Table 2: Data quality problems, reasons, and solutions regarding the objective bias.

Objective bias

Problems	Reasons	Solutions
Different know-how and skills of volunteers	Insufficient training of volunteers High complexity of tasks	Check skills and reliability of participants e.g. via games (certificates) Use only registered participants Offer facilities to re-train participants Decrease complexity of tasks
Under-motivation	In groups: not all may take data collection seriously	Stress importance of findings for society (personal link)
Decreasing motivation	High effort in data collection, long duration	Increase responsibility via personal links ("my" study location)
Over-motivated observers (false positive)	Volunteers want to find something Preconceptions of participants Competitions may decrease data quality for the sake of data quantity	Stress importance of randomized sampling in sampling protocols Be careful if using competitions, ranks, and prizes Address preconceptions in training
Absence data (in observational data bases)	Observers report only positive sightings, not negative ones	Include absence data by e.g. shifting focus from animal sightings to monitoring of habitats Insist on regular observations (e.g. same spot 5 times over a week) Include „background data" to avoid "no data" reports, e.g. weather condition, habitat description, etc.
Spatial bias	Personal preferences in field sampling	Assign sampling locations Include comments in the data entry form for deviations from sampling design Require geo-coded time stamped data
Temporal bias	Personal preferences in timing of sampling	Define time of sampling, duration, and eventually environmental conditions (e.g. weather) Include comments in the data entry form for deviations from sampling design