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## Interspecific variation in wildlife hazards to aircraft: Implications for airport wildlife management

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# Interspecific variation in wildlife hazards to aircraft: Implications for airport wildlife management



Travis L. DeVault, Jerrold L. Belant,  
Bradley F. Blackwell, and Thomas W. Seamans

# Background

- ✈ 70% of all wildlife strikes with aircraft occur at <500 ft, where management at the airport can be effective.
- ✈ At least 415 bird and 35 terrestrial mammal species were struck by aircraft from 1990-2009.
- ✈ Overall, 14% of all strikes with birds and 61% of all strikes with mammals caused some damage.
  - ✈ But, the severity and probability of damage is species-specific.
- ✈ To better prioritize management (e.g., habitat management, land-use planning, non-lethal dispersal), an improved understanding of which species are most hazardous is needed.

# Research questions

- ✈ Which species are most hazardous?
  - ✈ That is, which species are most likely to cause some type of damage to the aircraft when struck?
- ✈ How do body mass, body density, and flocking behavior contribute to hazard level?



# Building on previous research

- ✈ Dolbeer, R.A., S.E. Wright, and E.C. Cleary. 2000. Ranking the hazard level of wildlife species to aviation. *Wildlife Society Bulletin* **28**:372-378.
  - ✈ ~18,000 records in the database
  - ✈ 21 wildlife species/groups considered
- ✈ Dolbeer, R.A., and S.E. Wright. 2009. Safety management systems: How useful will the FAA National Wildlife Strike Database be? *Human-Wildlife Conflicts* **3**:167-178.
  - ✈ Did not use a composite hazard score
- ✈ Zakrajsek, E.J., and J.A. Bissonette. 2005. Ranking the risk of wildlife species hazardous to military aircraft. *Wildlife Society Bulletin* **33**:258-264.
  - ✈ Used the number of damaging strikes and cost as criteria

# Methods

- ✈ Used FAA National Wildlife Strike Database records: 1990-2009
  - ✈ 99,411 total strikes
- ✈ Summarized strikes for **77** species or groups with **≥20 records**
- ✈ Only used strikes ≤500 ft AGL (in the airport environment)
  - ✈ Reduced sample size to 23,503 reports
- ✈ Variables used in ranking
  - ✈ % of strikes with damage
  - ✈ % of strikes with substantial damage
  - ✈ % of strikes with effect on flight (EOF)
- ✈ Species were ranked and a relative hazard score was calculated
- ✈ For birds, we assessed effects of body mass, body density, and group size on relative hazard scores

# Top 10 most hazardous birds and mammals

Species	Total strikes reported	% with damage	% with substantial damage	% with EOF	Composite rank	Relative hazard score
Mule deer	47	96	38	83	1	100
White-tailed deer	814	87	36	68	2	88
Domestic dog	21	53	26	75	3	71
Other geese*	20	68	32	32	4	61
Canada goose	776	51	16	34	5	46
Turkey vulture	159	46	16	34	5	44
Other ducks*	77	49	24	30	7	48
Great horned owl	29	52	16	27	8	44
Double-crested cormorant	24	52	13	29	8	43
Brown pelican	31	35	13	38	10	40

# Top 15 most hazardous birds

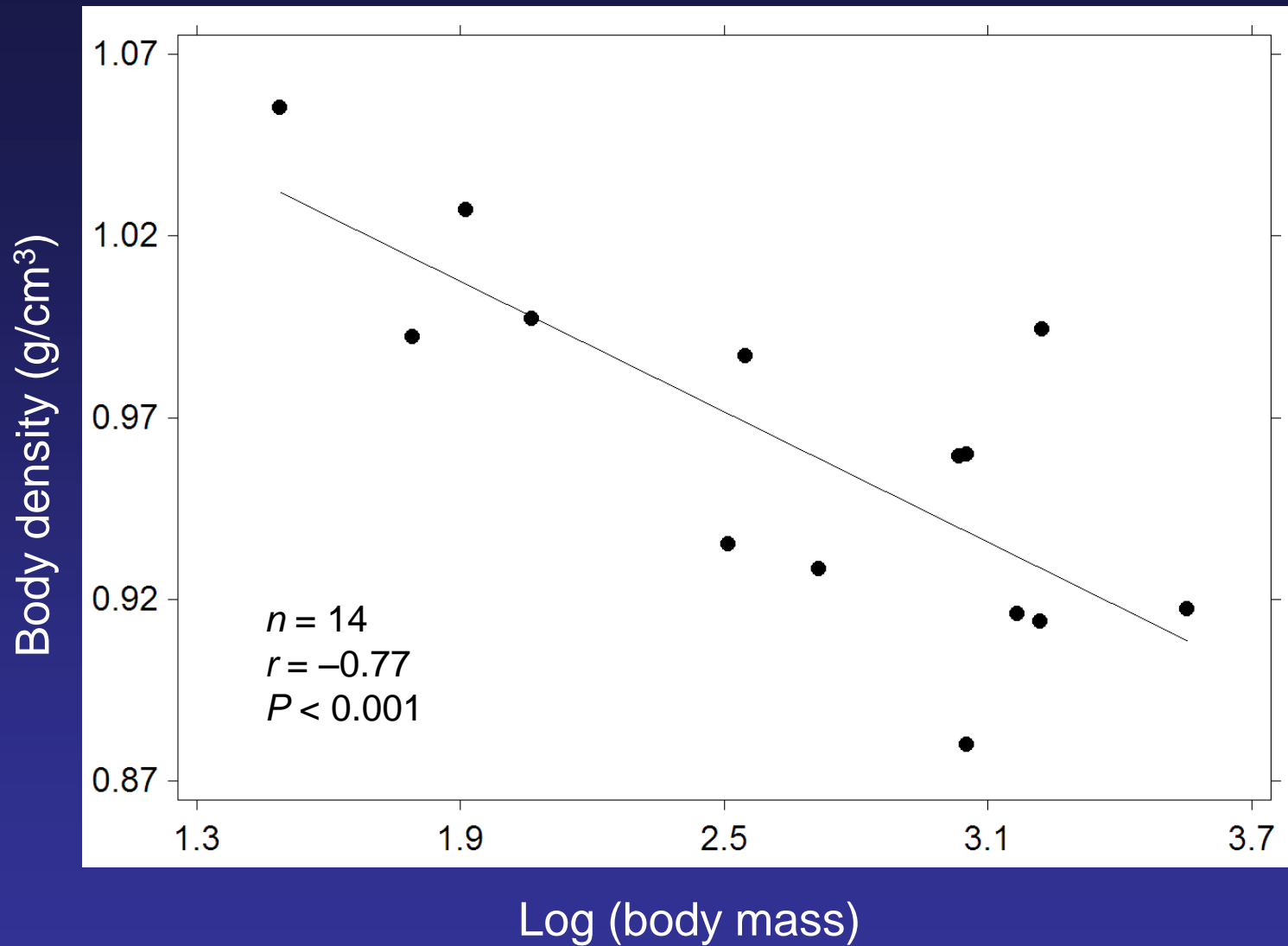
Species	Total strikes reported	Composite rank	Relative hazard score	Body mass (g)	% of strikes with mult. birds
Other geese*	20	1	100	2290	60.0
Canada goose	776	2	76	3564	47.9
Other ducks*	77	2	78	916	46.8
Turkey vulture	159	2	73	1467	9.0
Double-crested cormorant	24	5	71	1674	16.7
Great horned owl	29	5	72	1309	3.4
Brown pelican	31	7	66	3348	9.7
Sandhill crane	66	8	61	5571	44.6
Glaucous-winged gull	27	9	64	1010	25.9
Wild turkey	38	9	65	5811	23.7
Bald eagle	74	11	59	4740	12.2
Great black-backed gull	20	12	53	1659	15.0
Osprey	77	13	53	1485	2.6
Great blue heron	132	14	51	2390	2.3
Ring-necked pheasant	45	15	47	1135	8.9

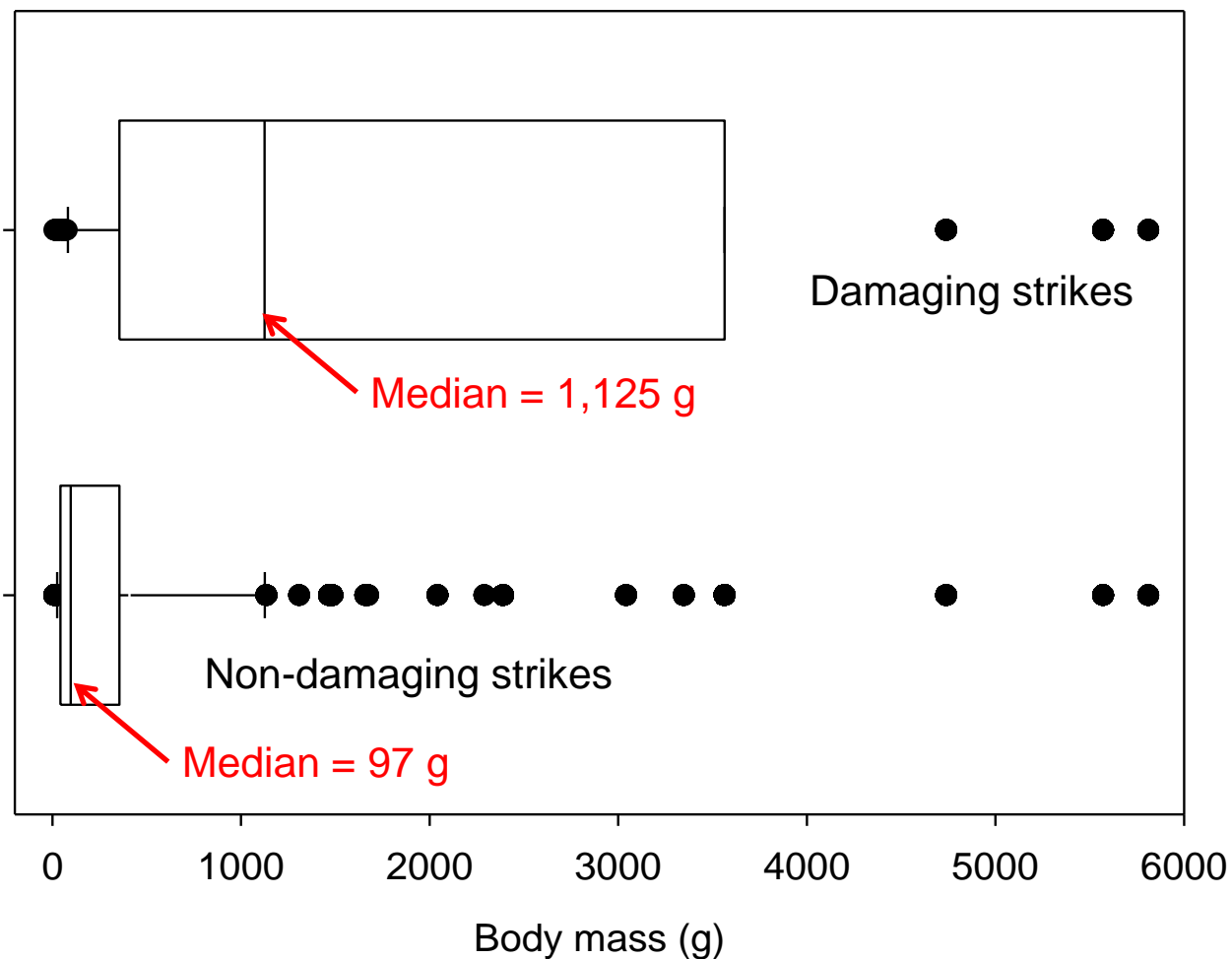


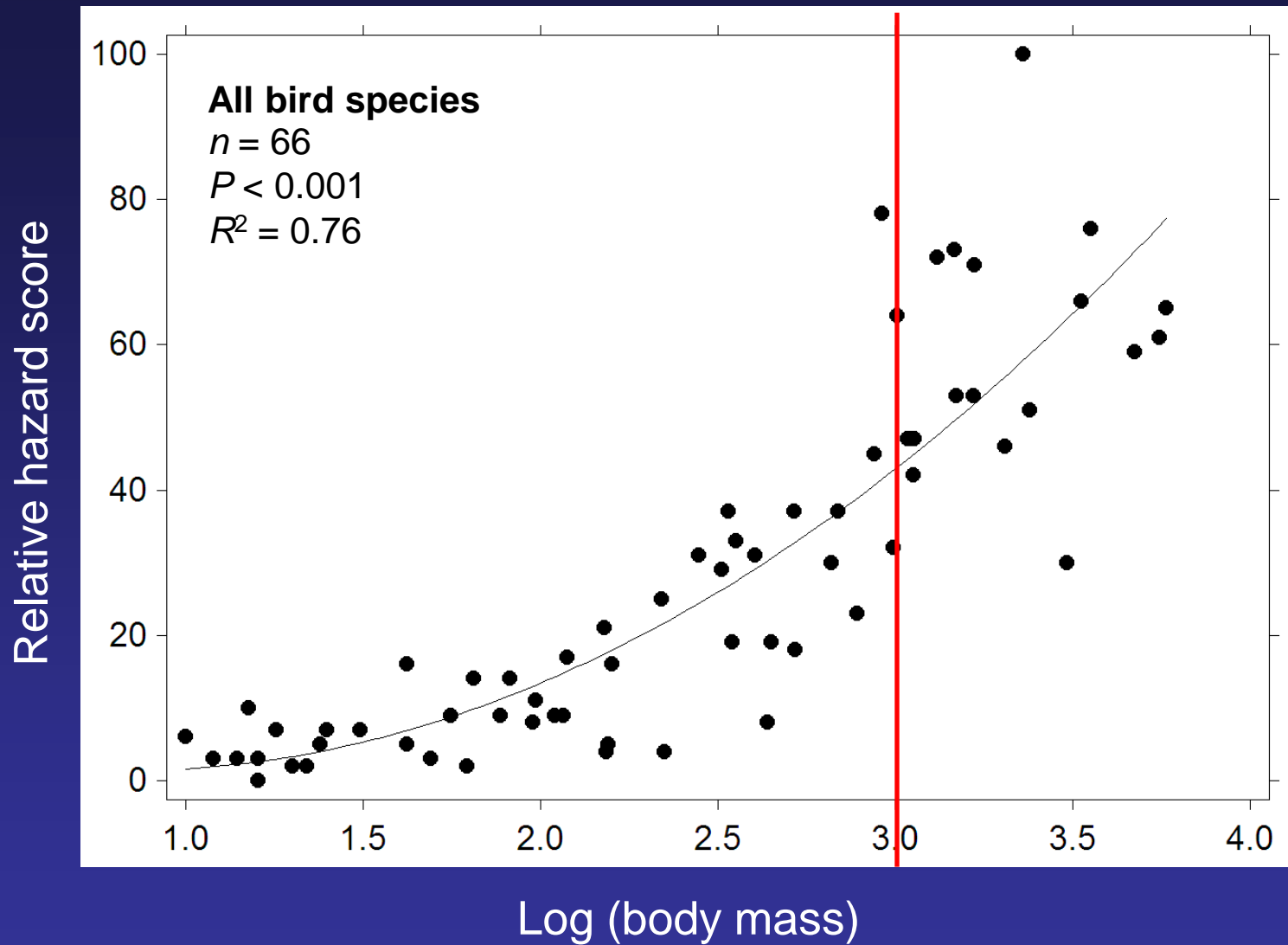
# What contributes to hazard level?

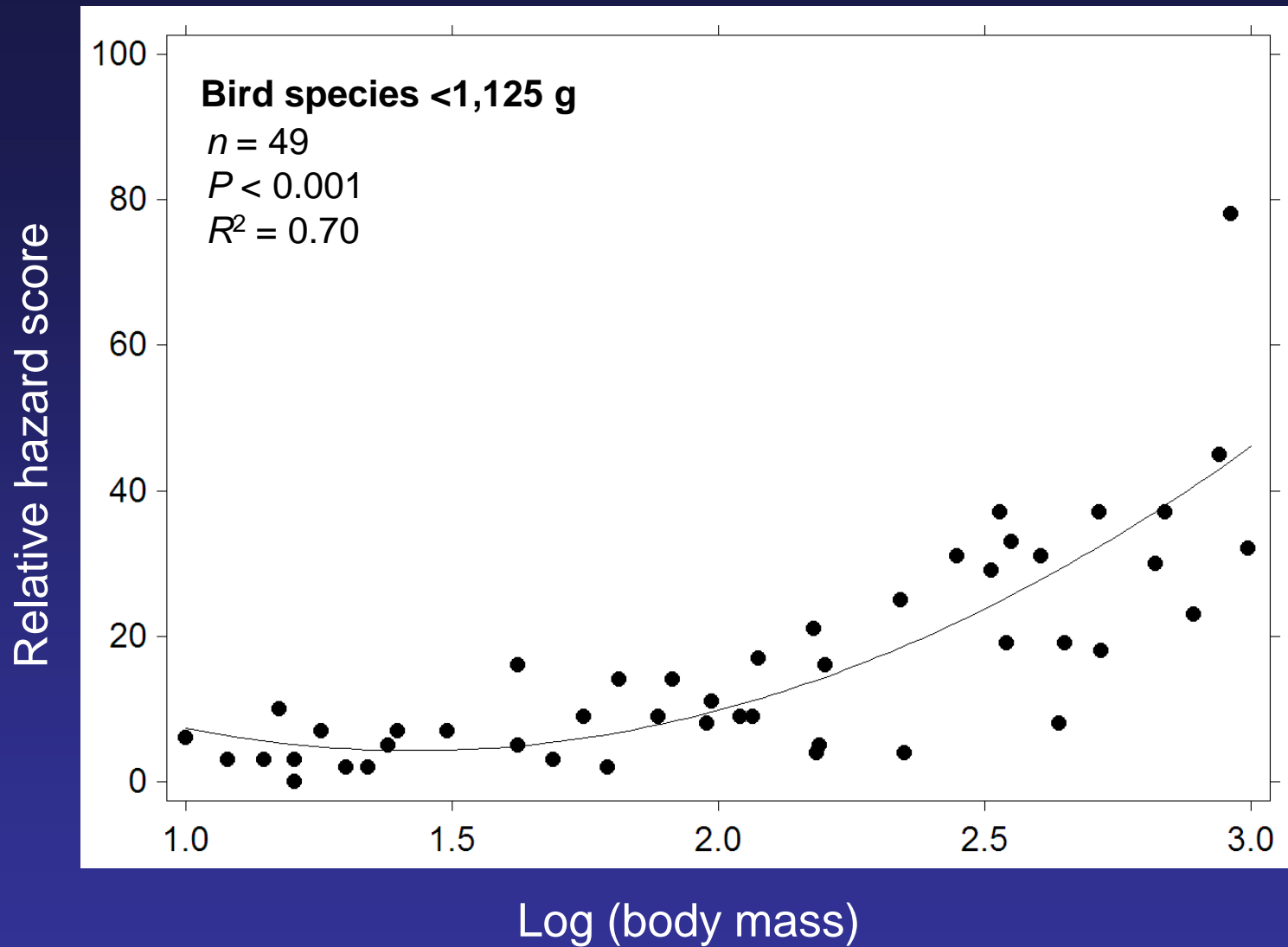


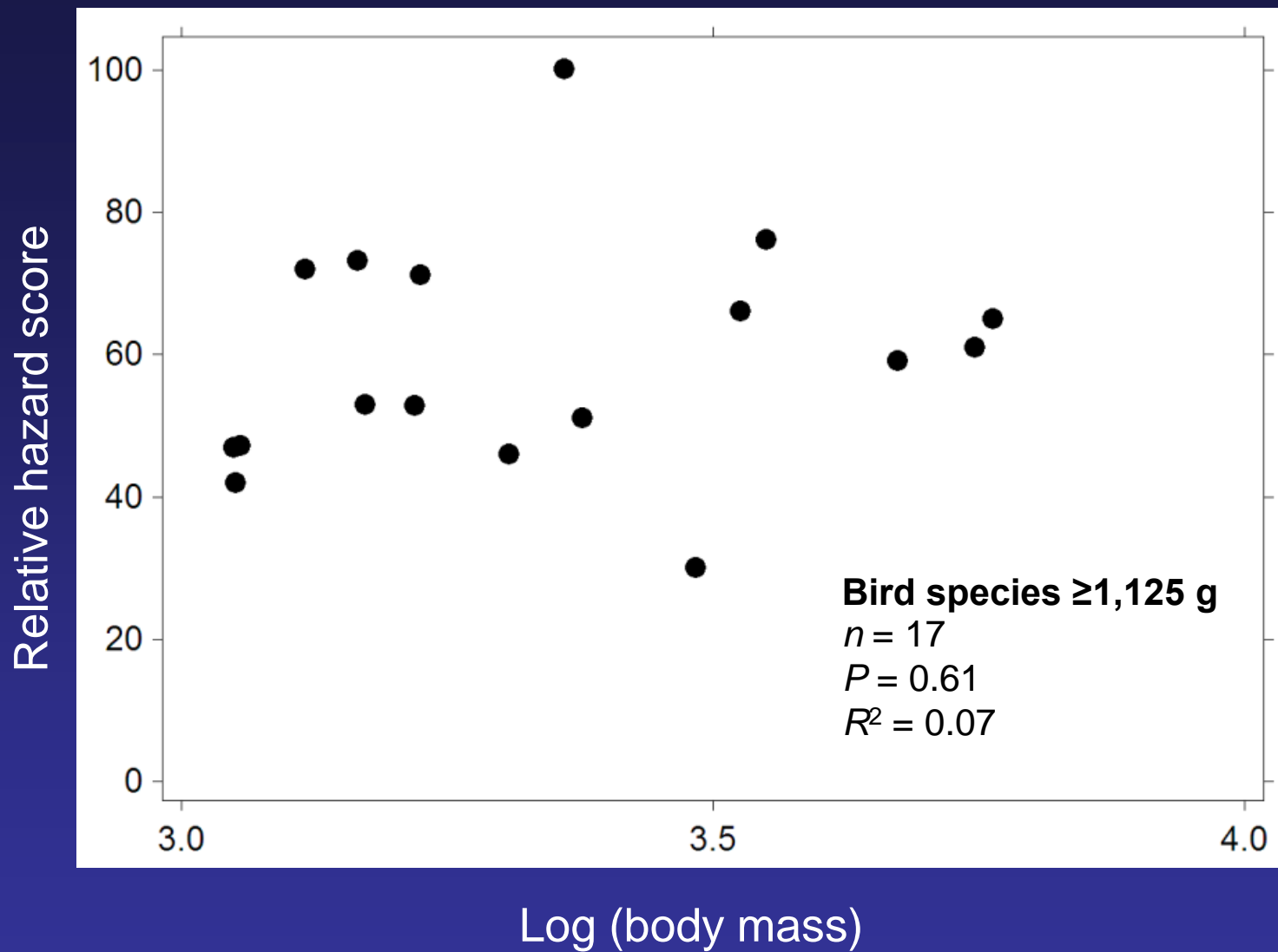
Double-crested Cormorant  
on nest

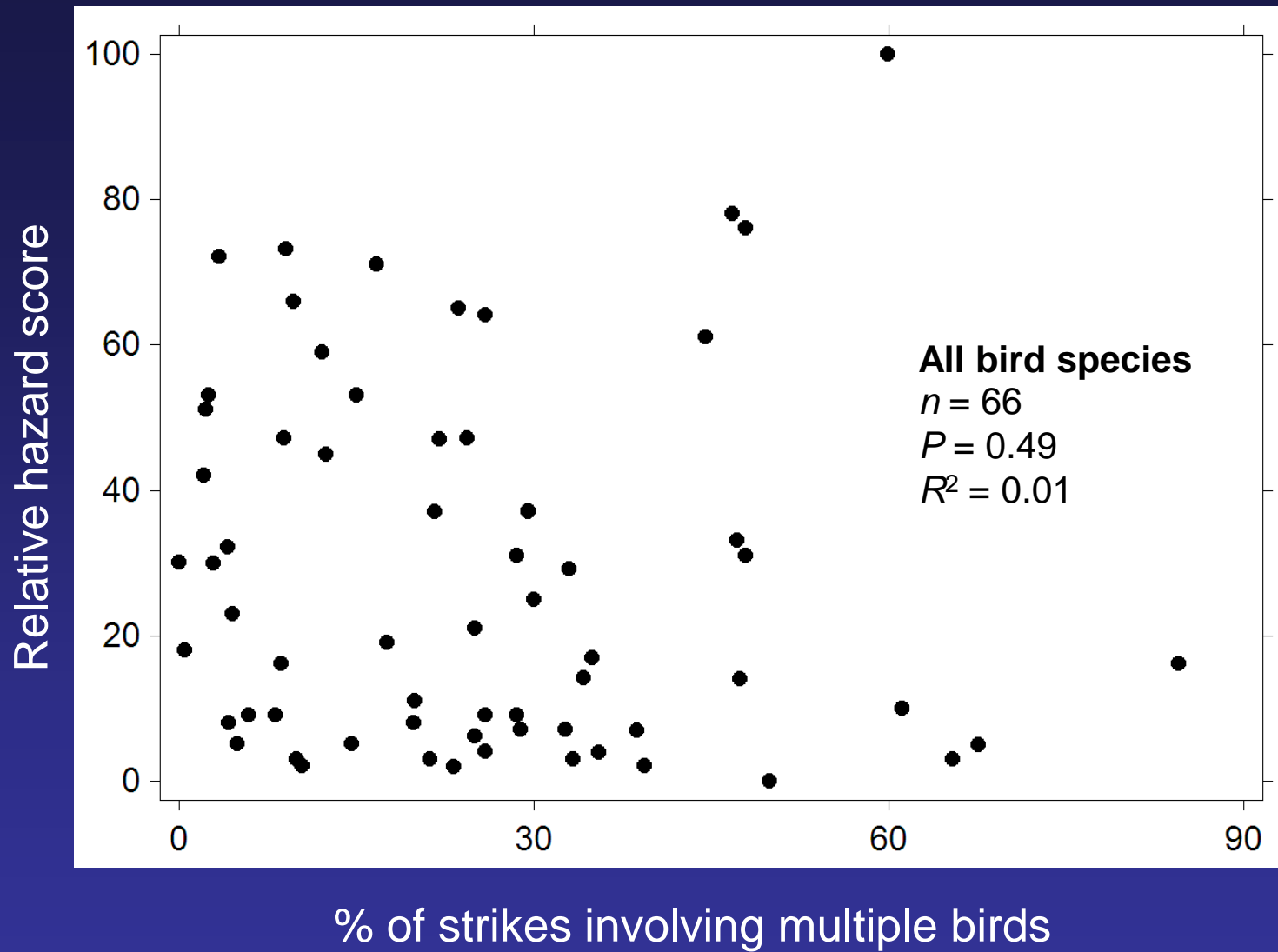


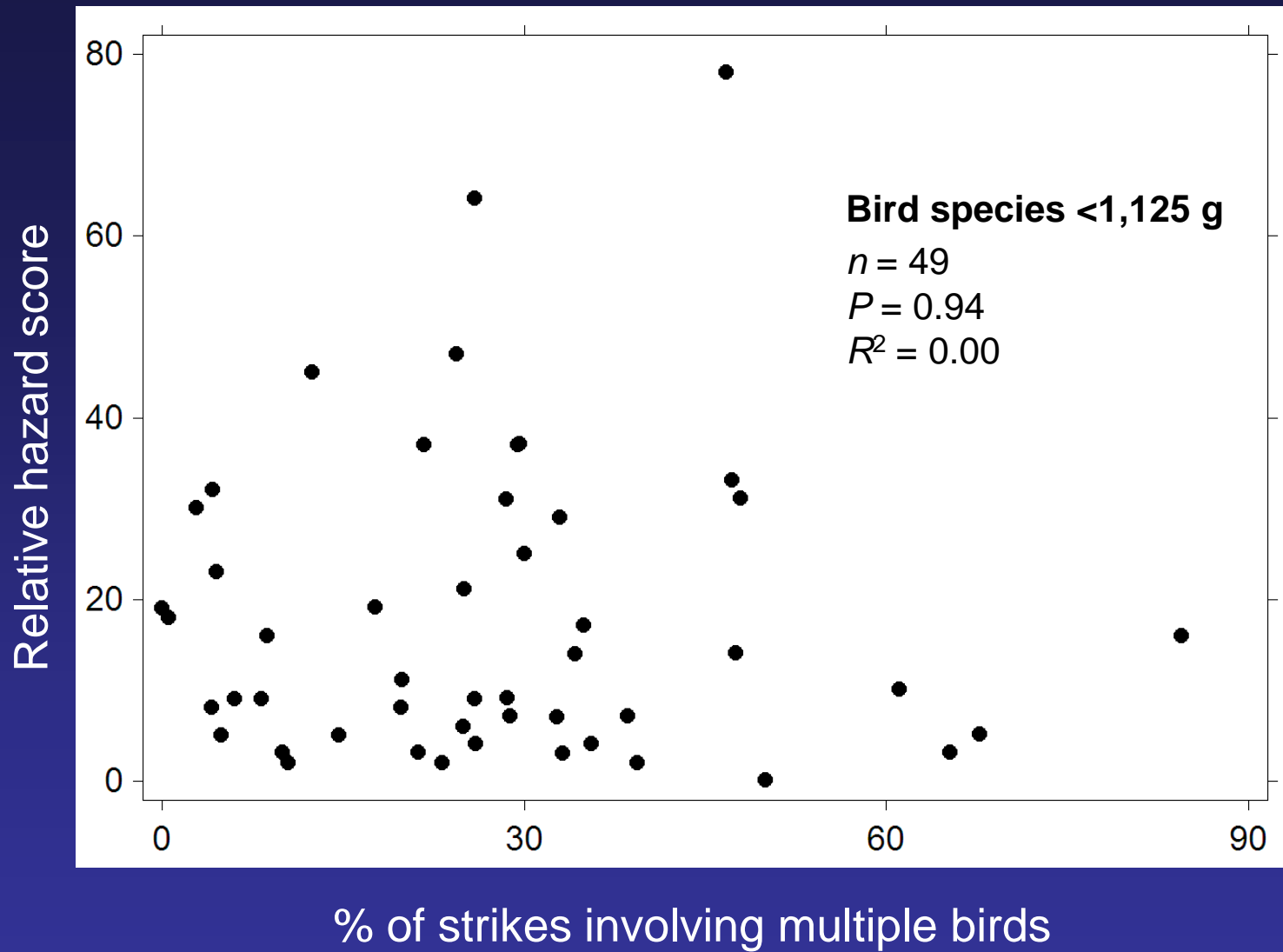




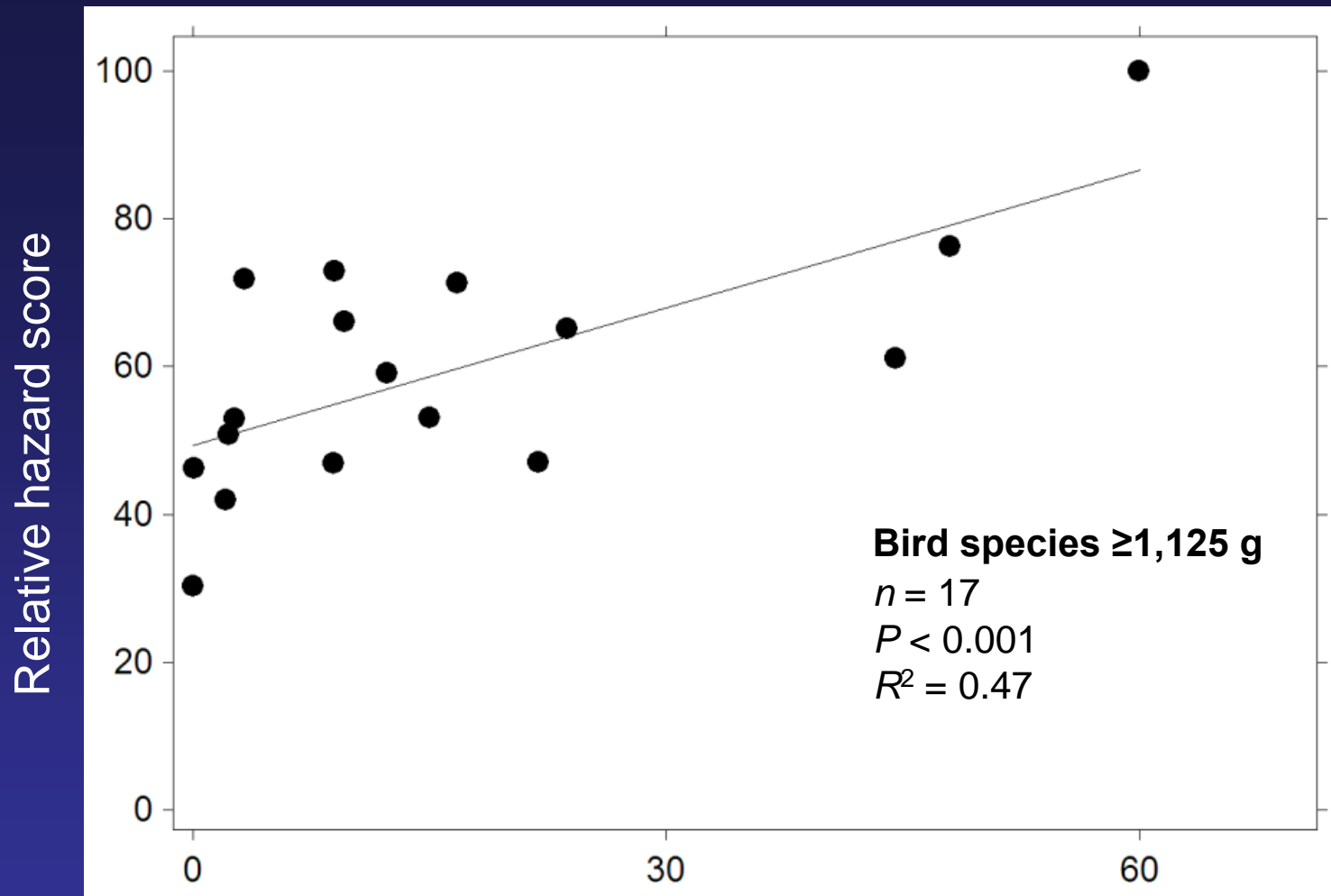












% of strikes involving multiple birds

# Conclusions—confirmed

- ✈ Large mammals are extremely dangerous on airports
  - ✈ The top 3 most hazardous species are large mammals
- ✈ Overall, large ( $>1$  kg) birds are most dangerous to aircraft
  - ✈ Median body mass for species in damaging strikes = **1,125 g**
  - ✈ Median body mass for species in non-damaging strikes = **97 g**
- ✈ Importance of proper management of stormwater retention ponds and other water bodies
  - ✈ 10 of 15 most hazardous birds were associated with water



# Conclusions—new

- ✈️ Avian body mass was strongly associated with relative hazard score, but not for species  $\geq 1,125$  g
- ✈️ Relative hazard score increased when multiple birds involved in strike, but only for species  $\geq 1,125$  g
  - ✈️ For small birds, are only very large flocks are especially dangerous?
- ✈️ The effect of avian body density is swamped by body mass





# Take-home messages

- ✈ Zero-tolerance for deer and other large mammals on the airfield
  - ✈ Fences!
- ✈ Geese and other waterbirds are often the most hazardous species at airports
- ✈ Prioritize habitat management for highest-hazard species/groups present at the airport





# For further reading...

**DeVault, T.L., J.L. Belant, B.F. Blackwell, and T.W. Seamans.**  
**Interspecific variation in wildlife hazards to aircraft: Implications for airport wildlife management.**  
***Wildlife Society Bulletin*: In Press.**



**Biondi, K.M., J.L. Belant, J.A. Martin, T.L. DeVault, and G. Wang.**  
**White-tailed deer incidents with U.S. civil aircraft. *Wildlife Society Bulletin*: In Press.**