The primary aim of this work has been to establish open ocean concentrations of PCB's and DDT residues in surface films and subsurface waters in oligotrophic regions of the ocean such as the North Central Pacific Gyre. The PCB content of open ocean waters are significantly lower relative to inshore waters, and represent the first such numbers for an open ocean environment in the Northeast Pacific.

Acknowledgments

We thank H. Bezdek for collection of the surface film samples from the Mexican coastal waters (M 1-4).

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Literature Cited


Materials and Methods

From 10 October to 12 November 1972, hybridization experiments were carried out between 1-yr-old male cherry salmon parr from anadromous stock and female rainbow trout, *Salmo gairdneri*; pink salmon, *O. gorbuscha*; chum salmon, *O. keta*; coho salmon, *O. kisutch*; sockeye salmon, *O. nerka*; and chinook salmon, *O. tshawytscha*. Our cherry salmon were reared at the Washington State Department of Fisheries’ Minter Creek Hatchery from eyed eggs sent in 1971 by the Hokkaido Salmon Hatchery, Sapporo, Japan. Incubation facilities were located at the Northwest Fisheries Center, National Marine Fisheries Service, Seattle, Wash. The standard dry fertilization technique was used in conjunction with delayed fertilization techniques described by Poon and Johnson (1970). All fertilization took place within 3 h of collection, with the exception of pink salmon eggs (14 h). There were no apparent effects from delayed fertilization. Numbers of eggs incubated ranged from 1,700 to 8,400; survival was based on the total eggs in each lot.

Discussion

Oshima (1957) reported that cherry salmon have successfully hybridized with redspot salmon, *O. rhodurus*, for many years. Other than hybrids of cherry salmon with redspot or Asian pink salmon, hybrids of cherry salmon with other salmon and trout are rare or unreported (Schwartz 1972; Dangel et al. 1973). Results of our own experiments, as shown in Table 1, show that crosses of cherry salmon with chum, chinook, and pink salmon and with rainbow trout were highly successful, each yielding higher hatching percentages than their respective controls. The reason for this phenomenon is not presently understood but it does indicate an area for further research. Only crosses of coho and sockeye salmon with cherry salmon showed poorer survival than their controls (Table 1). It is interesting to note that though there was no hatch of the cherry × sockeye cross, virtually all of the eggs were fertilized and developed to notochord formation. Each of the successful hybrid crosses yielded surviving fry to a 1 g or larger size accounting for over 85% of the hatch, except for the rainbow and coho crosses where survival to this size was less than 10%.

Literature Cited


<table>
<thead>
<tr>
<th>Species</th>
<th>Number of degree-days incubated</th>
<th>Percentage hatched</th>
<th>Previously reported results</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Salmo gairdneri</em> × <em>O. masou</em></td>
<td>396</td>
<td>39.5</td>
<td>85% hatch</td>
<td>Suzuki and Fukuda 1971a, b</td>
</tr>
<tr>
<td><em>Salmo gairdneri</em> (control)</td>
<td>321</td>
<td>34.7</td>
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<tr>
<td><em>Oncorhynchus gorbuscha</em> × <em>O. masou</em></td>
<td>512</td>
<td>71.6</td>
<td>37-46% hatch</td>
<td>Smirnov 1969</td>
</tr>
<tr>
<td><em>Oncorhynchus gorbuscha</em> (control)</td>
<td>593</td>
<td>62.5</td>
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<tr>
<td><em>Oncorhynchus keta</em> × <em>O. masou</em></td>
<td>436</td>
<td>94.1</td>
<td>77% hatch</td>
<td>Sano and Eguchi 1936</td>
</tr>
<tr>
<td><em>Oncorhynchus keta</em> (control)</td>
<td>504</td>
<td>90.9</td>
<td>0-90% hatch</td>
<td>Smirnov 1969</td>
</tr>
<tr>
<td><em>Oncorhynchus kisutch</em> × <em>O. masou</em></td>
<td>300</td>
<td>26.5</td>
<td>0-65% hatch</td>
<td>Terao and Hayashinaka 1961</td>
</tr>
<tr>
<td><em>Oncorhynchus kisutch</em> (control)</td>
<td>333</td>
<td>90.9</td>
<td>None</td>
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<tr>
<td><em>Oncorhynchus nerka</em> × <em>O. masou</em></td>
<td>660</td>
<td>0.0</td>
<td>0% hatch</td>
<td>Suzuki and Fukuda 1971a, b</td>
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<tr>
<td><em>Oncorhynchus nerka</em> (control)</td>
<td>642</td>
<td>96.0</td>
<td>0-3.3% hatch</td>
<td>Terao and Hayashinaka 1961</td>
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<tr>
<td><em>Oncorhynchus tshawytscha</em> × <em>O. masou</em></td>
<td>426</td>
<td>97.4</td>
<td>None</td>
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<tr>
<td><em>Oncorhynchus tshawytscha</em> (control)</td>
<td>465</td>
<td>72.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1Female listed first and male last.
SMIRNOV, A. I.  

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TRAP CONTRIBUTIONS TO LOSSES IN THE AMERICAN LOBSTER FISHERY

Studies to evaluate the impact of unbuoyed traps on American lobster, Homarus americanus, survival were conducted in Maine waters from July 1971 to June 1973.

Materials

On 22 July 1971, 98 tagged lobsters of various legal and illegal sizes and both sexes were placed in 35 unbaited conventional square traps, with 30-mm lath spacing, without buoy lines, on the sea bottom near Jonesport, Maine, in depths ranging from about 10 to 20 m (Table 1). On 29 July 1971, four tagged lobsters were added to one trap from which the previous occupants had escaped by 24 July.

The 84-m² study site, considered by fishermen not to be a good lobster habitat, having a muddy bottom and no rocks which could be utilized as cover, was purposely selected because its use would not interfere with commercial fishing and traps would be protected from storm damage.

Methods

Traps were checked on nine occasions before 15 October 1971, by scuba diving. When traps were checked by diving, it was possible to count the lobsters and observe evidence of cannibalism, but tagged lobsters could not readily be distinguished from others that entered the traps. In order to differentiate tagged from untagged lobsters, all traps were brought to the surface for more thorough examination. This practice was commenced on 15 October 1971 and continued throughout the remaining period of the study.

Traps were retrieved 16 times between 15 October 1971 and 26 June 1973, making a total of 25 checks during the investigation. The length of time between observations of the 2-yr period ranged from 1 to 161 days, with a median interval of 13 days and a mean of 28 days. Observations were curtailed during the low temperature months because of the inactivity of lobsters in relatively shallow water.

Results

During the first summer-fall season, 43% of the tagged lobsters cannot be accounted for; 25% remained captive; 20% escaped and were recaptured; and 12% were cannibalized. During the second summer-fall season, 126% recruitment occurred; 22% cannot be accounted for; 18% of both tagged and recruited lobsters were cannibalized; 55% remained in the traps; and 5% of tagged lobsters escaped and were recaptured.

A minimum 67 "wild" lobsters were recruited by the traps, of which 24 still remained captive when the study was terminated. Two tagged lobsters that departed their original traps entered other experimental traps which they in turn left before entering two of the commercial traps surrounding the study site. A tagged male lobster missing from trap no. 6 was caught in a commercial trap 0.4 km from the study area on 28 April 1973, after having remained in trap no. 6 for 22 mo and having moulted once in October 1971 from sublegal to legal size. Four traps failed to recruit any lobsters; 9 recruited one each; 13, two each; 6, three each; 2, four each; and 1, six. Only five traps recruited more lobsters than were initially placed in them, six recruited a like number.

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