, 1894. *
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Higgins, Elmer H. A Study of Fluctuations in the Sardine Fishery at San Pedro.
Thompson, Will F. Errors in the Method of Sampling Used in the Study of the California Sardine.
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