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Cuban Research Report for 1998

by

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A) Status of the fishery.

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A directed fishery on silver hake was conducted by the Cuban fleet during 1998 within the limits of the *Silver Hake Box* (Fig. 1). Fishing season extended from march to September continuously and furtherly in December, when a small fishery took place. A total of 4 large-tonnage trawlers participated in the fishery, one vessel starting in March and 3 more involved during April-May.

Silver hake overall catch during 1998 amounted to 6280.7 t (Table 1), a figure meaning around 6 400 t less than in 1997. This decrease is mainly due to the strong reduction in fishing effort during the 1998 season. The Cuban fishery was developed in Divisions 4VWX, but the bulk of the effort was expended in Division 4W (98.3 %), while very low levels were executed both in Division 4Vs and 4X, the latter accounting only for 0.3 % (Fig. 2). As no fishing took place practically in Division 4X, gear conflicts were reduced to zero.

Silver hake catch by months in 1998 showed an increasing pattern from March to June and a sharp decline in July (Fig. 3), remaining at very low levels for the rest of the season. A maximum catch of 2103.8 t was attained in June, resulting the best month in the fishery. The lowest catch was obtained in August with 6.5 t.

Highest catch rates were achieved from March to June, thus resulting the most productive period for the Cuban fleet. Values obtained ranged from 17.3 - 26.2 t/per day fished, with the maximum CPUE in April (Fig. 4). While May and June showed very close figures, indicating a stable fishery, an abrupt drop was observed in July (6.7 t/d), followed by even lower figures in August and September.

CPUE obtained by months and divisions for 1998 as compared to 1997 showed increased values in all periods, except for march (Table 2), thus indicating a better performance of the fleet related to a higher abundance of silver hake. A similar pattern of catch rates declining abruptly in July, both in 1997 and 1998, was observed.

In general, during 1998 a better availability of silver hake into the *Silver Hake Box* was observed and as a result, higher catch rates than in 1997 were attained (Fig.5). The yearly mean catch rate in 1998 (16.9 t/df) was higher than 1997's (11.6 t/df), so a more productive fishery was observed in 1998. **B**) Special Research Studies.

1) Environmental researches.

During July 1998, a Cuban commercial vessel targeting silver hake conducted a research in Division 4W aimed to determine the bottom thermal picture (by fishing squares) into the *Silver Hake Box*. The main objective was to associate a specific bottom temperature range to highest silver hake catch rates , and to provide a fishing strategy for the fleet based on temperature. The MINILOG system, a type of temperature probe to find out bottom temperature was used . The system was a model keeping a continuos recording of time, depth and temperature along the trawls which allowed to make comparisons between the fishing depth, bottom temperature and catch rates. The information collected could be downloaded to a desk computer (through an interface MINILOG-computer) where a graph of the tow temperature profile was obtained after the set was over . A total of 50 tows were conducted using this system. The experience covered a large extension of the *Silver Hake Box*, from the west of No name Canyon to east of Logan Canyon.

Bottom temperatures along the trawls determined by the former method are presented in figure 6. Results showed a thermal picture by fishing squares between 5.1 - 7.5 °C (mean values). The most intensively fished squares were numbers 1319 and 1303, where around 60 % of registrations with the MINILOG were taken. Higher catches of silver hake were attained between 7.0 - 7.5 °C.

2) Biological studies

Biological samplings were conducted on three Cuban commercial vessels fishing in divisions 4VWX during March-September. Silver hake was the main species sampled (Table 3) and additionally some bycatch species (haddock, pollock, and squid). Sampling methodology basically followed the Canadian scientific observer program requirements.

Silver hake catches resulted in fishes with length frequencies between 15- 47 cm (Table 4); an unimodal distribution was observed (mode 27.0 cm), coincident with a mean length of 27.04 cm.

Length-weight relationship for silver hake was also computed (Fig.7), showing a good fit ($r^2 = 0.99$). If compared with equations formerly estimated , the coefficient a = 0.0023 and the slope b = 3.337 show good agreement .

| | 1997 | | | 1998 | | | |
|-----------------|------------|--------|---------|------------|------|------|--------|
| Species | 4 W | 4X | Total | 4 W | 4X | 4Vs | Total |
| Silver hake | 9215,2 | 3481,7 | 12696,9 | 6274,4 | 2,9 | 3,4 | 6280,7 |
| Shortfin squid | 2511 | 466,8 | 2977,8 | 1083,9 | 0,4 | 0,5 | 1084,8 |
| Pollock | 41,5 | 15,8 | 57,3 | 7,4 | 0,10 | | 7,5 |
| Haddock | 20 | 6,9 | 26,9 | 11,8 | 0,04 | 0,03 | 11,8 |
| Cod | 0,022 | 0,421 | 0,443 | 0,5 | | | 0,5 |
| Red hake | 213,5 | 45,7 | 259,2 | 118,0 | 0,1 | 0,2 | 118,3 |
| Mackerel | 112 | 1,8 | 113,8 | 6,8 | 0,1 | | 6,8 |
| Herring | 250,9 | 2,3 | 253,2 | 133,1 | 0,8 | | 133,8 |
| Groundfish (NS) | 86,4 | 77,4 | 163,8 | 0,3 | | | 0,3 |
| TOTAL | 12450,5 | 4098,8 | 16549,3 | 7636,1 | 4,4 | 4,1 | 7644,6 |

Table 1. Summary of catches of the main species in 1997 and 1998.

| DIVISION 4W | | | | | | | | |
|-------------|--------------|---------|-----------|--------------|---------|-------|--|--|
| | | 1997 | | 1998 | | | | |
| Months | Catch | Hours | CPUE | Catch | Hours | CPUE | | |
| | (t) | fished | (t/h) | (t) | fished | (t/h) | | |
| Feb | 386,5 | 240,75 | 1,61 | | | | | |
| Mar | 1086,2 | 686,75 | 1,58 | 432,8 | 317,75 | 1,36 | | |
| Apr | 2090,3 | 2129,5 | 0,98 | 1259,2 | 637 | 1,98 | | |
| May | 2712,7 | 3024,75 | 0,90 | 1912,2 | 1433,5 | 1,33 | | |
| June | 2358,7 | 2128,5 | 1,11 | 2103,6 | 1467,75 | 1,43 | | |
| July | 552,3 | 2135,25 | 0,26 | 476,2 | 1103,75 | 0,43 | | |
| Aug | 19,2 | 831 | 0,02 | 3,1 | 109 | 0,03 | | |
| Sept | 9,3 | 67 | 0,14 | 8,5 | 55 | 0,15 | | |
| Dec | | | | 78,8 | 93,25 | 0,85 | | |
| TOTAL | 9215,2 | 11243,5 | 0,82 | 6274,4 | 5217 | 1,20 | | |
| DIVISION 4X | | | | | | | | |
| | | 1997 | | | 1998 | | | |
| Months | Catch | Hours | CPUE | Catch | Hours | CPUE | | |
| | (t) | fished | (t/h) | (t) | fished | (t/h) | | |
| May | 1384,8 | 1067,75 | 1,30 | | | | | |
| June | 1831,7 | 1928,25 | 0,95 | 2,9 | 6 | 0,48 | | |
| July | 129,1 | 340,5 | 0,38 | | | | | |
| Aug | 134,7 | 245 | 0,55 | | | | | |
| Sept | 1,4 | 25 | 0,06 | | | | | |
| TOTAL | 3481,7 | 3606,5 | 0,97 | 2,9 | 6 | 0,48 | | |
| | I | | DIVISION | 4Vs | | | | |
| | 1997 1998 | | | | | | | |
| Months | Catch | Hours | CPUE | Catch | Hours | CPUE | | |
| | (t) | fished | (t/h) | (t) | fished | (t/h) | | |
| Aug | | | | 3,4 | 55,25 | 0,06 | | |
| TOTAL | | | | 3,4 | 55,25 | 0,06 | | |
| | | | TOTAL DIV | S. 4VWX | | | | |
| | | 1997 | | | 1998 | | | |
| Months | Catch | Hours | CPUE | Catch | Hours | CPUE | | |
| | (t) | fished | (t/h) | (t) | fished | (t/h) | | |
| Feb | 386,5 | 240,75 | 1,61 | | | | | |
| Mar | 1086,2 | 686,75 | 1,58 | 432,8 | 317,75 | 1,36 | | |
| Apr | 2090,3 | 2129,5 | 0,98 | 1259,2 | 637 | 1,98 | | |
| May | 4097,5 | 4092,5 | 1,00 | 1912,2 | 1433,5 | 1,33 | | |
| June | 4190,4 | 4056,75 | 1,03 | 2106,5 | 1473,8 | 1,43 | | |
| July | 681,4 | 2475,75 | 0,28 | 476,2 | 1103,75 | 0,43 | | |
| Aug | 153,9 | 1076 | 0,14 | 6,5 | 164,25 | 0,04 | | |
| Sept | 10,7 | 92 | 0,12 | 8,5 | 55 | 0,15 | | |
| Dec | | | | 78,8 | 93,25 | 0,85 | | |
| TOTAL | 12696.9 | 14850 | 0.86 | 6280.7 | 5278.25 | 1.19 | | |

Table 2. Catch effort and c.p.u.e on the Cuban directed silver hake fishery in Div. 4VWX during 1997 and 1998.

| Species | Div. | Month | N [•] Samples | N• Fish | Length | N [●] of |
|-------------|------|-------|------------------------|----------|------------|-------------------|
| | | | | measured | range (cm) | Otoliths |
| Silver hake | 4W | April | 14 | 3721 | 19-40 | 92 |
| | 4W | May | 26 | 6978 | 21-47 | 48 |
| | 4W | June | 22 | 5999 | 15-45 | 57 |
| | 4X | June | 1 | 192 | 19-35 | |
| | 4W | July | 28 | 6413 | 18-38 | 38 |
| | | | | | | |
| Haddock | 4W | June | 3 | 78 | 27-57 | |
| | 4W | July | 14 | 765 | 17-49 | |
| | | | | | | |
| Pollock | 4W | April | 1 | 244 | 35-49 | |
| | 4W | June | 1 | 25 | 36-47 | |
| | 4W | July | 8 | 269 | 33-48 | |
| | | | | | | |
| Squid | 4W | June | 5 | 912 | 12-22 | |
| | 4W | July | 19 | 4598 | 10-23.5 | |

Table 3. Intensity sampling during 1997 by species, division and months.

| | April | May | June | | | July | General |
|------------------|---------|---------|---------|-----------|---------|---------|---------|
| Length (cm) | 4W | 4W | 4W | <i>4X</i> | Total | 4W | Total |
| 15 | | | 1 | | 1 | | 1 |
| 16 | | | 1 | | 1 | | 1 |
| 17 | | | 4 | | 4 | | 4 |
| 18 | | | 2 | | 2 | 1 | 3 |
| 19 | 1 | | 1 | 1 | 2 | 0 | 3 |
| 20 | 14 | | 5 | 2 | 7 | 12 | 33 |
| 21 | 32 | 1 | 30 | 7 | 37 | 31 | 101 |
| 22 | 96 | 93 | 101 | 10 | 111 | 114 | 414 |
| 23 | 209 | 299 | 277 | 13 | 290 | 294 | 1092 |
| 24 | 341 | 540 | 530 | 32 | 562 | 583 | 2026 |
| 25 | 482 | 763 | 624 | 25 | 649 | 778 | 2672 |
| 26 | 687 | 1228 | 855 | 30 | 885 | 867 | 3667 |
| 27 | 698 | 1328 | 976 | 22 | 998 | 894 | 3918 |
| 28 | 451 | 1095 | 772 | 13 | 785 | 963 | 3294 |
| 29 | 301 | 726 | 641 | 15 | 656 | 711 | 2394 |
| 30 | 197 | 439 | 536 | 8 | 544 | 494 | 1674 |
| 31 | 98 | 189 | 273 | 5 | 278 | 300 | 865 |
| 32 | 73 | 139 | 186 | 5 | 191 | 191 | 594 |
| 33 | 23 | 57 | 88 | 1 | 89 | 110 | 279 |
| 34 | 11 | 36 | 50 | 2 | 52 | 46 | 145 |
| 35 | 4 | 19 | 19 | 1 | 20 | 14 | 57 |
| 36 | 1 | 15 | 13 | | 13 | 9 | 38 |
| 37 | 1 | 4 | 5 | | 5 | 1 | 11 |
| 38 | 0 | 1 | 2 | | 2 | | 3 |
| 39 | 0 | 2 | 2 | | 2 | | 4 |
| 40 | 1 | 1 | 2 | | 2 | | 4 |
| 41 | 0 | 1 | 1 | | 1 | | 2 |
| 42 | 0 | 0 | 0 | | 0 | | 0 |
| 43 | 0 | 0 | 0 | | 0 | | 0 |
| 44 | | 1 | 1 | | 1 | | 2 |
| 45 | | 0 | 1 | | 1 | | 1 |
| 46 | | 0 | 0 | | 0 | | 0 |
| 47 | | 1 | 0 | | 0 | | 1 |
| | | | | | 0 | | 0 |
| N° Fish Meas. | 3721 | 6978 | 5999 | 192 | 6191 | 6413 | 23303 |
| N° Samples | 14 | 26 | 22 | 1 | 23 | 28 | 91 |
| Mean length (cm) | 26,57 | 27,04 | 27,23 | 25,95 | 27,19 | 27,16 | 27,04 |
| Depth range (m) | 200-650 | 190-600 | 180-280 | 190-200 | 180-280 | 160-275 | 160-650 |

Table 4. Silver hake length frequency from the Cuban commercial fishery in Div. 4W and 4X by months in 1998.



Fig 1. Silver hake Box showing the Cuban fleet deployment during the 1998 fishing season.











Fig. 6 Mean values of bottom temperatures (°C) by fishing square in July, 1998.



Fig 7. Length-weight relationship for silver hake from the Cuban samplings in 1998 .