

Biological Information

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

For January 1, 2013 to December 31, 2013

Average count for full year = 68

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 2013 road-count index value was derived from 5 standardized count surveys (one each from January, April, June, November, and December). For the period January through December, 2013, the value was 68. The 2012, 2011, 2010 and 2009 values were 59, 61, 57, and 64, respectively. The 13-year average was 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 second highest was 69.5 in 2005.

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 117 (this value was 161, 145, 113, and 121 in 2012, 2011, 2010, and 2009, respectively). The 2012 count (161 human-caused) was the highest on record since the mortality counts were started in 1966). The 2011 and 2009 counts were the second and the third highest values, respectively. Prior to the years 2009 – 2012, the highest mortality index occurred in 2005 (105 human-caused). The values first surpassed 100 in 2003 (102 human-caused).

In 2013, the total mortality count (all known mortalities from all causes) on Big Pine Key and No Name Key was 152; this value was 197, 175, 141, and 150 in 2012, 2011, 2010, and 2009, respectively). Prior to the years 2009 – 2012, the highest count of all known mortalities (all causes) on Big Pine Key and No Name Key (133) occurred in 2003. The values first surpassed 100 in 1997 (119 human-caused).

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. The peak road count (71.5) occurred in 2006, and remained between 57 and 66 from 2007 – 2012. The higher mortality indices in recent years are due to an increase in the absolute number of road-kills (DVCs). There has also been an increase in the absolute number of disease-related deaths, although of much smaller magnitude.

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)	Undetermined	Total	DVC as % Total
2007	1	6	0	4	1	1	83	1	15	112	74%
2008	0	2	0	3	1	1	89	1	23	120	74%
2009	0	4	0	4	2	2	112	1	25	150	75%
2010	1	7	0	7	1	0	103	2	20	141	73%
2011	2	12	6	3	3	0	131	2	16	175	75%
2012	4	17	2	3	5	0	150	1	15	197	76%
2013	0	8	0	5	2	0	110	0	27	152	72%

Mortalities in the core of the range (HCP area; Big Pine and No Name Keys), 2007 to 2013.

Human-caused mortalities are shown in **bold**. Note that human factors also contribute to Disease and a portion of Undetermined 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 2013 (approximately 72 percent) was similar to values for 2004 to 2012 (range, 73 to 78 percent). In 2013, approximately 77% of all known Big Pine and No Name Key mortalities were attributed to all human causes combined (ranging from 79 to 85 percent, 2004-2012). The long-term average proportion (encompassing 1966-2012) is approximately 83 percent. DVCs alone accounted for 74 percent of all known deaths over that period, similar to the 2013 value (72%). From 1983 to 2001, the 13-year average attributed to human causes had gradually declined from 91% to 73%. The 13-year average proportion attributed to human causes (80% as of 2012) has risen gradually subsequent to the 2001 low (73%, 1989—2001 average). 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 within the core in which sex was determined, approximately 38 percent were females in 2013. Of the road mortalities within the core in which sex was determined since 1966, approximately 40% were females (60% males). The 13-year average has ranged from approximately 37-43 percent females since 1978 (the first year a 13-year average was available). The 13-year average as of 2013 was approximately 42 percent females.

DVCs on U.S.1 comprised approximately 63 percent of all DVCs on Big Pine Key during 2013. The proportions in 2012 and 2011 were approximately 69 and 61%, respectively, which were the highest values since 1996 (70%). Similarly, in 2013 DVCs on U.S.1 comprised approximately 63 percent of all DVC mortalities on Big Pine Key and No Name Key combined (only one of the

DVCs was documented on No Name Key; 2011: 60%; 2012: 69%). Of the road mortalities documented on Big Pine Key since 1966, approximately 55 percent were on U.S.1. Of the total DVC mortalities documented since 1966 on Big Pine and No Name keys combined, approximately 52 percent were on U.S.1. Thus, U.S.1 accounts for half of all DVCs in the core over the long term, but approximately two-thirds of DVCs since 2011.

Of the total mortalities documented throughout the core since 1966, approximately 74 percent were from DVCs (13-year average ending 2013, also approximately 74%). Of the mortalities where the cause was determined throughout the core since 1966, approximately 87 percent were from DVCs.

Of all mortalities rangewide, the proportion that occurred on Big Pine Key was approximately 88 percent in 2013 (long term mean, 89% annually since 1966). Mortalities in the core (Big Pine and No Name keys combined), comprised approximately 89 percent of all mortalities rangewide in 2013 (annually 94% since 1966). Of all documented DVCs rangewide, the proportion that occurred on Big Pine Key was also approximately 87 percent (annually 90% since 1966). The proportion of known DVCs that were attributed to No Name Key was approximately 1 percent (annually 5% since 1966).

The long-term proportion of all Big Pine and No Name Key deaths attributed to disease (1966—2013) was approximately 4 percent. The annual proportion is greater in recent periods (5%, 13-year annual mean 2001 – 2013) compared to earlier decades (less than 1%, 1966-1990). The proportion of all Big Pine and No Name Key deaths attributed to disease in 2012 was approximately 5 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 2013 through December 2013

$$\text{Ratio} = \frac{\text{human-related deaths}}{\text{average deer seen}} = \frac{117}{68} = 1.73$$

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

$$\text{Ratio} = \frac{\text{human-related deaths}}{\text{average deer seen}} = \frac{145}{61.3} = 2.37 \text{ (Prev. reported as 2.50)}$$

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

$$\text{Ratio} = \frac{\text{human-related deaths}}{\text{average deer seen}} = \frac{121}{63.9} = 1.89 \text{ (Prev. reported as 1.97)}$$

The ratio of human-related deaths (mortality index) to average number of deer seen (count index, 1.97) was 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 ratio was at its highest level since 1987 (1.89; 1.98; 2.37, and 2.73, respectively, 2009-2012). The 13-year average as of 1987 (first year available) was 2.18. That declined to about 1.4 during 1999 through 2002, and subsequently rose to 1.77 (13-year average, 2001—2013). The long-term average (39 years, 1975 to 2012) was 1.78.

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

In 2013, there were 153 mortalities of all causes recorded in the core. Total mortalities in the core had jumped to at least 175 and 197 in 2011 and 2012, respectively, from a previous record high of at least 150 in 2009. Total DVC mortalities in the core jumped to at least 131 and 150 in 2011 and 2012, respectively, from a previous record high of at least 112 in 2009. DVC mortalities on U.S.1 (BPK) had jumped to at least 78 and 103 in 2011 and 2012, respectively, from a previous record high of 53 in 2009. The value was approximately 69 in 2013. However, the proportion of all deaths attributed to DVCs was approximately 72 percent in 2013, similar to the long-term average (74 percent; as discussed above).

Overall in 2013, the proportion of mortalities from DVCs, the proportion attributed to U.S.1, and the absolute number of DVCs attributed to U.S.1, were not particularly high, especially compared to 2011 and 2012. The 2013 values were similar to 2009 and 2010 values. Higher DVC values on U.S.1 indicate that deer abundance has increased, movement has increased (resulting in more deer intersecting U.S.1 and thus, colliding with vehicles), or that U.S.1 has become more lethal to deer that intersect it.

Absolute road mortalities in 2013 were below the peak values in 2011 and 2012, though the proportion attributed to U.S.1 remains high. The increase in absolute road mortalities in recent years 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 count index, which depicts a general lack of growth in recent years (all values 2007—2013, remain below the 2006 peak) accurately depicts an actual leveling off, slight decline, or lack of population increase indicated over those recent years. Alternatively, an increase in annual productivity could result in the patterns observed (a larger excess both produced, and removed by DVCs, annually in recent years).

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 have attained or exceeded carrying capacity within 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.

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. None were documented from the HCP area in 2013. Detection and documentation would likely be enhanced if a wide array of citizens recognized and effectively reported such cases.