

V. ASSESSMENT OF ABUNDANCE ESTIMATES

California Chinook Estimates

Sacramento River

The preseason abundance estimate for Sacramento River fall chinook salmon stock was based on recent years' landings and harvest rates, with considerations given for brood year natural escapement, hatchery releases, and previous year jack returns.

All 1987 preseason projections of ocean fishery harvest south of Point Delgada and the Sacramento River fall chinook spawning escapement were below postseason estimates (Table V-1). Deviations ranged from 16 percent to 51 percent. The preseason projection of sport harvest south of Point Delgada was only 51 percent of the actual catch; the preseason projection of Sacramento River fall chinook spawning escapement was 84 percent of the actual.

Large deviations in California fishery projections for landings and escapements south of Point Delgada also occurred in 1986. In both years, the deviations probably stemmed from above average ocean chinook population sizes south of Point Delgada, including Sacramento River fall chinook. The projection procedure for this management unit assumes average stock abundance levels for the coming season. This approach has been used since no biological predictor has been developed for any Central Valley chinook stock. The index of abundance for Central Valley stocks (CVI) has been close (within 15 percent) to the average (592,900) in most years since 1970 (Figure II-3).

Klamath River

The overall area chinook quota of 200,000; established preseason for ocean fisheries in the KMZ, was based on assumptions about fishery landings south of Cape Falcon and Klamath River fall chinook contribution rate to the landings. A midseason evaluation by the SPDT indicated season landings in critical areas and fisheries for Klamath River chinook would greatly exceed preseason projections. Thus, the commercial fishery in the KMZ through September 7 was limited to 118,700 chinook, compared to a preseason quota of 130,000.

A postseason evaluation of the July 29 season landings projections by the SPDT of critical salmon fisheries for Klamath River salmon is shown in Table V-2. The inseason projections were generally within 15 percent of the postseason estimates. The largest deviations were in the Coos Bay and Monterey projections; the Coos Bay projection was 26 percent above actual landings while the Monterey projection was 192 percent below actual landings.

Postseason analysis for actual ocean chinook landings south of Cape Falcon, based upon the model employed to establish the 200,000 chinook quota for the KMZ, indicates ocean fisheries landed 147,200 Klamath River fall chinook, 28,700 (24 percent) over the preseason harvest sharing agreement of the KFMC of 118,500.

Table V-1. Assessment of 1987 preseason stock estimates for California chinook.

Management Area	Key Chinook Stock(s)	Category	Estimate		Preseason/Postseason
			Preseason	Postseason	
South of Pt. Delgada	Sacramento River	Ocean Troll Harvest	471,500	790,100	.60
		Ocean Sport Harvest	<u>82,400</u>	<u>160,700</u>	<u>.51</u>
	Ocean Total	553,900	950,800	.58	
	Spawning Escapements	<u>144,000</u>	<u>171,100</u>	<u>.84</u>	
	Total	697,900	1,121,900	.62	
Pt. Delgada-Cape Blanco ^{a/}	Klamath River	Ocean Troll Harvest	190,600	126,600	1.51
		Ocean Sport Harvest	<u>27,000</u>	<u>51,200</u>	<u>.53</u>
	Ocean Total	217,600	177,800	1.22	
	Inriver Escapements	169,100	199,000	.85	

a/ Ocean fisheries in this zone were managed under quotas.

Table V-2. Postseason evaluation of July 29 action to further limit commercial chinook fishing in the KMZ.

Area	Midseason Projection ^{a/}	Postseason Estimates	Deviation (Percent)	Klamath River Chinook Landings ^{b/}
North Oregon				
Troll	116,160	133,123	- 15	4,313
Coos Bay				
Troll	470,498	349,456	+ 26	55,144
KMZ				
Sport	45,569	50,000	- 10	8,840
Troll	119,187	118,709	+ 1	20,988
Port Bragg				
Troll	313,203	305,500	+ 2	34,552
San Francisco				
Troll	307,353	305,200	+ 1	19,807
Monterey				
Troll	54,854	160,100	-192	<u>3,586</u>
				147,230

a/ See Table II-4 for assumptions.

b/ Season landings estimate generally based on landings through July 26, 1987.

Actual stock contributions to the fisheries south of Cape Falcon cannot be accurately estimated until 1987 CWT data have been analyzed. CWT estimates are also needed to evaluate the abundance projections for ages 3 and 4 Klamath River fall chinook, which were 255,900 and 164,900 fish, respectively.

Stock composition estimates are needed to estimate Klamath River chinook landings in late season special fisheries off the mouth of the Eel, Chetco, and Elk rivers. These estimates are essential to full accounting of the 1988 ocean allocations of Klamath River fall chinook.

Oregon Coastal Chinook Estimates

Quantitative preseason projections of total run size for either north or south migrating chinook stocks are not made; however, ODFW develops generalized forecasts of a qualitative nature. These generalized forecasts are developed from a variety of population measurements (see Chapter II).

ODFW estimates that the 150,000 to 200,000 Oregon coastal chinook goal for natural spawning adults was exceeded. Rogue and Umpqua spring chinook dam counts and Rogue fall chinook inriver escapement estimates by themselves account for approximately 150,000 chinook.

Columbia River Chinook Estimates

Preseason estimates of Columbia River fall chinook inriver abundance are based on relationships between successive age groups within a year class. Historic abundance data used in formulation of these relationships are derived by combining estimates of harvest and escapement and reconstructing the inriver runs originating from both hatchery and natural production sources. Four individual fall chinook stocks are classified according to destination above or below Bonneville Dam and known characteristic differences such as maturity rate, run timing, and ocean distribution. The data base used for inriver abundance estimation includes estimates of the return by age group for the years 1964 to 1986. Catches and escapements of individual stocks are estimated from CWT recoveries, dam counts based on skin color proportions, and other techniques. Age composition estimates are based on scale reading of fishery and escapement samples. This data base is the source for tables of annual inriver returns presented in Appendix B, Tables B-16 through B-19.

Preliminary estimates of abundance used in analyzing impacts of different regulatory options considered by the Council were presented in Table I-2 of the Council's "Preseason Report I Stock Abundance Analysis for 1987 Ocean Salmon Fisheries." The preseason estimates presented assumed a constant, or average, ocean impact. Final preseason expectations of inriver abundance were dependent on adopted regulations and were based on the assumption that ocean fisheries would harvest their full quotas for chinook in the area north of Cape Falcon. No additional ocean escapement was calculated as a result of harvest quotas imposed on the Canadian troll fishery operating off Vancouver Island.

Preseason estimates of ocean escapement were compared with very preliminary postseason estimates for critical stocks in Table V-3. The preseason estimate for the SCH stock (9,200), the stock most critical for determination of allowable harvest in ocean and inriver fisheries in 1987, was the same as the

Table V-3. Assessment of 1987 preseason inriver escapement estimates for Columbia River chinook stocks.

Stock	Ocean Escapement Estimates		Preseason/ Postseason
	Preseason	Postseason ^{a/}	
Upriver Spring	79,700	99,900	0.80
Lower River Willamette Spring	78,000	93,800	0.83
Upriver Summer	22,200	33,000	0.67
URB Fall	436,400	421,000	1.04
SCH Fall	9,200	9,200	1.00
LRH Fall	298,700	364,900	0.86
LRW Fall	29,200	37,000	0.79

a/ Postseason estimates are very preliminary and values, especially for the fall chinook stocks, are likely to change.

postseason estimate. The preseason estimate for the LRH stock (298,700) was 14 percent less than the postseason estimate (346,900). The preseason estimate for URB fall chinook (436,400) was within 4 percent above the post-season estimate of 450,000.

GSI methods applied to ocean fishery harvest formed a significant part of the preseason impact assessment for these chinook stocks. The allowable harvest of all stocks in 1987 fisheries was based on the expected contribution made by the Columbia River tule (LRH and SCH) stocks which varied by fishery and area. Estimates of Columbia River tule stock contribution to the nontreaty troll fishery chinook catch in May, for the years 1984-1986 averaged 50 percent. This average contribution rate was adjusted for anticipated stock abundance changes in 1987 and the resulting rate was applied to quotas to estimate stock impacts. The expected Columbia River tule stock contribution to the nontreaty troll catch in May for 1987 was 65 percent. Sampling and application of GSI methods for the 1987 fishery showed the contribution to be an estimated 68 percent.

In summary, preseason forecast of Columbia River fall chinook abundance and assessment of the fishery impact appear to have been reasonably accurate.

OPI Area Coho Estimates

In accordance with an amendment to the framework plan, adopted by the Council in September 1986, the SPDT evaluated several options for estimating the 1987 OPI area coho abundance proposed by the ODFW and WDF technical staffs. Fundamental to the broad preseason review and discussion of methodologies were several concerns.

1. The selection of a suitable data base on which to make the 1987 prediction.
2. The large predictive error observed in the 1986 OPI estimate. Should the 1986 data point (i.e., 1985 jacks and 1986 adults) be thrown out of any predictor used?
3. Evaluation of major changes in recent years to Columbia River hatchery release strategies (normal, delayed, volitional) of smolts and their effect on the rate of jack production and adult survival. Every predictor assessed relied on OPI area jack returns to estimate adult abundance.
4. Adjustment of Bonneville Dam jack counts for the occurrence of small adults. In some years, small adults were counted as jacks.
5. Determination of the best method for predicting the OCN coho stock component of the OPI--the major consideration in determining OPI area allowable harvest impacts.
6. Combining or separating predictors for OPI hatchery and OCN coho stocks.

These and other concerns were assessed by the SPDT in their 1987 preseason report I (see Chapter III), preseason report II (pages 27-29), and in preseason report III (pages 17-19).

After discussion on the technical merit of various approaches by the SPDT, Scientific and Statistical Committee, the states' technical staffs, and the Council; the following methodology was adopted by the Council to evaluate impacts of the Council-approved regulations for the 1987 ocean coho fisheries. The SPDT employed a data base to include 1969-1986 jacks and 1970-1986 adults (omitting 1982 jacks and 1983 adults due to El Nino influences). Public hatchery actual jack returns were adjusted for small adults. The OCN ocean escapement (rivers and lakes) was added to the "traditional" OPI predictor which historically included only OPI area ocean catch and hatchery escapements to yield a predictor of "total" (OCN and public hatchery coho) OPI area abundance. This predictor is shown in Table V-4 and Figure V-1.

The SPDT used ODFW's estimate of OCN stock abundance of 458,000 coho. The SPDT calculated the OPI area coho abundance of public hatchery and OCN coho stocks, to be 934,700 coho (Table V-4). The OCN escapement goal for 1987 was 200,000 fish, the long-term goal (Table V-5). Oregon coastal private hatchery coho were estimated independently by ODFW at 465,600 coho (Table V-6) based on smolt release by facility and applying an estimated smolt-to-adult survival factor.

The Council approved 2 "add-ons" to the OPI prediction (1) an estimate of 106,800 public hatchery coho, based on a proposal by ODFW to account for assumed survival advantage of delayed smolt release strategies at Columbia River facilities and (2) a STEP contribution of 6,100 to account for known projects rearing coho to smolts for release on the Oregon coast. These "add-ons" increased the preseason OPI area prediction to 1,047,600 (including the ODFW estimate of 458,000 OCN coho). A summary of the add-on procedure for delayed smolts is presented in the 1987 preseason report II (Table 10).

The OPI area abundance from all sources (public and private hatcheries, OCN, and STEP) was estimated preseason to be 1,513,200.

Postseason Evaluation

The preliminary postseason estimate of OPI area index of public hatchery and OCN abundance, as defined for the 1987 season is 952,200; 9 percent below the preseason estimate of 1,047,600. This estimate, however, does not yet include postseason estimates for STEP hatchery escapements, OCN lake escapement, final overall OCN spawning escapement, and Oregon coastal freshwater catches. It is estimated by ODFW that these additions will add approximately 20,000 to 25,000 coho to the postseason OPI estimate.

The postseason estimate of OPI area ocean coho fishery impacts (and troll hooking mortality impacts) is 715,300 fish, 19 percent below the Council's preseason expected impact of 883,800 fish. Total estimated fishery impact and escapement for all OPI area coho stocks (public and private hatchery, OCN, and STEP) was 1,243,500 coho (does not include projected postseason additions noted above), 18 percent below the preseason estimate of 1,513,200 fish. A summary of OPI area preseason and postseason estimates of stock components is shown in Table V-7.

Table V-4. Relationship of Columbia River and Oregon actual public hatchery coho jack index to adult coho abundance for the OPI area in thousands of fish, 1970-1987. This data represents the data set used preseason to predict 1987 OPI abundance.

Year of Adult Production	Jacks ^{a/} of Previous Year			Adult Production Index ^{b/}	
	Columbia ^{c/}	Coastal ^{d/}	Total	Expected ^{e/}	Observed
1970	147.6	18.0	165.6	3,648.1	3,084.6
1971	171.7	6.6	178.3	3,908.9	4,012.6
1972	98.3	4.1	102.4	2,349.9	2,181.7
1973	82.9	5.7	88.6	2,066.5	2,171.0
1974	127.8	14.0	141.8	3,159.2	3,276.9
1975	72.8	1.2	74.0	1,766.6	1,942.0
1976	144.5	32.2	176.7	3,876.1	4,298.3
1977	46.1	9.3	55.4	1,384.6	1,203.0
1978	98.4	4.9	103.3	2,368.4	1,932.6
1979	64.5	12.5	77.0	1,828.2	1,744.0
1980	51.3	7.0	58.3	1,444.1	1,372.5
1981	41.9	9.3	51.2	1,298.3	1,257.9
1982	57.5	9.1	66.6	1,614.6	1,460.3
1983	60.4	9.0	69.4	-	-
1984	26.4	3.3	29.7	856.7	890.5
1985	23.6	8.8	32.4	912.1	935.5
1986	62.6	14.0	76.6	1,820.0	2,544.8
1987 ^{f/}	25.2	8.3	33.5	934.7 (1,047.6) ^{h/}	952.2 ^{g/}

- a/ Components of jacks are ODFW and WDF hatcheries below Bonneville Dam; Willamette, Winchester, and North Fork dam counts, and Oregon and California coastal hatchery counts.
- b/ OPI includes (1) ocean catches off Columbia River, Oregon, and California; (2) estimates of additional ocean fishery induced ("shaker") mortality estimates since 1982 (excluding 1983); (3) Oregon and California coastal hatchery returns; (4) Winchester Dam counts; (5) river gillnet catches; (6) Bonneville, Willamette, and North Fork dam counts; (7) hatchery returns to the Columbia River below Bonneville Dam; and (8) OCN river escapement and inriver catch, and Tenmile Lakes natural escapement.
- c/ Columbia River jack counts were adjusted to account for small adults.
- d/ Includes estimated returns of public hatchery jacks to Oregon coastal areas and California Klamath River basin and from Oregon coastal off-station hatchery releases.
- e/ Expected values calculated using 1970-1987 data base, but excluding 1983 because of major El Nino influence.
- f/ Data are preliminary.
- g/ Does not include (1) final OCN escapement estimate, (2) Oregon coastal freshwater catch, (3) escapement to STEP facilities, and (4) OCN lake escapement.
- h/ Includes Council adopted add-ons to OPI area adult stock abundance to account for better adult survival based on Columbia River delayed smolt release strategies and STEP production.

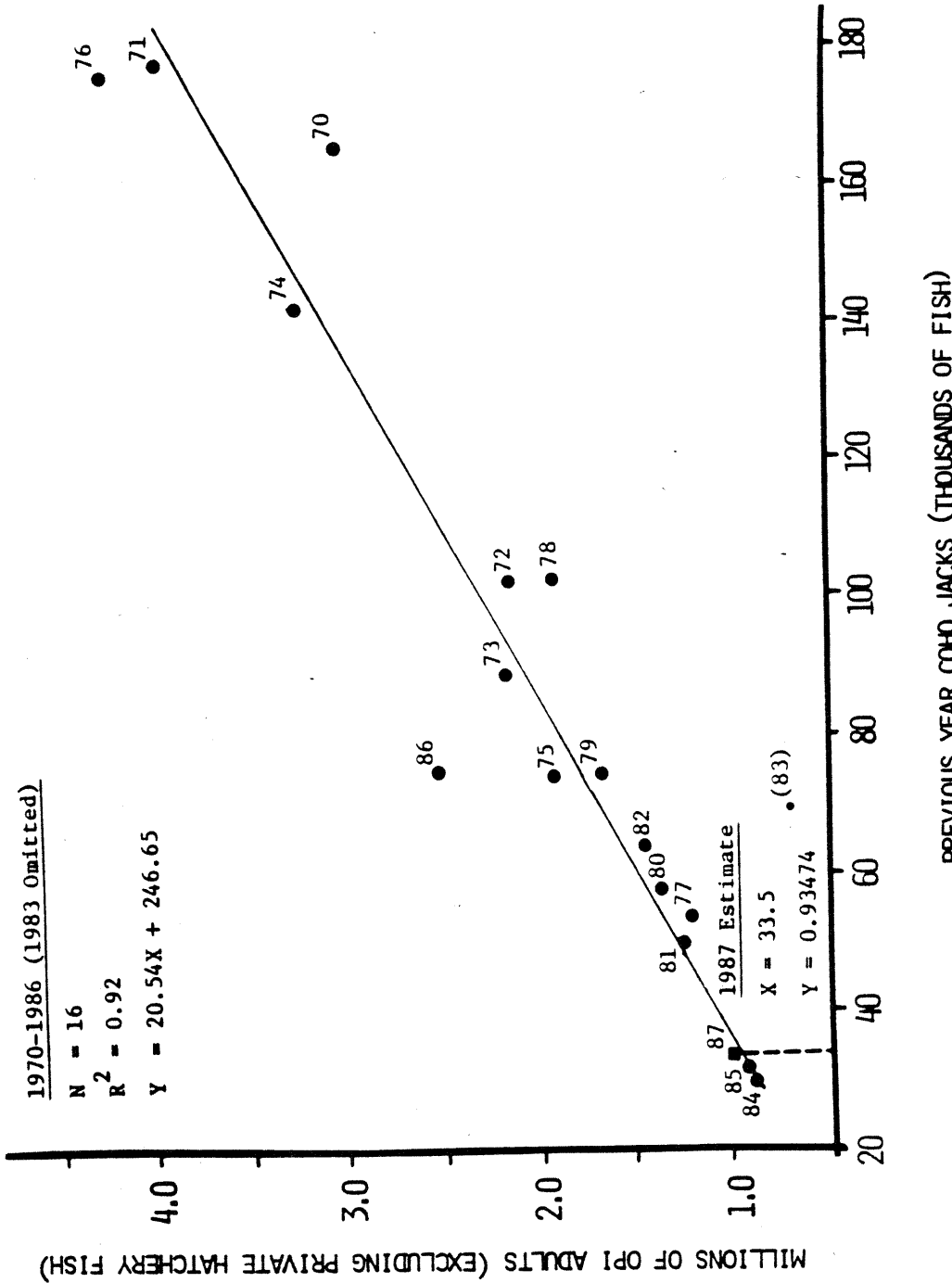


Figure V-1. Relationship of the OPI area coho stock abundance (all public hatchery and OCN coho) to the Columbia River and Oregon-California coastal coho jack index for the base years 1970-1982 plus 1984-1986. OPI area estimate for 1987 is shown by a dashed line. Actual 1987 value noted by black square.

Table V-5. Adult escapement of natural spawning stocks of Oregon coastal coho in thousands of fish. (Escapement numbers in parentheses indicate rebuilding schedule goals since 1981.)

Cycle	Year of Adult Return								
	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	172			129 (172)			183 (175)		
2		108			57 (140)		(143) ^{b/}	179	
3			73 (175)			200 (135)			105 ^{c/} (200)

a/ Spawning escapements prior to 1985 were calculated using complete OCN spawning habitat mileage (streams and lakes combined) and based on a coastwide average adult-spawners-per-mile value observed for streams. Estimates since 1985 are calculated by individual coastal river basins with adult-spawners-per-mile values calculated for each basin separately.

b/ Salmon framework amendment rebuilding goal of 170,000 was modified by the Council by OY considerations.

c/ Preliminary spawning estimate as of January 15, 1987 based on peak spawning adults per mile in index streams.

Table V-6. Comparison of preseason projection and actual ocean contribution and return of Oregon private hatchery adult coho in thousands of fish, 1981-1987.

Year	Preseason Estimate			Postseason Estimate			Deviation of Projected from Actual Total Production	
	Ocean Harvest ^{a/}	Return to Facility	Total Production	OPI Ocean Harvest ^{a/}	Non-OPI Ocean Harvest ^{b/}	Return to Facility ^{c/}		Total Production ^{b/}
1981	140.0	67.4	207.4	142.0	NA	111.3	253.3	+ 22%
1982	193.3	180.6	373.9	122.1	NA	176.9	299.0	- 20%
1983	103.0	103.0	206.0	110.3	NA	133.1	243.4	+ 18%
1984	16.0	68.0	84.0 ^{d/}	35.0	NA	114.9	149.9	+ 78%
1985 ^{e/}	23.7	73.1	96.8	54.9 ^{f/}	20.5	309.7	385.1	+298%
1986 ^{e/}	115.6	169.9	285.5	88.2	39.3	455.1	572.0	+100%
1987 ^{e/}	132.9	332.7	465.6	172.7	NA	118.6	NA	NA

a/ Estimates based on coded-wire tag recoveries.

b/ Includes the estimated ocean harvest north of Leadbetter Pt., including Canada, estimated from coded-wire tags. Total production does not include estuary sport harvest in Coos and Yaquina bays and private hatchery strays in coastal streams. These catches have not yet been calculated for earlier years.

c/ In 1985, adult coho estimates were recalculated using biological jacks determined from scale samples rather than length frequency.

d/ Adjusted downward 29 percent for El Nino impact.

e/ Preliminary estimates January 29, 1987.

f/ In addition, an estimated 20,500 coho were harvested in 1985 north of Leadbetter Pt., including Canada.

Table V-7. OPI area abundance and ocean and Buoy 10 coho catch and impact estimates for 1987. All postseason data are preliminary. Numbers in parentheses represent inseason adjustments.

Estimate	1987	
	Preseason	Postseason
<u>ABUNDANCE</u>		
OPI Area "Index" Prediction ^{a/}	1,047.6 ^{a/}	952.2 ^{b/}
Oregon Private Hatcheries		
OPI Ocean Catch	132.9 ^{c/}	172.7 ^{c/}
Stock Abundance	465.6 ^{c/}	291.3 ^{c/d/}
OCN		
Stock Size	458.0 ^{c/e/}	239.4 ^{c/}
Spawning Escapement	200.0 ^{e/}	105.1 ^{f/}
OPI Area (All Stocks)	1,513.2 ^{g/}	1,243.5 ^{b/h/}
<u>OCEAN CATCH AND IMPACTS</u>		
Columbia River Ocean Area	161.1 (184.1)	113.9
Columbia River Estuary (Buoy 10)	90.0 ^{i/}	47.4
South of Cape Falcon	722.7 ^{j/}	583.8 ^{k/}
All OPI Catch and Impact	883.8 ^{j/} (906.8)	715.3 ^{k/l/}

- a/ The OPI area predictor for 1987 includes combined OPI public hatchery and OCN stocks.
- b/ Does not include postseason estimates for (1) OCN lake escapement, (2) Oregon coastal freshwater sport catch, (3) final overall OCN spawning escapement, and (4) STEP return to facilities.
- c/ ODPW estimate.
- d/ Does not include additional coho estimated to have contributed to ocean fisheries north of the OPI area and Canada.
- e/ Expected spawning escapement under the Council-adopted regulations.
- f/ ODPW estimate (preliminary) using peak index counts of adult spawners per mile for standard index streams. Does not include (1) private hatchery straying adjustment, (2) OCN freshwater catch, and (3) OCN lake escapement.
- g/ Combined components of assessment include OPI public hatchery abundance (583,600); OCN stock size (458,000); Oregon coastal private hatchery (465,600); and STEP (6,100).
- h/ Includes preliminary OPI, ocean catch (715,300); OPI ocean escapement (304,500); Oregon coastal private hatchery escapement (118,600); and OCN spawning escapement (105,100). Does not include Oregon coastal private hatchery estuary recreational harvest and straying in coastal streams, OCN river catch, and Oregon coastal lake escapement.
- i/ As determined by the States of Oregon and Washington and affected treaty Indian tribes catch impact level only, not a quota.
- j/ Includes preseason troll coho hooking mortality estimate of 51,800.
- k/ Includes postseason ODPW estimate of troll hooking mortality for south of Cape Falcon of 17,700.
- l/ Includes all OPI area ocean harvest and troll hooking mortality impacts.

OCN Coho

A preliminary estimate of OCN spawning escapement (through January 15) is 105,100 adults based on peak counts of adults observed in coastal index streams. A preliminary adjustment for private hatchery strays in coastal streams has not been included in this estimate, but is expected to be minor. This escapement is 48 percent below the 1987 spawning escapement goal of 200,000 adults.

Private Hatchery

The postseason estimate of private hatchery contribution to OPI area ocean fisheries is 172,700; 30 percent above the preseason expectation of 132,900. An estimate of private hatchery coho caught in ocean fisheries north of the OPI area, including Canadian fisheries is not yet available. The total Oregon private hatchery adult stock size (catch and escapement), but without non-OPI area contributions is estimated to be 291,300 (Table V-6).

Washington Coastal and Puget Sound Coho Estimates

A variety of preseason abundance estimators are currently employed for Washington coastal and Puget Sound coho stocks (1987 preseason report I, Table I-3). For natural stocks, estimates are derived by: (1) Grays Harbor--parent spawner abundance expanded by average recruit per spawner, (2) Puget Sound--summer stream flows, (3) north Washington coastal--average survival rates for smolts based on coded-wire experimental release applied to estimates of smolt out migration. For hatchery stocks, predictions involve (1) Willapa and Grays Harbor--average adult production per smolt released and (2) north Washington coastal and Puget Sound--CWT experimental release survival estimates applied to smolts releases.

For the 1987 season, the allowable ocean fishery coho impact in the area north of Cape Falcon was determined primarily on the basis of preseason estimated abundance of Skagit River natural coho. Although the postseason estimate of abundance for this stock is presently unavailable, a comparison of pre and postseason Skagit River coho abundance estimates, for the years 1980-1986, is presented in Table V-8. Additionally, pre and postseason estimates for the total abundance of Puget Sound hatchery and natural stocks is presented in Table V-9. Note that pre and postseason estimates are not directly comparable for all years considering differences in assumed versus actual ocean fishery and Puget Sound sport fishery impacts. Also, methodological differences in pre and postseason estimates for some years effect comparability of the estimates.

Assessment of predictor performance for 1987, at this time, is difficult because of the preliminary, or unavailable, status of run-size information for many important stocks. Preseason estimates of ocean escapement for critical natural stocks are compared to available preliminary postseason estimates in Table V-10.

Table V-8. Skagit River coho predicted and observed run sizes, 1980-1986.

Return Year	Predicted Run Size		Observed Run Size	
	Natural	Total	Natural	Total
1980 ^{a/}	50,500	71,300	48,300	91,600
1981 ^{a/}	21,700	55,000	21,500	81,600
1982 ^{a/}	77,400	99,900	32,000	48,700
1983	35,400	45,100	35,100	50,500
1984	38,900	62,800	37,200	87,000
1985	24,300	40,100	31,500	44,100
1986	40,100	71,700 ^{b/}	73,400	98,600 ^{b/}

a/ Predicted and estimated run sizes are not directly comparable due to an update of the run reconstruction data base prior to the 1983 forecast. Estimated natural and total Skagit River run size for 1980-1982 were slightly lower than those listed above, before the data base adjustment.

b/ Preliminary.

Table V-9. Puget Sound coho predicted and observed total run sizes, 1980-1986.

Return Year	Predicted Run Size	Observed Run Size
1980	1,010,300	1,440,800
1981	991,500	948,500
1982	1,213,700	1,249,900
1983	1,378,800	1,321,400
1984	1,290,000	1,181,800
1985	1,407,600	1,285,700
1986	1,337,800	1,663,900

Table V-10. Preseason expected and preliminary postseason estimates of escapement for critical natural coho stocks originating north of Cape Falcon in 1987 in thousands of fish.

Stock	Ocean Escapement		Spawning Escapement	
	Preseason	Postseason	Postseason	Goal
Skagit	36.6	NA	NA	30.0
Stillaguamish	29.7	NA	NA	17.0
Quillayute Fall	12.2	20.7	10.9	6.3-15.8
Hoh Fall	5.9	7.2	3.7	2.0-5.0
Queets	9.3	9.3	5.0	5.8-14.5
Grays Harbor	106.7	55.5	20,700	35.4