2015 Southern Resident Killer Whale Satellite Tagging

Marine Mammal Ecology

Southern Resident Killer Whales

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Killer whale satellite tagging

The dynamics of persistent organic pollutant (POP) transfer from female dolphins to their offspring during gestation and lactation

Using DTAGs to study acoustics and behavior of Southern Resident killer whales

21 May - Final update – On our previous update of L84's movements (11 May) he (and likely at least a few other whales) were off the entrance to Clayoquot Sound. They continued south and on the evening of the 12th had reached the offshore area of the Juan de Fuca Canyon. By the morning of the 13th they were off Cape Alava and our colleagues from Cascadia Research Collective attempted to intercept the whales but were unsuccessful due to rain and sea state. They whales continued south - by the morning of the 15th they were off Cape Elizabeth, off the Columbia River the morning of the 17th, and off Tillimook Head on the morning of the 19th. The whales headed back north such that they were just south of the Columbia River on the morning of the 21st. Our colleagues from Cascadia Research Collective were able to intercept the whales late that day and document L84 in the presence of at least a few other members of L pod. They also observed that the tag was just about to detach from L84 and by 23 May, the next scheduled transmission day, no signals were received. This 96 day deployment exceeded the K25 deployment of 2013 by 3 days and was much later in the year, providing the first satellite-linked tag data for southern residents for the entire month of April and much of May. With the deployment of the tag on J27 in late December of 2014 and the tag deployed on L84 in Febraury, we were able to monitor the movements of some of the southern resident killer pods for nearly four and half continuous months this winter and spring.

Cumulative energetic costs of killer whale responses to anthropogenic disturbance

Characterizing soundscapes in Southern Resident killer whale habitat with projected increases in vessel traffic

Staff

Dr. Brad Hanson
Project Lead

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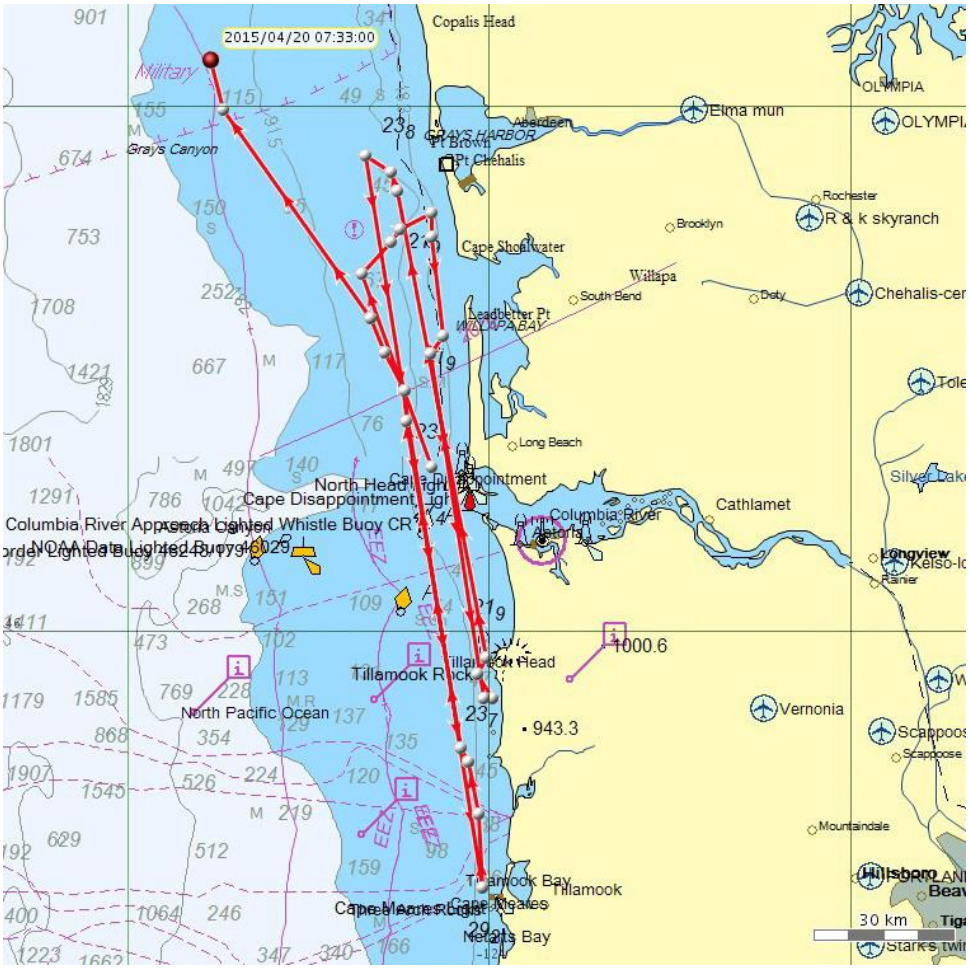
11 May update – As of the last update on 30 April L84, and at least a few other members of L pod, were off Willipa Bay heading north. By the morning of 1 May they were off Grays Harbor and continued north, reaching mid-continental shelf west of Destruction Island by the afternoon of 2 May before turning south. By 3 May they were off Grays Harbor and the morning of the 4th the found them off the middle of the Long Beach Peninsula, where they turned north. L84's transmitter again changed to an every other day duty cycle on 4 May to save power such that the next transmissions on the morning of 6 May showed the whales northwest of Cape Alava. By the morning of 8 May the whales had made a big jump north to the continental shelf break west of Estevan Pt. on central Vancouver Island. By the morning of 9 May they reached the northernmost point of this excursion - they were still on the shelf break about 25 km south of the Brooks Peninsula, which is about 3/4s the way up the west coast of Vancouver Island. By the morning of 11 May they continued south, moving more inshore and were at the south end of the entrance to the Nootka Sound and by the afternoon were off the entrance to Clayoquot Sound.

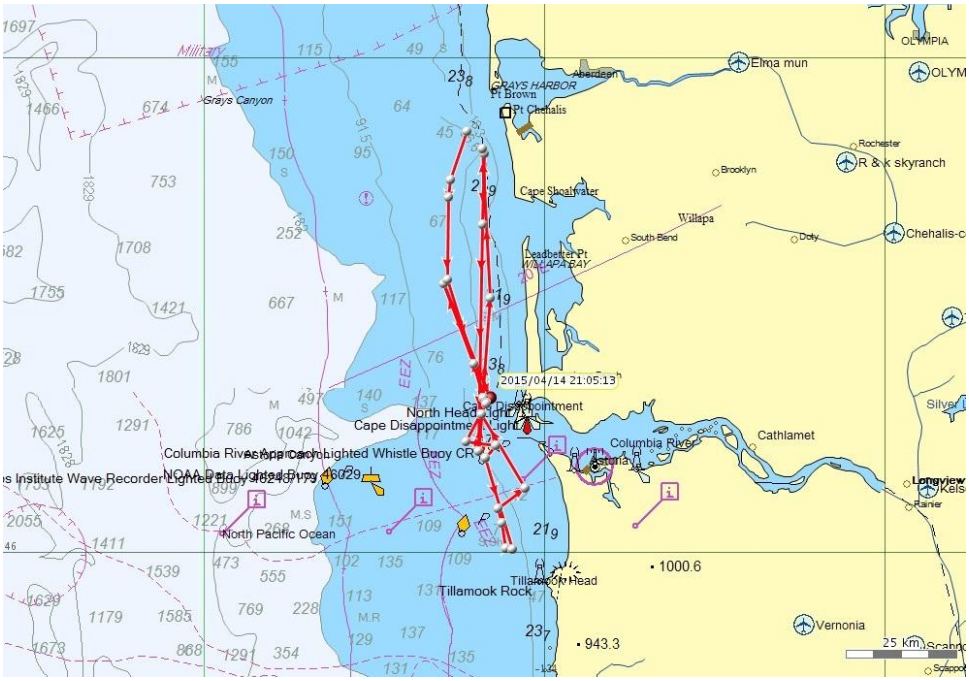
30 April update – On the morning of the last update (24 April) L84 and likely at least a few other L pod members were headed north off the Long Beach Peninsula, in southwest Washington. By the morning of the 25th they were off the entrance to Grays Harbor where they remained through the 26th. By the 27th they were headed south, off the entrance to Willipa Bay in the morning and off Cape Disappointment by that afternoon. They made a loop back to the north off the Long Beach Peninsula on the 28th but by the morning of the 29th they were off Nestucca Bay, in northern Oregon. They reversed direction and headed north such that by the morning of the 30th they were off the entrance to the Columbia River and the entrance to Willipa Bay by that afternoon.

24 April update – L84 was just to north of the entrance to Grays Harbor, but well offshore,on our previous update (20 April). The whales moved inshore that afternoon, to just off the entrace to Grays Harbor, but by the morning of the 21st they had traveled due west and were on the shelf break. They headed north/northeast and were just north of Cape Elizabeth on the morning of the 22nd. From there they traveled south and by the morning of the 23rd were near the entrance to the Columbia River. They remained in this general area overnight and as of this morning (24 April) they were just north of Cape Disappointment.

20 April update – This past week marked the beginning of the third month of tracking L84. The whales continued to spend time off the southwest Washington and northern Oregon coasts during this time. As of the morning of the last update (14 April) the whales were approaching the area near the Columbia River. They turned north and by the morning of the 15th were between the entrances to Grays Harbor and Willapa Bay. From there, they turned south and by the morning of the 16th were off Tillamook Head. They then turned north that day and by the morning of the 18th were off the entrance to Grays Harbor, before turning south. On the morning of the 18th they were off Tillamook Bay, where they again turned north and were off the entrance to the Columbia River on the morning of the 19th. By this morning (20th) they were just to north of the entrance to Grays Harbor, but well offshore.



14 April update – The whales have continued to spend time off the southwest Washington coast over the past several days. As of the morning of the last update (10 April) the whales were just north of the entrance to Willapa Bay, heading south. They continued south and by the morning of the 11th were off the Columbia River. On the morning of the 12th they were just south of the Columbia River, but heading north. The morning of the 13th found them between Grays Harbor and Willapa Bay and on the morning of the 14th they were off the middle of the Long Beach Peninsula heading south, approaching the area near the Columbia River by that evening.



10 April update – On the last update on 6 April L84 was off Willapa Bay. L84 was traveling north and by 8 April he was near La Push where our colleagues from Cascadia Research Collective were able to intercept a group of southern residents traveling north. The whales were very spread out but the individuals they saw included members of both L pod (but not including L84) and J pod. They were able to collect 4 prey and 1 fecal sample. However, L84 had turned south by the afternoon of the 8th so Cascadia staff launched out of Westport on the 9th and were able to intercept L84 and a few other L pod members just off Grays Harbor and collect 2 more prey and 1 more fecal sample. As of this morning (10 April) the whales were about were they were on the 6th, just off the entrance to Willapa Bay.

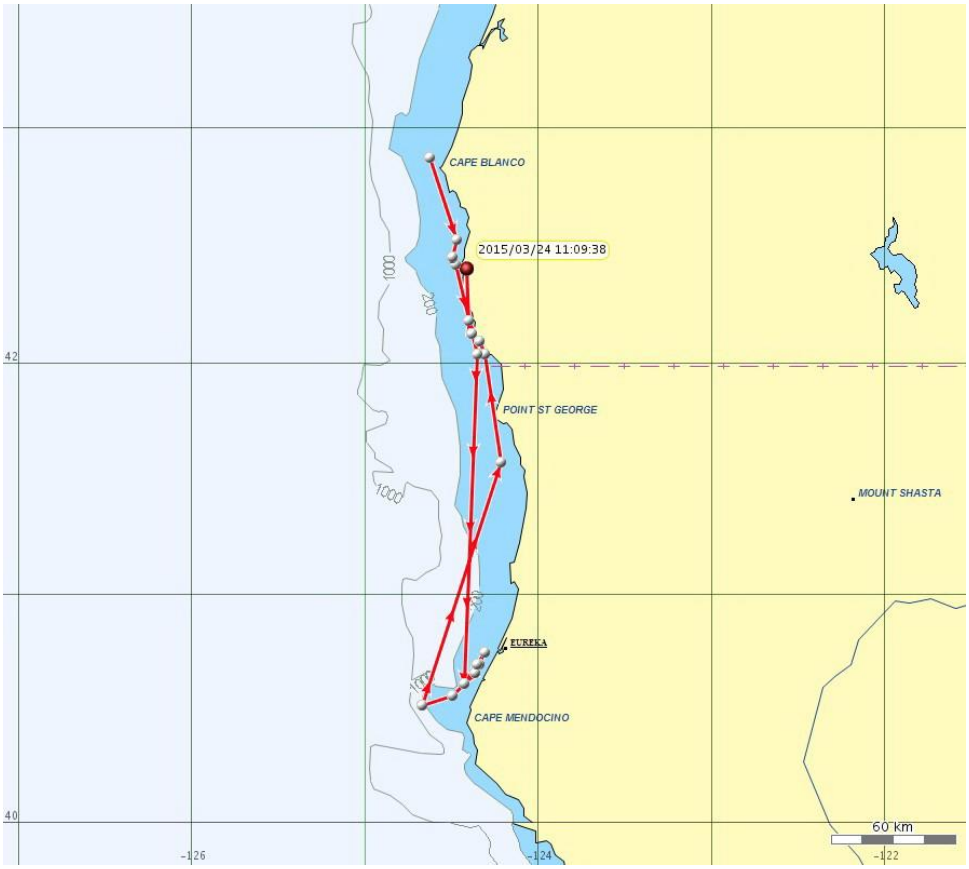
Greg Schorr, Cascadia Research Collective

6 April update – Since the last update a week ago on 30 March the whales have remained off the southwest coast of Washington. L84's tag went back to a duty cycle of transmitting every day beginning on 31 March. The whales remained in a relatively small area in the nearshore waters just north of the entrance to the Columbia River from 31 March until 4 April. By April 5th they had traveled north to just south of the

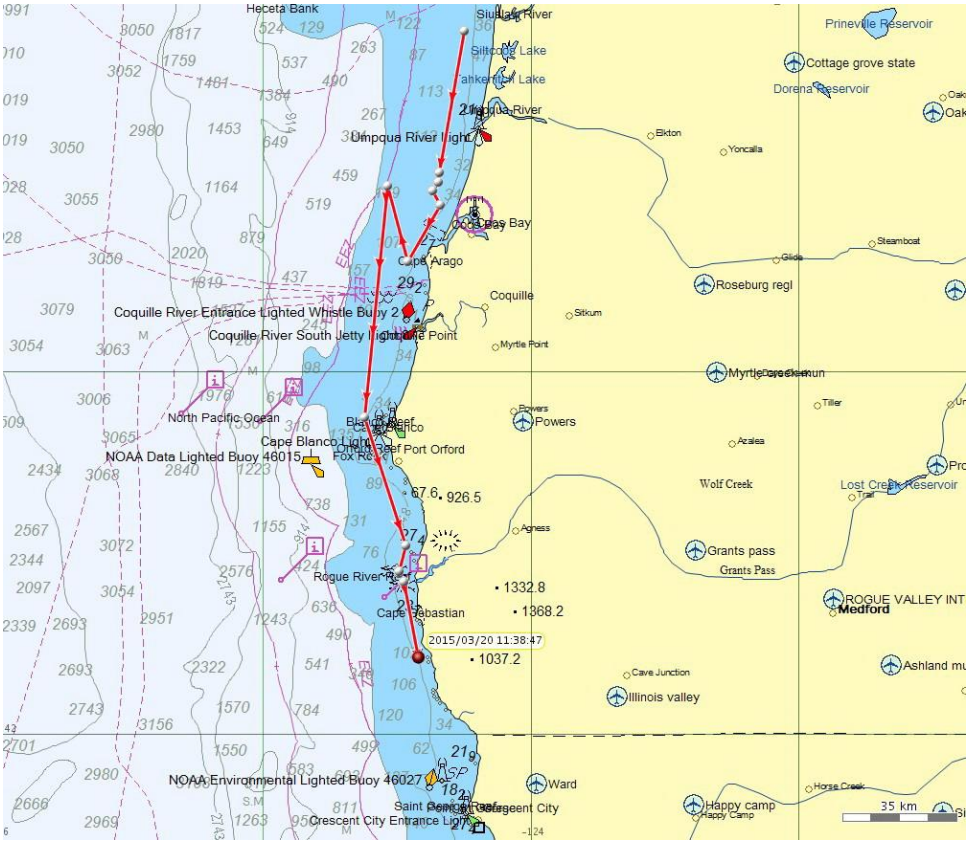
mouth of Willapa Bay, where they have remained through this morning (6 April)

30 March update – The previous update on 24 March found the whales northbound just south of Cape Blanco, Oregon. They continued north and by the 26th they were off Tillimook Bay in northern Oregon and by the 28th they were off Grays Harbor, Washington. There they turned south, and as of this morning (30th) they were off the Columbia River.

24 March update – On the previous post on 20 March the whales were southbound about 20 km north of Brookings, Oregon, near the California border. Our colleague Jeff Jacobson, who is based in northern California, was able to intercept them on the water that afternoon and determine that some of L pod and and K pod were with L84. The whales continued south, reaching Cape Mendocino on the afternoon of 22 March and then turned and headed north, reaching the area near the Rogue River at 1100 today.



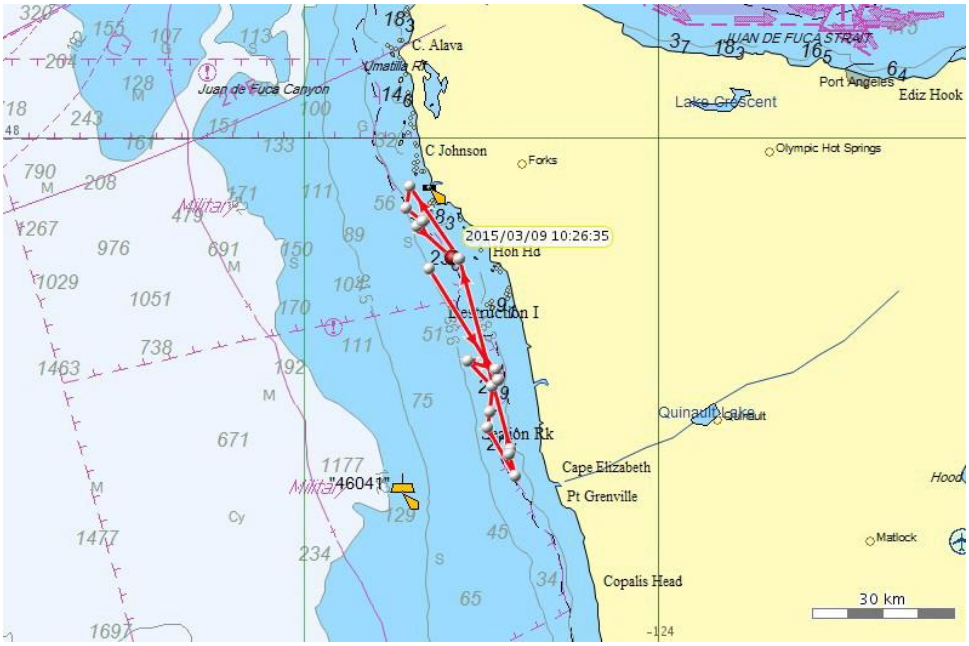
20 March update – As of the last update on the afternoon of the 16th L84 was nearly to Depoe Bay, Oregon. They have continued to travel south such that by the 18th they were off Coos Bay, rounded Cape Blanco on the evening of the 19th and were about 20 km north of Brookings, Oregon, near the California border about 1200 today.



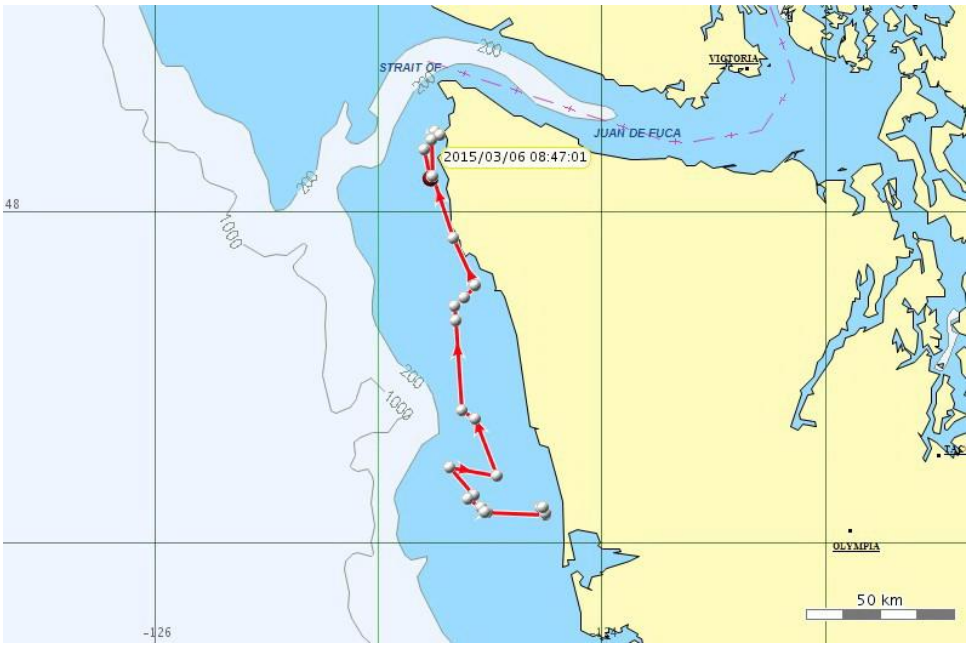
16 March update – At the last update on the morning of 12 March the whales were directly off Grays Harbor. They appeared to remain in that general area until the evening of 13 March when they had moved slightly south, to about half way between Gray Harbor and Willipa Bay. By the afternoon of the 14th they were off the entrance to the Columbia River. Since then they have continued moving south such that by the evening of the 15th they were just south of Cape Falcon, Oregon and by the afternoon of the 16th they were nearly to Depoe Bay, Oregon.

12 March Update – On the last update on 9 March the tagged whale was off of Hoh Head at mid-day heading south. By the morning of the 10th he was near Sea Lion Rock where they turned north again and by that afternoon were off Destruction Island. Starting that evening L84's tag shifted to an every other day transmission schedule to conserve power. Consequently, there is a large jump between that location and subsequent ones to the south with them being directly off Grays Harbor this morning.

9 March update – Friday 6 March our colleagues at Cascadia Research Collective intercepted the tagged whale and a few others off La Push as the whales moved south. They did not see L121 or any of the whales it would be associated with it as the other whales appeared to be extremely spread out. They were able to collect 4 prey and 3 fecal samples that day. The whales continued slowly south reaching Cape Elizabeth by the early morning hours of the 8th. Here they turned north and by early this morning they were off La Push before they again turned south, occurring off of Hoh Head by mid-day today.



6 March update – As of the morning of 3 March, the whales were just north of Ocean Shores. They circled back and spent the 4th and 5th traveling north. They turned back south at Cape Alava early this morning. Our colleagues at Casacdia Research Collective intercepted them this morning off La Push in their research boat to attempt to collect additional prey and fecal samples and get a look at L121. We ill post an update when they get off the water.



3 March Update – Since our 25 February update we have continued to follow L and K pods onboard the Bell M. Shimada. During that time the whale's movements have been confined to the coastal waters and northern Oregon. They were offshore of Westport on the 25th and by the 26th had moved to the near shore waters off Westport. From there they turned south and by the morning of the 27th had traveled as far south as Tillamook Head in northern Oregon. From there they headed back north and by the 28th were offshore of Westport again. On the morning of 1 March we followed them north to near LaPush. Over the course of the 2nd they moved south and were just north of Ocean Shores this morning. One interesting aspect of their behavior over the past several days was that the whales have been extremely spread out - over several miles - both north and south and east and west. Thus, while we were able to launch the Zodiac and find a few whales and collect additional prey and fecal samples, we did not see all the whales on a given day. Consequently, we didn't run into L94 so we don't have any additional reports on L121. Because we had to be back in Newport by 3 March, the last day of our 21 day cruise, and given that northern Washington is over a day's run from Newport, we headed south on the evening of 1 March and spent the daylight hours of the 2nd transiting along the shelf break in Washington where we observed Pacific white-sided dolphins, northern right whale dolphins, Risso's dolphins, as well as sperm whales, numerous fin whales, numerous black-footed albatrosses, and a couple of Laysans's albatrosses.

26 February – I keep thinking we have probably used all our luck up but things keep falling into place. By yesterday afternoon we were down to one day's fuel supply for the Zodiac. The whales have been all over the coasts of Washington and Oregon in the past two weeks but they managed to conveniently be in the vicinity of the entrance to Grays Harbor this morning allowing us to go in and quickly refuel. On the way back out we had just crossed the bar when we ran into the whales in the shipping channel, and in particular L94 and the new calf. This allowed us to spend more time with them, get a better look, and get a better photo than yesterday. In this photo you can see the fetal folds which indicates that the calf is only a few days old and this photo also seems to sum up the calf's vitality. Heading south, whales foraging off the Long Beach Peninsula this afternoon - 5 prey samples today.

25 February update – We were about 15 miles west of Westport this morning when we relighted the whales and observed a new calf - L94 appears to be the mother. To recap since our previous posting, on 23 February we were off Cape Lookout, Oregon following the whales north. Yesterday, we continued following the whales north past the mouth to the Columbia River. Since L84 was tagged a week ago we have been with all of K pod but only part of L pod. On 23 February Jon Scordino with Makah Fisheries sent us photos taken on 20 February of L25 off Cape Flattery, which indicated another part of L pod was in the general area. This morning, shortly after we launched our Zodiac we observed L41, part of the group that includes L25, indicating that another group of L pod had joined up overnight - this is first time we have documented pods reuniting on the outer coast. Fortunately the whales were very grouped up and within a few minutes we observed the new calf - with its unique orange-ish color on the white areas. The calf looked very energetic. We have five more days on the cruise and look forward to additional observations of the calf and collecting additional prey and fecal samples.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February 23 – As of Friday afternoon (the 20th) we were with the whales heading south off Cape Lookout. The whales continued south on the 21st and at about 1600 that day, near the mouth of the Umpqua River, in central Oregon they abruptly turned north. They continued north on the 22nd, sometimes up to 10 miles offshore. We observed alot of surface active behavior thoroughout the day - lots of spy hops - and at one point we observed numerous whales repeatedly breaching over a several minute period. Like the previous couple of days we have observed no apparent foraging and with the exception of a several hour period shortly after the breach fest episode they have remained quiet. This morning we are back off Cape Lookout and they are slowing continuing north.

February 20 – The last map up through February 18 showed the whales just south of Grays Harbor. They continued south until early morning on the 19th when they reached the Columbia River. They remained tightly grouped in that same general vicinity all day on the 19th with no apparent foraging - no fish chases, calls, or echolocation clicks all day. They had been trending north in the afternoon and evening but the early morning satellite tag location revealed they had reversed direction an

started traveling south. By this afternoon we caught up with them just south of Cape Lookout, Oregon.

February 18, Satellite tracking of L84 underway – As mentioned in our February 17 entry (below), we were able to intercept Ks and Ls at the western end of the Strait of Juan de Fuca and deploy a tag on L84.

You may recall that our SRKW satellite tagging project began in 2012 with the tagging of J26. In addition, we now have data from a second J pod member (L87 who travels with J pod) in January 2014 and most recently, the 6 week deployment in January and February 2015 on J27. Collectively, these data indicate only limited use of the outer coastal waters by J pod. In 2014 NMFS was petitioned to designate Critical Habitat on the outer coastal waters of Washington, Oregon, and California. The data used for this petition was derived from only one sample - the range of K25 during the January to March 2013 satellite tag deployment. Consequently, potential variability between pods and between years has led to making tagging a whale from L pod a high priority.

By being able to deploy a tag on L pod while on our cruise on the Bell M. Shimada we have the unique opportunity to now to be able to follow the whales each day (and potentially at night) and collect prey and fecal samples as well as other data about their environment this time of the

year. While we know that K and L pods sometimes co-occur in the winter, this will potentially be an opportunity to see the degree to which they remain together. We are off to an exciting start - four prey samples yesterday and four fecal samples today while the whales transited from near Cape Ozette yesterday morning to near Willipa Bay this afternoon.

See our Frequently Asked Questions about satellite tags, including how they work, the information they provide scientists, potential risks, and methods for minimizing potential impacts to the whales here.

February 15, Satellite tracking of J27 ends – On afternoon of 13 February J pod was at the north end of Texada Island. They spent the 14th moving around in the northern Strait of Georgia. That evening they headed down Malaspina Strait and then headed north between Texada Island and Vancouver Island on the morning of the 15th The last Argos location we received was at 1100 that morning and we later saw J27 without the tag, completing over 6 weeks of movement monitoring of J pod in the winter.

Feb 17 – On Sunday weather cooperated for small boat operations and despite whales again being extremely spread out in the northern St. of Georgia, we were finally able to get a look the newest calf J51 and mother J19. We also documented that as of 1600 the tag on J27 had detached, despite having gotten an Argos location as recently as 1200, so this was a fascinating opportunity to see progression tag detachment over the last couple of days. I will send a final map soon.

Because there had been a sighting of Ks and Ls off Sooke on Sat. afternoon we headed down to the Strait of Juan de Fuca and were very fortunate to intercept Ks and Ls about 1600 yesterday at the west entrance - we managed to stay with them sporadically through the night tracking acoustically.

We were able to do small boat ops today and deploy a tag on L84. We had great weather conditions all afternoon and were able to collect 3 scale samples and two biopsy samples - however, no one seems to be pooping.

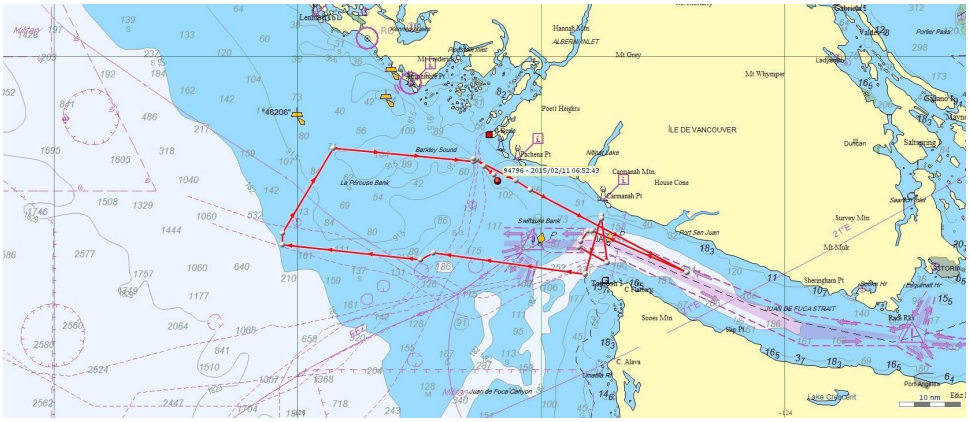
We are continuing south with Ks and Ls - we are about half way between LaPush and Westport.

13 Feb update – On 11 February the whales continued east entering the Strait of Juan de Fuca that afternoon. By the morning of the 12th they were off Victoria and then headed up Haro Striat where they were sighted and the new calf was observed. The continued north and by the morning of 13 Febraury were near the southern end of Texada Island in the Strait of Georgia, continuing up its east side until that evening.

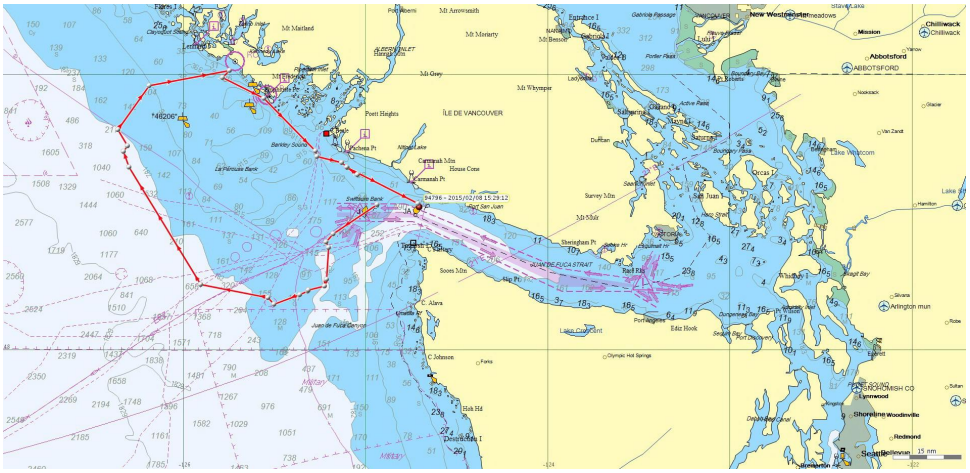
Cruise update – We departed Newport, OR, aboard the NOAA Ship Bell M. Shimada at 1030 on Wednesday the 11th. We proceeded north to try to intercept J27 and the rest of J pod near the the entrance of the Strait of Juan de Fuca where they had been for the past two weeks. By the time we reached the west entrace of the Strait of Juan de Fuca on the afternoon of the 12th, J pod had moved to the east and was in Haro Strait off the west side of San Juan Island. We were able to catch up with the whales off the south end of Texada Island in the Strait of Geogia on the morning of 13 Febraury. We launched our work boat and were able to spend most of the day conducting focal follows to collect predation event samples and feces. We were able to collect a sample of scales from a fish kill, the first outside of Puget Sound during Febraury. We also collected acoustic data on the whales, as well as bird counts and oceanographic data in this region. The whales were very spread out and

heavy rain set in the afternoon. Consequently, we did not encounter J51 but we did see J50.

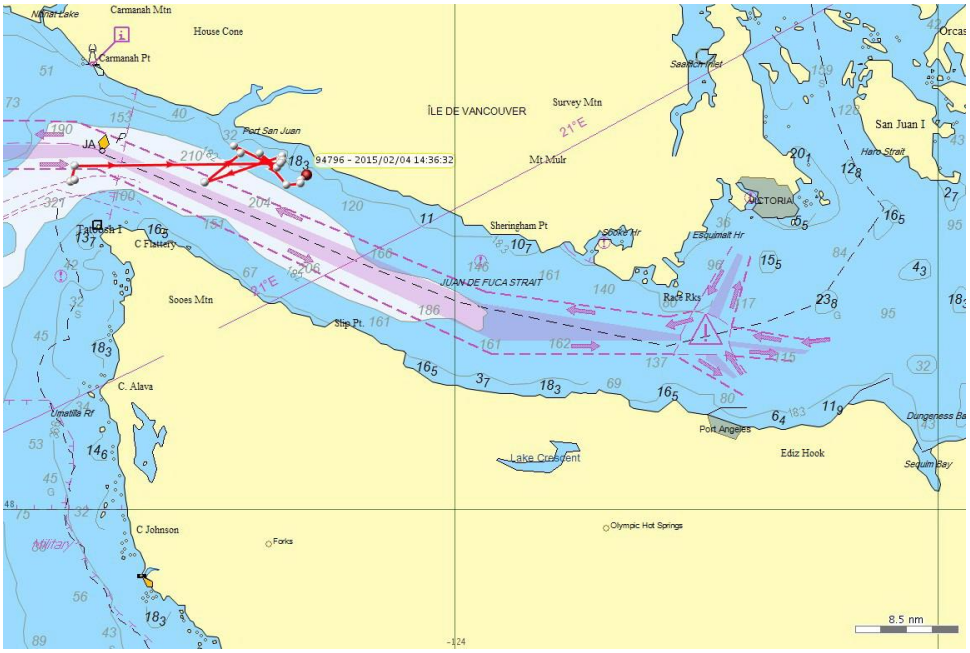
11 February update – On the evening of 8 February J pod was near the west entrance of the Strait of Juan de Fuca. They continued to spend the day in the same general vicinity but by the 10th they had moved back out near the continental shelf break before they looped back to the north around La Perouse Bank. By the morning of the 11th they were headed back toward the west entrance of the Strait of Juan de Fuca.



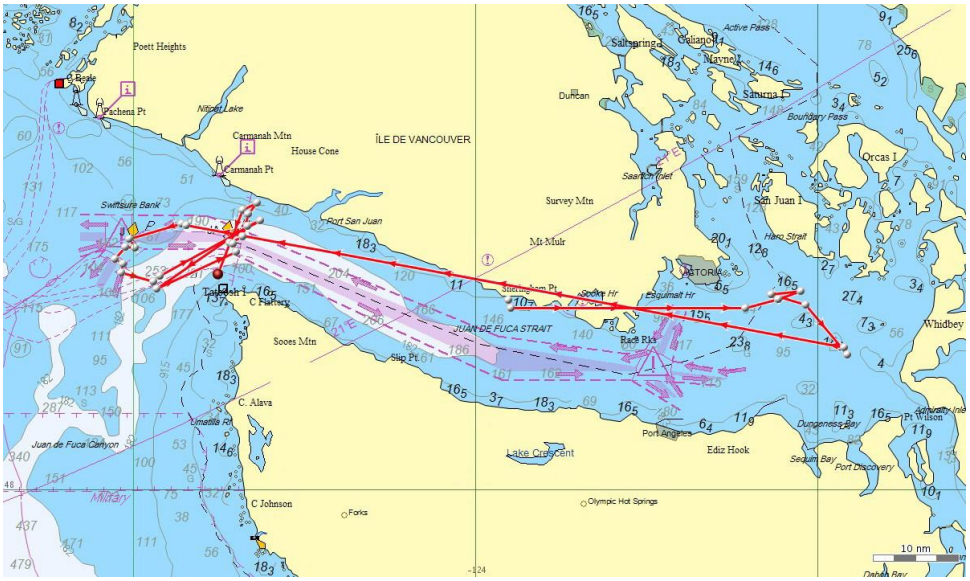
8 February update – As of the evening of 5 February when J27's tag turned back on from the day before the whales had continued to remain near the western entrance to the Strait of Juan de Fuca. By the following afternoon (6 February) the whales had moved southwest to the continental shelf break. The duty cycle on J27's tag reverted back to every day on 6 February such that we were able to follow the whales movements that day and the next as they followed the edge of the continental shelf slope northward before turning east and reaching the coast of Vancouver Island near Tofino. They headed south and were back near the western entrance to the Strait of Juan de Fuca by afternoon of 8 February.



5 February update – As of the evening of 3 February when J27's tag turned back on from the day before the whales were still out at the the western entrance to the Strait of Juan de Fuca. By the following morning (4 February) the whales had moved several miles to the east off the southwest coast of Vancouver Island.



2 February update – Based on the trajectory of travel on the afternoon of the 29th J pod was expected to show up in Puget Sound on Friday the 30th. Although they never arrived (but K pod did), by that evening when J27s tag turned back on we observed that they had returned to the western entrance to the Strait of Juan de Fuca. They spent the next day again meandering around the western end of the Strait of Juan de Fuca. Last night (1 February) and this morning's locations continue to show the whales remaining that same general area.

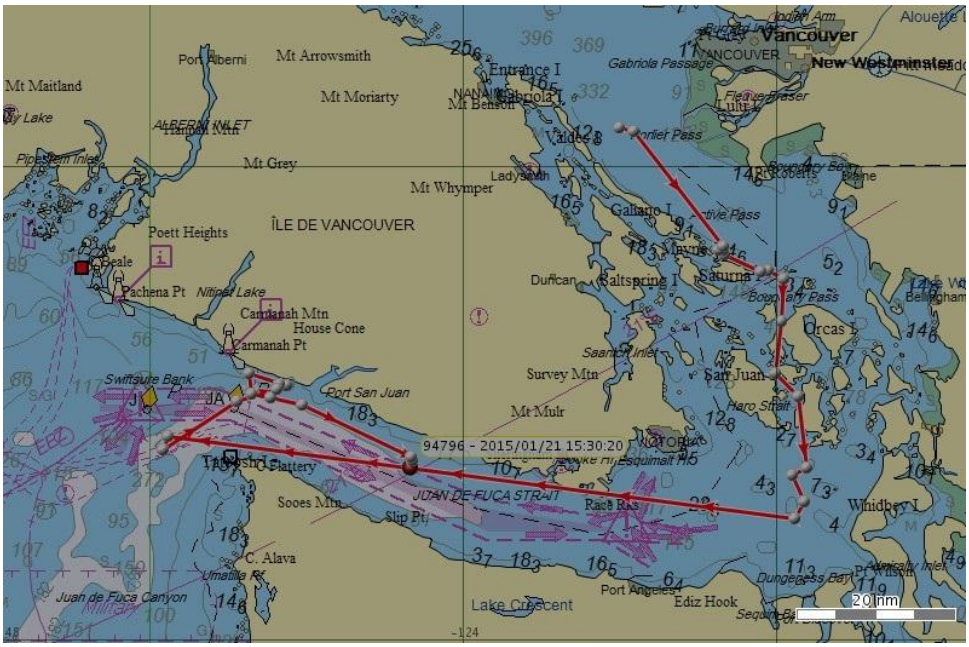


29 January update – The last location on the afternoon of 27 January showed J pod meandering around the western end of the Strait of Juan de Fuca. By the evening of the 28th when the tag turned back on the whales had moved east into the central Strait of Juan de Fuca. They continued traveling into the eastern Strait of Juan de Fuca over the course of the 29th and appeared to be on a trajectory for entry into Puget Sound.

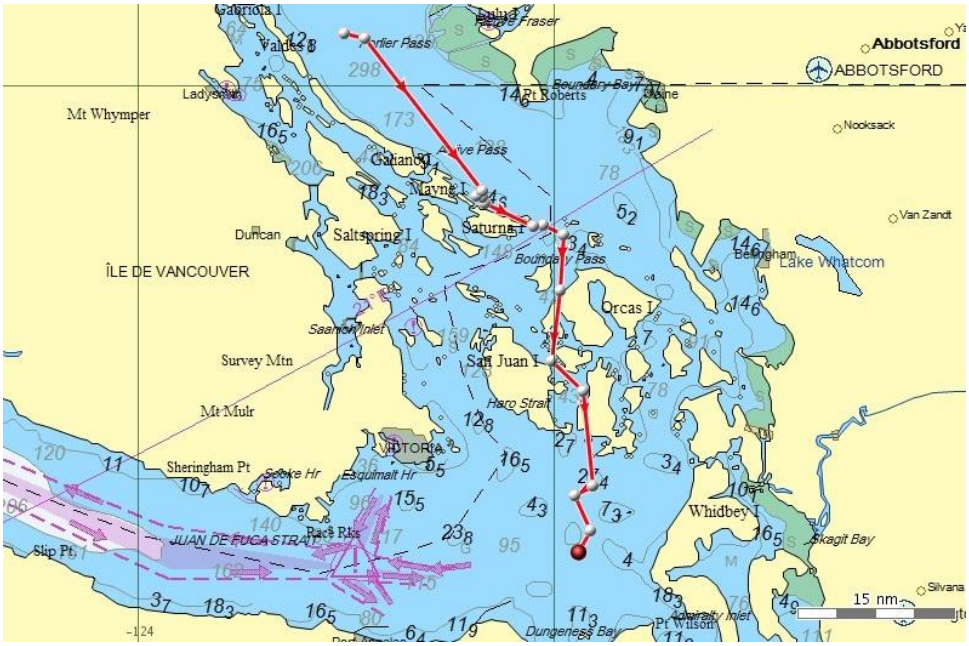
27 January update – On the afternoon of 25 January, the last location that day from J27 showed him heading west in the central Strait of Juan de Fuca after traveling down from the north side of the San Juan Islands. When the tag turned back on on the evening of 26 January the whales had made it to the western end of the Strait of Juan de Fuca where they continued meander around until the afternoon of the 27th.

25 January update – J27 (and the rest of J Pod) traveled around in the western Strait of Juan de Fuca from the last update (21 Janaury until the afternoon of the 23rd when the tag turned off. By the eveing of the 24th, when the tag turned back on, the whales were off the eastern entrance of Active Pass in the Strait of Georgia. They traveled south that night and by this afternoon (25 January) they were heading west in the central Strait of Juan de Fuca.

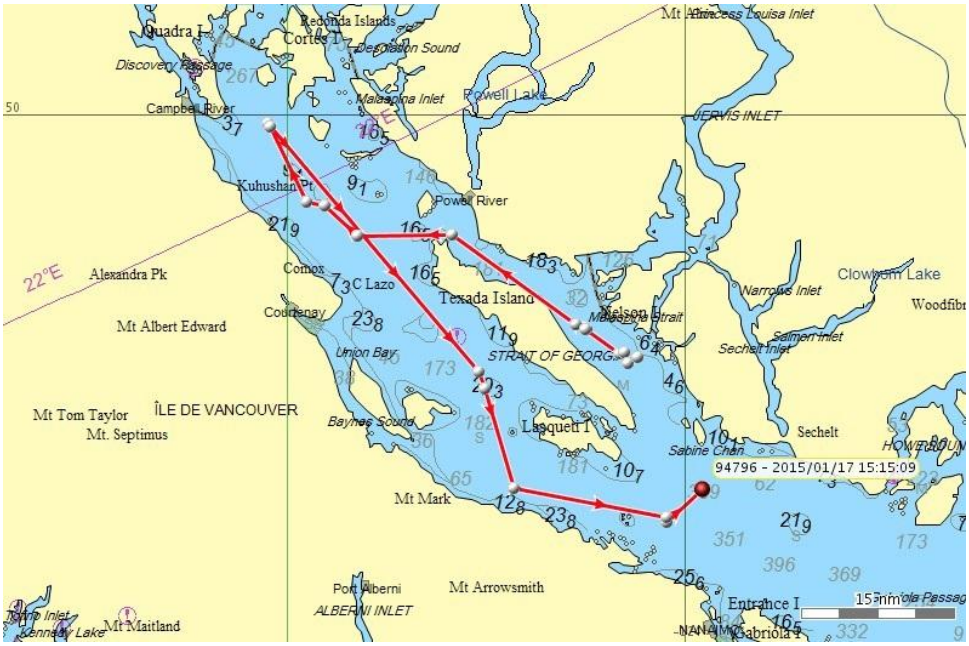
21 January update – After what appeared to be a direct run for Puget Sound by J27 on the last update (19 January), J pod were nowhere to be found in Puget Sound the next day. The mystery was solved when the tag fired up late yesterday (20 January) after its day off duty cycle and showed that the whales had made a 90 degree turn to the right and headed out to the ocean off the entrance to the Strait of Juan de Fuca. As of this afternoon they had moved back into the Strait of Juan de Fuca.



19 January update – The transmitter on J27 switched to transmitting every other day late in the day of 17 Janaury in order to conserve battery power. Consequently, there were no locations until late in the day on 18 January which found the whales west of the Fraser River headed south. They continued south during the night and on the morning of the 19th were heading down San Juan Channel. By that afternoon they were in the middle of the eastern end of the Strait of Juan de Juca.

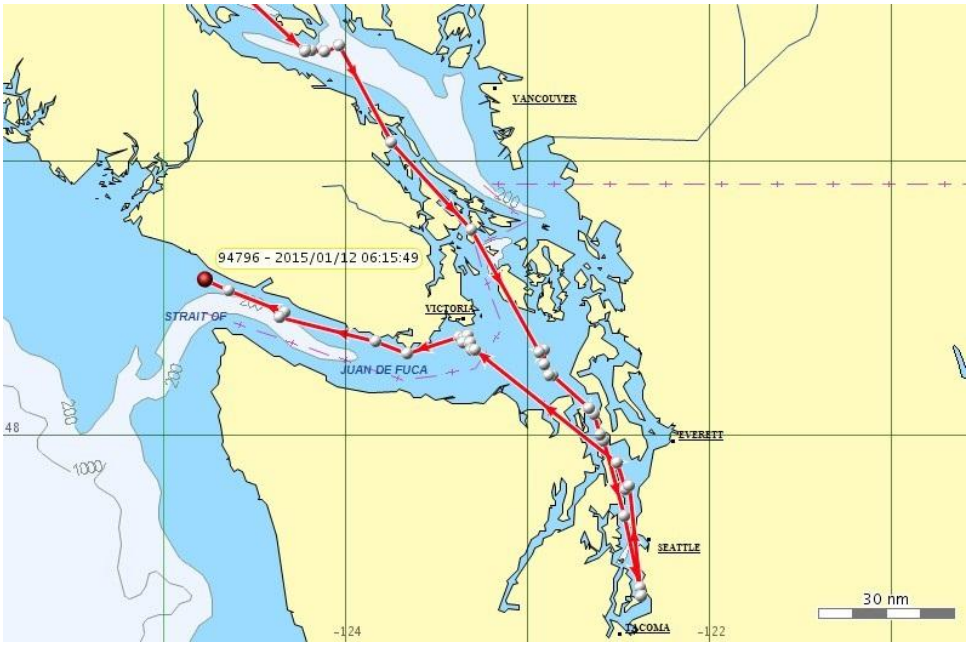


17 January update – On the previous update (Thursday, 15 January), J27 (and the rest of J pod) were off the northeast corner of Texada Island in the northern Strait of Georgia. By Friday morning (16 January) the whales had traveled north to just south of Campbell River. The whales then turned south such that by Saturday afternoon (17 January) the whales were off the south end of Texada Island.



15 January update – Our previous update (Monday, January 12), found J27 (and the rest of J pod) approaching the western entrance to the Strait of Juan de Fuca. The whales traveled into the open ocean, but only a short distance and for only for a brief time, before almost retracing their track back into the Strait of Juan de Fuca. By the evening of Tuesday, January 13 they were off Victoria, then traveled up Haro Strait, and by the morning of the January 14 they went through Active Pass. By this morning, January 15, they were off the northeast corner of Texada Island in the northern Strait of Georgia.

12 January update – On the previous update (Thursday, January 8), J27 (and the rest of J pod) were heading south in the northern Strait of Georgia. They made a bee line for Puget Sound arriving in there late Friday afternoon. Using the satellite tag location information we were able to anticipate their location on Saturday morning and readily locate them off Elliot Bay as they moved north. This allowed us to observe J50, who was with J16. We were also able to check the tag attachment on J27, which is holding as designed. In addition, we were able to collect several predation samples and fecal samples from the whales. By Sunday the whales were off Victoria and as of this morning they had reached the western entrance to the Strait of Juan de Fuca.

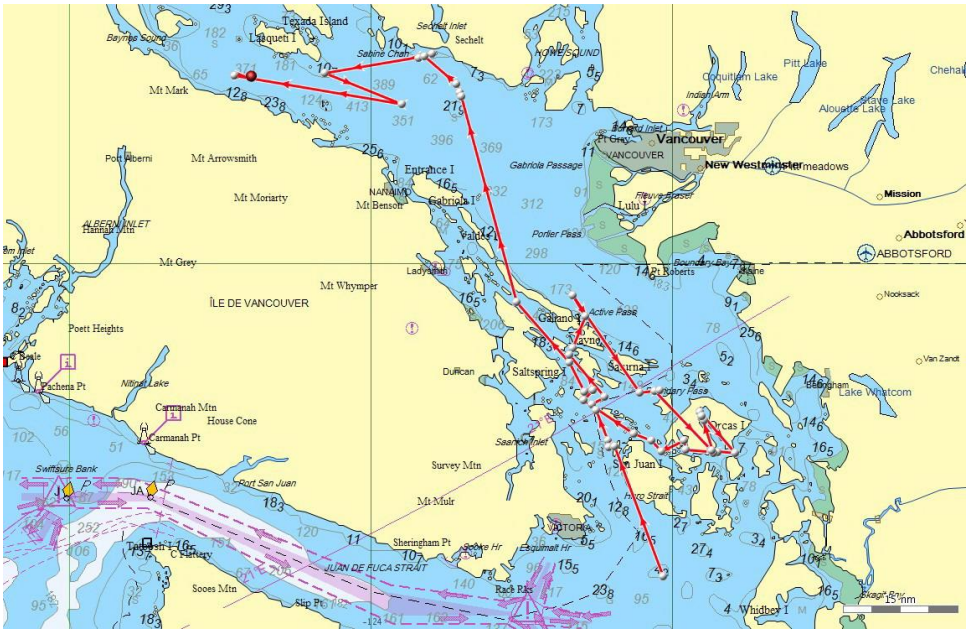


8 January update – On the previous update (January 5), J27 (and the rest of Jpod) were off the northwest corner of Texada Is. They continued northwest to near Campbell River, BC, and then looped around Tuesday and yesterday in the northern Strait of Georgia before heading on a more southerly course this morning. The near real-time locations from the satellite tag allowed staff from DFO Canada to readily locate the whales yesterday and confirm that the new calf, J50, was still alive.

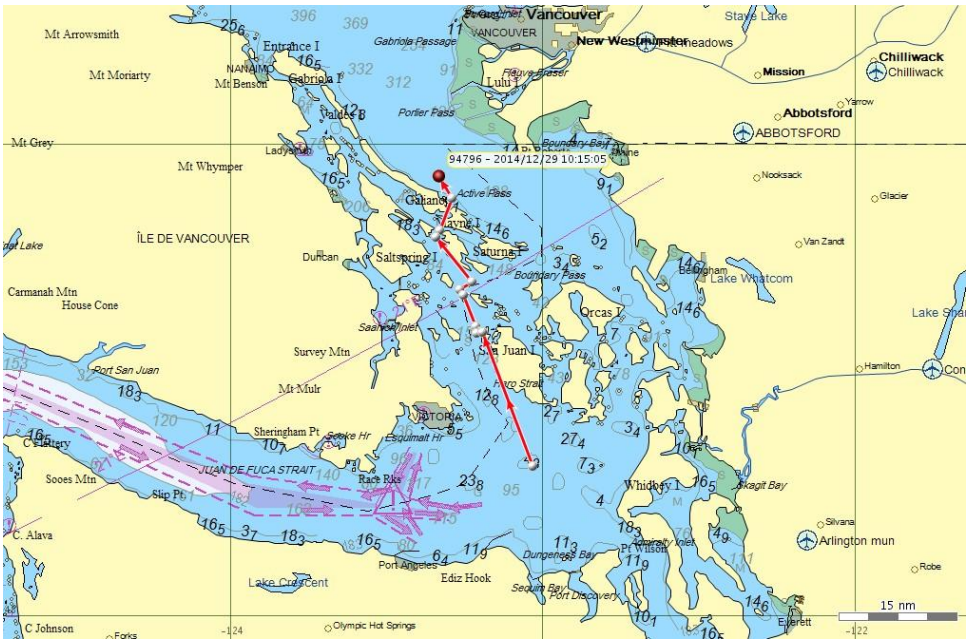
5 January update – On January 3, J27 (and the rest of Jpod) were near Campbell River, BC. In the past 2 days the whales traveled south and by early this morning were off Nanoose Harbor, just north of Nanaimo. However, they again turned north and by mid afternoon today were off the northwest corner of Texada Is.

3 January update – The location of the whales on the previous update (31 Dec 2014) was just to the southwest of Lasqueti Is. in the northern Strait of Georgia. From there the whales traveled north and were near Campbell River on the morning of 1 January. They them turned south such that by the morning of 2 January they were off Courtney, B.C.. The whales then looped back to the north and were again near Campbell river this morning (3 January)

31 December – Since the last location on 29 December when the J pod was just north of the entrance to Active Pass they turned south and headed into East Sound (the southern part of Orcas Island). Subsequently they were observed yesterday with the new calf (J50) off the north side of San Juan Island. As of today they have traveled to the northern Strait of Georgia.



29 December update – After J27 was tagged yesterday afternoon (the 28th) the whales traveled north through Haro Strait and entered the Strait of Georgia this morning.



29 December – This year we are again continuing the satellite tagging project that we began in 2011 to help us understand where Southern Resident killer whales go in the winter, and thus their winter habitat use. Yesterday afternoon we tagged an adult male, J27, in northern Puget Sound with a satellite-linked transmitter. The location information gathered from this tag will address the data gap in winter distribution identified in the Recovery Plan as well as provide information for improving Critical Habitat designation. An independent science panel recently identified such tagging as an important approach for addressing coastal habitat use by the Southern Resident killer whales.

The first tag deployed on a Southern Resident (J26), in 2012, yielded only three days of data, and while providing a brief glimpse of where J pod travels on the outer coast, more data was needed to understand the winter movements of J pod in particular. In late December 2013 we tagged L87 (who is most commonly sighted with J pod). During the 30 day duration of signal contact we gained valuable information about their extensive use of inland waters of the Salish Sea, particularly in the

northern Strait of Georgia where they are infrequently observed, but almost no time was spent on the outer coast.

Consequently, we still know less about the coastal distribution of J pod than K or L pod during this time of year. In addition to less tagging information, J pod has only been detected on one of our seven passive acoustic recorders (and infrequently at that) - the northernmost inshore mooring off Cape Flattery. As a result, J pod does not appear to travel very far south along the Washington coast nor do they go to Oregon or California like K and L pods. The lack of information on J pod's winter movements relative to K and L pod is particularly acute in light of the substantial and extremely valuable movement data we obtained in 2013 on a tag deployed on K25. We may deploy additional tags on K and L pod whales this year to assess their movements compared to the early winter movement data we obtained previously. In addition, little is still known about where the whales go during the spring months (April-June) so we are looking to deploy tags to cover this time of year as well.

The tag deployed on J27 is similar to the tags deployed J26, K25, L88, and L87. In response to an attachment failure of the tag deployed on K25 in 2013 (resulting in retention of an orphaned dart in the fin of K25) and as required by our research permit, we assessed the cause of the failure and worked with the tag manufacturer on a modification to mitigate for this possibility. The redesign incorporates a petal at the base of each dart to put more drag on the dart in the event of transmitter loss, which will reduce the time the dart remains in the fin.

We will post updated information and maps on this page for the duration of the tag deployment. For more information about the Satellite Tagging Project, see our FAQs.

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