

COMISION INTERAMERICANA DEL ATUN TROPICAL INTER-AMERICAN TROPICAL TUNA COMMISSION

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Vacancy Announcement

Senior Statistician for the Inter-American Tropical Tuna Commission (IATTC)

The Inter-American Tropical Tuna Commission (IATTC) invites applications for the position of Senior Statistician. This is a full-time appointment to work at the headquarters of this international organization, located in La Jolla, California, U.S.A.

The IATTC is one of five regional fisheries management organizations in the world. The IATTC is responsible for ensuring the long-term conservation and sustainable use of the stocks of tunas and tuna-like species, and other species of fish, taken by vessels fishing in the eastern Pacific Ocean. The IATTC employs a dedicated scientific staff that operates under the supervision of the Director of the Commission and of its Coordinator of Scientific Research. The functions of the scientific staff include, among others, conducting scientific research, providing information and scientific advice for management, and development and maintenance of data collection programs. More information about the IATTC can be found at www.iattc.org. The staff's [research activities](#) defined under the [Strategic Science Plan](#) are divided among several programs: Stock Assessment, Ecosystem and Bycatch, Biology, Data Collection and Database.

The selected applicant will be expected to work in both an applied and theoretical statistics capacity, developing new and/or extending existing statistical methods as required to solve applied problems in fisheries and conducting data analyses, as part of the IATTC Stock Assessment Program. However, the selected applicant will also be expected to assist IATTC scientific staff members from other programs.

Work in the Stock Assessment Program covers range of topics, which often involve statistical methods development, including population trend estimation, population assessments, spatio-temporal studies of fishing vessel behavior, development of sophisticated data screening algorithms for fisheries data review, and sampling designs for data collection by human observers and electronic monitoring. Several upcoming projects in this Program include:

- Spatio-temporal modelling of tuna tagging data. This project will involve joining a spatio-temporal mixture model for the tuna population distribution with an advection-diffusion model of the tagged individuals to deal with spatially limited tag releases and the consequent initial non-mixing.
- Close-kin mark-recapture. This project will involve the use of genetics to “tag” adults through kinship (parent offspring pairs (POPs) and half sibling pairs (HSPs)) to estimate species abundance. This requires developing statistical models to estimate the probability of POPs and HSPs from spatio-temporally non-random sampling.

- Developing a sampling program in Latin America. This project involves developing a practical sampling design to estimate total catch by species and length composition from shark fisheries in EPO coastal nation based longliners and artisanal vessels.

Duties of the selected applicant may include, among others:

- Analyzing various types of univariate and multivariate fisheries data (e.g., catch and effort, morphometric, environmental, mark-recapture, genetics, electronic monitoring).
- Developing sampling designs for diverse data collection programs, including catch and effort, electronic monitoring and mark-recapture.
- Providing statistical support to various IATTC scientific programs.
- Working with large, relational data bases.
- Contributing statistical analyses to reports and publications led by fisheries scientists on non-statistical matters.
- Writing IATTC technical reports and publications for peer-reviewed journals on statistical matters.
- Presenting results of statistical analyses and methods development at IATTC meetings.

Selection Criteria

A PhD in statistics with both theoretical and applied components, or a PhD from a quantitative interdisciplinary graduate program with solid theoretical statistics course work, is strongly preferred, but extensive relevant work experience will be considered for applicants with a master's degree in statistics or from a quantitative interdisciplinary graduate program.

Candidates should also possess the following skills:

- Proficiency in exploratory data analysis methods, including techniques for multivariate data.
- Proficiency with standard statistical modeling techniques such as generalized linear and additive models, mixture models, for Gaussian and non-Gaussian data, including count data with zero-inflation.
- A solid understanding of theoretical statistics and how to apply this knowledge to create new methods and modify existing methods to solve practical problems.
- Theoretical knowledge and practical experience with a range of spatio-temporal modelling approaches for diverse data types, including approaches for non-stationary data.
- Proficiency in the use of machine learning algorithms (e.g. random forests, support vector machines, clustering algorithms).

- Ability to develop and implement simulations and related analyses for development of sampling designs.
- Proficiency with the R programming language.
- Willingness to work in an office setting, primarily with computer databases, computer programs, and statistical software.
- Willingness to travel when necessary.
- Strong inter-personal skills and experience working as a part of a team, as well as working independently.
- Willingness to learn new skills and to self-teach new statistical methods.
- Creativity to adapt current methods or develop new methods to solve practical fisheries problems.
- Excellent communication skills, both oral and written.
- Working knowledge of English or Spanish, and at least reading fluency in English and an ability to hold a conversation in that language.
- Multiple first-author publications in peer-reviewed, quantitative journals.

Salary and Allowances

Commensurate with qualifications, skills, and experience the candidate chosen for the post will be appointed as “Statistician” or “Senior Statistician”. The base salary for an applicant with a PhD and limited experience will be equivalent to an adjusted US Federal pay grade GS 13:1. (US\$ 107,800 per year). Higher salaries will be considered based upon experience.

Allowances include annual leave with pay, sick leave with pay, medical, dental and life insurance and a defined contribution pension plan.

Availability

The candidate chosen for the post should be available to report at IATTC headquarters in early September, 2021, or as soon as possible thereafter.

Applications

Applications may be submitted in either English or Spanish and should be sent no later than **1 June 2021** in electronic format to tmusano@iattc.org, or to the following address:

Teresa Musano
Inter-American Tropical Tuna Commission
8901 La Jolla Shores Drive,
La Jolla CA 92037-1509
USA

Applications should include the following:

- A cover letter containing a statement of purpose of the application and succinct descriptions of the applicant's experiences and abilities.
- Curriculum Vitae – preferably the applicant should fill, electronically or in hardcopy, the IATTC personal history form that can be accessed at www.iattc.org/StaffVacancies/IATTCPersonalHistoryForm.pdf
- Official copy of transcripts and college degree.
- List of training courses, special skills, certificates and licenses, honors, or awards that relate to the specific description of this announcement. Please do not include copies of certificates.
- List of publications
- Letters of reference from persons with a recent knowledge of the applicant's character, qualifications and experience.
- A statement as to whether or not the applicant's current supervisor may be contacted.

Additional Information

Additional background information on the position may be found below (see Appendix).

Appendix. –

IATTC Senior Spatial Statistician (Vacancy Announcement) Background Information

The Inter-American Tropical Tuna Commission (IATTC; www.iattc.org) is an international organization located in La Jolla (San Diego), California, that is responsible for managing tuna and tuna like species in the eastern Pacific Ocean. The IATTC employs a dedicated scientific staff to implement the [Strategic Science Plan](#) and its [research activities](#) which are divided among several Programs: Stock Assessment, Ecosystem and Bycatch, Biology, Data Collection and Database.

The IATTC is recognized worldwide for its research and management. It conducts a variety of types of research including fisheries stock assessment methodology development, mark-recapture studies, age and growth studies, spawning ecology of captive yellowfin tuna, dynamic ocean management, ecosystem modelling, bycatch reductions methods development, risk analysis, Ecological Risk Assessment, management strategy evaluation, and applications development for electronic monitoring data. The IATTC has a variety of spatial-temporal databases including one of the most comprehensive bycatch databases based on data collected by observers on 100% of trips of large purse seiners.

The IATTC Stock Assessment Program, the program in which the statistician position will be based, is responsible for conducting stock assessments on tunas and other species and providing management advice. The main species with comprehensive assessments are bigeye and yellowfin tuna, and there are plans to assess skipjack tuna when data from the in-progress mark-recaptures studies become available. The IATTC staff also collaborate with ISC members to conduct assessments for Pacific bluefin tuna, Albacore tuna, and other species such as billfish and sharks. IATTC staff have also conducted assessment of non-tuna species such as silky sharks and dorado. The IATTC has a dolphin research program that includes data collection and assessments and is currently executing pilot programs in preparation for conducting a line-transect survey using both ship-based and drone-based methods.

The IATTC is also a cofounder of the national award-winning Center for the Advancement of Population Methodology (CAPAM; <http://www.capamresearch.org/>). CAPAM is recognized as a leader in the development of fisheries stock methodology and has won both the 2018 American Fisheries Society's (AFS) William E. Ricker Resource Conservation Award and the 2017 American Institute of Fishery Research Biologists' (AIFRB) Outstanding Group Achievement Award. CAPAM's reputation is a result of its successful workshop series and accompanying species issues in the journal Fisheries Research. The workshops have covered several topics including: next generation stock assessment models, spatial stock assessment models, spatio-temporal modelling, recruitment, data weighting, growth, and selectivity. A workshop on natural mortality was

organized for 2020 and has been postponed for 2021, and a workshop on stock assessment good practices is scheduled for 2022.

Due to the increasing amount of fine resolution spatial-temporal data, the increasing power of computers, and the acknowledgement that spatial-temporal structure is important for understanding and managing fish populations, the IATTC is conducting several research projects that require the use of spatial statistics.

The following describes a variety of projects being conducted at the IATTC.

Develop spatio-temporal models for creating indices of relative abundance and associated size composition data.

Indices of relative abundance derived for catch-per-unit-effort (CPUE) data are the most important piece of information in the bigeye and yellowfin stock assessments. These indices are also associated with size composition data that are used to determine what component of the population they represent. However, temporal changes in the spatial distribution of the fleet need to be modelled to reduce biases in the indices. Three dimensional (latitude-longitude-time) spatio-temporal models are extended to four dimensions (latitude-longitude-time-length) to model the length compositions.

Close-kin mark-recapture

Close kin mark recapture (CKMR) uses genetic information to estimate spawning biomass and adult survival through parent offspring pairs and half sibling pairs. These genetic relationships are used to “tag” individuals and removes the issues with traditional mark-recapture studies associated with tagging related mortality, tag loss, and detection. Algorithms are need to identify related individuals, minimize false positives, and calculate probabilities of relationships. Sampling designs are essential for the success of the CKMR study. Uncertainty associated with aging individuals needs to be incorporated into the analysis. The estimates of abundance and survival will be incorporated into the stock assessment. The IATTC is only starting to develop CKMR for stock in the EPO and much development work is expected.

Dynamic Ocean Management

Spatial management is becoming a common tool to manage fish populations, particularly for multi-species fisheries. The capture of bigeye and yellowfin tuna in the purse-seine fishery on floating objects that targets skipjack tuna is a management concern for the IATTC. Initial work evaluating spatial closures indicates that the optimal areas to close change annually and seasonally. Spatio-temporal models including environmental conditions are used to predict catch rates and evaluate dynamic spatial closures. These approaches can be used for other species including bycatch and protected species.

Assessing skipjack tuna using spatio-temporal models of tagging data that deal with incomplete mixing

Currently there is no comprehensive stock assessment for skipjack tuna in the EPO. Recently initiated mark-recapture (tagging) studies should provide information that could be used to develop a stock assessment. Practical issues in tagging skipjack tuna make

distributing tags through the EPO difficult and therefore dealing with tag mixing is an important issue. An abundance model based on spatio-temporal modelling combined with an advection-diffusion model for tagging individuals will be used to deal with tag mixing to estimate abundance of skipjack tuna.

Revise trend estimation methods for purse-seine silky shark indices for the EPO

Fluctuations in the index of relative abundance for juvenile silky sharks is correlated with inter-annual variability in oceanographic conditions in the offshore area of the northern EPO. Recent fluctuations in the index are not biologically realistic, compromising the reliability of the index as a stock status indicator. New methods that combine spatial data from multiple fleets and fishing methods across the entire Pacific Ocean are necessary to estimate more reliable trends in relative abundance for the silky shark using purse-seine observer data.

Investigate the movements, behavior, and habitat utilization

Archival tagging data is available for several species in the EPO (e.g. yellowfin, bigeye, silky sharks). These data can be analyzed to describe geographic variation in horizontal movements, vertical behavior and habitat utilization, as well as to estimate post release survivorship to help develop efficient bycatch mitigation measures. Analysis of tagging data is also used to define species habitat models to be used in ecological risk assessments (ERAs; see below)

Develop habitat models for bycatch species caught in the EPO to support spatially-explicit ecological risk assessments (ERAs)

Ecosystem based fisheries management (EBFM) has become an important concept that international fisheries agencies have to address. Reducing bycatch is an important component of EBFM and can be facilitated by developing habitat models for all bycatch species caught in EPO tuna fisheries. The resulting distribution maps can also be used for ecological risk assessment models using the spatial overlap of fishing effort with a species' distribution. A spatially-explicit model for quantifying the cumulative impact of multiple fisheries on data-limited bycatch species in the EPO will be developed. The model can be used to prioritize potentially vulnerable species for further data collection, research and/or management.

Spatial stock assessment models

Initial analysis of a variety of data sets (e.g., mark-recapture, genetics, microchemistry, catch rates, catch composition) has indicated that there is spatial structure in the tuna populations in the eastern Pacific Ocean (EPO) and the Pacific Ocean, in general. This means that assessments and management need to take the spatial structure into consideration. Research has investigated the impact on stock status and management using a single stock assessment for the whole EPO, multiple independent stock assessments within the EPO, and interacting sub-stocks.

To learn more about some these projects and other research at IATTC please see the following select publications:

Lennert-Cody, C.E., Maunder, M.N., Román, M.H., Xu, H., Minami, M., Lopez, J. 2020. Cluster analysis methods applied to daily vessel location data to identify cooperative fishing among tuna purse-seiners. *Environmental and Ecological Statistics* 27: 649-664.

Lennert-Cody, C. E., Buckland, S. T., Gerrodette, T., Webb, A., Barlow, J., Fretwell, P., Maunder, M. N., Kitakado, T., Moore, J. E., Scott, M. D., Skaug, H. J. 2018. Review of potential line-transect methodologies for estimating abundance of dolphin stocks in the eastern tropical Pacific. *Journal of Cetacean Research and Management*, 19. 9-21.

Lennert-Cody, C.E., Clarke, S.C., Aires-da-Silva, A., Maunder, M.N., Franks, P.J.S., Román, M., Miller, A.J., Minami, M., 2018. The importance of environment and life stage on interpretation of silky shark relative abundance indices for the equatorial Pacific Ocean. *Fish. Oceanogr.* 28, 43-53.

Lennert-Cody, C.E., Berk, R.A. 2007. Statistical learning procedures for monitoring regulatory compliance: An application to fisheries data. *Journal of the Royal Statistical Society, Series A.* 170, Part 3: 671-689.

Maunder, M.N., Thorson, J.T., Xu, H., Oliveros-Ramos, R., ... 2020. The need for spatio-temporal modeling to determine catch-per-unit effort based indices of abundance and associated composition data for inclusion in stock assessment models. *Fish. Res.* 105594.

Maunder, M. N. and Piner, K. R. 2017. Dealing with data conflicts in statistical inference of population assessment models that integrate information from multiple diverse data sets. *Fisheries Research.* 192: 16-27.

Xu, H., Lennert-Cody, C. E., Maunder, M. N., Minte-Vera, C. V. 2019. Spatiotemporal dynamics of the dolphin-associated purse-seine fishery for yellowfin tuna (*Thunnus albacares*) in the eastern Pacific Ocean. *Fisheries Research*, 213, 121-131.

Reports

Dynamic Ocean Management

https://www.iattc.org/Meetings/Meetings2019/SAC-10/INF/English/SAC-10-INF-D_Bigeye%20tuna%20Dynamic%20Ocean%20Management.pdf