From carcass searches to auditable biodiversity performance

An anonymized operational portfolio case study of post-construction fatality monitoring at South African wind energy facilities

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SafeTurbines
Protect wildlife. Power clean energy.

Policy Power People

Collision monitoring is only useful if we can trust the evidence

WTG
turbine searches

OHL
line searches

The reporting gap

FIELD IMPLEMENTATION	Was the intended area actually searched?
TIMING	Were searches frequent enough for local persistence?
BIAS TRIALS	How detectable and persistent were carcasses?
OUTCOMES	What mortality occurred and with what uncertainty given bias trial results?

Periodic reports can describe activity without preserving the audit trail needed to test monitoring quality.

PCFM QUALITY CHAIN

Four measurements sit between a carcass search and a defensible fatality estimate

1

SPATIAL COVERAGE

Where did the searcher actually walk?

→

2

SEARCH INTERVAL

Interval between searches?

→

3

SEARCHER EFFICIENCY

What proportion of carcasses are detected?

→

4

CARCASS PERSISTENCE

How long does a carcass persist?

Observed carcasses + survey effort + bias correction → fatality estimate

The IFC PCFM framework treats search design, unsearched area, searcher efficiency and carcass persistence as required linked components, not optional reporting detail.

CASE STUDY

An anonymized portfolio spanning different monitoring histories

~15
operational WEFs assembled for portfolio analysis

~10 y
monitoring history represented across the source records

4
sites with GPS-enabled SafeTurbines search data

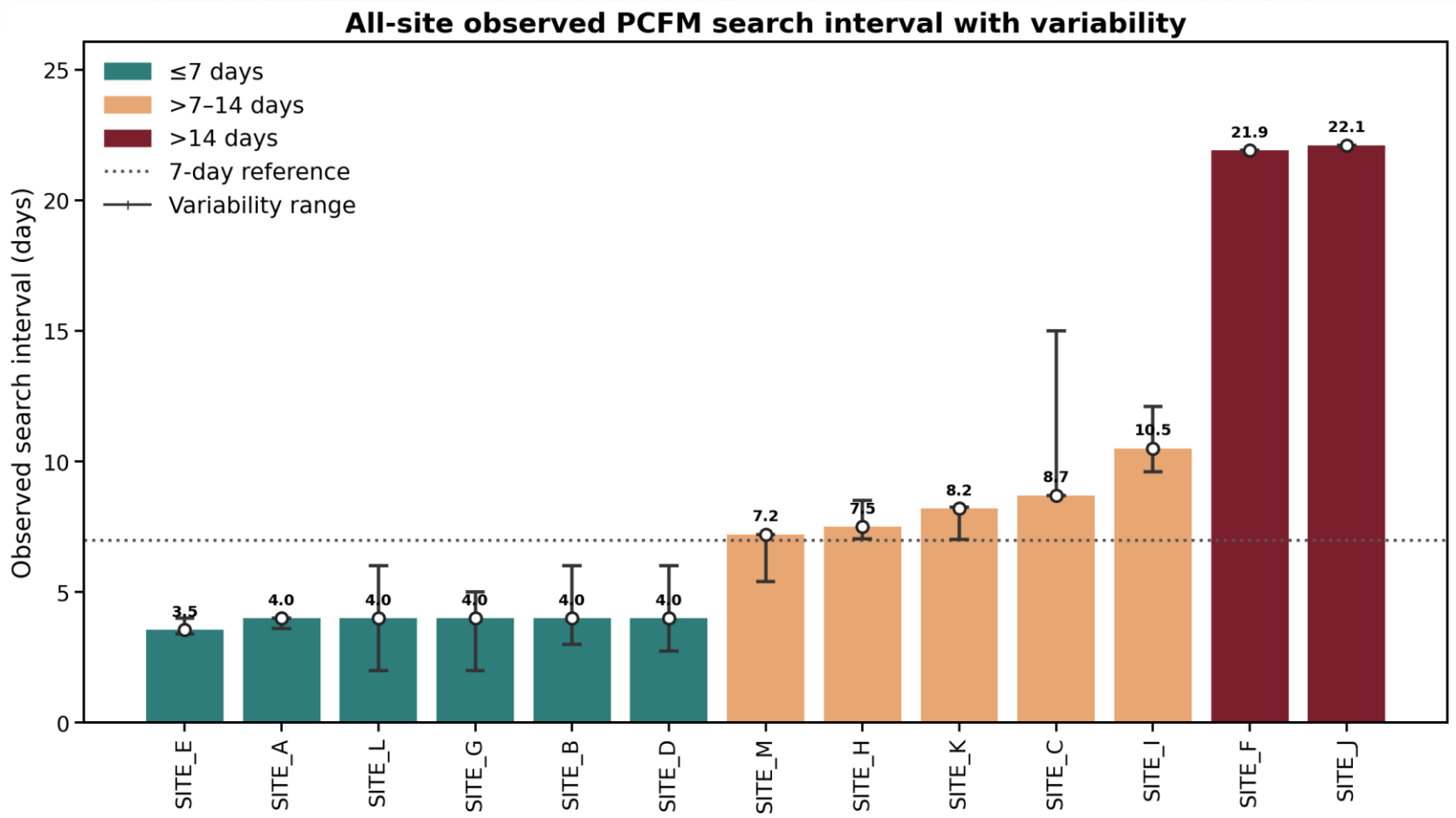
9+
consolidated datasets from reports / mortality files

Analysis sequence

How well are we searching? → **What biases affect detection?** → **What mortality is observed / estimated?** → **Can evidence be audited consistently?**

Sites are anonymized. Cross-site results describe this operational portfolio, not the South African wind industry as a whole.

Search intervals vary markedly across the portfolio



4 d

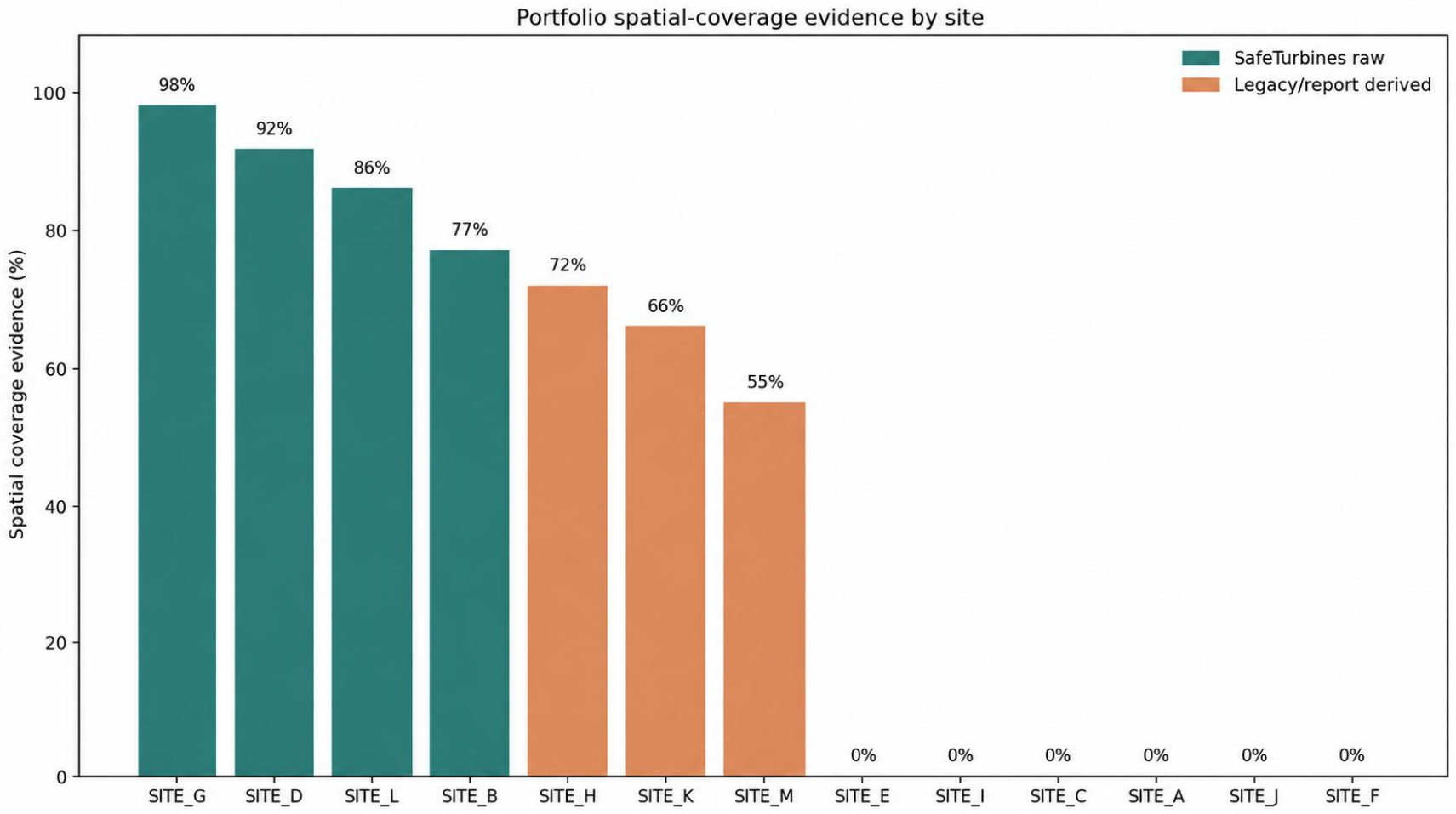
median interval at 6 top performing sites

22 d

longest observed site-level interval in the portfolio

Interval is not just "weekly" or "monthly": variability around the target/ideal matters.

Spatial search coverage is often not directly auditable

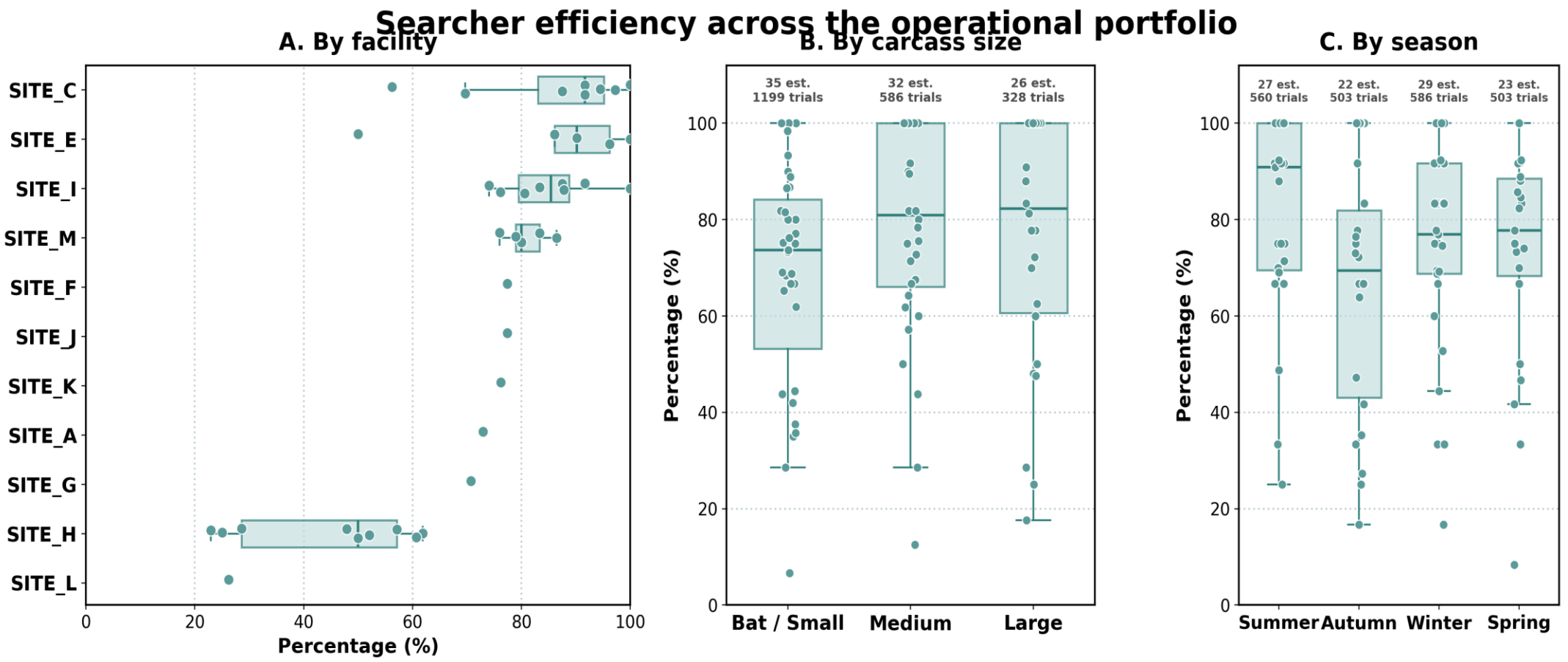


7 / 13
sites with directly measured GPS-union coverage

88.8%
median measured coverage across those four sites

For many legacy datasets, the question is not "low coverage?", it is "can coverage be reconstructed at all?"

Detection varies—and averaging can hide the operational signal

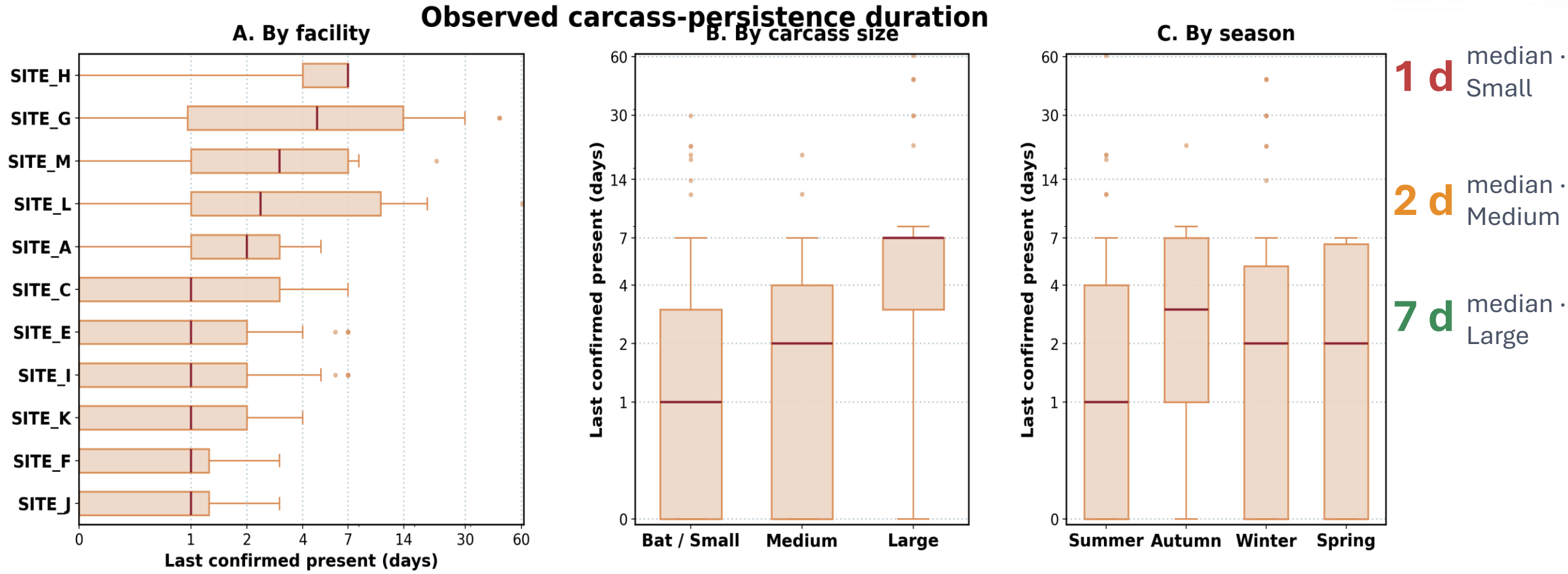


71%
pooled Bat / Small decoy detection

81%
pooled Medium decoy detection

83%
pooled Large decoy detection

Raw persistence duration shows why search timing matters



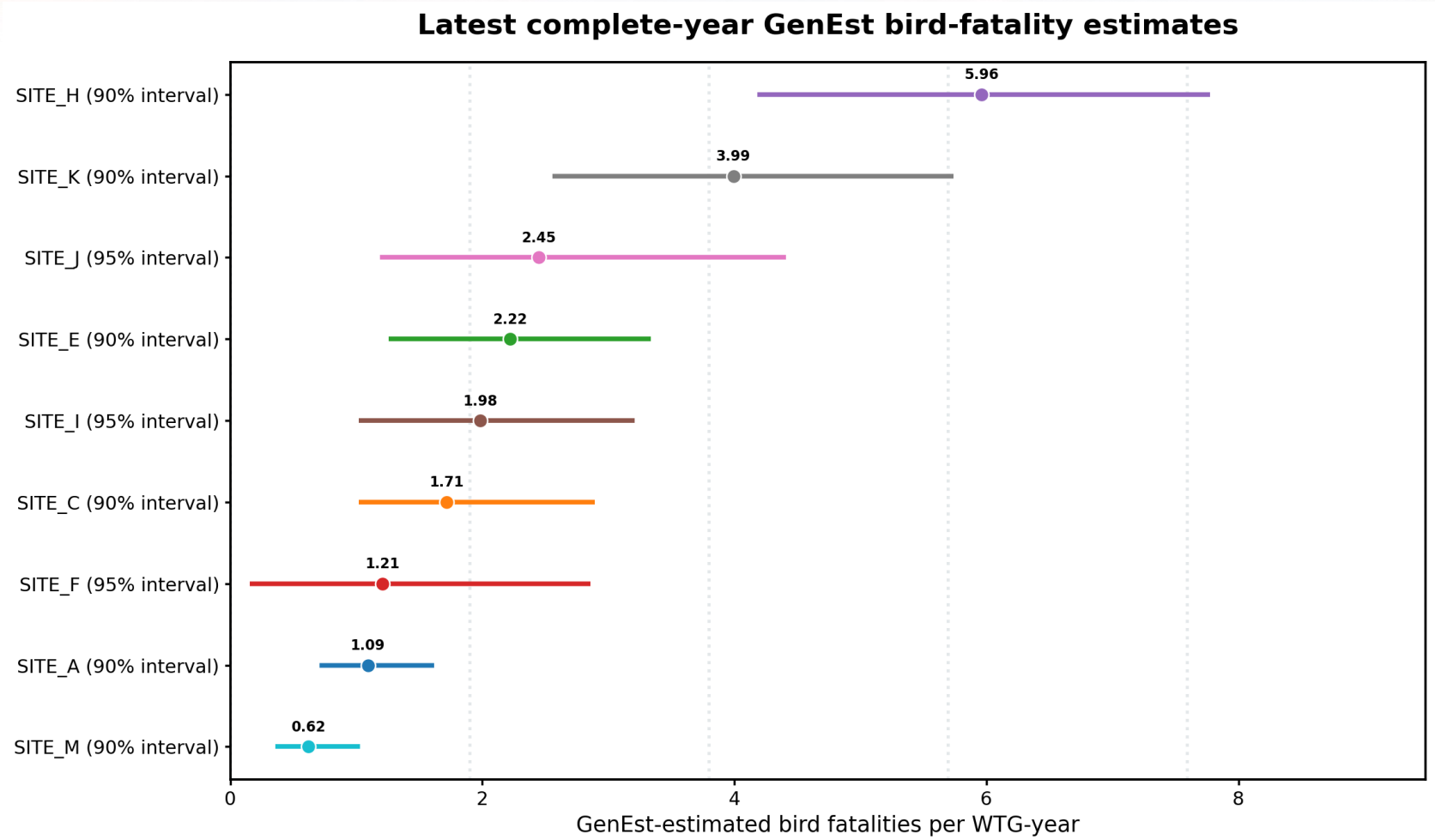
Search design and carcass persistence cannot be interpreted separately

A carcass must still be present when the next search occurs—and then it must be detected.



A nominally “regular” search interval may still be poorly matched to the carcass size classes driving the monitoring objective.

Bias-corrected bird mortality differs substantially among facilities



2.0

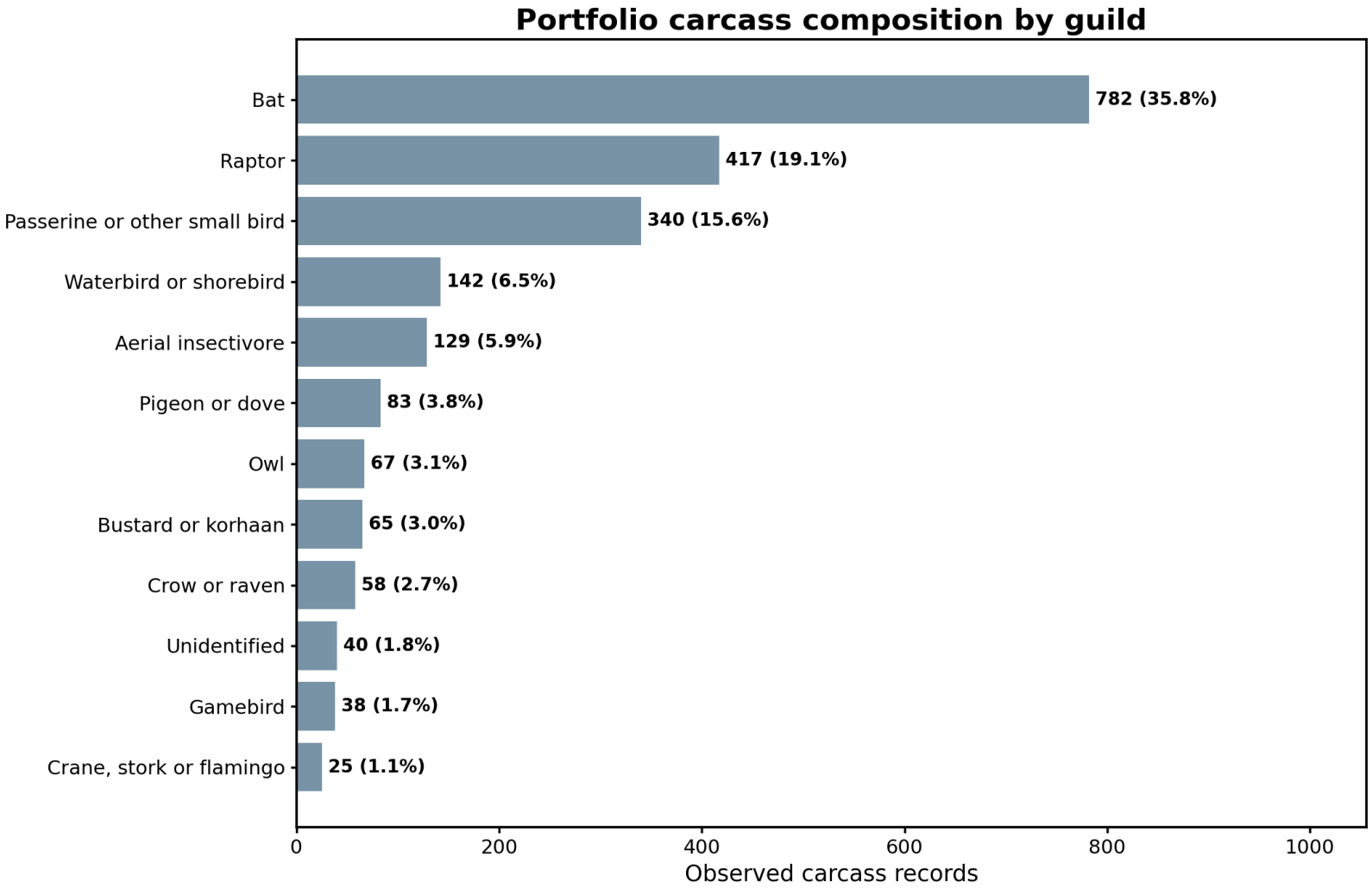
median estimated bird fatalities / WTG-year

0.62-5.96

range of site medians in latest complete years

Uncertainty intervals are wide at several sites: point estimates alone are not enough.

The mortality signal is not one species group



Observed mortalities:

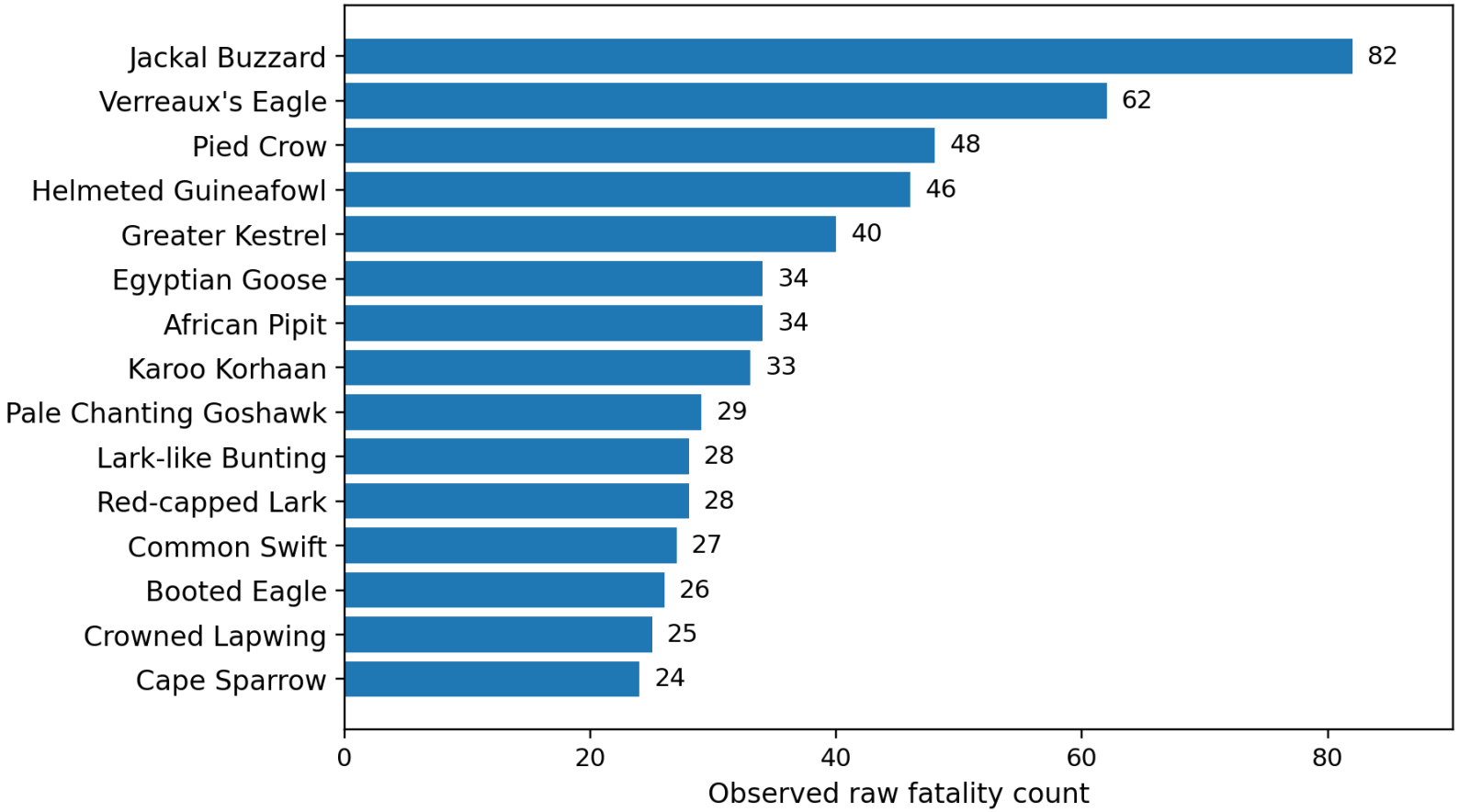
36% of observed records were bats

25% were small bird species

22% were raptors

12% were large terrestrial, gamebird and waterbird species

A relatively small set of species dominates the raw observed WTG and OHL bird fatality records



82 Jackal Buzzard observed records

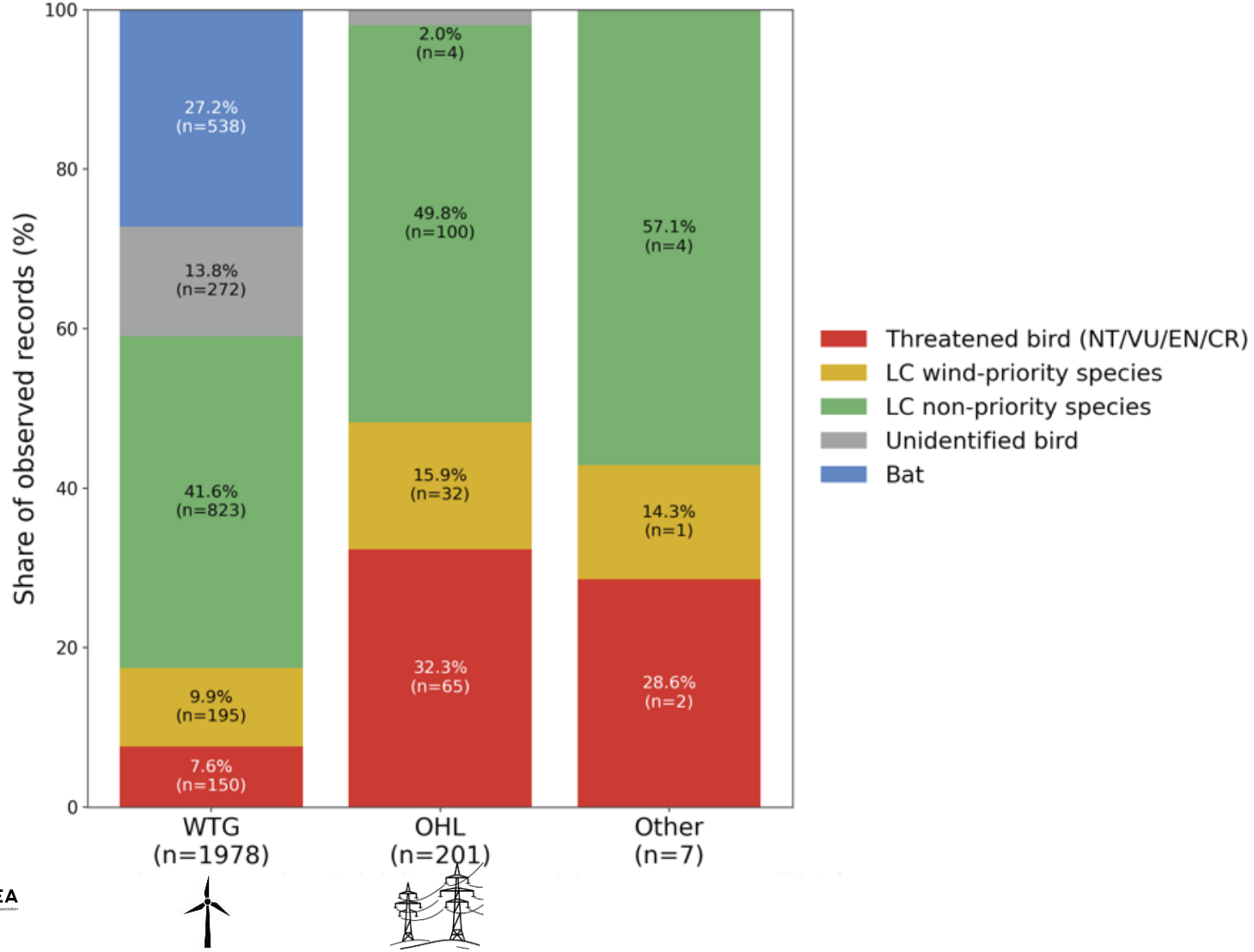
62 Verreaux's Eagle observed records

33 Karoo Korhaan observed records

26 Booted Eagle observed records

Threatened-species WEF records are led by large raptors and bustards

Conservation-priority event pool by infrastructure type



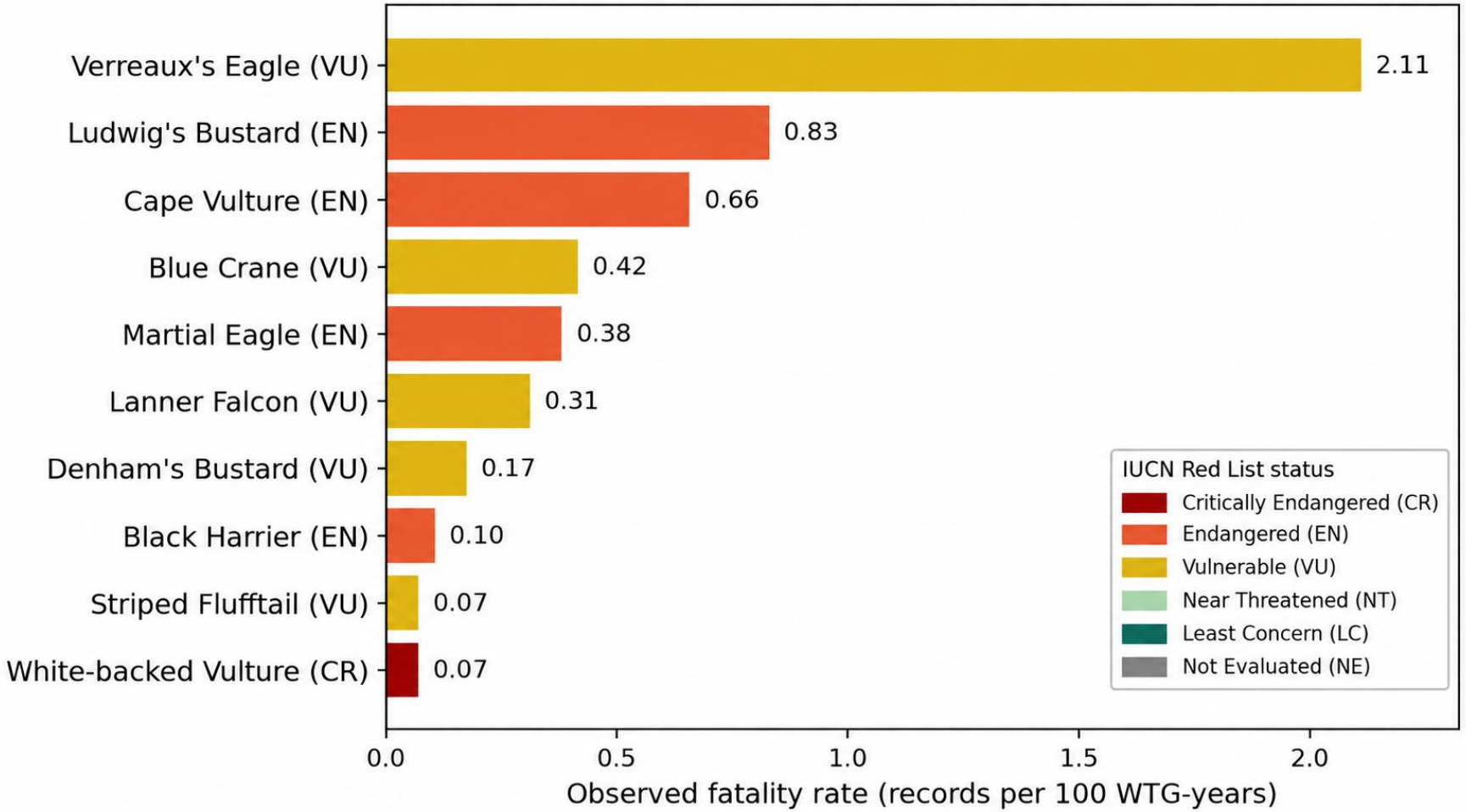


WTG records included a wider range of both threatened (~8%, n = 150) and non-threatened species



OHL records contain a much higher proportion of threatened/NT birds (~32%, n = 65)

Threatened-species WEF records are led by large raptors and bustards



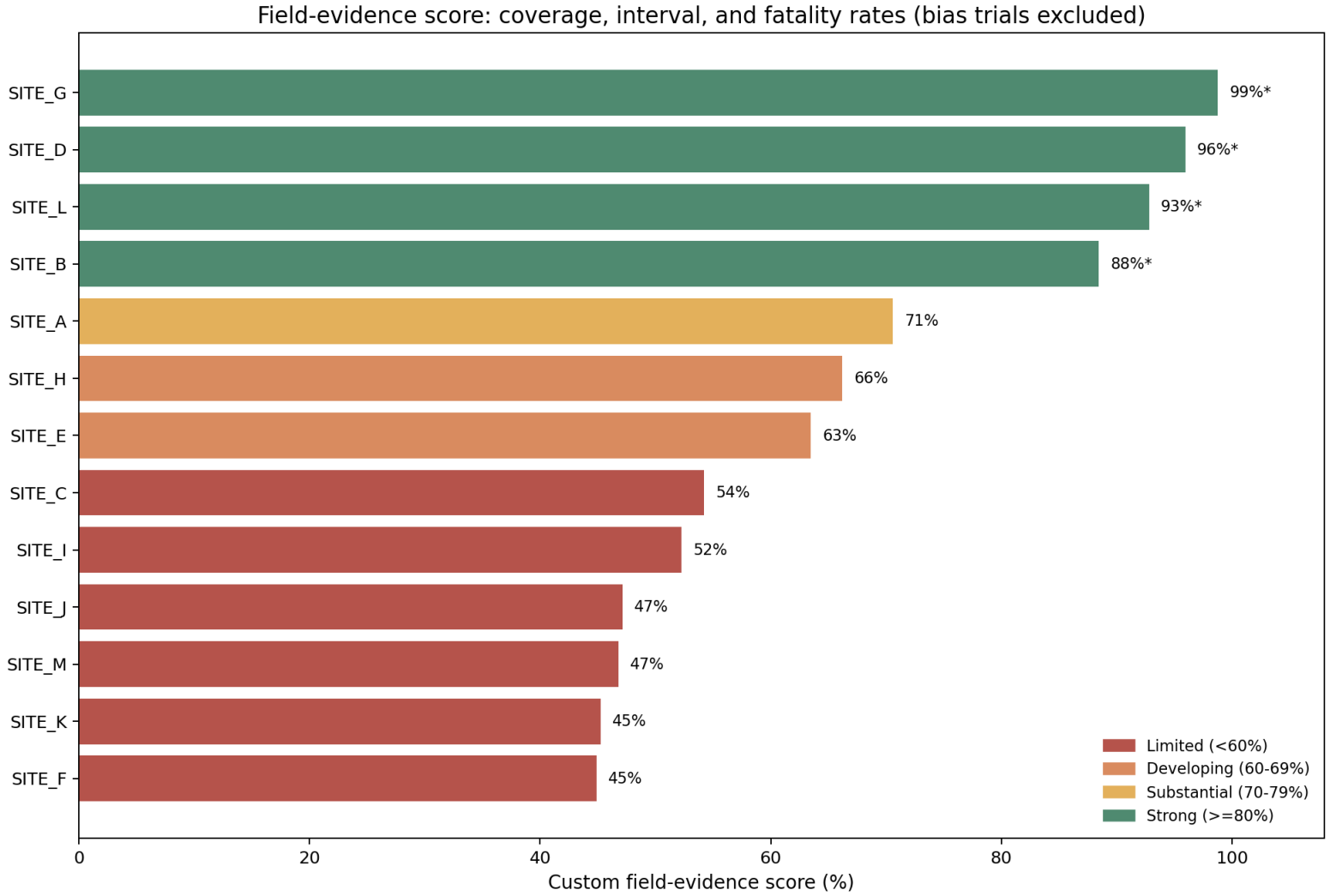
2.11 Verreaux's Eagle records per 100 WTG-years

0.83 Ludwig's Bustard records per 100 WTG-years

0.66 Cape Vulture records per 100 WTG-years

Rates are standardised against 2,891 monitored WTG-years

Ecological outcomes must be interpreted alongside evidence quality



A site can have low observed mortality yet weak evidence that the monitoring design was implemented a) appropriately or b) as intended.

The solution is not another report, it is a chain of evidence

PLAN

Project-specific PCFM design
assets · intervals · bias trials

→

CAPTURE

Offline field records
GPS · timestamps · carcasses

→

VALIDATE

QA and diagnostics
coverage · interval · completeness

→

ANALYSE

GenEst-ready exports,
observed + corrected outcomes

→

ACT

Thresholds and mitigation
issues · triggers · evidence

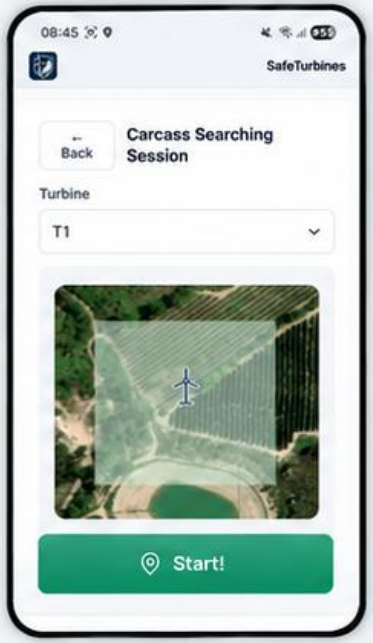
SafeTurbines links search design, field evidence, validation, and mitigation performance in one auditable workflow.

How the chain of evidence works in practice

Every search becomes traceable evidence, validated records and measurable management action.

SET UP

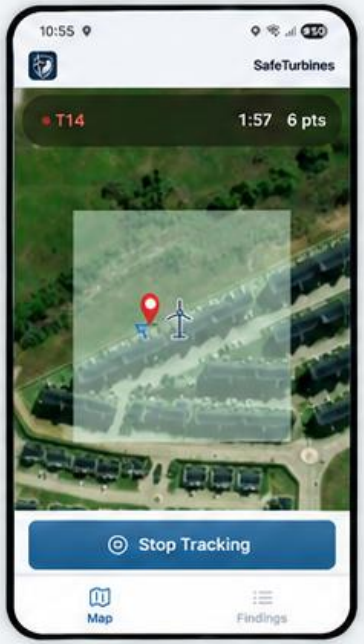
Define the turbine search box



Project- and turbine-specific search area

SEARCH

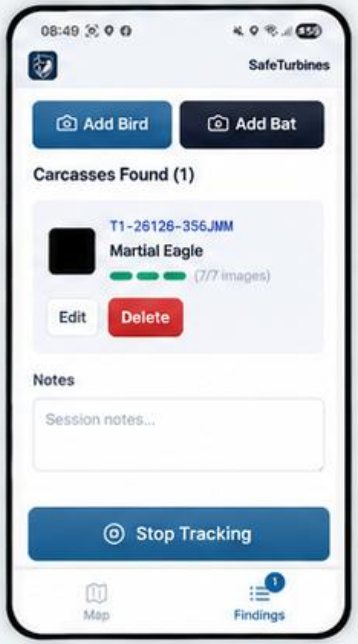
Run GPS-tracked field searches



Offline records • timestamps • coverage

CAPTURE

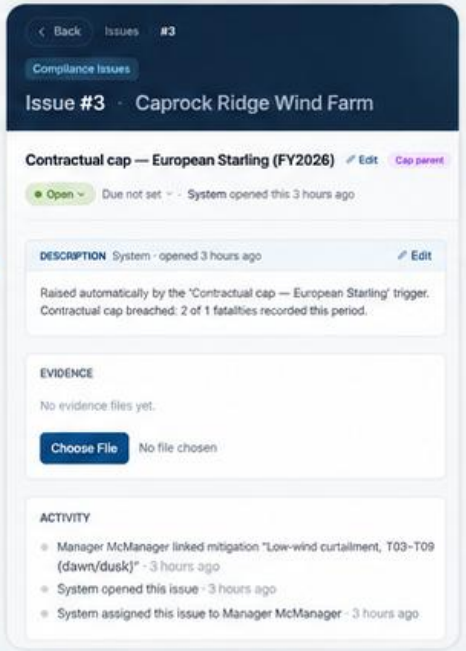
Log carcasses and evidence



Species • photos • notes • status

VALIDATE

Manager QA and audit trail



Review changes • link issues • export evidence

ACT & LEARN

Track mitigation effectiveness



Before/after performance • confidence • response

GenEst-ready exports • Compliance triggers • Audit-ready reporting

SafeTurbines links search design, field evidence, validation and mitigation performance in one auditable workflow.

SafeTurbines

Protect wildlife. Power clean energy.

If monitoring quality is not measurable and auditable, mortality results and PCFM efficacy are harder to defend.

Make the search effort visible. Preserve PCFM compliance. Link outcomes to action.

SafeTurbines · operational biodiversity monitoring and compliance

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