


Wine and Wildlife: An Exploratory Study of the Depiction of Animals on Wine Labels Available in the United States

Matthew D. Johnson ^a, Allison E. Huysman^b, Dane A. St. George^c, Deven Kammerichs-Berke^d,
Jaime E. Carlino^e, and Brooks R. Estes^f

^a*Professor, Department of Wildlife,
1 Harpst Street, California Polytechnic University Humboldt,
Arcata, CA 95521, USA*

^b*Graduate Student, Department of Wildlife,
1 Harpst Street, California Polytechnic University Humboldt,
Arcata, CA 95521, USA*

^c*Graduate Student, Department of Wildlife,
1 Harpst Street, California Polytechnic University Humboldt,
Arcata, CA 95521, USA*

^d*Graduate Student, Department of Wildlife,
1 Harpst Street, California Polytechnic University Humboldt,
Arcata, CA 95521, USA*

^e*Graduate Student, Department of Wildlife,
1 Harpst Street, California Polytechnic University Humboldt,
Arcata, CA 95521, USA*

^e*Graduate Student, Department of Wildlife,
1 Harpst Street, California Polytechnic University Humboldt,
Arcata, CA 95521, USA*

^f*Graduate Student, Environment and Community Program,
1 Harpst Street, California Polytechnic University Humboldt,
Arcata, CA 95521, USA*

Abstract

Wine labels that depict animal imagery could draw on consumers' interest in wildlife and biodiversity, but this topic has received little attention. We document the frequency of the depiction of animals on a sample of wine labels available in the United States. We found that

[Ⓢ]Corresponding author:

Tel: (707) 826-3218
Email: mdj6@humboldt.edu

animals were depicted on 16.7% of labels overall. Birds and mammals were the most commonly depicted animals, and certain types of birds, especially hawks, eagles, owls, ducks, and birds in the crow family, were especially common. We suggest that animal depictions on wine labels could communicate environmental values attractive to consumers

Keywords: label, eco-label, marketing, birds, consumer, wine, biodiversity

Introduction

Increasingly, consumers extract environmental and ethical values and aesthetic emphases from food package attributes and labels (Rokka and Uusitalo, 2008; Grunert, Hieke, and Wills, 2014). While much research has been aimed at understanding the power and limitations of eco-labels and certifications to communicate brand values, motivate customers, and effect change (Teisl, Roe, and Hicks, 2002; Rex and Baumann, 2007; Thøgersen, Haugaard, and Olesen, 2010; Yokessa and Marette, 2019), less attention has focused on the use of environmental imagery and iconography invoking animals and biodiversity in food advertising (Baker, 2001; Phillips and McQuarrie, 2004; Hansen and Machin, 2013). Recent evidence indicates that consumers' interest in biodiversity specifically can affect product choices (van Riemsdijk et al., 2017; Foti et al., 2019), including willingness to pay higher prices (Mazzocchi, Ruggeri, and Corsi, 2019; Ruggeri, Mazzocchi, and Corsi, 2020), so a better understanding of biodiversity-related imagery on labels is needed.

Improved understanding of the use of animals and other elements of biodiversity on labels is particularly important in the wine industry. Since wine consumers typically cannot taste or smell the wine while in a store, and because product perception is rapid in retail settings, wine packaging is the product until the wine has been consumed (Ksenia, 2013; Monteiro, Guerreiro, and Loureiro, 2020). With increased interest in the environment and animals, especially among younger wine consumers vital to the industry's persistence and growth (Wolf and Thomas, 2007), more work is needed to investigate the depiction of animals on wine labels.

This research requires at least two steps, examining how animals are currently depicted on wine labels and investigating consumers' responses to such depictions. This study focused on the first step. Our objective was to document the frequency of the depiction of animals on wine labels and examine whether their depiction varies among factors such as the type, region of origin, and price of wine. Since birds were the most frequently depicted wild animals on wine labels in our study (see Results section), we also sought to describe patterns in the depiction of birds by investigating whether particular types of birds are more likely to be depicted, and whether birds are depicted as simple icons, or if they are intended to communicate environmental values.

Literature Review

Synthesis of Environmental Labels, Animal Depiction, and Wine Marketing

A large body of literature affirms that images and language on packaging communicate brand meanings and values which, in turn, shape brand identity and reputation (Davis, 1993; Underwood and Klein, 2002; Oswald and Oswald, 2012; Black and Veloutsou, 2017). Many food products are selected in stores at the point of purchase, where they compete to attract favorable attention and consumer choice (Mueller and Lockshin, 2008; Chandon et al., 2009). Packaging attributes attract and sustain attention (Nancarrow, Wright, and Brace, 1998), helping consumers identify with the product and affecting their perceptions of a brand's quality, values, and image (O'Guinn, Allen, and Semenik, 2009).

Research conducted in the last couple of decades has revealed the capacity for some food labels to attract the growing market of environmentally concerned consumers by including natural imagery and, in some cases, information communicating a brand's environmental values (Davis, 1993; Rokka and Uusitalo, 2008; Grunert, Hieke, and Wills, 2014). Indeed, the rise of “eco-labels”—third-party certifications that enable consumers to quickly and easily identify products that meet specific environmental performance criteria—clearly shows the relevance of the environment in food labeling, including for wines (Delmas and Grant, 2014). However, consumers' interests in “the environment” are highly varied, from concern about greenhouse gas emissions stemming from food production or distribution (Bonini, Hintz, and Mendonca, 2008), to the use of chemical pesticides that could affect human or environmental health (Dunlap and Beus, 1992), to the accidental impacts on animals not intended to be harvested (Treves and Jones, 2010), to a loss of biodiversity associated with food production (Gatti et al., 2022). Substantial work has been conducted on the role of eco-labels and certifications (Teisl et al., 2002; Rex and Baumann, 2007; Thøgersen, Haugaard, and Olesen, 2010; Yokessa and Marette, 2019; Gatti et al., 2022), but far less research has examined the use of animal imagery in food advertising (Baker, 2001; Phillips and McQuarrie, 2004; Hansen and Machin, 2013).

Within the wine sector, research shows that packaging and brand are the most important factors in consumers' choice of wine (Barber and Almanza, 2006; Mueller et al., 2010; Mu, 2011). The visual appeal of front labels on wine bottles is seen as the predominant and first line of communication between the consumer and wine producer (Rocchi and Stefani, 2005; Halstead, 2012). Indeed, “the first taste is almost always with the eye” (Mueller and Lockshin, 2008; Tonder and Mulder, 2015). Furthermore, wine labels carry more social relevance than do labels of other food products because wine is often shared socially, with the wine bottle placed on a table, sideboard, or countertop visible to guests. Wine labels say something about the hosts' tastes, aesthetics, and values (Olsen et al., 2003).

The wine industry is an increasingly saturated and highly competitive global market (Sogari, Mora, and Menozzi, 2016), where individual wineries and growers respond by differentiating wines in ways that appeal to particular consumers (Tait et al., 2019). With the top 10 manufacturers generating less than 12% of the industry revenue (IBISWorld, 2019), low revenue concentration and high levels of competition combine to propel wine merchandisers to distinguish themselves beyond traditional differentiators, such as grape variety, origin, and price (Williams, 2018). A growing body of research demonstrates consumer interest in environmental attributes of wine (Barber, 2010; Pomarici and Vecchio, 2014; Pomarici, Amato, and Vecchio, 2016), which can be communicated with label imagery (Schmit, Rickard, and Taber, 2013; Kelley, Hyde, and Bruwer, 2015). In particular, wine labels that depict animal imagery could draw on consumers' interest in wildlife and biodiversity, but this topic has received little attention. In one of the only studies to include documentation of wine labels with animals, Wolf and Thomas (2007) found that while animal depiction was only slightly related to wine label desirability overall, its desirability was rated higher by younger generations than by Baby Boomers.

However, evidence for environmental labels boosting wine sales are mixed, and brand positioning strategies (Ries and Trout, 2002; Dressler and Paunovic, 2021) may render animal depiction on

wine labels favorable for only certain wines. In an analysis of over 13,000 wine sales records from 1998–2005, Delmas and Grant (2014) showed that certifying wine with some form of sustainability criteria increased the price by 13%, but including an eco-label reduced the price by 20%, and concluded that eco-labels can exert a penalty to wines at higher price points and from prestigious regions (Delmas and Grant, 2014; Delmas and Lessem, 2017). Thus, animal and other environmental imagery may be more relevant for inexpensive wines, and less valuable for wines drawing from a rich heritage better depicted with traditional imagery, such as chateaus and heraldic images and fonts (Pelet, Durrieu, and Lick, 2020). However, the availability, prices, and consumer perceptions of environmentally friendly food products are rapidly changing, and much remains unresolved (Di Vita et al., 2019). A recent review (Schäufele and Hamm, 2017) indicates that consumers from a broad range of countries generally report a willingness to pay a premium for wine with characteristics of sustainable production. Lim and Reed (2020) also found persistent positive effects of sustainable certifications on price, especially for wines from less prestigious regions. Moreover, consumers are now beginning to differentiate various dimensions of eco-labels and sustainability certifications. Recent work with consumers of California sauvignon blanc revealed their stronger interest in management of pests and disease as well as conservation of water resources than in energy sustainability or biodiversity management in particular (Tait et al., 2019). Even the choice of animals used in label and icon imagery can affect consumers' perception, because people find some types of animals more appealing than others, or associate favorable attributes and values with certain species (Roberge, 2014). For example, among “flagship” species depicted on nature magazines and organizational logos, large and charismatic species of birds and mammals are by far the most common (Clucas, McHugh, and Caro, 2008). The popularity of bird watching and birds in the United States (Kane, 2018; USDI, 2018) suggests birds may be especially prominent in wine labels.

Literature-informed Testable Hypotheses

Based on the literature reviewed above, we examined several hypotheses for the depiction of animals on wine labels. First, we hypothesized that the depiction of animals on wine labels is relatively common, and that it varies among regions and price points of wines based on a brand's positioning strategy. Specifically, we predicted that animals would be less commonly depicted on wines aimed at consumers valuing a winery's tradition and heritage, including higher-priced wines and bottles from regions with long wine traditions, such as France, Italy, and Spain. Second, we hypothesized that popular animals are the most commonly depicted on wine labels, predicting birds are especially frequent, and that certain types of charismatic bird species are more commonly depicted than others. Third, we hypothesized that the depiction of animals on wine labels is commonly linked to environmental value rather than as simple iconography, predicting that wine labels with animals also include information on the label indicating the brand's wildlife-friendly practices or other commitment to the environment.

Methods

Sampling

We obtained two samples of wine labels. First, we sampled 828 wine bottles from 10 shops located in eight states to represent a sample of retail wine bottles commonly available to American wine consumers (see Table 1). States were selected opportunistically based on our locations and travels, but also strategically to provide a wide range of consumer markets, though midwestern regions were underrepresented. The ten shops included grocery stores as well as wine and liquor stores. In each store, we either recorded data from all available bottles (for stores with small inventory) or we used systematic sampling (e.g., sampling every 10th bottle in stores with large inventories) to avoid bias toward eye-catching label characteristics. This sample was used to document the rate of animal depictions on wine labels. Among the 828 bottles were 537 unique wine labels (i.e., 291 labels were recorded in more than one store), and this sample of unique labels was used for examining variables associated with labels that did and did not depict animals. Multiple labels from the same wine maker were included if the labels differed.

Second, we augmented the sample of labels depicting animals obtained from the above survey by scan sampling in shops for additional labels depicting animals. This scan was done for the bottles not systematically sampled in the stores with large inventories described above, as well as in an additional 14 stores (24 in total) (see Table 1). While this scan sample was opportunistic, we aimed to obtain as large a sample as possible of labels with animals in order to describe patterns in their depictions. This sample included 296 unique labels depicting one or more animals.

Table 1. Grocery and Wine or Liquor Stores Where Wine Bottles and Labels Were Sampled

| State | Store Type | Name and Location | Sample |
|-------|-------------------|---------------------------------------|---------|
| AK | Wine/liquor store | Oaken Keg Anchorage | 1 and 2 |
| AZ | Grocery store | Clark's Market, Sedona | 1 and 2 |
| CA | Wine/liquor store | Dean & Deluca, St. Helena | 1 and 2 |
| CA | Grocery store | Safeway, Arcata | 1 and 2 |
| CA | Wine/liquor store | Backroom Wines, Napa | 2 |
| CA | Wine/liquor store | Wineshoppe, Ferry Bldg, San Francisco | 2 |
| CA | Grocery store | Ranch Market Too, Yountville CA | 2 |
| CA | Grocery store | Raley's Napa | 2 |
| CA | Grocery store | Wildberries, Arcata | 2 |
| CA | Grocery store | Safeway, American Canyon | 2 |
| CA | Grocery Store | Costco, Eureka | 2 |
| CA | Grocery store | Eureka Natural Foods, Eureka | 2 |
| CA | Grocery store | Safeway, Lodi | 2 |
| CA | Wine/liquor store | BevMo, San Luis Obispo | 2 |
| CO | Wine/liquor store | Divino Wine Shop, Denver | 1 and 2 |
| CO | Grocery store | Marczyk Fine Foods, Denver | 2 |
| NY | Grocery store | Trader Joe's Wine Shop, New York | 1 and 2 |
| NY | Wine/liquor store | Bayville Wines & Liquors, Bayville | 1 and 2 |
| OH | Wine/liquor store | House Wines, Columbus | 1 and 2 |
| OH | Grocery store | Kroger's, Columbus | 2 |
| OR | Grocery store | Fred Meyer, Hillsdale | 1 and 2 |
| OR | Grocery store | Whole Foods, Portland | 2 |
| OR | Grocery store | Cork & Bottle Shoppe, Corvallis | 2 |
| VA | Wine/liquor store | Wine Gallery, Alexandria | 1 and 2 |

Note: Sample 1 refers to 828 wine labels sampled systematically. Sample 2 refers to a scan sample of 296 wine labels depicting animals.

Recorded Variables

For every label, we recorded whether it visually depicted one or more animals, as well as the wine color (red, white, or rosé), varietal, region of origin (the United States, Europe, South America, South Africa, Australia/New Zealand), location of origin (U.S. state or country), and price of the wine to the nearest U.S. dollar. Varietals were collapsed to fewer categories to maintain a minimum sample size of 20 in each, resulting in five reds (Cabernet Sauvignon, Merlot, Pinot Noir, Zinfandel, or red misc., which included blends), three whites (Chardonnay, Sauvignon Blanc, or white misc., which included blends), and one rosé (rosé misc., which included blends).

For labels that depicted one or more animals (in either sample), we recorded the type of animal (bird, mammal, reptile, amphibian, insect, other invertebrate, or mythical [e.g., Pegasus]), its lowest possible taxonomic identification, whether it was domesticated, wild, or unknown, and whether the depiction was realistic, silhouetted, generalized, or abstract. An image was

characterized as generalized if it was recognizable but lacked enough detail for any detailed identification, or if it was fictionalized but identifiable (e.g., a generalized hawk). Abstract images were more fantastical or abstract in color or shape, but appeared to depict a real rather than mythical animal (see Figure 1 for examples). Wild birds were the most commonly depicted animals (see Results section), so for birds we also recorded the taxonomic Order and Family to examine taxonomic representation.



Note: Labels were categorized as realistic (a), generalized (c, e, h), silhouetted (b, g), and abstract (d, f, i), and from several types of animals, including birds (f), mammals (g, h), reptiles (a), amphibians (b), fish (i), insects (d, e), and other invertebrates (c).

Figure 1. Example Depictions of Animals on Wine Labels

We also examined whether the label made textual reference to the animal, such as in the wine name or text on the back of the bottle. We distinguished wine labels with animals as simple iconography versus depictions that aim to communicate or evoke environmental value. Labels with animals were considered simple iconography if there was no textual reference at all to the animal, if it was referenced textually only in the name of the wine, or if it was referenced textually on the label but not in a way related to the environment (e.g., a poem). We classified labels with animals as communicating environmental value if there was textual reference to the animal depicted in a way that related to the environment (e.g., by indicating that the species lives on the vineyard, the vineyard attempts to provide habitat or refrains from using pesticides that might impact biodiversity, etc.).

Analysis

The “consumer encounter rate” was calculated as the percentage of all 828 examined bottles in the systematic survey that depicted one or more animals. This sample included duplicate labels observed in more than one shop because frequently encountered labels are more available to consumers than are rare ones. The “retail label rate” was calculated from the 537 unique labels in the 828-bottle sample (avoiding duplicates), and these 537 labels were used to examine whether animal depiction varied with any of the label variables described above. Sample size was sufficient to examine the effect of location of origin within a region only for wine from the United States (disaggregated by state) and from Europe (disaggregated by country). Analysis of the patterns in the depiction of animals was conducted on the 296-label opportunistic scan sample. All variables were categorical except price, which was normally distributed. We used a logistic regression and backward variable selection to examine the association of wine type, varietal, region, location, and price on the presence or absence of animal depiction varietal, starting with the global model and sequentially removing the least selective variable until reaching a null model. Candidate models were then ranked with Akaike’s Information Criterion corrected for small sample size (AIC_c), with models within 2 AIC_c of the top model considered competitive. To aid interpretation, we also performed univariate χ^2 tests of independence and t -tests to examine categorical and continuous (price) variables, respectively. To compare the distribution of birds on wine labels to their taxonomic distribution, we restricted analysis to birds in the United States identifiable to Order or Family, and used the species tally of Cornell’s Laboratory of Ornithology Bird Guide (2020) as the null distribution in a χ^2 goodness-of-fit test. To examine preference for popular bird species, we restricted analysis to depicted birds from the United States identifiable to species, and we used the popularity score for all birds in the United States provided by Schuetz and Johnston (2019). Bird popularity scores range from -2 to +2, with a mean of 0, and summarize the relative abundance of Google searches for each species based on Google Trends data in the United States from 2008 to 2017 (Schuetz and Johnston, 2019). We used a 1-sample t -test to compare the mean popularity score of bird species depicted on wine labels to the expected null hypothesis of mean popularity (0). Likewise, to examine preference for large species, we used a 1-sample t -test to compare the mean mass (\log_{10} transformed) of bird species depicted on wine labels to the expected null hypothesis of the mean body mass of all bird species in the United States from Schuetz and Johnston (2019; mean \log_{10} mass = 1.983 or 96 g). All analyses were performed in *R studio* (R Core Team, 2017).

Results

Overall, 139 of the 828 bottles surveyed depicted one or more animals, for a consumer encounter rate of 16.7%. This rate was slightly higher in grocery stores (17.9%) than in wine/liquor shops (15.9%), but this difference was not significant ($\chi^2 = 0.58$, $df = 1$, $P = 0.44$). Based on this sample, a wine customer in the United States is most likely to encounter birds and mammals on bottles, which were depicted on 7.4% and 7.0% of the bottles surveyed, respectively. All other animal types were detected on fewer than 1% of bottles surveyed. The depiction of animals on wine labels did not vary strongly among the variables examined, though there were differences based on region. Of the 537 unique labels in the sample, 94 depicted one or more animals, for a retail label rate of 17.5%. As hypothesized, birds are the most frequent animals on labels, appearing on 8.9% of the labels, followed by mammals at 5.4% of the labels. The top model for variation in animal depiction on wine labels included region and price as predictors, though the model with region as the only predictor was competitive (see Table 2). Together these two models carried 95% of the model weight in the candidate model set (see Table 2). The rate of animal depiction on wine labels varied significantly among regions of origin, being lower in Europe (9%) than in other regions (Table 3). It was also high (33%) for wines from South Africa, though this amount was based on a small sample ($n = 9$). In Table 3, statistics for χ^2 tests of independence of animal depiction versus wine type, varietal, region, and location within Europe and the United States are provided. Sample sizes for labels with or without birds or mammals specifically were large enough only for wine type and region, and these were not statistically significant. Statistics for t -tests of differences in mean price for wine with and without animals are also provided. See Table 2 for logistic regression model selection results.

Table 2. Model Selection Results for Logistic Regression Analysis of Factors Associated with Presence or Absence of Animal Depiction

| Model # | Parameterization | K | AIC_c | Δ_i | W_i |
|---------|--|-----|---------|------------|-------|
| 1 | Global (Type+Varietal+Region+Location+Price) | 23 | 509.29 | 14.28 | 0.00 |
| 2 | Varietal+Region+Location+Price | 21 | 509.68 | 14.68 | 0.00 |
| 3 | Varietal+Region+Price | 14 | 510.22 | 15.22 | 0.00 |
| 4 | Region+Price | 6 | 495.01 | 0.00 | 0.61 |
| 5 | Region | 5 | 496.14 | 1.13 | 0.34 |
| 6 | Null | 1 | 500.13 | 5.12 | 0.04 |

Note: A total of 537 unique wine labels were analyzed, showing the model parameterization, number of parameters (K), Akaike Information Criterion corrected for small sample size (AIC_c), difference in AIC_c score between a given model and the topic model (Δ_i), and model weight (W_i) in the candidate set.

Table 3. Frequency of Wine Labels Depicting Animals (Any) and Those Depicting Birds and Mammals Specifically

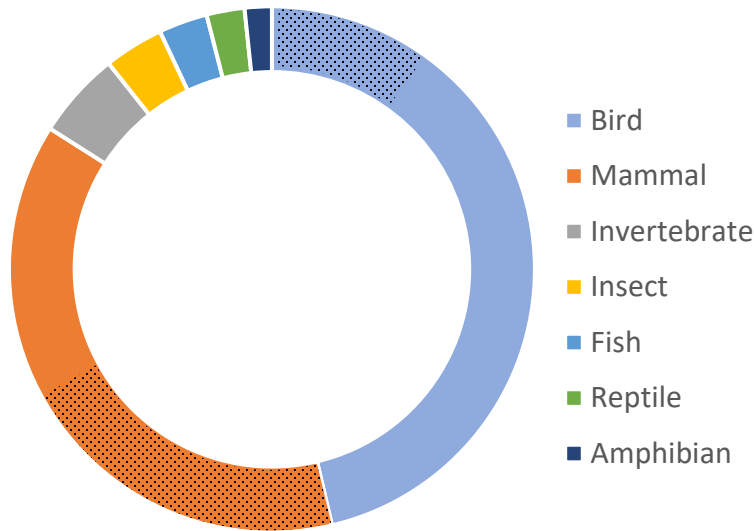
| Variable | Labels with Animals | Labels with Birds | Labels with Mammals | Labels without Animals | Total |
|--|------------------------------------|----------------------------------|------------------------------------|---------------------------------------|--------------|
| Overall | 94 (18%) | 48 (9%) | 29 (5%) | 443 | 537 |
| Type ($\chi^2 = 1.34$, $df = 2$, $P = 0.60$) | | | | | |
| Red | 56 (16%) | 28 (8%) | 17 (5%) | 285 | 341 |
| White | 35 (19%) | 20 (11%) | 10 (5%) | 149 | 184 |
| Rose | 3 (25%) | 0 (0%) | 2 (17%) | 9 | 12 |
| Varietal ($\chi^2 = 4.20$, $df = 8$, $P = 0.84$) | | | | | |
| Cabernet sauvignon | 14 (16%) | 7 (8%) | 3 (4%) | 71 | 85 |
| Merlot | 5 (26%) | 2 (11%) | 2 (11%) | 14 | 19 |
| Pinot noir | 14 (18%) | 9 (11%) | 2 (3%) | 65 | 79 |
| Zinfandel | 3 (30%) | 1 (0%) | 1 (10%) | 7 | 10 |
| Red misc. | 21 (14%) | 9 (6%) | 9 (6%) | 128 | 149 |
| Chardonnay | 17 (21%) | 9 (11%) | 7 (9%) | 64 | 81 |
| Sauvignon blanc | 5 (17%) | 3 (12%) | 1 (4%) | 20 | 25 |
| White misc. | 13 (18%) | 8 (10%) | 2 (3%) | 65 | 78 |
| Rose misc. | 2 (18%) | 0 (0%) | 2 (18%) | 9 | 11 |
| Region ($\chi^2 = 11.37$, $df = 4$, $P = 0.02$) | | | | | |
| Australia/New Zealand | 6 (24%) | 3 (12%) | 2 (8%) | 19 | 25 |
| Europe ($\chi^2 = 13.55$, $df = 3$, $P < 0.01$) | | | | | |
| France | 14 (9%) | 7 (5%) | 5 (3%) | 135 | 149 |
| Italy | 3 (5%) | 2 (4%) | 1 (2%) | 54 | 57 |
| Spain | 5 (10%) | 1 (2%) | 2 (3%) | 55 | 60 |
| All others | 0 (0%) | 0 (0%) | 0 (0%) | 13 | 13 |
| USA ($\chi^2 = 2.53$, $df = 3$, $P = 0.47$) | | | | | |
| California | 6 (32%) | 4 (3%) | 2 (2%) | 13 | 119 |
| Oregon | 67 (21%) | 35 (11%) | 18 (6%) | 259 | 326 |
| Washington | 46 (19%) | 25 (10%) | 12 (5%) | 195 | 241 |
| All other states | 14 (26%) | 8 (15%) | 3 (6%) | 39 | 53 |
| South Africa | 3 (16%) | 2 (11%) | 3 (16%) | 16 | 19 |
| South America | 4 (31%) | 0 (0%) | 0 (0%) | 9 | 13 |
| Price, mean \pm 1 SE | \$26.00 | \$29.45 | \$20.93 | \$30.66 | \$29.88 |
| ($t = 1.33$, $df = 155$, $P = 0.19$) | \pm \$3.09 | \pm \$5.45 | \pm \$2.05 | \pm \$1.69 | \pm \$1.50 |

Note: Labels are disaggregated by wine type, varietal, region and location of origin and include mean price for labels with and without animals.

Among European wines in our sample, most wine labels surveyed originated from France, Italy, or Spain (87%), with the remaining from Austria, Georgia, Germany, Greece, Hungary, Moldova,

Portugal, and Romania. The rate of animal depiction was higher among these rare countries pooled (32%) than it was in France, Italy, and Spain, but sample sizes were too small to examine the rare European countries separately. These findings are consistent with our hypothesis that wineries positioning themselves as traditional heritage brands, such as those from France, Italy, and Spain, are less likely to use animal imagery on their labels. The depiction rate of birds specifically was higher among the rare European countries pooled than it was in France, Italy, and Spain; it did not vary with any other examined variable (all $P > 0.10$). Within the United States, most wine labels surveyed overwhelmingly originated from California, Oregon, or Washington (96%), and the rate of animal depiction did not vary statistically based on state. The animal depiction rate was statistically similar among wine types and varietals. The depiction of birds versus mammals also did not differ among wine types, varietals, or production region (all $P > 0.10$). The mean price of wines depicting animals was slightly lower than those without animals, and price contributed to model fit (see Table 2), but this difference was not significant (see Table 1), showing relatively little support for our hypothesis for an effect of price on animal depiction. The mean price of wines depicting birds was higher than the price of wines depicting mammals, but price was highly variable, and this difference was not statistically significant ($t = 1.46$, $df = 59$, $P = 0.15$).

As hypothesized, among the labels that depicted animals, certain types of animals were disproportionately common. Among the augmented sample of labels depicting animals ($n = 296$ labels), 45% depicted birds, and 37% depicted mammals; other animal types were comparatively rare but included invertebrates (e.g., oysters, crabs), insects (e.g., bees, wasps, dragonflies, butterflies, ladybugs), fish (e.g., salmon), reptiles (e.g., snakes, a chameleon), and amphibians (e.g., frogs [see Figure 2]). The proportion of animal types (collapsed to birds, mammals, other vertebrates, and all invertebrates for analysis) did not vary by region of origin ($\chi^2 = 13.14$, $df = 12$, $P = 0.36$) or by wine color ($\chi^2 = 3.93$, $df = 6$, $P = 0.69$). Of the birds and mammals that could be determined to be domesticated or wild (i.e., omitting mythical or unidentifiable birds and mammals), over half (55%) of the depicted mammals were domesticated, whereas the vast majority of depicted birds were wild (84%); this difference was highly significant ($\chi^2 = 37.42$, $df = 2$, $P < 0.01$). Among mammals, the most commonly depicted species were horses (28%), domestic dogs (8%), bears (8%), pigs (6%), and lions (6%). Other depicted mammals were highly varied (e.g., alpaca, beaver, elephant, rhinoceros, zebra, etc.) but were rare; each was depicted on ≤ 3 labels.



Note: The portion of birds and mammals that were domestic is indicated with stippling.

Figure 2. Frequency of Types of Animals among a Sample of 296 Wine Labels Depicting Animals

For wine labels that depicted birds, some Orders or Families were overrepresented. Of the 22 Orders of birds commonly occurring in the United States, only 10 were depicted in our sample of wine labels with animals (see Table 4). Songbirds (Passeriformes, 28% of bird depictions), waterfowl (Anseriformes, 18%), and hawks and eagles (Accipitriformes, 18%) were the most commonly depicted. After restricting the available pool of species to these 10 Orders, some Orders were strongly overrepresented relative to their number of species commonly occurring in the United States ($\chi^2 = 65.7$, $df = 9$, $P < 0.01$). Specifically, hawks and eagles (Accipitriformes), waterfowl (Anseriformes), and owls (Strigiformes) were overrepresented on wine labels, whereas songbirds (Passeriformes) were underrepresented (i.e., 28% of bird depictions were songbirds, but songbirds comprise 64% of species commonly occurring in the United States). However, within the songbirds, the crow family (Corvidae) was strongly overrepresented, with 60% of all songbirds depicted on wine labels being corvids, whereas corvid species comprise only 6% of all songbird species commonly occurring in the United States.

Table 4. Number Of Wine Labels Depicting Wild Birds Disaggregated by Order, with the Number of Bird Species of Each of these Orders Commonly Occurring in the United States

| Bird Order | # Labels (%) | # Species Commonly Occurring in the United States (%) |
|---|--------------|---|
| | | |
| Accipitriformes (hawk, eagles, kites) | 13 (18%) | 21 (5%) |
| Anseriformes (waterfowl) | 13 (18%) | 45 (10%) |
| Caprimulgiformes (hummingbirds, swifts) | 4 (5%) | 23 (5%) |
| Coraciiformes (kingfishers) | 1 (1%) | 1 (< 1%) |
| Falconiformes (falcons) | 2 (3%) | 7 (2%) |
| Galliformes (grouse, pheasant, quail) | 7 (9%) | 23 (5%) |
| Gaviiformes (loons) | 2 (3%) | 3 (1%) |
| Passeriformes (songbirds) | 21 (28%) | 281 (64%) |
| Pelecaniformes (pelicans, egrets, herons) | 3 (4%) | 18 (4%) |
| Strigiformes (owls) | 8 (11%) | 16 (4%) |
| Total | 74 | 438 |

In addition, for wine labels that depicted birds, popular and large species appear to be preferred. A total of 25 identifiable bird species from the United States were depicted on 44 wine labels (see Table 5). The average popularity score of these species was significantly higher than 0 (0.71 ± 0.16 ; $t = 4.92$, $df = 24$, $P < 0.01$), indicating a strong preference for depicting popular species on wine labels in our sample. Similarly, the average body mass of depicted species was significantly higher than the average of all birds in the United States (976 ± 264 vs. 96 ± 1.1 g; $t = 3.59$, $df = 24$, $P < 0.01$), indicating a strong preference for depicting large species on wine labels in our sample.

Table 5. Birds Species on Wine Labels and Their Popularity and Body Mass

| Species | # Labels | Popularity Score | Body Mass (g) |
|---------------------|----------|------------------|---------------|
| American crow | 2 | -0.13 | 447 |
| American kestrel | 1 | 0.41 | 115 |
| Anna's hummingbird | 1 | -0.27 | 4 |
| American robin | 1 | 1.12 | 79 |
| Bald eagle | 5 | 1.9 | 4,677 |
| Barn owl | 5 | 1.84 | 407 |
| Belted kingfisher | 1 | -0.06 | 170 |
| Black-billed magpie | 2 | -0.2 | 219 |
| California quail | 1 | 0.91 | 186 |
| Canvasback | 1 | 0.87 | 1,202 |
| Chipping sparrow | 2 | -0.13 | 12 |
| Common goldeneye | 2 | -0.35 | 912 |

Table 5 (cont.)

| Species | # Labels | Popularity Score | Body Mass (g) |
|----------------------|-----------------|-------------------------|----------------------|
| Common loon | 2 | 0.41 | 5,012 |
| Common merganser | 1 | -0.06 | 1,445 |
| Common raven | 3 | 1.73 | 933 |
| Great blue heron | 2 | 1.01 | 2,512 |
| Mallard | 1 | 1.41 | 851 |
| Northern pintail | 3 | 0.96 | 955 |
| Osprey | 1 | 1.55 | 1,660 |
| Peregrine falcon | 1 | 1.65 | 759 |
| Red-tailed hawk | 2 | 1.13 | 1,096 |
| Red-winged blackbird | 1 | 0.5 | 51 |
| Spotted owl | 1 | 1.79 | 589 |
| Steller's jay | 1 | 0.28 | 129 |
| Violet-green swallow | 1 | -0.51 | 14 |
| Mean \pm 1 SE | | 0.71 \pm 0.16 | 977 \pm 264 |

Note: Tables only includes identifiable bird from the United States; popularity score is from Scheutz and Johnston (2019)

Most birds were depicted realistically (48%) or were generalized (28%), with fewer depicted abstractly (15%) or as silhouettes (10%). Birds that were depicted realistically or generalized were far more likely to be identifiable to Family (97% and 75%, respectively) than were silhouetted or abstractly depicted birds (53% and 36%, respectively; $\chi^2 = 36.66$, $df = 3$, $P < 0.01$). Overall, 37% of the 136 labels depicting birds included textual reference to the bird (e.g., in the wine's name or on the back of the label). Labels with realistically depicted birds were also far more likely to also include textual mention of the bird (54%) than were labels with birds depicted as generalized (30%), silhouetted (20%), or as abstractions (14%, $\chi^2 = 15.41$, $df = 3$, $P < 0.01$). Neither the popularity score nor the size (mass) of species differed among labels that did or did not include textual reference ($t = 0.90$ $df = 23$, $P = 0.37$; $t = 0.87$ $df = 23$, $P = 0.39$, respectively). Of those labels that included textual acknowledgment of the bird depicted ($n = 50$), 52% only referenced the bird in the name of the wine (see Figure 3). Other textual mentions of depicted birds ranged in the detail to which they referenced birds, from a nursery rhyme vaguely connected to the species (e.g., Mirth Chardonnay), to brief mention of a local native species (e.g., Lava Cap Zinfandel), to acknowledgement of the bird's presence on the vineyard and possible pest control (e.g., Z. Alexander Brown Pinot Noir), to more detailed natural history, environmental protection, and even acknowledgment of a share of profits donated to conservation funding (e.g., Mohua Sauvignon Blanc [see Figure 3 for examples]).

Contrary to our hypothesis, birds on wine labels appeared to be used most often as aesthetic icons rather than to explicitly communicate environmental values. Overall, we estimated that 89.7% of wine labels depicting birds did so with simple iconography, as evidenced by labels that made no textual mention of the birds depicted, or did so only in name and without reference to environmental value. Only 10.3% of wine labels depicted birds and made textual reference to their

ecology, environmentally friendly practices, sustainability, biodiversity conservation, or other indicator of environmental value.



Note: Species of hawks and eagles (i), waterfowl (a, g), owls (b, c), and the crow family (f) were all overrepresented relative to their taxonomic distribution in the United States. Depictions varied from simple iconography (a, b, c) to labels that included text (usually on the back label) about environmental values relevant to birds or other forms of biodiversity (d-i). The backs of two such labels that donate a portion of profits for conservation are shown (e, h).

Figure 3. Example Wine Labels Depicting Birds

Discussion

Our study found that animals are commonly depicted on wine labels available to consumers in the United States. Overall, 17% of the bottles surveyed had labels depicting animals, with birds and mammals being by far the most frequent. About half of all mammals depicted were domestic animals, such as horses, dogs, pigs, and sheep. Though these wine labels rarely made textual reference to these animals, their depiction may be intended to evoke images of rural landscapes and bucolic sentiments. In contrast, most birds depicted were wild species (see Figure 2). It is likely that these labels are intended to connect with consumers' interest in birds in some capacity, as the bird species depicted were on average much more popular and larger than the average bird species in the United States. Indeed, the two most commonly depicted bird species in our sample, Bald Eagle (*Haliaeetus leucocephalus*) and Barn Owl (*Tyto alba*), are the fourth and seventh most popular bird species in the United States according to Google search records (Schuetz and Johnston, 2019).

Certain bird types were disproportionately common on wine labels, especially hawks and eagles, waterfowl (mainly ducks), owls, and one particular family of songbirds, Corvidae, which is composed of crows, ravens, and jays. These species all possess attributes and characteristics admired and favored by people, such as power and fierceness (hawks), national symbology (eagle), beauty and relation to hunting (waterfowl), human-like faces and association with mystery and mythology (owls), and intelligence and curiosity (corvids) (Plous, 1993; Clucas et al., 2008; Zmihorski et al., 2013; Roberge, 2014). Confirming whether these patterns reflect the preferences of winemakers and their label design teams, or whether they are intended specifically to draw on consumers' interests awaits future study. Regardless, most depictions of birds were iconographic, as only 37% of labels with birds mentioned them in label text, and just over half of those did so in the name of the wine only. We observed that only 10% of wine labels with birds also included text explicitly linking bird imagery to ecology, environmental values, or sustainable practices.

This study did not examine consumer behavior, so future research should examine how consumers perceive wine labels depicting birds and other animals. In particular, it will be informative to examine the extent to which consumers respond to simple iconography versus imagery that is implicitly or explicitly used to index or symbolize a wine producer's environmental values, a point we return to below. Nonetheless, our results complement recent research on consumers' preferences in wine labels, which suggest that departures from traditional imagery (e.g., chateaus and vines) can be favored by some consumers. For example, in a study of wine consumers in central California, Wolf and Thomas (2007) found that label characteristics achieving the highest desirability rating included eye-catching, unique, stylish, creative, colorful, elegant, and artistic. In a study of online wine customers, Pelet et al. (2020) found that label characteristics associated with "authenticity" were favored, including heraldic colors and low visual complexity. In an analysis of South African wine consumers, Tonder and Mulder (2020) found that preferred label descriptors included uncluttered, minimalistic, and unpretentious, whereas designs that were too formal or traditional were less preferred. These findings suggest preferences that could be realized with animal depictions, and future work should examine consumer preference in relation to the meanings perceived by wine customers. Celhay and Remaud (2018) confirmed that a semiotic

analysis of wine labels can be a reliable tool for managers to design labels according to the brand's meanings they seek to communicate to their customers, but a full semiotic analysis of animal depictions on wine labels has not yet been conducted.

Several lines of evidence coalesce to suggest a potential for wine producers to reach consumers interested in animals. First, many Americans identify favorably with animals, and in particular, birds. The U.S. Department of Interior estimated that 40% of the U.S. population over the age of 16—more than 100 million people—participated in wildlife-related activities in 2016, such as hunting, fishing, and wildlife-watching (USDI, 2018). Birdwatching is especially popular, with 45.1 million birdwatchers in the United States (aged 16 years or older), roughly 18% of the US population (USDI, 2018). Furthermore, a staggering 57 million people participate in feeding wild birds in their yards. Once considered a hobby of mainly older white people, the birdwatching population is rapidly diversifying and becoming younger, with urban Millennials being the fastest growing sector in the birdwatching community (Green, 2018; Kane, 2018). Moreover, birdwatching has experienced a spike in interest since the start of the COVID-19 pandemic, which could persist even after public safety has improved (Glusac, 2020).

Second, wine consumption is increasing sharply in the United States among Millennials and other younger consumers, who often look to wine labels to make their purchasing decisions (Thach and Olsen, 2006; Williams, 2018). Attracting these consumers is especially important to the wine industry as consumption declines from the aging Baby Boomer generation upon which the US wine industry formerly relied. Millennials were quick to adopt wine as a favorite beverage, and this generation is part of the reason for the increased popularity of wine in the early 2000s (Castellini and Samoggia, 2018; LaTour, Joy, and Noujeim, 2020). The emotional and sensorial characteristics of Millennials' values and consumptive behaviors should inform wine label design (Wolf, Carpenter, and Qenani-Petrela, 2005; Iazzi et al., 2020). Though not all are of legal wine-drinking age yet, Gen Z consumers also show a high degree of eco-consciousness in their food choices (Su et al., 2019). Thach (2005) reported that younger wine consumers respond more favorably to unconventional and fun labels with bright and unique color schemes than to old world stylings and imagery, such as chateaus and elaborately scripted fonts. Wolf and Thomas (2007) found that wine labels with animals were rated more highly desirable by younger generations than by Baby Boomers. Though not a proper study of wine labels, Franson (2006) also noted shifts in label designs aimed at younger consumers. This included an apparent rise in the depiction of animals on wine labels, especially for non-European wines, an anecdote confirmed in our study by a significantly lower rate of animal depiction on European wines than on wines from other regions. Though it may be coincidence, it is worth noting that based on sales reported by the Beverage Information & Insights Group (Swartz 2020), several of the fastest-growing wine brands in the United States in 2019 depicted animals on their labels, including Winking Owl (generalized owl), Meiomi (silhouetted bear), Duckhorn (realistic Mallard), Decoy (realistic North Pintail [duck]), Starborough (generalized starfish), and Z. Alexander Brown (realistic Barn Owl).

Third, Millennials' interest in social and environmental responsibility is widely recognized to manifest in demand for sustainably produced food products (Smith and Brower, 2012; Grunert et al., 2014), including wine (Barber, Taylor, and Strick, 2009; Forbes et al., 2009; Pomarici and

Vecchio, 2014; Pomarici, Amato, and Vecchio, 2016; Sogari, Mora, and Menozzi, 2016), and that communicating environmentally friendly production practices to these consumers could command higher premiums (Schmit, Rickard, and Taber, 2013; Kelley et al., 2015). Combining this point with the two previous lines of evidence—the popularity of birds and other animals among young Americans and the recent rise in wine consumption by Millennials responsive to innovative wine labels—suggests animal depictions on wine labels could be attractive to younger wine consumers. However, wine producers should recognize consumers' interests not just in animal images and iconography, but in agricultural practices that actually favor biodiversity. Indeed, using choice experiments with Italian wine consumers, Mazzocchi, Ruggeri, and Corsi (2019) and Ruggeri, Mazzocchi, and Corsi (2020) recently found that consumers are willing to pay a higher price for biodiversity-friendly wines. Animal imagery on front labels and text on back labels should complement one another to communicate environmental meaning to consumers. Rocchi and Stefani (2005) confirmed that the role of the front label is as an evocative agent, while the back label primarily provides more technical information to interested customers. Jaud and Melynk (2020) showed that wine labels combining text with matching images outperform text-only labels and labels where images and text do not match. Yet results from our study suggest wine makers are only rarely connecting animal imagery on labels to agricultural or production practices that could benefit biodiversity, which is clearly important for some consumers. For example, among 136 wine labels depicting birds, only 10% included text about environmental values relevant to birds or other forms of biodiversity (see Figure 3 for examples). Interestingly, some animal labels in our study related to both the management of pests and to biodiversity conservation, as labels mentioned the use of artificial nest boxes or perches to attract owls and other raptors depicted on the label (e.g., Owl Post), which is an area of active ecological research (Johnson et al., 2018; St. George and Johnson, 2021).

Conclusion

We found that animals were depicted on 16.7% of wine labels overall, with birds and mammals being the most commonly depicted animals. As predicted, the depiction of animals was less common on wine labels from Europe than other regions, likely because many European wines use traditional imagery, such as chateaus and heraldic images and fonts, to attract consumers valuing a winery's heritage. Certain types of birds, especially hawks, eagles, owls, ducks, and birds in the crow family, were especially common. We also found that only 10% of wine labels with birds also included text explicitly linking bird imagery to ecology, environmental values, or sustainable practices. We suggest that animal depictions on wine labels could be a powerful way to communicate environmental values attractive to consumers, especially younger wine drinkers, but that wine makers should do more than use birds as simple icons.

Our work did not examine consumer behavior, so future research should examine how consumers perceive wine labels depicting birds and other animals. In particular, new research should investigate the relationship between animal depictions, eco-labels, and consumer preference. A full semiotic analysis of animal depictions on front wine labels could anticipate most of the idea associations that they are likely to produce in consumers' minds (*sensu* Celay and Remaud, 2018), and surveys to assess consumers' environmental value orientations (*sensu* Fulton, Manfredo, and

Lipscomb, 1996) could be combined with consumer choice experiments to ascertain whether consumers' interest in biodiversity can be marshaled to affect product selection. Our survey methods did not include distinguishing wines that were organic or other certifications (e.g., Fish Friendly Farms), although anecdotally relatively few of the wines we surveyed visually displayed any certification on the front label. Studying the success of eco-labeling of other luxury products, such as coffee and cocoa, may provide some insights relevant for wine consumers (Tscharntke et al., 2014; Rice, 2015; van Loo et al., 2015; Gatti et al., 2022). Certifications used on coffee and cocoa that focus specifically on biodiversity, such as Bird Friendly (Smithsonian, 2020), may be appropriate for wine, given the high rate of wildlife on labels illustrated in this study and the high levels of biodiversity in Mediterranean regions where wine is grown (Viers et al., 2013). However, consumer preference for eco-labels on wine remains somewhat unresolved (Di Vita et al., 2019), and it may be shifting with public awareness, cultural trends, and changing demographics. Research on eco-labels for wine should continue, and we recommend it also include examination of consumers' interest in biodiversity specifically, including their responses to animal imagery.

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