Olympic Fisher Reintroduction Project: 2009 Progress Report

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The 2009 progress report is a summary of the reintroduction, monitoring, and research efforts undertaken during the first two years of the Olympic fisher reintroduction project. Jeffrey C. Lewis of Washington Department of Fish and Wildlife, Patti J. Happe of Olympic National Park, and Kurt J. Jenkins of U. S. Geological Survey are the principal investigators of the monitoring and research program associated with the reintroduction. David J. Manson of Olympic National Park is the lead biological technician.

Disclaimer

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Background

Historically, the fisher (*Martes pennanti*) occurred throughout much of the coniferous forests of Washington. However, the fisher was extirpated from Washington within the last century, largely as a result of historical, unregulated trapping and loss of forests in older age-classes at low and mid-elevations. A status review completed in 1998 by the Washington Department of Fish and Wildlife (WDFW; Lewis and Stinson 1998) documented these findings and prompted the listing of the fisher as a state endangered species by the Washington Fish and Wildlife Commission in October of 1998. The fisher was also listed as a federal candidate species by the U. S. Fish and Wildlife Service after the proposed listing of its west coast population as endangered was deemed warranted but precluded by higher-priority listings (U. S. Fish and Wildlife Service 2004).

The listing of the fisher in Washington prompted considerable interest in restoring the species to its historical range within the state, as well as the development of a fisher recovery plan (Hayes and Lewis 2006). Recovery efforts throughout much of the fisher's North American range have relied heavily on reintroductions and the fisher has proven to be one of the most successfully reintroduced carnivores (Berg 1982, Powell 1993, Breitenmoser et al. 2001, Lewis 2006). Due to the extirpation of fishers, the lack of nearby fisher populations to support recovery through recolonization, and the past success of reintroductions elsewhere, WDFW began planning a fisher reintroduction as a means to restore the species in Washington (Hayes and Lewis 2006).

A reintroduction feasibility study was initiated in 2002 by WDFW and Conservation Northwest, a non-profit conservation organization. The study concluded that fisher reintroductions to the Olympic Peninsula and to the Cascades of Washington were biologically feasible (Lewis and Hayes 2004), and that the most suitable location for a reintroduction was within Olympic National Park (ONP). Biologists with ONP had long been interested in the status of fishers in the Park. The preliminary results of the feasibility study prompted ONP to join the reintroduction partnership with WDFW and Conservation Northwest. Subsequently, WDFW and the National Park Service (NPS) developed a reintroduction implementation plan (Lewis 2006), and an environmental

assessment/reintroduction plan (National Park Service et al. 2007) pursuant to the National Environmental Policy Act. With the approval of the environmental assessment and reintroduction plan by the NPS, and with other coordination and preparations in place, the proposed reintroduction was initiated in the fall of 2007.

The intent of the Olympic fisher reintroduction project is to reestablish a self-sustaining population of fishers on the Olympic Peninsula. To achieve this goal, the Olympic fisher reintroduction project is striving to reintroduce ~100 fishers to the Olympic Peninsula over three years. The reintroduction of fishers to the Olympic Peninsula is designed as an adaptive management project. The project incorporates research and monitoring of released fishers as a means to evaluate reintroduction success, investigate key biological and ecological traits, and inform future reintroduction, monitoring, and research efforts. WDFW and ONP are the co-leads for the reintroduction efforts, while WDFW, U. S. Geological Survey (USGS) and ONP are the leads for the research and monitoring program associated with the reintroduction. In this report, a preliminary summary is provided of the progress made during the first two years (Fall 2007 – Fall 2009) of the 3-year reintroduction, monitoring, and research project. Our research and monitoring objectives are focused on evaluating measures of reintroduction success, investigating the ecological relationships of reintroduced fishers, and adaptively managing the reintroduction to increase the likelihood of success.

Acknowledgments

Reintroduction planning and implementation depended on the assistance of the British Columbia Ministry of Environment, who supported our efforts to undertake a translocation of British Columbia fishers to the Olympic Peninsula. Members of the British Columbia Trappers Association from central British Columbia captured fishers for the reintroduction. In addition to the 22 trappers that have provided fishers for this project, we would like to thank our hosts, Marg and Don Evans for working with the trappers and providing expert care for the fishers prior to their transport and release.

Funding for the project has come from a number of sources including the U. S. Geological Survey, U. S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Doris Duke Foundation and the Wildlife Conservation Society, National Park Service, and Washington's National Parks Fund.

Numerous people from many agencies and organizations provided essential support to the project. From the National Park Service we thank Roger Hoffman, Katherine Beirne, Cat Hawkins Hoffman, Barb Maynes, Scott Gremel, Nancy Hendricks, Sandy Hamilton, Tom Kay, Josh Chenowith, Mike Danisiewicz, Mark McCool, George Leite, Kraig Snure, Gabe Asarian, Stuart Curtin, Les Young and the Olympic National Park road crew, and Superintendents Bill Laitner, Sue McGill, and Karen Gustin. From Conservation Northwest, we thank Dave Werntz, Jasmine Minbashian, Paul Bannick, Jen Watkins, Mitch Friedman, Erin Moore, Mark Skatrud, and Fred Munson. From Washington Department of Fish and Wildlife, we thank Harriet Allen, Rocky Beach, Greg Schirato, Anita McMillan, Marion Snyder, Jack Smith, Craig Bartlett, Tom Davis, Ken Warheit, Kristin Mansfield, Warren Michaelis, Gerry Hayes, Cheryl Dean, Cherrill Bowman, Jennifer Von Bargen, Scott Pearson, John Pierce, pilots Jim Hodgson and Marty Kimbrell, and Officers Brian Fairbanks and Win Miller. From the British Columbia Ministry of Environment, we thank Eric Lofroth, Helen Schwantje, Randy Wright, Tom Ethier, Irene Teske,

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Progress to Date

We previously described four main aspects of the reintroduction process: 1) the capture, housing and care of fishers; 2) the preparation of fishers for reintroduction; 3) transporting fishers to Washington; and 4) releasing fishers in ONP (Lewis and Happe 2009). We employed the same procedures during the second year of the project. In year 1 of the project, 18 fishers were successfully captured, transported to Washington, and released in ONP (Table 1, Figure 1, Appendix 1). Fishers released in year 1 have been monitored (via radio-telemetry) for approximately 22 months (January 2008-November 2009). In year 2, we released an additional 31 fishers in ONP (Table 1, Figure 1, Appendix 1). These year-2 fishers have been monitored via radio-telemetry for approximately 11 months.

Table 1. The number and age-class of fishers released in years 1 and 2 of the Olympic fisher reintroduction project.

Release year	Fisher age classes	Females	Males
Year 1 Releases in Jan 2008 and Mar 2008	Juveniles (<1 year old)	3	1
	Subadults (1 year old)	3	4
	Adults (≥2 years old)	6	1
	Total (18)	**12**	**6**
Year 2 Releases in Dec 2008, Jan 2009, and Feb 2009	Juveniles (<1 year old)	7	7
	Subadults (1 year old)	5	4
	Adults (≥2 years old)	8	0
	Total (31)	**20**	**11**
Years 1 & 2	**Grand Total (49)**	**32**	**17**

All 49 fishers released during years 1 and 2 were captured in central British Columbia (Figure 1). In year 2, 31 fishers were transported to Washington and released in Olympic National Park on 3 occasions. The first group of fishers (9 females, 5 males) was transported on 20 December 2008 and released on 21 December 2008 in the Elwha and Sol Duc Valleys (Figure 2). The second group (9 females, 6 males) was transported on 16 January 2009 and released on 17 January 2008 in the Queets Valley, Hoh Valley, and near the Staircase ranger station (Figure 2). The last group (2 females) was transported on 22 February and released on 23 February 2009 in the Hoh Valley (Figure 2). Two fishers were kept in captivity in British Columbia for an additional 25 days to treat against infection associated with a damaged tooth (F029) and a laceration (M030). Both were released in good health, with the second release group.

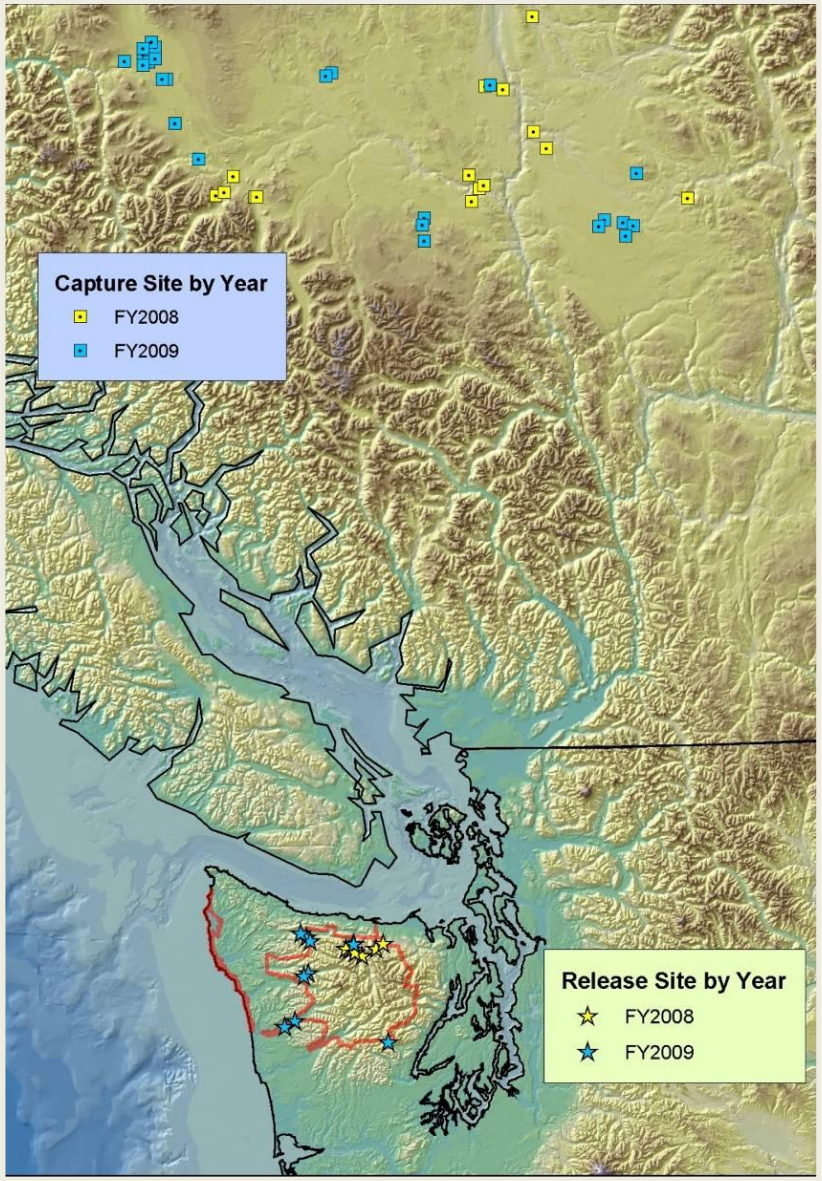

Figure 1. Capture (squares) and release (stars) locations for 49 fishers released in Olympic National Park in 2008 (yellow) and 2009 (blue).

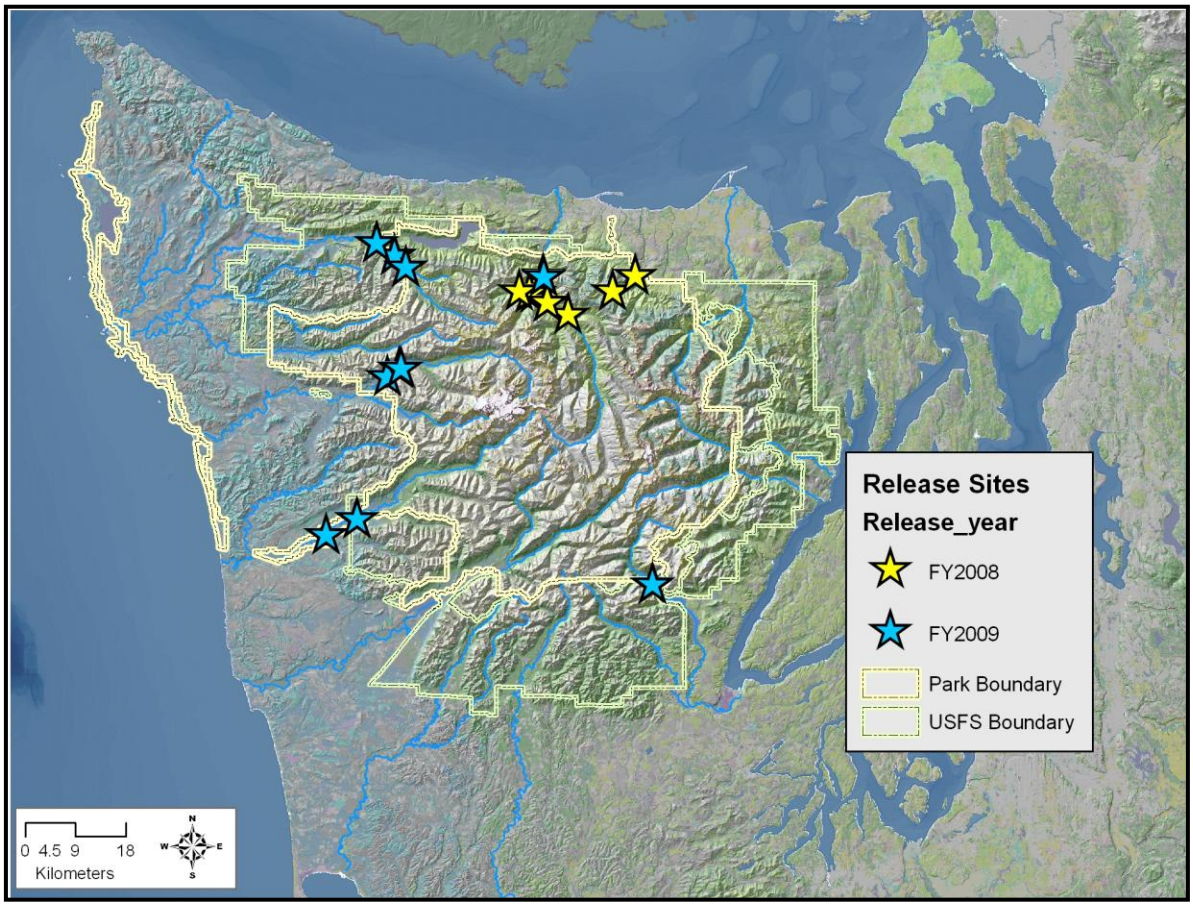

Figure 2. Release locations for fishers (n=49) in Olympic National Park in 2008 (yellow stars) and 2009 (blue stars). Release locations include the Morse, Elwha, Sol Duc, Hoh, Queets, and North Fork Skokomish Drainages.

Reintroduction Success Monitoring

Our monitoring efforts in year 1 and 2 focused on evaluating movements, survival, home range establishment and reproduction of reintroduced fishers. Because most of the released fishers occurred in areas that were relatively inaccessible to ground or vehicle-based telemetry, we relied primarily on aerial telemetry to monitor fishers following their release. Although we attempted to locate each fisher every week, inclement weather, poor flying conditions and logistical considerations often interfered. Hence, our goal was to locate each collared fisher up to once weekly, but no less than once per month. For more accessible individuals, we have also obtained locations using ground telemetry procedures. Ground telemetry locations, derived from homing and triangulation, were instrumental for locating and describing fisher rest and den sites and for discovering scats that will be used in food habits analyses.

Movements

We assessed post-release movements of fishers to determine if the landscape features (e.g., terrain, water bodies, high elevations, barren areas) of the Olympic Peninsula presented barriers or impediments to fisher movements and to determine if potential barriers or impediments are significant enough to prompt an adjustment to the planned reintroduction approach.

While most fishers gradually moved away from release sites, the distance that fishers moved away from their release sites varied among individuals (Figures 3 and 4). Male and female fishers made extensive movements between consecutive telemetry relocations including movements across rivers, over high-elevation ridges, and through the mountainous interior of ONP (Figure 3). By 30 November, the movements of released fishers had become localized (Figure 4). Maximum movements of fishers from their release sites ranged from approximately 17-72 km for females and approximately 15-111 km for males (Table 2).

Table 2. Maximum distances that fishers were located away from their release site by release-year cohort and sex.

		Maximum distance located from release site			
Release cohort	**Sex**	**Mean (km)**	**SD**	**n**	**Range (km)**
1	F	38.0	18.2	10	18.2-72.3
1	M	68.2	33.9	5	22.2-111.0
2	F	35.4	16.6	9	17.1-69.1
2	M	51.5	25.3	7	15.0-95.0

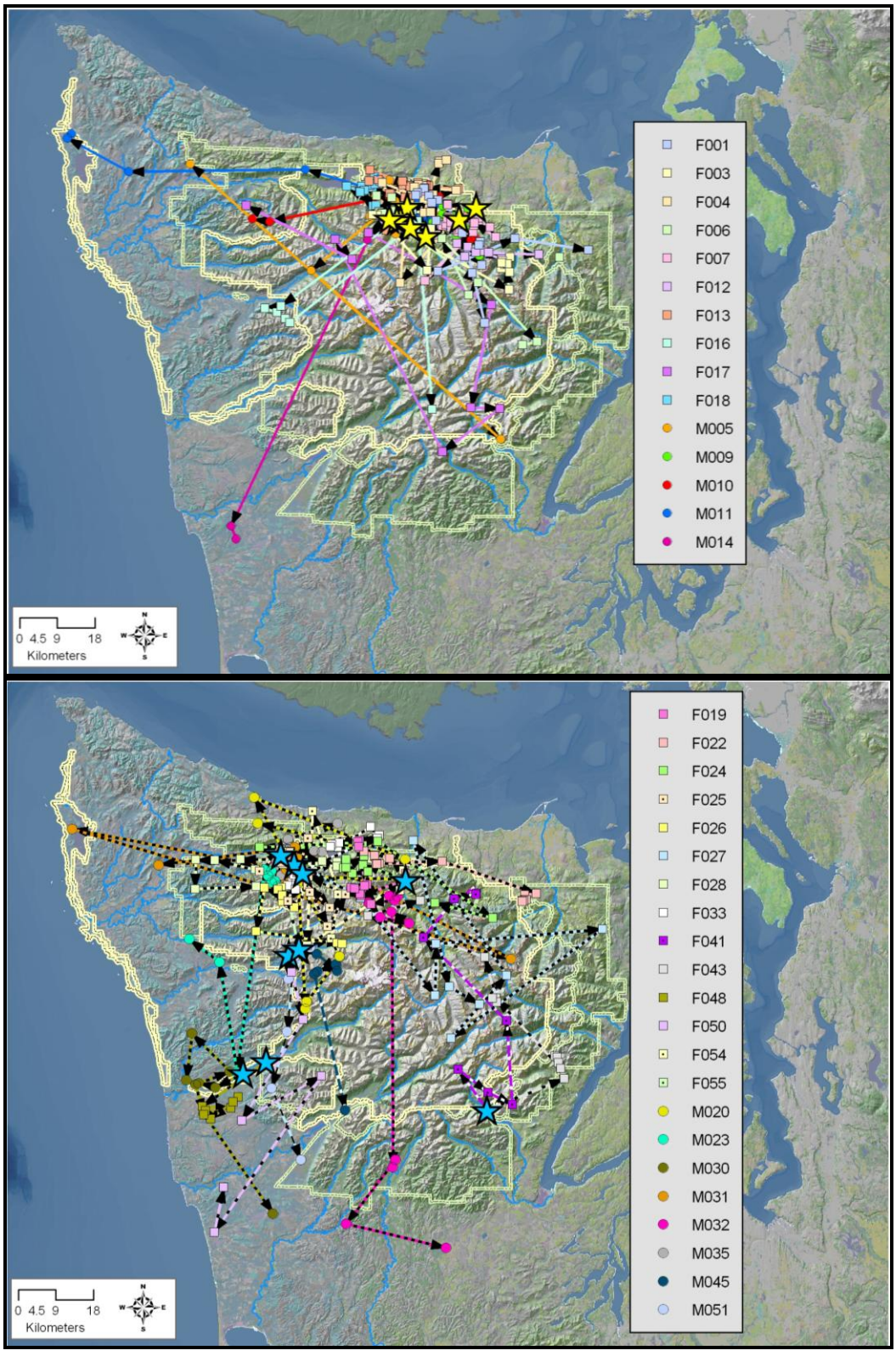

Figure 3. Locations and movements until 30 May of their release year for fishers released in January and March of 2008 (top; release year 1) and for fishers released in December 2008, and January and February 2009 (bottom; release year 2). Note that release site locations (yellow stars in top graphic, blue stars in bottom graphic) differ between the 2 release years.

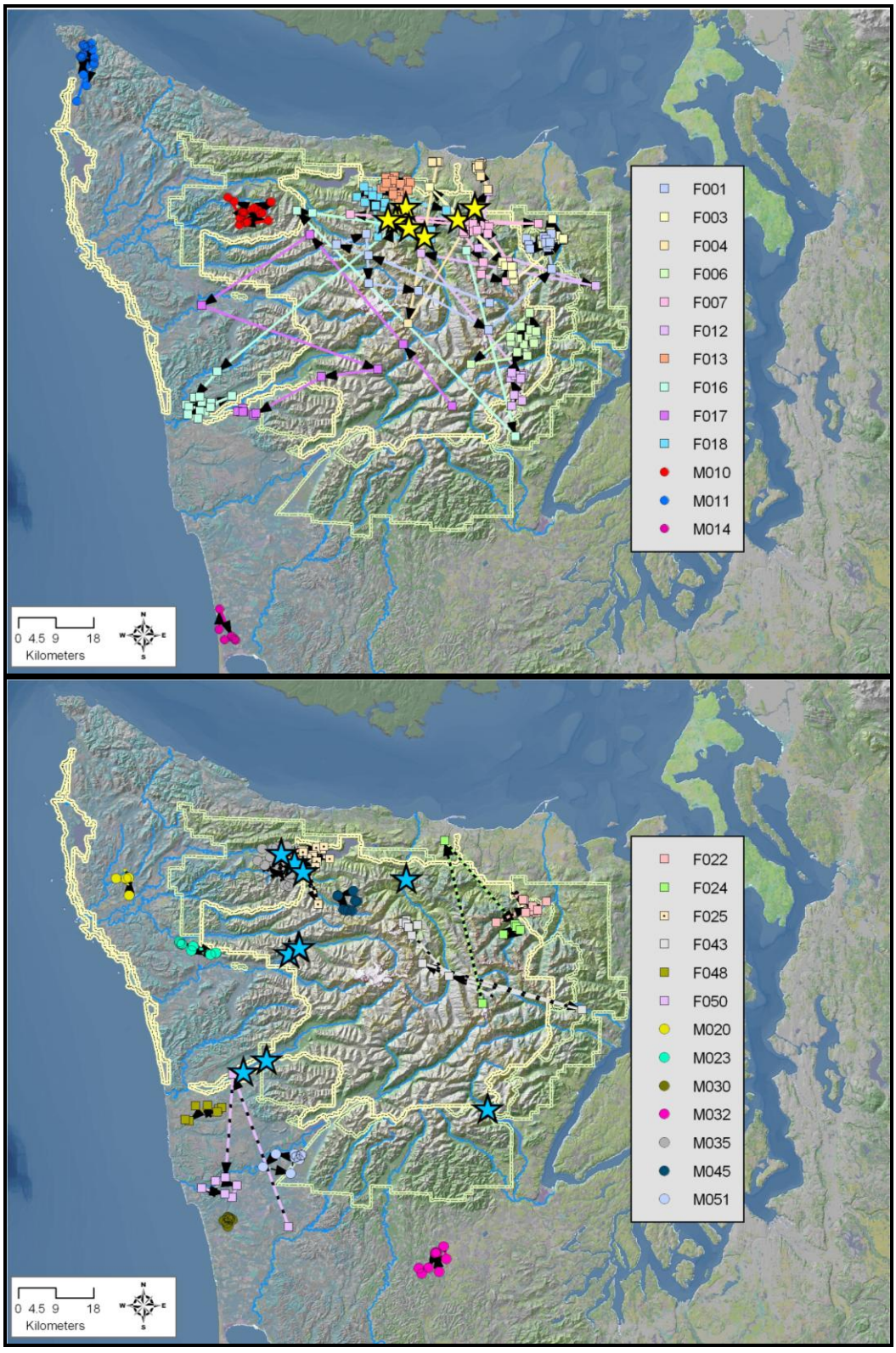

Figure 4. Locations and movements from 1 June to 30 November of their release year for fishers released in January and March of 2008 (top; release year 1), and for fishers released in December 2008, and January and February 2009 (bottom; release year 2).

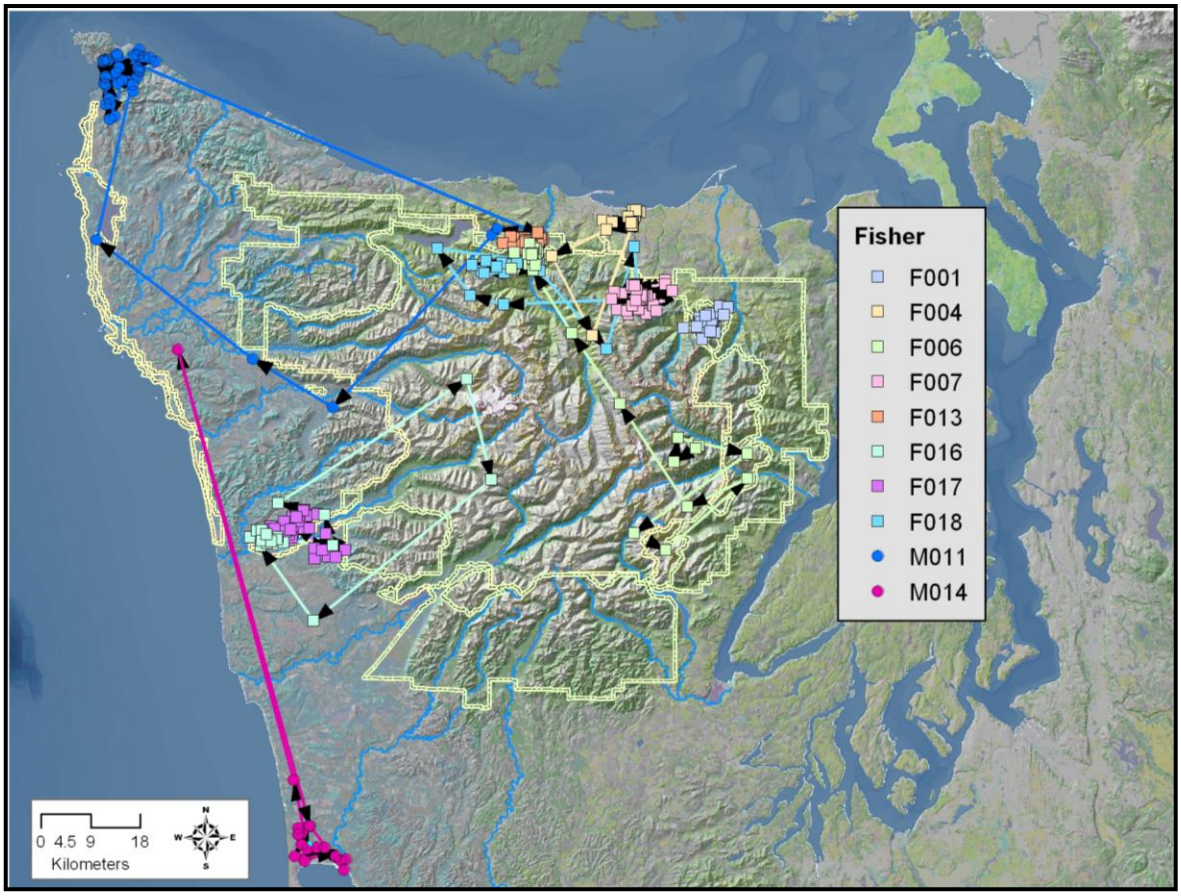

Figure 5. Locations and movements in 2009 for fishers released in January and March of 2008. The long distance movements of males M011, M014, and females F004, F006, F016, and F018 occurred during the breeding season (March–May, 2009).

Survival

We determined the survival status of each radio-collared fisher at each location by noting whether a higher radio-transmitter pulse-rate (a mortality signal of 72 bpm vs the normal 42 bpm) indicated that a collar had remained motionless for ≥6 hours (indicating a collared individual is dead or that its collar came off). Whenever possible, we use ground telemetry to investigate mortality signals to determine if a mortality has occurred or if a fisher's collar came off. We calculated finite survival rates for males and females as the proportion of radio-collared animals that survived the year. If the fate of any fisher could not be determined throughout the year because of radio failure or undetected emigration, we censored that individual from the survival rate calculation (Table 3, Appendix 2).

Fishers released in Year 1 of the project (27 January -31 December 2008) - The survival status (alive vs. dead) in year 1 was known for 17 of the 18 fishers released in year 1 (Table 3, Appendix 2). Among the 17 fishers of known status, 14 survived the entire first year (82.4% survival), 10 of the 12 females (83.3% survival), and 4 of 5 males (80%). The status of male M002 was unknown for the entire first year of the project (after his

release on 27 January), however he was found alive in April of 2009. M002 was observed within the city limits of Port Angeles by members of the public, and was subsequently identified by project biologists. Radio interference with M002's radio-collar made it difficult to locate him >300 m away from his known location. The status of male M009 was unknown for 4 months, from September to December.

The survival status in year 2 was known for 11 of the 18 fishers that were released in year 1 (Table 3, Appendix 2). Among these 11, 10 survived the entire second year (90.9% survival): 8 of 9 females (88.9%), and both males (100%). The status of males M002, M009, M010, and female F003 were unknown (censored) for all or part of the year (Table 3, Appendix 2).

Table 3. Percent survival for fisher release cohorts, based on numbers of fishers released, surviving, dead, and censored. Percent survival for release cohort 1 (fishers released in year 1) was calculated for 2008 and 2009. Percent survival values are minimum survival rates as some fishers that were presumed dead (based on a mortality signal) may have lost their collar and may have survived after their collar came off.

Release Cohort	Year[1]	Sex	#	Survived	Dead[2]	Censored[3]	% Survival[4]
1	2008	F	12	10	2	0	83.3
1	2008	M	6	4	1	1	80.0
1	2008	**All**	**18**	**14**	**3**	**1**	**82.4**
1	2009	F	10	8	1	1	88.9
1	2009	M	4	2	0	2	100.0
1	2009	**All**	**14**	**10**	**1**	**3**	**90.9**
2	2009	F	20	6	12	2	33.3
2	2009	M	11	7	2	2	77.8
2	2009	**All**	**31**	**13**	**14**	**4**	**48.1**

[1]Interval for 2008 was from the release date to 31 Dec 2008; interval for 2009 was from 1 Jan 2009 or release until to 30 Nov 2009
[2]Includes fishers presumed dead, but could include fishers that are alive but lost their collar.
[3]includes fishers with failed radios or missing fishers
[4]% Survival = [survived/(survived + dead)]*100

Fishers released in year 2 of the project (21 December 2008 – 30 November 2009) – The survival status was known for 27 of the 31 fishers released in year 2 (Table 3, Appendix 2). Among the 27 fishers, 13 survived until 30 November 2009 (48.1% survival): 6 of 18 females (33.3%) and 7 of 9 males (77.8%). The status of 4 fishers, females F027, F029 and males M039 and M042 were unknown for part of year 2 (Table 3, Appendix 2).

Causes of Mortality

We recovered remains of 14 released fishers (11 females, 3 males) known to have died during the first two years of the project (Appendix 2). Additionally, we assume four other fishers died based on our detection of mortality signals, but we were unable to recover their remains from very remote or unsafe locations. The cause of death has been determined for one fisher. Female F008 was killed by a bobcat in April, 2008; cause of death was determined forensically with the identification of bobcat DNA obtained from wound sites on her body (G. Wengert, UC Davis, unpubl. data). Fishers M005, M031, F033, and F049 were found dead along roads, however we await cause of death confirmations from pathologists to rule out underlying disease issues. We have submitted a total of seven dead fishers for necropsy and are awaiting results on six.

Home Range Establishment

The establishment of a home range is an indication that an area is suitable for occupancy by an animal. We have not yet analyzed home ranges of the released fishers, yet preliminary results indicate that fishers established home ranges during their first year in a variety of landscapes ranging from mountainous terrain to coastal plains and land ownerships including federal, state, private, and tribal (Figure 4 and 5).

Reproduction

Because the production and recruitment of young into a breeding population are critical to population persistence, reproduction is an important indicator of reintroduction success. Efforts to document reproduction included identifying possible denning behaviors of females, by closely scrutinizing movements of females during the denning season (late March-July). When we identified females using localized areas during the denning season, we used radio-telemetry homing procedures in an attempt to find the female in a den. Frequently, it took several trips into the suspected denning area to identify a radio-collared female within a potential natal den; in other instances we never found the female within a den. We used two methods to document reproduction. If a suspected den was indentified, we placed 2-3 cameras (Reconyx, Inc., Holmen,WI; models PC85 and PC90) in locations to photograph the female or kits entering or exiting the den. If we could not identify a den site, we placed baited camera stations within the area regularly used by an adult female in an attempt to photograph kits after they left the natal den.

In year 1 of the project, three females of reproductive age (F003, F007, and F018) localized movements for >2 months during the denning season. We were unable, however, to locate any den sites or obtain photographs of any kits.

In year 2, we documented reproduction by three radio-collared females: one from the 2008 release cohort (F007) and two from the 2009 cohort (F022, F033). In May of 2009, project biologists repeatedly located F007 in a large western red cedar (*Thuja plicata*)

snag in northeastern ONP, where they placed 4 cameras around the suspected den. On 23 May, 2009, we captured several images that showed female F007 moving four kits from the large cedar snag, at approximately 50 minutes intervals, presumably to another den site (Figure 6). Fishers can give birth to 1-4 kits (Powell 1993), but two kits is the average litter size in western North America. The litter of four kits indicates that female F007 not only successfully bred and reproduced following translocation, but gave birth to a large litter. This case was distinctive because it provided the first evidence that a female released on the Olympic Peninsula had established a home range, was impregnated, and raised a litter of 4 kits beyond weaning age, all following her translocation from British Columbia.

Female F022 was released on 21 December 2008, and was photographed with at least one kit on 21 May 2009 at a den site on Olympic National Forest (Figure 8). Her den site was located in a cavity in a western hemlock (*Tsuga heterophylla*) snag. She may have had more than one kit, but we only confirmed one from the photographs taken.

Female F033, was also released in year 2 of the project, and was located at two den sites in Olympic National Park near Lake Crescent (Figures 7 and 8). The first den site was a cavity in a live western hemlock tree found on 18 June 2009 and the second site was located in a mountain beaver burrow system on 1 August 2009. F033 was repeatedly photographed with two kits at the second den site over a period of five days (Figure 7).

Although we could not confirm reproduction by females other than F007, F033, and F022, four other females (F001, F013, F017, and F048) appeared to occupy a localized area during the denning season (late March to July; Figure 8), and may also have reproduced. Reproduction by females F022 and F033 indicates that pregnant females captured in British Columbia and transported to Washington successfully gave birth to young within 4 months after being released.

Figure 6. Sequence of photographs showing female F007 climbing a suspected den snag, descending head-first with a kit in her mouth, and at the base of the den snag with a kit in her mouth, May 2009. These photographs provide the first documentation of reproduction by a reintroduced fisher in Olympic National Park.

Figure 7. Female F033 (foreground) with one of her 2 kits using a mountain beaver burrow system as a den site near Crescent Lake in Olympic National Park, 1 August, 2009.

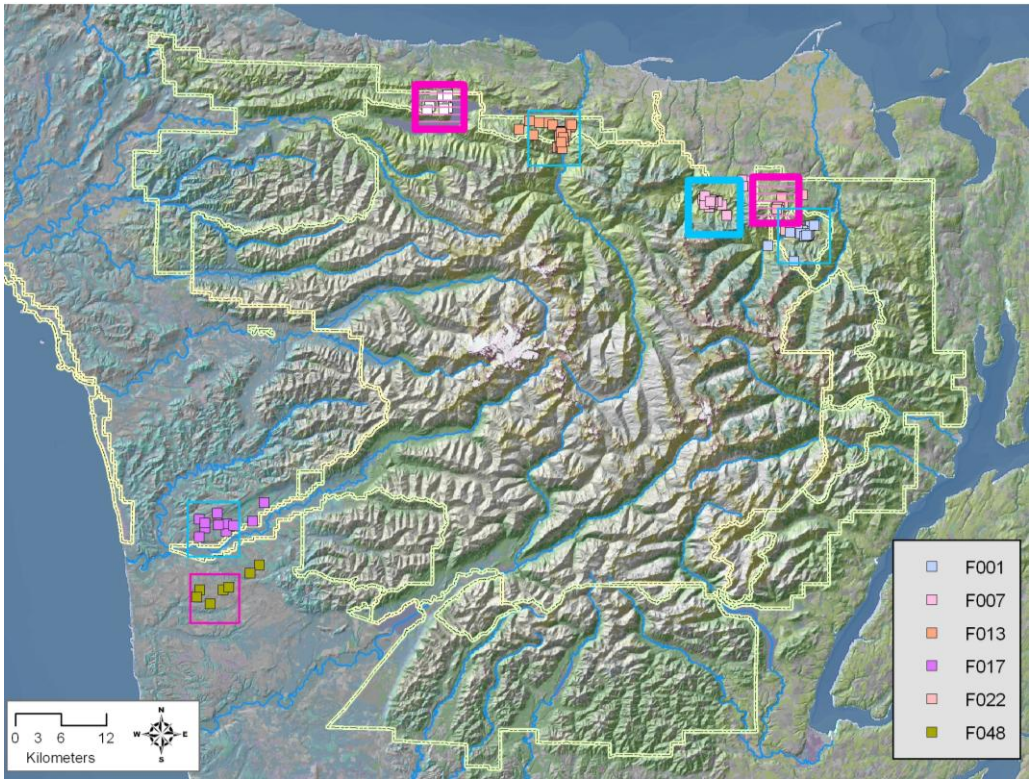

Figure 8. Localized use areas of females that had kits (bolded square outlines for F007, F022, and F033) and those that used localized areas during the denning season and may have given birth to kits, but reproduction was not confirmed (non-bolded outlines for F001, F013, F017, and F048). Blue outlines indicate females that were released in year 1; magenta outlines indicate females that were released in year 2.

Because of the difficulty of locating den sites in remote areas of ONP and ONF, we also placed baited camera and hair-snare stations to detect the offspring of fishers we suspected (on the basis of movement patterns) had successfully reproduced. With the assistance of volunteers from Conservation Northwest and Betsy Howell, a biologist with ONF, we photographed two uncollared fishers (Figure 9) and obtained hair samples. Although we have not yet analyzed DNA from the hair samples to confirm parentage, photographs of uncollared fishers indicate that at least 2 kits born in Washington have survived to become adult-sized individuals.

Figure 9. One of two uncollared fishers photographed at a baited camera and hair-snare station in the Gray Wolf drainage on Olympic National Forest, September 2009. This photograph documents the survival of a fisher kit to an adult-sized individual.

Food Habits

Prior to releasing fishers, a basic assumption was made that the diversity and abundance of prey on the Olympic Peninsula would be sufficient to support a reintroduced

population (Lewis and Hayes 2004). The reintroduction provides an opportunity to identify the prey species and other foods consumed by reintroduced fishers on the Olympic Peninsula. Using ground telemetry, we located fisher rest sites and den sites where we recovered fisher scats (feces) and prey remains. We also retain the gastrointestinal tract contents of recovered fishers. The contents of scats and gastrointestinal tracts will be analyzed to identify prey species and other foods, and to determine their relative contributions in the diet.

We collected a total of 89 scats at fisher den sites and rest sites during the first two years of the project. We have also recovered prey remains of several species at fisher den sites, rest sites, and foraging sites, which include mountain beavers, snowshoe hare, mallard, and duck egg-shells. Additionally, at least four fishers have been found using active, mountain beaver burrow-systems as rest sites. Female F033 used an active mountain beaver burrow system as a maternal den for her 2 kits in August of 2009 (Figure 7).

We currently have funding to start an initial analysis of recovered scats and will seek additional funding to conduct a complete analysis at the end of the active field research phase of the project. Scat collection was much greater in year 2 than in year 1 of the project, and we hope to have greater success in year 3, as we anticipate locating a greater number of den sites.

Genetic Analysis

We collected tissue samples from each reintroduced fisher during the first two years of the project. Dr. Ken Warheit and the staff at WDFW's molecular genetics laboratory, have extracted DNA from these samples and have conducted the initial genotyping work. They have used 27 microsatellite markers to successfully genotype each of the released fishers and will use these genotyping data to conduct a genetic analysis (e.g., diversity, relatedness) of the founding population once we have DNA from fishers released in year 3 of the project.

Expectations for Year 3 of the Project

In year 3, as many as 45 fishers will be released in ONP to meet our target of ~100 fishers released over three years. Each released fisher will be radio-collared so we can monitor its status, location, and behavior. In year 3 (Fall 2009 to Fall 2010), monitoring efforts will continue to track all surviving fishers released in year 1 as well as those released in year 2. While much of the monitoring effort will rely on aerial telemetry tracking, we will use ground telemetry, remote camera stations, and remote hair-snare stations to monitor movements, survival, home range establishment, and reproduction. These techniques will also be used to support research investigations of den site and rest site habitat selection, survival and food habits. During years 4 and 5 of the project, we will focus our efforts on data analysis and the preparation of manuscripts for publication.

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Appendix 1. Identification, capture, age and monitoring data for each of the 49 fishers released in 2008 and 2009 in Olympic National Park, Washington.

Animal Number	Study Year	Sex	Capture Date	Release Date	Days Captive	Age at release	Age Class	Weight (kg)	Fate as of Nov 2009[1]	Number relocations	Number Days monitored[2]
2008F001	Y1	F	14-Dec-07	27-Jan-08	44	0	Juvenile	3.4	Alive	80	still active
2008M002	Y1	M	26-Dec-07	27-Jan-08	32	1	Sub-ad	4.3	Unknown	4	434
2008F003	Y1	F	27-Dec-07	27-Jan-08	31	2	Adult	1.8	Unknown	48	428
2008F004	Y1	F	29-Dec-07	27-Jan-08	29	2	Adult	2.5	Alive	84	still active
2008M005	Y1	M	5-Jan-08	27-Jan-08	22	4	Adult	5.4	Dead	31	259
2008F006	Y1	F	6-Jan-08	27-Jan-08	21	1	Sub-ad	2.8	Alive	69	still active
2008F007	Y1	F	6-Jan-08	27-Jan-08	21	2	Adult	2.9	Alive	89	still active
2008F008	Y1	F	7-Jan-08	27-Jan-08	55	3	Adult	2.7	Dead	15	37
2008M009	Y1	M	9-Jan-08	27-Jan-08	18	0	Juvenile	4.6	Unknown.	32	234
2008M010	Y1	M	13-Jan-08	27-Jan-08	14	1	Sub-ad	3.9	Unknown	29	402
2008M011	Y1	M	13-Jan-08	27-Jan-08	14	1	Sub-ad	4.2	Alive	67	still active
2008F012	Y1	F	16-Jan-08	27-Jan-08	11	2	Adult	2.0	Dead	27	348
2008F013	Y1	F	25-Jan-08	2-Mar-08	37	0	Juvenile	3.1	Alive	112	still active
2008M014	Y1	M	13-Feb-08	2-Mar-08	18	1	Sub-ad	5.4	Alive	28	still active
2008F015	Y1	F	14-Feb-08	2-Mar-08	17	nd[3]	Adult	2.6	Dead	10	64
2008F016	Y1	F	15-Feb-08	2-Mar-08	16	1	Sub-ad	2.8	Alive	49	still active
2008F017	Y1	F	23-Feb-08	2-Mar-08	8	0	Juvenile	2.9	Alive	73	still active
2008F018	Y1	F	29-Feb-08	2-Mar-08	2	1	Sub-ad	2.6	Alive	60	still active
2009F019	Y2	F	3-Nov-08	21-Dec-08	48	4	Adult	2.62	Dead	12	236
2009M020	Y2	M	13-Nov-08	21-Dec-08	38	1	Sub-ad	5.23	Alive	13	still active
2009F021	Y2	F	16-Nov-08	21-Dec-08	35	3	Adult	2.16	Dead	2	115
2009F022	Y2	F	23-Nov-08	21-Dec-08	28	1	Sub-ad	2.73	Alive	31	still active
2009M023	Y2	M	29-Nov-08	21-Dec-08	22	0	Juvenile	3.95	Alive	19	still active
2009F024	Y2	F	30-Nov-08	21-Dec-08	21	0	Juvenile	2.81	Alive	20	still active
2009F025	Y2	F	30-Nov-08	21-Dec-08	21	0	Juvenile	2.73	Alive	35	still active
2009F026	Y2	F	30-Nov-08	21-Dec-08	21	2	Adult	2.64	Dead	13	95
2009F027	Y2	F	30-Nov-08	21-Dec-08	21	2	Adult	2.54	Unknown	11	211
2009F028	Y2	F	6-Dec-08	21-Dec-08	15	n/d	Sub-ad	2.46	Dead	19	275
2009F029	Y2	F	8-Dec-08	17-Jan-09	40	2	Adult	2.91	Unknown	7	68
2009M030	Y2	M	11-Dec-08	17-Jan-09	37	1	Sub-ad	4.14	Alive	17	still active
2009M031	Y2	M	11-Dec-08	21-Dec-08	10	0	Juvenile	4.47	Dead	14	134
2009M032	Y2	M	14-Dec-08	21-Dec-08	7	0	Juvenile	3.72	Alive	21	still active
2009F033	Y2	F	13-Dec-08	21-Dec-08	8	1	Sub-ad	2.55	Dead	30	228
2009M035	Y2	M	18-Dec-08	21-Dec-08	3	0	Juvenile	4.10	Alive	30	still active
2009F036	Y2	F	19-Dec-08	17-Jan-09	29	4	Adult	2.35	Dead	3	9
2009M037	Y2	M	22-Dec-08	17-Jan-09	26	1	Sub-ad	3.88	Dead	5	93
2009M039	Y2	M	23-Dec-08	17-Jan-09	25	1	Sub-ad	4.27	Unknown	4	55
2009F040	Y2	F	26-Dec-08	17-Jan-09	22	0	Juvenile	2.09	Dead	2	5
2009F041	Y2	F	24-Dec-08	17-Jan-09	24	1	Sub-ad	2.32	Dead	12	156
2009M042	Y2	M	27-Dec-08	17-Jan-09	21	0	Juvenile	4.62	Unknown	4	72
2009F043	Y2	F	30-Dec-08	17-Jan-09	18	4	Adult	2.12	Alive	23	still active
2009F044	Y2	F	31-Dec-08	17-Jan-09	17	0	Juvenile	1.94	Dead	5	68
2009M045	Y2	M	3-Jan-09	17-Jan-09	14	0	Juvenile	3.90	Alive	17	still active
2009F048	Y2	F	8-Jan-09	17-Jan-09	9	1	Sub-ad	2.47	Alive	15	still active
2009F049	Y2	F	8-Jan-09	17-Jan-09	9	n/d	Adult	2.60	Dead	3	17
2009F050	Y2	F	14-Jan-09	17-Jan-09	3	0	Juvenile	2.67	Alive	15	still active
2009M051	Y2	M	14-Jan-09	17-Jan-09	3	0	Juvenile	3.57	Alive	16	still active
2009F054	Y2	F	16-Jan-09	23-Feb-09	38	0	Juvenile	3.02	Dead	8	105
2009F055	Y2	F	30-Jan-09	23-Feb-09	24	0	Juvenile	2.56	Dead	4	225

Appendix 2. Survival status of individual fishers released in Olympic National Park in 2008 and 2009. Blue fill indicates that a fisher survived that month. Red fill with an "M" indicates the fisher died that month. Yellow fill with a "C" indicates that a fisher was not located that month and its status is unknown or "censored". White fill to the left of a blue box indicates that a fisher had not yet been released.