

Results of 2009 Marbled Murrelet Surveys at Gazos Mountain Camp

by
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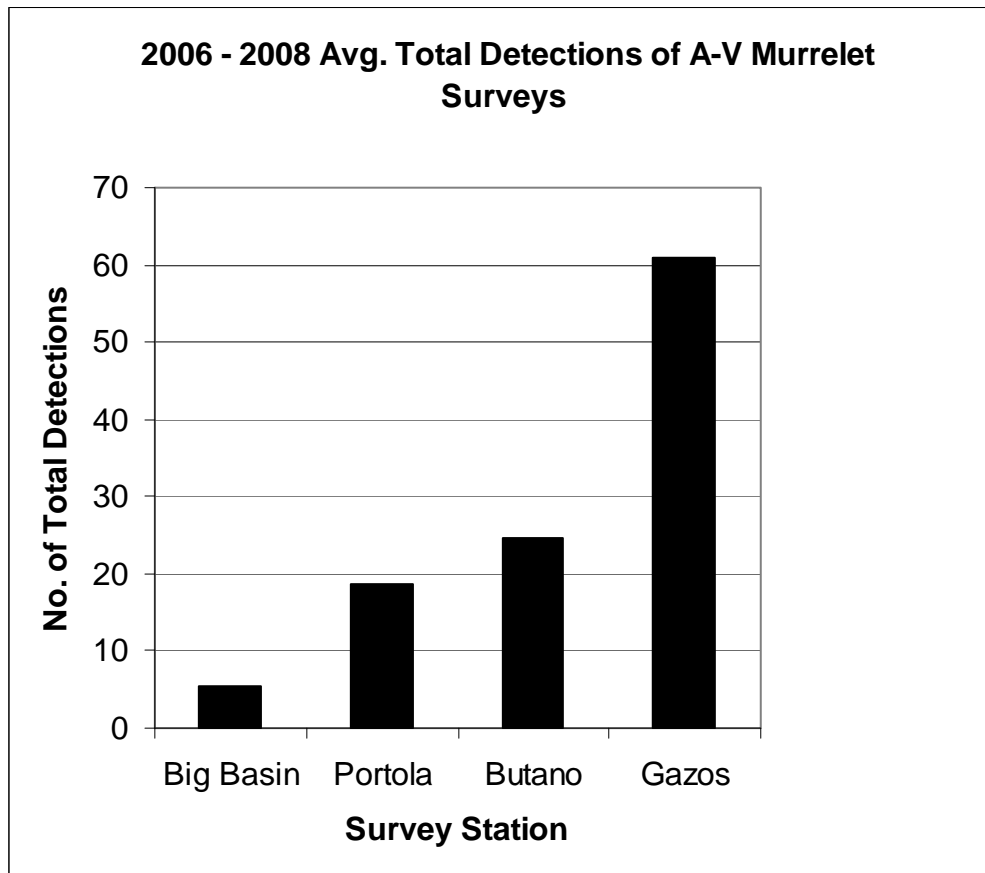
Preface

This paper reports the 2009 collapse of Marbled Murrelet detections at Gazos Mountain Camp which was believed to be the last remaining stronghold for murrelet nesting in the Santa Cruz Mountains (also referred to as Zone 6). Whether this collapse was due to a temporary reduction in inland flights or a permanent reduction in inland flights remains to be determined. This collapse was not detected in radar surveys downstream of the site or in at-sea surveys conducted offshore. Only additional audio-visual surveys at Gazos Mountain Camp can determine if this decline in detections is permanent.

Introduction

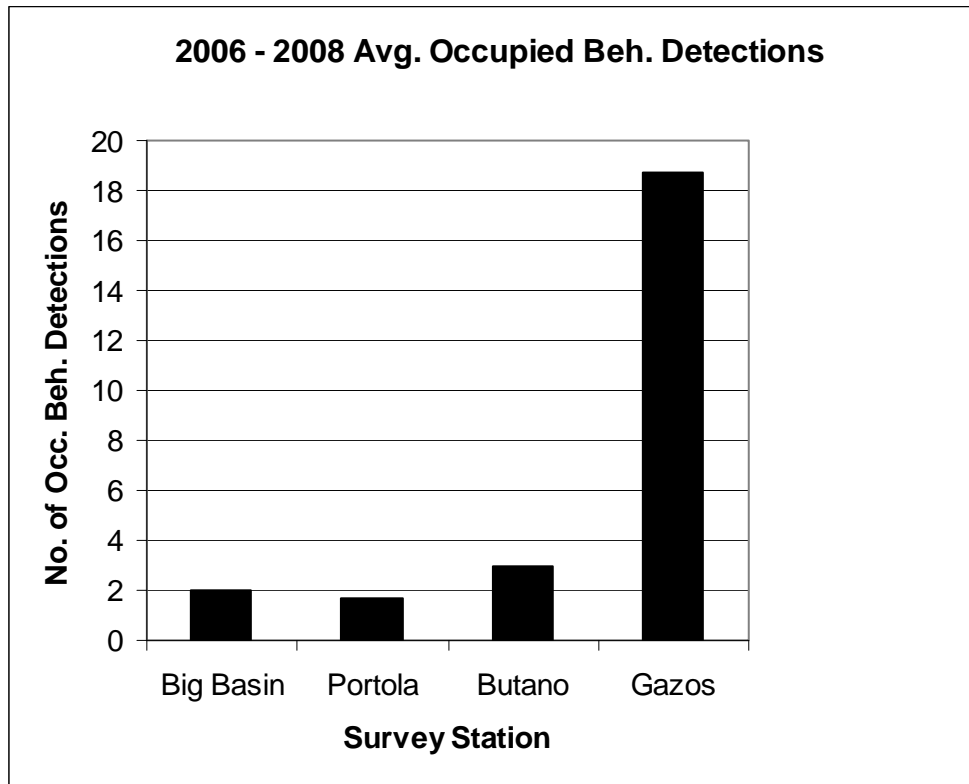
There are currently six audio-visual murrelet survey stations or complexes of closely-associated stations that are regularly monitored in the Santa Cruz Mountains with surveys occurring in June and July. These are located in known or suspected murrelet breeding stands and include Big Basin State Park, Butano State Park (on Little Butano Creek), Portola State Park, Memorial County Park, Pilarcitos Creek, and at Gazos Mountain Camp, which is a recent addition to Butano State Park on Gazos Creek. In recent years (but excluding 2009), Gazos Mountain Camp has had the greatest number of total murrelet detections (see Figure 1) and the greatest number of occupied behavior detections (see Figure 2) of any station in the Santa Cruz Mountains.

Figure 1.



Note: Surveys conducted from late June to early August. Detections at Pilarcitos Creek are not shown, but were less than those at the Portola station (Evans, pers. comm.)

Figure 2.



Note: Occupied Behaviors for Pilarcitos Creek are not shown on the graph but were less than 10. (Evans, pers. comm.)

Six audio-visual surveys have been conducted at Gazos Mountain Camp in July (or the immediately bordering days) from 1998 to the present. These surveys were originally part of the Apex Houston Gazos Creek Marbled Murrelet Monitoring Program, but have been a pro bono research effort since 2005. The A-V surveys are currently being conducted by the author and Portia Halbert, but to insure surveys can continue, additional funding is needed so that experienced murrelet surveyors can be enlisted each year, the performance of field work can be assured, and so that the research program can proceed with some degree of certainty.

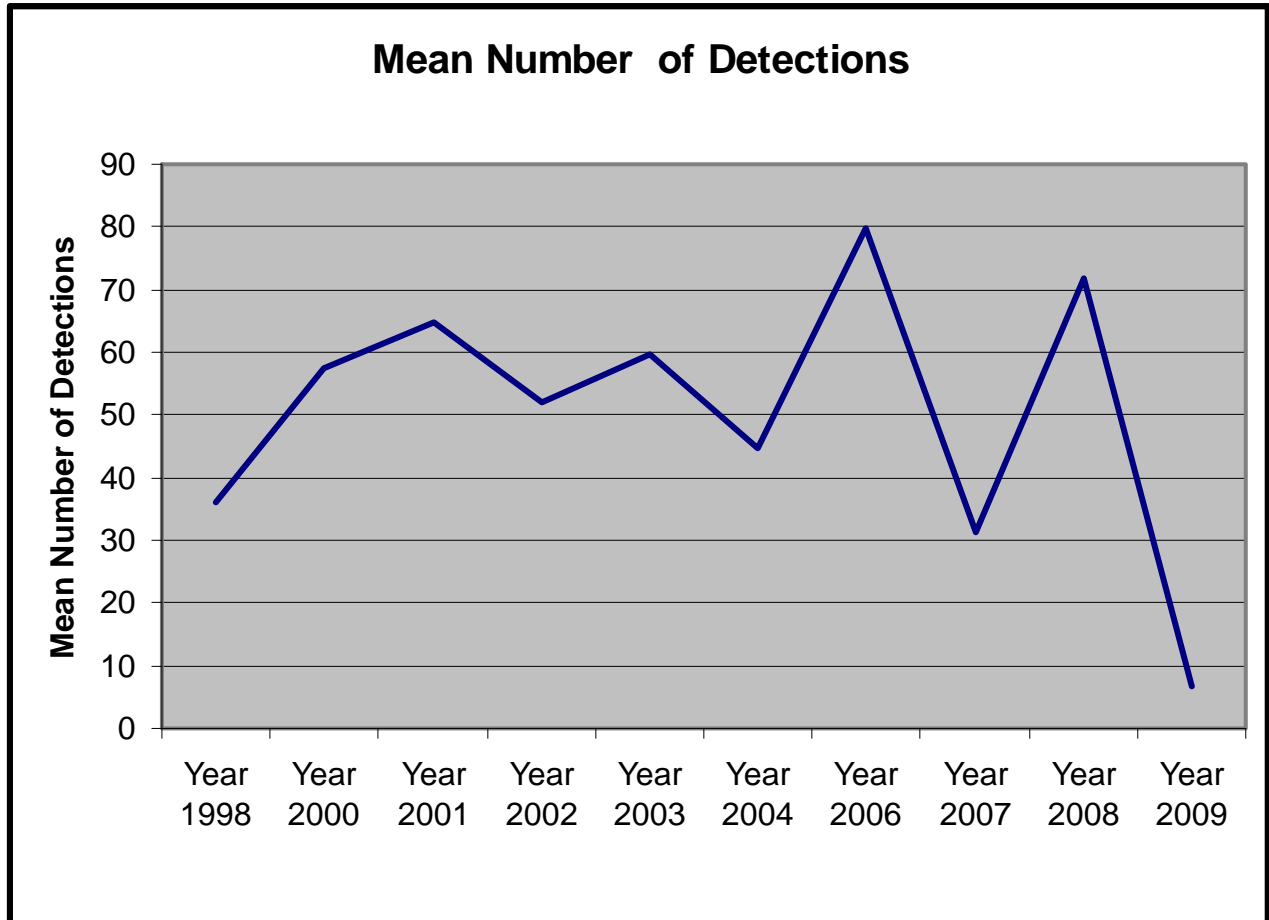
Findings

Major Decline of Murrelet Numbers at Gazos Mountain Camp

The number of murrelets detected at this site experienced a major decline this season as seen in Figure 3 which shows the mean of six audio-visual surveys

conducted each year. Since Gazos Mountain Camp was the last inland survey site in the Santa Cruz Mountains to have high detection numbers, its possible collapse is of great concern.

Figure 3. Mean Number of Audio-visual Detections



The results from the 2009 surveys are presented in Table 1 below. In 2009, the mean number of total detections, visual detections, occupied behaviors and detections of single silent birds below canopy height (SSBBC) all declined to extremely low numbers compared to all prior years. Additionally, on July 29, 2009, only a total of 4 detections were tallied which is the lowest number of detections ever recorded since surveys began in 1998. This contrasted dramatically with last year when the record high number of one-day detections (128) was recorded. The highest number of one-day detections in 2009 was only 11. The single day high and low detection numbers are shown in Table 2 below.

Table 1. Year 2009 ground observer surveys for murrelets at Gazos Mountain Camp. Values for the mean, standard deviation (s.d.) and coefficient of variation (C.V.) are given in the bottom rows.

Date	% Overcast	Fog or low ceiling?	Number of Detections (# Visuals)	Number of Occupied Behaviors	Number of Single, Silent Birds Below Canopy
6/28/2009	0	N	11 (4)	1	1
7/20/2009	0 – 66%	N	5 (1)	0	0
7/22/2009	0	N	10 (0)	0	0
7/24/2009	100%	N	5 (0)	0	0
7/27/2009	0	N	6 (0)	0	0
7/29/2009	100%	N	4 (3)	4	3*
MEAN			6.83 (1.33)	0.83	0.67
STDV			2.93 (1.75)	1.60	1.21
CV			0.43 (1.31)	1.92	1.82

* Note: One bird seen at 18 minutes before sunrise.

Table 2. Daily extremes of ground observer detections, 1998 – 2009, and annual means.

Number of Detects	Year 1998	Year 2000	Year 2001	Year 2002	Year 2003	Year 2004	Year 2006	Year 2007	Year 2008	Year 2009
Highest Day	49	100	105	75	127	59	125	59	128	11
Lowest Day	18	25	26	25	39	29	25	11	16	4
Mean	36.00	57.33	64.67	52.00	59.67	44.7	79.7	31.17	71.83	6.83

Table 3 shows the 2008 ground observer survey results for comparison. It is interesting to note that the coefficient of variability for the total number of detections each season were similar, suggesting that the difference between the two seasons was not due to a few anomalous low or high days.

Table 3. Year 2008 results of ground observer surveys for murrelets at Gazos Mountain Camp. Values for the mean, standard deviation (s.d.) and coefficient of variation (C.V.) are given in the bottom rows.

Date	% Overcast	Number of Detections (# Visuals)	Number of Occupied Behaviors	Number of Single, Silent Birds Below Canopy
7/3/2008	0	70 (23)	21	7
7/4/2008	0-66%	70 (33)	33	21
7/6/2008	100-66%	77 (49)	40	6
7/16/2008	100-90%	128 (71)	48	29
7/23/2008	0	70 (33)	20	12
7/26/2008	0	16 (0)	1	0
MEAN		71.83 (34.83)	27.17	12.5
s.d.		35.52	16.77	10.71
C.V.		0.49	0.62	0.86

Evidence of Nesting Found After the Survey Period

Two additional surveys, not done to project protocol, were conducted by Portia Halbert on July 14 and August 4. These surveys either did not extend for the full duration of the survey period or did not record every single detection, instead focusing on visuals and near birds. On the August 4 survey, biologist Halbert saw a murrelet carrying a fish and captured it on video. The results from these two surveys are shown in Table 4.

Table 4. Additional partial ground observer surveys at Gazos Mountain Camp in 2009.

Date	% Overcast	Fog or low ceiling ?	Number of Detects (Visuals)	Number of Occ. Beh.	Numbers of Single, Silent Below Canopy Birds	Special Observations
7/14/2009	0	N	10 (3)	0	0	None
8/4/2009	33% - 0	N	? (8)	3	3*	One bird at 0.2 canopy had a fish in its beak.

* Note: One bird seen at 18 minutes before sunrise.

Discussion

Value of Audio-Visual Surveys

Audio-visual surveys can provide information on the breeding ecology of this species that can't be provided by radar surveys or at-sea surveys. Only A-V surveys can provide evidence of nesting attempts and indicate which stands are still being used for nesting.

There are three different indicators of nesting that could potentially be observed during an audio-visual survey, other than finding a fledgling on the ground or finding a nest. These are as follows:

1. Observation of a murrelet carrying a fish (certainty of nesting nearby)
2. Observation of a single silent murrelet flying below canopy height during the earliest incubation exchange or feeding time (usually no later than 8 minutes before sunrise) (very strong likelihood of nesting nearby – see Singer et al. 1995)
3. Observation of below-canopy flight (possible nesting nearby)

Of these three, the first two are most diagnostic, but few A-V surveyors pay any attention to the second indicator.

In forested landscapes, such as the Santa Cruz Mountains, radar surveys cannot detect birds flying below the canopy and usually cannot detect birds flying low enough to be seen by ground observers (Singer, pers. obs. and Hamer, pers. obs.) This fact leads to some interesting questions, such as are radar surveys and audio-visual surveys sampling the same inland flight population of birds?

In 2009, audio-visual surveys at Gazos Mountain Camp showed a major decline in the number of murrelet detections, yet radar surveys in Gazos Canyon about 2 km. downstream of Gazos Mountain Camp and along the murrelet flight corridor to the Camp, found no decrease in numbers from 2008 (Colclazier, Stumpf, and Singer, 2010). Is it possible that nesting birds are flying lower than purely-socializing or scouting birds, and therefore are not being detected by radar? This could explain why audio-visual surveys at breeding sites could all be collapsing while radar surveys are not detecting a significant decline.

Timing and Seasonal Spread of A-V Surveys

The August 4 observation of a bird carrying a fish occurred after the end of the normal survey period. The only other "certain" or "diagnostic" indicators of nesting found on land during the 2009 breeding season were category #2 (see above) observations at Gazos Mountain Camp on June 28 and July 29, and a juvenile bird found on the ground in the Butano Canyon area on June 25 (Strachan, pers. com.). If one excludes a few observations of occupied behaviors, no evidence of nesting was found on any of the 2009 A-V surveys at Big Basin, Portola, Butano, or Memorial survey sites (Suddjian, pers. com.). Over the past several years, the greatest number of behaviors indicative of nesting by far, have occurred at Gazos Mountain Camp, making it the best location in the Santa Cruz Mountains to check for evidence of nesting.

The fact that the grounded juvenile was found in June and the fish-carrying bird was observed in August, suggest that A-V surveys conducted only in July may not be sufficient. Nesting can begin and finish before July and can extend into September. If inland flights of murrelets are correlated to some degree with active nesting, which is believed to be the case, then surveys conducted after nesting have finished would detect fewer birds. Theoretically the low numbers in July 2009 might not be reflective of a reduced breeding effort in 2009, but rather of the fact that most nesting had been completed by the end of June – although the finding of a bird with a fish in August argues against that point.

As ocean conditions and prey availability become more variable under the influence of a changing climate, the period of peak murrelet nesting may also become more variable – perhaps earlier in most years, and peaking in July in only a few years. If this is the case conducting additional A-V surveys in April, May, and June would be warranted, and might serve to reduce some of the season-to-season variability.

Another factor affecting the period of peak inland activity is the intensity of predation pressure. If nest predation rates are high, then many early season nests may have failed before July, decreasing the number of inland flights in July. This is another reason for expanding the A-V survey period into the early part of the breeding season.

In fact, the peaks and troughs shown in Figure 3 might not be as indicative of year-to-year breeding effort, as it is of month-to-month variation in the time of nest initiation and attendance. If this were the case, the low number of

detections in 2009 might not represent a reduced breeding effort, but just a switch in the timing of that effort.

Conclusion

Recent events and the scientific data argue that the A-V survey program at Gazos Mountain Camp should be continued and expanded to include early and late season surveys. The approximate cost for two years of 10 A-V surveys per year would be the same as one year of 7 radar surveys. The replacement of radar surveys with A-V surveys in 2010 could provide the answers to such important questions as: (1) was the 2009 drop in detections a one-year fluke or the beginning of a long-term reduction in use?; (2) are nesting attempts continuing to occur at Gazos Mountain Camp?; and (3) is early or late season nesting becoming more common than mid-season nesting? The answers to these questions are essential to the wise management of the Zone 6 murrelet population, and they can only be provided by A-V surveys.

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