BIRD FOCAL SPECIES SELECTION

An approach to refine the vulnerability in bird focal species selection

© ebird 2023 (*Luscinia svecica*, breeding season)

tier3 solutions
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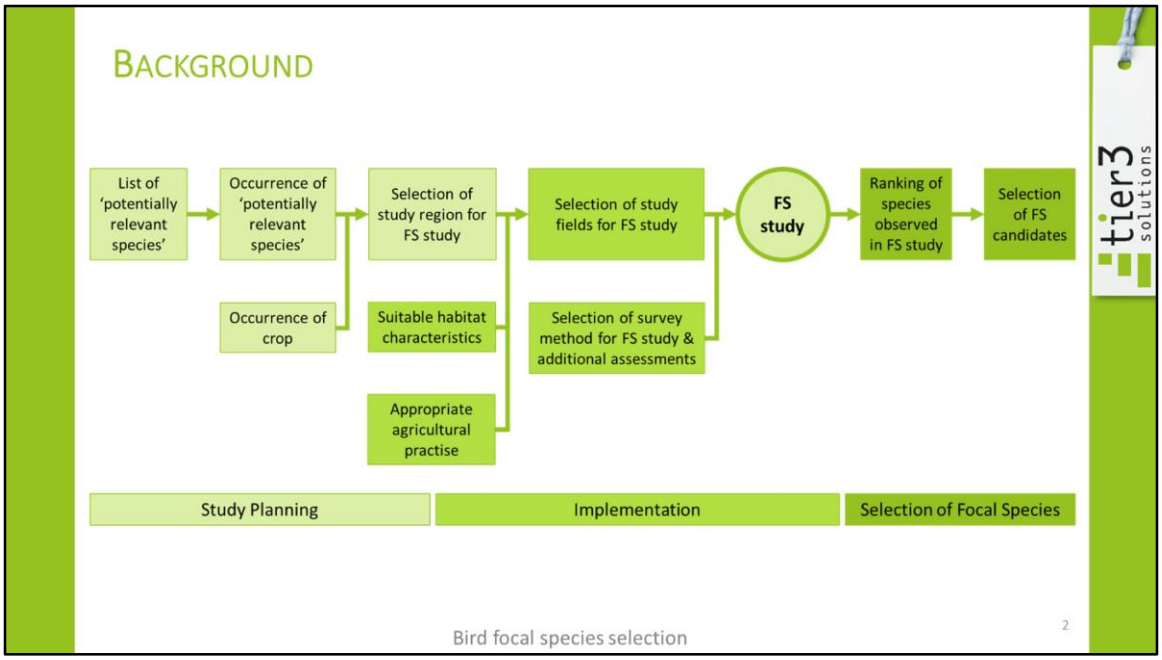
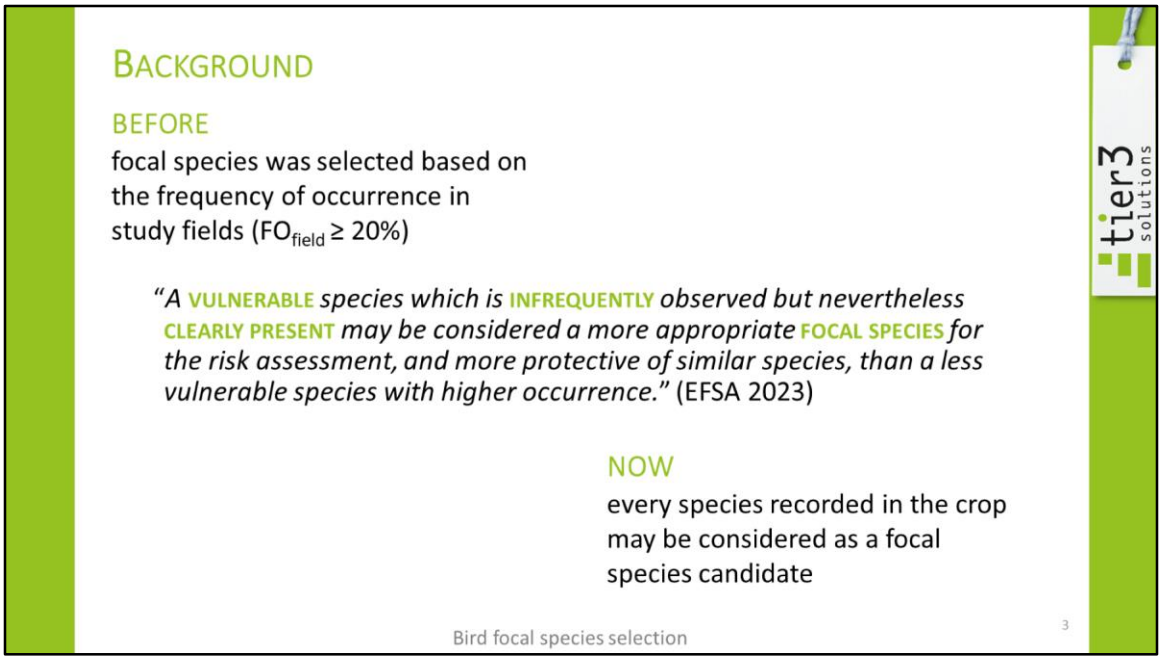
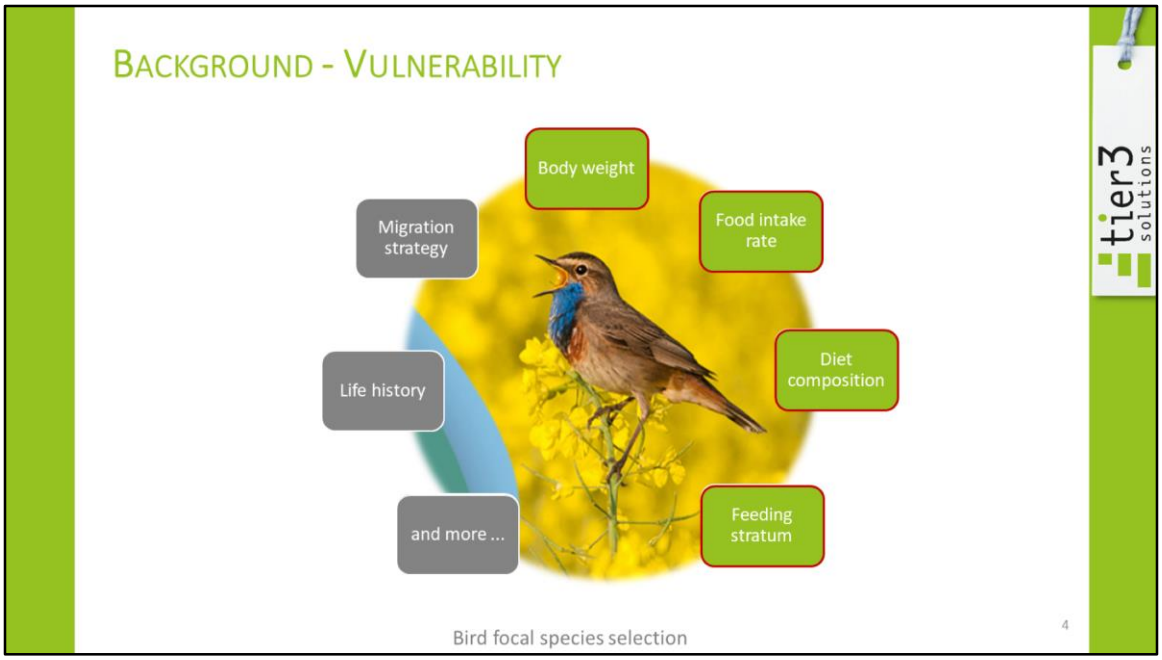


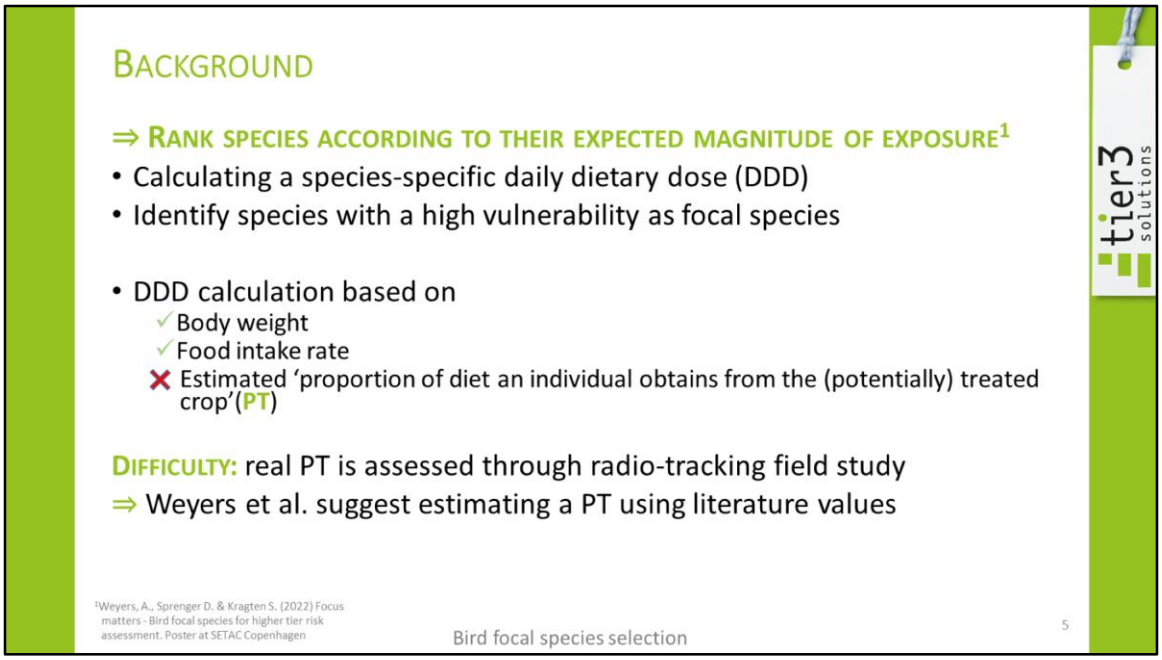
- selection of species includes 2 steps
- step 1: ranking of species based of FS study
- step 2: incorporate ecological information of the ranked species to come to a final selection of FS
- presented approach is only a suggestion how to takle the requirements from the new guidance, there might be others



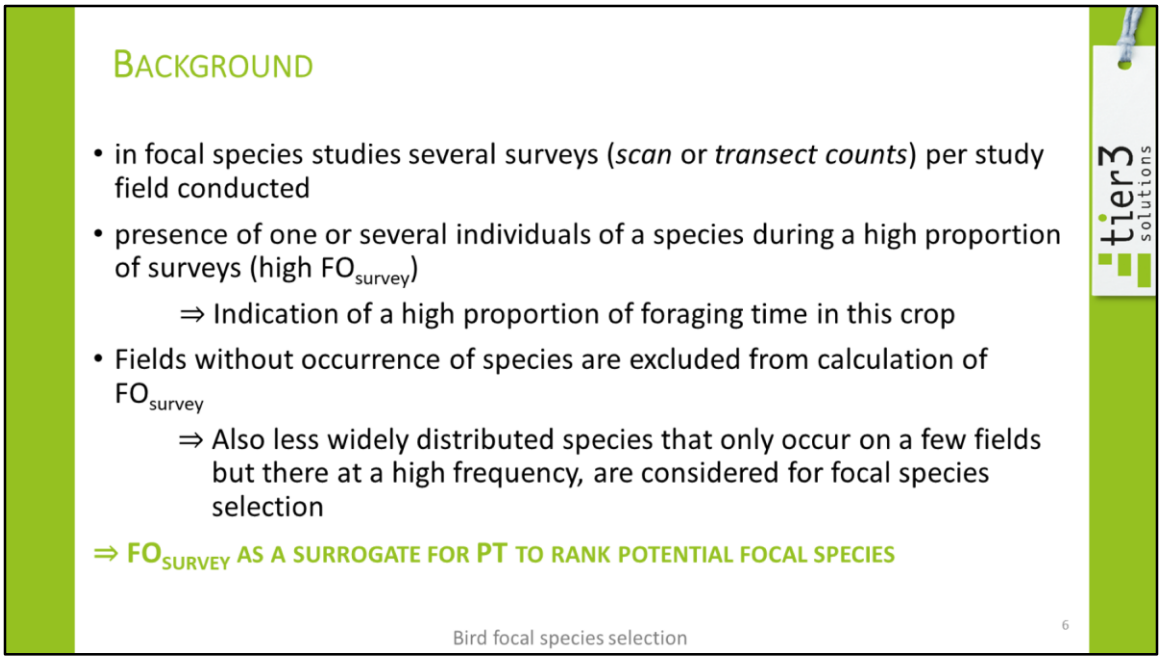
- selection of FS is crucial as it should be protective of other species of the same feeding guild
- before: selection criteria was based on prevalence
- the revised EFSA guidance on birds and mammals emphasizes the vulnerability of species
- now: potentially each species has to be considered as a FS candidate, based on vulnerability rather than prevalence and distribution



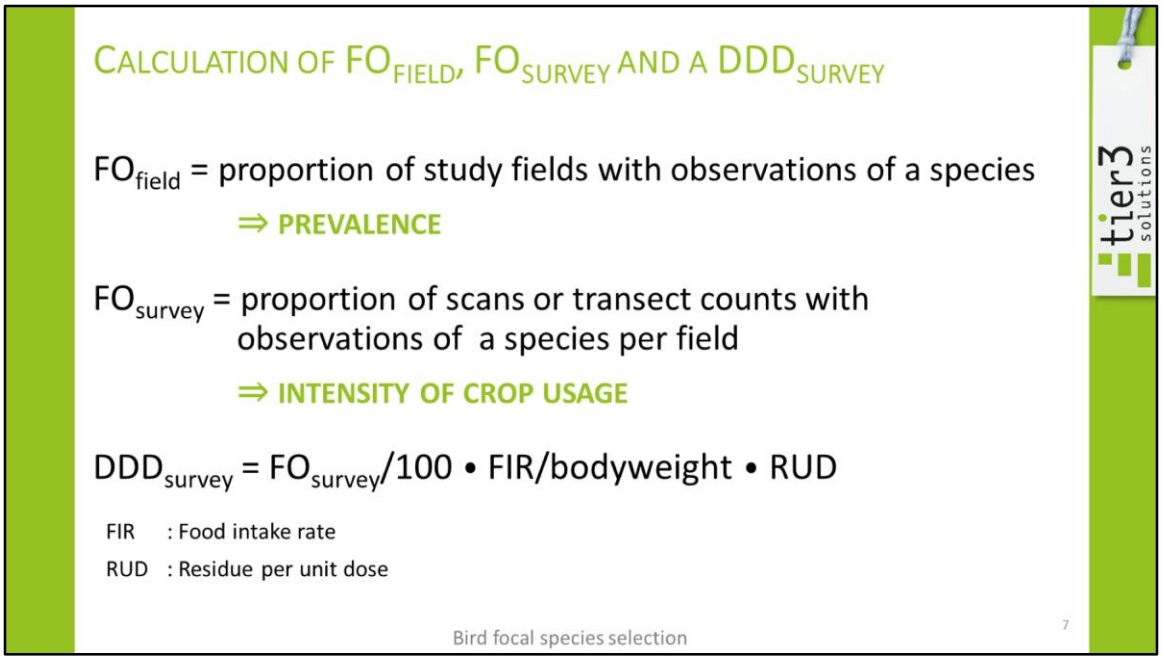
- What indicates the vulnerability of a bird species occuring in the relevant crop?
- Vulnerability is related to certain life history traits, migration strategy, body weight and many other traits
- In terms of exposure it is influenced by: Food intake rate, diet composition, and where the bird forages
- For the presented approach, we focussed on the exposure-related traits that causes inter-specific differences in sensitivity to a pesticide.



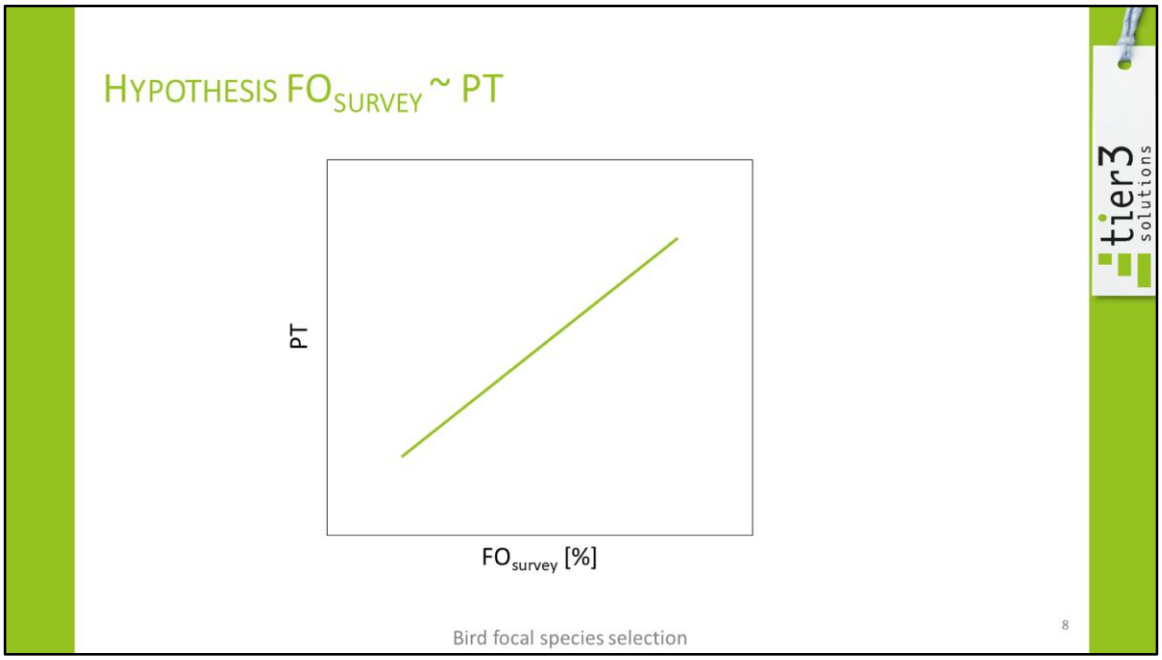
- How can vulnerability be assessed?
- Weyers et al. (2022) made an attempt to quantify vulnerability by calculating a species-specific Daily Dietary Dose (DDD) to assess exposure, species ranked by DDD
- DDD calculation includes
    - body weight and FIR – data available
    - a measure for intensity of crop usage (PT) – data not readily available
- Is there an information that can be used that is already assessed in the focal species study, to achieve a measure that can be used as surrogate for the PT?



During FS studies, surveys are conducted to record all bird species that are present on the study fields. If individuals of one species forage intensively on a field, they will be present during a high proportion of surveys, i.e. a high Frequency of occurrence. Thus, a high FOsurvey indicates a proportionally high foraging time in the crop. Because fields where a species does not occur at all, are not considered in the FOsurvey calculation, also less widely distributed species that are only present on a few fields (but there frequently) can also obtain a high FOsurvey and thus be considered as FS.
FOsurvey seems to be a measure to rank the species and might be used as a surrogate for PT in theoretical DDD calculations.
It needs to be emphasized: FOsurvey is not to be used as a replacement for a real PT obtained from a PT study!



- 2 important information from FS study:
  - FO_{field} → measure of prevalence, used as selection criteria before
  - FO_{survey} → measure of the intensity a field is used by a species
- DDD includes
  - 90 percentile of FOsurvey, excluding scans/transects without any observations of a species, to be protective of rare species that show only up on a few fields, but there are frequently observed
  - bodyweights from literature
  - species had to be classified into feeding guilds due to calculation of exposure (for determination of FIR and RUD)



- hypothesis: FOsurvey is a suitable indicator for the intensity a crop is used by a species‘
- if assumption is true, there should be a positive correlation between FOsurvey and PT
- hypothesis can be evaluated with FOsurvey values from focal species studies and the PT values that were obtained in subsequently conducted radio-tracking studies

Field Study Data

- 10 focal species – PT study pairs identified

Zone	Crop	BBCH
South	spinach	0 - 9
South	vineyard	0 - 75
South	citrus	0 - 75
South	pome fruit	0 - 79
Central	leavy vegetables	10 - 49
Central	maize	0 - 19
Central	oilseed rape	> 96, 0 - 9
Central	pome fruit	7 - 81
Central	pome fruit	51 - 79
Central	cereals	0 - 83

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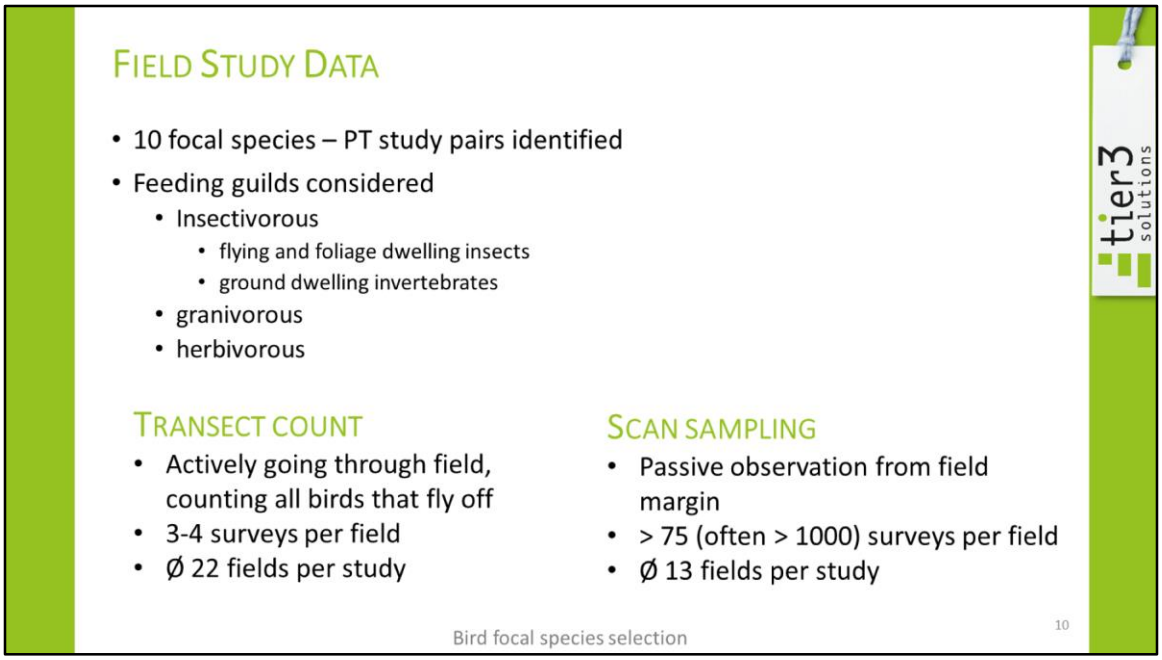
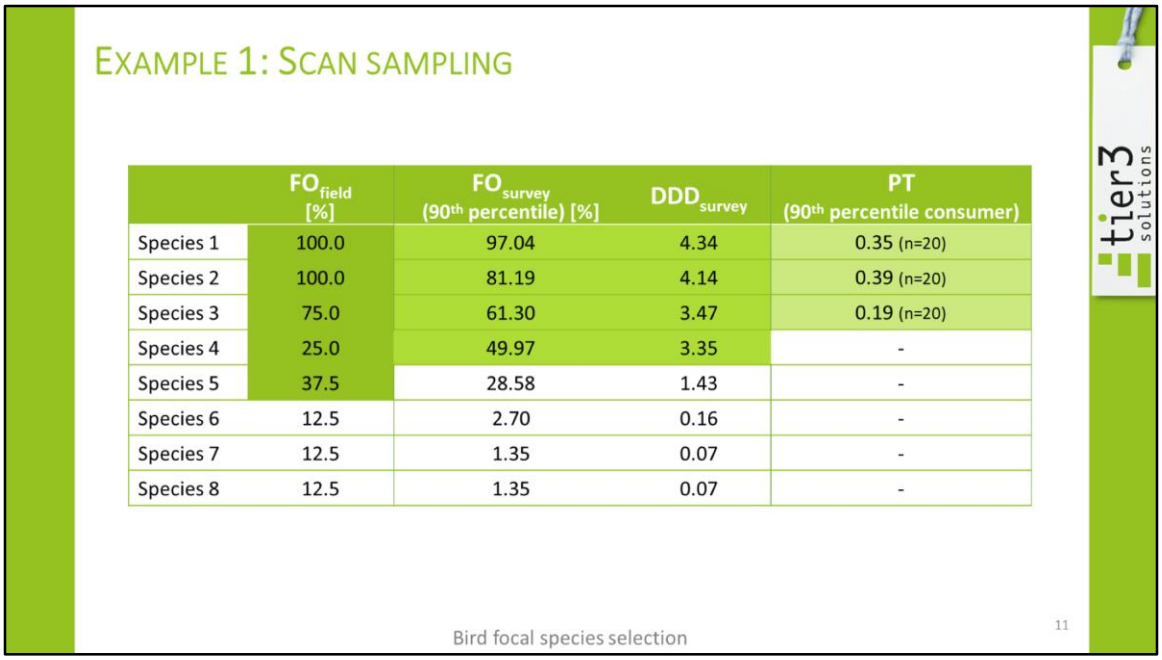
- Scanned 44 FS- and PT-studies provided by industry
- Could identify 10 focal species-PT study pairs, according to crop, BBCH, region/regulatory zone



- feeding guilds considered:
  - insectivorous - foraging on flying and foliage dwelling insects
  - feeding on ground dwelling invertebrates
  - granivorous
  - herbivorous
- FS studies either conducted as transect count or scan samplings.
- The two methods were considered seperately in the analysis due to the differences in the two methods.



Example 1: scan sampling with 8 granivorous bird species below 50g body weight observed in study fields

- green highlighted values in the FO_{field}-column indicate values ≥ 20%, those that were FS candidates based on the old guidance
- DDD_{survey} – approach: no threshold defined yet
- Woud be feasible to chose the four top most species as FS candidates due to the gap in DDD_{survey} values between species 4 and 5
- in a next step, ecology of the FS canditates has to be taken into account
- In the original study, the three top most species where selected for a PT study

Here, ranking of different approaches is consistent.

EXAMPLE 2: TRANSECT COUNT

	FO_{field} [%]	FO_{survey} (90th percentile) [%]	DDD_{survey}	PT (90th percentile consumer)
Species D	36.67	100.00	2.21	0.09 (n=20)
Species F	16.67	86.67	2.01	-
Species E	36.67	100.00	1.96	0.77 (n=20)
Species A	66.67	100.00	1.93	1.00 (n=20)
Species G	13.33	56.67	1.50	-
Species C	40.00	66.67	1.39	-
Species H	10.00	60.00	1.39	-
Species B	56.67	100.00	1.21	-
Species J	3.33	50.00	1.02	-
Species I	10.00	33.33	0.75	-

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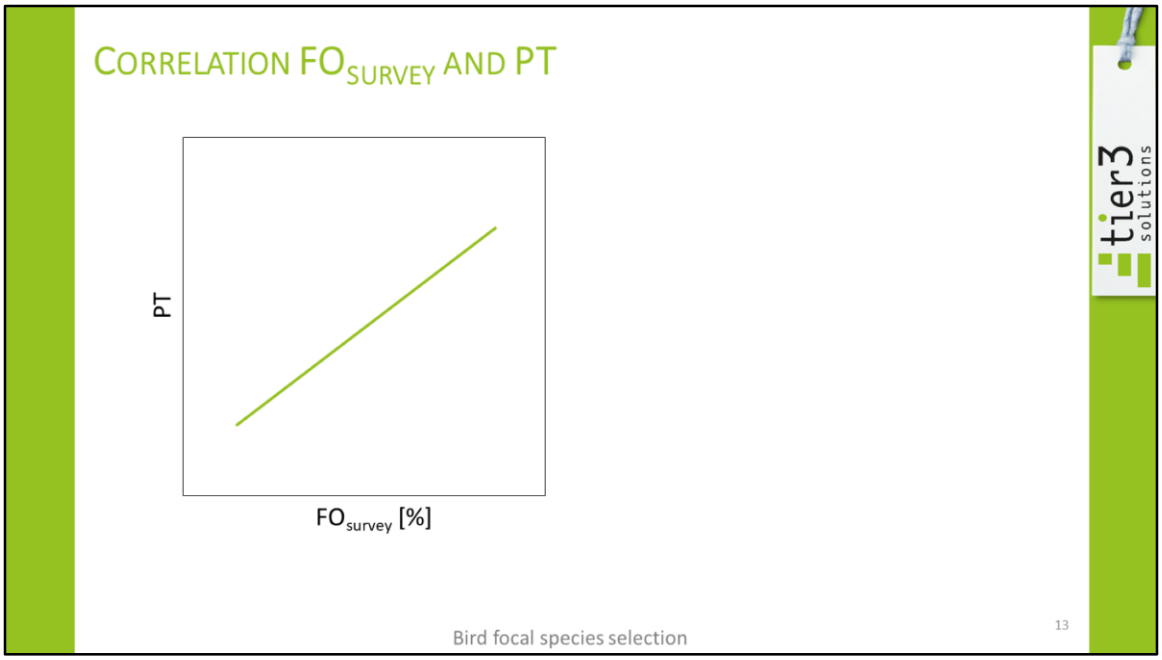
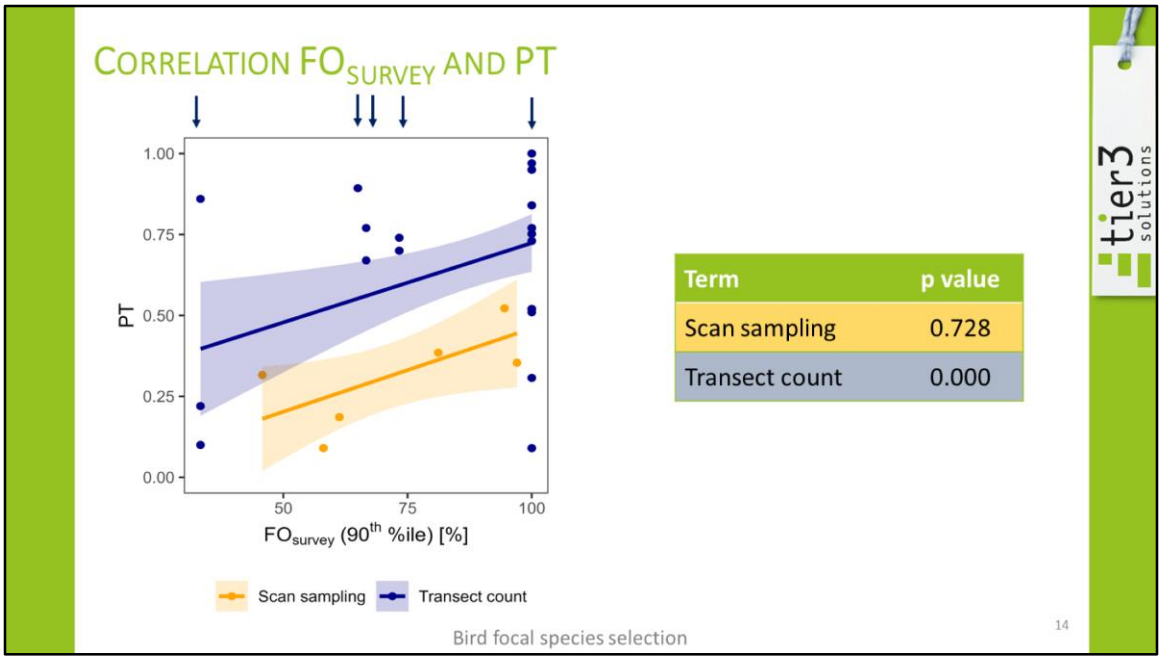
Example 2: transect count, 28 species feeding on ground dwelling invertebrates were observed in FS study (only first 10 shown here)

- 5 species selected based on previous FO_{field} > 20% criterion
- based on DDDsurvey, 4 species ranking relatively high
    - species F (probably rare species) was not considered with the former approach, as its FO_{field} was below 20%, however, its DDD_{survey} is the second highest and thus, this species would be considered in the new approach
- Disdvantage with transect counts becomes obvious here: Due to usually low number of surveys in Transect counts, FO_{survey} lacks differentiation (takes on only 7 different values here)

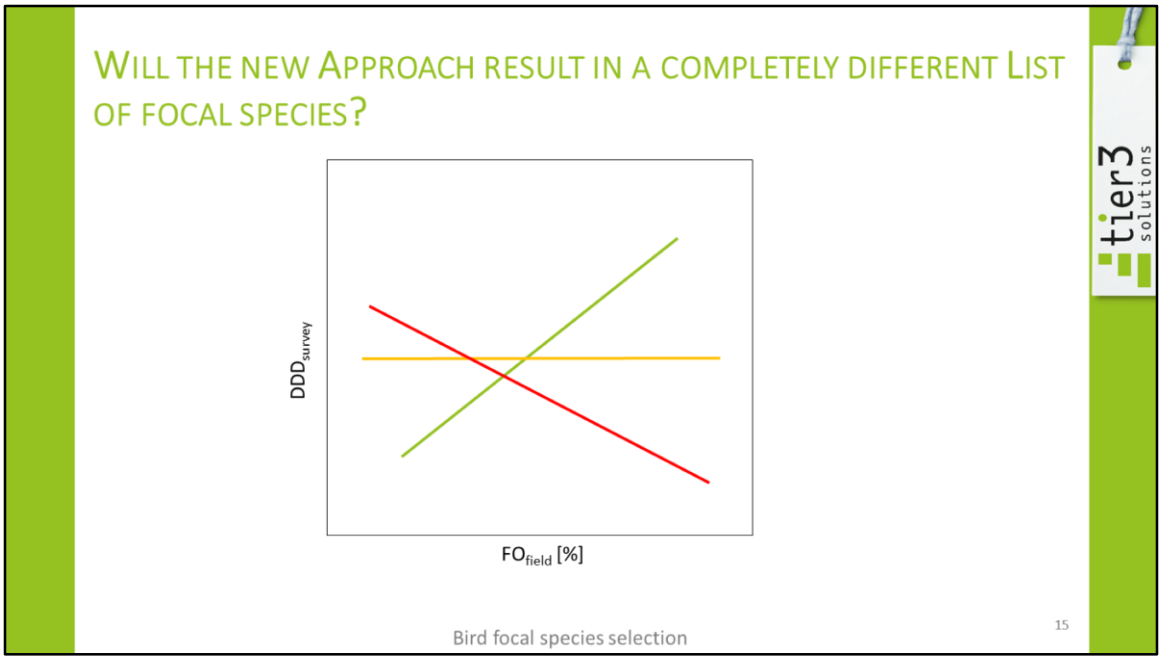


Reminder: if hypothesis (FOsurvey is a suitable indicator for the intensity a crop is used by a species) is true, we shall see a positive relationship between FOsurvey and PT

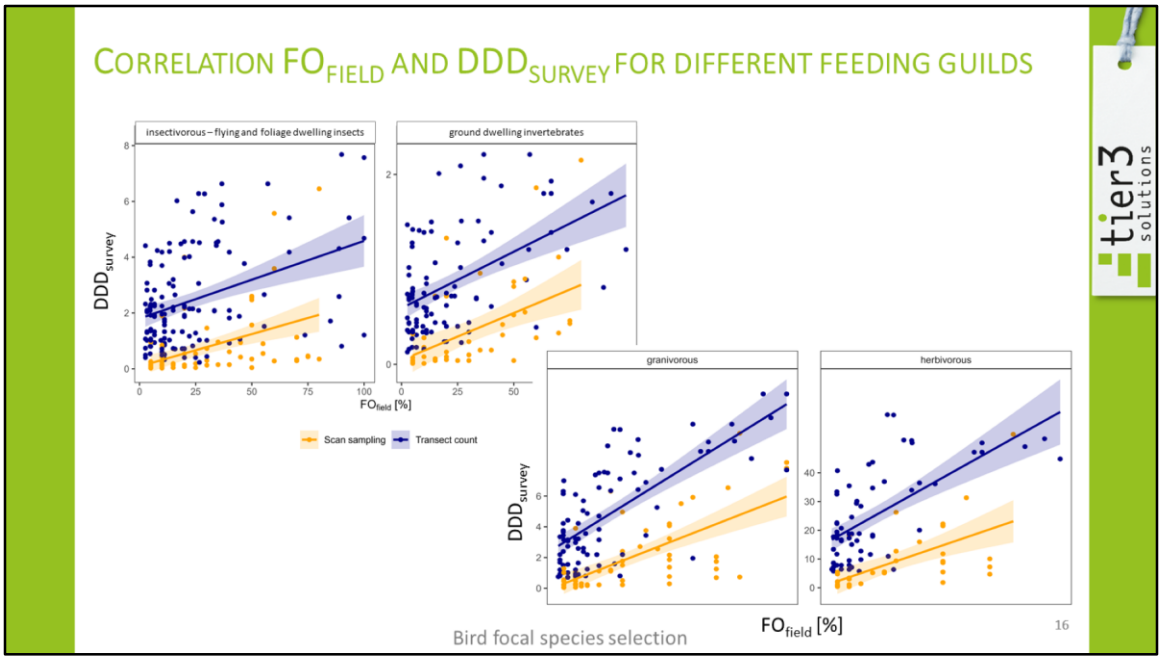


Summary of all available data sets (FS and PT studies):

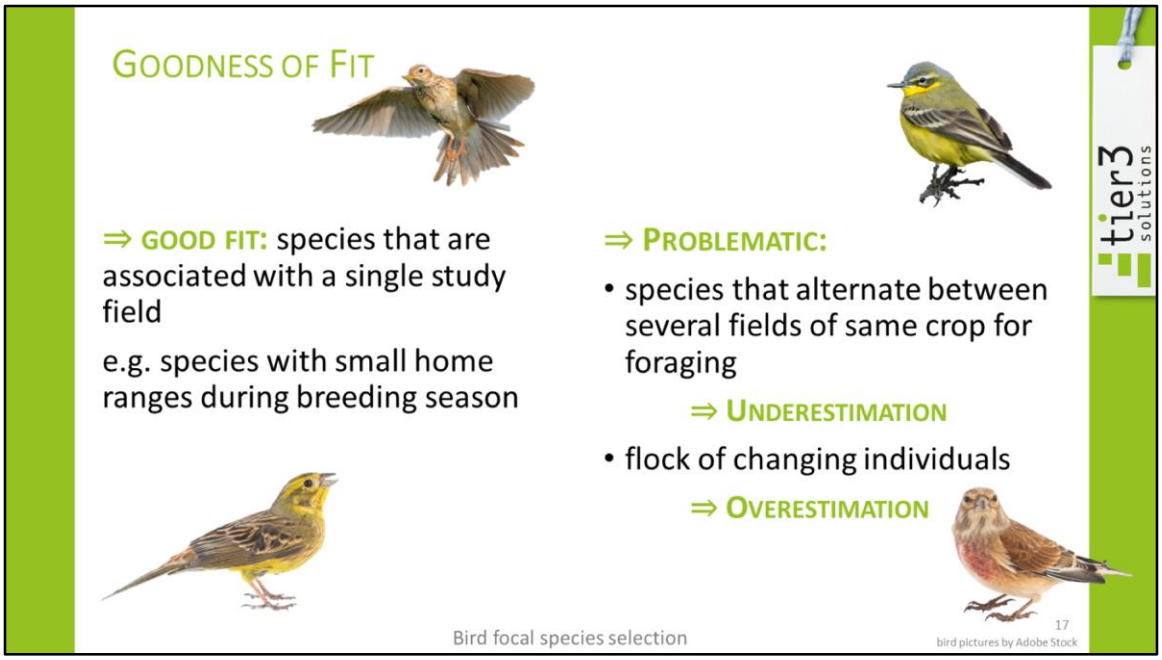
- statistics (GLMM) calculated for scan sampling and transect count seperately
- data set too small to include additional factors, therefore feeding guild and crop were included as random effects in GLMM
- clear correlation between FOsurvey and PT
- too few data for scan samplings (9 data points) to be significant
- as mentioned before, transect counts lack differentiation of FO_{survey} values (indicated by the arrows above the graph)



Would this proposed approach (DDD_{survey}) lead to different results compared to the old approach based on FO_{field}?
The more similar DDD_{survey} and FO_{field} data, the less change the new approach will bring compared to the old one (green line).
In case a complete new list of species needs to be considered as FS, there would be no (yellow line) or a negative correlation between FOfield and DDDsurvey (red line).



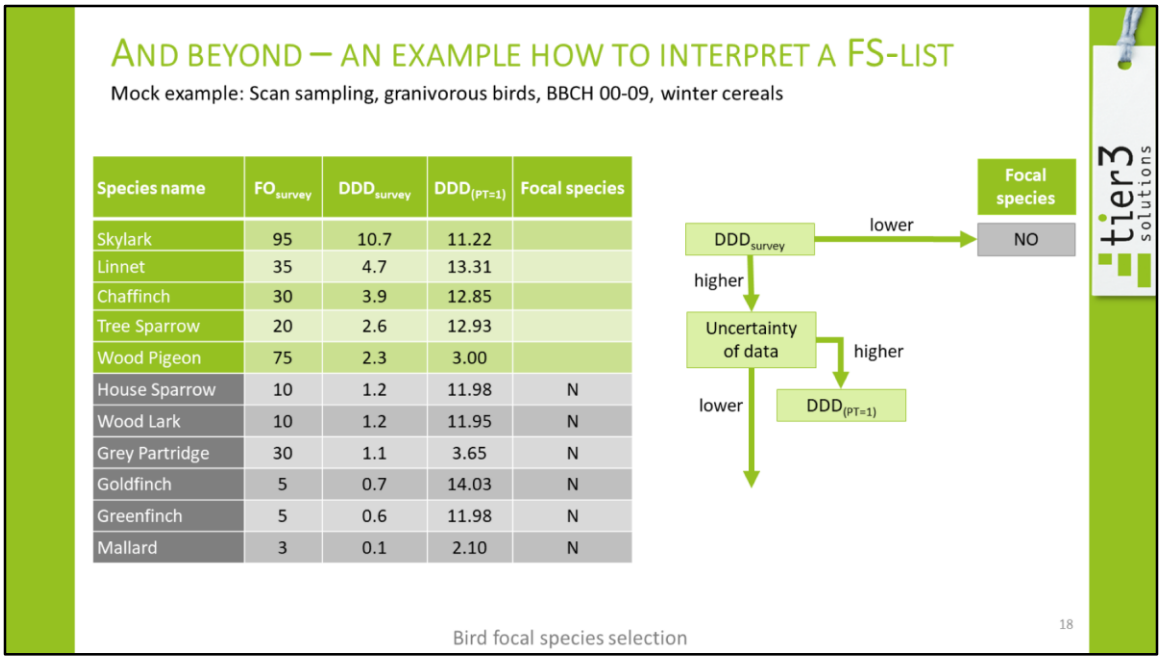
The fear that completely new species will have to be considered as FS with the new guidance/approach is unfounded.
This is obvious from a significant correlation between the former prevalence criteria FO_{field} and the calculated DDD_{survey}.
Though, there is some scatter which indicates that some new species have to be considered (those in the upper left corner of each graph), while others might be less relevant (lower right corner of graphs).



The goodness of the approach depends also on the birds‘ ecology.
The approach has a good fit for species that are associated with just a few or even one field, due to a small home range. These are probably recorded during each survey and obtain a high FO_{survey}.
Other species have a lower fit:

- Species that alternate between fields of the **same** crop for foraging; that have a large home range and likely use several fields. Their exposure will be underestimated by FOsurvey.
- Species that form flocks on fields. Although the flock is observed frequently on the field, the composition of the individuals change. In FO_{survey} calculation it is assumed observed bird is always the same individual. Here, the exposure will be overestimated by $FO_{survey.}$

These and other traits have to be considered in final selection of FS species.



Step 2: consideration of ecological information/traits of the ranked species to come to a final selection of FS

Procedure is shown on a fictive mock example.

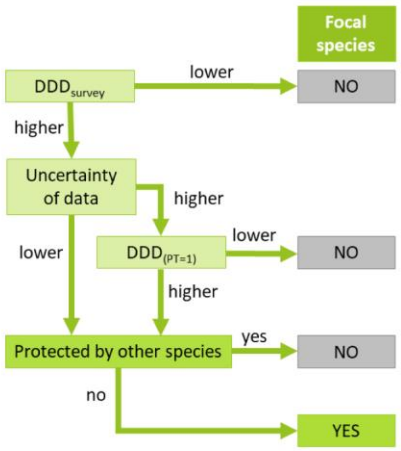
There is no defined threshold, how many species have to be considered. We recommend to use a decission tree:

1. for each species, decide whether DDD_{survey} is higher in relation to other observed species
2. It is also necessary to consider the uncertainty of data in terms on how much effort was put in the FS study (e.g. number of study fields and surveys, is chosen method suitable for crop and growth stage. A high effort during conducting the FS study pays off here in confidence in the data. The higher the uncertainty, the more conservative the selection has to be, because the ranking could re-order with a change in FOsurvey-value.
    a. high uncertainty: To get an idea what is highest DDD possible for certain species if PT would be 1, the DDD for PT =1 is calculated ($DDD_{(PT=Q1)}$). Is it possible that lower ranked species change rank with higher ranked species?
        If DDD_{PT1} is low, the species needs no further consideration (here: exclusion of wood pigeon, but tree sparrow included)

AND BEYOND – AN EXAMPLE HOW TO INTERPRET A FS-LIST

Mock example: Scan sampling, granivorous birds, BBCH 00-09, winter cereals

Species name	FO_{survey}	DDD_{survey}	$DDD_{(PT=1)}$	Focal species
Skylark	95	10.7	11.22	Y
Linnet	35	4.7	13.31	Y
Chaffinch	30	3.9	12.85	Y
Tree Sparrow	20	2.6	12.93	N
Wood Pigeon	75	2.3	3.00	N
House Sparrow	10	1.2	11.98	N
Wood Lark	10	1.2	11.95	N
Grey Partridge	30	1.1	3.65	N
Goldfinch	5	0.7	14.03	N
Greenfinch	5	0.6	11.98	N
Mallard	3	0.1	2.10	N



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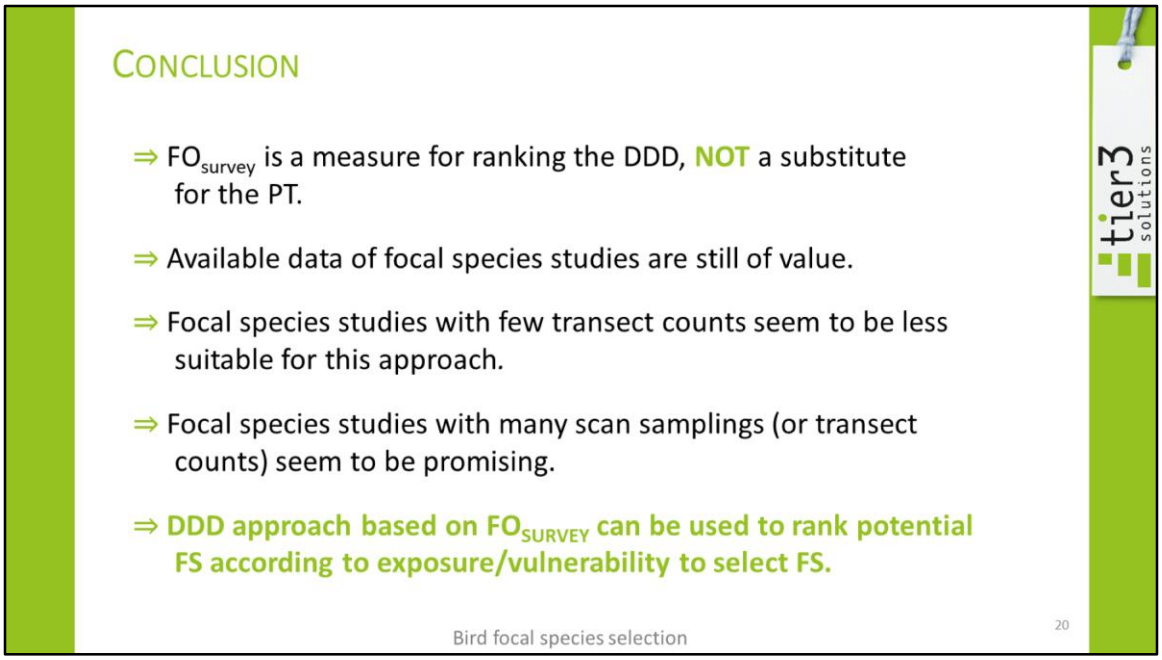
b. here, also known aspects of feeding ecology/flocking behavior that causes under-/overestimation of FO_{survey} should be taken into account (overestimation of linnet FO_{survey})

3. Would species be covered by other/ more protective species? This would be the case here for tree sparrow which is covered by the chaffinch.

Hence, final selection in this example would be to consider skylark, linnet and chaffinch as FS.



- FO_{survey} is a measure to rank DDD, it is NOT a substitute for the PT
- Available data of (old) FS studies are not wrong, but still of value if they were conducted appropriately. Not everything has to be done again under the new guidance, but they maybe need to be re-evaluated based on this approach and may come to slightly different conclusions in terms of the FS selection.
- Focal species studies with few transect counts seem to be less suitable for this approach.
- Focal species studies with many scan samplings (or transect counts) seem to be promising.
- DDD approach based on FO_{survey} can be used to rank potential FS according to exposure/vulnerability to select FS for further consideration.