SEACAR Nekton catch per unit effort

In order to analyze the various nekton datasets we must standardize the data to account for varying sampling methods and equipment. Fundament differences between equipment requires nekton data to be split into 3 classifications (Trawls, Seines, Visual). For each of the net based samples we need to be able to calculate the total surface area sampled.

Trawls

Trawls are net sampling that is actively being towed by a vessel. To calculate the total surface area sampled during the trawl we need to know:

1. Size of the net being used (preferably actual net width while deployed)
2. One of the following.
    a. Distance towed
    b. Speed of tow and length of time of tow

Program 60 – **NO ACTUAL NET WIDTH WHILE TRAWLING WAS GIVEN** Many different net configurations and deployments. Data contains gear codes (net widths, heights, mesh etc.), speed of vessel and time net was fished.

Program 69 - 6.1m otter 10 minute trawl has an approximate opening of 4.0m while trawling (5 minute in rivers, 3 minutes in Indian River bay sampling). 0.2 nautical miles is target in Bays, 0.1nm in rivers, 0.07nm in IRBS. 1nm is 1852 meters so in bays approximately 1,482.4 m^2 is sampled, 741.2 m^2 in rivers and 518.56 m^2 in IRBS. **Bays effort correction is 14.824, Rivers correction is 7.412, IRBS correction is 5.1856**

Program 115 - **NO ACTUAL NET WIDTH WHILE TRAWLING WAS GIVEN** 6.1m otter 2-3 knts for 10 minutes effort = 30.887 (2.5knts is 1.28611m/s *600 (10 minutes) = 771.666m*4.0m = 3086.664m^2 /100 is an effort correction of 30.887) (assuming a net trawling width of 4.0m measured by Program 69)

Program 115 – **NO ACTUAL NET WIDTH WHILE TRAWLING WAS GIVEN** 4.9m otter 2-3 knts for 10 minutes (2.5knts is 1.28611m/s *600 (10 minutes) = 771.666m*4.5m =3472.497m^2 /100 is an effort correction of 34.725 (communication with program 129 indicated they estimate net opening as 4.5 m)

Program 115 – **NO ACTUAL NET WIDTH WHILE TRAWLING WAS GIVEN** 21.3m Center Bag 2-3 knts for 10 minutes (2.5knts is 1.28611m/s *600 (10 minutes) = 771.666m*18.91 m =14595.6 m^2 /100 is an effort correction of 145.956 (communication with program 129 indicated they estimate net opening as 4.5 m)

Program 129 – 4.9m otter each site has 5 -2 minute tows at each station at 1 m/s (120m) (communication with program indicated they estimate net opening as 4.5 m) 540m^2 per trawl gives an effort correction of **5.4**

Program 3004 – **NO ACTUAL NET WIDTH WHILE TRAWLING WAS GIVEN** 4.9m otter (3 replicate samples each towed at 2-3 knts for 2- minutes) effort correction of 6.9

Program 4043 – 6.1m otter 0.1nm towed (1,129.72 m^2) effort **7.412**

Trawl and Seine Calculations

A. Species level

   a. Individual species Abundance – count of each unique species in the trawl (3004)

      i. Data_69d_Final – For each "reference" and "scientificname" "ToatlCount"/"effort" will give species specific # / 100m^2

      ii. Data_115_b_Final– For each unique "STA_NAME", "DATE", "TR_REP" and "COD_EMAP", "ABUNDANC" gives total count of that species/41.67(6.1m net) or 34.725 (4.9m net),

      iii. Data_115_f_Final and Data_115_g_Final– For each unique "StationName", "SamplingCollectionDate", "ReplicateNumber" and "LatinName", "Abundance" gives total count of that species/41.67(6.1m net) or 34.725 (4.9m net) or 145.956 (21.3m net)

      iv. Data_4043_Final – For each unique "LocationID", "Month", "Day","Year" and "Species", "N" gives number of that species / 7.412 give number of that species per 100m^2

      v. Data_129b_Final – For Each unique "Station", "Date", "Tow" and "GENSPE", "Total" gives the abundance of each species/5.4 gives number of that species per 100m^2

   b. Catch per unit effort – total abundance/ number of tows with standard deviation (3004)

B. Species specific measurement data

   a. Total number of individuals measured

      i. Data_69c_Final – for each "uniq" the total number measured is "totalmeasured"

      ii. Data_115_f_Final and Data_115_g_Final– For each unique "StationName", "SamplingCollectionDate", "ReplicateNumber" and "LatinName", "LengthsMeasured" gives the count of individuals measured of that taxa

      iii. Data_4043_Final – For each unique "LocationID", "Month", "Day", "Year" and "Species", values in "L1"-"L40" give individual measurements in mm so total number of individuals measured for each species is the number of columns with measurements

      iv. Data_129b_Final – For Each unique "Station", "Date", "Tow" and "GENSPE", "Len1"- "Len20" give individual measurements in mm. Total number of individuals measured per species is the number of columns "Len1"- "Len20" that are not NULL

   b. Minimum length

i. Data_69c_Final – for each “uniq” the minimum length measured is the lowest value “Length”

ii. Data_4043_Final – For each unique “LocationID”, “Month”, “Day”, “Year” and “Species”, values in “L1”-“L40” give individual measurements in mm Minimum for each species is the lowest value of columns with measurements

iii. Data_129b_Final – For Each unique “Station”, “Date”, “Tow” and “GENSPE”, “Len1”- “Len20” give individual measurements in mm. Minimum measured per species is the lowest value of columns “Len1”- “Len20” that are not NULL

c. Median length

i. Data_69c_Final – for each “uniq” the median length measured is the median value of “Length”

ii. Data_4043_Final – For each unique “LocationID”, “Month”, “Day”, “Year” and “Species”, values in “L1”-“L40” give individual measurements in mm. Median Length for each species is the median value of columns with measurements

iii. Data_129b_Final – For Each unique “Station”, “Date”, “Tow” and “GENSPE”, “Len1”- “Len20” give individual measurements in mm. Median length measured per species is the median value of columns “Len1”- “Len20” that are not NULL

d. Mean Length

i. Data_115_f_Final and Data_115_g_Final– For each unique “StationName”, “SamplingCollectionDate”, “ReplicateNumber” and “LatinName”, “TaxonMeanLength” gives the mean length of individuals measured of that taxa

e. Standard Deviation of Length

i. Data_115_f_Final and Data_115_g_Final– For each unique “StationName”, “SamplingCollectionDate”, “ReplicateNumber” and “LatinName”, “TaxonStandardDeviation” gives the standard deviation of length of individuals measured of that taxa

f. Maximum length

i. Data_69c_Final – for each “uniq” the maximum length measured is the highest value “Length”

ii. Data_4043_Final – For each unique “LocationID”, “Month”, “Day”, “Year” and “Species”, values in “L1”-“L40” give individual measurements in mm. Maximum Length for each species is the maximum value of columns with measurements

iii. Data_129b_Final – For Each unique “Station”, “Date”, “Tow” and “GENSPE”, “Len1”- “Len20” give individual measurements in mm. Maximum measured per species is the highest value of columns “Len1”- “Len20” that are not NULL

C. Trawl/Seine level

a. Species Richness – Count of unique species in trawl (3004)

   i. Data_69d_Final – For each "reference" Sum of unique "scientificname"/"effort" will give species richness per 100m^2 (Trawls and Seines)

   ii. Data_4043_Final – For each unique "LocationID", "Month", "Day", "Year" a count of unique "Species", where "N" is not 0 gives number of species / 7.412 give number of species per 100m^2

   iii. Data_129b_Final – For Each unique "Station", "Date", "Tow" the count of unique "GENSPE"/5.4 gives number of species per 100m^2

b. Species Diversity – Shannon Diversity Index, Natural log transformed (3004)

c. Species Evenness – Pielou's Evenness (3004)

Seines

Seines are net sampling that is conducted either by hand or by vessel. To calculate the total surface area sampled during a seine net sampling we need to know:

1. Size of the net being used
2. Arrangement of net deployment (rectangle, circle)

Program 69 – 183m seine deployed net in a 40mx103m rectangle using the shoreline as the other side approximately 4,120 m^2. Deployed as a circle, 2,664.97m^2

Program 69 – 21.3m seine Bay – deploys as a circle with a circumference of 21.3m covers an area of 36.1m^2

Program 115 – 21.3m seine

Visual

Visual survey are conducted by divers using either a stationary point count in a "column" or along a predetermined transect. To calculate the total surface area sampled in a visual survey we need to know:

1. Length of transect
2. Width of transect
3. Radius or other measure of column
4. Length of time of observation

Program 899 – belt transect – 2m wide, 10m transects = 20m^2

Data_899g_final for each "Site_ID" and "Transect_ID" and "Parrotfish_taxon", "Density_per_100m^2" gives the calculated number of that taxon per 100m^2

Program 915 – belt transect – 2m wide, 10m transects = 20m^2 (dataset should have diadema counts on transect (I do not see it in data) and we have 915b that has fish species but no mention in any of the protocols of nekton)

Program 4050 –transect – 30 meters, 2m wide =60m^2

Program 4050 – Throw trap 1$m^{2,}$ 3 throws per site

Program 3022 – column – 7.5 m radius or 4.0 m radius depending on visibility from substrate to surface or the limits of vertical visibility 5- minutes for first list, another 5 minutes for second list, can add species up to 15 minutes

Program 3024 – stationary -column 15m diameter for 10 minutes from substrate to surface

Program 3024 – roving – 20-45 minutes “across entire reef”

Program 5034 – column 7.5 m radius or 4.0 m radius depending on visibility from substrate to surface or the limits of vertical visibility 5- minutes for first list, another 5 minutes for second list, can add species up to 15 minutes