NOTES

A Night-lighting Technique for At-Sea Capture of Xantus' Murrelets

DARRELL L. WHITWORTH[1], JOHN Y. TAKEKAWA[1], HARRY R. CARTER[2] AND WILLIAM R. MCIVER[2]

[1]U.S. Geological Survey, Biological Resources Division, California Science Center, San Francisco Bay Estuary Field Station, P. O. Box 2012, Vallejo, CA 94592 USA

[2]U.S. Geological Survey, Biological Resources Division, California Science Center, Dixon Field Station, 6924 Tremont Road, Dixon, CA 95620 USA

Abstract.—We captured 575 Xantus' Murrelets (*Synthliboramphus hypoleucus*) with spotlights and dip nets at 3 islands in the Southern California Channel Islands during April and May of 1995-1997. Working at night (2100-0500 h), 3-person teams in inflatable boats located murrelets with a spotlight and captured them in dip nets from the waters near known breeding colonies at Santa Barbara, Anacapa, and San Clemente Islands. Our average capture rate was 4.7 murrelets hr^{-1}, but we captured up to 12.3 murrelets hr^{-1}. We recaptured 34 murrelets or 6% of the capture total. We recommend this simple, inexpensive, safe and effective night-lighting capture technique for Xantus' Murrelets and other seabirds. *Received 7 March 1997, accepted 26 May 1997, final version received 26 September 1997.*

Key words.—Capture methods, night-lighting, seabirds, spotlighting, *Synthliboramphus hypoleucus*, Xantus' Murrelet.

Colonial Waterbirds 20(3): 525-531, 1997

Seabirds are usually captured on land at nesting colonies by nest-trapping or mist-netting. These capture techniques are not advisable for seabird species that are sensitive to disturbance caused by research activity at colonies, especially when it leads to nest failures or colony abandonment (Burger and Gochfeld 1994). Nest trapping also is impractical when nest sites are difficult to locate or inaccessible. Techniques for capturing birds at sea have been developed for certain species and locations. For example, hundreds of Marbled Murrelets (*Brachyramphus marmoratus*) have been captured in floating mist nets in the coastal inlets of British Columbia and Alaska (Burns *et al.* 1995, Kaiser *et al.* 1995). Other at-sea capture techniques such as sunken gill nets and net guns have been used with much less success (Quinlan and Hughes 1992, Kaiser *et al.* 1995).

Our radio telemetry research on the at-sea distribution of Xantus' Murrelets (*Synthliboramphus hypoleucus*) in the Southern California Bight required the capture of many murrelets (Whitworth *et al.* 1997). Xantus' Murrelets are small, crevice-nesting members of the family Alcidae, which breed on islands from central western Baja California, Mexico, to the Channel Islands off southern California (Drost and Lewis 1995). These murrelets are sensitive and prone to abandon their nests when handled at nest sites (Murray *et al.* 1983, Whitworth *et al.* 1997).

During studies in the California Channel Islands, we observed Xantus' Murrelets, Cassin's Auklets (*Ptychoramphus aleuticus*), and Ashy Storm-petrels (*Oceanodroma homochroa*) attracted to the bright deck lights of our research vessel while anchored near seabird nesting colonies on dark or foggy nights (Carter *et al.*, unpubl. data). Several accounts of Xantus' Murrelets and other seabirds being attracted to light, both on land and at sea, are known (Howell 1910, McLellan 1926, Dick and Donaldson 1978). We captured 40 Xantus' Murrelets in 1994 at Santa Barbara, San Clemente, and Santa Cruz islands on foggy nights after they had been attracted aboard by bright deck lights and landed on or beside our research vessel (Carter *et al.*, unpubl. data). However, passive light attraction did not work at Santa Barbara Island in March 1995. Therefore, we developed a less intrusive at-sea capture method, a night-lighting technique adapted from methods used previously on waterfowl (Cummings and Hewitt 1964, Bishop and

Barratt 1969, Snow *et al.* 1990) and cormorants (King *et al.* 1994).

STUDY AREA AND METHODS

Santa Barbara Island hosts the largest breeding colony of Xantus' Murrelets in southern California (Carter *et al.* 1992, Drost and Lewis 1995). Moderate numbers nest at Anacapa Island, but only small numbers nest at San Clemente Island, mainly in the Seal Cove area (Carter *et al.*, unpubl. data). We captured Xantus' Murrelets near these colonies (Fig. 1) during the 1995-1997 breeding seasons. We captured murrelets on the east side of Santa Barbara Island near Landing Cove in April and May of 1995-1997 (Table 1). We performed single night capture efforts in 1996 near East Fish Camp on the south side of Middle Anacapa Island, and near Seal Cove on the west side of San Clemente Island.

During the breeding season, Xantus' Murrelets congregate at night on the water adjacent to nesting areas (Murray *et al.* 1983; Carter *et al.*, unpubl. data). Capture crews searched near-shore waters from 2100-0500 h PDT in a 4.25 m inflatable boat powered by a 15 or 25 hp outboard motor. The capture crew consisted of a driver, spotlight operator, and dip net handler (Fig. 2). If only two crew members were available, the driver also served as spotlight operator. The crew patrolled areas of high murrelet density while scanning around the craft with a 100,000-200,000 candlepower hand-held spotlight. The spotlight was powered by a 12-volt marine battery through a pigtail extension. The marine battery was stored in a watertight plastic box secured near the bow.

Murrelets were observed on the water usually alone or in pairs, although larger groups of 3-5 birds were seen. When a single bird or group was located, the spotlight operator focused the beam on a single bird as the boat approached. The speed and angle of approach varied depending on conditions, but we usually approached slowly (5-10 km h^{-1}). The spotlight operator sat just behind the net handler on the side of the boat opposite the driver, to provide the driver with the best possible view of the murrelet. The net handler leaned over the bow with the net held low over the water. The handler used an aluminum dipnet (1.25 m handle, 0.7 m diameter × 1 m deep basket, 4 cm nylon or polyethylene mesh) to capture murrelets from the water or in the

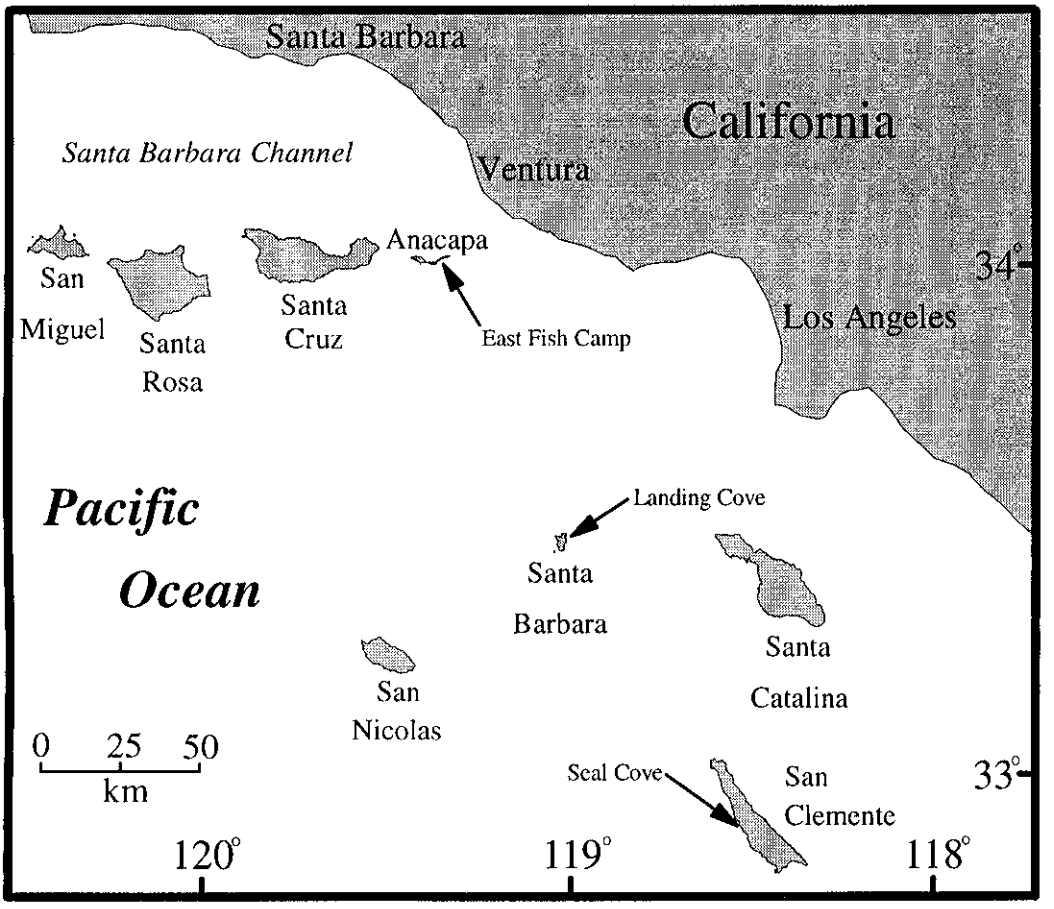

Figure 1. Map of the Southern California Bight and Channel Islands. Arrows indicate night-lighting capture locations.

Table 1. Date, location and nightly capture data for Xantus' Murrelets caught in the Southern California Channel Islands in 1995-1997.

Date	Location	Captures (recaptures)	Capture effort (h)	Capture rate (murrelets h^{-1})
1995				
26-27 April	Santa Barbara I.	12	6.9	1.7
27-28 April		36	7.7	4.7
28-29 April		31(1)	7.7	4.0
19-20 May	Santa Barbara I.	15	3.4	4.4
20-21 May		28(2)	6.3	4.4
1995 Totals		122(3)	32.0	3.8
1996				
15-16 April	Santa Barbara I.	18(1)	5.8	3.1
16-17 April		52	7.5	6.9
17-18 April		25(1)	7.3	3.4
18-19 April		22(3)	6.8	3.2
26-27 April	Anacapa I.	21	4.1	5.1
4 May	San Clemente I.	6	1.2	5.0
7-8 May		40(1)	4.2	9.5
8-9 May	Santa Barbara I.	48(3)	3.9	12.3
13-14 May	Santa Barbara I.	33(2)	7.5	4.4
14-15 May		22(2)	4.0	5.5
15-16 May		32(2)	4.5	7.1
16-17 May		18(2)	5.4	3.3
1996 Totals		337(17)	62.2	5.4
1997				
10-11 April	Santa Barbara I.	26(3)	6.3	4.1
11-12 April		20(4)	6.1	3.3
5-6 May	Santa Barbara I.	25(1)	6.0	4.2
6-7 May		26(4)	5.6	4.6
7-8 May		19(2)	3.7	5.1
1997 Totals		116(14)	27.7	4.2
1995-1997 Totals		575	121.9	4.7

air. We were successful only when we were able to approach within 1 m of the murrelet. Many birds were captured on the first attempt, but we made multiple capture attempts if a bird made short escape dives or flights that could be followed with the spotlight. We ended our pursuit after a few failed attempts to prevent undue stress to the murrelets. Captured murrelets were transported in cardboard holding boxes for examination aboard the research vessel. As many as 3 birds were captured before delivery to the research vessel for processing.

RESULTS AND DISCUSSION

We captured 575 Xantus' Murrelets, including 34 recaptures, over 22 nights (121.9 h) with the night-lighting technique (Table 1). No murrelets were killed or injured during the capture process. This capture total does not include 19 murrelets which were attracted by the deck lights and captured aboard the research vessel. We calculated an overall capture rate of 4.7 murrelets hr^{-1}. This is a conservative estimate, because it assumes a constant effort through the night from first to last capture. In fact, we usually suspended capture efforts several times each night when a sufficient number of murrelets

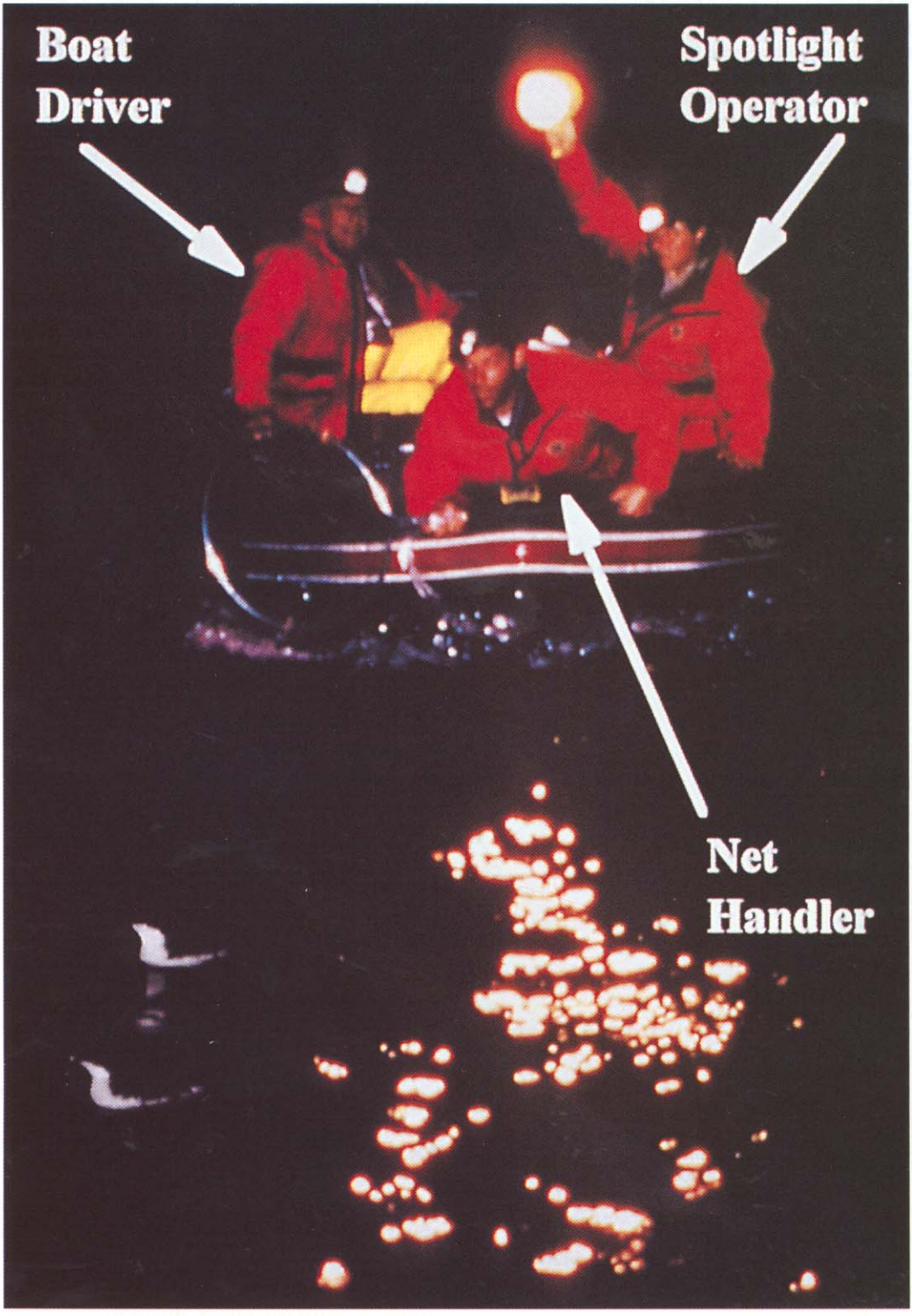

Figure 2. Image depicting capture boat and crew showing positions of crew members during capture attempts.

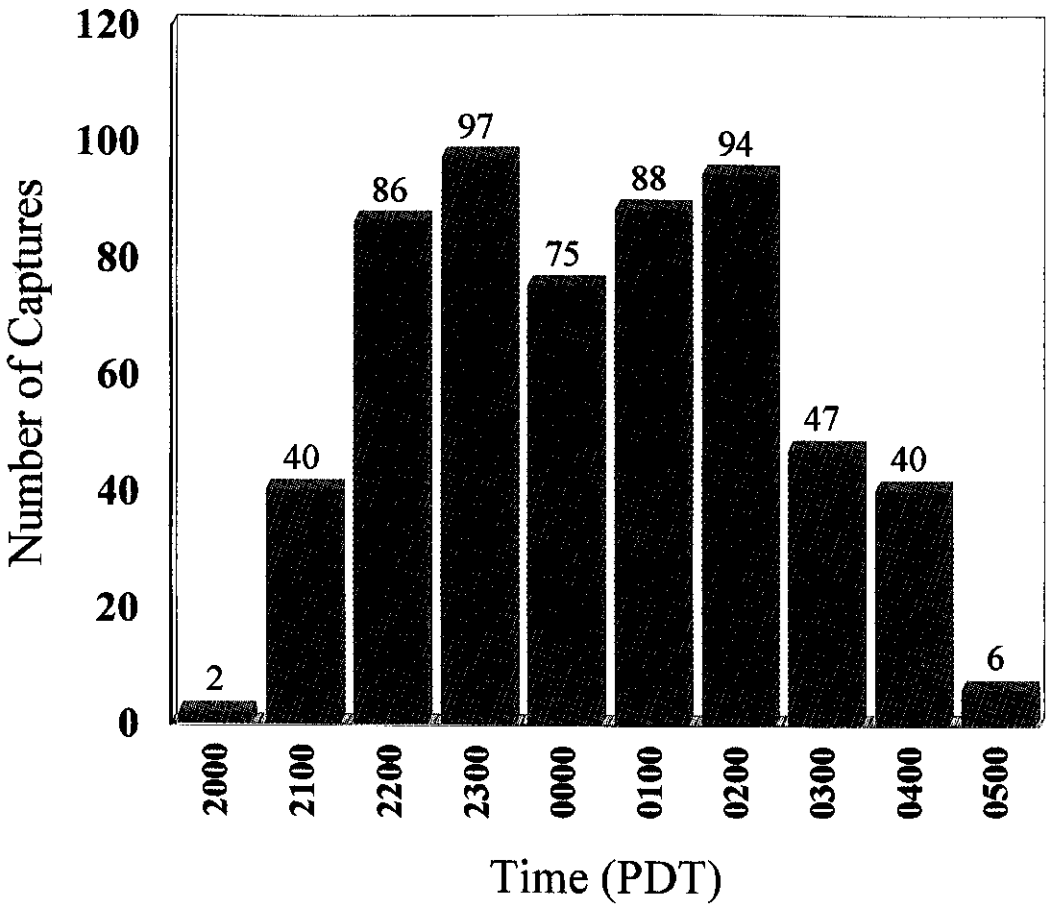

Figure 3. Numbers of Xantus' Murrelets caught during each hourly period throughout the night in the Southern California Channel Islands, 1995-1997.

were being held for processing, but we did not record the duration of these breaks. Our maximum capture rate for 1 night (12.3 murrelets h^{-1}) on 8-9 May 1996 reflects the higher potential rate at which murrelets can be captured with sustained effort. We captured as many as 15 murrelets in 1 hour on this night with an experienced crew and with no breaks in capture effort. Our night-lighting capture rate for Xantus' Murrelets exceeds all other known at-sea capture techniques for seabirds (e.g., Kaiser *et al.* 1995). Nightly capture rates were dependent on crew experience, murrelet densities, and transport and processing time.

There were no obvious differences in capture success among hours throughout the night once murrelets began arriving at the islands in significant numbers, usually after 2200 h (Fig. 3). We captured murrelets as early as 2052 h and as late as 0519 h. The sharp drop in captures after 0300 h reflects reduced effort, since on 8 nights we ceased capturing murrelets before that time, after we had caught an adequate sample. We captured murrelets in a variety of weather conditions, but capture success was usually higher on dark, overcast or foggy nights with calm seas. We usually worked on the lee sides of the islands to obtain protection from prevailing winds and swells.

Murrelets responded to the spotlight in various ways. Some murrelets remained still or slowly swam away as we approached, while others dove or flew at some distance. We often captured birds on our initial approach, but we rarely caught murrelets if they flew or dove soon after being illuminated by the

spotlight. However, a few murrelets which flushed and circled back toward the spotlight flew into our net or capture boat. Murrelets that waited to dive until the boat was near usually surfaced again near the boat, and we attempted to follow their underwater movements with the spotlight. Our low recapture rate (6%) may reflect a large unmarked population or an aversion to recapture. However, our recapture rate did increase in succeeding years. Recaptures were 1% of our capture total in 1995, 5% in 1996 and 12% in 1997 (Table 1).

Murrelets are sexually monomorphic with no known plumage differences by age, therefore we were unable to detect any visual sex or age differences in the capture sample. However, sex was determined from blood samples of 59 murrelets captured and radiomarked in 1997. Thirty-two of the tested birds were male and 27 female, suggesting no differences ($\chi^2_1 = 0.42$; $p = 0.52$) from a 1:1 sex ratio.

Few captured murrelets showed evidence of nesting activity based on brood patch development. None of the murrelets caught in 1995 had brood patches, but we caught birds prior to egg-laying which was delayed that year (P. Martin, pers. comm.). No brood patches were observed in murrelets captured during our April capture efforts at Santa Barbara Island in 1996 and 1997. In contrast, 26% of the murrelets captured after peak nest initiation in 1996, and 14% captured after peak initiation in 1997 had brood patches. Substantial numbers of murrelets began nesting at monitored sites on Santa Barbara Island by mid-April in 1996 and 1997 (J. Roth, pers. comm.). These data suggest that there is a substantial non-breeding population, or that the capture sample is biased by age or breeding status.

We are unaware of other literature regarding successful night-lighting capture of alcids or other seabirds. We rarely saw other seabirds on the water during capture efforts and nocturnal surveys of Xantus' Murrelets in the Channel Islands despite breeding populations of several species on these islands (Carter *et al.* 1992). Incidental captures at Santa Barbara Island included a Pacific Loon (*Gavia pacifica*), Brant (*Branta bernicla*), and Northern Fulmar (*Fulmarus glacialis*). On 20 August 1995, we investigated the potential of the night-lighting technique for capture of other Alcidae near Año Nuevo State Reserve, California. Five fledgling Pigeon Guillemots (*Cepphus columba*) and an independent juvenile Common Murre (*Uria aalge*) were captured while searching for Marbled Murrelets (none were seen). However, 27 Marbled Murrelets, 2 adult Pigeon Guillemots and a subadult Pelagic Cormorant (*Phalacrocorax pelagicus*) were captured near Año Nuevo over five nights in May and June 1997 (E. Burkett *et al.*, unpubl. data). Other researchers also have reported recent success night-lighting Marbled Murrelets in British Columbia and Washington (F. Cooke and M. Raphael, pers. comms.). Common Murre chicks have been caught in Newfoundland and Alaska by night-lighting on peak fledging nights (J. Piatt, pers. comm.). We suggest that other researchers try this night-lighting technique to better assess its utility over a wider range of species and habitats.

ACKNOWLEDGMENTS

Our field work was funded and conducted in cooperation with the U.S. Navy (Naval Air Warfare Center Weapons Division Seatest Range, Naval Air Weapons Station Pt. Mugu, Pt. Mugu Natural Resources Management Plan and Legacy Resources Management Program), U.S. Geological Survey (Biological Resources Division), Humboldt State University, California Department of Fish and Game, Channel Islands National Marine Sanctuary, and Channel Islands National Park. We greatly appreciate the assistance of T. Keeney, D. Gilmer, D. Rugen, R. Golightly, P. Kelly, E. Burkett, L. Comrack, E. Cassano, S. Beckwith, and P. Martin who facilitated our work through the above agencies. D. and B. Christy provided their charter boat *Instinct* for transportation, accommodations and research platform in 1995-1997. E. Cassano and S. Beckwith of the Channel Islands National Marine Sanctuary provided the research vessel *Ballena* for capture efforts in 1996. We thank all the personnel who kindly assisted our capture efforts: B. Becker, J. Bulger, E. Burkett, L. Comrack, N. Drilling, D. Fritcher, C. Gailband, L. Henkel, J. Huckabee, C. James, P. Jodice, J. Kelson, K. Kruse, K. Kuletz, J. Lanser, C. Lieske, I. Manley, G. McChesney, A. Newman, S. H. Newman, S. L. Newman, S. M. Newman, J. Roth, M. Schultz, L. Stauss, J. Trupkeiwicz, T. Williamson, and S. Wolf. We appreciate the comments on this paper provided by P. Jodice, K. Kuletz, G. McChesney, J Piatt, and an anonymous reviewer.

REFERENCES CITED

Bishop, R. A. and R. Barratt. 1969. Capturing waterfowl in Iowa by nightlighting. Journal of Wildlife Management 33: 956-960.

Burger, J. and M. Gochfeld. 1994. Predation and effects of humans on island-nesting seabirds. Pages 39-67 *in* Seabirds on islands: threats, case studies, and action plans (D. N. Nettleship, J. Burger, and M. Gochfeld, Eds.). BirdLife International (BirdLife Conservation Series No. 1), Cambridge, United Kingdom.

Burns, R. A., G. W. Kaiser and L. M. Prestash. 1995. Use of mist nets to capture Marbled Murrelets over the water. Northwestern Naturalist 76: 106-111.

Carter, H. R., G. J. McChesney, D. L. Jaques, C. S. Strong, M. W. Parker, J. E. Takekawa, D. L. Jory and D. L. Whitworth. 1992. Breeding populations of seabirds in California, 1989-1991. Volume I—Population estimates. Unpublished draft report, U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Dixon, California.

Cummings, G. E. and O. H. Hewitt. 1964. Capturing waterfowl and marsh birds at night with light and sound. Journal of Wildlife Management 28: 120-126.

Dick, M. H. and W. Donaldson. 1978. Fishing vessel endangered by Crested Auklet landings. Condor 80: 235-236.

Drost, C. A. and D. B. Lewis. 1995. Xantus' Murrelet (*Synthliboramphus hypoleucus*). Pages 1-23 *in* The Birds of North America, No. 164 (A. Poole and F. Gill, Eds.). The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Howell, A. B. 1910. Notes from Los Coronados Islands. Condor 12: 184-187.

Kaiser, G. W., A. E. Derocher, S. Crawford, M. J. Gill and I. A. Manley. 1995. A capture technique for Marbled Murrelets in coastal inlets. Journal of Field Ornithology 66: 321-333.

King, D. T., K. J. Andrews, J. O. King, R. D. Flynt, J. F. Glahn and J. L. Cummings. 1994. A night-lighting technique for capturing cormorants. Journal of Field Ornithology 65: 254-257.

McLellan, M. E. 1926. Expedition to the Revillagigedo Islands, Mexico, in 1925, VI, The birds and mammals. Proceedings of the California Academy of Sciences (4th series), 15(11): 279-322.

Murray, K. G., K. Winnett-Murray, Z. A. Eppley, G. L. Hunt, Jr. and D. B. Schwartz. 1983. Breeding biology of the Xantus' Murrelet. Condor 85: 12-21.

Quinlan, S. E. and J. H. Hughes. 1992. Techniques for capture and radio tagging of Marbled Murrelets. Pages 117-121 *in* Status and conservation of the Marbled Murrelet in North America (H. R. Carter and M. L. Morrison, Eds.). Proceedings of the Western Foundation of Vertebrate Zoology 5.

Snow, W. D., H. L. Mendall and W. B. Krohn. 1990. Capturing Common Eiders by night-lighting in coastal Maine. Journal of Field Ornithology 61: 67-72.

Whitworth, D. L., J. Y. Takekawa, H. R. Carter, S. H. Newman and T. W. Keeney. 1997. Foraging distribution and post-breeding dispersal of Xantus' Murrelets in the Southern California Bight: 1996 Progress Report. Unpublished report, U.S. Geological Survey, Biological Resources Division, California Science Center, Vallejo and Dixon, California; Wildlife Health Center, University of California, Davis, California; and Naval Air Weapons Station, Pt. Mugu, California.