COMISION INTERAMERICANA DEL ATUN TROPICAL
INTER-AMERICAN TROPICAL TUNA COMMISSION

8901 La Jolla Shores Drive, La Jolla CA 92037-1509, USA – www.iattc.org
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Vacancy Announcement

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

The Inter-American Tropical Tuna Commission (IATTC) invites applications for the position of Senior Statistician specialized in spatial statistics. 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 the regional fisheries management organization responsible for the implementation of the 2003 Antigua Convention, the objective of which is to ensure 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 for tunas and tuna like species 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 are defined in article XIII of the Convention and include, among others, conducting scientific research, providing information and scientific advice and collecting statistical data. 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 applied spatial statistics but with the opportunity to developed new statistical methods to address unique problems in fisheries, as part of the IATTC Stock Assessment Program. The selected applicant will also be expected to assist IATTC scientific staff members from all other programs specified above, as well as scientists and relevant personnel or institutions from IATTC Members, in the area of spatial statistical analysis and statistical analysis in general. Duties of the selected applicant will be to conduct statistical analysis, as well as other support activities as appropriate and required. These duties may include, among others:

- Spatial analysis of diverse types of data (e.g., fisheries catch and bycatch data, environmental and oceanographic data, mark-recapture data).
- Undertaking exploratory data analyses for spatial and non-spatial data, including developing algorithms for data quality screening.
- Analyzing various data types (e.g., target fisheries catch and effort data, morphometric data, bycatch data, environmental and oceanographic data, mark-recapture data).
- Fitting complex statistical models to various types of data, both spatial and non-spatial.

- Developing new and extending existing statistical methods as required to solve applied problems, particularly for analyzing spatial and spatial-temporal data.
- Writing technical reports and publications on statistical matters.
- Presenting statistical analyses at IATTC meetings and other meetings.

Selection Criteria

A PhD in spatial statistics with both theoretical and applied components, or a PhD from a quantitative interdisciplinary graduate program with a dissertation in spatial statistics, is 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:

- Very knowledgeable about the theoretical aspects of a range of spatial-temporal modelling approaches.
- Strong proficiency in the implementation of spatial models for diverse data types.
- Strong proficiency in exploratory statistical methods, including multivariate analysis techniques.
- Strong proficiency with standard statistical modeling techniques such as generalized linear and additive models, including mixture models (e.g., models for count data with zero-inflation).
- Proficiency in the use machine learning algorithms (e.g. random forests, Boosted regression trees).
- Strong proficiency with the R programming language.
- Familiarity with at least one of the following data types: fisheries, ecological, environmental, oceanographic.
- 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.
- Excellent communication skills, both oral and written.
- Working knowledge of English or Spanish and at least reading fluency in English and ability to hold a conversation in that language. Fluency in both languages, written and oral, will be considered as an asset.
- 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 will be equivalent to an adjusted US Federal pay grade GS 13:1. (US$ 107,800 per year).

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 July, 2020, or as soon as possible thereafter.

Applications

Applications may be submitted in either English or Spanish and should be sent no later than **1 May 2020** 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 accessed at http://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, 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 spatial 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. For example, CAPAM held a workshop on spatio-temporal modelling in 2018 (http://www.capamresearch.org/Spatio-Temporal-Modelling-Mini-Workshop) and the special issue is nearing completion (https://www.sciencedirect.com/journal/fisheries-research/special-issue/100WBJSDQ26).

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 some of those projects.

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.

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.

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 a 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.

Spatially explicit ecosystem model of the EPO

Ecosystem based fisheries management (EBFM) has become an important concept that international fisheries agencies have to address. Most research and management in the EPO have been on reducing bycatch, but this does not address the impact of biological interaction. An ecosystem model of the EPO has been created and is being updated. However, there is spatial variation in the ecosystem process and the environment can have a large impact on population abundance and distribution. Therefore, a spatial ecosystem model is desirable. Data and understanding of the spatial and ontogenetic variation in the feeding ecology will be required to develop the model.

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

Kai, M., Thorson, J.T., Piner, K.R., Maunder, M.N. 2017. Spatiotemporal variation in size-structured populations using fishery data: an application to shortfin mako (Isurus oxyrinchus) in the Pacific Ocean. Canadian Journal of Fisheries and Aquatic Sciences, 2017, 74(11): 1765-1780

Kai, M., Thorson, J.T., Piner, K.R, Maunder, M.N. 2017. Predicting the spatio-temporal distributions of pelagic sharks in the western and central North Pacific. Fish Oceanogr. 2017;26:569–582.

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.

Lee, H-H., Piner, K.R., Maunder, M.N., Taylor, I.G., Methot Jr., R.D. 2017. Evaluation of alternative modelling approaches to account for spatial effects due to age-based movement. Canadian Journal of Fisheries and Aquatic Sciences, 2017, 74(11): 1832-1844

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.

Martínez-Ortiz, J., Aires-da-Silva, A.M., Lennert-Cody, C.E. and Maunder, M.N., 2015. The Ecuadorian Artisanal Fishery for Large Pelagics: Species Composition and Spatio-Temporal Dynamics. PloS one, 10(8), p.e0135136.

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

Spatio-temporal modelling of CPUE and composition data
https://www.iattc.org/Meetings/Meetings2017/SAC-08/PDFs/Docs/_English/SAC-08-05d_Spatial-temporal-modeling-of-CPUE-data.pdf