Research Article

Effectiveness of Spinning-Wing Decoys Varies Among Dabbling Duck Species and Locations

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Abstract

*Spinning-wing decoys are strong attractants to ducks and increase kill rates over traditional decoying methods. However, it is unknown whether all duck species are attracted similarly to spinning-wing decoys and whether the effectiveness of these decoys changes with latitude. We examined the effectiveness of spinning-wing decoys for 9 species of dabbling ducks during 545 experimental hunts in California (1999–2000), Minnesota (2002), Manitoba (2001–2002), Nebraska (2000–2002), Missouri (2000–2001), and Arkansas (2001–2003). During each experimental hunt, we systematically alternated between 2 paired decoy treatments every 15–30 min (depending on study site): traditional decoys only and traditional decoys with a spinning-wing decoy. Overall, 70.2% (n = 1,925) of dabbling ducks were harvested (shot and retrieved) when spinning-wing decoys were turned on, ranging from 63.6% (n = 187) in Missouri to 76.4% (n = 356) in Minnesota. Effectiveness of spinning-wing decoys increased with latitude of study sites. Proportions of ducks shot when spinning-wing decoys were turned on differed among species, from a low of 50.0% (n = 8) for cinnamon teal (*Anas cyanoptera*) to a high of 79.0% (n = 119) for American wigeon (*A. americana*). The probability of being shot when spinning-wing decoys were turned on increased with annual survival rates among species; for example, spinning-wing decoys were more effective for American wigeon and mallard (*A. platyrhynchos*) than they were for cinnamon teal and American green-winged teal (*A. crecca*). Effectiveness of spinning-wing decoys did not differ consistently by age or sex of harvested ducks. Our results indicate that the effectiveness of spinning-wing decoys differs among duck species and changes with latitude; thus, consideration of these effects may be warranted when setting harvest regulations and methods of take.* (JOURNAL OF WILDLIFE MANAGEMENT 70(3):799–804; 2006)

Key words

Anas, dabbling ducks, harvest, hunting, kill rates, latitudinal trends, life history, spinning-wing decoy, survival.

Spinning-wing decoys (hereafter SWDs) are strong attractants to ducks and increase kill rates over traditional decoying methods (Eadie et al. 2001, Humburg et al. 2002, Caswell and Caswell 2004, Szymanski and Afton 2005). Use of SWDs has become widespread throughout North America since their initial use by California duck hunters during the 1998–1999 waterfowl hunting season. Percentages of hunters using SWDs have increased from 32% to 40% in California (1999–2000 to 2000–2001; D. Yparraguirre, California Department of Fish and Game, unpublished data), 10% to 26% in Minnesota (2000–2002; Shroeder et al. 2002), 44% to 69% in Missouri (2000–2002; Humburg et al. 2002), and 7% to 61% in Illinois (1999–2000 to 2000–2001; Miller 2002). Additional estimates of SWD use by hunters include 36% in Nebraska (2002–2003; M. Vrtiska, Nebraska Game and Parks Commission, unpublished data), 46% in Minnesota (2001; Szymanski 2004), and 88% in Arkansas (2001–2002; J. M. Checkett, Arkansas Game and Fish Commission, unpublished data). Use of SWDs has been controversial among hunters, and several states have responded by completely (Oregon, Washington, and Arkansas) or partially (California and Minnesota) prohibiting the take of waterfowl with the aid of SWDs (California Fish and Game Commission 2001, Washington Department of Fish and Wildlife 2001, Minnesota Statutes 2002, Oregon Fish and Wildlife Commission 2002, Arkansas Game and Fish Commission 2004). Pennsylvania also prohibits the use of SWDs, but this regulation was in place before the advent of SWDs and prohibits the take of all game species with mechanized decoys (Pennsylvania Game Commission 2001).

Although use of SWDs increases kill rates of ducks over traditional decoying techniques, it is unclear whether all duck species are affected similarly and whether SWDs are equally

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effective in all geographic regions. For example, SWDs may be more effective at northern latitudes, where naïve ducks first encounter these decoys during fall migration, than at southern latitudes, where ducks may have been exposed to these decoys previously. We examined whether effectiveness of SWDs (numbers of ducks killed when SWDs were used compared to when they were not used) differed among dabbling duck species and varied with latitude. To do so, we used all of the existing experimental data on the effectiveness of SWDs in North America. Although methodologies differed slightly among the 6 study sites, they were sufficiently coordinated enough to warrant combining data. At each study site, we conducted experimental duck hunts and recorded total numbers of ducks harvested for each species during each of 2 paired decoy treatments that were systematically alternated every 15–30 min (depending on study site): traditional decoys only and traditional decoys with a SWD. We further assessed whether variation in effectiveness of SWDs among species was related to annual survival rates.

Study Areas

We analyzed available data from 6 locations: 1) Central Valley of California from 16 October 1999 to 23 January 2000; 2) 17 counties in Minnesota from 28 September to 26 November 2002; 3) southern Manitoba from 8 September to 11 November 2001 and 8 September to 30 October 2002; 4) Nebraska from 5 October to 1 December 2000, 4 October to 22 December 2001, and 9 October to 18 December 2002; 5) Missouri from 1 November 2000 to 12 January 2001; and 6) Arkansas from 19 November 2001 to 20 January 2002 and 25 November 2002 to 25 January 2003. We used average latitudes of experimental hunt locations within a state to characterize latitudes of each site. In California, we conducted hunts in moist-soil and agricultural wetland habitats (flooded rice fields after harvest), in the predominant waterfowl wintering areas in the Sacramento Valley, Suisun Marsh, and San Joaquin Grasslands regions (Eadie et al. 2001). We conducted experimental hunts in Minnesota wetlands where mallards typically concentrate throughout the hunting season (Szymanski and Afton 2005). Similarly, we conducted hunts in Manitoba wetlands at locations where ducks were known to concentrate in early September (Caswell and Caswell 2004). In Nebraska, we conducted hunts in moist-soil wetland habitats. In Missouri and Arkansas, we conducted hunts in various wetland habitats common in the area, including flooded agriculture (corn, rice, and soybean), moist soil, reservoirs, oxbow sloughs, and flooded timber. We excluded hunts conducted in dry fields in Manitoba (Caswell and Caswell 2004) and Minnesota (Szymanski 2004), and rivers in Nebraska (M. Vrtiska, Nebraska Game and Parks Commission, Lincoln, Nebr., USA, unpublished data) to standardize wetland habitats across study sites. Additionally, primarily mallards were harvested in these habitats; therefore, we could not assess differences among species in the relative effectiveness of SWDs in these locations.

Methods

Experimental Hunts and Decoy Treatments

We conducted 40 (California), 205 (Minnesota), 97 (Manitoba), 52 (Nebraska), 50 (Missouri), and 101 (Arkansas) experimental hunts. Our study complied with all federal and state waterfowl regulations and was conducted under scientific collection permit numbers CWS01-M011, CWS02-M019 (Canadian Wildlife Service), 11360 (Minnesota Department of Natural Resources), MB022391-6 (United States Fish and Wildlife Service), and was conducted in part under Louisiana State University Animal Care and Use Committee Approved Protocol AE02-12. We recruited potential volunteer hunters in California by contacting duck hunters drawn randomly from membership lists of state waterfowl organizations or drawn randomly from private duck-hunting club lists provided by state agencies. In Minnesota, we randomly contacted potential hunters from the Minnesota Harvest Information Program database and solicited hunters in the field; in Manitoba, we also solicited hunters in the field. We did not use volunteer hunters in Nebraska, Missouri, or Arkansas; instead mostly agency personnel from the Nebraska Game and Parks Commission, Missouri Department of Conservation, or Arkansas Game and Fish Commission participated with guests. One observer accompanied each hunting group (2 hunters in California, 1–4 in Minnesota, 1–3 in Manitoba, 2–4 in Nebraska, 1–4 in Missouri, and 1–3 in Arkansas) and hid either with the hunters in the blind or in nearby vegetation. We encouraged hunters to hunt as they would under normal hunting conditions. We did not direct or influence their shooting and tried to have as little influence on their hunting as possible (except during buffer periods, see below).

We used 2 decoy treatments within each hunt: 1) traditional decoys, and 2) traditional decoys and 1 or 2 SWDs. Hunters used calls at their discretion during both decoy treatments. We randomly determined the starting order of the decoy treatment for the first hunt of the season in California and Manitoba and then systematically alternated the starting order of the decoy treatment for each subsequent hunt. In other states, we randomly determined the starting order of the decoy treatment for each hunt. After determining the starting order of treatments, we then systematically alternated decoy treatments every 30 min in California, Missouri, and Arkansas, 15 min in Minnesota and Manitoba, and 25 min in Nebraska, until 6 sampling periods (yielding 3 paired treatments per hunt in California, Missouri, and Arkansas), 4–10 sampling periods (yielding 2–5 paired treatments per hunt in Minnesota), and 4 sampling periods (yielding 2 paired treatments per hunt in Manitoba and Nebraska) were completed. We used 3–5-min buffer periods to separate decoy treatments, during which no shooting was allowed, to ensure that there were no lasting effects of the prior decoy treatment on flock behavior.

The SWDs were placed at the discretion of the hunters within 15 m of blinds. In California, we used a goalpost-style SWD (the original model) that had a rotating oval blade with sides painted either dark brown or white (Motoduck Enterprises, Woodland, California). In Minnesota, we used 1 drake and 1 hen Mojo Mallard SWD (full-body model; HuntWise, Bastrop, Louisiana). In Manitoba, Nebraska, and Arkansas, we used 1 drake Mojo Mallard SWD (HuntWise, Bastrop, Louisiana). In Missouri, we used 1 full-bodied drake mallard SWD per hunt of several types: Roto Duck (formerly Fatal deDUCKtion) for 40 hunts (Motor Mallard Company, Marysville, California), RoboDuk for 5 hunts (RoboDuk Mfg., Marysville, California), Mojo Mallard for 2

Table 1. Percentage of total dabbling ducks shot and retrieved when the spinning-wing decoy was turned on at each of the 6 study sites in North America during 1999–2003. Study sites and species are ordered by the percentage of ducks shot when the spinning-wing decoy was turned on. na = no birds were harvested.

	Species[a]																			
	AMWI		GADW		MALL		NOPI		BWTE		WODU		NSHO		AGWT		CITE		Total[b]	
Study site	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Minnesota	83.3%	18	78.6%	42	78.3%	203	90.0%	20	62.1%	29	50.0%	8	55.6%	9	74.1%	27	na	0	76.4%	356
Manitoba	84.8%	33	77.8%	36	76.8%	289	73.3%	30	69.6%	23	na	0	70.0%	30	63.5%	52	na	0	75.1%	493
California	93.9%	33	76.9%	13	66.1%	59	87.5%	16	na	0	na	0	62.1%	29	72.5%	51	50.0%	8	73.2%	209
Arkansas	50.0%	6	72.9%	70	66.9%	299	16.7%	6	100.0%	1	60.0%	20	50.0%	8	56.1%	82	na	0	64.6%	492
Nebraska	58.3%	24	65.0%	20	72.8%	81	37.5%	16	71.4%	7	100.0%	1	80.0%	5	52.9%	34	na	0	63.8%	188
Missouri	60.0%	5	61.5%	26	66.2%	139	0.0%	1	na	0	100.0%	4	50.0%	4	25.0%	8	na	0	63.6%	187
Total[b]	79.0%	119	72.9%	207	72.1%	1070	68.5%	89	66.7%	60	63.6%	33	63.5%	85	61.4%	254	50.0%	8	70.2%	1925

[a] Species are American wigeon (AMWI), gadwall (GADW), mallard (MALL), northern pintail (NOPI), blue-winged teal (BWTE), wood duck (WODU), northern shoveler (NSHO), American green-winged teal (AGWT), and innamon teal (CITE).

[b] Average weighted by sample size.

hunts (HuntWise, Bastrop, Louisiana), homemade decoy on 1 hunt, and an unknown model on 2 hunts.

Annual Survival Rates

We studied 9 species of dabbling ducks (family Anatidae, tribe Anatini): American wigeon (*Anas americana*), mallard (*A. platyrhynchos*), northern pintail (*A. acuta*), gadwall (*A. strepera*), northern shoveler (*A. clypeata*), blue-winged teal (*A. discors*), American green-winged teal (*A. crecca*), cinnamon teal (*A. cyanoptera*), and wood duck (*Aix sponsa*; we included wood ducks based on Livezey's [1991] classification). These species were commonly harvested during fall and winter hunting seasons in North America (United States Fish and Wildlife Service 2003). For each species, we averaged annual survival rate estimates for adult females summarized by Krementz et al. (1997) for North America waterfowl; we used an estimate from Gammonley (1996) for cinnamon teal. Annual survival rate was an appropriate parameter for comparative life-history analyses of waterfowl (Krementz et al. 1989).

Statistical Analyses

For each experimental hunt, we recorded numbers of each duck species shot and retrieved by hunters during each decoy treatment. We also recorded age (HY or AHY) and sex of harvested ducks. We then pooled all data from each study site to calculate proportions of each duck species that were shot and retrieved when SWDs were turned on. To test for differences in numbers of ducks harvested, we used a log-linear analysis for a 5-dimensional contingency table (2 [decoy treatments] $\times$ 2 [sexes] $\times$ 2 [age classes] $\times$ 6 [species] $\times$ 6 [study sites]) using PROC GENMOD with a Poisson distribution and log link function (Christensen 1990, SAS Institute 1999, Agresti 2002). For this analysis, we included decoy treatment, sex, age class, species, study site, all 2-way interactions, and only those 3-way interactions involving the decoy treatment. Including all 3-way interactions caused the model to fail to converge. We then used a backwards stepwise selection process to drop nonsignificant ($P > 0.05$) terms until only statistically significant interactions and their components remained. For example, if the 3-way interaction decoy $\times$ sex $\times$ species was statistically significant, then the 2-way interactions decoy $\times$ sex, decoy $\times$ species, and sex $\times$ species and the 3 main effects (decoy, sex, and site) remained in the model. We excluded cinnamon teal, blue-winged teal, and wood ducks from our analysis because they did not occur at all study sites; therefore, we tested for differences in hunting success only among the 6 species harvested at all sites.

We also tested whether effectiveness of SWDs was related to 1) latitudes of study sites and 2) annual (adult female) survival rates among duck species with the use of logistic regression (PROC GENMOD with a binomial distribution and logit link function; SAS Institute 1999). For this analysis, the nominal dependent variable was number of ducks shot when the SWD was turned on or off, and explanatory variables were study-site latitude, annual survival rate, and an interaction term for study-site latitude $\times$ survival rate. We conducted logistic regression analyses under the assumption that overdispersion could be present in the data. Overdispersion occurs when there are unmodeled similarities or correlations between sampling units. We adjusted all statistics and standard errors appropriately for this ("dscale" option in PROC GENMOD). We considered results statistically significant when alpha levels were ≤ 0.05. Although we used the actual numbers of ducks harvested in the statistical analyses, we discuss the results in terms of proportions of ducks shot when SWDs were turned on compared to the total number that were harvested during both decoy treatments for easier interpretation.

Results

During 545 experimental hunts at the 6 study sites, 877 hunters shot and retrieved 1,925 dabbling ducks (Table 1). For all dabbling ducks combined, 70.2% were shot when the SWD was turned on (decoy treatment; $\chi^2_1 = 84.93$, $P < 0.0001$) and ranged from 63.6–76.4% among study sites (decoy treatment $\times$ site interaction; $\chi^2_5 = 33.78$, $P < 0.0001$). More than 50% of each duck species was shot and retrieved when the SWD was on (Table 1).

The effectiveness of SWDs differed among species (decoy treatment $\times$ species interaction; $\chi^2_5 = 17.14$, $P = 0.004$). For example, when we pooled data among study sites, 79.0% of American wigeon were shot when the SWD was turned on compared to 61.4% of harvested American green-winged teal (Table 1). We did not detect a statistical difference among study sites in proportions of ducks shot for each species when the SWD was turned on (decoy treatment $\times$ site $\times$ species interaction; $P =$

Table 2. Percentage of total dabbling ducks shot and retrieved when the spinning-wing decoy was turned on by age at each of the 6 study sites in North America during 1999–2003. Study sites are ordered by decreasing latitude.

	Age			
	HY		AHY	
Study site	**%**	***n***	**%**	***n***
Manit.	73.0%	222	76.8%	271
Minn.	78.7%	235	71.9%	121
Nebr.	45.3%	53	71.1%	135
Calif.	73.2%	97	73.2%	112
Mo.	59.7%	62	65.6%	125
Ark.	66.7%	135	63.9%	357
Total[a]	70.8%	804	69.8%	1121

[a] Average weighted by sample size.

Table 3. Percentage of ducks shot and retrieved when the spinning-wing decoy was turned on for each sex and dabbling duck species during 1999–2003. Species are ordered by decreasing effectiveness of spinning-wing decoys on females.

	Sex			
	Female		Male	
Species[a]	**%**	***n***	**%**	***n***
NSHO	80.0%	45	45.0%	40
MALL	74.0%	354	71.1%	716
AMWI	71.4%	49	84.3%	70
GADW	70.1%	77	74.6%	130
BWTE	66.7%	33	66.7%	27
AGWT	65.2%	112	58.5%	142
WODU	64.3%	14	63.2%	19
NOPI	63.9%	36	71.7%	53
CITE	50.0%	2	50.0%	6
Total[b]	71.3%	722	69.6%	1203

[a] Species are northern shoveler (NSHO), mallard (MALL), American wigeon (AMWI), gadwall (GADW), blue-winged teal (BWTE), American green-winged teal (AGWT), northern pintail (NOPI), wood duck (WODU), and cinnamon teal (CITE).
[b] Average weighted by sample size.

0.10; we dropped this interaction from the final model), suggesting that the variation observed among study sites in the effectiveness of the SWD did not vary by species.

Effectiveness of SWDs did not consistently differ by age class (decoy treatment × age interaction; $\chi^2_1 = 1.09$, $P = 0.30$); overall, 70.8% of HYs were shot when the SWD was on compared to 69.8% of harvested AHYs (Table 2). However, we detected a difference among sites in the proportions of ducks shot for each age class when the SWD was on (decoy treatment × age × site interaction; $\chi^2_5 = 17.15$, $P = 0.004$; Table 2). For example, more HYs (78.7%) than AHYs (71.9%) ducks were harvested in Minnesota, whereas the converse was true in Nebraska (HYs = 45.3%, AHYs = 71.1%).

Proportions of ducks harvested when the SWD was on also did not differ consistently by sex (decoy treatment × sex interaction; $\chi^2_1 = 0.19$, $P = 0.66$); overall, 71.3% of harvested females and 69.6% of harvested males were shot when the SWD was on (Table 3). However, there was a difference among species in proportions of ducks shot for each sex when the SWD was on (decoy treatment × sex × species interaction; $\chi^2_5 = 16.16$, $P = 0.006$). For example, 80.0% of harvested female and 45.0% of harvested male northern shovelers were shot when the SWD was on compared to 71.4% and 84.3%, respectively, for American wigeon (Table 3).

We then tested whether observed differences in effectiveness of SWDs among sites and species were related to latitudes of study sites and annual survival rates among species. The probability of being shot when SWDs were turned on increased with the latitude of the study site ($\chi^2_1 = 13.31$, $P = 0.0003$; Fig. 1) and annual survival rates among species ($\chi^2_1 = 10.73$, $P = 0.001$; Fig. 2) after dropping the nonsignificant interaction term (survival rate × study-site latitude; $\chi^2_1 = 0.37$, $P = 0.54$). Because California raises a larger proportion of (naïve) mallards that are harvested locally than the other midlatitude states, we repeated the analysis without California ($n = 1{,}716$); the relationship with latitude remained ($\chi^2_1 = 15.72$, $P < 0.0001$). We also repeated the analysis excluding Minnesota ($n = 1{,}569$) where we used 2 SWDs compared to only 1 SWD at the other study sites. Again, there was a significant relationship with latitude ($\chi^2_1 = 9.25$, $P = 0.002$). These results indicate that the latitudinal decline in hunting success with SWDs was not an artifact of methodology.

Discussion

Currently, several states are evaluating the effectiveness of SWDs, and a number of states have partially or fully restricted their use. To date, few scientific data have been available to guide these decisions. Although a number of state-specific studies have now been completed, our study provides a broader perspective by integrating the results of several studies throughout North America (all using similar methods) to draw general conclusions about effectiveness of these decoys and to examine potential differences among species of dabbling ducks in their response to this new technology. We found that SWDs were effective at all locations and for all species of dabbling ducks (Table 1). Accordingly, our results reduce any further uncertainty over the increased effectiveness of these decoys. Moreover, the differential effects of SWDs among duck species (Fig. 2) and latitudes (Fig. 1) indicate that not all species or locations will be impacted equally.

Among our study sites, SWDs increased kill rates of ducks by a factor ranging from 1.3 (Humburg et al. 2002) to 33.0 (Caswell and Caswell 2004). In our combined analysis, we found that 2.4 times as many ducks were shot and retrieved when SWDs were used ($n = 1{,}352$) than when only traditional decoys were used ($n = 573$). The proportion of ducks shot when the SWD was on varied among the 6 study sites in North America, ranging from 63.6% (Mo.) to 76.4% (Minn.), and increased with the latitude of the study site (Fig. 1). We did not conduct experimental hunts during the same years at every study site, and latitude could potentially be confounded with year if, for example, ducks became less responsive to SWDs in succeeding years with increased exposure. However, in 2 of the first studies conducted (Calif. and Mo.) effectiveness of SWDs was lower for mallards (56% of the total

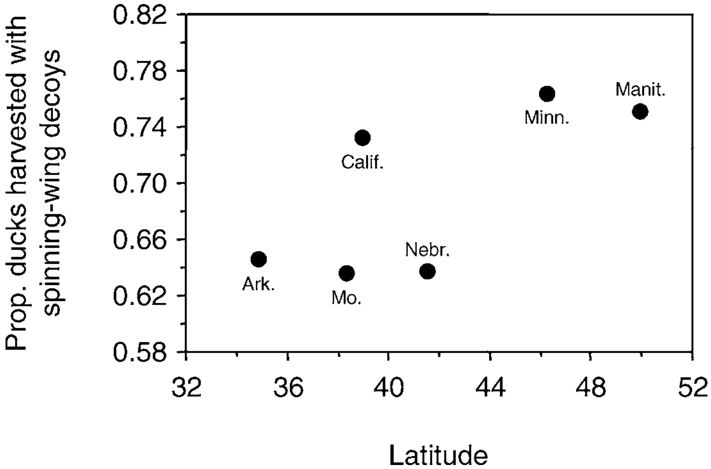

Figure 1. The proportion of ducks shot and retrieved while spinning-wing decoys were in use increased with latitude of study sites. Study sites are: Calif. (1999–2000), Minn. (2002), Manit. (2001–2002), Nebr. (2000–2002), Mo. (2000–2001), and Ark. (2001–2003).

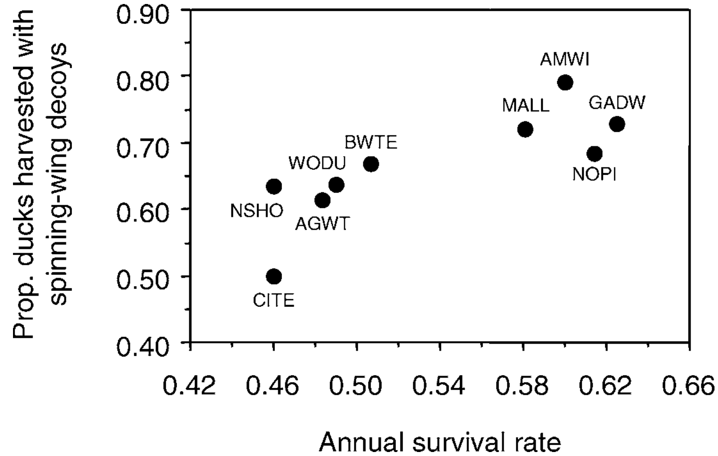

Figure 2. The proportion of ducks shot and retrieved while spinning-wing decoys were in use increased with a species' average annual survival rate for adult female dabbling ducks. Data are pooled among 6 study sites in North America. Species are cinnamon teal (CITE), American green-winged teal (AGWT), blue-winged teal (BWTE), northern shoveler (NSHO), wood duck (WODU), northern pintail (NOPI), gadwall (GADW), mallard (MALL), and American wigeon (AMWI).

harvest) than that observed in subsequent studies, indicating that year did not drive the observed relationship with latitude. In addition, it is possible that relative hunting success in Minnesota may have been inflated by using 2 SWDs, when all other study sites used only a single SWD. This could explain why hunting success with SWDs was slightly higher in Minnesota than in Manitoba, but our reanalysis still revealed a latitudinal trend after we excluded Minnesota data. These results suggest that naïve mallards in the north either 1) became less responsive with increased exposure to SWDs as they migrated south during the fall and winter, or 2) were harvested from the population at more northern latitudes. At all study sites, however, more ducks were harvested when SWDs were turned on than when only traditional decoys were used (Table 1).

We also found that effectiveness of SWDs differed among dabbling duck species (Table 1) and was related to annual survival rates of each species (Fig. 2). The SWDs were more effective for species that typically exhibit higher annual survival rates, such as American wigeon and mallard, than for species with lower annual survival rates, such as cinnamon teal and American green-wing teal (Fig. 2). If species with higher annual survival rates are more susceptible to SWDs than are species with lower annual survival rates, recent changes in hunting techniques could result in kill rates being increased disproportionately for those species that historically experienced higher annual survival rates. This would occur only if SWDs had population-level effects—a result that will be difficult to detect.

We speculate that the relationship between annual survival rate and hunting success with SWDs among species is due to variation in life-history strategies. For example, duck species characterized by a slower life-history strategy (e.g., larger and longer-lived species, such as northern pintail) may be more risk-averse than species with a faster life history strategy (e.g., smaller and shorter-lived species, such as cinnamon teal; Forbes et al. 1994, Gunness et al. 2001; Ackerman et al., U. S. Geological Survey, unpublished data). Perhaps SWDs reduced risk-aversive behavior relatively more for species with slow life histories simply because fast species already had low levels of risk aversion.

Management Implications

We stress that we have only measured the effect of SWDs on kill rates of ducks, and these rates will not necessarily translate into overall changes in population harvest rates. Accordingly, management recommendations will differ depending on whether SWDs effect only kill rates or harvest rates as well. For example, widespread use of SWDs might simply redistribute a fixed level of harvest, either among hunters (e.g., those using vs. not using SWDs or those at different latitudes) or among time periods (e.g., the same number of birds might be harvested, but at a faster rate or earlier in the season). We recommend future studies focus on determining what influence, if any, SWDs have on overall harvest rates of North American ducks. Increasing use of SWDs by hunters in many states warrants a careful monitoring of the impact of these decoys, especially if SWDs continue to be effective in future years.

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