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SIKA-LIKE DEER *CERVUS NIPPON* TEMMINCK, 1838 OBSERVED SWIMMING OUT TO SEA AT GREYSTONES, CO. WICKLOW: INCREASING DEER POPULATION PRESSURE?

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Abstract

During September 2011, an adult-size sika-like deer doe *Cervus nippon* Temminck, 1838 was observed swimming out to sea near Greystones, Co. Wicklow, off the east coast of Ireland (Irish Sea). It is hypothesised that this unusual behaviour may be inherently related to a phenomenal increase in deer distribution, abundance and density in Ireland over the last three decades.

Based on census data from 2009, the estimated mean density of all deer species in the Republic of Ireland was 0.04/ha total land area (county range: 0.003-0.65) and 0.4/ha forestry (county range: 0.02-3.68). Significantly, Co. Wicklow accounted for the highest densities of all deer species, 3.7/ha forestry and 0.65/ha total land area, including the highest densities of sika deer (3.1/ha forestry and 0.55/ha total land area) and hybrid deer (0.3/ha forestry and 0.05/ha total land area).

Previous observations on swimming deer are reviewed. It was concluded that deer are capable of swimming over relatively long distances. It is hypothesised that in some situations swimming may have facilitated the colonisation of new land masses by deer.

Key words: swimming deer, deer population pressure, deer densities, sika deer, Ireland

Introduction

Between 5.30 and 6.00pm on 4 September 2011, one of us (SM) observed an adult-sized sika-like doe *Cervus nippon* Temminck, 1838 barrelling down towards the south beach near Greystones (53.144^{0}N, 6.072^{0}W), Co. Wicklow, on the east coast of Ireland (Irish Sea). The deer was initially observed making its way along the edge of a coastal golf driving range before dropping down one side of a railway embankment, leaping over the railway tracks, scrambling up the opposite embankment and out across the strand at full speed towards the water's edge where without any hesitation it splashed into the waves and began swimming directly out to sea, its head and a good part of its neck held stiffly up out of the water. Over the next 45 minutes, the deer was observed with binoculars, albeit with decreasing resolution, until it eventually

disappeared from view. Two hours later, there was still no sign of the deer returning to shore either at or near the location where it originally entered the sea. Although the deer may have made landfall at another location, its ultimate fate is unknown.

What prompted this sika-like deer to leave the seclusion and relative protection afforded by its usual forest habitat, stray into a densely human populated urban area, and swim out to sea? Perhaps it was inherently due to the effects of a rapidly expanding deer population and/or the aggressive territoriality of stags during the rutting season, which for sika deer can extend from late August to early December (Hayden and Harrington, 2000), and/or a deliberate attempt to migrate offshore in search of new territory? Perhaps after straying into an unfamiliar urban environment populated by humans and other potential predators (e.g. domestic dogs), the deer panicked and raced into the sea to escape rather than back towards its more familiar forest environment from whence it had undoubtedly come. How frequently do deer swim and how far can they swim?

Methods

Current data on Irish deer species distribution and abundance (Carden *et al*., 2010; Burkitt, 2012) were used to estimate deer densities by species (numbers/ha) on a county basis both in terms of forest cover (Anon, 2012a) and total land area. Previous observations on swimming deer were collated and reviewed by carrying out an extensive on-line web-based search.

Results

Irish deer distribution and abundance

According to the most recent national survey, the total number of deer of all species in the Republic of Ireland (ROI), red deer *Cervus elaphus* L., fallow deer *Dama dama* (L.), sika deer, red*sika deer hybrids and muntjac deer *Muntiacus reevesi* (Ogilby, 1839), was estimated to have increased almost six-fold between 1978 and 2008 (Burkitt, 2012). Indeed, over the latter 30-year period, the compound annual rate of expansion was 7% for red deer, 5% for sika deer and 3% for fallow deer. The total range increase was 565% for red deer, 353% for sika deer and 174% for fallow deer (Carden *et al*., 2010). Population estimates for 2009, based on cull returns, suggested that the total population of all deer species in the ROI was 303,490 animals and that this was likely to increase by *circa* 30% to 393,000 animals by 2016 (Burkitt, 2012). Sika deer and fallow deer accounted for 47.4% (143,790) and 41% (124,390) of the estimated national deer population (Fig. 1). Significantly, Co. Wicklow accounted for 43.5% (132,040) of the total estimated national deer population, including 77.6% (111,530), 82.5% (10,540) and 66.7% (60) of the total sika deer (143,790), hybrid deer (12,770) and muntjac deer (90) populations respectively (Table 1).

Irish deer densities

In 2012, it was estimated that 10.5% of the total land area of the ROI (731,660 ha) was covered by forest (Anon, 2012a). Significantly, Co. Wicklow accounted for the highest percentage (18%) of forest cover by county. An analysis of the data on the estimated number of deer (Burkitt, 2012), forest cover (Anon, 2012a) and the total land area by county indicated that the average densities of deer of all species in the ROI during 2009 was 0.4/ha of forestry (county range: 0.02-3.68) and 0.04/ha of total land area (county range: 0.003-0.65) (Figs 2 and 3). Significantly, Co. Wicklow accounted for the highest densities of all deer species, 3.7/ha forestry and 0.65/ha total land area, including the highest densities of sika deer (3.1/ha forestry and 0.55/ha total land area) and hybrid deer (0.3/ha forestry and 0.05/ha total land area). The latest census of the ROI's human population (Anon, 2011a) indicated that the average national density of humans was 0.7/ha total land area and that Co. Wicklow ranked seventh at 0.7/ha.

Previous observations on swimming deer

Although there are no known previous published reports about deer swimming in Irish waters, over the last decade several video clips have been posted on <www.youtube.com> of deer swimming during daylight hours in both marine (9) and freshwater (17) environments, particularly in North America. A summary of these web-based reports are presented in Table 2. The vast majority of observations involved white-tailed deer *Odocoileus virginianus* Zimmermann, 1780 (69.2%), black-tailed or mule deer *O. hemionus* (Rafinesque, 1817) (11.5%), and sitka black-tailed deer *O. hemionus sitkensis* Merriam, 1898 (11.5%). There was one record of the chital deer *Axis axis* (Erxleben, 1777) from Maui, Hawaii and a possible red deer from Norway. The vast majority of observations were made in freshwater habitats (65.4%). Mature stags accounted for 42.3% of the observations. Almost 27% of the records involved 2 or more animals, including stags, does and fawns. The monthly frequency distribution of observations was as follows: January, 3; April, 2; July, 2; August, 5; September, 1; October, 8; and November, 5. Over 80% of the observations occurred during the second half of the year (July to November) which would generally coincide with the rutting season. Although all of the observations were made during daylight hours, it is possible that deer may also swim across water bodies during the hours of darkness. In summary, it clear that deer are capable swimmers and probably cross water bodies, particularly freshwater lakes, more frequently that the paucity of observations would suggest, either in search of food, especially in disjoint habitats, or due to other population pressures (e.g. aggressive behaviour during the rutting season, increasing densities and/or predator avoidance).

How far can deer swim?

Reimchen *et al*. (2008) noted that white-tailed deer are known to swim up to 25km between islands in the Great Lakes (North America). Serjeantson (1990) and Mulville (2010) noted that red deer can swim up to 7km in the marine environment. Voorhees (2007) noted that deer often swim across the ocean between Papua New Guinea and Saibai Island (Australia), a distance of *circa* 4-5km.

Discussion

Irish deer populations are increasing in distribution and abundance throughout the country, primarily due to increasing afforestation, legal protection and a lack of natural predators (Carden *et al*., 2010; Burkitt, 2012). Significantly, during 2009, it was estimated that Co. Wicklow accounted for 43.5% of the total estimated national deer population, including 77.6%, 82.5% and 66.7% of the total sika deer, hybrid deer and muntjac deer populations respectively.

According to Hayden and Harrington (2000), sika deer readily colonise suitable habitats but once established, their home ranges may be relatively small. Although females may spend their entire lifespan within an area as small as 50ha, males tend to travel over greater distances, and during the course of a year they may wander over an area as large as 1,000ha. However, as deer population densities continue to expand, it is likely that increasing numbers of both male and female deer may be forced to forage well beyond their original home ranges and this may result in both increasing levels of hybridization (Senn *et al*., 2010), introgression (Goodman *et al*., 1999), negative impacts on ecosystems, and encroachments into nearby urban areas (Putman *et al*., 2011a, b), particularly densely populated areas close to natural deer habitats. Indeed, it is interesting to note that the estimated minimum density (numbers/ha total land area) of both deer (0.65/ha) and humans (0.7/ha) in Co. Wicklow are broadly similar.

Although it is acknowledged that deer are not exclusively confined to forestry habitats, many species spend a considerable amount of time either in or near forestry. Hayden and Harrington (2000) remarked that sika deer can attain local densities of 0.15-0.5 animals/ha in coniferous plantations with access to good grazing areas. Putman *et al*. (2011a, b) noted that although negative impacts may occur in commercial forestry above a threshold of 0.04 deer/ha, the actual threshold level is likely to be both species specific and habitat dependent. For example, they noted that unfenced native woodlands seem to regenerate naturally if there were fewer than 0.04-0.05/ha large deer (e.g. sika, red and fallow deer) or fewer than 0.25/ha smaller deer (e.g. roe deer *Capreolus capreolus*), while open habitats may suffer only light or moderate impacts from red deer at landscape densities of 0.07-0.08/ha. Putman *et al*. (2011a, b) concluded that although deer density alone is unlikely to be a good predictor of impact, long-term management should be based on the assessment of both actual impacts and the apparent density of deer at the

landscape level. Nevertheless, the estimated density of all deer species in Co. Wicklow (3.7/ha forestry) far exceeds the threshold for commercial forestry (0.04/ha) suggested by Putman *et al*. (2011a), a density that is likely to have a several negative effects on the environment. Indeed, the estimated minimum density (numbers/ha total land area) for all deer species in the ROI during 2009 was 0.04/ha, and apart from Co. Wicklow (0.65), it was also significantly high in Cos Dublin (0.09), Tipperary (0.08), Laois (0.06) and Waterford (0.06).

Although many species of deer are known to be good swimmers and probably take to the water more frequently than observed, there is surprisingly very little published information on the maximum distance that they can swim. Serjeantson (1990) and Mulville (2010) noted that red deer can swim up to 7km, a distance enough for the species to have naturally colonised the Inner Hebrides (Scotland) with ease, but for islands separated by wide or dangerous straits, such as the Outer Hebrides, they concluded that the species must have been introduced by humans. Welsh (2003) also noted that sika deer had also naturally colonised several islands within the Inner Hebrides, such as Skye, Scalpay and Raasay, by swimming across open sea channels. Reimchen *et al*. (2008) noted that although white-tailed deer are known to swim up to 25km between islands in the Great Lakes (North America), strong currents and extensive wave action may limit opportunities for deer to colonise offshore islands in the marine environment. Voorhees (2007) noted that deer often swim across the ocean between Papua New Guinea and Saibai Island (Australia), a distance of *circa* 4-5km.

Although red deer are known to occasionally frequent islands in the Lakes of Killarney (Nugent *pers. comm*.), there is no evidence to date that deer naturally colonised any Irish nearshore or offshore marine islands. It is possible that a lack of suitable habitats on these islands and/or previously low onshore deer population densities may have precluded any inherent pressure for natural colonisation. However, considering the current extremely high and increasing density of deer populations on mainland Ireland, it is possible that some deer, particularly in or near coastal locations, may be forced to emigrate to nearby islands. Perhaps the Greystones' deer represents the vanguard of a potentially lemming-like plunge into the unknown? Under optimum climatic conditions, the mountain peaks of Snowdonia (NW Wales), maximum height 1,085m (Mount Snowdon), are visible from elevations as low as 120m along the Co. Wicklow coast (DQ *pers. observation*.). However, in the unlikely event that a Co. Wicklow deer somehow managed to successfully reach the nearest landmass (Bardsey Island, Lleyn Peninsula, Caernarvonshire, NW Wales), a minimum distance of 96km from Greystones, this remarkable achievement would have major implications for the on-going debate as to whether or not Ireland was naturally colonised by swimming mammals (e.g. red deer) following the end of the last Ice Age *circa* 18,000 years BP (Harrington, 1979; Devoy, 1986; Yalden, 1986; Sleeman, 1997; McCormick, 1999; Searle, 2008; Carden *et al*., 2012).

Nevertheless, considering that sea levels were estimated to be *circa* 120m lower than present during the Last Glacial Maximum (*circa* 26,000 years BP) (Edwards and Brooks, 2008), the minimum distance between Ireland and the UK would have been significantly shorter, albeit only temporarily, during the immediate post glacial period and this may have facilitated a window of opportunity for the natural colonisation of Ireland by some swimming mammal species such as deer.

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Anon. (2007b) Deer swimming across lake.
<http://www.youtube.com/watch?v=I5_Xde3AyGw>

Anon. (2007c) Deer swimming across a Canadian lake it's a fawn.
<http://www.youtube.com/watch?v=Ct640Fjme10>

Anon. (2007d) Deer swimming across a creek.
<http://www.youtube.com/watch?v=ITUTGke7UAM>

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Anon. (2012d) The swimming deer of Oak Bay. <http://www.youtube.com/watch?v=zkrLn1WxF5Q>

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FIGURE 1. Estimated number and % of deer species in the ROI during 2009 (Burkitt, 2012).

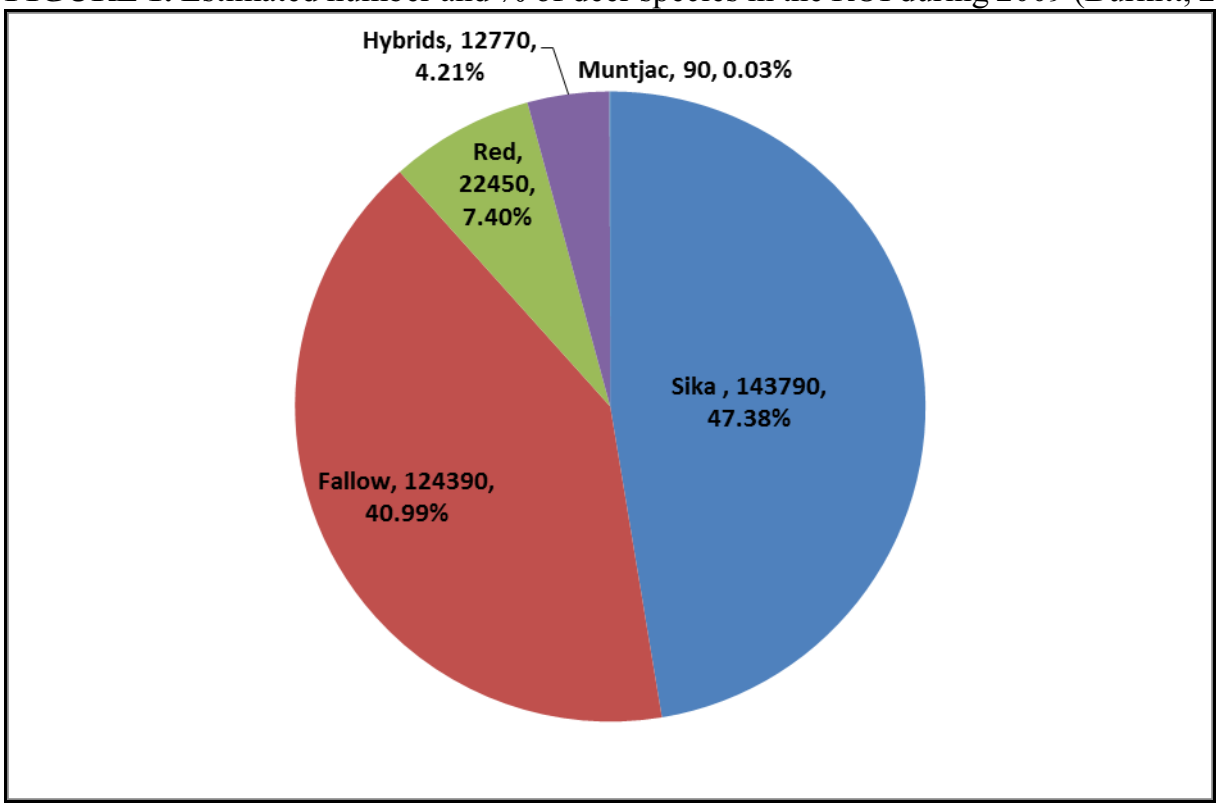

FIGURE 2. Irish deer densities by species (numbers/ha forestry/county) 2009.

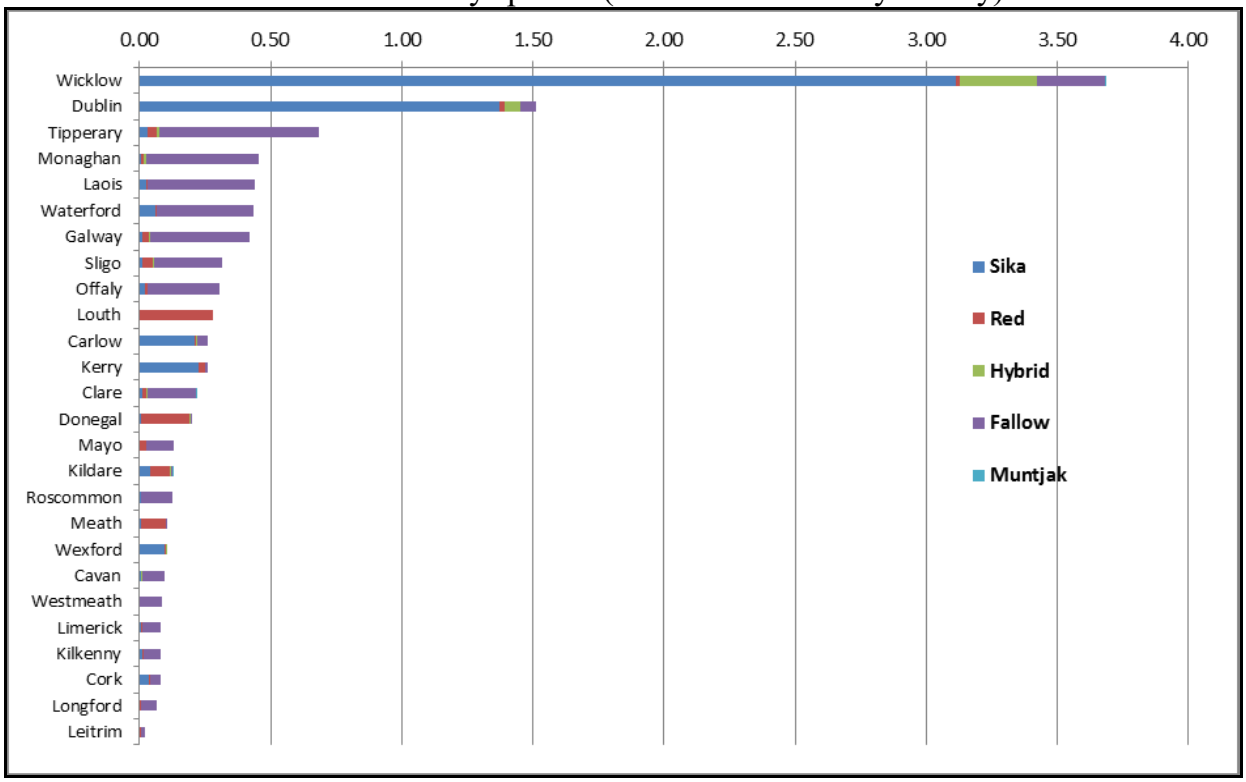

FIGURE 3. Irish deer densities (total numbers/ha total land area/county) 2009.

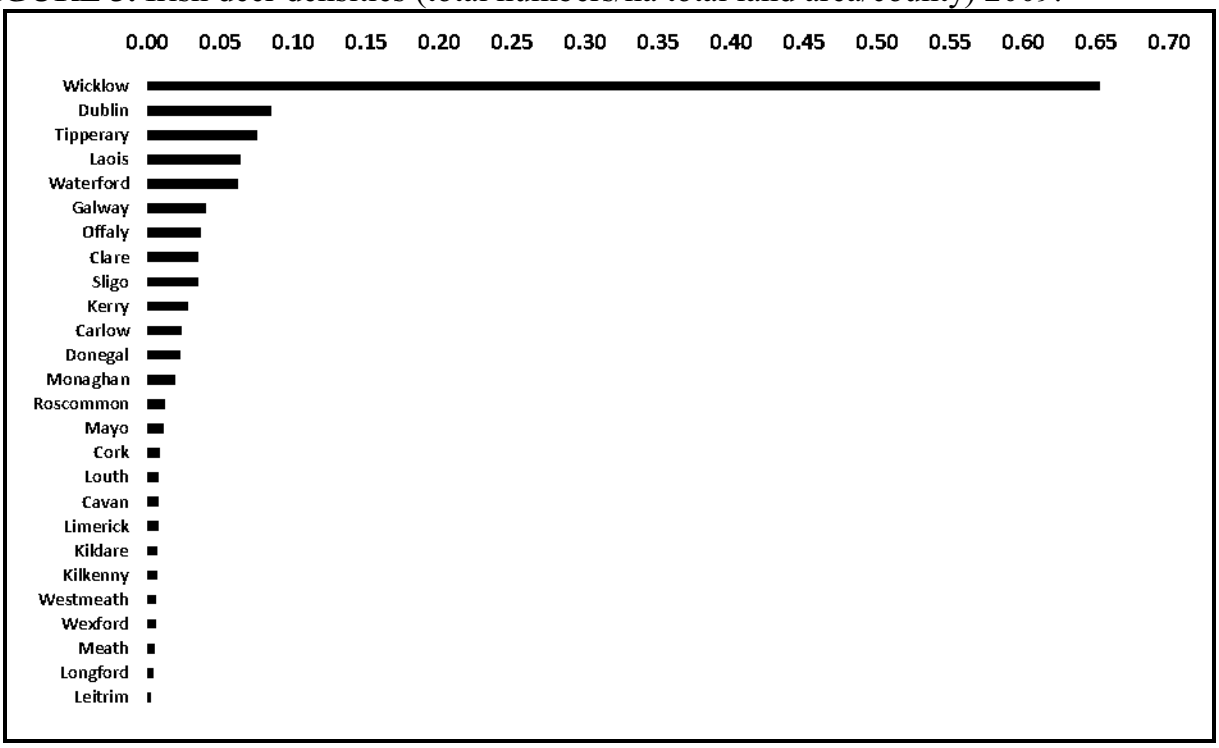

TABLE 1. Estimated numbers and densities of deer by species in Co Wicklow.

Species	Number	%	% National	Densities (number/ha)	
				Forestry	Total Land Area
Sika	111530	84.5	77.6	3.110	0.551
Hybrids	10540	8.0	82.5	0.294	0.052
Fallow	9300	7.0	7.5	0.259	0.046
Red	610	0.5	2.7	0.017	0.003
Muntjac	60	0.05	66.7	0.002	0.0003
Totals	**132040**	**100.0**	**43.5**	**3.682**	**0.652**

TABLE 2. Summary of on-line video clip observations of swimming deer.

Year	Month	Habitat	Location	State	Country	Species	Sex	Reference
2007	January	freshwater	New Melones Lake	California	USA	Black-tailed Deer	doe	Anon. (2007a)
2007	April	marine	c.3.2km off Cape May	New Jersey	USA	White-tailed Deer	unknown	Voorhees (2007)
2007	July	freshwater	Clearwater Lake	Missouri	USA	White-tailed Deer	stag	Anon. (2007b)

TABLE 2 (Continued)

Year	Month	Habitat	Location	State	Country	Species	Sex	Reference
2007	August	freshwater	unknown	unknown	Canada	White-tailed Deer	fawn	Anon. (2007c)
2007	October	marine	Farstad and Averøy	Møre og Romsdal	Norway	Red Deer	doe	Somme (2007)
2007	October	freshwater	Pomme de Terre Lake	Missouri	USA	White-tailed Deer	doe	Garrett (2007)
2007	November	freshwater	unknown	unknown	USA	White-tailed Deer	doe	Anon. (2007d)
2008	April	freshwater	Lake Guntersville	Alabama	USA	White-tailed Deer	3 doe	Anon. (2008a)
2008	September	freshwater	Puzzle Bay	Ontario	Canada	White-tailed Deer	stag	Anon. (2008b)
2010	January	freshwater	Sardis Lake	Mississippi	USA	White-tailed Deer	stag	Woods (2010)
2010	October	marine	c.1.6km off Point Arden	Alaska	USA	Sitka Black-tailed Deer	4 juvenile males	Lowell (2010)
2010	October	freshwater	Little Bald Lake	Ontario	Canada	White-tailed Deer	stag	McNally (2010)
2010	November	marine	Montauk	New York	USA	White-tailed Deer	stag	Anon. (2010)
2011	August	freshwater	Rotary Marches	unknown	USA	Black-tailed Deer	doe & 2 fawns	Anon. (2011b)
2011	August	freshwater	Lake Lanier (Buford)	Georgia	USA	White-tailed Deer	2 stags	Anon. (2011c)
2011	November	freshwater	Lake Chehaw	Georgia	USA	White-tailed Deer	doe	Anon. (2011d)
2011	October	freshwater	Stoney Lake (Humboldt)	Saskatchewan	Canada	White-tailed Deer	stag	Marcus (2011)
2012	January	marine	off Fort Myers	Florida	USA	White-tailed Deer	unknown	Anon. (2012b)
2012	October	marine	Wailea Beach (Maui)	Hawaii	USA	Chital Deer	stag	Walsh (2012)
2012	October	freshwater	Lake Kissimmee	Florida	USA	White-tailed Deer	stag	Anon. (2012c)
2012	October	marine	c.4.8km off Casco Bay	Maine	USA	White-tailed Deer	unknown	Wallace (2012)
2012	November	marine	Oak Bay	British Columbia	Canada	Sitka Black-tailed Deer	stag	Anon. (2012d)
2013	August	marine	Hopkins Beach	California	USA	Black-tailed Deer	herd (5)	Anon. (2013)
2013	August	freshwater	Clear Lake	Michigan	USA	White-tailed Deer	unknown	Peterson (2013)
2013	November	freshwater	Lake near Monticello	Virginia	USA	White-tailed Deer	2 stags	Anderson (2013)
2014	July	freshwater	Lake near Kodiak	Alaska	USA	Sitka Black-tailed Deer	herd (9)	Anon. (2014)