Effects of capture, marking, and tracking on the welfare of wild birds

- *Katrine Eldegard*
- *VKM panel CITES, Professor Norwegian University of Life Sciences*

- *15.10.2024 Online meeting on 3Rs in Wild Bird research*

Photo: Trond Berg

VKM* was requested** to give an updated risk assessment and evidence-base for:

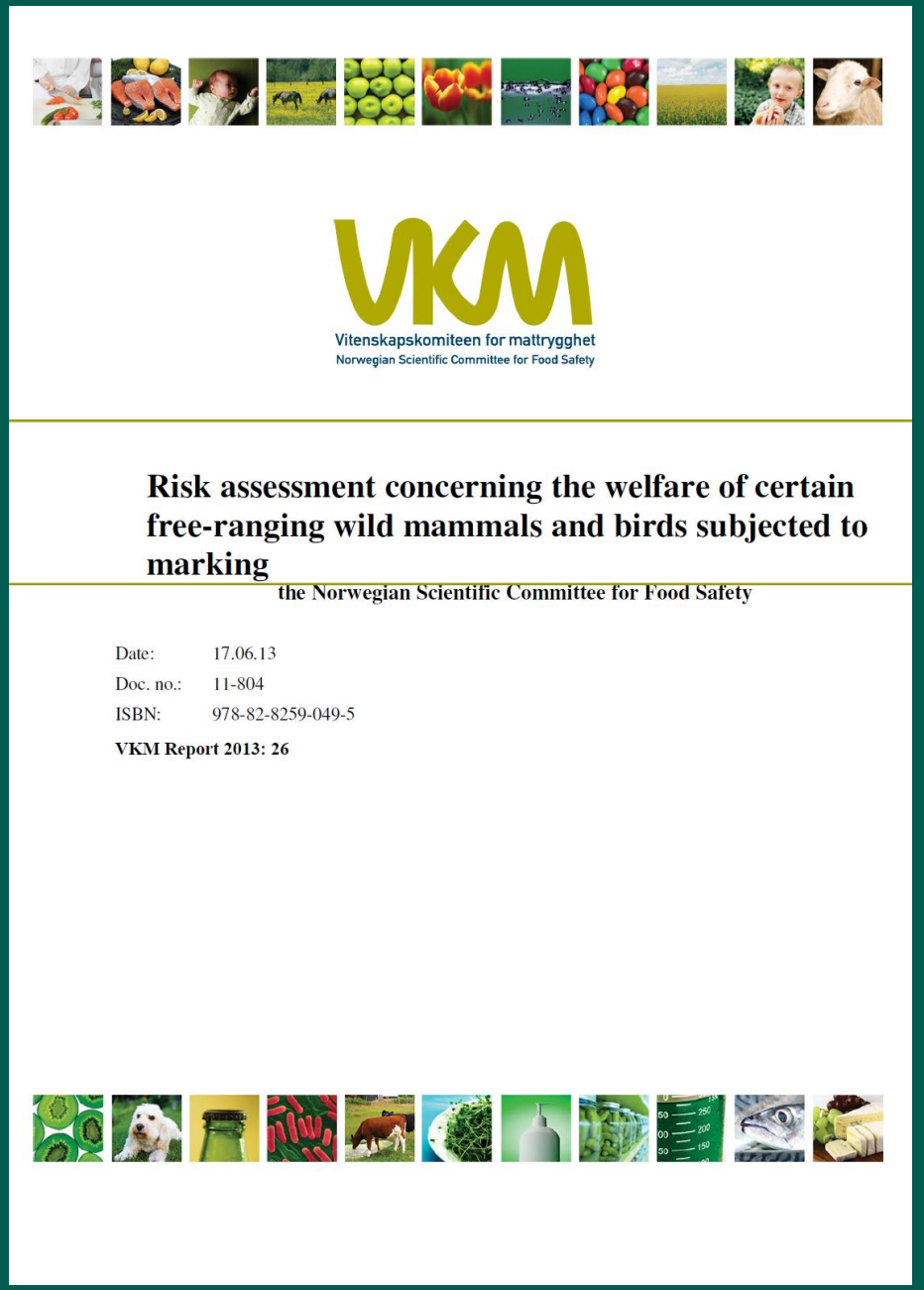
→Capture and handling methods

→Marking and tagging methods

→Risk-reducing measures

* The Norwegian Scientific Committee for Food and Environment (Vitenskapskomiteen for mat og miljø)

**by the Norwegian Food Safety Authority (Mattilsynet) and the Norwegian Environment Agency (Miljødirektoratet)



Terms of Reference (from Mattilsynet and Miljødirektoratet)

1. Describe new knowledge about the methods presented in the 2013 report, and any changes that may alter the risk associated with the capture, handling, and marking of wild birds.
2. Describe new methods (not mentioned in the 2013 report) and technological developments in the field that are relevant under conditions regulated by Norwegian legislation.
3. Assess (if possible) the risk of reduced welfare when using the methods mentioned in points 1 and 2, both direct consequences and consequences from a life cycle perspective **as part of the 3R method**: replacement, reduction, and refinement (such as the impact on behavior and demographics).
4. Describe (if possible) measures that can reduce the risk (e.g., use of best practice protocols) of impaired welfare when using the methods described in points 1 and 2

New report May 2024

→ VKM project group:

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→ VKM approval committe:

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→ VKM secretariat project leader:

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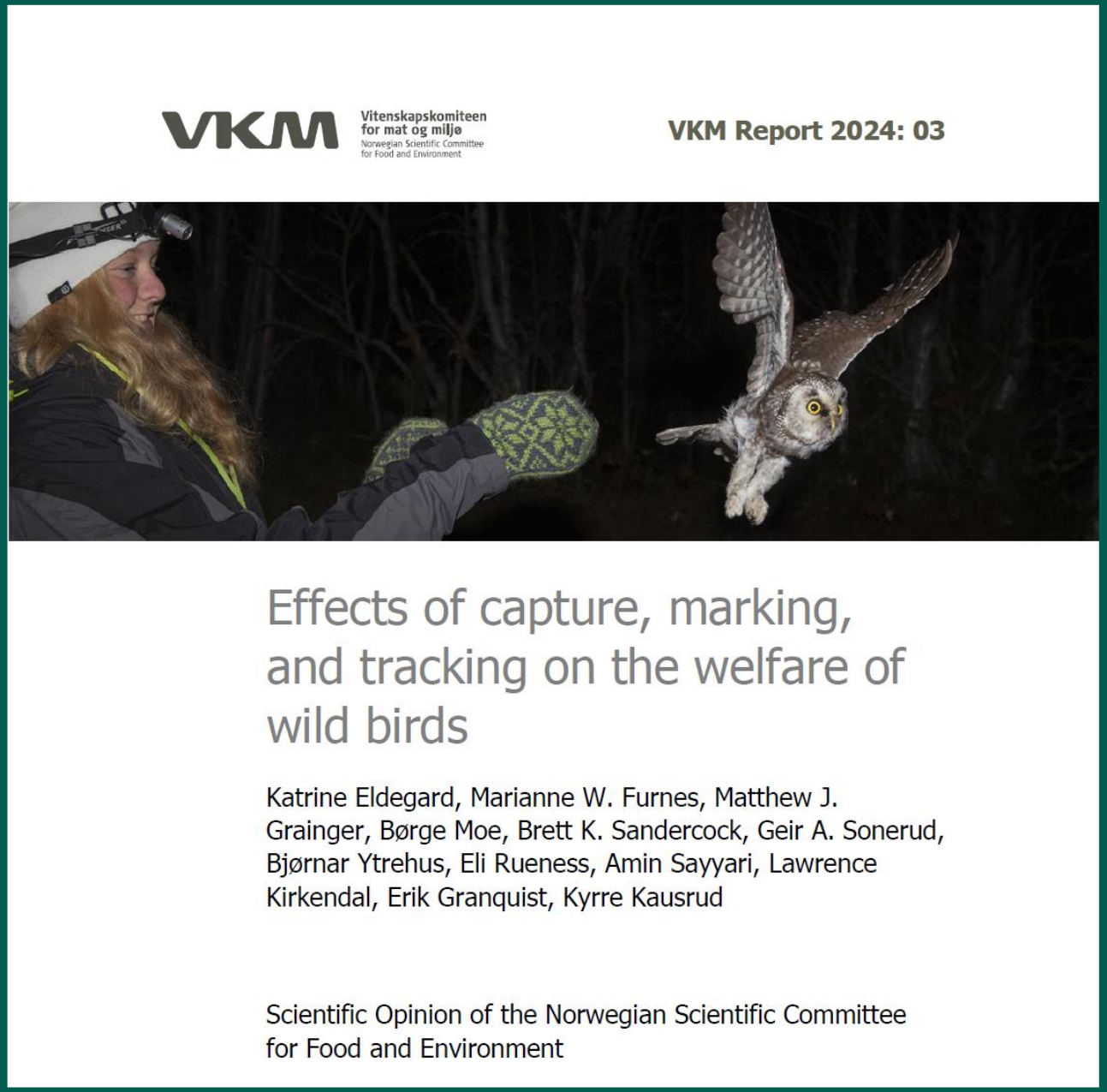


Limitations

- Included any bird species belonging to the orders of birds that are represented on the Norwegian mainland, other land areas where Norwegian law applies, or in Norwegian territorial waters.
- Methods that require an animal care permit from the National Animal Research Authority, or a bird ringing license or a wildlife permit from the Norwegian Environment Agency.
- Assessments of potential impacts of physical sampling methods were included.
- Risks to animal welfare related to ecological manipulations or experimental approaches and keeping birds in captivity for an extended period beyond marking, were *not* included.
- The assessment of methods that involve anesthesia or surgical procedures were restricted to the impacts of abdominal implantation of tracking devices.

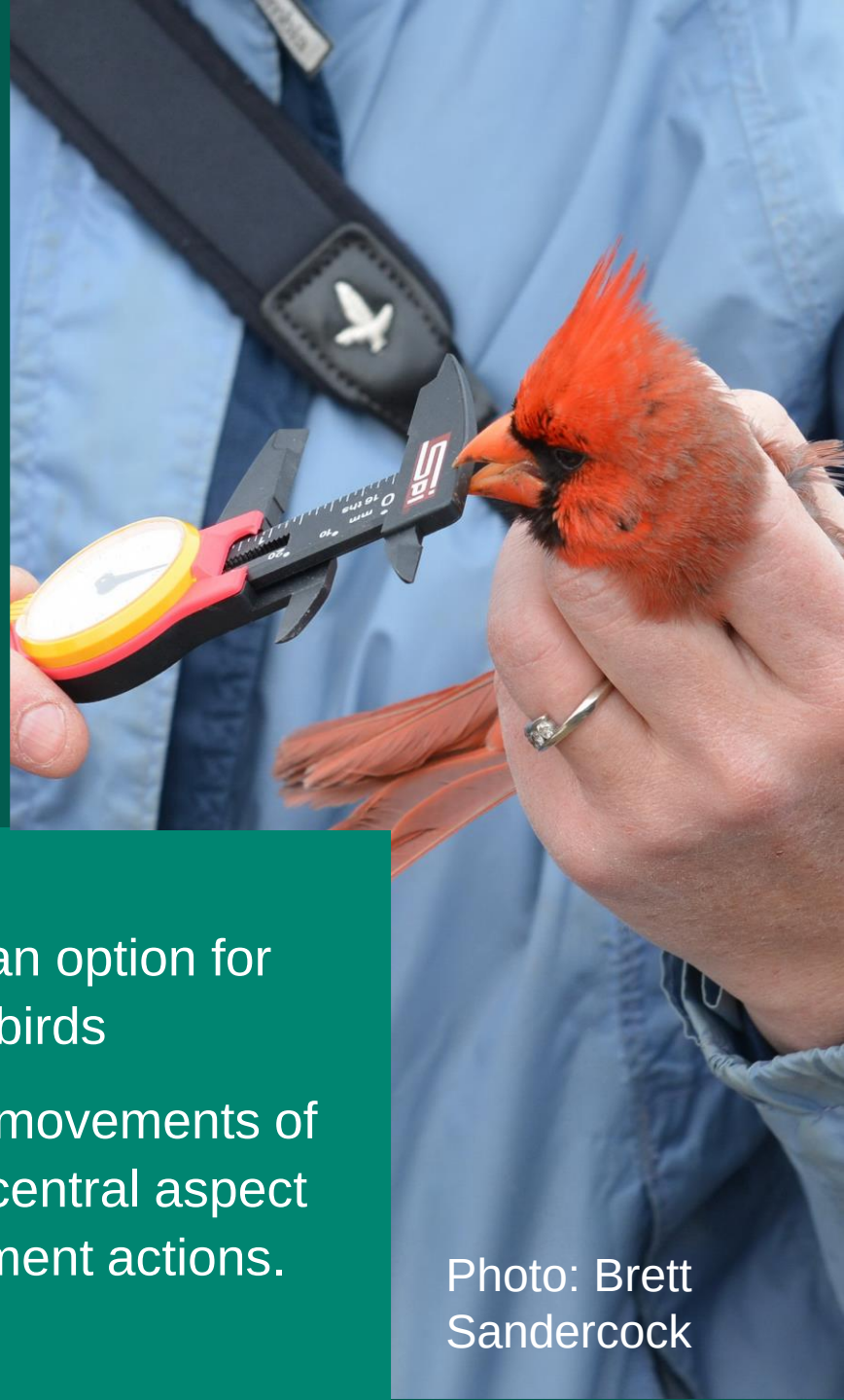
3Rs approach

The new risk assessments focus on the

Refinement of methods in cases where marking is regarded as the most appropriate and adequate method, and

use of new marking and tracking devices that provide detailed movement data from a ***Reduced*** sample of marked birds,

rather than whether field studies of wild birds should be replaced with alternative approaches.



Replacement is not often an option for field studies of wild birds

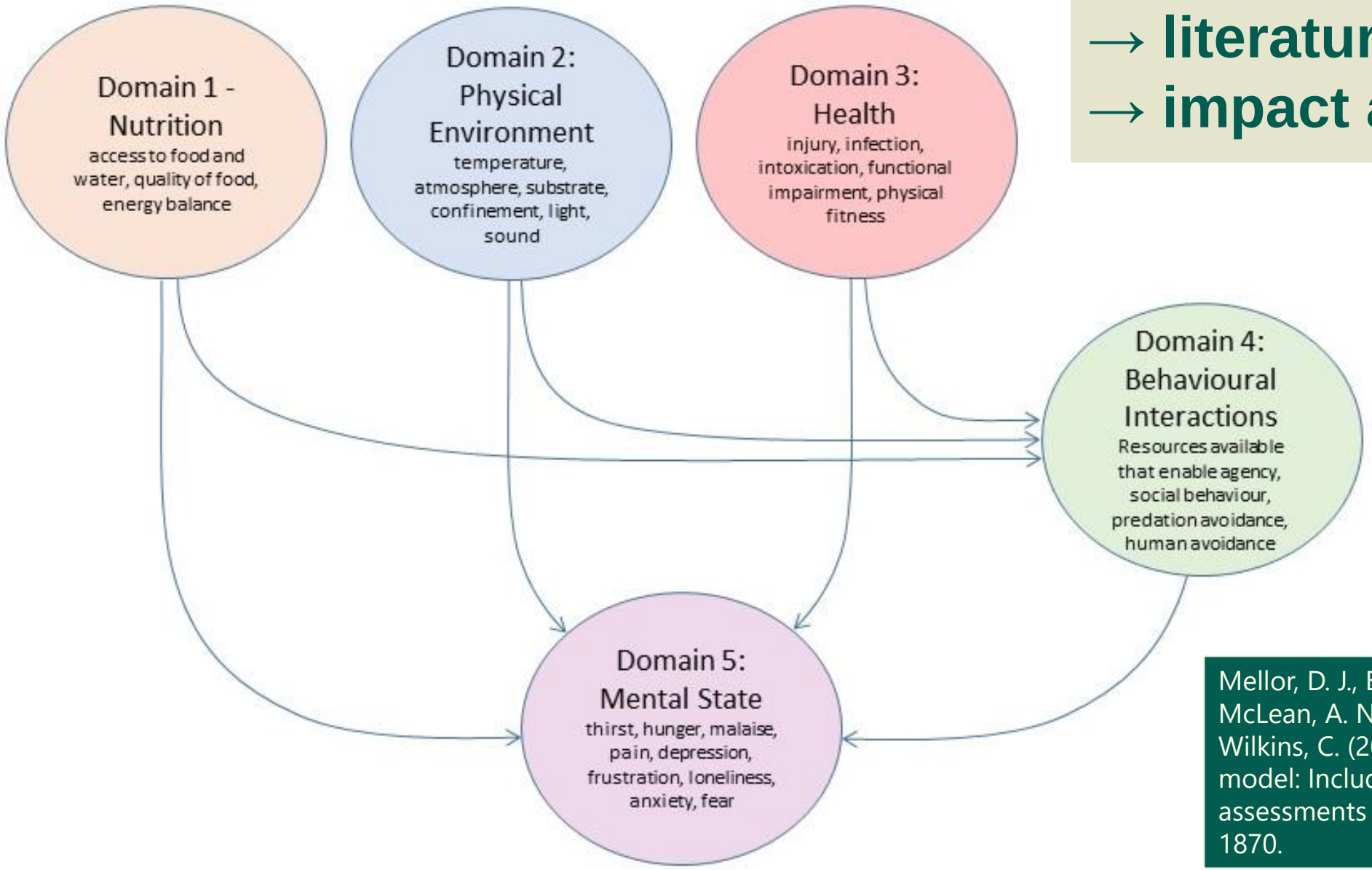
because the demography or movements of target species are often the central aspect of conservation or management actions.

Photo: Brett Sandercock

Animal welfare* in wild birds

- Assessing risks to animal welfare from capturing, handling, and marking/tagging is complicated by a lack of clarity about indicators of animal welfare for wild birds
- We used Broom's definition: 'The welfare of an individual is its state as regards its attempts to cope with its environment'.
- The animal welfare literature is dominated by studies concerning domesticated animals or wild species held in captivity
- The Norwegian Animal Welfare Act does not differentiate between domestic and wild animals
- *Before* designing the literature search, agreed on: **The Five Domains Model** for assessment of animal welfare

The Five Domains Model
→ literature search
→ impact assessment



Mellor, D. J., Beausoleil, N. J., Littlewood, K. E., McLean, A. N., McGreevy, P. D., Jones, B., & Wilkins, C. (2020). The 2020 five domains model: Including human–animal interactions in assessments of animal welfare. *Animals*, *10*(10), 1870.

Evidence base

Compiled 92 benchmark papers fot the capture, handling, sampling, and marking of wild birds

Marking and tracking methods: full systematic literature search

- Peer-reviewed articles in Web of Science, Biological Abstracts, Scopus
- 17,995 unique citations
- Topic modelling to aid screening
- Screened articles based on defined criteria for inclusion/exclusion
- Considered only articles published after 2000…
- ….that evaluated methods for marking and tracking of wild birds, and
- ….provided some assessment of animal welfare in response to marking and tracking in either an observational study or in relation to a suitable control group
- Metadata extracted from 190 articles (732 studies)

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Capture, handling, and sampling:

- information from VKM 2013,
- the initial list of benchmark papers,
- the extensive libraries and first-hand experience of project group members,
- additional literature searches for relevant articles.

The Five Domains Model
→ literature search
→ impact assessment
→ score sheet

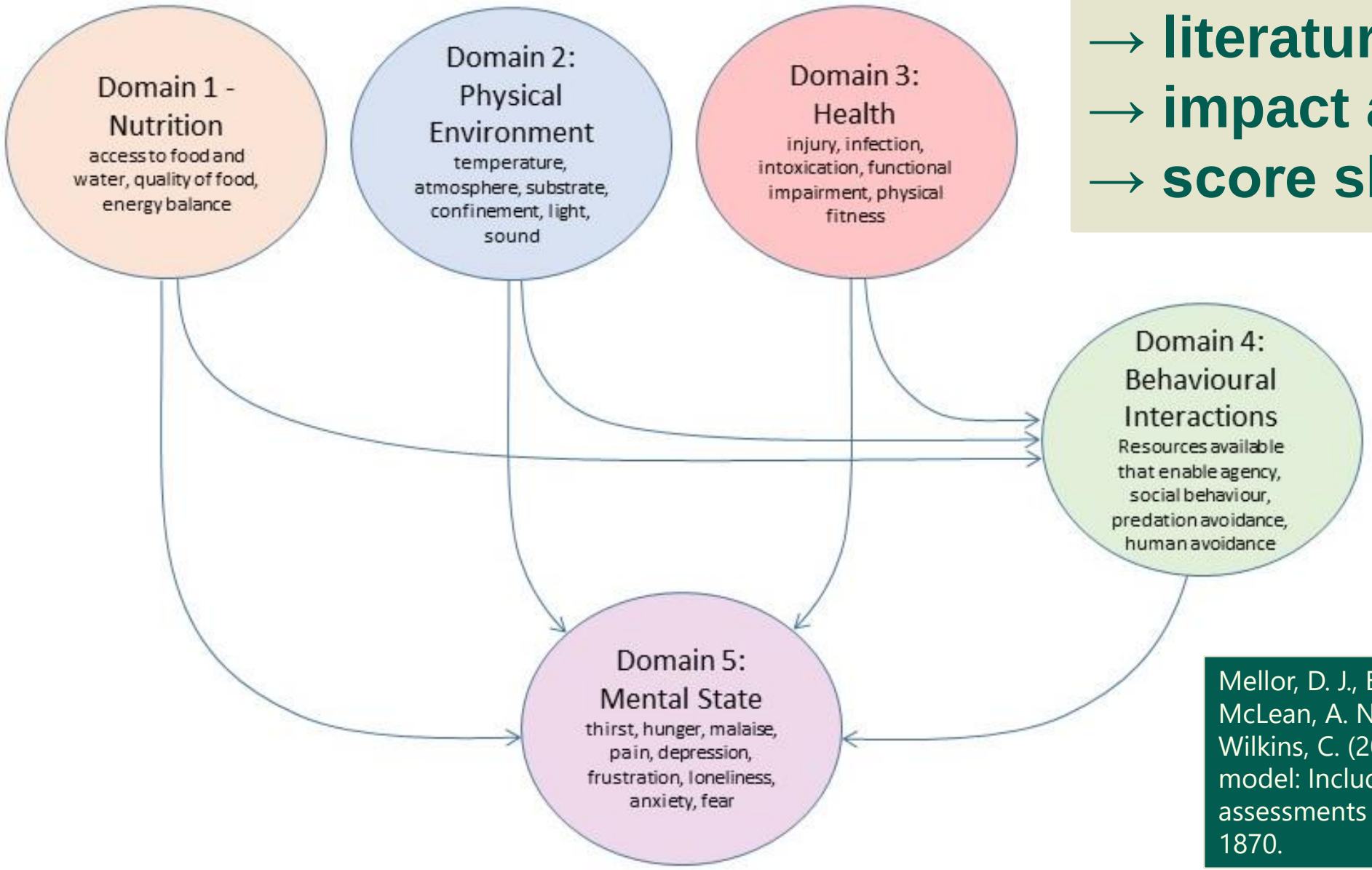

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Table 2. Rubric developed from the Five Domains Model (Mellor et al., 2020, Figure 5-1) by the project group and used in this report to assess short-term and long-lasting impacts on animal welfare from capture, handling, and marking of wild birds. Notably, the form is not developed for detailed evaluation of the immediate animal welfare impact during capture and handling and does consequently not take into account the potential fear and stress the bird experience in this situation. The three Domains: Nutrition (D1), physical environment (D2), and health (D3) are physiological responses, whereas a fourth domain covers behavioural responses (D4). The fifth domain (D5) is the integrated effects of the four other domains on the overall mental state of a research animal. Assessments were done separately for each method (and bird group) in Table 4. Probability (P) of an impact of the method on the species/species group on each subdomain under the first four domains was given a score from 0 (no), 1 (very low), 2 (low), 3 (moderate), 4 (high) to 5 (very high). Animal welfare assessment categories in the rightmost column: Probability of harm, Welfare impact, Risk assessment, correspond to the categories in the risk assessment matrix in Figure 3, and Table 6, and the confidence level corresponds to ratings of confidence in Table 7.

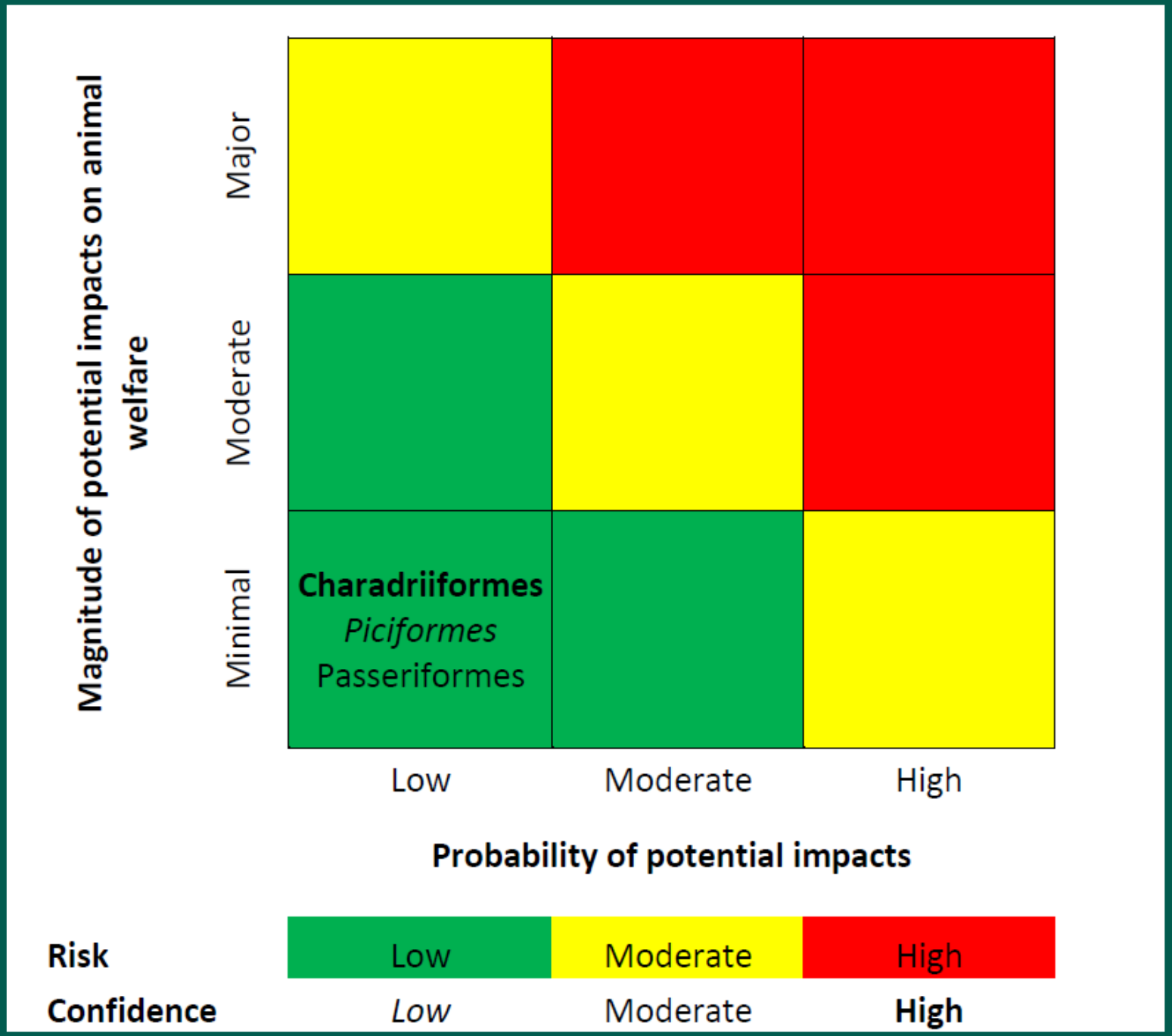
Method of capture/handling/sampling/marking:			**Species/species groups:**		
Physical/functional Domains:	**Observable indicators:**	**Welfare alerting indicators:**	**P** *(0-5)*	**Affective Experience Domain:**	**ANIMAL WELFARE ASSESSMENT:**
Domain 1: Nutrition				Domain 5: Mental State	**Probability of harm:** *(low – moderate – high)*
a) Restricted water intake	Physical examination (sunken eyes, skin fold) blood variables	Bird not drinking while other drinks		*Thirst*	
b) Restricted food intake	Body condition score, fat score, body mass, growth rate	Bird not foraging when this would be normal behavior		*Hunger*	
c) Low food quality/variety	Variable malnutrition syndromes	Bird not foraging on preferred food		*Malaise of malnutrition*	
d) Energy expenditure	Body condition score, fat score, body mass, growth rate	Mass of device relative to bird mass		*Hunger, weakness, exhaustion*	
Domain 2: Physical Environment					**Welfare impact:** *(minimal – moderate – major with regard to intensity and/or duration)*
a) Entrapment/confinement during procedures	Time, character, bird behavior, capture myopathy	Mounting and design of device, bird behavior		*Anxiety, fear, hypervigilance,*	
b) Thermal extremes	Physical examination/ necropsy, respiratory rate	Metal on skin, feather loss/damage, heat generated from glue or device, icing on tag		*Feeling frozen, feeling overheated*	

c) Aerodynamics/balance/drag	Flight, diving, movement pattern, reduced performance	Bird seeming to be uncomfortable with device		*Unease, frustration, helplessness*	
d) Entanglement	Examination/necropsy, mortality	Shape/form of device or harness		*Pain, frustration, helplessness*	
Domain 3: Health					**Risk Assessment:** *(low – moderate – high risk of harm to animal welfare)*
a) Decreased comfort	Trying to remove device, time used for preening, feather picking	Posture, restlessness, stretching		*Discomfort, frustration*	
b) Injury c) Disease susceptibility	Clinical signs/necropsy lesions, mortality	Lameness, lethargy, feather loss, abrasions		*Pain, breathlessness, debility, weakness, sickness, malaise, nausea, dizziness*	
Domain 4: Behavioural Interactions					**Confidence Level:** *(low – moderate – high)*
- with environment					
a) Habitat use, spatial/temporal	Habitat shift	Increased movement		*Frustration, confusion*	
b) Activity, foraging	Aberrant activity pattern, time budget	Changes in activity pattern, time budget		*Unease, confusion, fear*	
c) Migration, movement	Reobservation rate, location use, route, aberrant movement pattern	Delay, route deviation, atypical movement pattern		*Anxiety, fear, frustration*	
- within species					**Central References:**
d) Social behavior	Aggression, social exclusion, isolation	Withdrawal from interaction		*Loneliness, depression, frustration, fear*	
e) Mating	Pairing or mating success	Species-specific behavior		*Frustration, confusion*	
f) Reproduction	Reproductive output, hatching success	Parental behavior, attendance, abandonment of nest/brood		*Frustration, confusion*	
- with other animals					
g) Probability of predation	Predation mortality, escape behavior, increased vigilance	Visibility, loss of camouflage, impairment, decreased shyness		*Fear, anxiety, hypervigilance*	

Method of capture/handling/sampling/marking: surgical implants			**Species/species groups:**		
Physical/functional Domains:	**Observable indicators:**	**Welfare alerting indicators:**	P *(1-5)*	**Affective Experience Domain:**	ANIMAL WELFARE ASSESSMENT:
Domain 1: Nutrition				Domain 5: Mental State	**Probability of harm:**
a.					
b.					
c.					
d.					
Domain 2: Physical Environment					**Welfare impact:**
a.					
b.					
c.					
d.					
Domain 3: Health					**Risk Assessment:**
a.					
b.					
c.					
Domain 4: Behavioural Interactions					**Confidence Level:**
- with environment					
a.					
b.					
c.					
- within species					**Central References:**
d.					
e.					
f.					
- with other animals					
g.					
h.					
- with humans					
i.					

VKM risk assessment

→ for each method and bird group



Definitions of categories

Magnitude of impact

Rating	Descriptors
Minimal	Negligible or minimal impact on the welfare of individual birds, either short-term (< a few weeks) with minimal intensity or transient with moderate intensity, resulting in no or minimal changes in welfare-alerting or observable indicators.
Moderate	Impact(s) with long-term (> month) or short-term moderate or transient high intensity, resulting in moderate changes in welfare-alerting or observable indicators
Major	Impact with short- or long-term high intensity, resulting in major changes in welfare-alerting or observable indicators.

Probability of impact

Rating	Descriptors
Low	Negative consequences would be expected to occur with a probability of 0-10%
Moderate	Negative consequences would be expected to occur with a probability of 10-50%
High	Negative consequences would be expected to occur with a probability of 50-100%

Confidence in risk assessment

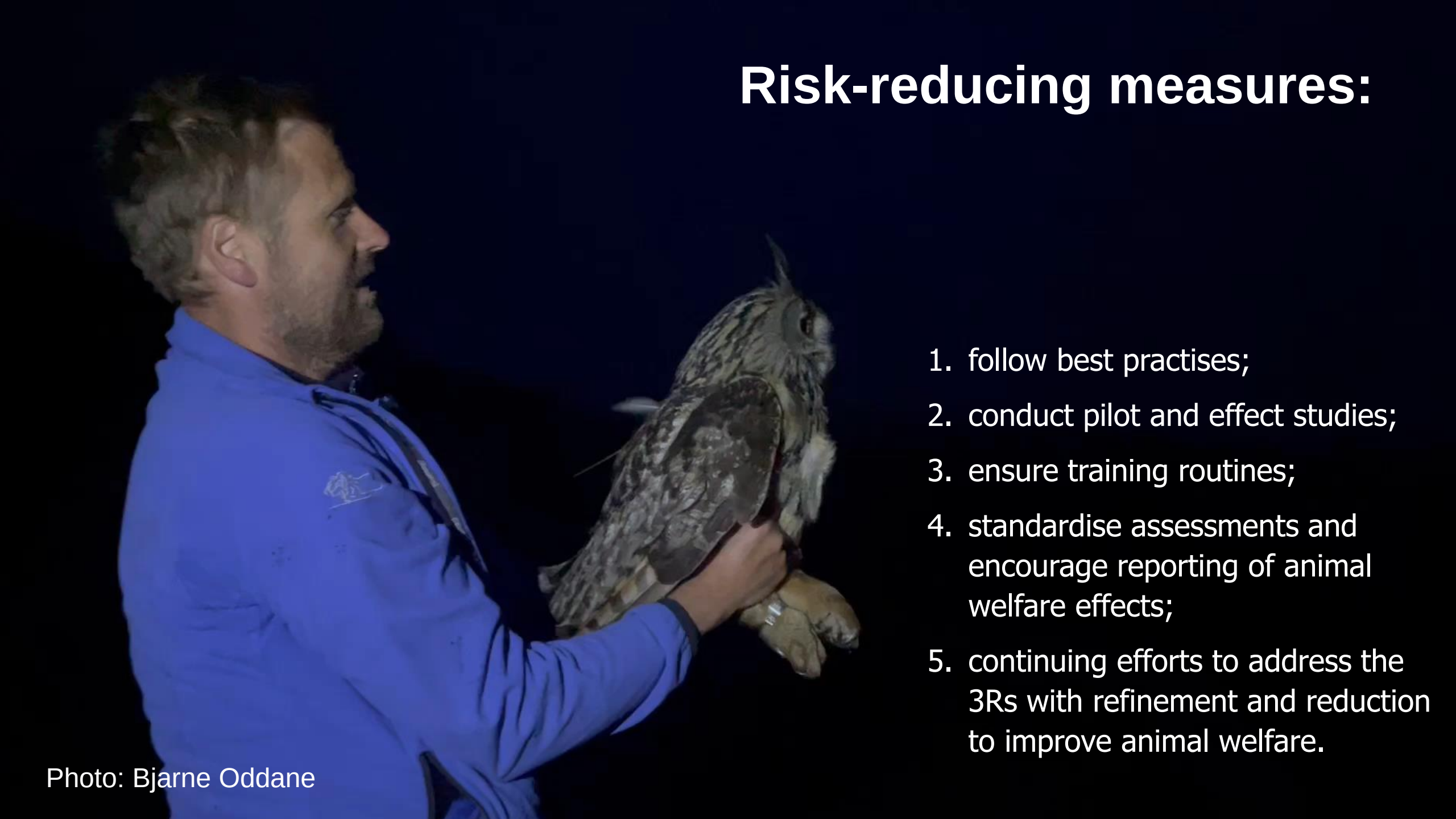
Rating	Descriptors
Low	There are no published data, or the available information on the topic is very limited and/or the available information is very divergent regarding impacts on animal welfare, and mostly expert judgements are used. These are based on the accumulated observations of wild birds by the expert panel, combined with inferences from human experience with similar situations.
Moderate	Some published information with some degree of consistency exists on the topic, but there is a need for more specific or detailed data OR the published literature presents discrepant results regarding impacts on animal welfare, and expert judgements are still used.
High	There is sufficient and consistent published information, and expert judgments are in concurrence. The topic is very well investigated in peer-reviewed journals, with consistent results regarding impacts on animal welfare.

Results

Table 4. Overview of methods described and assessed in this report; the assessed risks (Low, Moderate, or High) for specific methods; and whether the risk assessment was confirmed *[→]*, downgraded *[↓]* or upgraded *[↑]* compared to the risk assessments in VKM 2013. More than one change per method is possible when effects depend on bird group; for example, both confirmed and downgraded *[→ ↓]*. NA: No formal risk assessment in VKM 2013. For the methods marked with an asterix (*), the Five Domains scores sheet(s) (Table 3) is(are) included in a An electronic Supplementary Information.

Risk:	Low	Mod	High	VKM 2013
Chapter 8: Capture				
Mistnets	■			↓
Corral, funnel, and walk-in traps	■			NA
Drop nets	■			NA
Pull nets, flip nets, and bow nets	■			NA
Nestbox traps	■			NA
Crow traps	■			NA
Noose carpets and noose lines, leg noose traps	■			NA
Raptor traps (dho-gaza, bal-chatri, and box traps)	■			NA
Night captures with spot-lights, thermal imaging and dip nets	■			NA
Noosing poles and hooks, dip nets, cast nets and hoop nets	■			NA
Net guns	■	■		NA
Cannon and rocket nets	■	■		NA
Chapter 9: Handling and sampling				
Handling and capture myopathy		■		NA
Blood sampling	Best practice described			NA
Feather sampling	Best practice described			NA
Cloacal and oral swabs for microbes and sperm	■			NA
Sedatives and anaesthesia	Best practice described			NA
Chapter 10: Marking for individual identification (no tracking or logging)				
Temporary feather dyes	■			→
Metal rings	■	■	■	→↑
Colour rings and leg flags	■	■	■	→↑
Patagial wing and web tags	■	■	■	→↑
Nasal discs and saddles	■		■	→↑
Neck bands*	■	■	■	→↑
Flipper tags on penguins*			■	↑
Chapter 11: Marking for tracking and logging (types of tags) – for risk assessment: see Mode of				
Radio Frequency Identification (RFID)	Method described			
Light loggers	Method described			
VHF radios	Method described			
GPS tags	Method described			
Satellite tags (archiving and non-archiving)	Method described			
Accelerometers	Method described			
Time-depth-recorders (TDR)	Method described			
Other biologgers	Method described			
Video cameras	Method described			
Chapter 12: Mode of attachment (of tags for tracking and logging)				
Glue and tape methods	■	■		→↑
Sutures, subcutaneous anchors and PIT tags*	■	■	■	→ (PIT) NA
Tail mounted tags*	■	■		NA
Leg mounted tags*	■	■	■	NA
Necklace collars	■	■		NA
Leg-loop harness	■	■	■	↓ NA[1]
Backpack (thoracic) harness*	■	■	■	→↓
Surgical implants*	■	■		→↓

Risk-reducing measures:



1. follow best practises;
2. conduct pilot and effect studies;
3. ensure training routines;
4. standardise assessments and encourage reporting of animal welfare effects;
5. continuing efforts to address the 3Rs with refinement and reduction to improve animal welfare.

Photo: Bjarne Oddane

Striking a balance between animal welfare considerations and filling important knowledge gaps