Testing waterfowl hunters' waterfowl identification skills

ADAM A. AHLERS[1,]* & CRAIG A. MILLER[2]

[1]Department of Horticulture and Natural Resources, Kansas State University, Manhattan, Kansas 66506, USA.

[2]Illinois Natural History Survey, Prairie Research Institute, University of Illinois, Champaign, IL 61820, USA.

*Correspondence author. E-mail: aahlers2@ksu.edu

Abstract

Waterfowl management in North America is partially informed by hunter harvest data, which includes the number and sex of each species harvested. Self-reporting harvest via online surveys or paper forms is common for many agencies and at wildlife management areas. For these data to be useful to managers, however, it is critical that self-reported harvest data are precise and accurate. If this assumption is violated, harvest data may be biased and subsequent management efforts misinformed. We surveyed waterfowl hunters (n = 149) in Kansas, USA, immediately after the regular waterfowl hunting season in autumn–winter 2017/2018 to assess their ability to identify waterfowl to species and sex. In particular, participants attending events focused on waterfowl hunting and wetland conservation were asked to complete a survey that tested their ability to identify Northern Pintail *Anas acuta*, Lesser Scaup *Aythya affinis*, Canvasback *Aythya valisineria* and Redhead *Aythya americana* from colour photographs of breeding-plumage waterbirds commonly encountered in North America's Central Flyway. Respondents' average number of days spent hunting waterfowl during the 2017/2018 Kansas waterfowl season was 22 days – almost six times greater than the average Kansas waterfowl hunter during the same season. Seventy-nine percent of respondents misidentified at least one photograph. The number of days that an individual hunted during the 2017/2018 waterfowl season was generally a good predictor of successful identification. Participants misidentified female Lesser Scaup and Redhead more than other species and sex. Given that our survey included avid waterfowl hunters and high-definition photographs of waterfowl in breeding plumage, our results likely underestimate false identifications and suggest there may be a bias in self-reported waterfowl harvest data. We propose that self-reporting mediums for waterfowl harvest (both online and on paper forms) also include colour photographs of species that could potentially be harvested within the area of reporting.

Key words: ducks, harvest, harvest reporting, Pied-billed Grebe, Lesser Scaup.

Wildlife managers throughout North America rely on harvest information, in part, to inform waterfowl management efforts (Williams & Johnson 1995; Nichols *et al.* 2007; Alisauskas *et al.* 2011). Moreover, adaptive harvest management – the process which informs the setting of annual waterfowl hunting regulations in the United States of America (Blohm 1989) – requires accurate harvest reporting (Johnson 1993). These efforts are often encumbered by uncertainty (Nichols *et al.* 1995; Williams *et al.* 1996) partially resulting from various survey-specific biases and errors (Atwood 1956; Vaske & Beaman 2006; Padding & Royle 2012). Current waterfowl harvest estimates in the USA rely partially on survey questionnaires administered voluntarily to individuals who must legally enrol in the Harvest Information Program prior to hunting waterfowl (Raftovich *et al.* 2018). Most state fish and wildlife agencies also conduct their own harvest surveys, with many using the self-administered survey method to collect harvest data. Several factors can introduce bias to these surveys (*e.g.* response and non-response bias, recall bias, coverage bias, digit preference) that must be controlled when estimating waterfowl harvest (Miller & Anderson 2002; Vaske & Beaman 2006; Padding & Royle 2012).

Accuracy of self-reported harvest data are dependent on hunters' ability to recall accurate and precise information about their level of participation (*e.g.* days in the field) and total harvest numbers. Yet significant biases can exist in respondents' answers (Atwood 1956; Wright 1978; Miller & Anderson 2002; Beaman *et al.* 2005). For instance, waterfowl hunters employ complex cognitive processes when reporting their own participation (*i.e.* number of days spent waterfowl hunting during a particular season) and harvest (*i.e.* number of waterfowl harvested during a particular hunting season) that often result in approximation biases (Beaman *et al.* 2005). Along with questions regarding participation and total harvest, many state agencies also require waterfowl hunters to report the species present in their harvest. For example, in Kansas, USA, waterfowl hunters are asked to report the species (via an online reporting platform) they harvested whilst hunting on state-owned sites. It is unrealistic to assume that all waterfowl hunters have perfect waterfowl identification skills (see Wilson & Rohwer 1995; Christensen *et al.* 2017) and this imperfect knowledge may introduce biases into self-reported hunter harvest data.

In North America, region-specific harvest regulations include a daily bag limit (total number of ducks or geese you can harvest in one day), comprised of a species- and sex-specific daily harvest limit. In Kansas, for instance, each hunter could harvest six ducks per day during the 2017/2018 waterfowl-hunting season, and of that harvest they could possess no more than five Mallard *Anas platyrhynchos*, (only two of which could be females), three Lesser Scaup *Aythya affinis*, three Wood Ducks *Aix sponsa*, two Northern Pintail *Anas acuta*, two Redheads *Aythya americana*, and two Canvasbacks *Aythya valisineria*. To comply with harvest regulations hunters must identify correctly the species and sex of waterfowl prior to pulling the trigger. This can be challenging as decisions to harvest waterfowl can occur quickly whilst birds are in flight, during imperfect observation conditions (*e.g.* low light, cloudy, at a distance), or whilst targeting a particular bird from a mixed-species flock. Waterfowl and sympatric waterbirds exhibit significant species- and sex-specific diversity in phenotype characteristics (*e.g.* plumage colour, body size, wing morphology; Sibley 2000; Baldassarre 2014) as well as different call and flight characteristics. Additionally, species- and sex-specific phenotypic variations also exist across seasonal moult phases (Pyle 2005; Hawkins 2011). If hunters have imperfect waterfowl identification skills, they may unknowingly be in violation of their daily bag limits and their self-reported harvest may be incorrect. Additionally, they may unknowingly harvest protected species (*i.e.* illegal to hunt), which can have negative conservation implications (Newth *et al.* 2019).

We conducted in-person surveys to test waterfowl hunters' waterfowl identification skills and to identify predictors of individual hunters' waterfowl identification abilities. Given that past research (*e.g.* Wilson & Rohwer 1995; Christensen *et al.* 2017) and anecdotal information (*e.g.* posts on social media, news stories, conversations with hunters and waterfowl managers in the field) suggests that hunters may find it difficult to correctly identify particular waterfowl species and sex, we predicted that our population of respondents would also have imperfect identification skills. Additionally, we predicted that individuals who were more experienced waterfowl hunters (*e.g.* more days spent hunting waterfowl) would have enhanced abilities to identify species and sex of waterfowl during the survey (Council Directive 79/409/EEC 2009).

Methods

Study area

The mid-western U.S. state of Kansas is positioned at a narrowing ("bottleneck") on the Central Flyway, a key migratory corridor for many waterfowl and waterbird species in North America. We sampled waterfowl hunters at three separate locations in Kansas, immediately following the 2017/2018 regular waterfowl season (February–March 2018). Each sampling location corresponded to region- and state-wide non-profit events centred on waterfowl hunting and wetland conservation. Although we did not ask participants to disclose their residence, respondents represented a wide distribution of localities within Kansas (A. Ahlers, pers. obs.).

Study design

The waterfowl hunters were surveyed whilst attending fundraising banquets for organisations that focus on waterfowl hunting and conservation. Our sample of hunters was likely biased in favour of individuals with greater waterfowl hunting experience (*i.e.* years spent hunting), *per capita* waterfowl harvest, and days spent waterfowl hunting during the season (Alessi & Miller 2012). Thus, all inferences resulting from this sample will likely overestimate waterfowl identification skills among the total population of waterfowl hunters in Kansas and the North American Central Flyway.

We designed a digital survey to test individuals' ability to identity waterfowl species and sex by using high-definition photographs of live species in breeding plumage (similar to Keane *et al.* 2011). We were careful to choose photographs that were unambiguous and clearly identifiable to species and sex. All photographs depicted a single species motionless and resting on the water. We first asked questions regarding participants' basic demographic information, number of waterfowl they harvested during the 2017/2018 Kansas waterfowl hunting season, if they could not identify a waterfowl species they had harvested during the 2017/2018 waterfowl hunting season, and number of years of waterfowl hunting experience.

We focused on four waterfowl species that had restricted daily harvest limits (limit of ≤ 3 birds per day) during the 2017/2018 Kansas waterfowl season (Northern Pintail, Canvasback, Redhead and Lesser Scaup). Additionally, these species are commonly encountered while waterfowl hunting in Kansas (A. Ahlers, pers. obs.) and comprised *c.* 6% of the total duck harvest during the 2017/2018 Kansas waterfowl season (Raftovich *et al.* 2018). We asked participants to select the correct photograph (*e.g.* "Please select the photograph of a Northern Pintail hen") from a collection of nine randomly arranged digital photographs of waterfowl species presented on a hand-held electronic tablet. For each species and sex (eight total questions), participants were presented with nine photographs of different species of ducks. For questions regarding male identification, all species presented in the photographs were males. We used the same approach for questions regarding female identification. Each question had only one correct answer and all others were coded as incorrect. We then asked participants to identify those species that were legal to harvest during the 2017/2018 Kansas waterfowl season. Possible answers (n = 9) included Common Merganser *Mergus merganser* (female and male) and Hooded Merganser *Lophodytes cucullatus* (female and male), American Coot *Fulica americana*, Pied-billed Grebe *Podilymbus podiceps*, Greater White-fronted Goose *Anser albifrons*, Franklin's Gull *Leucophaeus pipixcan* and Double-breasted Cormorant *Phalacrocorax auritus*. Of these species, only Common and Hooded Mergansers, American Coot, and Greater White-fronted Goose were legal to harvest in Kansas during the 2017/2018 waterfowl hunting season. All photographs of species used in the survey were unambiguous and identical for each participant. Moreover, the random spatial arrangement of photograph answers for each question were the same for each participant. Prior to conducting the survey, we pilot-tested it on 20 individuals for clarity and length and did not identify any issues with the question format or photographs.

We administered the survey to participants using the online platform Qualtrics® on handheld tablets at events sponsored by non-profit conservation organisations (February–March 2018). At each event, two individuals walked around the room selecting potential participants (≥ 18 years old) at random, asking if they would like to take an online quiz that tested their ability to identify waterfowl species. We informed participants that all of their answers would be anonymous and that participation was strictly voluntary. On average, it took participants < 5 min to complete the survey. The Kansas State

University Institutional Review Board approved the methods used in this study (approval number 9065).

Analyses

In order to obtain a broad assessment of participants' ability to identify waterfowl species and sex, we calculated the total proportion of misidentifications for each participant. We also investigated any species- or sex-specific biases in identification by calculating the proportion of misidentifications for both sexes of Northern Pintail, Canvasback, Redhead and Lesser Scaup identification. We tested for within species (female *vs.* male) differences between the proportions of misidentifications using a 2-proportion z-test (SAS® v 9.4, SAS Institute, Cary, North Carolina, USA). We established an *a priori* cut-off for statistical significance at $P \leq 0.05$.

Logistic regression analysis (PROC LOGISTIC in SAS® v 9.4) was used to model the probability that hunters could identify waterfowl species correctly (1 = identified, 0 = misidentified). Independent variables included in the model were an individual's age (Age) and waterfowl hunting experience (Hunt Days = number of days hunted during the 2017/2018 Kansas waterfowl season; Hunt Years = number of years hunting waterfowl). For the four focal species (Northern Pintail, Canvasback, Redhead and Lesser Scaup), we investigated support for factors affecting hunters' identification ability among a candidate set of six models for each sex of each species. Each candidate set included models with single effects (Age, Hunt Days, Hunt Years) and additive effects (Hunt Days + Age; Hunt Days + Hunt Years) along with an intercept-only model (Constant). We evaluated support for models in each candidate set using an information-theoretic approach (Burnham & Anderson 2002; Arnold 2010) and considered models with $\leq 2.00\ \Delta AIC_c$ to be competitive.

Results

A total of 149 individuals were surveyed during the study. Based on respondents who allowed their gender to be included ($n = 108$) there was a bias towards males in our sample ($n = 97$). Mean (± s.d.) age and years spent waterfowl hunting of respondents was 36.3 ± 16.48 years (range = 18–76 years) and 16.7 ± 15.38 years (range = 0–66 years), respectively. On average, respondents hunted 22 ± 17.90 days during the 2017/2018 waterfowl season (range = 0–100 days) – almost six times more than the average waterfowl hunter in Kansas (3.7 days/hunter during the 2017/2018 season; Raftovich *et al.* 2018). Thirty-three percent of respondents ($n = 48$) indicated that they harvested > 30 ducks, 6% ($n = 9$) harvested 21–30 ducks, 16% ($n = 24$) harvested 11–20 ducks, and 45% ($n = 66$) harvested 0–10 ducks during the 2017/2018.

Slightly more than half of the respondents (52%, $n = 77$) were unable to identify immediately at least one species they harvested during the 2017/2018 waterfowl hunting season. Those who could not identify their harvest indicated the duck was either a female (41%, $n = 32$), male (22%, $n = 17$), juvenile (23%, $n = 12$) or in eclipse plumage (15%, $n = 12$). To identify harvested waterfowl, hunters stated they either consulted the internet (37%, $n = 32$), their hunting partner (28%, n = 24), a field guide (22%, n = 19), or a state official (8%, n = 7). Five hunters (6%) reported they did not attempt to identify their harvested duck.

Only 21% (n = 32) of respondents correctly identified all sex- and species-specific waterfowl photographs (median proportion of individual correct responses = 0.75, range = 0–1). The proportion of overall misidentifications was greatest for female Lesser Scaup (0.61, 95% CI = 0.53–0.69) and lowest for female Northern Pintail (0.12, 95% CI = 0.08–0.18; Fig. 1). In addition, when comparing sexes of the same species respondents were more likely to misidentify females than males for Lesser Scaup (z = 2.63, P = 0.01) and Redhead (z = –5.32, $P \leq 0.001$) but not for Northern Pintail (z = 0.49, P = 0.62, n.s.) or Canvasback (z = –0.59, P = 0.55, n.s.). Equally concerning, 47%, 38% and 19% of respondents indicated that Pied-billed Grebes, Franklin's Gull and Double-crested Cormorants, respectively, were harvestable species.

The single-effect model, Hunt Days, was the most-supported model for identification of female and male Lesser Scaup and Redhead, and for female Canvasback (Table 1). Individuals who hunted more days during the waterfowl season had greater probabilities of successfully identifying species and sex

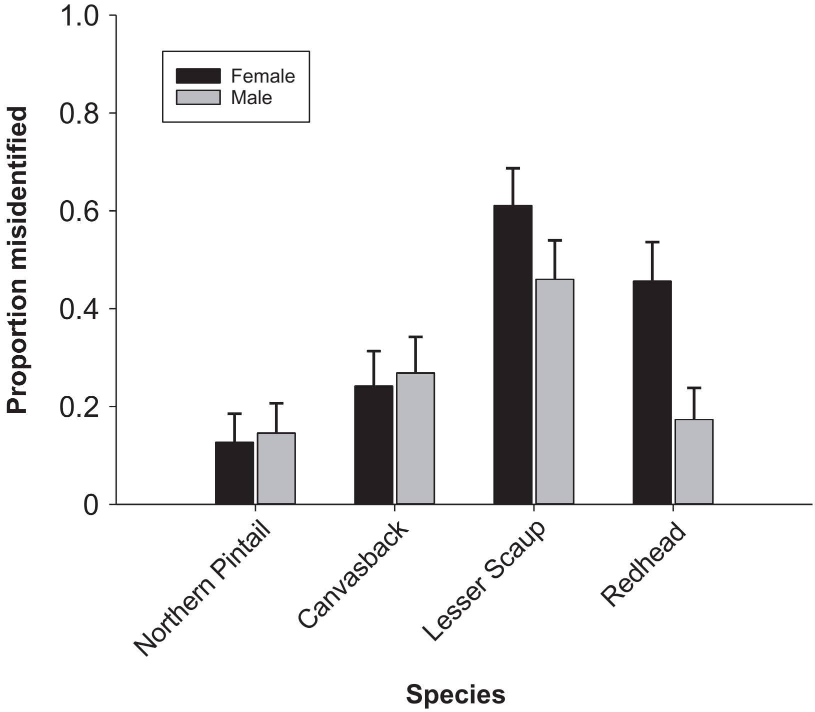

Figure 1. Proportion of species- and sex-specific misidentification (and 95% confidence intervals) by waterfowl hunters for Northern Pintail, Canvasback, Lesser Scaup, and Redhead.

Table 1. Ranking of models used to predict waterfowl identification success by waterfowl hunters in Kansas, USA, immediately following the autumn–winter 2017/2018 waterfowl hunting season. Hunters were asked to identify correctly, via high-definition photographs, the species and sex of waterfowl including Lesser Scaup, Canvasback, Redhead and Northern Pintail. Hunt Days = total number of days hunted during the 2017/2018 waterfowl season, Hunt Years = total number of years waterfowl hunting, Age = age of respondent (years), Constant = intercept-only model. ΔAIC_c = change in AIC_c values from lowest-ranked model, K = number of model parameters, ω = model weight, –2LogLike = measure of model fit.

Species (sex)	**Model**	**ΔAIC_c**	**K**	**ω**	**–2LogLike**
Lesser Scaup (female)	Hunt Days	0.00	2	0.23	179.64
	Constant	13.63	1	0.12	195.33
Lesser Scaup (male)	Hunt Days	0.00	2	0.23	183.28
	Hunt Days + Hunt Years	0.43	3	0.23	181.62
	Hunt Days + Age	0.99	3	0.22	182.18
	Constant	17.30	1	0.10	202.63
Canvasback (female)	Hunt Days	0.00	2	0.23	141.63
	Hunt Days + Age	1.72	3	0.21	141.25
	Hunt Days + Hunt Years	1.86	3	0.21	141.40
	Constant	14.79	1	0.11	158.48
Canvasback (male)	Hunt Days + Age	0.00	3	0.23	144.47
	Hunt Days + Hunt Years	0.49	3	0.23	144.96
	Constant	18.79	1	0.09	167.42
Redhead (female)	Hunt Days	0.00	2	0.21	188.64
	Hunt Days + Hunt Years	1.99	3	0.19	188.54
	Constant	10.36	1	0.13	201.05
Redhead (male)	Hunt Days	0.00	2	0.21	121.58
	Hunt Days + Age	1.87	3	0.19	121.36
	Hunt Days + Hunt Years	1.97	3	0.19	121.47
	Constant	7.20	1	0.14	130.84
Northern Pintail (female)	Hunt Days + Age	0.00	3	0.27	78.52
	Constant	22.81	1	0.09	105.30
Northern Pintail (male)	Hunt Days + Age	0.00	3	0.24	99.67
	Constant	19.41	1	0.09	117.23

(Figs. 2 and 3; Table 2). The variable "Hunt Days" was included in all supported models (Table 1) and models including this effect contained the majority of model weights (ω) for each species and sex (Σω for Northern Pintail female = 0.65, male = 0.65; Canvasback female = 0.65, male = 0.65; Redhead female = 0.60, male = 0.58; Lesser Scaup female = 0.65, male = 0.68). The most-supported model for male Canvasback and female and male Northern Pintail included the effects "Hunt Days" and "Age" (Tables 1 and 2). Older individuals had greater probabilities of successfully identifying these species (Fig. 4; Table 2).

Discussion

Our results suggest waterfowl hunters have imperfect waterfowl identification skills and that indices leveraging self-reported waterfowl harvests may be biased. Hunters who hunted more days during the waterfowl season had a greater probability of identifying the species and sex of waterfowl correctly. Hunters who spend more time in the field likely encounter more species of waterfowl than those who do not, and therefore may have enhanced identification skills (Wilson & Rohwer 1995). Further, days afield is one factor defining avidity and specialisation

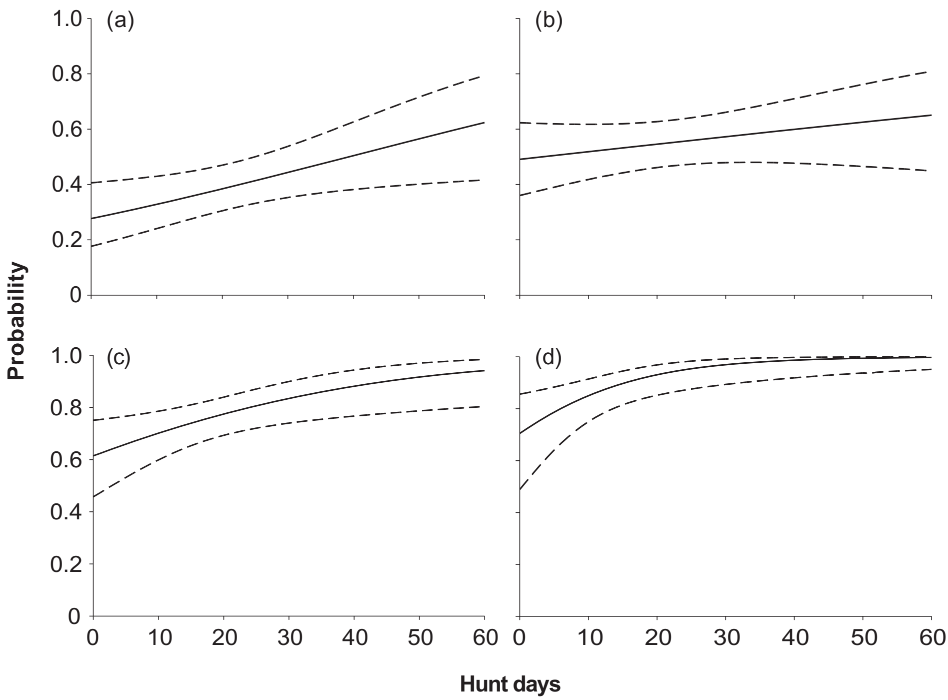

Figure 2. Relationship between the number of days an individual hunted waterfowl during the 2017/2018 Kansas, USA, waterfowl season and the probability of identifying waterfowl species successfully. Species include: (a) female Lesser Scaup, (b) female Redhead, (c) female Canvasback, and (d) female Northern Pintail.

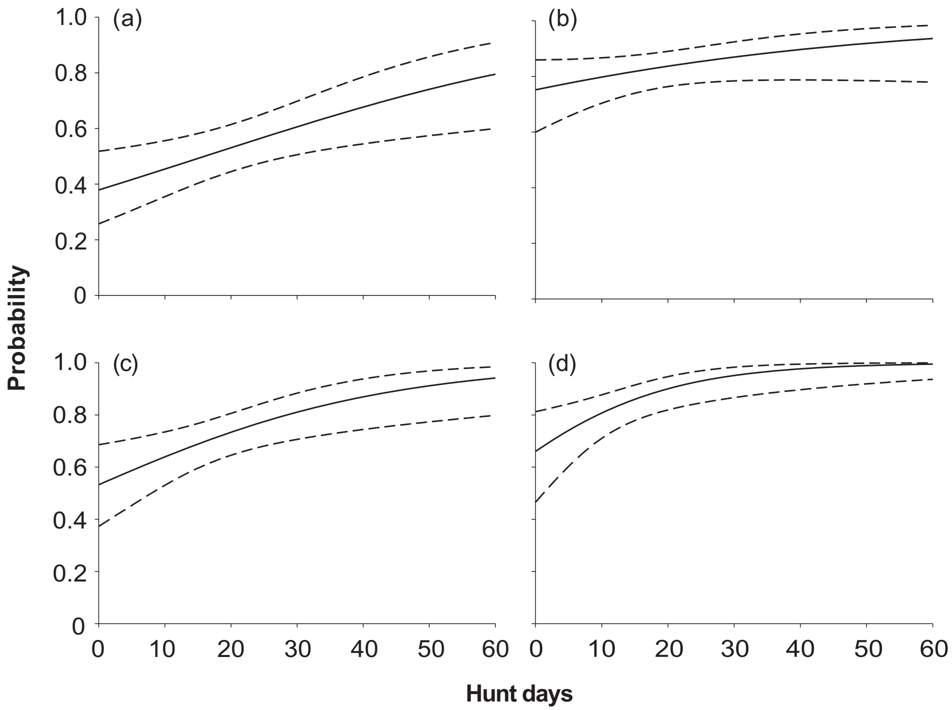

Figure 3. Relationship between the number of days an individual hunted waterfowl during the 2017/2018 Kansas, USA, waterfowl season and the probability of identifying waterfowl species successfully. Species include: (a) male Lesser Scaup, (b) male Redhead, (c) male Canvasback, and (e) male Northern Pintail.

(Miller & Graefe 2001), and more avid or committed waterfowl hunters would be expected to be able to recognise the birds around them. It is important to mention here that the distribution of days afield and harvest tends to be a right-skewed distribution such that mean days afield and harvest are low, and hunters spending greater number of days afield and harvesting more birds are a lower proportion of the hunter population. This distribution suggests there may be a question of the proportion of harvest being reported by those experienced hunters. Older hunters were also more likely to have better waterfowl identification skills, which may reflect their time and experience in acquiring these skills. Moreover, older hunters may have hunted under the old "point system", whereby different species and sexes were ranked on points (*e.g.* 1 female Mallard = 90 points, male Mallard = 20 points) and the daily bag was determined by total points (*e.g.* 100 points; U.S. Department of Interior, Fish and Wildlife Service 1970; Smith & Dubovsky 1998). Hunters who hunted under this system had a greater need to learn species and sex identification than is required for

Table 2. Estimates from logistic regression models used to predict successful identification of species and sex of waterfowl including Lesser Scaup, Canvasback, Redhead, and Northern Pintail. Coefficient estimates and standard errors (s.e.), and odds ratios and 95% Wald confidence limits (95% CI), from the most-supported model for each species and sex are presented (Table 1). Hunt Days = the number of days an individual hunted waterfowl during the Kansas, USA, 2017/2018 waterfowl season; Age = the age (in years) of the waterfowl hunter.

Species (sex)	**Coefficient estimate (s.e.)**		**Odds ratio (95% CI)**	
	Hunt Days	**Age**	**Hunt Days**	**Age**
Lesser Scaup (female)	0.025 (0.011)	—	1.025 (1.004–1.046)	—
Lesser Scaup (male)	0.031 (0.011)	—	1.031 (1.009–1.005)	—
Canvasback (female)	0.039 (0.015)	—	1.039 (1.009–1.071)	—
Canvasback (male)	0.044 (0.016)	0.031 (0.013)	1.045 (1.013–1.078)	1.032 (1.006–1.069)
Redhead (female)	0.011 (0.001)	—	1.001 (0.991–1.031)	—
Redhead (male)	0.026 (0.016)	—	1.027 (0.995–1.060)	—
Northern Pintail (female)	0.087 (0.031)	0.061 (0.023)	1.091 (1.026–1.159)	1.061 (1.016–1.109)
Northern Pintail (male)	0.077 (0.027)	0.041 (0.018)	1.080 (1.025–1.138)	1.040 (1.005–1.077)

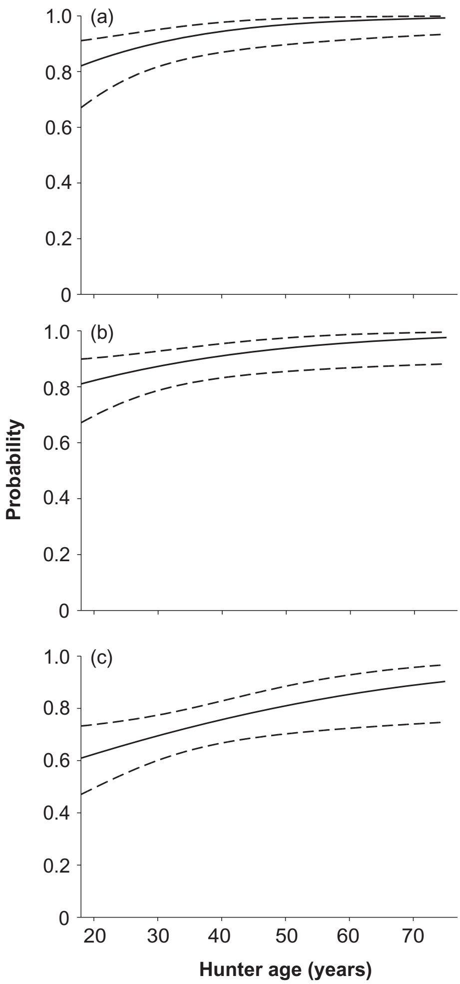

Figure 4. Relationship between a waterfowl hunters' age (years) and the probability of identifying waterfowl species successfully. Species include: (a) female Northern Pintail, (b) male Northern Pintail, and (c) male Canvasback.

recording daily bags under more recent frameworks.

As our moderate sample was not representative of the entire population of waterfowl hunters in Kansas or along the Central Flyway, we are likely underestimating the level of misidentification in self-reported harvest data. Moreover, because we focussed our study on four species with restricted harvest limits, patterns of misidentification in other waterfowl species may also exist. It is important to note that if a hunter could not correctly identify a species present in a high-quality photograph (in breeding plumage), it is likely that they will have trouble identifying the same species in the field under imperfect observation conditions. Respondents in our sample commonly misidentified female Lesser Scaup as female Ring-necked Duck *Aythya collaris*. During the 2017/2018 Kansas waterfowl hunting season, hunters' daily harvest limit included six total ducks of which only three could be Lesser Scaup; however, all six could be Ring-necked Duck. If our observed patterns match misidentification occurring in the field, it is plausible that some hunters could have doubled their harvest of Lesser Scaup while unknowingly self-reporting their harvest as Ring-necked Duck. Similarities between our observed results and patterns of imperfect harvest reporting in the field therefore should be investigated in future studies.

Surprisingly, many respondents thought that it was legal to harvest some species of protected migratory birds (Pied-billed Grebe, Double-crested Cormorant, Franklin's Gull). In fact, almost half of all respondents (47%) considered Pied-billed Grebe a harvestable species. This is particularly disconcerting, given the tendency for Pied-billed Grebes to forage along shallow shorelines and among waterfowl hunters' decoys. Indeed, waterfowl hunters have been known to harvest Pied-billed Grebes illegally (Ernst 1943). It is unclear, however, how common this practice is in Kansas or across North America. Anecdotally, waterfowl hunters have reported that they thought Pied-billed Grebes were actually "teal" (*Anas* sp.) or "hen Coots" (A. Ahlers, pers. obs.). Future research should quantify population-level impacts of illegal harvest of Pied-billed Grebes and other protected waterbird species.

Although our findings are striking, there are potential caveats associated with our interpretation of these results. First, we assumed that the ability of hunters to identify species based on photographs of live waterfowl and harvested waterfowl "in-hand" would be similar. Photographs of waterfowl may not convey the body-size differences between species (*e.g.* Redhead *vs.* Ring-necked Duck) and do not allow a hunter to observe alternate identifying features not visible in the photograph (*e.g.* full speculum). Additionally, photographs do not accurately represent other in-flight cues that hunters may use to identify them (Ellis 2011). Depending on their location in a particular flyway and timing of the hunting season, however, many hunters will likely not be able to use breeding-plumage traits to identify their harvest. This challenge can be exacerbated in northern latitudes where hunting seasons occur when many species are still in drab eclipse plumage and identification may be more difficult. Second, our results may not be translatable to other flyways. For instance, waterfowl hunters along the Mississippi Flyway or the Atlantic Flyway of North America may encounter female Lesser Scaup more frequently than hunters on the Central Flyway. Thus, waterfowl hunters in different regions of the North American Central Flyway may have a more difficult time identifying female Lesser Scaup. Indeed, hunters are more likely to identify waterfowl species successfully if they are commonly encountered in the region in which they hunt (Wilson & Rohwer 1995; Christensen *et al.* 2017). Future studies should identify flyway-specific patterns in species misidentification and latitudinal variation in waterfowl identification skills. We also suggest that, if hunters have difficulty identifying species and sex in unambiguous colour photographs, identification of flying birds during early legal hunting hours or in instances with imperfect visibility, will be particularly challenging.

Given the results of our study, we recommend that internet-based harvest-reporting mediums should include high-quality photographs of waterfowl species for hunters to verify the accuracy of their self-reported harvest. Additionally, it may be useful for self-reporting websites to include a function whereby waterfowl hunters can upload photographs of their harvest. These photographs can be used for wildlife managers to compare waterfowl hunters' self-reported harvest against true harvest. This function may be particularly useful for self-reported harvests that include waterfowl species that are rare to a particular flyway, species that may be easily confused with another species (*i.e.* female Lesser Scaup and female Ring-necked Duck), or species that are subject to restrictive harvest limits.

We agree with Wilson & Rohwer (1995) in that managers must identify effective ways to teach waterfowl identification skills to hunters. However, we recognise that hunter education curricula are already stretched in covering all required course materials, and that expanding them to include waterfowl identification, although clearly important, would be problematic. We also concede that hunters are responsible for properly identifying their targets before pulling the trigger. We suggest identification guides may need to be made more available to hunters, either online or as field guides (*e.g.* "Ducks at a Distance"; Hines 1978), and that these guides should be emphasised to a greater extent. Additionally, as previously suggested almost 25 years ago (Wilson & Rohwer 1995), non-profit organisations with large memberships (*e.g.* Ducks Unlimited and Delta Waterfowl) will likely be effective distributors of educational material related to waterfowl identification. They will also likely be effective at conveying the importance of waterfowl identification skills to waterfowl hunters.

Finally, we offer this study as a glimpse into the identification skills of waterfowl hunters. Managers assume that hunters are reporting number of birds harvested correctly and take reporting errors into account when calculating harvests by species (Williams *et al.* 2018). However, correction factors do not take into account misidentification of birds reported by species. Based on this limited study, we suggest more research is needed to determine identification accuracy on a larger scale. If the findings reported here are manifest more widely, additional correction measures should be considered for determining harvest rates each year.

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