# Indian River Project
## Hatchery Straying & Stock Identification on the Indian River

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Currently the Sitka Sound Science Center's (SSSC) permit allows the release of: 250,000 silver salmon, 3 million pink salmon, and 12 million chum salmon (Sitka Sound Science Center: Hatchery). In order to keep their permits the SSSC must monitor the number of hatchery stock salmon that are not returning to the hatchery. The SSSC keeps its own records of salmon escapement and the Alaska Department of Fish and Game does aerial surveys of the Indian River to obtain an estimate of the pink salmon, but the numbers they record are not actual escapement number. The Alaska Department of Fish and Game in Sitka does have records of these numbers on file, but would also be beneficial for the Sitka National Historical Park to have numbers by either obtaining them from Fish and Game or collecting their own regarding the salmon within Indian River since none are published.

There are many ways to obtain the numbers of fish moving up rivers and creeks. Two of the more widely utilized methods involve structures that span rivers and streams: counting towers and weirs. However, another method that might be more affective for Indian River may simply be otolith collection. This paper will examine the methods and cost of obtaining information about the salmon in Indian River and whether they are wild or hatchery stock.

The first option for discussion is a counting tower. A tower only has a technician there for a part of every hour and switches shifts with two other technicians. This method is typically used with rivers that are too wide or swift for a weir. The tower itself can be made out of whatever materials are available. Normally there is a metal frame tower with a platform at the top for the technician to stand on. Across the bottom of the river there will be a flash panel. This is a white tarp that is laid in front of the tower.

In order to count for 10-20 minutes every hour there needs to be some access to lights. At the end of the season the time gets extrapolated to represent a full hour. In the figure below the lights are strung across the river to make night counts possible and more accurate.

Counting towers are not as accurate as a weir would be, but in terms of cost they are a great deal less than a weir. It would also not give a number of hatchery or wild stock. In order to obtain this information a series of seines would need to be performed over the season. The fish in the seine would be sampled and that number would be extrapolated to give numbers of hatchery and wild stock. The cost of setting up a counting tower (excluding shipping and no tax) is shown in Figure 3. This method will give a general concept of how many fish are moving up stream. This method also will have a smaller impact on the river and for those who are visiting attempting to see wildlife.

**Figure 1. Flash Panel with lights strung across for night counts in the Copper River. Photo by Mike Canino (http://www.udel.edu/udaily /2015/ oct/alaska-salmon-internship-102114.html)**

**Figure 2. Counting tower and technician. Photo by Alaska Fisheries Sonar (http://www.dspsalaska.com/alaskafisheriessonar/estimating.html)**

| Item | Individual Cost | Amount Required | Total Cost | Reason | Seller |
|---|---|---|---|---|---|
| Big Game Treestands Platinum Odyssey 20-ft. Ladder Stand | $229.99 | 2 | $459.98 | One for both sides and needs to be high enough | Cabelas |
| 10 ft. x 20 ft. White Heavy Duty Tarp | $29.97 | 1-2 | $29.97 - $59.94 | Makes fish more visible (also can be cut in half to make longer) | Home Depot |
| Total Cost of Materials: $489.95 - $519.92 | | | | | |

**Figure 3. Cost of materials involved with building a fish tower and flash panel.**

Another option would be a weir. This structure completely crosses a river in order to count all of the fish moving upstream. Naturally, it would have to be placed into the river before the fish begin to return. This method is vastly more accurate in obtaining numbers of fish because an observer must be present for the fish to continue up the river.

There are several styles of weir, but the most cost affective would be a simple one consisting of metal pickets, stringers, and tripods. Since the weir will need to be placed as close to the mouth of the river as possible in order to be as accurate as possible, it would be better for the pickets (metal pipes) to be galvanized. The materials for the construction of a simple weir are shown in Figure 4.

| Item | Individual Cost | Amount Required | Total Cost | Reason | Seller |
|---|---|---|---|---|---|
| 1/2 in. x 10 ft. Galvanized Steel Pipe (Pickets) | $17.40 | 150-300 | $2,610 - $5,220 | Keep fish from migrating and to corrode at a slower rate | Home Depot |
| 3/4 in. x 5 ft. Galvanized Steel Schedule 40 Cut Pipe | $20.53 | 9-18 | $184.77- $369.54 | Supports the weir | Home Depot |
| 3/4 in. Galvanized Malleable Iron 90 Degree Elbow with Side Outlet | $5.78 | 3-6 | $17.34 - $34.68 | Supports the weir | Home Depot |
| 1 in. x 96 in. Aluminum Angle Bar with 1/20 in. Thick | $15.27 | 2-3 | $30.54 - $45.81 | Supports Pickets | Home Depot |
| Total Cost of Materials: $2842.65 - $5670.03 | | | | | |

**Figure 4. Cost of materials involved with building a seasonal weir**

This option would be more costly than the counting tower and flash panel, but more accurate and there would be the option of taking scales, age, and lengths (ASL) from some of the fish than are migrating upstream without having to do a seine that would take at least three technicians. Simply creating a fish trap as a part of the weir, as shown in Figure 6, would make it possible with just one person.

Scales are read much like a tree core; by counting the rings. These would probably need to be sent to the Alaska Department of Fish and Game or it may be possible to inquire about having someone train a park staff member. It is important, to maintain a level of constancy, that scales are read by the same person(s).

**Figure 5. Glacial Lake weir. Photo by Anneliese Moll**

**Figure 6. Nome River Weir and fish trap used in ASL sampling. Photo by Anneliese Moll**

**Figure 7. Chum salmon migrating up river through the Nome River Weir. Photo by Anneliese Moll**

The third option is otolith collection. Otoliths are small and oval calcium carbonate structures inside the head of bony fish (Figures 8-11). There are usually three different pairs of otoliths within the fish (Online Otolith Lab). However, only the largest pair, the sagittae, are suitable for reading. Figure 10 shows the size of the three pairs of otoliths.

These can be collected after the fish has spawned and died with minimal affect on the river. Reading otoliths is similar to reading scales in that the reader is counting rings. However, with otoliths there can be more information. If there is a change in the environment it will leave a band on the otolith that is not like a normal growth ring. Hatcheries will often change the temperature of the water the fry or smolts are living in, to make these marks. This allows for them to be easily identified as hatchery stock(Online Otolith Lab). Hatcheries will also cut off the adipose fin of some of their stock, but when they are raising thousands of fish this is only done to a small number. Usually the fish with the missing adipose fin also have a small wire in their nose that can trace them back to the hatchery and the year that it was released. However, this is not done with pinks. This is done with fish that are considered of higher value, such as, sockeye and king salmon.

This would be the most cost affective method because it would only take place at the end of the spawning season, the only tools necessary are containers for the otoliths and knives for retrieving them, and because the Sitka Sound Science Center (SSSC) has an interest in collecting otoliths. In a conversation with Victoria O'Connell, Research Director of the SSSC, about the research that the SSSC is conducting she indicated potential interest in doing an otolith collection in Indian River and would welcome the assistance of Park volunteers. This would give Sitka National Historical Park the information about the fish in Indian River.

**Figure 8. Photo by Alan Murray, SSRAA**
**http://elearning.uaf.edu/cc/otolith/extraction/chop.htm**

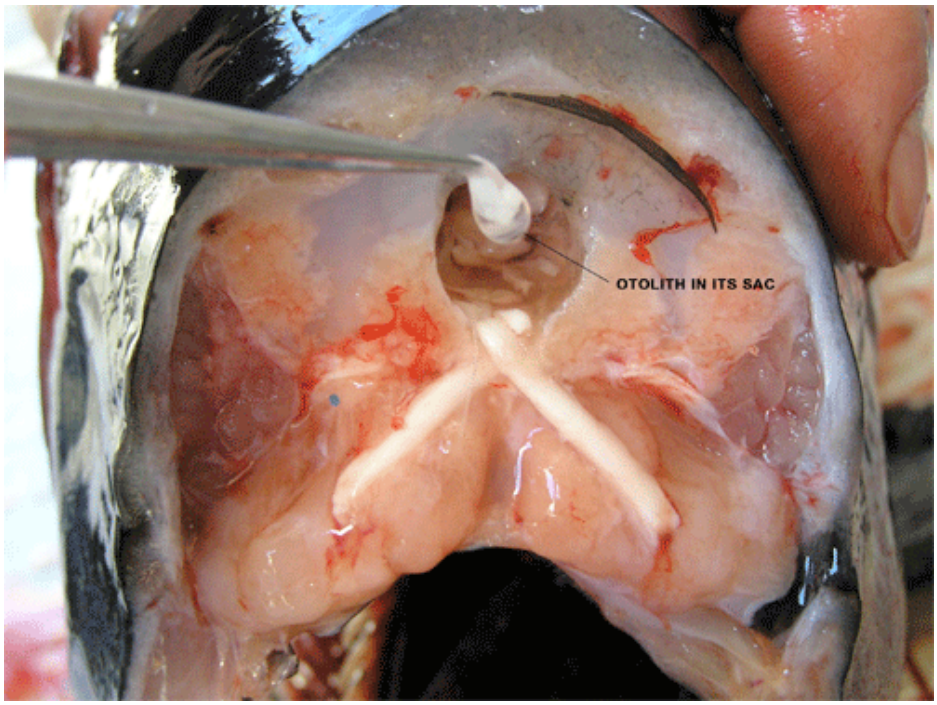


**Figure 9. Photo by Alan Murray, SSRAA.**
**http://elearning.uaf.edu/cc/otolith/extraction/chop.htm**

**Figure 10. Photo by Dr. Steven Campana, Bedford Institute of Oceanography.**
**http://elearning.uaf.edu/cc/otolith/whatis.htm**

**Figure 11. Photo by Alan Murray, SSRAA**
**http://elearning.uaf.edu/cc/otolith/extraction/chop.htm**

There are also other opportunities to obtain more information about the marine biology within the park. The SSSC is going to do a student bio blitz out at Starrigavan on May 20th, they would be interested in doing some of that at the Park if that is an option.

There are many options that Sitka National Historical Park can choose in order to obtain information on the salmon within Indian River. Three major and relatively simplistic methods were presented in this paper. A weir would give the most accurate counts, but is expensive compared with the counting tower and otolith collection. The counting tower offers less accurate numbers, but is more cost affective than a weir. The tower also will have a smaller impact on the park and its visitors. Otolith collection can be done with or without the Sitka Sound Science Center, but their involvement could offer more insight later on about the marine impact on the park. All three methods are utilized around the state of Alaska and will result in numbers of hatchery strays and wild stock.

# References

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