Method of trapping/marking: VHF/GPS tag, tailmount			**Species/species groups:** Procellariformes, Charadriformes, Accipitriformes, Caprimulgiformes, Piciformes, Passeriformes		
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:** *Very low, except for alcids.*
a) Restricted water intake					
b) Restricted food intake	In breeding European storm-petrels there was no negative effect of tail-mounted GPS-tag on adult body mass. [5]	None.	0		
c) Low food quality/variety					
d) Energy expenditure	In breeding European storm-petrels there was no negative effect of tail-mounted GPS-tag on adult body mass. [5]	None.	0		
Domain 2: Physical Environment					**Welfare impact:** *Minimal, except for alcids.*
a) Entrapment/confinement during procedures	In Pileated woodpeckers, survival decreased with increasing handling time (time from capture to release). With handling time restricted to 30 minutes, all 30 Pileated woodpeckers marked with tail-mounted tag survived the first 3 months after capture. [1]	Long handling time and many procedures.	1	*Anxiety, fear, hypervigilance,*	
b) Thermal extremes					
c) Aerodynamics/balance/drag					
d) Entanglement					
Domain 3: Health					**Risk Assessment:** *Very low risk of harm to animal welfare, except for alcids.*
a) Decreased comfort	Among European starlings in captivity, birds with tail-mounted mock transmitters showed pecking and preening at the attachment site than the birds with other methods of tag attachment (leg-loop backpack harness and glued backpack). [3]	Extensive pecking and preening.	1	*Discomfort, frustration*	
b) Injury	Among previously radio-tagged (fully grown juveniles in captivity before release or nestlings over six weeks old) Red kites, no pathological lesions were detected in birds with tail-mounted tag. [4]	None.	0		
c) Disease susceptibility					
Domain 4: Behavioural Interactions					**Confidence Level:** *High level of confidence because most studies have fairly large or large sample*
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging	Among European starlings in captivity, birds with tail-mounted	Altered activity pattern and time budget.	2	*Unease*	

	mock transmitters showed less behavior response than the birds with other methods of tag attachment (leg-loop backpack harness and glued backpack). [3] Among breeding Common murres and Razorbills, tagged birds made fewer foraging trips (had fewer absences from the nest) per day than control birds, and each trip lasted longer for tagged birds than for control birds. The proportion of arrivals at the nest with fish tended to be lower for tagged birds than for control birds. [6]				*size. No reason to suspect more than minor differences between species, except possibly for alcids.*
c) Migration, movement	In Pileated woodpeckers, survival was higher for birds with tail-mounted tag than for birds with leg-loop mounted tag, and decreased with increasing handling time (time from capture to release). With handling time restricted to 30 minutes, all 30 Pileated woodpeckers marked with tail-mounted tag survived the first 3 months after capture. [1]		1	*Anxiety*	
- within species					**Central References:** 1 = Noel et al., 2013 2 = Shewring et al., 2020 3 = Woolnough et al., 2004 4 = Peniche et al., 2011 5 = Bolton, 2020 6 = Wanless et al. 1989
d) Social behavior					
e) Mating					
f) Reproduction	In European nightjars, no evidence was identified to support a negative effect of tail mounted radio tag deployment (either male, female or both mates) on the nest success (proportion successful) or daily nest survival rate. [2] In breeding European storm-petrels there was no negative effect of tail-mounted GPS-tag on daily nest survival rate. [5]	None.	0		
- with other animals					
g) Probability of predation					
h) Competition, kleptoparasitism					
- with humans					
i) Handling	In Pileated woodpeckers, survival decreased with increasing handling time (time from capture to release). With handling time restricted to 30 minutes, all 30	Long handling time and many procedures.	1	*Fear, anxiety*	

	Pileated woodpeckers marked with tail-mounted tag survived the first 3 months after capture. [1]				

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Method of capture/handling/sampling/marking: neck band			**Species/species groups:** geese (2 refs) and swans (1 ref) (Anseriformes)		
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:** From low to high
a.					
b.					
c.					
d.	Pink-footed geese. *Anser brachyrhynchus.* There was no detectable difference in body condition, assessed by an abdominal profile index, of geese which had experienced no, light or heavy icing of neckbands.[10] Greater snow geese. *Chen caerulescens.* Reduced body condition of geese with neck collars.[8] Greenland white-fronted geese *Anser albifrons flavirostris*. There were no significant differences between the API scores (body condition index) of iced and non-		0 3 0		

	iced geese prior to, during and immediately after the icing period, during the mid-staging period, or prior to departure (Fig. 1).[6] Black Swan. *Cygnus atratus*. Collared Black Swans in our population did not differ in body condition from those that were uncollared.[7] Pink-footed geese *Anser brachyrhynchus*. We found no support for a long-term effect of neckbands on the body mass of individual birds, indicating that the capture and handling event might be the main contributory cause to the transitory decline in body condition.[4]		0 1		
Domain 2: Physical Environment					**Welfare impact:** Potentially high, but anything from low to high
a.					
b.					
c.					
d.					
Domain 3: Health					**Risk Assessment:**
a.					

b. c.					Potentially high, but anything from low to high
Domain 4: Behavioural Interactions	Pink-footed Geese *Anser brachyrhynchus*. Results indicate that capture and marking substantially altered behaviour of marked birds in the days immediately after capture, but also that this effect faded quickly and was not discernible six days after marking. Our study indicates that, after an initial period of discomfort, neck collars and GPS collars are suitable for studying the behaviour of individual geese.[5] Black Swan. *Cygnus atratus.* Collars had no significant effect on the proportion of time Black Swans spent on different behaviours in the non-breeding season. However, post hoc power analysis indicated that we had a <80% chance of detecting a 5% change in activity budget between collared and uncollared Swans. Thus, we cannot discount the possibility of Type II error, that is that our sample size was too small to allow us to detect small		**1** **1**		**Confidence Level:** Low (because results are very variable)

	changes in behaviour caused by neck-collars. [7]				
- with environment					
a.					
b.					
c.	Ross's geese. *Anser rossii*. Estimates of survival in adults with neckbands were an average of 0.16 (range: 0.12 to 0.20) lower than were estimates for adults with only legbands; annual mortality probabilities of adults marked with neckbands were 1.94 to 2.62 times higher than mortality of adults with legbands only. Neckbands had a smaller effect on juvenile survival, reducing it by an average of 0.05 (range: 0.04 to 0.08) compared to those with legbands only; annual mortality rates of neckbanded juveniles were only 1.06 to 1.13 times higher than juveniles with only legbands. Negative effects of neckbands on goose survival may result from nonhunting mortality (e.g., icing), greater harvest rate of neckbanded birds via hunter selection, or some interplay		4		

	between nonhunting and hunting mortality.[2]				
	Ross's geese. *Chen rossii*. Mortality rates of neckbanded birds were about twice a as those of legbanded birds, with no difference between neckband colour, suggesting that the neckbands themselves were responsible for the decline in survival. *Icing, increased energetic and thermodynamic costs, and increased risk of predation* warrant further investigation into their contribution to reduced survival in Ross's geese and other goose species.[3]		5		
	Greater snow geese. *Chen caerulescens atlantica*. We conclude that neck bands did not affect survival.[11]		0		
	Snow goose. *Anser caerulescens.* Neck-collared birds experienced a stronger decline in survival compared to noncollared birds		3		

	...when hunting regulations were liberalized in both Canada and the United States (not sure wheat is due to marking and what is due to increased hunting [marked birds more conspicuous]).[9] <u>Greylag Geese.</u> *Anser anser*. Corrected for the effects of sex, age at marking and years since marking, survival did not differ between geese with and without a neckband.[13] <u>White-fronted geese.</u> *Anser albifrons frontalis*. Survival probability of neckbanded + legbanded birds annually ranged from 0.006 to 0.23 lower than for legbanded only birds.[1] <u>Canada geese.</u> *Branta canadiensis hutchinsi*. Survival probability of neckbanded + legbanded birds annually ranged from 0.006 to 0.23 lower than for legbanded only birds.[1]		0 4 4		

	Canada geese and white-fronted geese. No effects on neckbands on fidelity probability [1] Greater snow geese. *Chen caerulescens atlantica*. Neck-banded females: apparent survival rate was not affected compared to leg-banded only or unbanded females. [12]		0 0		
- within species					**Central References:** 0 = own expert judgement, 1 = Alisauskas & Lindberg 2002, 2 = Alisauskas et al. 2006, 3 = Caswell et al. 2012, 4 = Clausen & Madsen 2014, 5 = Clausen et al. 2020, 6 = Fox et al. 2014, 7 = Guay & Mulder 2009, 8 = Legagneux et al. 2013, 9 = LeTourneux et al. 2022, 10 = Madsen et al. 2001, 11 = Menu et al. 2000, 12 = Reed et al. 2005, 13 = Schreven & Voslamber 2022
d.					
e.					
f.	Greater snow geese. *Chen caerulescens atlantica*. Breeding propensity, indexed by capture probabilities of neck-banded females was, on average, 48% lower than that of leg-banded-only females but clutch size was only 10% lower. Neck-banded females: nest initiation and hatching dates, and nest survival were not affected compared to leg-banded only or unbanded females. [12]		3		
- with other animals					
g.					
h.					

- with humans					
i.					

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Method of trapping/marking: Coelomic surgical implant			**Species/species groups:** Large waterbirds (divers, loons, auks, cormorants, ducks, geese etc.), large waders, raptors		
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:** *moderate*
a) Restricted water intake			1		
b) Restricted food intake	No impact on long term body weight in macaroni penguins[1].	Temporal after surgery[0]	1		
c) Low food quality/variety					
d) Energy expenditure	No impact on long term body weight in macaroni penguins[1].		1		
Domain 2: Physical Environment					**Welfare impact:** *severe in cases with mortality, otherwise medium*
a) Entrapment/confinement during procedures	Long handling time (0,5-1 h)[0]		4	anxiety, fear	
b) Thermal extremes			1		
c) Aerodynamics/balance/drag	Thought to not affect[0]		1		
d) Entanglement	Reducing probability[0]		1		
Domain 3: Health					**Risk Assessment:** *moderate*
a) Decreased comfort	Implanted eider ducks showed acute decreased comfort after surgery and were more likely to pick or preen on incision site and antenna exit site than controls, but spent little time preening and showed no gross behavioural changes[6].	Temporal after surgery[0]	5	discomfort	
b) Injury c) Disease susceptibility	1 % mortality associated with implant in Canada geese[3]. Lower survival first year after marking, but not subsequent years in eider ducks[6]. Five of 43 godwits either died during or were euthanized because of inability to stand after surgery[5].		1	pain, debility, sickness	
Domain 4: Behavioural Interactions					**Confidence Level:** Medium due to few studies and often small sample sizes of treated individuals, though some studies include large sample populations. Suspected large species differences increases uncertainty.
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging	Adélie penguins with implants had longer foraging trips with more frequent dives of shorter duration than birds with external devices[12]. Little penguins with implants spent a similar proportion of time at sea	No impact on return date after pre-moult foraging or duration of incubation foraging trip in macaroni penguins[1].	1	unease	

	and did a similar number of forage trips as non-marked individuals[15].				
c) Migration, movement	No impact on return rate after migration in macaroni penguins[1]. Saker Falcons with radio-tags and others marked only with leg bands and implanted transponders had the same recapture rate (7%) in autumn, indicating similar survival[8]. No impact on survival in mallards[7]. No difference in survival observed between scoters with coelomic implant, subcutaneous implant and external mounts. Breeding site attendance were lower and occurred later in seaducks one year after marking compared to subsequent years[11]. No difference in recapture rate between implanted harlequin ducks and banded controls[14]. In 2600 female mallards with implants, recovery rates and survival did not differ from expectations based on other studies of band-marked females[17]	No impact on return date after migration in macaroni penguins[1]. Small impact on laying dates in common eider[2]. Arrival of female Canada geese affected some, but not all years[3]. No impact on dispersal in mallards[7].	2	frustration	
- within species					**Central References:** 0 = own expert judgement 1 = Green et al., 2004 2 = Guillemette et al., 2002 3 = Hupp et al., 2006 4 = Arnold et al., 2012 5 = Mulcahy et al. 2011 6 = Fast et al., 2011 7 = Sheppard et al., 2017 8 = Kenward et al., 2001 9 = Iverson et al., 2006 10 = Whidden et al., 2007 11 = Lamb et al., 2020 12= Beaulieu et al., 2010 13 = Bloom et al., 2012 14 = Esler et al., 2000 15 = Ritchie et al., 2010 16 = Hooijmeijer et al., 2014 17 = Arnold & Howerter, 2012
d) Social behavior					
e) Mating					
f) Reproduction	No impact on breeding success or chick body mass in macaroni penguins[1]. No impact on clutch sizes or hatching success in common eider[2]. No impact on nesting date, clutch size or egg volume in Canada geese[3]. Nest abandonment in eider ducks that were implanted during nesting period[6]. No impact on reproductive effort in mallards[7]. Reduced fledging success and nestling growth rate in tufted puffins implanted while in nest[10]. Decreased survival in mallard ducklings raised by females with anchor-suture transmitters compared to females with implants[13]. Black-tailed godwits showed reproduction failure		2	frustration	

	(decreased egg viability) after implantation[16].				
- with other animals					
g) Probability of predation	No impact on return rate after migration in macaroni penguins[1].		1		
h) Competition, kleptoparasitism	No impact on long term body weight in macaroni penguins[1].		1		
- with humans					
i) Handling	Initially increased dispersion of marked sea ducks, but returned to normal 5 days after[11].	Long handling time, anaesthesia, surgery[0]	2	fear, anxiety	

Mode of attachment; sutures, subcutaneus anchors and subcutaneous PIT-tags			Species/species groups: Gaviiformes, Anseriformes, Charadriiformes		
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: *Low to moderate.*
a) Restricted water intake					
b) Restricted food intake	No change body mass or growth rate in chicks[9]. Body mass after 0,5 years did not significantly differ from controls[5]. No effect[7]. Effect?[1].	Temporal after procedure[0]	1		
c) Low food quality/variety					
d) Energy expenditure	No change in daily energy expenditure in chicks[9]. Possibly increased energy expenditure[12]. No effect[7]. Effect?[1].		2		
Domain 2: Physical Environment					Welfare impact: *Low long-term, but moderate during procedure. For young chicks in some species there is a higher risk of mortality, and therefore the welfare impact is severe.*
a) Entrapment/confinement during procedures	Handling time[0]. No effect[13]. No effect[8].		3	Anxiety, fear	
b) Thermal extremes	No effect[13]. No effect[7].		1		
c) Aerodynamics/balance/drag	No effect[13]. No effect[7]. Effect?[1].		2		
d) Entanglement	Reducing probability[0]. No effect[13]. No effect[7]		1		
Domain 3: Health					Risk Assessment: *Low to moderate. Special considerations must be taken when considering attaching equipment with these methods on young chicks.*
a) Decreased comfort	Anecdotal observation[4]. No observable effect[13].	Temporal after procedure[0].	3	discomfort	
b) Injury c) Disease susceptibility	Reduced cumulative survival of ducklings to day 30 but this is the effect of marking the ducklings[2]. No effect on chick survival rate[9]. No effect[13]. Followed chicks for 2-6 weeks and no problems such as infection was observed[15]. 3% of birds died from surgical trauma		3	Local irritation, pain, pruritus	

	less than 5 days after procedure[7]. Increased mortality 14 days postattachment, may be direct result of infection(greater risk with 2 sc anchors than 1). No infections were observed when recaptured[14].				
Domain 4: Behavioural Interactions					Confidence Level: Medium due to few studies and often small sample sizes of treated individuals, though some studies include large sample populations. Suspected large species differences increases uncertainty.
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging	No change in activity pattern in chicks[9]. No effect[13]. No long-term changes observed[14].		1	unease	
c) Migration, movement					
- within species					Central References: 0 = own expert judgement 1 = Ackerman et al., 2004 2 = Amundsen et al., 2010 3 = Arnold et al., 2012 4 = Bloom et al., 2012 5 = Farr et al., 2021 6 = Fondell et al., 2008 7 = Hepp et al., 2002 8 = Herzog et al., 2020 9 = Kenow et al., 2003 10 = Lewis et al., 2017 11 = Nicolaus et al., 2008 12 = Northrup et al., 2018 13 = Schlicht et al., 2018 14 = Schroeder et al. 2011 15 = Scriba et al., 2013

Method of capture/handling/sampling/marking: VHF/GPS/satellite tag, mounted on the back with a backpack harness			**Species/species groups:** owls (Strigiformes)		
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
a.	Owl usually they get the water they need from the prey they consume		0*		
b.	Tawny owl. No effect on body mass[4].		0		
c.					
d.	Tawny owl (juveniles): We (…) envisage that the adverse effects were linked to an increased weight burden that made birds less efficient at foraging[3].		3	hunger, weakness, exhaustion	
Domain 2: Physical Environment					**Welfare impact:** Moderate
a.					
b.					
c.					
d.		Snowy owl. Transmitters were hidden in the plumage and observations of the antennas sticking	0		

		out at the back suggested that transmitters were still well positioned on the birds[5].			
Domain 3: Health					**Risk Assessment:** Low
a.	Burrowing owl: Many of the radioharnessed owls were observed biting at the harnesses and preening[1],	Tawny owl (juveniles): We recorded no negative physical or behavioural effects of radio tags[3].	2/0	Discomfort	
b.		Tawny owl. Subsequent examination of dead juveniles showed that harnesses fitted well, had been groomed under the feathers and had caused no skin abrasions[3]. Tawny owl. The single case (out of 51) of an abrasion caused by a too-narrow harness emphasizes the importance of considering the annual variation in fat deposition rate when fitting the harness[4]. Stunted feather growth and an increased subcutaneous fat layer beneath the body of the tag, which was the usual physiological reaction to	0	Pain or discomfort	
c.					

		the tag, must be characterized as a normal and undisruptive response. [4].			
Domain 4: Behavioural Interactions					**Confidence Level:** Moderate
- with environment					
a.	Snowy owl. Summer movement patterns, combined with ground checks in several cases, suggested that all successfully tracked birds initiated a nest every year after marking[5].		0		
b.	Snowy owl. Overall, our data indicate that life history traits of adult, female snowy owls were not affected by satellite transmitters[5].		0		
c.	Tawny owl (juveniles): Radios had (…) a significant negative effect on juvenile survival (x21 = 6.00, P = 0.01)[3]. Tawny owl. No effect on survival[4].	Burrowing owl: It seems more likely that the additional mortality was caused by disrupted patterns of owl behavior. Many of the radioharnessed owls were observed biting at the	2	frustration	

	Snowy owl. 1 year after marking, all successfully tracked birds settled in confined areas. ... marked birds were resighted and appeared healthy[5].	harnesses and preening, and the most frequent known cause of death was predation[1]. Snowy owl: The authors found no evidence of mortality caused by the PTT devices in the present study, although a lowered survival rate of equipped Snowy Owls cannot be excluded based on available data[2].	1		
- within species					**Central References:** 0 = own expert judgement, 1 = Gervais et al. 2006, 2 = Heggøy et al. 2017, 3 = Petty et al. 2004, 4 = Sunde 2006, 5 = Therrien et al. 2012
d.					
e.					
f.	Tawny owl (juveniles): Radios had no significant effect on yearling breeding probability (x21 = 1.1, P = 0.29)[3]. Tawny owl. No effect on breeding frequency, clutch size, or recruitment of juveniles[4]. Snowy owl. For 7 of these 8 birds, we found a nest. GPS	Burrowing owl: Owls distracted by harnesses will not be as vigilant, and perhaps not as responsive to the needs of their young, as owls without transmitters[1].	0/2	No effect /frustration	

	poistions strongly suggest that the last female was breeding to, and also that the birds settled and bred again in 2009 and 2010[5].				
- with other animals					
g.	Tawny owl (juveniles): We (…) envisage that the adverse effects were linked to an increased weight burden that made birds (…) more vulnerable to predators[3].		3	Anxiety, hypervigilance	
h.					
- with humans					
i.					

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4. Sunde, P. (2006). Effects of backpack radio tags on tawny owls. *The Journal of wildlife management*, 594-599.
5. Therrien, J. F., Gauthier, G., & Bêty, J. (2012). Survival and reproduction of adult snowy owls tracked by satellite. *The Journal of Wildlife Management*, *76*(8), 1562-1567.
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Method of trapping/marking: VHF/GPS tag, full body (wing) harness			**Species/species groups:** Anseriformes,		
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:** *Very low*
a) Restricted water intake					
b) Restricted food intake	Body mass of Barnacle geese during molt did not differ between birds with GPS-logger, geolocator, or only colored legband. [2]	None.	0		
c) Low food quality/variety	Variable malnutrition syndromes				
d) Energy expenditure	Body mass of Barnacle geese during molt did not differ between birds with GPS-logger, geolocator, or only colored legband. [2]	None.	0		
Domain 2: Physical Environment					**Welfare impact:** *Minor*
a) Entrapment/confinement during procedures					
b) Thermal extremes					
c) Aerodynamics/balance/drag	Pintails with GPS tag moved slower on spring migration (started from the overwinter area at the same time but arrived at breeding sites later) than control (ringed) birds, and also moved slower on autumn migration. [1]	Delayed arrival at breeding site and at overwinter area.	2	Exhaustion.	
d) Entanglement					
Domain 3: Health					**Risk Assessment:** *Low risk of harm to animal welfare.*
a) Decreased comfort	Captive Canada geese with back-pack or neckband tags exhibited discomfort behaviours at a similar level during a short habituation period. [3] Female Barrow´s goldeneyes with transmitters spent less time feeding and more time in maintenance activities than females without transmitters, while mean time devoted to other behavior did not differ. [4]	Altered posture and activity pattern.	1	*Discomfort, frustration*	
b) Injury	Of 18 Barnacle geese with harness-attached GPS-loggers recaptured during molt, 12 were either not damaged, or only missing some down feathers in the axillar region or had some broken back feathers below the logger, 4 were missing feathers in	Feather loss in some cases, abrasions in rare cases	2	Moderate pain in rare cases	
c) Disease susceptibility					

	the axillar region and had broken back feathers, and 2 had suffered from more severe damage, showing old wounds in the axillar region. [2]				
Domain 4: Behavioural Interactions					**Confidence Level:** *High level of confidence because most studies have fairly large or large sample size. Little reason to suspect large differences between species.*
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging					
c) Migration, movement	Pintails with GPS tag moved slower on spring migration (started from the overwinter area at the same time but arrived at breeding sites later) than control (ringed) birds, and also moved slower on autumn migration. [1] Greater white front geese, Brent geese and Barnacle geese) with GPS-loggers or GPS-GSM transmitters experienced reduced one-year return rates compared to their control group. This did not differ between species and sex/age groups. [2] There were no differences in departure from wintering grounds or in migration speed of Barnacle geese with harness-attached GPS- loggers and those with geolocators. [2] None of 16 female Barrow´s goldeneyes harnessed were recaptured in nest boxes or seen again on the study area, while 66% of those captured in nest boxes and marked with legs bands were either re-captured or seen again in subsequent years. [4] None of the tagged male Light-bellied brent geese showed obviously delays in their migration timing relative to the rest of the population. [5]	Negative effect on migration speed in Pintails, but not in Barnacle geese and Light-bellied brent geese. Reduced return rate after one or more years in female Barrow ´s goldeneye and in Greater white front geese, Brent geese and Barnacle geese.	2		
- within species					**Central References:** 1 = Hupp et al., 2015 2 = Lameris et al., 2018
d) Social behavior					
e) Mating					

f) Reproduction	Clutch size of Barnacle geese did not differ between those with GPS-logger and those with geolocators or other birds in the colony, but geese with GPS-loggers initiated egg laying later than geese with geolocators and other geese in the colony. [2]	Negative effect on egg laying date, but not on clutch size, in Barnacle geese.	1		3 = Kölzsch et al., 2016 4 = Robert et al., 2006 5 = Vissing et al., 2020 6 = Lameris & Kleyheeg 2017
- with other animals					
g) Probability of predation					
h) Competition, kleptoparasitism					
- with humans					
i) Handling					

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4. Robert, M., Drolet, B., & Savard, J. P. L. (2006). Effects of backpack radio-transmitters on female Barrow's goldeneyes. *Waterbirds*, *29*(1), 115-120.
5. Vissing, M. S., Fox, A. D., & Clausen, P. (2020). Non-stop autumn migrations of Light-bellied Brent Geese Branta bernicla hrota tracked by satellite telemetry–racing for the first Zostera bite?. *Wildfowl*, *70*(70), 76-93.
6. Lameris, T. K., & Kleyheeg, E. (2017). Reduction in adverse effects of tracking devices on **waterfowl** requires better measuring and reporting. Animal Biotelemetry, 5, 1-14.

Not added in score sheet but taken on board in the risk assessment in the main report:

The main problematic features of harness backpacks are that they are relatively large external structures causing abrasion and drag, disrupt waterproof plumage and that the harness may be too loose or too tight, partly depending on the bird's body stores, which can vary greatly over the year especially in migrants [30, 43, 61, 62]. Effects on survival are most often detected by low return rates of tagged birds to breeding or staging sites compared to ring-marked individuals. (…) In contrast, other studies did not find any effects of harness attachments on survival. (…)

Besides occasionally reported to increase mortality, harnesses have been found to affect behaviour of tagged birds. Disturbed behaviour shortly after tag deployment is reported regularly, involving increased maintenance behaviour and reduced foraging [6, 30, 32, 62, 65, 70]. In some studies, these effects diminished over time ([32], E.K. pers. obs.), while they persisted in others [30, 62]. In several cases, avoidance of water was observed, most likely due to loss of waterproofing capacity of the plumage caused by the harness, which may limit the access to food, reduce body condition and prompt (sometimes fatal) illness or starvation ([62, 30, 43, E.K. pers. obs.). On the longer term, feather and skin abrasion may occur, especially on the bird's back (underneath the transmitter) or at the pectoral muscle where the harness goes under the wing ([62], E.K. and T.L. pers. obs.).

There is also evidence that harnesses increase the cost of migration. The shape and size of external backpacks (including the presence of an external antenna) can greatly affect the drag during flight. (…) However, migration is not always affected given the lack of any difference in timing of arrival (…) If backpacks have a negative effect on migration and the condition of birds upon arrival on their breeding grounds, this may have carry-over effects on the breeding success, additional to potential direct effects of devices on breeding effort. Backpack attachments have been found to affect clutch size and timing and propensity of breeding.

Method of trapping/marking: VHF/GPS tag, full body (wing) harness			**Species/species groups:** Charadriformes		
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*
a) Restricted water intake					
b) Restricted food intake					
c) Low food quality/variety					
d) Energy expenditure					
Domain 2: Physical Environment					**Welfare impact:** *Major in cases with mortality, otherwise minimal*
a) Entrapment/confinement during procedures					
b) Thermal extremes					
c) Aerodynamics/balance/drag	No visible changes in harness position or tension when two Common Terns were recaptured, and both birds appeared to be good condition. [5]	None.	1		
d) Entanglement					
Domain 3: Health					**Risk Assessment:** *low risk of harm to animal welfare for gulls and skuas, moderate for terns*
a) Decreased comfort	Of 10 tagged Roseate terns, 3 birds got their bill lodged in the harness. [5]	Posture.	2	*Discomfort, frustration*	
b) Injury	Of 10 tagged Roseate terns, 2 birds were lethargic for at least 24 hours after tagging. Three birds got their bill lodged in the harness, and at least one of them died. [5] Of 2 recaptured tagged Common terns, the interscapular region under the transmitter of one female had a foul odor; the contour and down feathers appeared matted, presumably because this area could not be preened. Otherwise, the two recaptured individuals appeared healthy, although slightly reddened skin on the interscapular region of the male was detected. [5] Most recaptured Kittiwakes marked with the thoracic harness showed some degree of feather wear or abrasion. [7]	Lethargy, feather loss, abrasions.	3	*Pain, debility*	
c) Disease susceptibility					

Domain 4: Behavioural Interactions					**Confidence Level:** *High level of confidence because most studies have fairly large or large sample size. Little reason to suspect large differences between species, except possible for terns.*
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging					
c) Migration, movement	Great black-backed gulls with tag did not have lower return rate to breeding site after migration than control birds. [1] For Lesser black-backed gull there was no difference in over-winter return rates between tagged and control birds. [4] For Great skua, tagged birds had lower over-winter return rates than control birds. [4] In Sandwich terns, birds fitted with self-releasing harness might have experienced a lower survival rate than control birds. [6] Among Herring gulls, the return rate to the breeding colony in the following years did not differ between tagged birds and control birds. [8]	Negative effect on over-winter return rate in Great Skua and possibly Sandwich terns, but not in Herring gull, Great black-backed gull and Lesser black-backed gull.	2		
- within species					**Central References:** 1 = Lopez et al., 2024 2 = Manosa et al., 2004 3 = Kavelaars et al., 2018 4 = Thaxter et al., 2016 5 = Paton et al., 2020 6 = Fijn et al., 2024 7 = Clewley et al. 2022 8 = Clewley et al., 2021
d) Social behavior					
e) Mating					
f) Reproduction	Among breeding Great black-backed gulls, tagged birds had lower hatching success, but not lower fledging success, than control birds that had been trapped, but not tagged, and control birds that had not been trapped. [1] Among breeding Audouin´s gulls, hatching success was lower in pairs in which both members were tagged than in control pairs and pairs in which only one member was tagged, but did not differ between the two latter groups. [2]	No effect on propensity to breed or on clutch size in Herring gull. No effect on nest attendance in Kittiwake. Negative effect on hatching success in Great black-backed gull and Audouin´s gull, but not in Herring gull, Lesser black-backed gull, Common tern and Great skua. Slight negative effect on fledging success in Common tern, but no effect in Great black-backed gull, Lesser black-backed gull and Great skua.	2		

	Carrying devices did not have negative effects on offspring development or survival in Lesser black-backed gulls; no difference between offspring of pairs where both members were tagged, one member was tagged, and control pairs. [3] For Lesser black-backed gulls there was no difference between tagged birds and control birds in number of eggs hatched and number of chicks present per nest. [4] For Great skua there was no difference between tagged birds and control birds in number of eggs hatched, number of chicks per nest, and number of chicks fledged per nest. [4] In Common tern, the hatch rate was similar among nests of tagged birds, control nests, and in productivity plots, whereas the mean number of chicks fledged per pair tended to be slightly lower at nests of tagged birds compared to control nests and productivity plots. [5] Of 10 tagged Roseate terns, two birds deserted their nest. [5] Tagged Kittiwakes had a similar nest attendance rate to control birds, which was also similar to attendance of captured but untagged birds on an adjacent nesting area. [7] Among Herring gulls, the minimum number of eggs hatched in the year of capture/tagging, and the clutch size and propensity to breed in the following year, did not differ between tagged birds and control birds. [8]				
- with other animals					

g) Probability of predation					
h) Competition, kleptoparasitism	For Great skuas, there was no difference in territory attendance between tagged birds and control birds. [4]		0		
- with humans					
i) Handling					

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2 = Mañosa, S., Oro, D., & Ruiz, X. (2004). Activity patterns and foraging behaviour of Audouin's gulls at the Ebro Delta, NW Mediterranean. *Scientia Marina, 2004, vol. 68, num. 4, p. 605-614*.

3 = Kavelaars, M. M., Stienen, E., Matheve, H., Buijs, R. J., Lens, L., & Müller, W. (2018). GPS tracking during parental care does not affect early offspring development in lesser black-backed gulls. *Marine biology*, *165*, 1-8.

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5 = Paton, P. W., Loring, P. H., Cormons, G. D., Meyer, K. D., Williams, S., & Welch, L. J. (2020). Fate of Common (Sterna hirundo) and Roseate Terns (S. dougallii) with satellite transmitters attached with backpack harnesses. *Waterbirds*, *43*(3-4), 342-347.

6 = Fijn, R.C., van Bemmelen, R.S.A., Collier, M.P., Courtens, W., van Loon, E.E., Poot, M.J.M. & Shamoun-Baranes, J. 2024. Evaluation of tag attachment techniques for plunge-diving terns. Ibis xx: xxx-xxx. doi: 10.1111/ibi.13306

7 = G.D. Clewley, A. S. C. P. Cook, J. G. Davies, E. M. Humphreys, N. J. O'Hanlon, E. Weston, T. Boulinier & A. Ponchon (2022): Acute impacts from Teflon harnesses used to fit biologging devices to Black-legged Kittiwakes Rissa tridactyla, Ringing & Migration, 36(2): 69-77. DOI: 10.1080/03078698.2022.2151065

8 = Clewley, G.D., Clark, N.A., Thaxter, C.B., Green, R.M., Scragg, E.S. & Burton, N.H.K. 2021: Development of a weak-link wing harness for use on large gulls (Laridae): methodology, evaluation and recommendations. Seabird 33: 18-24.

Method of trapping/marking: VHF/GPS/geolocator tag, full body harness			**Species/species groups:** Apodiformes, Gruiformes, Passeriformes		
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*
a) Restricted water intake					
b) Restricted food intake					
c) Low food quality/variety					
d) Energy expenditure	In Common swifts there were no differences in body mass and wing length between returned logger birds and those logger birds which did not return to breeding site after migration. [2]	Mass of device relative to bird mass	0	*Hunger, weakness, exhaustion*	
Domain 2: Physical Environment					**Welfare impact:** *Severe in the few cases with severe injury, otherwise minimal.*
a) Entrapment/confinement during procedures					
b) Thermal extremes					
c) Aerodynamics/balance/drag					
d) Entanglement	Negative transmitter impacts were reported for ≥1 bird for 38% of species but concluded that most serious problems are probably short-lived and affect few individuals within any one study. Furthermore, species that had transmitters attached using harnesses or glue were equally likely to experience entanglement[5]		4		
Domain 3: Health					**Risk Assessment:** *Low risk of harm to animal welfare for swifts Moderate for ground-nesting passerines and grassland passerines (see detail in Hill and Elick) Low risk in many other passerines High: some covidrs, rails*
a) Decreased comfort	Two Florida scrub-jays pecked and preened at the harness after release, but stopped within 4-5 hours, although both continued pecking the antenna. [4]	Posture, restlessness, stretching	2	*Discomfort, frustration*	
b) Injury	In the flightless New Zealand Takahe, ten birds that had never worn a harness had no evidence of wing injury. Of 16 birds that had worn a harness, 10 (63%) had superficial soft tissue injury to skin or patagium or more severe injury, such as remodeling of the distal humerus at the harness cord-wing interface, or pathologic fractures. In the ten affected birds, 50%	Lameness, lethargy, feather loss, abrasions	4	*Pain, breathlessness, debility, weakness, sickness, malaise, nausea, dizziness*	
c) Disease susceptibility					

	were classified as having mild injury, 20% had moderate injury, and 30% had severe injury. Five of the 10 affected birds had bilateral lesions spread over all injury grade categories. The severity of wing injury increased with the length of time that the bird had worn the harness. [3] Negative transmitter impacts were reported for ≥1 bird for 38% of species but concluded that most serious problems are probably short-lived and affect few individuals within any one study. Furthermore, species that had transmitters attached using harnesses or glue were equally likely to experience non-entanglement injury (17% vs. 13% of species).[5]		4		
Domain 4: Behavioural Interactions					**Confidence Level:** *Medium due to few studies, one of them with very low sample size.*
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging	Two Florida scrub-jays foraged less, perched more, and were more vigilant than nine control birds, but did not differ from control birds after removal of the harness. [4]	Changes in activity pattern, time budget	3	*Unease, confusion, fear*	
c) Migration, movement	Common swifts and Pallid swifts with geolocator had lower return rate to breeding site after migration, and lower survival, than control birds. [1] Common swifts and Pallid swifts with geolocator with light stalk had lower return rate to breeding site after migration than birds with geolocator without light stalk. [1] Common swifts with geolocator did not have lower return rate to breeding site after migration, and did not have lower survival, than control birds. [2] Common swifts with geolocator with light stalk did not have lower	Delay, route deviation, aberrant movement pattern	1	*Anxiety, fear, frustration*	

	return rate to breeding site after migration than birds with geolocator without light stalk. [2] Common swifts with geolocator, which were heavier than control birds when marked, arrived earlier at the breeding site after migration than control birds, following the general pattern that heavier and larger birds arrived earlier at the breeding site than lighter and smaller birds. [2]				
- within species					**Central References:** 1 = Morganti et al., 2018 2 = Wellbrock & Witte, 2022 3 = Michael et al., 2013 4 = Bowman & Aborn, 2001 5 = Hill & Elick 2021
d) Social behavior	Two Florida scrub-jays kept longer distance to conspecifics than did nine control birds, but did not differ from control birds after removal of the harness. [4]	Withdrawal from interaction	5	*Loneliness, depression, frustration, fear*	
e) Mating	In Common swifts, the timespan between arrival and start of egg laying did not differ between birds with geolocator and control birds. [2]	Species-specific behavior	0	*Frustration, confusion*	
f) Reproduction	In Common swifts, neither start of egg laying, nor clutch size, number of nestlings, and number of fledglings differed between birds with geolocator and control birds. [2]	Parental behavior, attendance, abandonment of nest/brood	0	*Frustration, confusion*	
- with other animals					
g) Probability of predation					
h) Competition, kleptoparasitism					
- with humans					
i) Handling					

1 = Morganti, M., Rubolini, D., Åkesson, S., Bermejo, A., de la Puente, J., Lardelli, R., ... & Ambrosini, R. (2018). Effect of light-level geolocators on apparent survival of two highly aerial swift species. *Journal of Avian Biology*, *49*(1), jav-01521.

2 = Wellbrock, A. H., & Witte, K. (2022). No “carry-over” effects of tracking devices on return rate and parameters determining reproductive success in once and repeatedly tagged common swifts (Apus apus), a long-distance migratory bird. *Movement Ecology*, *10*(1), 58.

3 = Michael, S., Gartrell, B., & Hunter, S. (2013). Humeral remodeling and soft tissue injury of the wings caused by backpack harnesses for radio transmitters in New Zealand Takahē (Porphyrio hochstetteri). *Journal of Wildlife Diseases*, *49*(3), 552-559.

4 = Bowman, R., & Aborn, D. A. (2001). Effects of different radio transmitter harnesses on the behavior of Florida Scrub-Jays. *Florida Field Naturalist*, *29*(3), 81-86.

5 = Hill, J. M., & Elphick, C. S. (2011). Are grassland passerines especially susceptible to negative transmitter impacts?. Wildlife Society Bulletin, 35(4), 362-367.

Method of trapping/marking: VHF/GPS tag, full body (wing) harness			**Species/species groups:** Pelecaniformes, Procellariformes		
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.*
a) Restricted water intake					
b) Restricted food intake					
c) Low food quality/variety					
d) Energy expenditure					
Domain 2: Physical Environment					**Welfare impact:** *Severe in one case with mortality, otherwise minor.*
a) Entrapment/confinement during procedures					
b) Thermal extremes					
c) Aerodynamics/balance/drag					
d) Entanglement					
Domain 3: Health					**Risk Assessment:** *Low risk of harm to animal welfare.*
a) Decreased comfort					
b) Injury	In one Atlantic yellow-nosed albatross the severity of the wound caused by the transmitter rubbing against the body while in the harness and the fact that the bird had lost more than 20% of its body weight 3 days after capture suggests that the harness was a significant source of pain and discomfort. The muscular damage in this case was probably caused by one or a combination of the following factors: capture and prolonged physical restraint by researchers. [2]	Lameness, lethargy, feather loss, abrasions.	5	*Pain, discomfort*	
c) Disease susceptibility					
Domain 4: Behavioural Interactions					**Confidence Level:** *Low due to only one study with sufficient sample size.*
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging	In free-ranging Brown pelicans 1–3 days post-capture, there was no differences between tagged individuals and untagged neighbors in the proportion of observation time spent in preening, resting, alert/loafing or agitated behavioral states were observed. [1]	None.	0		
c) Migration, movement					
- within species					**Central References:** 1 = Lamb et al., 2017
d) Social behavior					

e) Mating					2 = Hurtado et al., 2021
f) Reproduction	GPS-tagged Brown pelicans had slightly lower breeding success than untagged conspecifics in the same colonies (51% vs. 62%). [1]	Lowered breeding success.	1	*Frustration, confusion*	
- with other animals					
g) Probability of predation					
h) Competition, kleptoparasitism					
- with humans					
i) Handling	In Brown pelicans, handling time at capture was longer in unsuccessful than successful breeders, with sharp decrease in breeding success among birds that were handled for more than 20 minutes. [1]	Long handling time.	2	*Fear, anxiety.*	

1. Lamb, J. S., Satgé, Y. G., Fiorello, C. V., & Jodice, P. G. (2017). Behavioral and reproductive effects of bird-borne data logger attachment on Brown Pelicans (Pelecanus occidentalis) on three temporal scales. *Journal of Ornithology*, *158*, 617-627.
2. Hurtado, R., Egert, L., Santos, A. P., do Nascimento Silva, R. R., do Amaral, I. N. A., & Vanstreels, R. E. T. (2021). Successful Treatment of Capture Myopathy and Satellite Transmitter Injury in an Atlantic Yellow-nosed Albatross (Thalassarche chlororhynchos). *Journal of Avian Medicine and Surgery*, *35*(2), 210-216

Method of trapping/marking: VHF/GPS tag, full body (wing) harness			**Species/species groups:** Accipitriformes and Falconiformes		
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*
a) Restricted water intake	Hawks and falcons usually get the water they need from the prey they consume. [0]	None.	0		
b) Restricted food intake	Body mass of tagged Black kites was similar at marking and when re-trapped, independently of the time-lag between the two. [1]	None.	0		
c) Low food quality/variety					
d) Energy expenditure	Body mass of tagged Black kites was similar at marking and when re-trapped, independently of the time-lag between the two. [1]	None.	0		
Domain 2: Physical Environment					**Welfare impact:** *Major in some cases with mortality, otherwise minimal*
a) Entrapment/confinement during procedures	Handling time up to 15 minutes. [0]		3	*Anxiety, fear*	
b) Thermal extremes					
c) Aerodynamics/balance/drag	All radiomarked Prairie falcons flew well upon release. [4] In all cases of re-sightings of radiomarked American kestrels the kestrel apparently flew without any visible restrictions, and no detectable detrimental effects due to the presence of the harness or tracker was observed. [5]	None.	1		
d) Entanglement					
Domain 3: Health					**Risk Assessment:** *moderate risk of harm to animal welfare*
a) Decreased comfort	Most radiomarked Prairie falcons preened extensively during the first hour after release; most pulled at their leg bands as much as or more than they tugged at their backpack harness. [4] Aside from the releasing day, radio-tagged American kestrels spent little time preening or tugging on the transmitter packages, and some individuals seemed to interact an equivalent time with their leg-bands during the first week. [8]	Extensive preening, tugging at harness.	3	*Discomfort, frustration*	

b) Injury c) Disease susceptibility	Of 42 Black kites re-trapped or recovered freshly dead up to 4 years after tagging, one had an abrasion below the ventral T-junction of the harness, caused by an unusually tightfitting ventral loop of the harness. In all the recovered black kites, the skin under the transmitter was always featherless but intact, with no sign of inflammation or previous injury. No other signs of injury were evident. [1] Of 18 previously radio-tagged (fully grown juveniles in captivity before release or nestlings over six weeks old) Red kites recovered for post-mortem examination, four (22%) had moderate to severe lesions associated with the presence of the harness and radio transmitter. These lesions probably led to death in one bird, and may have precipitated the death in two of the three others. The four recovered birds that had lesions had lived longer (on average 4.3 years) than those that did not have lesions (on average 1.5 years), so lesions appeared to have occurred as a consequence of the length of the deployment. [2] Among 10 radio-tagged adult Saker falcons, one male recaptured after 3 years had feather loss and skin abrasion caused by the harness. [6] Of 89 male and female juvenile Saker falcons (fledglings radio-tagged shortly before they left the nest) there was no evidence of abrasion from harness straps in two dead falcons found intact enough to examine [7]	Feather loss, in some cases abrasions or lesions.	2	*Mild pain, discomfort, in some cases moderate pain*	

	In American kestrels, there was no difference in Fecal Glucocorticoid Levels between control (leg-banded) and radio-tagged kestrels throughout the 55-day monitoring period. [8]				
Domain 4: Behavioural Interactions					**Confidence Level:** *High level of confidence because most studies have fairly large or large sample size. No reason to suspect large differences between species.*
- with environment					
a) Habitat use, spatial/temporal					
b) Activity, foraging					
c) Migration, movement	For both breeding and non-breeding Black kites, there was no difference in the survival of tagged and control individuals, and no significant interaction between marking treatment and age or sex. For Black kites tagged as nestlings, the remotely recorded survival of the satellite birds to 1 year of age was 0.42 (N = 18), that is similar to the 0.41 estimate based on ring recoveries for the same population. For Black kites that died during the course of the study, there was no difference in mean longevity between tagged and control individuals, independently of their age or sex. [1] Prairie falcons that shed their radio tag clearly increased their probability of survival. The tag probably affected falcons more during migration and winter than during the nesting season because tags would have created greater energetic demands on falcons during migration and winter. [4] Radio-tagged American kestrels showed no reduction in survival (return rate to winter territory). [5] Possibly reduced survival (return rate to breeding area after 1 year) in radio-tagged Saker falcons, but poor evidence [6]	No effect on survival in Black kites. [1] Reduced survival in Prairie falcons. [4] No effect on survival in American kestrels. [5] Possible reduced survival in Saker falcons, but poor evidence. [6,7]	2		

	Saker Falcons with radio-tags and Saker falcons marked only with leg bands and implanted transponders had the same recapture rate (7%) in autumn, indicating similar survival. [7]				
- within species					**Central References:** 0 = own expert judgement 1 = Sergio et al., 2015 2 = Peniche et al., 2011 3 = Gregory et al., 2003 4 = Steenhof et al., 2006 5 = Biles et al., 2023 6 = Dixon et al., 2016 7 = Kenward et al., 2001 8 = Pereia et al., 2009 9 = Marzluff et al., 1997
d) Social behavior					
e) Mating	The annual and cumulative recruitment of floating Black kites into the breeding population and their age of first breeding were not affected by tagging, nor by its interaction with age or sex. [1]	None.	0		
f) Reproduction	In Black kites, laying date, clutch size and the number of young raised to fledging did not vary with tagging or its interaction with age or sex. [1] In Golden eagles, trapping at the nest (nestling period) and radio-tagging in Scotland was followed by a reduction in breeding success. [3] In contrast, a study in Idaho, USA, where Golden eagles were trapped and radio-tagged away from nests in winter, found no overall difference between radio-tagged birds and controls, but radio-tagged birds bred less well in a year with a cold and wet spring and low prey populations. [9] Possibly increased rate of nest desertion in Saker falcons, but poor evidence [6] In Saker falcon there was no indication of reduced post-fledgling survival: 81 of 89 (91%) tagged birds survived the 20–45 days from leaving the nest until natal dispersal. [7]	No effect on reproduction in Black kites. [1] Reduced reproduction in Golden eagles if trapped on the nest during breeding, but not if trapped away from nest during winter. [3,9] Possibly reduced reproduction in Saker falcons. [6,7]	1		
- with other animals					
g) Probability of predation					

h) Competition, kleptoparasitism	Body mass of tagged Black kites was similar at marking and when re-trapped, independently of the time-lag between the two. [1]	None.	0		
- with humans					
i) Handling					

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