Título: DETECTING, COUNTING AND SIZING BLUEFIN TUNA SCHOOLS USING MEDIUM RANGE SONARS OF BAITBOATS IN THE BAY OF BISCAY.

Nombre: URANGA AIZPURUA, JON

Universidad: Universidad del País Vasco/Euskal Herriko Unibertsitatea

Departamento: Ciencia de la computación e inteligencia artificial

Fecha de lectura: 17/07/2017

Programa de doctorado: Programa Oficial de Doctorado en Ingeniería Informática

Dirección:

> **Director:** Haritz Joseba Arrizabalaga de Mingo

> **Director:** CARMEN HERNANDEZ GOMEZ

Tribunal:

> **presidente:** BASILIO SIERRA ARAUJO

> **secretario:** Ana Gordoa Ezquerra

> **vocal:** VÍCTOR ESPINOSA ROSELLO

Descriptores:

> INTELIGENCIA ARTIFICIAL

> DINAMICA DE POBLACIONES

El fichero de tesis ya ha sido incorporado al sistema

> http://hdl.handle.net/10810/26207

Localización: REPOSITORIO INSTITUCIONAL E.H.U./U.P.V.

Resumen: This study presents a methodology for the automated analysis of commercial medium-range sonar signals for detecting, counting and sizing bluefin tuna (Tunnus thynnus) schools at the Bay of Biscay. Data can be recorded from commercial fishing campaigns and scientific acoustic systematic sampling surveys in the Bay of Biscay. Image processing techniques are used to analyze sonar screenshots and generate supervised database composed by morphometric characteristics. Data mining techniques are used to test different classification algorithms over the database. The tuna presence/absence classification capacity through sonar imagery is demonstrated by resulting statistical indices. For counting and sizing, a novel methodology is presented, which gathers data from different sources: ¿Tuna¿ and ¿No-Tuna¿ labels (originated from the morphometric classification model) and operational data related to the live baitboat (extracted by an optical character recognition application). These data and scientific observations onboard are used to develop a methodology to estimate the number and size of bluefin tuna schools. Results validation is done by contrasting the number of estimated schools with the number of observed ones. Final number and size of schools represents a first milestone towards the first fisheries independent abundance estimation evaluations. Thus, factors that introduce bias in the inter-annual abundance indices calculation, such as food availability, feeding

behavior and stomach repletion are avoided and the methodology can be applied in two ways: replacing the currently used captures per unit effort (CPUE) index by a detection per unit effort (DPUE) index based on acoustic bluefin tuna school detection or performing systematically sampled acoustic surveys to monitor the presence of this species at the BoB year after year.