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DISTRIBUTION OF CEPHALOPODS IN NORTH-WEST AFRICA

( CAPE BOJADOR - PUNTA PESCADOR )

by

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There is an important demersal fishing area between Cape Bojador (23° N) and Punta Pescador (23° 30' N) in the Spanish Sahara coast, supported basically by species belonging to the SPARIDAE and CEPHALOPODA groups. At the present cephalopods are extended to the sparidae grounds due to the high level of exploitation upon sparidae species in past years (1.950 - 1.960). Fishing effort is raising so high levels that yield for cephalopods is decreasing dramatically.

In this paper we check the spatial distribution pattern of different species of cephalopods. These are: Octopus vulgaris, Loligo vulgaris, L. forbesi, Sepia officinalis, S. bertheloti and S. orbignyana. Except the two last, all other four species present the greatest density distribution and in the other hand, the most interesting commercial value. Our data is picked up from ATLOR III oceanographic cruise carried out in 1.973 by R/V. "Cornide de Saavedra". For each species length frequencies are distributed in

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depth ranges from 0-25, 25-50, 50-75 and 75-100 mts. We apologize for the different bottom constitution in the area covered by this paper: North from paralel 25° N. The 100 mts. isoline is near from the coast and the continental slope has a constinuous and smooth inclination, South form paralel 25° N. the isoline of 100 mts. the limit of our depth ranges is far away from the coast (80 miles) and the continental slope is very rough.

### Octopus vulgaris

The spatial distribution of that species shows a pick of density (50,6 %) in shallow waters (25-50 mts.) and low but uniform densities in the other ranges. It can not be detected any important variation of size distribution (measured as mantle length) in all four depth ranges. Modal values in ranges 0-25 and 25-50 are situated between 9 and 14 cms. there is a low increase of mean length in the more deept ranges but difficult to test the signifiante. In range 25-50 there is a seconcdary modal pick between 23 and 33 cms. but very diffuse; this data is concerned by a great sample (248 specimens) of high abundance and all individual had great sizes. This specific sample and former experiences taked out in other cruises suggest a breeding migration to shallow waters. In this line, the migration pattern could be in the idea of a strong concentration of any kind of individuals in shallow waters in a small area during the breeding season; the new generation of youngs will be quickly distributed to all the area, and due to the fishing operation maximum ranges (75-100) deeper waters are attained only by big specimens.

Sepia officinalis

Strong concentrations (69 %) are found in ranges 0-25, 25-50 mts. decreasing as depth increases, in the top range (75-100 mts.) only 11 % is found. Concerning size distributions, there is a similar pattern than in previous case: a very uniform size distribution in all ranges; it can be pointed out a secondary pick of 8-11 cms. between 25-50 mts. and the smallest specimens are found between 75-100 mts. (11,2 % of individuals smaller than 5 cms. measured as mantle length). In the other hand, the biggest ones are found between 25-50 mts. were 5,3 of all specimens have more than 25 cms. All these details of size variation suggest a great and scattered breeding area, only with this hypothesis can be explained the presence of small individuals in any depth of a so extended continental shelf.

Sepia bertheloti

The distribution of abundances is uniform in all the area; just in range 75-100 there is a decrease. Concerning size distribution, there is an increase of sizes as depth increases and small differences between ranges 50-75 and 75-100. The modals values are 5 to 8 cms. for range 0-25 mts. ; 7-10 cms. for range 25-50 mts. and 11-14 for range 50-75 mts. In range 75-100 mts. modal values are similar than 50-75 range but lower due to the general dispersion of size distribution. Sepia bertheloti is less abundant than S. officinalis (60 %)

Sepia orbignyana

S. orbignyana shows a similar situation than S. bertheloti but with some more abundances in deeper waters. In the same line,

modal picks increases in size of the coast: 4-7 cms. for 0-25 range; 6-10 cms. for 25-50 and 8-11 for 50-100 mts. range.

S. orbignyana and S. bertheloti set up a group of secondary importance in these waters.

### Loligo vulgaris

The demersal distribution of that species follows very well the model of increasing size in deep waters and a great abundance of youngs near the coast. The relative proportion of abundances are 44 % for depths less than 25 mts. and 17 % for depths greater than 75 mts. Size distributions show a tendency not only in the sense of an increase of modal values but also the distributions slip to higher values as depth increases: individuals of 43 and 45 cms. are only found in 100 mts. and only in very shallow waters are found individuals smaller than 5 cms. It is necessary to point out that L. vulgaris is not specifically demersal, spending a great part of his life in pelagic waters with strong day/night migrations. Data presented must be taken in account in the idea that represents size/depth ratio only when downward migration till the bottom. It is very interesting to point out that in size distribution in 25-50 mts. range there is a modal pick of 11-15 cms. independently of another pick of 23-24 cms. suggesting a breeding model similar to the O. vulgaris.

### Loligo forbesi

The abundance of L. forbesi is much low than L. vulgaris. Its distribution pattern shows great concentrations in shallow waters with scattered size distributions. Size distributions for each range show two modal picks that slip to higher values as

depth increases, with some temporal picks of big specimens in shallow waters supporting a breeding model as in L. vulgaris case.

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R E S U M E

On présente la distribution de tailles et abondances chez les cephalopodes à la plateforme continentale près du Sahara Spagnol, avec commentaires des espèces les plus importantes du point de vue scientifique et commerciale. Les relations des deux paramètres cités avec la profondeur est spécialement abordée.

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Octopus vulgaris

| <u>Length</u> | <u>0-25 m.</u> | <u>25-50 m.</u> | <u>50-75 m.</u> | <u>75-100 m.</u> |
|---------------|----------------|-----------------|-----------------|------------------|
| 3             |                |                 | 0.709           |                  |
| 4             | 0.870          | 0.976           | 1.418           |                  |
| 5             | 2.610          | 0.244           | -               | 0.694            |
| 6             | 0.870          | 1.464           | -               | 0.694            |
| 7             | 5.220          | 1.220           | 1.418           | 0.694            |
| 8             | 8.700          | 4.392           | 4.254           | 3.470            |
| 9             | 12.180         | 4.880           | 9.926           | 0.694            |
| 10            | 6.960          | 5.856           | 14.180          | 4.858            |
| 11            | 17.400         | 5.368           | 12.053          | 12.492           |
| 12            | 10.440         | 4.636           | 14.889          | 13.880           |
| 13            | 10.440         | 2.440           | 12.762          | 17.350           |
| 14            | 5.220          | 2.440           | 4.963           | 21.514           |
| 15            | 4.350          | 1.708           | 6.381           | 9.716            |
| 16            | 1.740          | 0.488           | 3.545           | 5.552            |
| 17            | 3.480          | 2.440           | 7.799           | 1.388            |
| 18            | 2.610          | 0.976           | 1.418           | 0.694            |
| 19            | 1.740          | 0.488           | 1.418           | 2.082            |
| 20            | 0.870          | 1.220           | -               | 2.776            |
| 21            | 3.480          | 1.464           | 0.709           | -                |
| 22            | 0.870          | 0.488           | 0.709           | -                |
| 23            | -              | 6.100           | 0.709           | -                |
| 24            | -              | 5.612           | -               | 0.694            |
| 25            | -              | 3.904           | -               | -                |
| 26            | -              | 4.636           | 0.709           | -                |
| 27            | -              | -               | -               | 0.694            |
| 28            | -              | 5.856           | -               | -                |
| 29            | -              | 4.148           | -               | -                |
| 30            | -              | 2.928           | -               | -                |
| 31            | -              | 3.172           | -               | -                |
| 32            | -              | -               | -               | -                |
| 33            | -              | 5.368           | -               | -                |
| 34            | -              | -               | -               | -                |
| 35            | -              | 2.684           | -               | -                |
| 36            | -              | 2.684           | -               | -                |
| 37            | -              | 2.440           | -               | -                |
| 38            | -              | -               | -               | -                |
| 39            | -              | 3.172           | -               | -                |
| 40            | -              | 4.148           | -               | -                |
| Suma total    | 115            | 410             | 141             | 144              |
| % del total   | 14.198         | 50.617          | 17.407          | 17.778           |

Sepia officinalis

| <u>Length</u> | <u>0-25 m.</u> | <u>25-50 m.</u> | <u>50-75 m.</u> | <u>75-100 m.</u> |
|---------------|----------------|-----------------|-----------------|------------------|
| 3             | -              | -               | -               | 2.439            |
| 4             | -              | -               | -               | 9.756            |
| 5             | 0.862          | 0.758           | -               | 2.439            |
| 6             | 2.586          | 2.274           | -               | 2.439            |
| 7             | 4.310          | 3.032           | 5.556           | 2.439            |
| 8             | 0.862          | 7.580           | 1.389           | 7.317            |
| 9             | 4.310          | 9.096           | 5.556           | -                |
| 10            | 2.586          | 3.790           | 4.167           | 7.317            |
| 11            | 10.344         | 11.370          | 6.945           | 14.634           |
| 12            | 6.896          | 5.306           | 5.556           | 14.634           |
| 13            | 13.792         | 3.790           | 18.057          | 12.195           |
| 14            | 14.654         | 4.548           | 9.723           | 12.195           |
| 15            | 9.482          | 4.548           | 6.945           | 2.439            |
| 16            | 10.344         | 4.548           | 9.723           | 4.878            |
| 17            | 5.172          | 5.306           | 4.167           | -                |
| 18            | 2.586          | 2.274           | 4.167           | 2.439            |
| 19            | 2.586          | 6.064           | 2.778           | -                |
| 20            | 4.310          | 8.338           | 5.556           | -                |
| 21            | 0.862          | 3.032           | 4.167           | 2.439            |
| 22            | 0.862          | 3.790           | 1.389           | -                |
| 23            | 0.862          | 2.274           | -               | -                |
| 24            | -              | 0.758           | 2.778           | -                |
| 25            | 0.862          | 2.274           | 1.389           | -                |
| 26            | -              | 1.516           | -               | -                |
| 27            | -              | -               | -               | -                |
| 28            | 0.862          | -               | -               | -                |
| 29            | -              | 0.758           | -               | -                |
| 30            | -              | -               | -               | -                |
| 31            | -              | 0.758           | -               | -                |
| 32            | -              | 1.516           | -               | -                |
| 33            | -              | -               | -               | -                |
| 34            | -              | 0.758           | -               | -                |
| Suma total    | 116            | 152             | 72              | 41               |
| % del total   | 32.133         | 36.565          | 19.945          | 11.357           |

Sepia bertheloti

| <u>Length</u> | <u>0-25 m.</u> | <u>25-50 m.</u> | <u>50-75 m.</u> | <u>75-100 m.</u> |
|---------------|----------------|-----------------|-----------------|------------------|
| 3             |                |                 |                 |                  |
| 4             | 2.222          |                 |                 | 7.692            |
| 5             | 15.554         |                 |                 | -                |
| 6             | 18.887         | 5.716           |                 | -                |
| 7             | 15.554         | 20.006          | 3.846           | 3.846            |
| 8             | 15.554         | 31.438          | 3.846           | 11.538           |
| 9             | 4.444          | 15.719          | 7.692           | 19.230           |
| 10            | 6.666          | 11.432          | 15.384          | 11.538           |
| 11            | 4.444          | 5.716           | 19.230          | 3.846            |
| 12            | 4.444          | 4.287           | 15.384          | 15.384           |
| 13            | 8.888          | 2.858           | 11.538          | 7.692            |
| 14            | 3.333          | -               | 11.538          | 11.538           |
| 15            | -              | 1.429           | 7.692           | 7.692            |
| 16            | -              | -               | 3.846           | -                |
| 17            |                |                 |                 |                  |
| Suma total    | 90             | 70              | 26              | 26               |
| % Total       | 42.453         | 33.019          | 12.264          | 12.264           |

Sepia orbignyana

| <u>Length</u> | <u>0-25 m.</u> | <u>25-50 m.</u> | <u>50-75 m.</u> | <u>75-100 m.</u> |
|---------------|----------------|-----------------|-----------------|------------------|
| 3             | 0.877          |                 |                 |                  |
| 4             | 14.032         |                 |                 |                  |
| 5             | 18.417         | 4.941           |                 |                  |
| 6             | 22.802         | 10.980          | 2.300           | 0.758            |
| 7             | 19.294         | 23.058          | 8.050           | 10.612           |
| 8             | 8.770          | 20.313          | 11.500          | 22.740           |
| 9             | 9.647          | 19.764          | 27.600          | 38.658           |
| 10            | 1.754          | 11.529          | 17.250          | 15.918           |
| 11            | 1.754          | 4.941           | 14.375          | 10.612           |
| 12            | 1.754          | 1.647           | 9.200           | -                |
| 13            | -              | 1.098           | 8.050           | 0.758            |
| 14            | 0.877          | 0.549           | 1.725           | -                |
| 15            | -              | -               | -               | -                |
| 16            | -              | -               | -               | -                |
| 17            | -              | 0.549           | -               | -                |
| 18            | -              | 0.549           | -               | -                |
| Suma total    | 114            | 182             | 174             | 132              |
| % Total       | 18.937         | 30.233          | 28.904          | 21.927           |



Loligo vulgaris

| <u>Length</u> | <u>0-25 m.</u> | <u>25-50 m.</u> | <u>50-75 m.</u> | <u>75-100 m.</u> |
|---------------|----------------|-----------------|-----------------|------------------|
| 5             | 0.678          |                 |                 |                  |
| 6             | 2.034          |                 |                 |                  |
| 7             | 2.034          | 1.550           | 0.752           |                  |
| 8             | 5.085          | 0.775           | 1.504           |                  |
| 9             | 8.814          | -               | -               |                  |
| 10            | 8.136          | 0.775           | 0.752           |                  |
| 11            | 6.441          | 7.750           | 2.256           | 4.350            |
| 12            | 8.814          | 3.100           | -               | 6.960            |
| 13            | 6.102          | 6.975           | 1.504           | 14.790           |
| 14            | 8.136          | 5.425           | 1.504           | 9.570            |
| 15            | 7.119          | 7.750           | 2.256           | 0.870            |
| 16            | 5.085          | 3.875           | 6.768           | 10.440           |
| 17            | 2.034          | 6.975           | 6.016           | -                |
| 18            | 3.051          | 7.750           | 10.528          | 4.350            |
| 19            | 2.373          | 5.425           | 9.024           | 3.480            |
| 20            | 4.407          | 5.425           | 14.288          | 1.740            |
| 21            | 2.712          | 4.650           | 11.280          | 4.350            |
| 22            | 2.034          | 4.650           | 10.528          | 6.090            |
| 23            | 1.695          | 5.425           | 4.512           | 7.830            |
| 24            | 2.712          | 9.300           | 6.768           | 7.830            |
| 25            | 1.017          | 3.875           | 3.008           | 5.220            |
| 26            | 1.695          | 2.325           | 0.752           | 4.350            |
| 27            | 1.695          | 0.775           | 1.504           | 1.740            |
| 28            | 1.017          | 0.775           | 1.504           | 2.610            |
| 29            | 0.339          | -               | -               | 0.870            |
| 30            | 1.017          | 1.550           | -               | 0.870            |
| 31            | 0.339          | 0.775           | 0.752           | 0.870            |
| 32            | 1.017          | -               | -               | -                |
| 33            | 0.339          | 2.325           | -               | -                |
| 34            | 1.017          | -               | -               | -                |
| 35            | 1.017          | -               | -               | -                |
| 36            | -              | -               | -               | -                |
| 37            | -              | -               | -               | -                |
| 38            | -              | -               | -               | -                |
| 39            | -              | -               | 0.752           | -                |
| 40            | -              | -               | -               | -                |
| 41            | -              | -               | -               | -                |
| 42            | -              | -               | -               | -                |
| 43            | -              | -               | 0.752           | 0.870            |
| 44            | -              | -               | -               | -                |
| 45            | -              | -               | 0.752           | -                |
| Suma total    | 295            | 129             | 133             | 115              |
| % del total   | 43.899         | 19.196          | 19.792          | 17.113           |

Loligo forbesi

| <u>Length</u> | <u>0-25 m.</u> | <u>25-50 m.</u> | <u>50-75 m.</u> | <u>75-100 m.</u> |
|---------------|----------------|-----------------|-----------------|------------------|
| 8             |                |                 | 2.778           |                  |
| 9             |                |                 | -               |                  |
| 10            | 0.893          |                 | 2.778           |                  |
| 11            | 1.786          | 1.639           | 2.778           |                  |
| 12            | -              | 1.639           | -               | 3.774            |
| 13            | 1.786          | 3.278           | -               | 9.435            |
| 14            | 4.465          | 1.639           | -               | 5.661            |
| 15            | 12.502         | 4.917           | 2.778           | -                |
| 16            | 4.465          | 3.278           | 5.556           | -                |
| 17            | 4.465          | 8.195           | 8.334           | -                |
| 18            | 6.251          | 9.834           | 5.556           | 3.774            |
| 19            | 1.786          | 6.556           | 8.334           | 1.887            |
| 20            | 3.572          | 18.029          | -               | -                |
| 21            | 4.465          | 4.917           | 8.334           | 3.774            |
| 22            | 5.358          | 3.278           | 5.556           | 1.887            |
| 23            | 8.037          | 1.639           | 2.778           | 3.774            |
| 24            | 3.572          | 1.639           | -               | -                |
| 25            | 3.572          | 8.195           | 2.778           | 1.887            |
| 26            | 2.679          | 3.278           | 2.778           | 3.774            |
| 27            | 0.893          | 1.639           | 5.556           | 9.435            |
| 28            | 3.572          | 3.278           | -               | 1.887            |
| 29            | 2.679          | 6.556           | 8.334           | 1.887            |
| 30            | 1.786          | -               | 2.778           | 1.887            |
| 31            | 2.679          | 3.278           | -               | 1.887            |
| 32            | 1.786          | -               | 5.556           | -                |
| 33            | 2.679          | -               | 5.556           | 1.887            |
| 34            | 3.572          | 1.639           | 2.778           | 3.774            |
| 35            | 4.465          | -               | -               | 11.322           |
| 36            | 3.572          | -               | 2.778           | 5.661            |
| 37            | -              | -               | 2.778           | 3.774            |
| 38            | 0.893          | 1.639           | -               | 3.774            |
| 39            | -              | -               | 2.778           | 1.887            |
| 40            | -              | -               | -               | 1.887            |
| 41            | -              | -               | -               | -                |
| 42            | -              | -               | -               | 3.774            |
| 43            | 0.893          | -               | -               | -                |
| 44            | 0.893          | -               | -               | 1.887            |
| 45            | -              | -               | -               | 1.887            |
| 46            | -              | -               | -               | -                |
| 47            | -              | -               | -               | -                |
| 48            | -              | -               | -               | -                |
| 49            | -              | -               | -               | 1.887            |
| Suma total    | 112            | 61              | 36              | 53               |
| % del total   | 42.748         | 23.282          | 13.740          | 20.229           |