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Population estimates and the timing of waterfowl censuses

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The effect of the timing of waterfowl censuses on the estimates of breeding population sizes of different species was studied in southeast Finland from 1991 to 1994. Lakes used only for breeding and a local stop-over lake that was used for staging during spring migration were analysed separately. Also, the effect of the break-up of ice cover on the order of lake occupation by breeding pairs was studied. A standard waterfowl census was made four times in May at an interval of approximately seven days in each year. In general, the timing of waterfowl censuses within the three-week period considered did not cause serious biases in population estimates, though differences between species and between lake types were observed. The timing of the break-up of the ice cover was critical in the build-up of local breeding populations. However, pairs of many species, especially the Mallard, Teal, and Common Goldeneye occupied breeding lakes even when the lake still was considerably covered by ice. A comparison of recommended census times between earlier studies and this study suggests that in some species censuses could be started much earlier than previously recommended.

1. Introduction

For monitoring and conservation purposes, let alone more specific population studies, we need correct estimates of breeding population sizes. In migratory bird species this may be an especially difficult task because the timing of spring migration can affect census results. Potential error, caused by the incorrect timing of censuses in relation to spring migration, may be minimized by repeating the census several times in the beginning of the breeding season. This may not always be feasible, however, but a compromise between census effort and the reliability of census results is needed.

There are methodological studies of the timing of waterfowl censuses in relation to the timing of spring migration and local population composition (Linkola 1959, Siira 1959, Kauppinen 1983). All studies have stressed the importance of the correct timing of the census, and Siira (1959) and Kauppinen (1983) also present data to demonstrate it. The authors also give recommendations of optimal census periods for different species in their study regions and these have been adopted as guidelines in standard waterfowl census methods (see Koskimies & Väisänen 1991). According to Kauppinen (1983, p. 56), the length of the optimal census period in each species is from the start of egg laying, or few days before laying, to the stage of incubation where the pair bond breaks, and, depending on the species, it may vary from 10 to 30 days.

Of course, optimal census times should be followed. However, this is not always possible and in large scale population surveys a one-visit census may often be the only feasible method. Hence, we need to know how serious is the bias caused by incorrect timing. This kind of information is needed to judge the comparability of censuses made outside the recommended optimal period. There may also be differences between regions in the magnitude of the error. Unfortunately, earlier studies of the timing of waterfowl censuses lack quantitative statistical analysis of the data. It is thus impossible to evaluate the actual error. Furthermore, earlier studies have not differentiated between stop-over lakes that are used for staging during spring migration and lakes that are not used for staging. The problem of census timing is obvious in stop-over lakes but less obvious in lakes used only for breeding.

In this paper I will study quantitatively the effect of the timing of waterfowl censuses on the estimates of breeding population sizes of several waterfowl species in lakes used only for breeding and in a stop-over lake. Because the break-up of ice cover affects the timing of waterfowl breeding (e.g., Väisänen 1974), I also examined the effect of the break-up of ice cover on the order of lake occupation by breeding pairs. This is a factor probably critical for the build-up of local breeding populations but it has not been studied earlier.

2. Material and methods

The study was conducted in southeast Finland (61°35′N, 29°40′E). The study area has several small lakes differing in vegetation structure and productivity (a map of the study area is given in Pöysä 1995 and more details of the vegetation structure and productivity (food abundance) of the lakes are given in Elmberg et al. 1993, Pöysä et al. 1994a,b, and Pöysä 1995). Thirty-seven lakes (0.05–24.0 ha) that are not used as stop-over lakes during spring migration (hereafter 'breeding lakes') and one lake (38.1 ha) used both for staging and breeding (hereafter 'stop-over lake'; the study area has only one stop-over lake, Lake Pieni Rautjärvi, Saari, Honkakylä) were selected for this study. The stop-over lake is a shallow, eutrophic lake where the break-up of ice cover is earliest among the lakes in the study area. As distinct from breeding lakes, large flocks of migrating waterfowl are resting and staging on the lake during spring migration.

From 1991 to 1994, a standard waterfowl point count (Koskimies & Pöysä 1991) covering all the open water area and shoreline in each lake was made four times in May at an interval of approximately seven days in each year (Table 1). All lakes were monitored within 2–4 days on each census round. During each census the progress of the break-up of ice cover on each lake was marked down on a field map and later scored as follows (hereafter 'open water score'): 0 = lake fully iced over; 1 = small openings along shoreline, central parts fully iced over; 2 = half of the shoreline open, central parts fully iced over; 3 = more than half of the shoreline open; central parts partially (< 50%) open; 4 = shoreline fully open, small ice rafts or buildups here and there; 5 = lake fully open. In each year the first census was made so early that some of the lakes still were fully iced over, while some other lakes were fully open (Table 1). In 1991 and 1992, some of the lakes were still partially iced over (open water score 3–4) during the second census, but not in 1993 and 1994.

All waterfowl species were recorded and field observations for each of the four census rounds were interpreted as breeding pair numbers, according to standard criteria (see Koskimies & Väisänen 1991). Data on the Pochard *Aythya ferina* and the Coot *Fulica atra* were too small for both lake types,

Table 1. The date (1 = 1 May) of the four censuses (I–IV) and the open water score during the first census on 38 lakes, 1991–94.

	Census date								Open water score, first census	
	I		II		III		IV			
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
1991	2.5	1–4	9.1	8–11	15.7	15–17	22.5	22–25	2.5	0–5
1992	6.8	6–8	15.5	14–16	22.0	21–23	28.5	28–29	1.8	0–5
1993	3.9	3–5	10.7	10–12	17.5	17–18	25.5	24–27	3.8	0–5
1994	2.5	1–4	10.3	9–12	18.7	18–20	25.8	25–27	3.7	0–5

so these species were excluded. Because my aim was to study how similar (or different) an estimate of the size of the breeding population censuses made at different times will give, I did not study changes in population composition (i.e., pairs, lone males, male groups, etc.; Siira 1959, Kauppinen 1983), but used estimated breeding pair numbers as units in analyses.

In most cases, data did not meet the requirements of parametric statistical tests, especially that of normality even after appropriate transformations (Lilliefors test; SYSTAT, Wilkinson 1992). Therefore, I used Friedman's two-way analysis of variance (see Sokal & Rohlf 1981) to test if the timing of the census affected estimated pair numbers. Because there were clear differences between years in the timing of the break-up of ice cover in relation to the timing of the first census (Friedman's test, $\chi^2 = 51.78$, df = 3, $P < 0.001$, N = 38 lakes; Table 1), and because some lakes did not get breeding pair observations of a given species every year, data from different years were analysed separately. To adjust probability values for the number of simultaneous tests, I also calculated table-wide significance levels by Bonferroni tests to judge the probability of incorrectly rejecting a true null hypothesis (H_0 = censuses give similar population estimates within a year) (Rice 1989). In each year and species, lakes where no breeding pairs were observed were left out of analyses. The exclusion of the empty lakes eliminated the risk of artificially increasing the fit between censuses. Thus, for the breeding lakes the four censuses of each year were considered as treatments and the lakes included in each year as blocks in the Friedman's test. For the stop-over lake the four censuses were considered as treatments but, in this case, the four study years were considered as blocks (between-year differences were not a problem in this lake because its open water score during the first census was between 3–5 in all years, and all species included had a breeding pair observation for the lake every year). If Friedman's test showed that there were significant ($P < 0.05$) or nearly significant ($P < 0.10$) differences in breeding pair estimates between the censuses, I used Tukey's test to identify significantly differing census pairs.

The effect of the break-up of the ice cover on the order of lake occupation by pairs was studied as follows. I compared the open water scores of the first census between lakes that were occupied already on the first census and lakes that were not occupied on the first census, but were occupied on later visits in the same year. The open water scores of each year were first standardized (z score) and the comparison was made by the Mann-Whitney U-test with data pooled over years.

The statistical analyses were made by SYSTAT procedures (Wilkinson 1992).

3. Results

3.1. Population estimates and the timing of census

In the breeding lakes, data on seven species were sufficient for statistical tests in all years. Population estimates varied between censuses in all species and in all years, but were statistically significantly (or nearly significantly, $P < 0.10$) only in the Mallard (1992), the Wigeon (1991 and 1992), the Common Goldeneye (1992 and 1993), and the Goosander (1992) (Table 2). In the Mallard, Common Goldeneye, and Goosander the tests also indicate significance at the table-wide $P < 0.05$ level, but not in the Wigeon (standard or sequential Bonferroni tests, see Rice 1989). In the Mallard the difference was between the second and fourth census, and in the Wigeon between the first and the third census in both years. In the Common Goldeneye the third census differed from the fourth one in 1992, and the fourth census from the first and the second census in 1993. In the Goosander the second census differed from the first and the fourth census.

Even though statistically significant differences between censuses were few, it should be noted that the first census seemed to give in many species lower population estimates compared with the second census in 1991 and 1992, but not in 1993 and 1994 (see Table 2). The difference between the first and the second census was significantly ($P < 0.05$) greater in 1991 and 1992 than in 1993 and 1994 in the Mallard, Tufted Duck, Common Goldeneye, Goosander, and Slavonian Grebe, and nearly significantly ($P = 0.070$) greater in the Teal (Mann-Whitney U-tests; pair number in the first census minus pair number in the second census, data pooled from 1991 and 1992 versus data pooled from 1993 and 1994).

In the stop-over lake significantly or nearly significantly varying population estimates were found in the Teal, Shoveler, Tufted Duck, and Common Goldeneye (Table 3). However, the tests do not indicate significance at the table-wide P < 0.05 level in any species (standard Bonferroni test). In the Teal, Tufted Duck, and Common Goldeneye the first census usually gave the highest population estimate, which differed significantly either from the third census (Teal) or the fourth census (Tufted Duck and Common Goldeneye). In the Shoveler the trend was the opposite: the fourth census gave the highest population estimate and differed significantly from the first census. Population estimates of the Garganey and the Wigeon also varied quite a lot between censuses but not significantly (see Table 3). In the Garganey the population estimate usually increased from the first to the fourth census while the opposite seemed to happen in the Wigeon.

3.2. Lake occupation and the break-up of ice cover

There was still extensive ice cover on some of the breeding lakes during the first census in all years, especially in 1991 and 1992 (Table 1). The ice cover, per se, may thus have affected the occupa-

Table 2. Total pair number of different species in the four censuses (I–IV) during 1991–94 in lakes (N = 37) used only for breeding. *n* gives the number of lakes included in the analysis in a particular species in a particular year. χ^2 is the Friedman's test statistics (df = 3 in all cases); census pairs differing significantly (P < 0.05) from each other in the pairwise comparison with Tukey's test are indicated after the test statistics. For further explanation see text.

		n	I	II	III	IV	χ^2	P
Podiceps auritus	1991	5	2	8	7	10	5.94	0.115
	1992	5	3	10	6	6	5.70	0.127
	1993	5	6	7	9	9	1.32	0.724
	1994	5	4	6	6	5	1.32	0.724
Anas platyrhynchos	1991	20	16	31	28	25	2.21	0.531
	1992	19	13	29	17	8	11.15	0.011; II,IV
	1993	19	17	12	16	13	0.68	0.880
	1994	16	9	6	16	8	4.44	0.217
Anas crecca	1991	19	6	20	18	18	4.66	0.199
	1992	19	23	16	21	8	4.37	0.224
	1993	21	26	17	19	17	1.51	0.679
	1994	14	19	17	15	9	2.38	0.498
Anas penelope	1991	12	5	14	17	10	6.70	0.08; I,III
	1992	16	4	8	16	10	7.44	0.059; I,III
	1993	12	5	7	9	9	2.05	0.562
	1994	15	16	16	13	7	4.54	0.209
Aythya fuligula	1991	6	0	10	4	6	4.45	0.217
	1992	4	1	4	8	7	5.03	0.170
	1993	6	16	8	8	11	0.95	0.813
	1994	8	10	9	7	3	1.58	0.665
Bucephala clangula	1991	21	26	32	32	22	3.01	0.389
	1992	26	24	35	34	15	10.64	0.014; III,IV
	1993	26	40	40	29	11	15.29	0.002; I,IV;II,IV
	1994	20	38	29	27	21	5.15	0.161
Mergus merganser	1991	10	2	7	5	2	3.81	0.283
	1992	12	0	12	4	1	12.2	0.007; I,II;II,IV
	1993	7	5	5	2	1	3.81	0.282
	1994	17	13	10	11	1	4.41	0.220

Table 3. Total pair number (sum for 1991–94) of different species in the four censuses (I–IV) in a stop-over lake. χ^2 is the Friedman's test statistics (df = 3 in all cases); census pairs differing significantly (P < 0.05) from each other in the pairwise comparison with Tukey's test are indicated after the test statistics. For further explanation see text.

		I	II	III	IV	χ^2	P
Podiceps cristatus	1991	5	10	12	10		
	1992	8	9	8	9		
	1993	7	7	6	4		
	1994	5	5	4	3		
	Total	25	31	30	27	1.88	0.599
Anas platyrhynchos	1991	5	5	9	8		
	1992	11	1	4	2		
	1993	2	2	0	9		
	1994	3	3	0	5		
	Total	21	11	13	15	0.75	0.861
Anas crecca	1991	12	12	9	7		
	1992	49	5	2	5		
	1993	26	12	3	12		
	1994	44	3	4	6		
	Total	131	32	18	30	7.13	0.068; I,III
Anas querquedula	1991	0	0	1	2		
	1992	1	2	2	2		
	1993	2	4	2	4		
	1994	0	0	1	2		
	Total	3	6	6	10	6.15	0.105
Anas penelope	1991	36	102	5	11		
	1992	6	4	13	6		
	1993	60	48	5	4		
	1994	47	27	11	15		
	Total	149	181	34	36	3.53	0.318
Anas acuta	1991	4	5	2	1		
	1992	0	3	3	3		
	1993	5	2	1	1		
	1994	1	0	0	0		
	Total	10	10	6	5	2.48	0.480
Anas clypeata	1991	2	3	3	4		
	1992	1	2	4	4		
	1993	2	5	3	4		
	1994	2	2	5	5		
	Total	7	12	15	17	7.28	0.064; I,IV
Aythya fuligula	1991	0	12	1	0		
	1992	9	7	6	2		
	1993	3	2	2	0		
	1994	20	3	0	0		
	Total	32	24	9	2	6.68	0.083; I,IV
Bucephala clangula	1991	6	5	2	2		
	1992	24	4	3	0		
	1993	3	3	0	0		
	1994	6	4	3	1		
	Total	39	16	8	3	18.58	0.014; I,IV

tion of the lakes, especially because the stop-over lake had harbored a great number of migrants already by the first census (see Table 3). This was, in fact, the case: lakes not occupied during the first census, but occupied later in the same year, were more iced over during the first census than lakes occupied already during the first census, a significant difference being found in the Mallard, Teal, Wigeon, and Common Goldeneye (Table 4). However, some Mallard, Teal, and Common Goldeneye pairs occupied breeding lakes surprisingly early in relation to the break-up of ice cover (Table 4). In 1991 and 1992, 29% (N = 21) of the lakes occupied by the Mallard during the first census had an open water score 2, the corresponding proportions being 21% (N = 14) in the Teal and 10% (N = 21) in the Common Goldeneye.

4. Discussion

Taking into account the number of simultaneous tests done, few statistically significant differences were found in breeding population estimates between censuses. In general, the timing of waterfowl censuses seems not to cause serious biases in population estimates within the three-week period considered. However, to retain reasonable conservativeness, some variation in population estimates occurred. Also, differences between lake types, years, and species were evident.

In the present study area, censuses made at the break-up of ice cover (usually 1–5 May) may give underestimates of population sizes of all species on lakes used only for breeding. At the same time, however, the stop-over lake usually has a surplus of pairs, many of which evidently belong to the local breeding population. Breeding pairs of most species are able to disperse to breeding lakes soon after the break-up of ice cover has started. For instance, in many species the first census in 1991 and 1992, but not in 1993 and 1994, seemed to be too early in the breeding lakes and gave in many cases underestimates of population sizes. This overall difference was to be expected, because in 1991 and 1992 during the first census the lakes were more iced over than they were in 1993 and 1994. Still, in 1991 and 1992 the stop-over lake had harboured a great number of pairs of different species already by the first census, which suggests that spring migration was underway but all pairs were not yet dispersed to local breeding lakes. The timing of the break-up of the ice cover seemed to be critical in the build-up of the local breeding populations. Pairs of many species, especially the Mallard, Teal, and Common Goldeneye occupied the breeding lake very early, often when the lake still was considerably iced over.

Table 4. Standardized (*z* score) open water scores during the first census of lakes occupied already during the first census and of lakes occupied later in the same year by different species (pooled data for years 1991—94). Range of original open water scores of lakes occupied during the first census are also given.

	Lakes occupied during the first census Range	Mean	SD	N	Lakes occupied later Mean	SD	N	U	P
Podiceps auritus	3–5	1.03	0.46	8	0.52	0.52	8	45.5	0.146
Anas platyrhynchos	0–5	0.38	0.63	38	–0.02	0.88	36	900.0	0.019
Anas crecca	1–5	0.52	0.68	31	–0.10	0.96	41	894.5	0.003
Anas penelope	3–5	0.70	0.38	16	–0.11	0.89	40	487.0	0.002
Aythya fuligula	3–5	0.79	0.32	6	0.31	0.79	12	50.0	0.186
Bucephala clangula	1–5	0.57	0.59	52	–0.30	0.78	40	1657.5	0.000
Mergus merganser	3–5	0.61	0.46	13	0.24	0.68	23	200.5	0.089

What is the appropriate census time for different species? Evidently the answer to this question varies between regions. Recommended census times for different species, compiled from different sources including this study, are given in Table 5. In general, the agreement between the present study and earlier papers from South and Central Finland is good, but there are four major differences in the recommended census times. At least in my study area, the census of the Great Crested Grebe, Slavonian Grebe, Wigeon, and Tufted Duck could be started much earlier than previously recommended. In fact, the recommended start of censuses made in this study should be considered conservative in many species because pairs disperse to local breeding lakes soon after the break-up of ice cover has started. Moreover, statistically significant differences between censuses within years were few, even though some existed. It may be that the difference in the recommendations between this and earlier studies is because earlier studies have not stressed the importance of the timing of the break-up of ice cover but have stressed more the overall timing of spring migration and changes in the composition of

Table 5. Recommended census times of breeding waterbirds in South and Central Finland in different studies. Only species examined in the present study are included.

	Linkola 1959	Kauppinen 1983	Koskimies & Väisänen 1991	This study
Podiceps cristatus			25–30 May	10–25 May
Podiceps auritus			25–30 May	10–25 May
Anas platyrhynchos	25 April–10 May	4–13 May	10–15 May	10–20 May
Anas crecca	8–20 May	10–15 May	10–15 May	10–20 May
Anas querquedula	15–30 May	15 May–4 June	25–30 May	25–30 May
Anas penelope	8–20 May	18 May–4 June	25–30 May	10–25 May
Anas acuta		4–17 May	10–15 May	10–20 May
Anas clypeata	10–25 May	10–31 May	10–15 May	10–25 May
Aythya fuligula	15 May–5 June	20–31 May	25–30 May	10–25 May
Bucephala clangula	25 April–10 May	about 10 May	10–15 May	10–20 May
Mergus merganser			10–15 May	10–20 May

Table 6. Difference in pair numbers between censuses made before or after the recommended census period and censuses made during the recommended census period for different species. The difference is given as percentage of how much smaller (–) or greater (+) the average pair number in the incorrectly timed censuses is of the average pair number in censuses for the recommended census period. In the Great Crested Grebe, Garganey, Pintail, and Shoveler the data is from the stop-over lake (Table 3; mean and range of years, 1991–94), in the other species from the breeding lakes (Table 2; mean and range of years, 1991–94). Incorrectly timed censuses are given after the ranges.

	Census before the recommended period		Census after the recommended period	
	Mean	Range	Mean	Range
Podiceps cristatus	–3.4	–53.3–+25.0; I		
Podiceps auritus	–48.1	–75.9– –27.7; I		
Anas platyrhynchos	–21.5	–45.8–+21.4; I	–28.7	–7.1–+65.2; IV
Anas crecca	+4.8	–68.4–+44.4; I	–27.9	–56.8– –5.4; IV
Anas querquedula	–55.4	–83.5– –15.0; I–III		
Anas penelope	–33.7	–64.6–+33.3; I		
Anas acuta	+49.2	–233.3– –100.0; I	–34.9	–71.4– –0; IV
Anas clypeata	–52.3	–69.7– –39.4; I		
Aythya fuligula	–11.9	–100.0–+77.8; I		
Bucephala clangula	+0.6	–31.4–+35.7; I	–45.2	–68.1– –25.0; IV
Mergus merganser	–25.0	–100.0–+42.9; I	–79.0	–90.5– –66.7; IV

the population observed during censuses (see Siira 1959, Kauppinen 1983). This concerns especially those lakes used only for breeding where staging birds are not a problem. By contrast, in prime stop-over lakes birds staging in the area during spring migration may cause serious problems, and the census should be delayed until the overall migration has ended.

To complete the census early enough in relation to the progress of breeding is equally important when considering the appropriate timing of censuses. In the present study area, the censuses could last slightly longer than previously recommended. This is the case in the Mallard, Teal, Pintail, Shoveler, Common Goldeneye, and Goosander. However, especially in the Mallard, Common Goldeneye, and Goosander but, to a lesser extent, in some other species, too, the last census made after 20th May usually showed a clear drop in the population estimate (see Tables 2 and 3). At that time, females are incubating and males are leaving the whole study area for moulting; hence, censuses should not be done anymore.

The actual error of population estimates derived from incorrectly timed censuses can be evaluated by comparing pair numbers of each species in censuses made before or after the recommended census period with pair numbers of censuses from the recommended census period. As can be expected from the discussion above, differences in the errors of population estimates are clear both between species and years (see Table 6). However, because data from most species are still quite small the error estimates of this study should be treated with caution.

In conclusion, it is important to time waterfowl pair censuses appropriately in relation to the build-up of the local breeding population. In addition to the timing of the overall spring migration, the timing of the break-up of ice cover in local breeding lakes is important for the timing of censuses. Even though the overall spring migration may still be in progress and stop-over lakes may be occupied by a surplus of birds, local breeding pairs of many species disperse to breeding lakes soon after the break-up of ice cover has started. Results of this study suggest that in some species censuses could be started much earlier than previously recommended. In terms of optimal timing, a census made around the middle of May would give an unbiased population estimate of all other species excluding the Garganey in the present study area.

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Selostus: **Populaatiokoon arviot ja vesilintulaskentojen ajoitus**

Aikaisemmissa vesilintulaskennan metodiikka koskevissa töissä on korostettu laskennan ajoittumisen merkitystä luotettavan parimääräarvion saamisessa. Ajoittumisesta mahdollisesti koituvan arviointivirheen suuruutta ei kuitenkaan ole analysoitu tilastollisesti. Virhettä ei myöskään ole tarkasteltu erikseen eri järvityypeillä. Tässä työssä analysoidaan tilastollisesti laskennan ajoittumisesta koituvan parimääräarvion vaihtelua järvillä, joita vesilinnut käyttävät vain pesintään (37 järveä), ja yhdellä järvellä, jota käytetään myös levähdyspaikkana kevätmuuton aikana. Työssä tarkastellaan myös jäiden lähdön ajoittumisen vaikutusta siihen, kuinka parit asuttavat paikalliset pesimäjärvet. Aineistot on kerätty Kaakkois-Suomessa Saaren ja Parikkalan kunnissa sijaitsevalla tutkimusalueella vuosina 1991–94. Kunkin vuoden toukokuussa kullakin järvellä tehtiin neljä laskentaa viikon välein (Taulukko 1). Analyysit pohjautuvat näiden laskentojen antamien parimääräarvioiden vertailuun.

Laskennan ajoittumisesta koituva parimääräarvion vaihtelu oli tilastollisesti tarkasteltuna varsin vähäistä, joskin tässä suhteessa esiintyi eroja sekä lajien että järvityyppien välillä (Taulukot 2 ja 3). Jäiden lähdön ajoittuminen vaikutti useimmilla lajeilla oleellisesti pesintäjärvien asuttamiseen (Taulukko 4). Se on siten kriittinen tekijä, joka monella lajilla sanelee laskennan aloittamisajankohdan. Oli kuitenkin merkille pantavaa, että erityisesti sinisorsa-, tavi- ja telkkäpareja esiintyi pesimäjärvillä varsin yleisesti jo silloin, kun järvi oli laskennan aikana vielä valtaosin jäässä.

Työssä annetaan eri lajeille suositeltavat laskenta-ajankohdat tutkimusalueella ja verrataan näitä muissa töissä annettuihin suosituksiin (Taulukko 5). Merkittävin ero tässä työssä annettujen ja aikaisempien suositusten välillä on se, että joillakin lajeilla laskennat voitaisiin aloittaa nykyisin käytössä olevia suosituksia aikaisemmin ilman, että siitä koituisi merkittävää virhettä parimääräarvioon. Laskennan ajoittumisesta (ennen tai jälkeen suositusajankohdan) koituvan virheen suuruudesta ja suunnasta esitetään myös alustava tarkastelu (Taulukko 6). Aineistot ovat kuitenkin vielä riittämättömiä luotettavien virhe-estimaattien laskemiseksi.

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