

Biological Information

1. Results of the Key deer abundance indices, including the calculation of the average number of deer seen.

For January 1, 2012 to December 31, 2012

Average count for full year = 59.0

The Key deer road-count index value is the average count from multiple road count surveys throughout the year on Big Pine Key and No Name Key. It has also been referred to as the Key deer “census”, road count, and count index; these labels are often used interchangeably. The road counts are conducted on the USFWS Survey Route, approximately monthly. The 2012 road-count index value was derived from 10 standardized count surveys. For the period January through December, 2011, the census value was 59.0. The 2011 value was 61.3 and the 2010 value was 57.1. The 13-year average was 41.5 as of 1999, and 59.1 as of 2012. The record high count index value for any year since 1975 (when the counts were started) occurred in 2006 (71.5).

The other index of Key deer abundance is the mortality index (human-caused deer deaths documented on Big Pine and No Name Keys). The human-caused mortality index was 161 (this value was 153, 113, and 126 in 2011, 2010, and 2009, respectively). The 2011 count (161 human-caused) is the highest on record since the mortality counts were started in 1966). The second highest was the 2011 value and the third highest was in 2009 (126 human-caused). Prior to 2009 to 2011, the highest mortality index occurred in 2005 (105 human-caused). The values first surpassed 100 in 2003 (102 human-caused).

In 2012, the total mortality count (all known mortalities from all causes) on Big Pine Key and No Name Key was 197; this value was 184, 142, and 155 in 2011, 2010, and 2009, respectively). Prior to 2009, 2010 and 2011, the highest total count of all known mortalities (all causes) on Big Pine Key and No Name Key (132) occurred in 2003.

Over the long-term, the Big Pine Key-No Name Key mortality index (count of human-caused deaths documented over the year) and the road count index illustrated a direct correlation, with an overall positive trend in each. However, the peak road count occurred in 2006, and has declined for six years to the present. The decline is not precipitous. Two earlier declines appear to have been somewhat sharper, although each lasted only four years prior to changing upward. The annual mortality counts have been at their highest for the last four years. The high mortality indices are due to an increase in the absolute number of road-kills (DVCs). An increase in the absolute number of disease-related deaths also contributes slightly.

2. *A summary of Key deer mortality information, including the calculation of the number of human-related deaths.*

	Combat	Disease	Dog	Drowning	Entanglement	Poached	Deer-vehicle collision (DVC)	Miscellaneous (human causes)	Unknown	Total	DVC as % Total
2007	1	6	0	4	1	1	83	1	15	112	74%
2008	0	2	0	4	1	1	86	2	24	120	72%
2009	0	4	0	4	2	2	117	1	25	155	75%
2010	2	7	0	7	1	0	104	1	20	142	73%
2011	2	13	4	3	3	0	138	3	16	184	75%
2012	4	17	4	3	5	0	150	1	15	197	76%

Mortalities in the core of the range (HCP area; Big Pine and No Name Keys), 2007 to 2012. Human-caused mortalities are shown in **bold**. Note that human factors also contribute to Disease and a portion of Unknown (causes; e.g., some of those are likely DVC related).

The proportion of all known Big Pine and No Name Key deaths that were due to DVCs in 2012 (76 percent) was similar to values for 2004 to 2012 (range, 72 to 76 percent). In 2012, 83% of the total known Big Pine and No Name Key mortalities were attributed to all human causes combined (ranging from 78 to 85 percent, 2004-2012). The long-term average proportion (encompassing 1966-2012) is approximately 83 percent (DVCs alone account for 76 percent of all known deaths). From 1983 to 2001, the 13-year average attributed to human causes had gradually declined from 91% to 73%. The 13-year average attributed to human causes (79% in 2011, 80% in 2012) has risen gradually subsequent to the 2001 low (73%, 1989—2001). Some of the deaths for which the cause was “undetermined”, and likely even some disease deaths, undoubtedly include a number of cases that may actually be attributable to human causes, particularly DVCs. However, an unknown number of both natural and human-caused deaths go entirely undetected.

Of the road mortalities in which sex was determined since 1966, approximately 39% were females (61% males). The 13-year average has ranged from approximately 37-41 percent females since 1978 (the first year a 13-year average was available). The 13-year average as of 2012 was approximately 41 and 59 percent females and males, respectively. The lowest values (37%) occurred

DVCs on U.S.1 comprised approximately 67 percent of all DVCs on Big Pine Key during 2012. The 2012 proportion (67%) was the highest value since 1996 (70%). Similarly, DVCs on U.S.1 comprised approximately 67 percent of all DVC mortalities on Big Pine Key and No Name Key combined (only one DVC was attributed to No Name Key). Of the road mortalities documented

on Big Pine Key since 1966, approximately 54 percent were on U.S.1 (13-year averages ending 2012, 1994, and 1978 were approximately 50, 58, and 53%, respectively). Of the total DVC mortalities documented on both Big Pine and No Name keys since 1966, approximately 50 percent were on U.S.1. Thus, U.S.1 accounts for half of all DVCs in the core over the long term, and two-thirds of DVCs in 2012.

Of the total mortalities documented throughout the core since 1966, approximately 76 percent were from DVCs (13-year average ending 2012, approximately 72%). Throughout the core since 1966, of the mortalities where the cause was determined, approximately 88 percent were from DVCs.

Of all mortalities rangewide, the proportion that occurred on Big Pine Key was approximately 94 percent (mean, 88% since 1966). Mortalities in the core (Big Pine and No Name keys combined), comprised approximately 95 percent of all mortalities rangewide. Of all DVCs rangewide, the proportion that occurred on Big Pine Key was also approximately 94 percent (grand mean, 90%). The proportion of DVCs that were attributed to No Name Key was approximately 1 percent (grand mean, 6%).

The long-term proportion of all Big Pine and No Name Key deaths attributed to disease (1966—2006) was approximately 2 percent. The annual proportion is greater in recent periods (5%, 1991-2012) compared to earlier decades (less than 1%, 1966-1990). The 13-year average increased from approximately 0.1 percent in 1966 to 5 percent as of 2005; the 13-year average remains above 5 percent. The proportion of all Big Pine and No Name Key deaths attributed to disease in 2012 was approximately 9 percent.

5. *An assessment of whether the ratio of the number of human-related deaths to average deer seen remains below 1.53.*

For January 2012 through December 2012

$$\text{Ratio} = \frac{\text{human-related deaths}}{\text{average deer seen}} = \frac{161}{59.0} = 2.73$$

For January 2011 through December 2011

$$\text{Ratio} = \frac{\text{human-related deaths}}{\text{average deer seen}} = \frac{153}{61.3} = 2.50$$

For January 2010 through December 2010

$$\text{Ratio} = \frac{\text{human-related deaths}}{\text{average deer seen}} = \frac{113}{57.1} = 1.98$$

For January 2009 through December 2009

$$\text{Ratio} = \frac{\text{human-related deaths}}{\text{average deer seen}} = \frac{126}{63.9} = 1.97$$

The ratio of human-related deaths (mortality index) to average number of deer seen (count index), 2.73, was well above the upper boundary of the 95% confidence interval (1.53) defined in the HCP. The 2012 mortality index (2.73) was at the highest level since 1986. During each year, 2009 through 2012, the mortality index was at its highest level since 1987. The 2012 mortality index was also substantially above the previously high values (2009, 1.97; 2010, 1.98; and 2011, 2.50) following the late 1980s. The 13-year average as of 1987 (first year available) was 2.29. That declined to 1.42 in 2000, 2001, and 2002, and subsequently rose to 1.79 (13-year average, 2000—2012; 95% CI=0.23 for those 13 years gives limits of 1.56—2.02). The long-term average (38 years, 1975 to 2012) was 1.83 (95% CI=0.24 for those 38 years gives limits of 1.59—2.07).

3. *A discussion and interpretation of mortality data.*

Total mortalities in the core jumped to 184 and 197 in 2011 and 2012, respectively, from a previous record high of 155 in 2009. Total DVC mortalities in the core jumped to 138 and 150 in 2011 and 2012, respectively, from a previous record high of 117 in 2009. DVC mortalities on U.S.1 jumped to 85 and 100 in 2011 and 2012, respectively, from a previous record high of 56 in 2009. However, the proportion of all deaths attributed to DVCs was approximately 76 percent, similar to the long-term average (72 percent; as discussed above).

Overall in 2012, the proportion of mortalities from DVCs is not particularly great (although the trend appears increasing), the proportion attributed to U.S.1 is somewhat high, the absolute number of DVCs attributed to U.S.1 was very high (also high in 2011), the road-count has continued to decline somewhat (for the sixth year), and the ratio has continued to increase. These results may suggest that movement has increased, resulting in more deer intersecting U.S.1 and thus, colliding with vehicles. Alternatively, U.S.1 has become more lethal to deer that intersect it.

Absolute road mortalities increased, with much of the increase attributed to U.S.1. The increase would result from increased abundance and or a higher mortality rate. Higher population levels could result in commensurately more DVCs. Alternatively, mortalities may be occurring at a higher per capita rate than in previous years, such as if U.S.1 has become more lethal to deer. This may be the case if the mortality and count indices, respectively, accurately depicted the increase in mortality and the lack of population increase indicated over recent years). If so, one factor that could evidently explain it is that the proportion of mortalities attributed to U.S.1 was high in 2011 and 2012. However, actual abundance may or may not be well indicated by the count index on a given year.

With regard to recent years in the context of the long term record of the count index, we may be witnessing a possible decrease in the long-term population growth trajectory. Key deer may have attained or exceeded carrying capacity within the HCP area, which is the core of the Key deer's range. Accordingly, in the absence of new and substantial threats or major changes in habitat that result in major changes in food availability and or survival, the Key deer population within the core may fluctuate around carrying capacity (the actual value of which cannot be

directly calculated). Numerical fluctuations will result from source-driven and random variation in factors including environmental influences, annual productivity of the landscape, mortality rates, and annual variation in female productivity. We are unable to determine whether the current mortality rate is compensatory or additive.

DVCs remain the prominent source of Key deer mortality. Roadside feeding may exacerbate the threat of DVCs to a subset of Key deer. Though roadside feeding may directly or indirectly influence DVCs to some degree, the more profound impacts of feeding in any context are changes in Key deer social behavior, movement, dispersion, nutrition, and possibly genetic patterns.

8. *A summary of reported Lower Keys marsh rabbit road mortality.*

In both 2006 and 2007, the occurrence of at least one road kill on Big Pine Key was verbally reported by local naturalists, but not otherwise substantiated. In 2008, at least two mortalities were detected and the carcasses retrieved. One was killed by a vehicle on Wilder Road, along a stretch where a rabbit had previously been seen by USFWS personnel fleeing from a cat. In 2009, one was taken from Big Pine Key to a veterinarian, where it died. It reportedly involved a vehicle strike, but no other details were conveyed. A necropsy conducted on that mortality suggested that a predation attempt was likely, but that subsequently, a vehicle strike may have occurred as well. These observations indicate, as per the literature on Lower Keys marsh rabbits, that cats continue to suppress rabbit populations and that vehicle strikes are an additional threat. In 2010, no road mortalities were detected on Big Pine, No Name, or other areas outside of Naval Air Station Key West. In late February, 2011, one LKMR road mortality occurred on and was retrieved on Key Deer Blvd., Big Pine Key. In 2012 (February), one LKMR road mortality occurred on (and retrieved from) Key Deer Blvd., Big Pine Key. Detection and documentation would likely be enhanced if a wide array of citizens recognized and effectively reported such cases.

