The following was prepared by Diana Dobson, Stock Assessment Division, Science Branch, 3225 Stephenson Point Rd., Nanaimo, BC V9T 1K3. It is an excerpt (pages 83-87) from:

Simpson, K., R. Semple, D. Dobson, J. Irvine, S. Lehmann, and S. Baillie. 2000. Status in 1999 of coho stocks adjacent to the Strait of Georgia. Can. Stock Assess. Secret. Res. Doc. 2000/158: 87 p. *http://www.dfo-mpo.gc.ca/csas/*

Survey life (SL) is defined as the time a spawning fish is available for observation in a particular survey area. Being the denominator in the area-under-the-curve estimate of escapement, the choice of SL has a direct effect (doubling the life halves the estimate). Perrin and Irvine (1990) reviewed estimates that were reported in the literature and gathered from questionnaires. Although their review was exhaustive, examples documenting SL's in the literature were quite sparse. For coho they found only 15 references. There have been more studies since, but these studies are mostly concerned with developing accurate statistical estimators instead of associating the variance with biological or environmental variables (Bue et al. 1998, Lady and Skalski 1998). Since the cost of estimating SL on every stream surveyed is prohibitive and often not feasible, it is usually necessary to assume a value. Our objective in reviewing the available information again was to estimate the variability of survey lives: the annual variability within a stream and variability between streams. Most AUC estimates are used as indicators of annual trends. An assumed SL need not be accurate for this purpose if its error is not highly variable, i.e. if within-stream annual variation is not great. Secondly, we wanted to examine between-stream variation in an effort to refine the accuracy of the assumed SL. Most field observers feel that SL's are positively correlated with stream size. We stratified the size of streams with SL data to see if using a mean SL for each strata or group of strata was justified and possible.

Data came from Perrin and Irvine (1990) and references therein and was also augmented with recent examples from the literature (Manske and Schwarz 2000) and unpublished data (S. Baillie and B. Finnegan). Perrin and Irvine (1990) tested for a location effect using latitude but did not examine the effect of system size on survey life. A very rough index of system size was assigned to each BC stream by multiplying the stream watershed area with November precipitation normals from the nearest weather station. Although this measure oversimplifies hydrology, it provides at least some index of system size. The results for coho are summarised in Tables 20 and 21and Figure 18. In Figure 18 standard error bars are displayed for streams on which estimates of survey life have been generated in multiple years.

As noted by Perrin and Irvine (1990), there is a great deal of variation in survey lives between streams. No clear trend was observed between stream size indices and SL although this may be an effect of sample size. There have been only a few studies conducted on larger systems. In those studies, the survey life was somewhat higher. The two largest systems (Little Qualicum and Keogh) with reported survey lives are both located on the East Coast Vancouver Island. While survey life has been calculated for Kirby, a smaller West Coast Vancouver Island system, there is no reliable data for larger West Coast streams. Field data suggests survey lives in these systems can be quite long (e.g. between 20 and 30 days). The suggestive trend and these observations are compatible and there is little justification at this point in changing these assumed SL's for most of the large chinook survey streams on the WCVI. On the other hand, there is insufficient data to support using other than the overall mean SL for streams being monitored in the Georgia Basin, all of whose size indices are less than approximately 15,000 and most are less than 5,000. For all streams with reported survey lives in BC, Oregon and Washington, the weighted average for coho is 14 days. The standard error of the mean is 1.5 days.

In most examples available, we would characterise annual within-stream variation as not severe (Table 20, Figure 1). The largest coefficient of variation was recorded at Black Creek where two estimates were made: 10 days and 15 days. Others had less variation relative to the mean.

One difficulty with comparing the data between studies is that methods used to calculate survey life vary. Also, in some cases, survey life is equivalent to stream residence time whereas in others survey life is only a portion of stream residence time. This inconsistency occurs when the survey area is limited to a portion of the stream. Clearly, more estimates are needed, especially on larger systems to see if the suspected positive correlation between system size and survey life is accurate. There are also potential regional differences in survey lives – e.g. between interior and coastal fish (R. Bailey, DFO, Kamloops, pers. comm.). If so, ascribing survey lives according to system size and regional variation may address some of the inaccuracies in AUC estimates without the prohibitive job of estimating survey life yearly on every system. Indicator streams, where fences are already in place, could be used to calibrate estimates on a year to year basis if need be. In summary, with more data, we may be able to refine SL assumptions to make AUC estimates more accurate. We also need more annual replications to further define the confidence limits for these SL's.

In the meantime, we opted to apply a uniform survey life of 14 days corresponding to the weighted average of coastal North American systems. When local estimates were available for a particular stream they were used. This practice is similar to other jurisdictions, such as Oregon and Washington, who apply a uniform survey life to every escapement estimate pending more detailed information survey life variation (S. Jacobs, Dept. F & W, Oregon, pers. comm.).

Table 1. Summary of survey lives for coho reported in the literature and from unpublished estimates.

River	Region	Survey Life Estimates			Mean SL	CV	Reference(s)
		1	2	3			
Keogh R.	Johnstone Str.	13.0			13.0		Johnston et al. (1986)
Kirby	Juan de Fuca Str.	13.0	13.5	15.6	14.0	9.8	S. Baillie, unpubl. data (1997-1999)
Bella Coola trib.	Central Coast	20.0			20.0		Finnegan, unpubl. data
Lachmach	North Coast	18.0	25.0		21.5	23.0	Finnegan, unpubl. data
Big Qualicum	Str. of Georgia	33.0			33.0		Fraser et al. (1993)
Black Cr.	Str. of Georgia	15.1	9.6		12.4	31.5	J. Irvine, unpubl. data (1987, 1988)
Chase	Str. of Georgia	16.0	10.4	8.9	11.8	31.8	Manske and Schwarz (2000), J. Irvine et al. (1992)
French Cr	Str. of Georgia	13.3	12.5		12.9	4.4	Irvine, unpubl. data (1987, 1988)
Lake Cowichan tribs	Str. of Georgia	8.2			8.2		Baillie, unpubl. data
Little Qualicum	Str. of Georgia	13.3			13.3		Johnston et al. (1987)
Shaw	Str. of Georgia	12.9			12.9		S. Baillie, unpubl. data
Trent R.	Str. of Georgia	7.1	9.6		8.4	21.2	J. Irvine, unpubl. data (1987, 1988)
Salmon R. (Langley)	Lower fraser	7.4	6.8		7.1	6.0	R. Semple, unpubl.data (1999)
Adams	Thompson	10.0			10.0		Whelen et al. (1983)
Coldwater	Thompson	12.5			12.5		Whelen et al. (1983)
Eagle	Thompson	12.5			12.5		Whelen et al. (1983)
Salmon R.	Thompson	15.0			15.0		Whelen et al. (1983)
Deer Cr.	Oregon	13.7			13.7		Koski (1966)
Flynn Cr.	Oregon	13.1			13.1		Koski (1966)
Spring Cr.	Oregon	11.5			11.5		Willis (1954)
Deer Cr.	Washington	9.2			9.2		van den Berghe and Gross (1986)
Harris Cr.	Washington	10.0			10.0		Flint (1984)
Little Bear Cr	Washington	24.0			24.0		Flint and Zillges (1980)

Table 2. Stream index for BC streams with reported survey life estimates for coho.

River	November precipitation (mm)	Station	Watershed Area	Stream Index = Nov. precip * watershed area
Keogh R.	261	Port Hardy	129.8	33904
Kirby	209	Victoria Marine	24.1	5053
Bella Coola trib.	189	Bella Coola	40.2	7611
Lachmach	272	Prince Rupert	41.6	11332
Big Qualicum	187	Comox	147.6	27661
Black Cr.	210	Campbell River	74.8	15705
Chase	180	Nanaimo	37.1	6658
French Cr	187	Comox	68.1	12758
Lake Cowichan tribs	180	Nanaimo	20.0	3590
Little Qualicum	187	Comox	247.7	46416
Shaw	180	Nanaimo	75.9	13628
Trent R.	187	Comox	81.5	15281
Salmon R. (Langley)	188	Langley	76.4	14359
Adams	60	Revelstoke	3337.9	201612
Coldwater	12	Kamloops	917.2	10639
Eagle	60	Revelstoke	1251.2	75575
Salmon R.	48	Lytton	1553.1	74704

Figure 1. Plot of survey lives versus stream index for BC coastal systems. The average for all coastal systems is 14.5 days. The outlier estimate at 33 days is from Big Qualicum River.

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