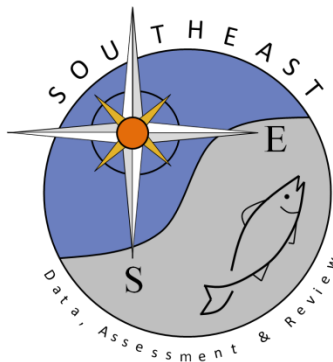Spiny Lobster SEAMAP Program Survey 2021-23


Department of Natural and Environmental Resources


# SEDAR91-RD-12


November 2024

PROGRESS REPORT

Independent fishery data collection for lobster (Panulirus argus) and conch (Lobatus gigas) under the SEAMAP-C program

Prepared by Dr. Juan J. Cruz Motta. Department of Marine Sciences. University of Puerto Rico-Mayagüez.

1. Introduction:

This report provides a description of activities undertaken and completed to date, as well as the results of some preliminary analyses of the available data. To date, CIMA divers training activities have been completed, ossicle extraction and reading processing training completed, locust census work completed, ossicle extraction work completed. Although it has begun, the work of Carrucho censuses and ossicle reading remains to be completed, which will be reported in the next report once the contract with DRNA is renewed.

2. Training:

a. Fieldwork: 100% complete. Between March 20, 2022, and July 14, 2022, 15 training sessions were completed with 12 CIMA students. Of these 12 students, 8 completed all training sessions.
b. Laboratory: Training for the extraction and reading of ossicles is completed. For them, two workshops of one week each were held. The first was conducted at the Florida Fish and Wildlife Service laboratories located in Marathon (Florida) during the month of May 2022. The second training workshop was held at the DRNA Fisheries Laboratories in Cabo Rojo (Puerto Rico) during the month of July 2022. As a result of this training, student Ana Medina (CIMA) is fully trained to carry out this type of analysis on the island of Puerto Rico.

1. Lobster Sampling:

a. Overview: A total of 123 stations were completed with partial participation of CIMA divers. At those 123 stations, a total of 529 individuals were counted. The information about the individuals was delivered to CIMA through an Excel sheet that was checked and subject to quality controls. After fixing inconsistencies, minor typo errors and format changes, it was determined that of those 529 individuals, 26 ($\approx$ 5%) belonged to the species *Panulirus guttatus* and were not used in subsequent analyses. The average count per station (independent of area covered or search time) was approximately 4 individuals (3.84 +/- 4.51 individuals per station), however the distribution of *Panulirus ar*gus was highly aggregated and counts varied between 0 and 50 individuals per station. Of all the individuals who were counted, 405 were measured (chest length) and 301 collected for additional analysis that included: weight, ossicle extraction and collection of gonads and samples for genetic analysis. Of the individuals that were sexed (401), 198 were females ($\approx$ 50%) and the rest (203) were males. The average size of females was 7.74 +/- 2.56 cm, while that of males was 8.89 +/- 2.98 cm, however, the fashion was higher for females (9) than for males (6).

b. Cost-benefit analysis: The database, in addition to the information described above, contained information on sampling station coordinates, dive time at each station, depth, weight, sampling date, and general biological observations. Based on these, estimates of covered area were made based on routes recorded with GPS. These area estimates were only made for those stations that had georeferenced information. Based on the area and time used, it was determined that:

i) Area covered was well variable as it varied between a minimum of 0.000194 and a maximum of 0.096 km2 (average 0.02 +/- 0.017 km2).

ii) Lobster search time per station was very constant between 33 and 73 minutes (average 53.30 +/- 10.37 minutes). This duration range does not include a dive that lasted 20 minutes as it had to be cancelled due to bad weather, and another dive that lasted 103 minutes as 50 lobsters were found.

iii) Consequently, there was no relationship between lobster dive time and the area covered in each dive (Fig. 1). This indicates, as planned, that sampling was geared towards finding individuals rather than estimating some time of abundance indicator (e.g. density).

iv) Regardless of the previous point, area estimates were used to calculate "relative" density estimators, assuming that the search time remained relatively constant. Relative densities of lobsters were highly variable, reporting a range between 0 and 7852 lobsters/km2 with an average of 694 +/- 1412 lobsters/km2. These estimates, however, must be handled carefully since they may be overestimated for those places with little area, but that are dedicated the same search time.

v) Based on density estimates, it was estimated that to achieve a relative accuracy of 10% it is necessary to double the sampling effort (at least 250 sampling stations). This is due to the high variability and aggregate distribution of lobsters. If density estimates are to be made, it is suggested to use standardized units of areas covering between 0.002 and 0.01 km2.

vi) Given the high variability and the fact that the samples were not designed to estimate densities, statistical power analyses were not performed for this parameter.

vii) In relation to the size structure, power analyses indicate that in order to detect changes (1-β = 0.9) of 10% in the average size of lobsters (females and/or males) it is necessary to collect a total of 500 lobsters per sampling region (e.g. West). These values may change if other power values (e.g. 1-β = 0.8) or other effect sizes (e.g. 20% change in locust size are considered (Fig. 2). Please note that to detect differences of 20%.
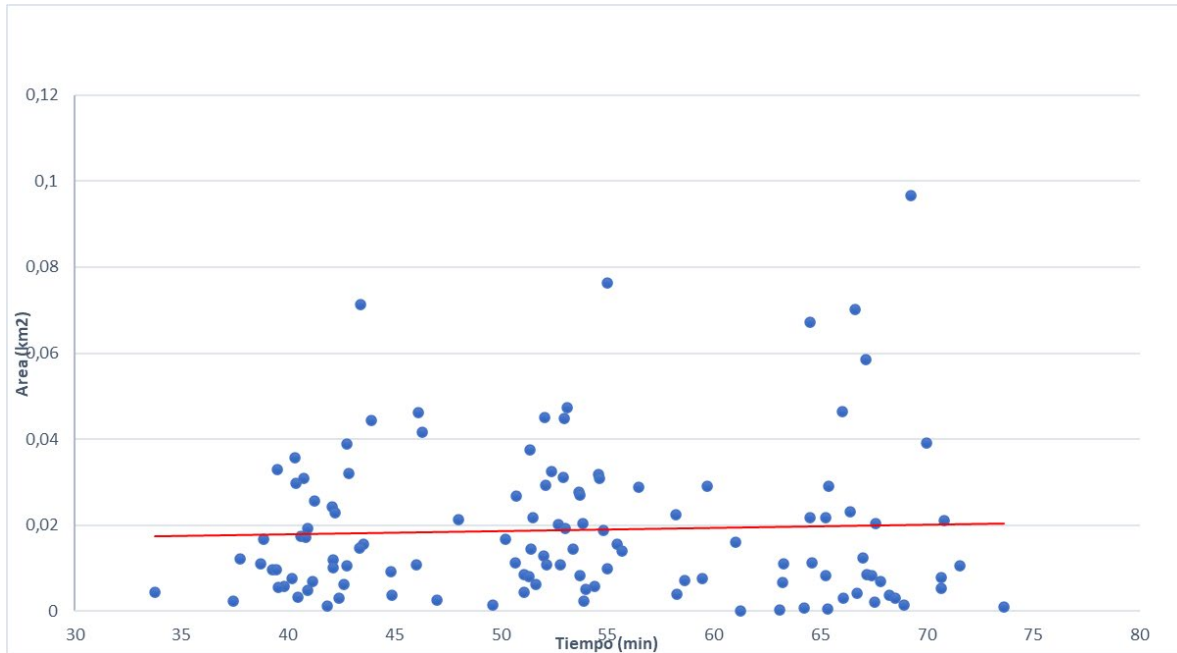
*Figure 1. Relationship diving time and area of each station. Red line = linear model (n.s.).*
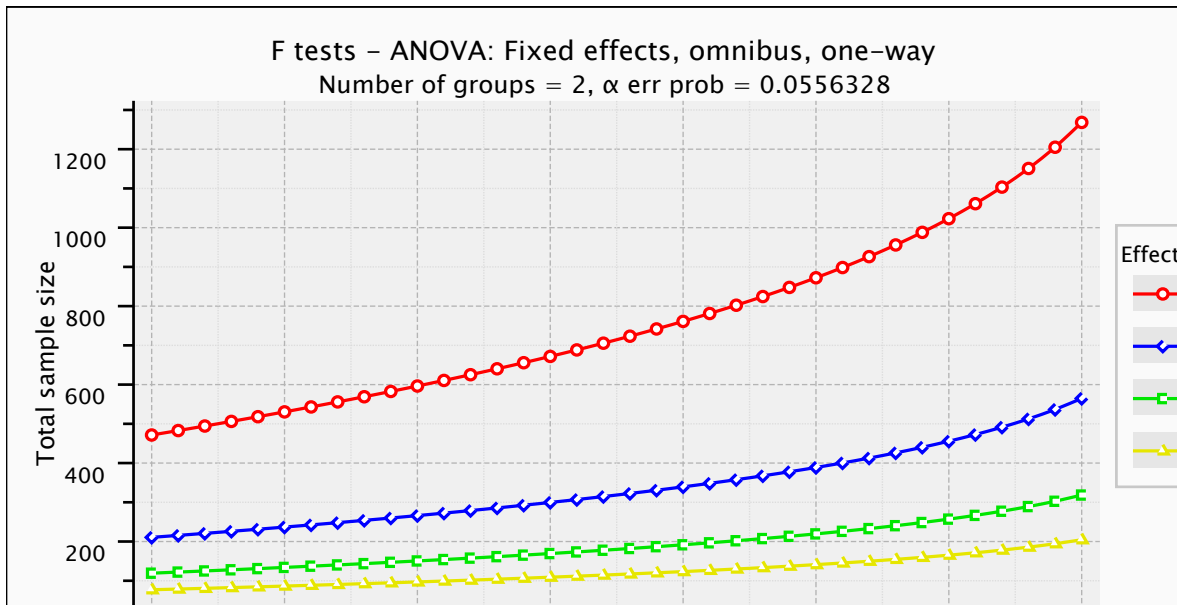


*Figure 2. Relationship between the statistical power (1-β) and the number of samples (individuals) needed to reach this power. Four effect size scenarios are presented (i.e. percentage change in average locust size): 5% = 0.1, 10% = 0.15, 15% = 0.2, 20% = 0.25.*

4. Ossicle analysis:

From the 301 lobsters collected in the fieldwork, ossicles were extracted from 100 lobsters divided into five size categories. The extraction work has been completed in its entirety, although for the thesis of the student Ana Medina it is being considered to raise this number

to 140 to be able to work on a scientific publication. At the moment the student Medina is cutting and polishing the ossicles to prepare them for later reading.

5. Conch sampling:

They began in September 2022, completing a total of nine sampling stations in the southwest and 7 sampling stations in the west, where transect and circle methods were compared. It is expected that these works will be summarized when the contract with the DNER is renewed.