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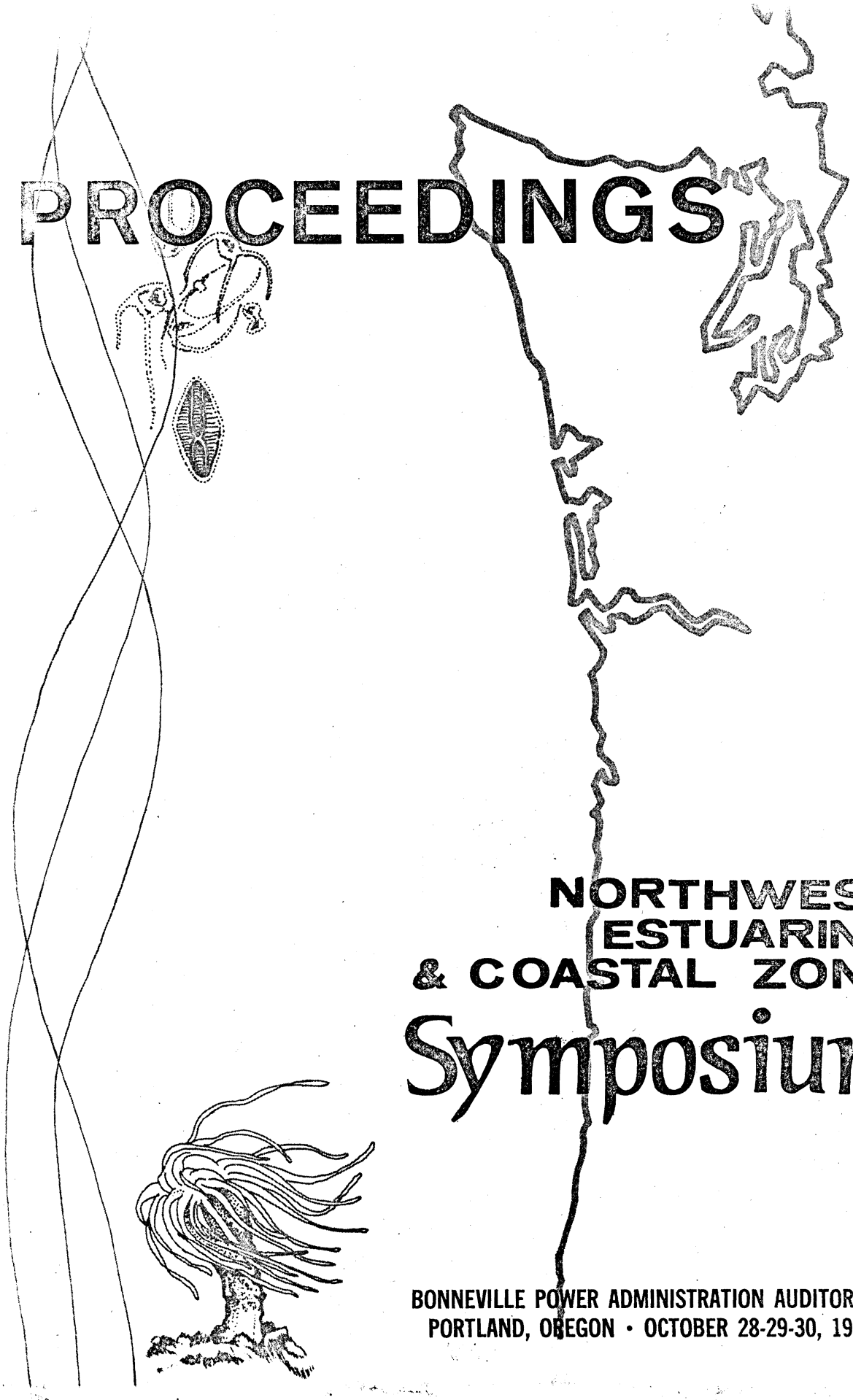

NORTHWEST ESTUARINE & COASTAL ZONE

Symposium

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JUVENILE SALMON AND STEELHEAD IN THE COLUMBIA RIVER ESTUARY

by
Carl W. Sims
Fisheries Biologist

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National Marine Fisheries Service
Biological Laboratory
Seattle, Washington

Whenever you mention the Columbia River estuary to people who live in the Pacific Northwest, they almost immediately think of the great salmon and steelhead runs of the Columbia River. Four species of Pacific salmon and two species of anadromous trout are native to this great river system. These are the chinook salmon (Oncorhynchus tschawytscha), coho salmon (O. kisutch), sockey salmon (O. nerka), chum salmon (O. keta), cutthroat trout (Salmo clarkii), and the steelhead trout (S. gairdnerii). Each of these fish must pass through the estuary at least twice during its life to complete its life cycle. To the millions of juvenile salmon and trout that enter the Columbia River estuary each year on their way to the sea, the estuarine environment is of special importance. The time they spend in the estuary may well be the most critical stage of their life history, for it is in the estuary they must make the transition from the freshwater to the marine environment. It is the duration and timing of the juvenile salmonid outmigration in the Columbia River estuary that I would like to discuss with you today. In the interest of time, I will limit my discussion to the three major species; the chinook and coho salmon and the steelhead trout.

The Columbia River Estuary

Before going on, I should describe the area I will be talking about. For our studies, we have considered the estuary to extend from the river mouth approximately forty miles upstream. We have divided this area into three sections; an upper, middle and lower estuary.

The upper estuary is essentially freshwater but is under significant tidal influence. Current reversal occurs daily except during periods of high river flow. The middle estuary is where the freshwater and salt water meet. It is the transition zone and is generally brackish in nature. The lower estuary is marine in nature. Salinities are generally above 20 parts per thousand and it is inhabited by many marine organisms.

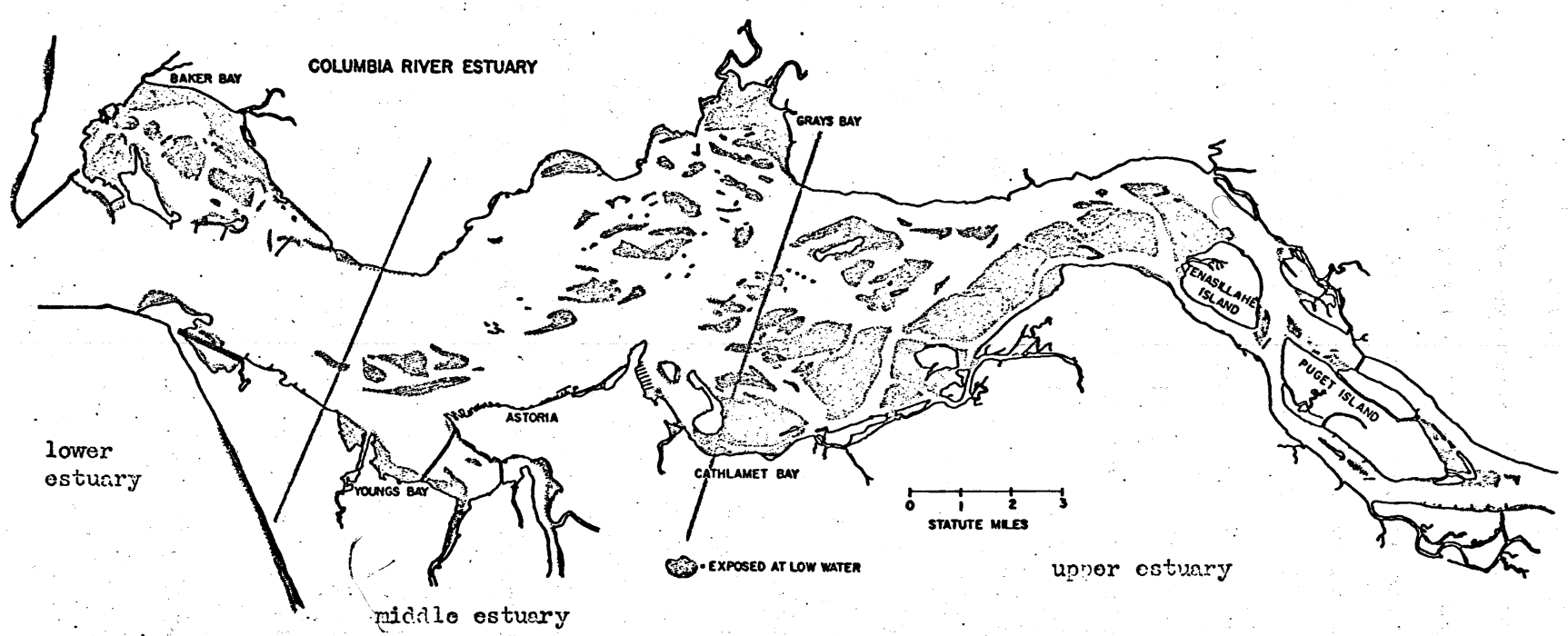

Figure 1 --. The Columbia River Estuary

The time required for juvenile salmonids to make the transition from freshwater to saltwater varies with species and with individuals within species. Fall chinook fingerlings appear to remain in the estuary longer than all other species, but individuals may vary greatly. Several thousand fall chinook fingerlings were taken from fresh water in the upper estuary, marked and released about 38 miles above the river mouth. The following day, two of these fish were captured 30 miles downstream, in water of 20% salinity. In contrast, several fish of the same size, from this same release were recaptured at the original release site 8 weeks later. We would estimate that the average fall chinook fingerling remains in the estuary for from 10 to 15 days during the spring and early summer and for from 7 to 10 days later in the season.

Juvenile fall chinook usually begin to show up in the estuary about mid-April. Since 1966, their outmigration has been characterized by 2 peaks--one about the first of June and another about mid-July. By the 15th of September, the major outmigration is generally over, although some fall chinook fingerlings are still entering the system in mid-November.

Juvenile fall chinook generally avoid deep water and concentrate in the shallow flats along the beaches. Once they reach saltwater, they appear to move out of the system within a day or two.

Juvenile spring and summer chinook differ from fall chinook

in that they are one year older and considerably larger when they enter the estuary. They generally begin to enter the system in early February. Their outmigration generally peaks early in May and is over by mid-June. Although our data is skimpy, they appear to pass quickly through the system, generally within 3 to 5 days.

Coho Salmon

Juvenile coho salmon exhibit some interesting migrational characteristics. The timing of their outmigration is quite precise. In contrast to the fall chinook, whose outmigration may extend from early April into November, the coho fingerlings begin to enter the estuary about the last week in April and by the second week in June, they are gone. In several instances, marked hatchery coho fingerlings, released into the estuary during the latter part of March, have actually migrated upstream out of the estuary during the early part of April, only to return again in mid-May. In general, we have found that coho fingerlings released in the estuary remain in the general release area until early May. Once they begin to move, they are out of the system within 3 to 5 days. Coho fingerlings are found from mid-channel to the island sloughs; in deep water or shallow. When the coho are in the estuary, you can find them everywhere.

Steelhead Trout

The steelhead trout outmigration begins in mid-March, peaks in early May, and is over by the end of June. We do not have sufficient data at this time to determine their rate of movement

through the estuary. They prefer the deeper channel areas of the system and avoid the shallow water near the shore.

Importance Of The Estuary

The importance of the estuary to juvenile salmonids is twofold. Not only does the estuary provide a place for the saltwater transition to occur, it also provides the young fish with the energy required to successfully make this transition. The estuary serves as a gigantic pasture for tens of millions of migrating salmonids each year. This requires tremendous productivity. To provide ten million fingerlings with one gram of food per day for five days, the estuary must produce fifty metric tons of food organisms. Most of this food production takes place in the tidal flats, sloughs and marshes. These areas are the life of the estuarine system and it is these areas that are threatened by industrial and municipal development today. I would like to emphasize that responsible development of the Columbia River estuary demands that the developers, whether industrial, municipal or recreational, recognize the importance of these food producing areas. To destroy them by pollution or by land-fill would greatly affect the productivity of the system; the loss of this productivity would be disastrous to salmon and steelhead stocks.