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Elevated artificial nest sites for Mallard *Anas platyrhynchos* in Latvia

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Abstract

The use of elevated covered nest sites for Mallard *Anas platyrhynchos* was studied in 1999 - 2003 on coastal lakes and ponds of different origin. Within the 5-year period, a total of 723 checks of nest sites were made. Nest site occupancy by Mallard was much higher on ponds (46.8 %) than on large lakes (3.3 %). Occupancy of nest sites increased by years, likely due to increased experience by both managers and ducks. Nest sites appearing more natural seemed to be preferred by ducks. No significant difference was found in occupancy between two-entrance nest sites (hay cylinders, wooden boxes) and one-entrance nest sites (53.4 % and 50.0 %, respectively) in 2003. Nesting success within a pond was higher in elevated nest sites with predator guards (87.7%) than in those without them (67.6 %). In the nest sites with predator guards nesting success averaged as high as 89.4 % (all locations combined) which is much higher than recorded in natural nests during the same period (L. Engure – 23.3 %, L. Kanieris – 54.3 %, ponds – 25.0 %). In the nest sites with predator guards, 7.6 % were abandoned nests and 2.9 % were predated (only American mink *Mustela vison*). No predation by Marsh Harrier *Circus aeruginosus*, Hooded Crow *Corvus corone cornix* and Raven *Corvus corax* was observed in the elevated nests. The best results were achieved in the fifth year: 55 nest sites, 35 occupied, and 27 successfully hatched in a 10 ha pond.

Key words: American mink, artificial nest sites, Latvia, Mallard, predators, nesting success.

Introduction

The decline of waterfowl populations in at least several hundreds of years has been documented in the Northern Hemisphere. It is widely agreed that the main cause of the decline is habitat loss for breeding, moulting, staging during migration and wintering but it is clear that also other factors such as human-caused mortality due to overshooting, lead-poisoning, oil-spills and by-catch have played a certain role. Recently, many studies of ducks have recorded very low nesting success below the threshold level (15 - 20 %) believed necessary to maintain a population (Covardin et al. 1985; Klett et al. 1988).

Breeding populations of ducks have declined also in Latvia, especially during recent decades. The decline has affected nearly all species including also the Mallard *Anas platyrhynchos*, the most common duck species, which was considered stable about 10 or 20 years ago (Strazds et al. 1994). Recently, in Lake Engure, where in the early 1990s the breeding population of Mallard was estimated as 1200 pairs (Blums et al. 1993), it decreased to 500 pairs in 1999 (Viksne et al. 2000). During the same time, the nesting success declined from 71 % in the 1989 - 1993 period to 48 % in 1994 - 1998, to 23 % in

1999 - 2003, and was even as low as 10 % in 2002. According to our observations during the 1999 - 2003 period the nesting success of Mallard was very low also on ponds – about 25 %, and was comparatively higher (52.3 %) only in some places as Lake Kanieris.

The low nesting success of Mallard and other ducks is caused by heavy nest predation. Besides the traditional nest predators such as Marsh Harrier *Circus aeruginosus*, Hooded Crow *Corvus corone cornix* and Raven *Corvus corax*, which are common depredators of Mallard nests on ponds and lakes in Latvia (Vīksne et al. 2000), American mink *Mustela vison* became a new alien mammalian predator in the 1970s. This species was widely reared in farms for fur, and escaped specimens established a wild population exceeding 19065 individuals in 2003 (unpublished data by the State Forest Service of Latvia; the real number is believed to be much higher). American mink predates duck nests destroying clutches and killing incubating females. Although Mallard suffers less from mink predation in comparison with some other duck species, in specific habitats such as mats of emergent vegetation and small islets, nest loss due to mink predation is quite significant. According to our observations in 1999 - 2003 on ponds, at least 70 % of the total Mallard nest predation could be accounted for by American mink.

The idea to protect Mallard nests from predators by mounting elevated artificial nest sites is known at least since the 17th century (Eley Game Advisory Station 1969, cit. by Doty et al. 1975) and since then such attempts (less often regular practice) have appeared in different countries in Europe (Bjärnvall 1970; Majewski, Beszterda 1990). Elevated nest sites have been widely used in North America since the 1960s, where they gradually developed from open nest baskets (protect nests from climbing mammals) to covered structures which quite effectively protect duck nests also from avian predators (Bishop, Barrat 1970; Doty 1979; Haworth, Higgins 1993; Eskowich et al. 1998). Good occupancy of these artificial nesting structures by Mallard and its high nesting success stimulated us to launch the present study, the purpose of which was:

(i) to test different types of covered artificial nest sites for suitability for Mallard nesting in Latvia, in relation to the wetland;

(ii) to establish artificial nest sites for Mallard, which are optimal in our conditions considering the availability of materials, costs, occupancy and duck nesting success;

(iii) to promote as wide as possible implementation of artificial nest sites in Latvian wetlands to protect nesting Mallards from avian and mammalian predation.

Materials and methods

The study was carried out in 1999 - 2003 on different Latvian wetlands, including shallow freshwater coastal lakes and ponds of different origin. In the coastal lakes Engure (41 km^2) and Kanieris (11.4 km^2), which are well known bird lakes, Ramsar sites since 1995, both rich in emergent vegetation and islets, breeding populations of Mallard in 1999 - 2003 were estimated correspondingly as 500 and 300 pairs (Vīksne et al. 2000). More detailed descriptions of these lakes are available in other publications (Vīksne 1997; Vīksne et al. 2000). The strongly overgrown Lake Sarnate (ca. 1.5 km^2; Ventspils region) was lowered in 1970s, then restored in 2001 but is still almost completely covered with continuous reed.

Ponds used for experiments with artificial nest sites were: specially created by hunters mostly for waterfowl, fish-ponds abandoned long ago and recently partly covered with

emergent vegetation, and Beaver *Castor fiber* ponds. In some cases nest sites were erected on fish-ponds used also recently for intensive fish-breeding. The size of ponds averaged 12.2 ha (4 - 30). Unfortunately, we have no information about the number of nesting Mallards on the ponds before erection of the artificial nest sites. As a rule, single or some pairs of Mallards attempted to nest there also before, except perhaps in some newly created ponds.

As no special funding was obtained for this study in 1999 - 2002, we attempted to involve volunteers – landowners and hunters. Beginning in January 1999, articles advertising mink-safe nest sites for Mallard were published in the Latvian hunters' journal MMD (e.g. Vīksne 1999; 2000). Appeals were made to hunters to try different types of artificial nest sites and they were requested to inform the authors on the wetland location, number and type of nest sites, the number of occupied and the number of successful clutches. After receiving the above information nearly all of the locations were visited by the authors, the nest sites were checked repeatedly, and recommendations were given to owners regarding the construction and placement of nest sites, identification of successfully hatched and predated nests, etc. In 2003, information was obtained about 27 wetlands in which no less than 350 artificial nest sites were erected. However, the number of both localities and nest sites erected was higher – many hunters who erected several nest sites did not inform the authors.

In 1999 - 2003, a total of 723 checks were made of available nest sites. Several types of artificial nest sites were used (Table 1, Fig. 1): (i) two-entrance (Fig. 1A, 1B, 1C, 1D) and (ii) one-entrance nest sites (1E), both mounted on wooden poles supplied with predator guards, and (iii) nests made on black alder *Alnus glutinosa* stumps (1F) which were impossible to supplement with predator guards. Hay cylinders, which were widely used in North America, served as a prototype for two-entrance nest sites (Doty 1979; Lewis 1998), both according to materials and dimensions (welded wire fencing, fine hay, roofing felt, fine hay; 80 cm long and 30 cm in diameter). About 20 % of hay cylinders were fashioned differently – with a wooden floor and an arched hay roof. Both from the inside and outside they were similar to the hay cylinder, and therefore both these types were combined for analysis. Other two-entrance nest sites followed the same idea – to give a chance for incubating duck to escape predator which could appear at either entrance. They differed only according to the external material – wood, their dimensions

Table 1. Numbers of available artificial nest sites of different types in Latvia, 1999 - 2003

Type of nest site	Available	Designation on Fig. 1
Hay cylinders	301	A
Wooden boxes	82	B
Hollowed round timbers	12	C
Wigwams	11	D
Two-entrance nest sites on poles, total	*406*	
One-entrance nest sites on poles	260	E
Nest sites on poles, total	*666*	
Stump nests	57	F
Total	*723*	

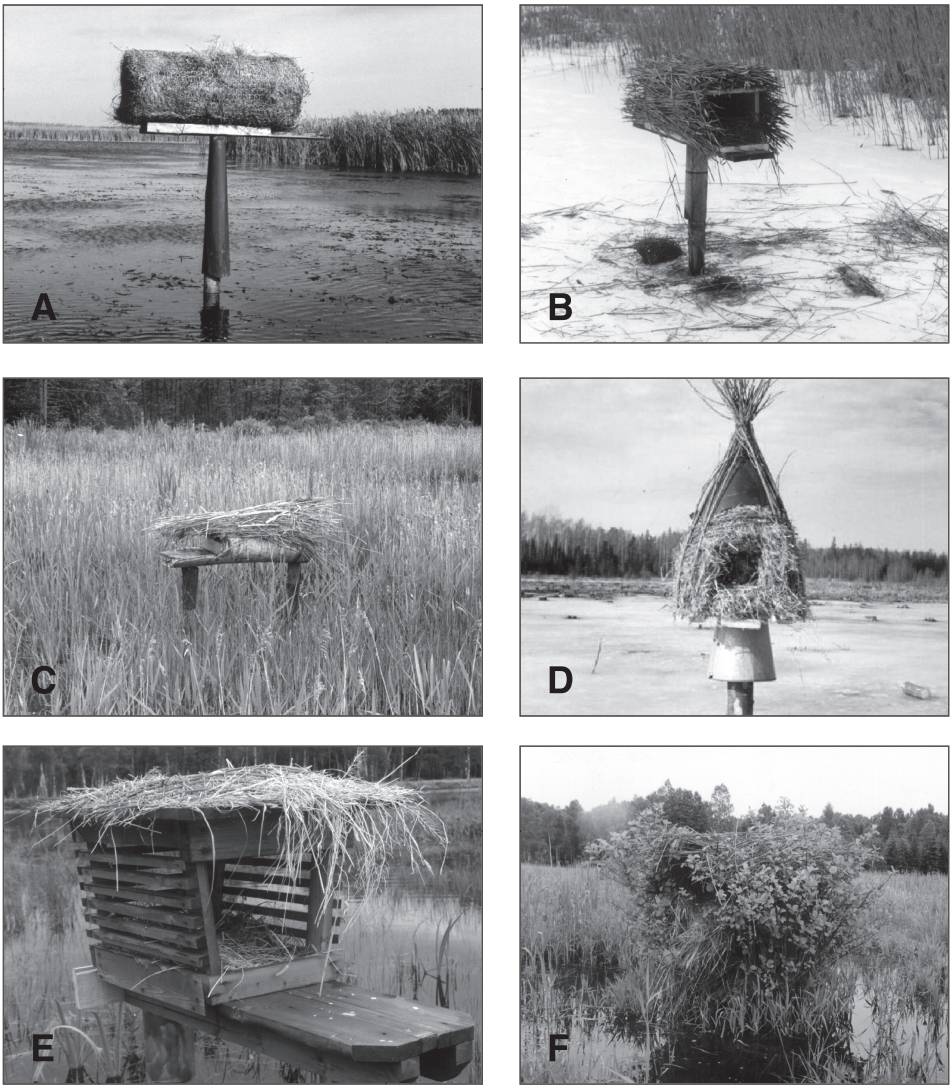

Fig. 1. Types of artificial nest sites used: A, hay cylinder; B, wooden box; C, hollowed round timber; D, wigwam; E, one-entrance nest site; F, stump nest.

were similar to that of hay cylinders (wooden boxes – 80-cm-long, ca. 28-cm-wide and high; hollowed round timber – 80 cm long, inside diameter 30 cm). Wigwams had a wooden floor 50 × 50 cm, two entrances and cone-shape roof consisting of shrub stems, hay, roofing felt, hay and stems. The same materials were used to cover stump nests. One-entrance nest sites (Wandel 1994) had an inside floor 50 × 30 cm, inside ceiling 50 × 45 - 50 cm, 35 cm high, racky walls and a 50-cm long landing platform ahead of entrance.

Beginning with 2000, two-entrance nest sites were supplemented with ca. 20-cm long and 15 - 20 cm wide wooden landing platforms in front at one or both entrances to facilitate exploring of the nest site by a female. Wooden boxes and hollowed round timber

nest sites, in recent years also hay cylinders, as a rule were covered with reed forming a roof over the landing platforms. Side walls of wooden boxes usually were also covered with reed. The purpose of this was to give wooden nest sites a more natural appearance and to make the landing of Marsh Harrier on the platform in front of the entrance more difficult.

All nest sites were mounted on wooden poles 0.6 - 1.0 m above water, iron pipes were used only in some places. Poles as a rule were supplied with "predator guards" – mostly tin-plate (iron or aluminium) tubes or narrow cones, about 60 cm high which should prevent mink climbing. Nest sites were erected usually on open water, most often 5 – 10 m from the edge of emergent vegetation (usually common reed *Phragmites australis* or cattail *Typha* sp.). Area covered with continuous emergent plants which lacked a hard stem above water (e.g. floating sweet-grass *Gliceria fluitans*), were also used for artificial nest sites.

As a rule we avoided disturbing incubating ducks and checked nest sites when nesting season was over. Used nests (hay with down and egg shells) were removed and replaced with fresh hay or last years grass before every breeding season.

Due to the great number of inexperienced persons involved in making and erecting nest sites, the quality of nest sites varied widely. This raises difficulty in evaluating the occupancy rate of the nest sites. Therefore, we attempted to exclude from analysis nest sites which obviously were not suitable for nesting due to technical defects (usually insufficiently stable attachment to pole, insufficient inside space or a low amount of hay for nest).

The chi-square test with Yates' Correction was used to evaluate the significance in occupancy and nesting success.

Preliminary results obtained up till now have been published in Latvian, to maintain feedback with the network of nest site enthusiasts (Vīksne 2002; Vīksne, Laubergs 2004).

Results

Species composition of nesting ducks

Only Mallard was found nesting in the artificial nest sites. The only exception was a case when both Goldeneye *Bucephala clangula* and Goosander *Mergus merganser* attempted nesting in one wigwam on a pond near Saldus in 2002, but the nest was abandoned during egg laying. Some feathers of Shelduck *Tadorna tadorna* were found in a hay cylinder on Lake Engure in 1999, suggesting some interest of this species in artificial nest structures. Also, White Wagtail *Motacilla alba* quite often nested in artificial nest constructions but it could not be considered as competitor for Mallard. This paper deals only with Mallard nesting.

Differences in occupancy of nest sites among wetlands

There was a great difference in occupancy of nest sites on different wetlands (Table 2). Nest sites on ponds were favoured (46.8 %) over lakes rich in emergent vegetation mats and other potentially suitable substrates for nesting (3.3 %). Nest site occupancy by Mallard in single years did not exceed 10 % on Engure and 18.2 % on Kanieris. The very low occupancy on Lake Sarnate (1.5 %) might be explained by late erection of nest

Table 2. Occupancy of elevated artificial nest sites by Mallard *Anas platyrhynchos* on lakes and ponds in Latvia, 1999 - 2003

Type and name of wetland	Available	Occupied	
		number	%
L. Engure	44	3	6.8
L. Kanieris	52	4	7.6
L. Sarnate	206	3	1.5
Lakes, together	302	10	3.3
Ponds, together	421	197	46.8

sites in 2002 and unfavourable vegetation structure (many large continuous reed swards with very few interspersions of open water), compared with Engure and Kanieris. The difference in occupancy between ponds and lakes remains highly significant even if L. Sarnate is excluded (χ^2=36.04, p<0.0001).

Occupancy of different nest site types

To evaluate the occupancy of different nest site types we used data only from ponds. We also divided the records by periods: 1999 - 2002 when on many ponds experiments were started and both people and ducks had no or little experience with nest sites, and 2003 when no new nest site plots were set up by inexperienced persons (Table 3).

Nearly all types of nest sites were more occupied in 2003 than in 1999 - 2002 (hay cylinders: χ^2 = 4.12, p = 0.04; hay cylinders and wooden boxes, combined: χ^2 = 4.72, p = 0.03; two-entrance nest sites, combined: χ^2 = 6.1, p = 0.01), only stump nests were

Table 3. Occupancy of different types of artificial nest sites on ponds by Mallard *Anas platyrhynchos* in Latvia, 1999 - 2003

Type of nest site	1999-2002			2003			1999-2003		
	available	occupied		available	occupied		available	occupied	
		no.	%		no.	%		no.	%
Two-entrance nest sites on poles									
1. Hay cylinders	131	51	38.9	65	36	55.4	196	87	44.4
2. Wooden boxes	14	4	28.6	23	11	47.8	37	15	40.5
Total 1 + 2	145	55	37.9	88	47	53.4	233	102	43.8
3. Hollowed round timbers	8	6	75.0	4	4	100.0	12	10	83.3
4. Wigwams	3	2	66.7	8	6	75.0	11	8	72.7
Total 1 + 2 + 3 + 4	156	63	40.4	100	57	57.0	256	120	46.9
5. One-entrance nest sites on poles	76	24	31.6	32	16	50.0	108	40	37.0
Total 1 + 2 + 3 + 4 + 5	232	87	37.5	132	73	55.3	364	160	44.0
6. Stump nests	46	30	65.2	11	7	63.6	57	37	64.9

occupied equally in both periods.There was no difference between hay cylinder and wooden box occupancy ($\chi^2 = 0.15$, $p = 0.703$) in 2003, nor between these two types of nest sites combined and one-entrance nest sites ($\chi^2 = 0.02$, $p = 0.901$).

A very high occupancy of hollowed round timber nest sites and wigwams was observed. Combining all records for the whole period (1999 - 2003), occupancy of these nest sites was 83.3 % and 72.7 %, respectively, i.e. significantly higher than that of hay cylinders (44.4 %), wooden boxes (40.5 %) and one-entrance nest sites (37.0 %). The only explanation is that all the hollowed timber and wigwam nest sites were of ideal quality and mounted, from the ducks' point of view, in very suitable places. However, it is not excluded that wigwams were really more attractive and preferred by ducks due to their more natural appearance.

The idea of preference of nest sites which look as natural as possible was supported by much better occupancy of stump nests compared with all other nest sites mounted on poles in 1999 - 2003 (64.9 % versus 44.0 %, $\chi^2 = 7.87$, $p = 0.005$).

Occupancy and nest site density

Nest sites were set up on ponds of different size ranging from 4 to 30 ha (average 12.2 ha), with an average density of 1.7 nest sites per ha. Usually the number of nest sites was gradually increased when duck nesting was observed. The occupancy of nest sites increased with time which was evidently caused by two factors, i.e. increasing of skills of nest site managers and learning by ducks. Therefore, it is difficult to find a relationship between the density of nest sites and their occupancy by ducks.

The upper limit of Mallard occupied nests per ha that is possible by erecting nest sites is still unknown. Fig. 2 illustrates the number of artificial nest sites available, number of occupied nest sites and successfully hatched clutches on the pond Elkskene, 10 ha. The

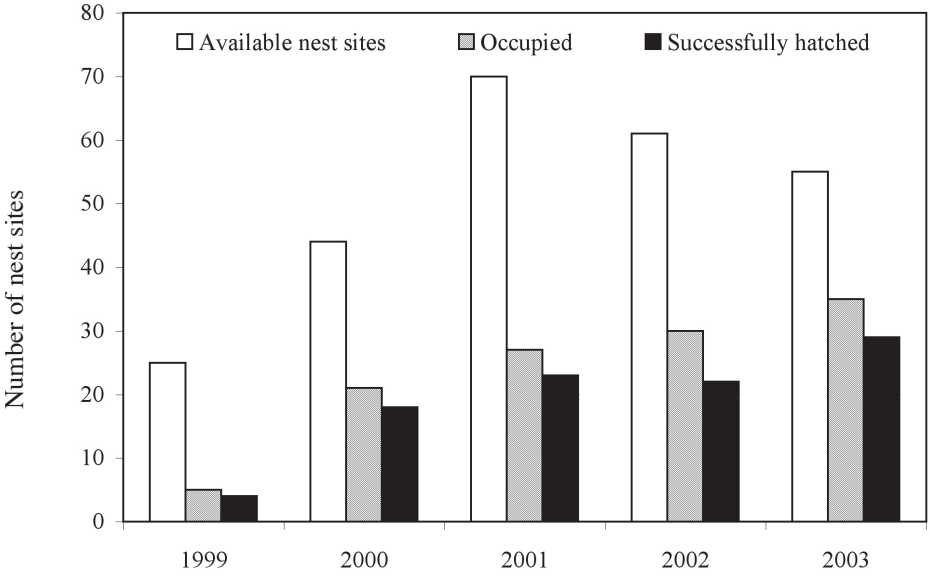

Fig. 2. Numbers of available and occupied by Mallard *Anas platyrhynchos* nest sites, and the number of successfully hatched broods on the pond Elkskene (10 ha), Latvia, 1999 - 2003.

number of nest sites here increased from 25 in 1999 to 70 in 2002, then declined to 61 in 2001 and 55 in 2003; the percent occupancy between 1999 and 2003 was 20, 48, 39, 49 and 64. During this time the number of nesting ducks increased every year from 5 in 1999 to 35 in 2003. The above indicates that it is possible to attract at least 3.5 pairs of Mallard per ha given a density of 5.5 available nest sites per ha. Probably even more can be attracted by increasing the number of nest sites and improving their quality.

Nesting success

No significant difference was found between nesting success of Mallards nesting in different nest sites mounted on poles with predator guards. The average nesting success in all these nest sites was 89.4 % (range 80 % to 100 % for different nest site types). In contrast, the nesting success of Mallards in stump nests accessible to climbing mammals was much lower – 67.6 % ($\chi^2 = 10.00$, $p = 0.002$). The difference between nesting success on Elkskene pond in predator guard supplemented nests and stump nests (the only location where we had this type of nests) was similar for the two types (87.7 % versus 67.6 %).

Reasons of nesting failure

In total, nesting was unsuccessful in 30 nests (Table 4) for two reasons – nest abandonment (14 nests) and predation (16 nests). The number of failed nests was too small to compare their frequency by different types of nest sites.

All abandoned nests contained incomplete clutches or, in some cases, probably complete clutches with fresh eggs. The widely known sensitivity of Mallard to disturbances during laying and early incubation can likely explain the nest abandonment in most cases.

The only nest predator recorded in elevated nest sites was American mink. Its predation rate differed between nest sites on poles with predator guard (2.9 %) and the easily accessible stump nests (29.7 %), thus proving the effectiveness of the predator

Table 4. Nesting success and failure of Mallard *Anas platyrhynchos* in artificial nest sites in Latvia, 1999 - 2003

Type of nest site	Nested	Hatched		Failed			
		no.	%	abandoned	predated	total	%
Hay cylinders	96	86	89.6	8	2	10	10.4
Wooden boxes	16	13	81.3	0	3	3	18.7
Hollowed round timbers	10	8	80.0	2	0	2	20.0
Wigwams	8	8	100.0	0	0	0	0
Two-entrance nest sites on poles, total	130	115	88.5	10	5	15	11.5
One-entrance nest sites on poles	40	37	92.5	3	0	3	7.5
Nest sites on poles, total	170	152	89.4	13	5	18	10.6
Stump nests	37	25	67.6	1	11	12	32.4
Total	207	177	85.5	14	16	30	14.5

guards. All five cases when American mink managed to predate clutches in nest sites on poles were recorded in 2003, four of them on the same pond where no mink predation was observed in artificial nest sites in 1999 - 2002 but was recorded in natural ground level nests. In all these cases, deviations from the recommended construction or placement (e.g. a supporting wire stretched between the landing platform and the pole below the predator guard, lack of or too narrow predator guard, cattail or shrubs growing very close to nest pole) were found.

Predation by avian predators such as Marsh Harrier, Hooded Crow and Raven was not observed. In a few cases, Magpie *Pica pica* was suspected at taking eggs from already abandoned nests.

Discussion

Mallard is adapted to an extremely wide range of habitats and nest sites. Although usually it nests on ground level, nesting on trees and different artificial constructions is known as well, even up to 32.5 m high. These elevated nests are not randomly distributed, as there are areas where they are quite common, separated by areas where they are very rare (Bauer, Glutz von Blotzheim 1968). One reason for the geographical patterns is probably the lack of such nesting experience in some populations. A switch to a new nesting habit could be prevented by abundant suitable natural (traditional) nesting sites, even though predation on these ground sites may be high. The site tenacity of Mallards which have successfully hatched ducklings in artificial nest sites (Doty, Lee 1974; Bishop et al. 1978; Majewski, Beszterda 1990; Yerkes 1999) allows to believe that a population will gradually switch from natural on-ground nests to artificial nests even in places where occupancy of newly mounted artificial nest sites is very low, as on natural lakes in our study and in some areas in the USA (Doty et al. 1975). In our conditions artificial nest sites could be very important as they prevent predation also by Marsh Harrier, probably also by Hooded Crow and Raven, which are the main Mallard nest predators on big coastal lakes.

It seems likely that American mink, the only nest predator recorded in artificial nest sites during this study, prefers searching for nests located at the ground level (on islets, along the shore line, on mats of emergent vegetation). Mink predation on natural nests placed on the ground level on ponds was higher (about 57 %) than on accessible nests placed on black alder stumps about 1 m above the water level (30 %). There also were cases when ducklings were successfully hatched in artificial nest sites that were accessible to mink due to some technical defects and placed very close to small grassy islets where mink predated natural ground nests. However, if mink succeeds in overcoming the predator guard, it is likely that it will show more interest in all elevated nest sites and that this experience could be spread among conspecifics.

The very high density of nesting Mallards achieved on the pond Elkskene during this study raises a special interest. The number of nesting ducks increased on the pond during five years, reaching 3.5 pairs per ha, and it is not excluded that a further increase could be expected. The density of nest sites available at Elkskene (5.5 nest sites per ha) exceeds that used and recommended in USA (Doty et al. 1975 – 2.5; Bishop, Barrat 1970 – 1.3 - 1.65; The Manitoba Habitat Heritage corporation – 0.6 - 1.2). However, in 2001 when the number of hatched broods was 23 (i.e. 2.3 broods per ha) the number of ducks on the pond declined dramatically at the opening of hunting season (August, 18). In 2002 nearly all

ducks had left the pond by hunting season (2.2 broods per ha, opening at August, 17). In 2003, when additional feeding of ducks with wheat was started already in July, a decline of duck numbers in mid- August was not observed. It seems that the lack of food was the reason for the unusually early departure of Mallards from the pond. Unfortunately, it is not clear whether and how increasing duck brood density influenced the amount and composition of zoobenthos organisms (the only information on benthos in Elkskene is from mid-October 2000, when 5040 and 5560 ind. m^2, correspondingly 122 and 73 g m^2, were found at the best sampling points – unpublished data by E. Parele).

It can be concluded that elevated artificial covered nest sites supplied with predator guards can be an effective management tool to increase nesting success and the breeding population size of Mallard. Considering the availability of different materials, ease of production, and longevity of nest sites, wooden boxes seem to be the most suitable type of nest site under the present Latvian conditions.

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References

Bauer K.M., Glutz von Blotzheim U.N. 1968. *Handbuch der Vögel Mitteleuropas. Band 2. Anseriformes (1. Teil).* Akademische Verlagsgesellschaft, Frankfurt/Main. 534 S.

Bishop R.A., Barrat R. 1970. Use of artificial nest baskets by Mallard. *J. Wildlife Manage*. 34: 734–738.

Bishop R.A., Humburg D.D., Andrews R.D. 1978. Survival and homing of female Mallards. *J. Wildlife Manage*. 42: 192–196.

Bjärvall A. 1970. Nest-site selection by the Mallard (*Anas platyrhynchos*). A questionnaire with special reference to the significance of artificial nests. *Viltrevy* 7 : 151–182.

Blums P., Bauga I., Leja P., Mednis A. 1993. Breeding populations of ducks on Engure lake, Latvia, for 35 years. *Ring* 14: 165–169.

Cowardin L.M., Gilmer D.S., Shaiffer C.W. 1985. Mallard recruitment in the agricultural environment of North Dacota. *Wildlife Monogr.* 92: 1–37.

Doty H.A. 1979. Duck nest structure evaluations in prairie wetlands. *J. Wildlife Manage*. 43: 976–979.

Doty H.A., Lee F.B. 1974. Homing to nest baskets by wild female Mallards. *J. Wildlife Manage*. 38: 714–719.

Doty H.A., Lee F.B., Kruse A.D. 1975. Use of elevated nest baskets by ducks. *Wildlife Soc. Bull.* 3: 68–73.

Eskowich K., McKinnon D., Brewster G., Belcher K. 1998. Preference and use of nest baskets and nest tunnels by mallards in the parkland of Saskatchewan. *Wildlife Soc. Bull*. 26: 881–885.

Hawort M., Higgins K.F. 1993. Waterfowl use and production from nesting baskets and bales in South Dakota wetlands. *Prairie Natur.* 25: 149–160.

Klett A.T., Shaffer T.L., Johnson D.H. 1988. Duck nest success in the prairie pothole region. *J. Wildlife Manage*. 52: 431–440.

Lewis L. 1996. *Updated Instructions for Construction, Placement and Maintenance of Pole Mounted Hen House Waterfowl Nest Structures*. Fish and Wildlife Service, Morris, MN.

Majewski P., Beszterda P. 1990. Influence of nesting success in female homing in Mallard. *J. Wildlife Manage*. 54: 459–462.

Strazds M., Priednieks J., Vāveriņš G. 1994. Bird numbers in Latvia. *Putni dabā* 4: 3–18 (In Latvian. Latvijas putnu skaits).

Vīksne J. 1997. *The Bird Lake Engure*. Jāņa Sēta Publishers, Rīga. 111 p.

Vīksne J. 1999. It can be done still in April! MMD 4: 3. (In Latvian. To vēl var paspēt aprīlī!)

Vīksne J. 2000. Safe nest-sites for Mallard. MMD, 2: 8–11. (In Latvian. Meža pīlēm drošas ligzdvietas)

Vīksne J. 2002. Increasing Mallard numbers through offering artificial nesting sites. In: Opermanis O. (ed.) *Examples of Management of Wild Species and Habitats in Latvia*. DANCEE, Rīga, 68–73. (In Latvian. Mākslīgo ligzdvietu izvietošana dīķos un ezeros meža pīļu skaita palielināšanai)

Vīksne J., Laubergs A. 2004. Artificial nest sites for Mallard in Latvia, 1999 - 2003. *MMD* 2: 16–19. (In Latvian. Meža pīļu mākslīgās ligzdvietas Latvijā 1999. - 2003. gados)

Vīksne J., Mednis A., Janaus M. 2000. Breeding duck numbers and breeding success at two Latvian Ramsar sites, lakes Engure and Kanieris, in 1999. *Newsletter Migratory Birds of the Western Palearctic – OMPO* 22: 25–39.

Wandel G. 1994. *Revier-einrichtungen selbst gebaut*. BLV Verlagsgesellschaft, München.

Yerkes T. 1999. Fidelity of Mallards to artificial nesting structures. *Prairie Natur.* 31: 243–244.

Virs ūdens paceltas mākslīgās ligzdvietas meža pīlei *Anas platyrhynchos* Latvijā

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Kopsavilkums

Virs ūdens paceltas mākslīgās ligzdvietas meža pīlei *Anas platyrhynchos* izmēģinātas 1999. - 2003. gados piejūras ezeros un dažādos dīķos. Kopā analizētas 723 ligzdvietu kontroles. Meža pīle mākslīgās ligzdvietas daudz labāk aizņem dīķos (46,8 %) nekā lielos ezeros (3,3 %). Ligzdvietu aizņemtība ar gadiem pieaug, domājams, pateicoties gan to gatavotāju, gan pīļu lielākai pieredzei. Ligzdvietām, kuras izskatās dabiskākas, pīles dod priekšroku. Nav konstatētas būtiskas aizņemtības atšķirības divieeju ligzdvietām (siena cilindri, dēļu koridori) un vienieejas ligzdvietām (attiecīgi 53,4 % un 50,0 %) 2003. gadā. Vienā un tai pašā dīķī ligzdošanas sekmes bija augstākas ligzdvietās ar pretplēsēju aizsargiem (87,7 %), nekā bez tiem (67,6 %). Ligzdvietās ar pretplēsēju aizsargiem (visas vietas kopā) ligzdošanas sekmes vidēji bija 89,4 %, resp. ievērojami augstākas nekā dabiskajās ligzdās (Engurē – 23,3 %, Kaņierī – 54,3 %, dīķos – 25,0 %) tanī pat laikā. Ligzdvietās ar pretplēsēju aizsargiem 7,6 % dējumu tika pamesti, plēsēji (tikai Amerikas ūdele *Mustela vison*) izpostīja 2,9 %. Līdz šim virs ūdens paceltajās ligzdvietās nav konstatēti niedru lijas *Circus aeruginosus*, pelēkās vārnas *Corvus corone cornix* un kraukļa *Corvus corax* postījumi. Labākie rezultāti sasniegti kādā 10 ha lielā dīķī piektajā gadā (55 ligzdvietas, 35 meža pīles aizņemtas, 27 sekmīgi izvestas).