El **Museo Nacional de Ciencias Naturales**: Propuesta como **laboratorio de referencia** para la identificación de especies post-colisión

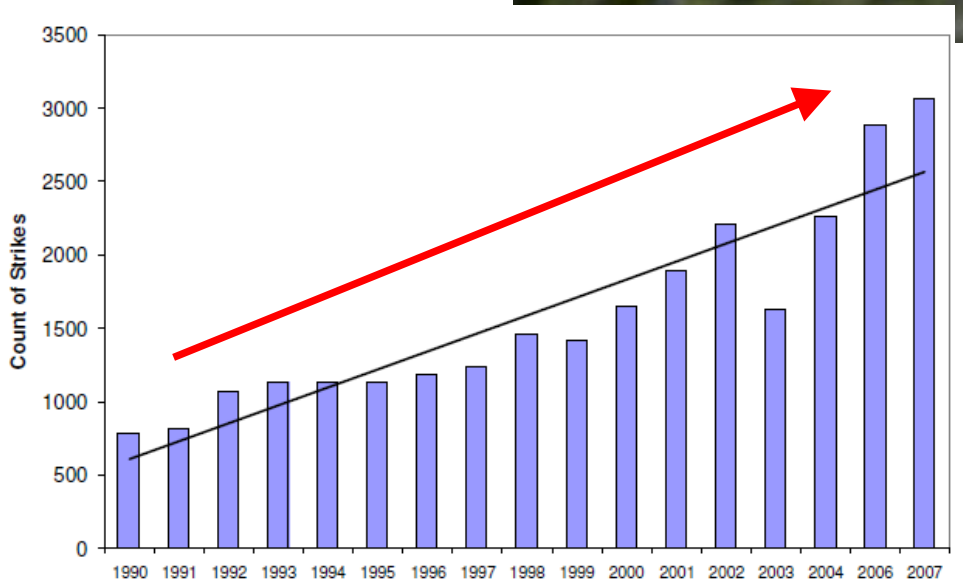
Rafael Zardoya San Sebastián
Director del Museo Nacional de Ciencias Naturales (CSIC)

WILDLIFE STRIKE

Aumento de colisiones entre animales y aeronaves

Incremento:

- ✓ notificación
- ✓ vuelos
- ✓ áreas naturales protegidas
- ✓ poblacional de aves medianas y grandes (muchas asociadas al hombre)
- ✓ aeropuertos rodeados de actividades humanas y/o urbanización creciente



Bird Strike Damage & Windshield Bird Strike. EASA

WILDLIFE STRIKE

- ✓ Sucesos relativamente **frecuentes** (entre 2 y 5 colisiones por 10.000 movimientos de aeronaves)
- ✓ Un alto porcentaje de las colisiones no producen daños (95-99%)
- ✓ Los accidentes son muy raros

Fuente: Forbes

WILDLIFE STRIKE

- ✓ Mayor proporción de colisiones con aves pequeñas.
- ✓ Pero también hay colisiones con aves más peligrosas como:
  - ✓ Gaviotas
  - ✓ Palomas
  - ✓ Rapaces medianas
  - ✓ Aves acuáticas
- ✓ Alta proporción de especies sin identificar
  - ✓ Predominancia notificación pilotos
  - ✓ Dificultad de encontrar restos en campo de vuelo
  - ✓ Falta de capacidad de análisis de restos en avión

¿Cómo se identifican estas aves?

IDENTIFICACIÓN DE ESPECIES

Desde 1916 se clasifican las aves por análisis microscópico de sus plumas…

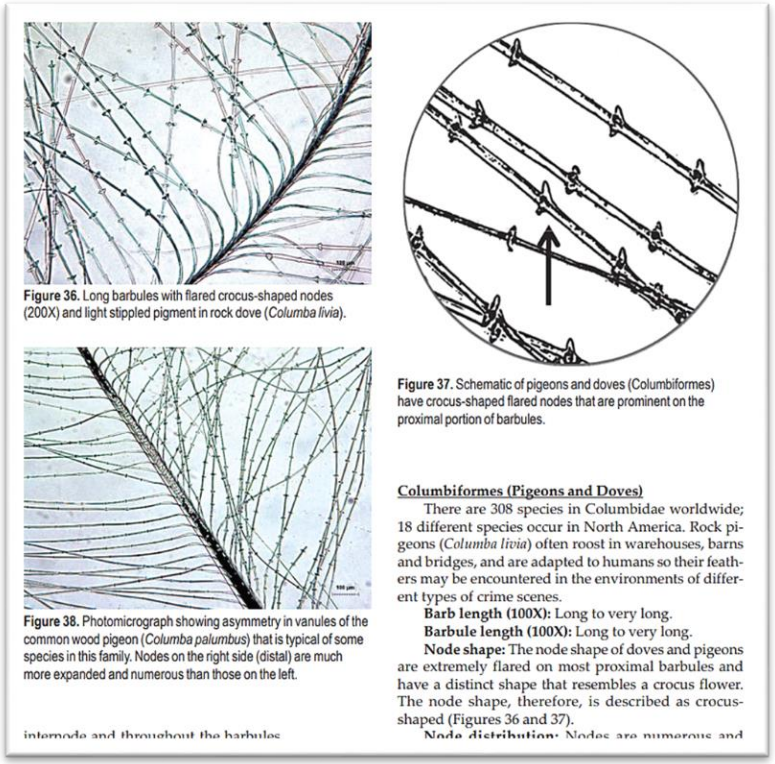


Figure 36. Long barbules with flared crocus-shaped nodes (200X) and light stippled pigment in rock dove (*Columba livia*).

Figure 37. Schematic of pigeons and doves (Columbiformes) have crocus-shaped flared nodes that are prominent on the proximal portion of barbules.

Figure 38. Photomicrograph showing asymmetry in vanules of the common wood pigeon (*Columba palumbus*) that is typical of some species in this family. Nodes on the right side (distal) are much more expanded and numerous than those on the left.

Columbiformes (Pigeons and Doves)

There are 308 species in Columbidae worldwide; 18 different species occur in North America. Rock pigeons (*Columba livia*) often roost in warehouses, barns and bridges, and are adapted to humans so their feathers may be encountered in the environments of different types of crime scenes.

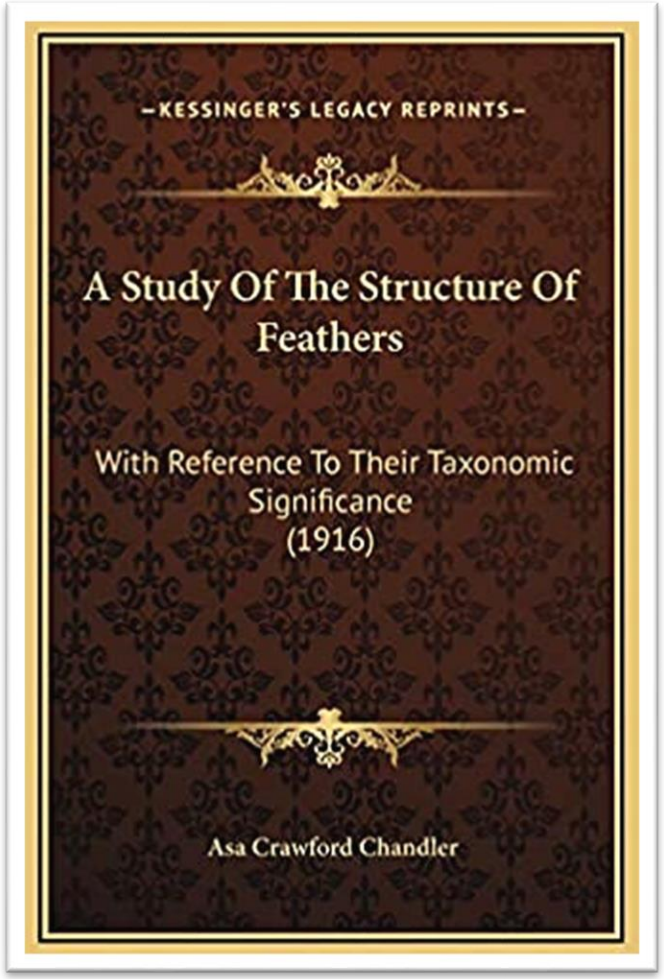
Barb length (100X): Long to very long.

Barbule length (100X): Long to very long.

Node shape: The node shape of doves and pigeons are extremely flared on most proximal barbules and have a distinct shape that resembles a crocus flower. The node shape, therefore, is described as crocus-shaped (Figures 36 and 37).

internode and throughout the barbules

Node distribution: Nodes are numerous and



IDENTIFICACIÓN DE ESPECIES

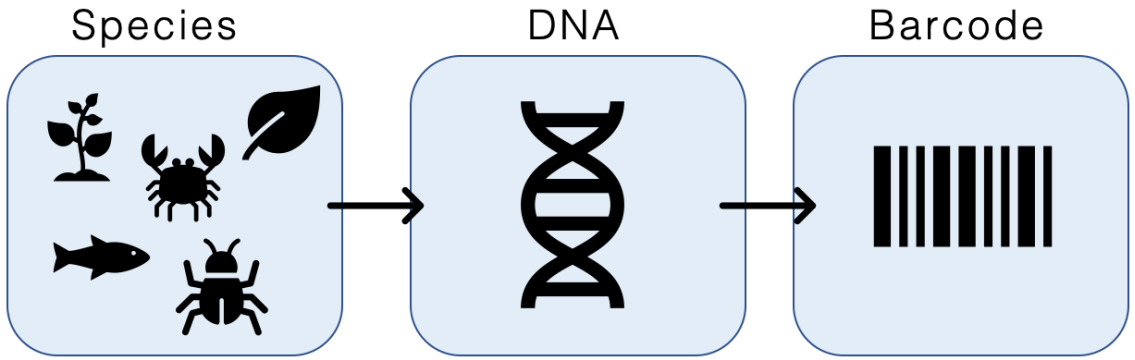
A partir de los años 60 se usan técnicas moleculares

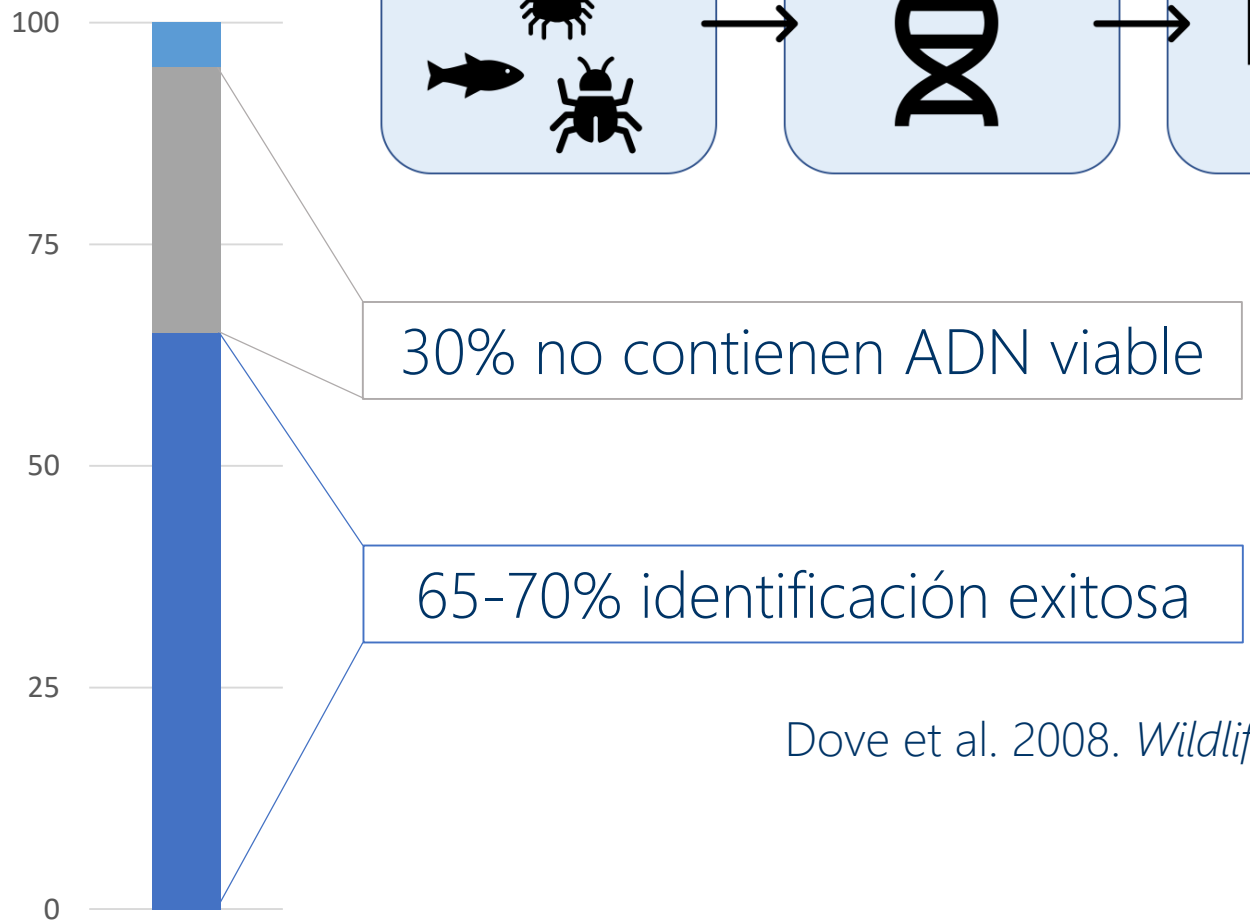
- ✓ Análisis de aminoácidos
- ✓ Análisis de albúminas
- ✓ Electroforesis para queratina (en plumas)
- ✓ **Análisis de ADN: actual**

IDENTIFICACIÓN DE ESPECIES

¿Cómo se hace?

- ✓ Recogida de muestra (sangre, tejido)
- ✓ Extracción de ADN
- ✓ Amplificación de genes
- ✓ Análisis comparativo



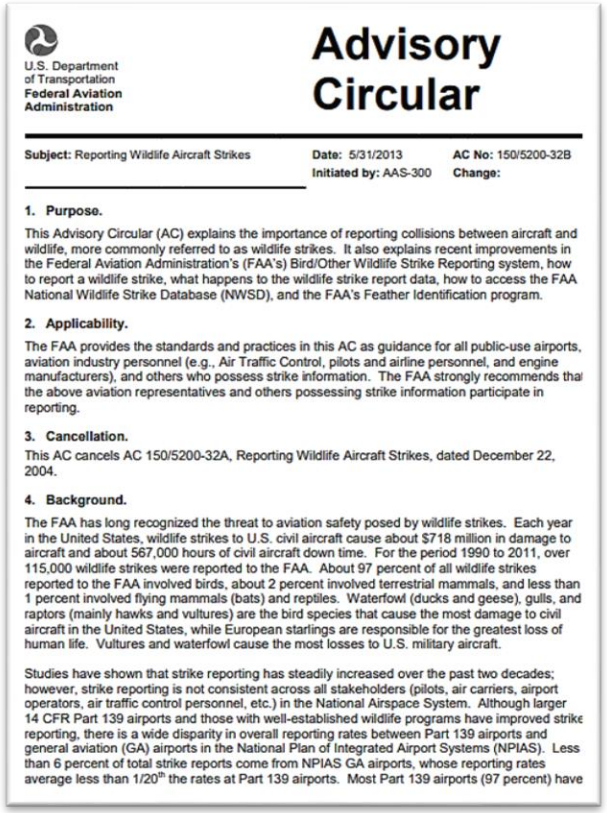


Dove et al. 2008. *Wildlife Management*

IDENTIFICACIÓN DE ESPECIES

SISTEMATIZACIÓN MANEJO DE MUESTRAS

Principalmente en los países anglosajones: sistematización en recogida, análisis y manejo de muestras



U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Reporting Wildlife Aircraft Strikes **Date:** 5/31/2013 **AC No:** 150/5200-32B
Initiated by: AAS-300 **Change:**

1. Purpose.

This Advisory Circular (AC) explains the importance of reporting collisions between aircraft and wildlife, more commonly referred to as wildlife strikes. It also explains recent improvements in the Federal Aviation Administration's (FAA's) Bird/Other Wildlife Strike Reporting system, how to report a wildlife strike, what happens to the wildlife strike report data, how to access the FAA National Wildlife Strike Database (NWSD), and the FAA's Feather Identification program.

2. Applicability.

The FAA provides the standards and practices in this AC as guidance for all public-use airports, aviation industry personnel (e.g., Air Traffic Control, pilots and airline personnel, and engine manufacturers), and others who possess strike information. The FAA strongly recommends that the above aviation representatives and others possessing strike information participate in reporting.

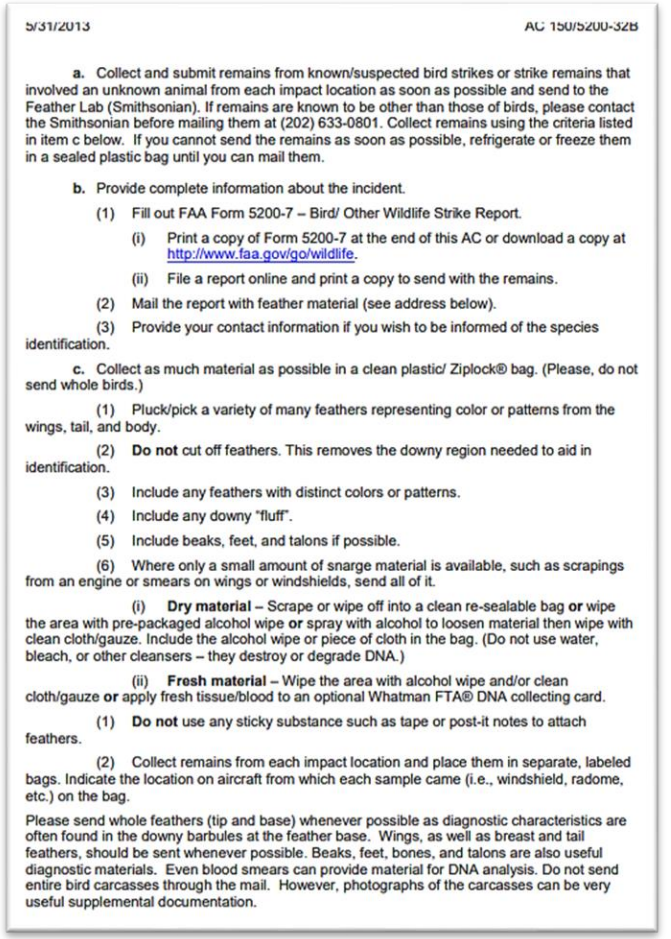
3. Cancellation.

This AC cancels AC 150/5200-32A, Reporting Wildlife Aircraft Strikes, dated December 22, 2004.

4. Background.

The FAA has long recognized the threat to aviation safety posed by wildlife strikes. Each year in the United States, wildlife strikes to U.S. civil aircraft cause about $718 million in damage to aircraft and about 567,000 hours of civil aircraft down time. For the period 1990 to 2011, over 115,000 wildlife strikes were reported to the FAA. About 97 percent of all wildlife strikes reported to the FAA involved birds, about 2 percent involved terrestrial mammals, and less than 1 percent involved flying mammals (bats) and reptiles. Waterfowl (ducks and geese), gulls, and raptors (mainly hawks and vultures) are the bird species that cause the most damage to civil aircraft in the United States, while European starlings are responsible for the greatest loss of human life. Vultures and waterfowl cause the most losses to U.S. military aircraft.

Studies have shown that strike reporting has steadily increased over the past two decades; however, strike reporting is not consistent across all stakeholders (pilots, air carriers, airport operators, air traffic control personnel, etc.) in the National Airspace System. Although larger 14 CFR Part 139 airports and those with well-established wildlife programs have improved strike reporting, there is a wide disparity in overall reporting rates between Part 139 airports and general aviation (GA) airports in the National Plan of Integrated Airport Systems (NPIAS). Less than 6 percent of total strike reports come from NPIAS GA airports, whose reporting rates average less than 1/20th the rates at Part 139 airports. Most Part 139 airports (97 percent) have



a. Collect and submit remains from known/suspected bird strikes or strike remains that involved an unknown animal from each impact location as soon as possible and send to the Feather Lab (Smithsonian). If remains are known to be other than those of birds, please contact the Smithsonian before mailing them at (202) 633-0801. Collect remains using the criteria listed in item c below. If you cannot send the remains as soon as possible, refrigerate or freeze them in a sealed plastic bag until you can mail them.

b. Provide complete information about the incident.

(1) Fill out FAA Form 5200-7 – Bird/ Other Wildlife Strike Report.

(i) Print a copy of Form 5200-7 at the end of this AC or download a copy at http://www.faa.gov/go/wildlife.

(ii) File a report online and print a copy to send with the remains.

(2) Mail the report with feather material (see address below).

(3) Provide your contact information if you wish to be informed of the species identification.

c. Collect as much material as possible in a clean plastic/ Ziplock® bag. (Please, do not send whole birds.)

(1) Pluck/pick a variety of many feathers representing color or patterns from the wings, tail, and body.

(2) **Do not** cut off feathers. This removes the downy region needed to aid in identification.

(3) Include any feathers with distinct colors or patterns.

(4) Include any downy "fluff".

(5) Include beaks, feet, and talons if possible.

(6) Where only a small amount of snarge material is available, such as scrapings from an engine or smears on wings or windshields, send all of it.

(i) **Dry material** – Scrape or wipe off into a clean re-sealable bag **or** wipe the area with pre-packaged alcohol wipe **or** spray with alcohol to loosen material then wipe with clean cloth/gauze. Include the alcohol wipe or piece of cloth in the bag. (Do not use water, bleach, or other cleansers – they destroy or degrade DNA.)

(ii) **Fresh material** – Wipe the area with alcohol wipe and/or clean cloth/gauze **or** apply fresh tissue/blood to an optional Whatman FTA® DNA collecting card.

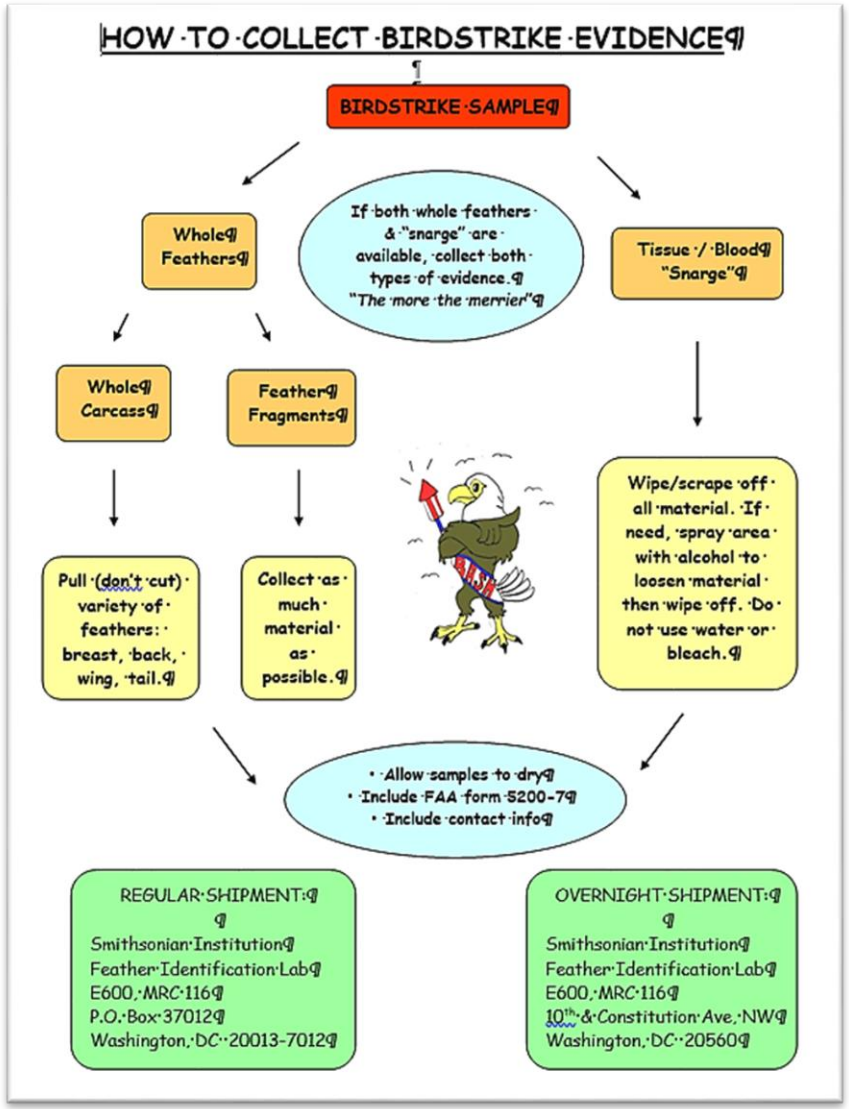
(1) **Do not** use any sticky substance such as tape or post-it notes to attach feathers.

(2) Collect remains from each impact location and place them in separate, labeled bags. Indicate the location on aircraft from which each sample came (i.e., windshield, radome, etc.) on the bag.

Please send whole feathers (tip and base) whenever possible as diagnostic characteristics are often found in the downy barbules at the feather base. Wings, as well as breast and tail feathers, should be sent whenever possible. Beaks, feet, bones, and talons are also useful diagnostic materials. Even blood smears can provide material for DNA analysis. Do not send entire bird carcasses through the mail. However, photographs of the carcasses can be very useful supplemental documentation.

IDENTIFICACIÓN DE ESPECIES

SISTEMATIZACIÓN MANEJO DE MUESTRAS



Fuente: Airport Wild!

IDENTIFICACIÓN DE ESPECIES

DIFICULTADES A TENER EN CUENTA

- ✓ Recogida de muestra
- ✓ Permisos
- ✓ Limpieza previa
- ✓ Falta de personal
- ✓ Falta de homogeneización y guía (va solventándose en algunos aeropuertos)

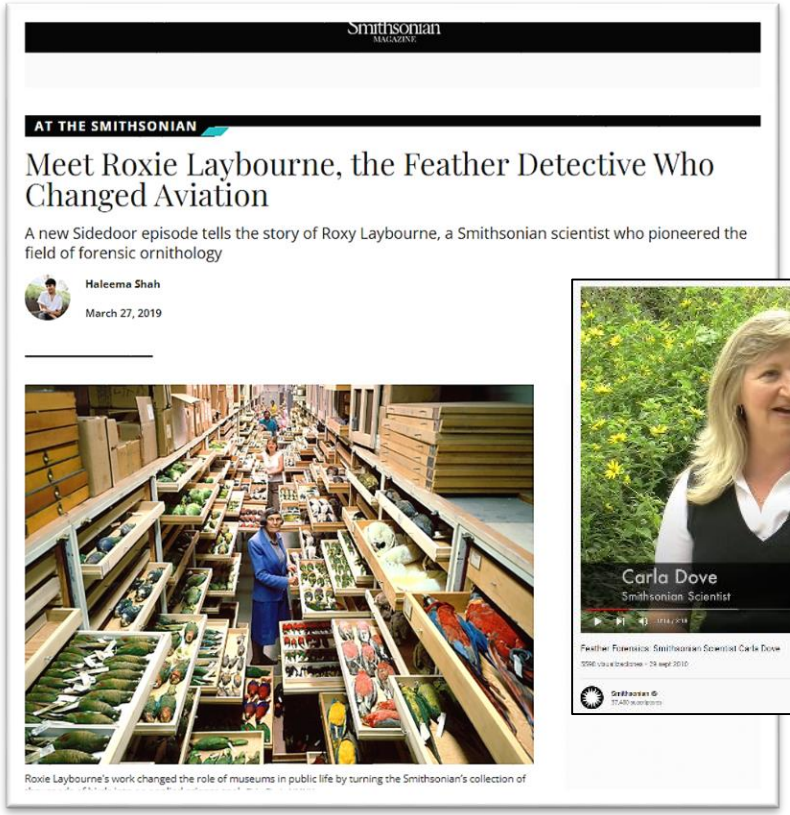
www.avherald.com, Photo: Arjan van de Leur

IDENTIFICACIÓN DE ESPECIES

En varios países del mundo se han desarrollado **"asociaciones"** entre el **sector aeronáutico** (operadores, autoridades u organismos) y el **sector científico**, para facilitar el reconocimiento de especies post-colisión en el mundo de la aviación

IDENTIFICACIÓN DE ESPECIES

En Estados Unidos: asociación entre **la FAA y la Smithsonian Institution**, con cierta popularidad mediática


Smithsonian MAGAZINE

AT THE SMITHSONIAN

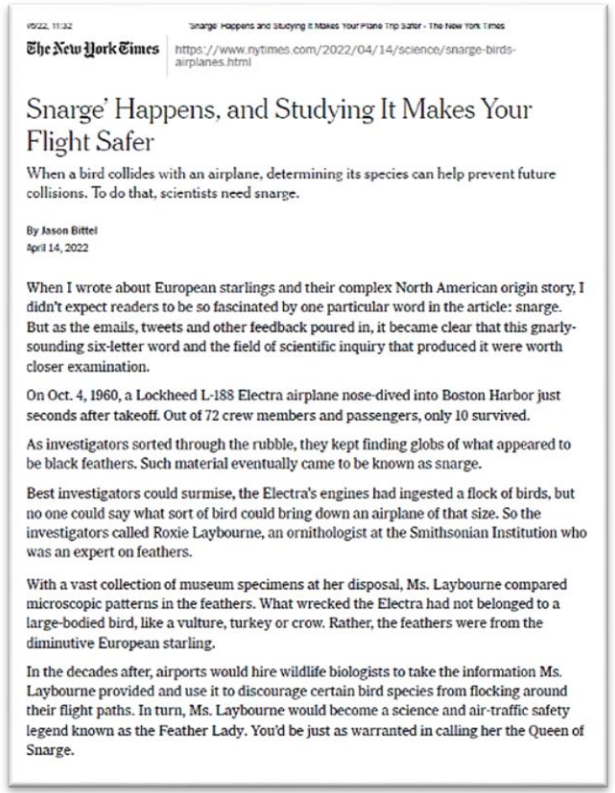
Meet Roxie Laybourne, the Feather Detective Who Changed Aviation

A new Sidedoor episode tells the story of Roxy Laybourne, a Smithsonian scientist who pioneered the field of forensic ornithology

Haleema Shah

March 27, 2019

Roxie Laybourne's work changed the role of museums in public life by turning the Smithsonian's collection of


The New York Times https://www.nytimes.com/2022/04/14/science/snarge-birds-airplanes.html

Snarge' Happens, and Studying It Makes Your Flight Safer

When a bird collides with an airplane, determining its species can help prevent future collisions. To do that, scientists need snarge.

By Jason Bittel
April 14, 2022

When I wrote about European starlings and their complex North American origin story, I didn't expect readers to be so fascinated by one particular word in the article: snarge. But as the emails, tweets and other feedback poured in, it became clear that this gnarly-sounding six-letter word and the field of scientific inquiry that produced it were worth closer examination.

On Oct. 4, 1960, a Lockheed L-188 Electra airplane nose-dived into Boston Harbor just seconds after takeoff. Out of 72 crew members and passengers, only 10 survived.

As investigators sorted through the rubble, they kept finding globs of what appeared to be black feathers. Such material eventually came to be known as snarge.

Best investigators could surmise, the Electra's engines had ingested a flock of birds, but no one could say what sort of bird could bring down an airplane of that size. So the investigators called Roxie Laybourne, an ornithologist at the Smithsonian Institution who was an expert on feathers.

With a vast collection of museum specimens at her disposal, Ms. Laybourne compared microscopic patterns in the feathers. What wrecked the Electra had not belonged to a large-bodied bird, like a vulture, turkey or crow. Rather, the feathers were from the diminutive European starling.

In the decades after, airports would hire wildlife biologists to take the information Ms. Laybourne provided and use it to discourage certain bird species from flocking around their flight paths. In turn, Ms. Laybourne would become a science and air-traffic safety legend known as the Feather Lady. You'd be just as warranted in calling her the Queen of Snarge.

IDENTIFICACIÓN DE ESPECIES

En **Canadá**: UBC Biodiversity Museum y Bird Strike Association of Canada

300 dólares canadienses por muestra de plumas

BIRD STRIKE ASSOCIATION OF CANADA
ASSOCIATION CANADIENNE SUR LE PÉRIL AVIAIRE

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HOME MEMBERS SERVICES EVENTS BSAC AWARDS USEFUL INFORMATION CONTACT US REPORT A WILDLIFE STRIKE

FREE Bird Strike DNA Testing: Transport Canada Pilot Project

Transport Canada is undertaking a new pilot project investigating the relevance of DNA identification for unidentifiable bird remains found after bird strikes.

~~For the first three months of 2021 (January 1st to March 31st)~~, Now airports will be able to send any unidentifiable remains, **free of charge**, to Guelph University's Biodiversity lab for DNA identification.

Please do not send intact bird remains. (BSAC asks that you photograph intact or largely intact remains (how to photograph and label your strike photo) and send them to photo@canadianbirdstrike.ca

All certified airports will be receiving a DNA sampling kit directly from Transport Canada in the coming weeks. Many airports will also have received on from BSAC several years ago. If additional sampling kits are required, they can be requested from Transport Canada (Devon.Harris@tc.gc.ca) or directly from Guelph University (info@ccdb.ca).

If you find unidentifiable remains at your airport, please take the following steps:

1. Collect the sample as per the instructions in the DNA kits
2. Mail the sample and form to:

Attn: Canadian Bird Strike Services

Biodiversity Institute of Ontario, University of Guelph

50 Stone Road East, Guelph, ON, N1G 2W1

DNA results will be provided to both the organization which submitted the remains, as well as directly to Transport Canada. We look forward to the results. Any feedback or comments on this pilot project are welcome and can be addressed to Devon.

Subscribe to our Mailing list

Sign up to get our quarterly newsletter, and keep up to date with the latest on airport wildlife strike prevention.

email address

Subscribe

Group 2 – Feather Sample (when all you have are a collection of feathers but no intact animal):

The Cowan Tetrapod Avian Forensics Morphology Initiative, University of British Columbia Beaty Biodiversity Museum offers feather identification services. The normal fee is $300. BSC members receive a discounted price of $200 per sample.

Before sending samples, please send an email outlying how many and what type of feather samples (e.g., whole feather, feather pieces) to Ildiko Szabo, a Society of Forensic Science (SWFS) certified Avian Forensic Morphologist. All sample labels must include date, location found, flight information if available, and your case number. (Suggested case number: Airport Code – Date (DDMMYY)-airline code, flight number, 24 hour clock time)

Please email: ildiko@zoology.ubc.ca

Ship samples to:

Ildiko Szabo

SWFS Certified Forensic Scientist

Assistant Curator

Cowan Tetrapod Collection UBC Beaty Biodiversity Museum

2212 Main Mall Vancouver, BC Canada V6T 1Z4

ildiko@zoology.ubc.ca

office: 604-822-4665

UBC Science Follow

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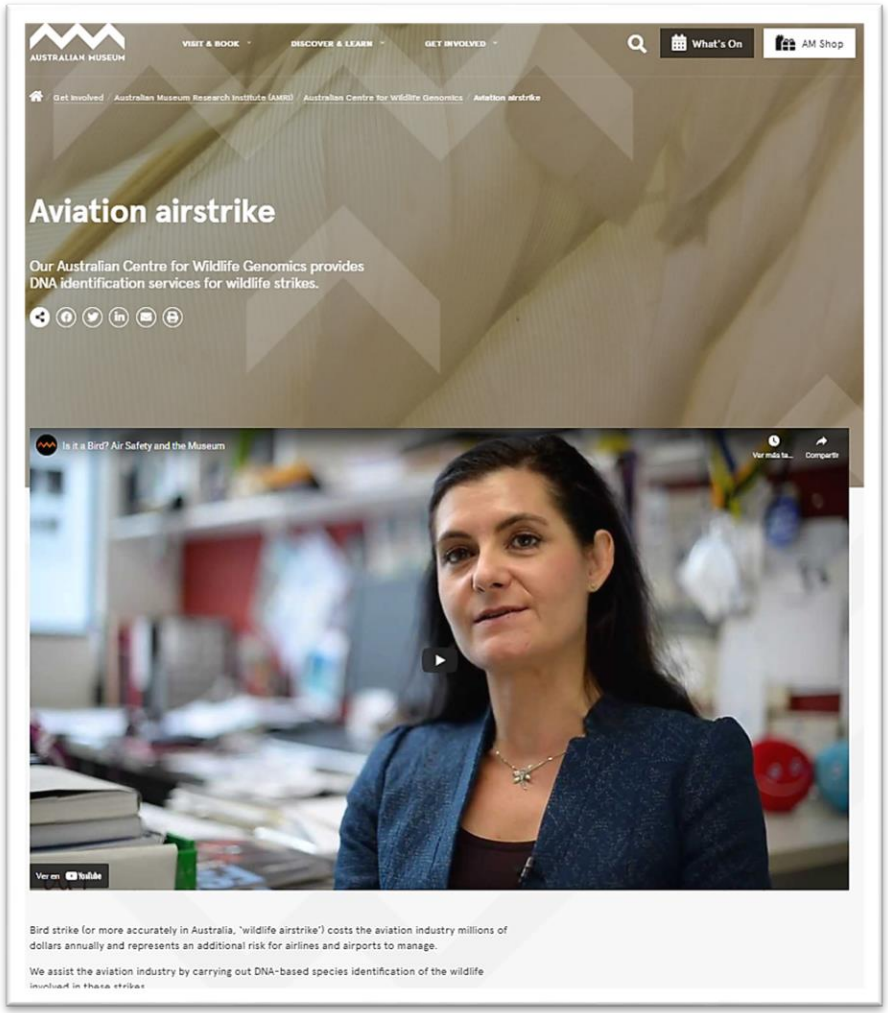
Ildiko Szabo is Canada's only certified avian forensic morphologist. Photo: Mairin Kerr.

https://focus.science.ubc.ca/feathers-c85f10658e47 1/14

IDENTIFICACIÓN DE ESPECIES

En **Australia**: Australian Museum y Australian Transport Safety Bureau




Australian Government
Australian Transport Safety Bureau

ATSB RESEARCH AND ANALYSIS REPORT
Aviation Safety Research Grant – B2005/0117
Final

Forensic Identification of Aviation Bird Strikes in Australia

Dr Leslie Christidis
Science and Collections Division, Australian Museum
Dr Janette A. Norman
Division of Collections, Research and Exhibitions, Museum Victoria
Dr Rebecca N. Johnson
Science and Collections Division, Australian Museum
Ms Sue Lindsay
Science and Collections Division, Australian Museum

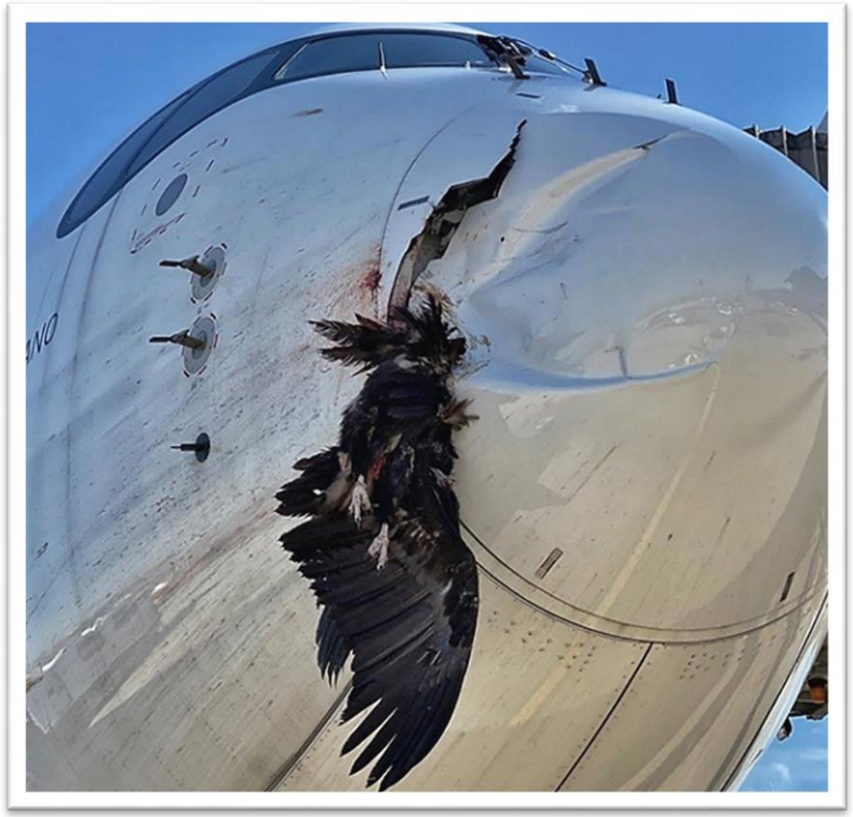
June 2006

IDENTIFICACIÓN DE ESPECIES

En **Reino Unido**: Rolls Royce y Natural History Museum of London

IDENTIFICACIÓN DE ESPECIES

- ✓ Se estiman entre 10-200 colisiones al año por media de aeropuerto en el mundo
- ✓ Hay un % apreciable de colisiones sin identificación



Dove et al. 2008. *Wildlife Management*

IDENTIFICACIÓN DE ESPECIES

En España

No hay un "laboratorio de referencia": se acude a contactos locales o, algunos, últimamente, al Instituto de Investigación en Recursos Cinegéticos (IREC)

IDENTIFICACIÓN DE ESPECIES

¿Qué ofrecemos desde el MNCN?

- ✓ Expertos mundiales en identificación de aves: análisis de plumas
- ✓ Colecciones de referencia a nivel estatal de aves
- ✓ Análisis moleculares avanzados
- ✓ Personal experto en "barcoding" de aves y análisis comparativo de secuencias

IDENTIFICACIÓN DE ESPECIES

¿Qué ofrecemos desde el MNCN?

- ✓ Convenio con aeropuertos, compañías aéreas… (CSIC)
- ✓ Centralización del proceso
- ✓ Homogeneización en el tratamiento de muestras (estadísticas comparables)
- ✓ Reparto de kits y guía de recogida de muestras
- ✓ Personal especialista de laboratorio dedicado
- ✓ Abaratamiento de costes

Muchas gracias

250 1771 2021 museo nacional de ciencias naturales