Feather development in the chicks of Northern Lapwings *Vanellus vanellus*

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In this study, carried out during 2006–2008 in the valley of the middle Pripyat River, S Belarus, the feather development of Northern Lapwing chicks was described in detail. Chicks were ringed on the day they hatched. Later they were recaptured and their plumage and feather growth stages were described. Seven age classes were identified. The first was downy chicks, 1–7 days old, with no visible growing feathers. Older age classes were distinguished according to the stage of development of different feather tracts. These observations, coupled with biometric data, provide a valuable means of ageing Northern Lapwing chicks.

INTRODUCTION

Most of studies of chick development have focussed on biometric analysis resulting in growth curves for various measurements (e.g. Elowe & Payne 1979, Holland & Yalden 1991, Miller & Knopf 1993, Schew & Collins 1990). Shortly after hatching, Northern Lapwing chicks leave the nest and are able to move considerable distances, even 1–2 km (Girard & Trolliet 1992, Johansson & Blomqvist 1996). The degree to which they move depends mainly on habitat composition and available food supply. Foraging chicks may have different habitat requirements to that of the vicinity of the nest and this is often the reason they move elsewhere (Redfern 1982). Recaptures of lapwing chicks ringed at the nest are rare because of their mobility and frequent high mortality in the days after hatching (Jackson & Jackson 1975, Redfern 1983). Moreover it is common in wader studies that the number of recaptured chicks declines with their age (Fuller 1983, Galbraith 1988, Thompson *et al.* 1990). This could influence the accuracy of biometric growth curves used for ageing chicks. Study of feather development affords a complementary method of age determination, a method that has been shown to work quite well for some passerine (Horwich 1966, Kania 2001), and waterfowl chicks (Evrard 1996, Popovkina & Gerasimov 2000). To the best of our knowledge no such method has yet been developed for waders. Our study focussed on describing feather development in a way that could be used as a method for ageing Northern Lapwing chicks. We also provide an equation based on total head length, which may be helpful in ageing downy chicks.

STUDY AREA

The study area comprised two grassy islets in the seasonally-flooded Pripyat valley, near Turov, Gomel Region (S Belarus, 52°04'N, 27°44'E, Fig. 1). The water level of the Pripyat River fluctuates seasonally and from year to year. In spring, the gradually decreasing water level exposes meadows and sandy riverbanks which are attractive for migrant and breeding waders, including Northern Lapwings (Karlionova *et al.* 2006). Fieldwork was carried out from mid April to mid June in 2006–2008. Human disturbance in this area is negligible. It is an area of extensive pastures and low numbers of predators, and is therefore good nesting habitat for several species of wader. We found very high densities of Northern Lapwing nests: in 2005, there were >50 on a 100 m × 30 m island, while in 2006 there were >70 on a 200 m × 20 m island.

METHODS

Chicks were ringed with a metal ring on the first or, at the latest, on the second day of life when it was easy to locate them in the nest or nearby. Nests with eggs were located and marked early in the season and the hatching date of each was estimated using the flotation method (Hays & Le Croy 1971). Marking and visiting nests does not significantly increase predation risk and chick mortality (Galbraith 1987). During repeated visits to the nesting islets, chicks were later recaptured and their plumage and feather growth stages described. Because the chicks were confined to the islets, it was not too difficult to recapture an adequate sample. To avoid bias, most descriptions of feather development were carried out by the same observer. Most of the chicks that were used to determine feather development were from first nesting attempts. In 2006 and 2007 we took photographs of 67 chicks of exactly known age (Table 1). Altogether, data were collected on 533 Northern Lapwing chicks of which 465 (87%) were in full downy plumage (Table 1).

RESULTS

We did not observe growing pins in chicks younger than eight days. Therefore if chicks have no growing feathers (visible pins emerging from down) and they are still completely in down, they are most probably not older than seven days. The age of such birds can be assessed using our equation based on total head length (Table 2). An additional character which may be used for distinguishing one-day-old chicks is presence

of the egg tooth (Jehl 1968). This structure needed while hatching adheres to the bill tip until the soft tissues of the bill have dried; it disappears when the chicks begin feeding. Therefore a chick that is completely covered by down and with its egg tooth should not be older than one day. However, some very small downy chicks without an egg tooth might also be one day old.

We identified the seven age categories described below based on the stage of growth of different feather tracts: 1–7, 8–10, 11–13, 14–16, 17–23, 24–28 and 29–35 days (Table 2). Among all feather tracts, three seemed to be the most useful for assessing age: scapulars, secondaries and median coverts of the secondaries. The growth stages of these tracts were assessed for each chick examined and allotted to one of nine categories (Table 2).

Fig. 1. The study area.

Age-classes

Key: SC = scapulars, MC = median coverts of secondaries, SEC = secondaries

1–7 days: no growing feather pins, completely covered in down,
8–10 days: first pins visible, SC and MC are starting to unsheath by about 1 mm at the tip (Fig. 2a),
11–13 days: SEC still in waxy sheath, MC at the same growth stage as in previous category, SC <half of final feather length and unsheathed by >1 mm (Fig. 2b),
14–16 days: SC unsheathed by half of total feather length, MC emerging from the waxy sheath >1 mm and clearly <half of total feather length, SEC unsheathed by about 1 mm at the tip (Fig. 2c),
17–23 days: SEC and MC unsheathed by <two-thirds total feather length, SC unsheathed for about two-thirds total feather length (Fig. 2d),
24–28 days: SC and MC are fully grown, feathers are not completely unsheathed but when looking down on the bird without blowing on feathers, the waxy sheaths are not visible, SEC unsheathed for two-thirds total feather length (Fig. 2e),
29–35 days: SEC are the slowest growing, while SC and MC are already grown SEC are still unsheathed for only about four-fifths total feather length (Fig. 2f).

DISCUSSION

Our descriptions of feather growth in Northern Lapwing chicks focus on just three feather tracts. We noted the development of other feathers but decided to exclude them from

Table 1. Number and age of Northern Lapwing chicks examined in the study area during 2006–2008.

Number of days after hatching	1–7	8–10	11–13	14–16	17–23	24–28	29–35	Total
Number of chicks examined	465	12	10	12	20	10	4	533
Number of chicks whose feathers were photographed	14	8	9	12	17	6	1	67

Table 2. Ageing criteria for Northern Lapwing chicks based on plumage development, measurements and the presence of the egg tooth in a study population in the mid Pripyat River, S Belarus.

Age class (in days)	Scapulars	Secondaries	Median coverts
1–7	Down	Down	Down
	Egg tooth = 1 day old. For chicks with no egg tooth: Age (in days) = 0.72*Total head length – 22.22 ($R^2 = 0.78$)		
8–10 Fig. 2a	Feathers in waxy sheath, or feathers emerge from the waxy sheath by 1 mm	Feathers in waxy sheath	Feathers in waxy sheath, or feathers emerge from the waxy sheath by 1 mm
11–13 Fig. 2b	Feathers emerge from the waxy sheath more than 1 mm and clearly less than half total feather length	Feathers in waxy sheath	Feathers in waxy sheath, or feathers emerge from the waxy sheath at 1 mm
14–16 Fig. 2c	Feathers emerge from the waxy sheath at about half total feather length	Feathers in waxy sheath, or feathers emerge from the waxy sheath at 1 mm	Feathers emerge from the waxy sheath more than 1 mm and clearly less than half total feather length
17–23 Fig. 2d	Feathers emerge from the waxy sheath at about two-thirds total feather length	Feathers emerge from the waxy sheath more than 3 mm, but clearly less than two-thirds of total feather length	Feathers emerge from the waxy sheath from half to two-thirds total feather length
24–28 Fig. 2e	Fully grown feathers (when looking down on the bird without blowing on feathers, the waxy sheaths are not visible)	Feathers emerge from the waxy sheath at about two-thirds of total feather length	Fully grown feathers (when looking down on the bird without blowing on feathers, the waxy sheaths are not visible)
29–35 Fig. 2f	Fully grown feathers (when looking down on the bird without blowing on feathers, the waxy sheaths are not visible)	Feathers emerge from the waxy sheath at about four-fifths of total feather length	Fully grown feathers (when looking down on the bird without blowing on feathers, the waxy sheaths are not visible)

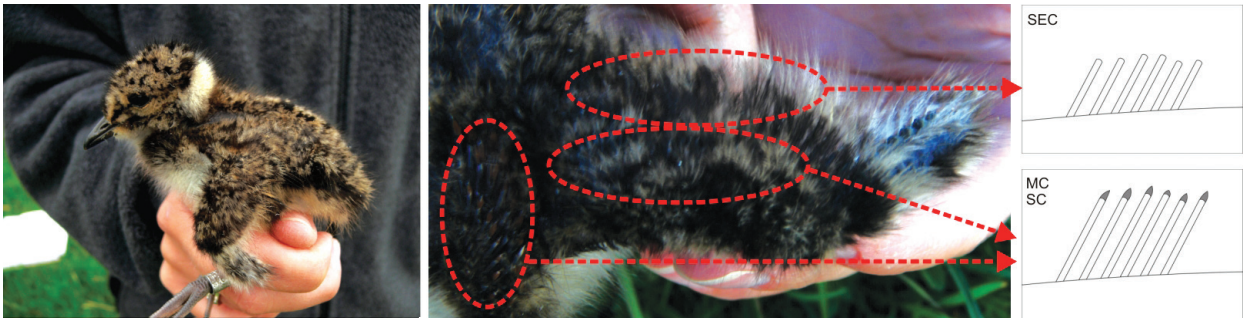

Fig. 2a. Feather development of 8–10 day old Northern Lapwing chicks (SEC – secondaries, MC – median coverts, SC – scapulars).

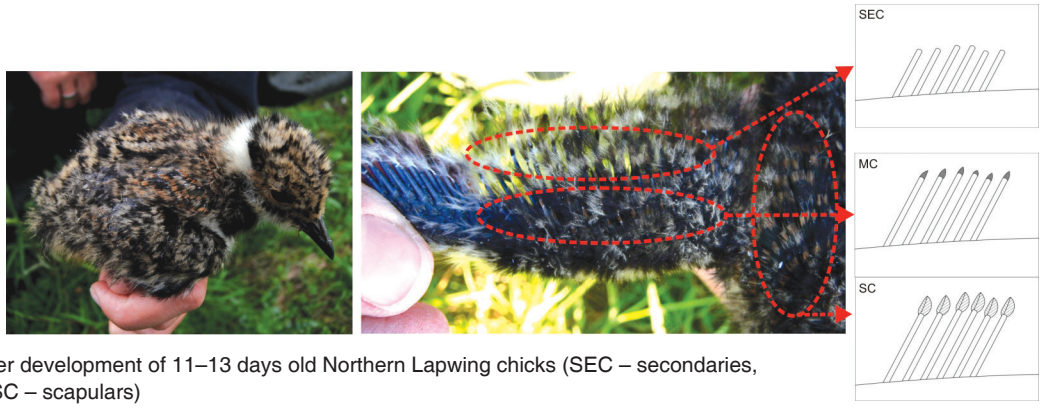

Fig. 2b. Stage of feather development of 11–13 days old Northern Lapwing chicks (SEC – secondaries, MC – median coverts, SC – scapulars)

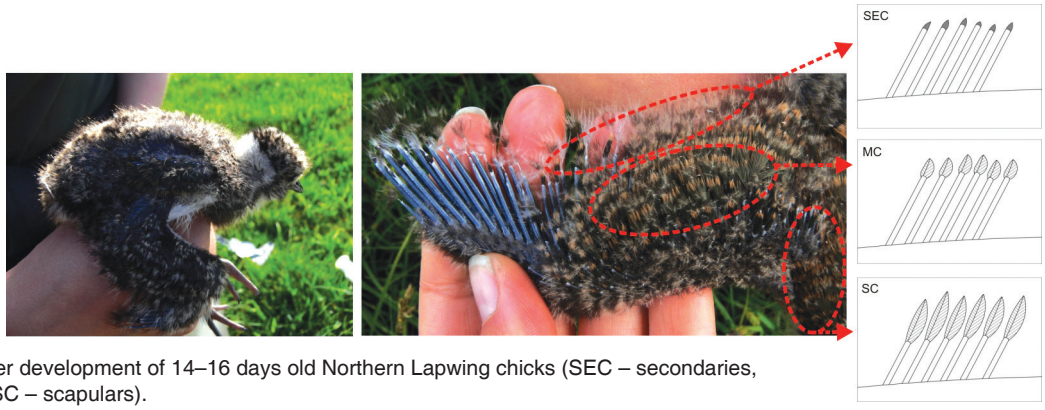

Fig. 2c. Stage of feather development of 14–16 days old Northern Lapwing chicks (SEC – secondaries, MC – median coverts, SC – scapulars).

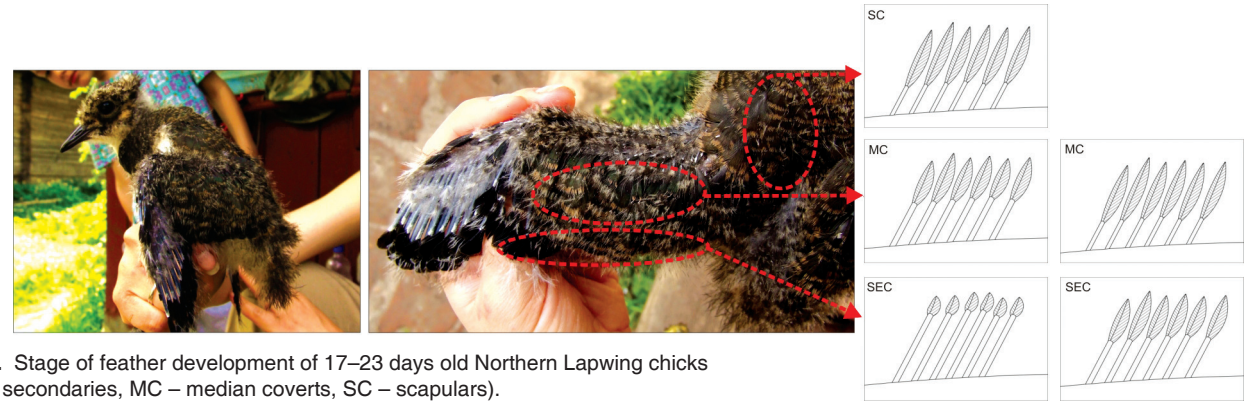

Fig. 2d. Stage of feather development of 17–23 days old Northern Lapwing chicks (SEC – secondaries, MC – median coverts, SC – scapulars).

Fig. 2e. Stage of feather development of 24–28 days old Northern Lapwing chicks (SEC – secondaries, MC – median coverts, SC – scapulars).

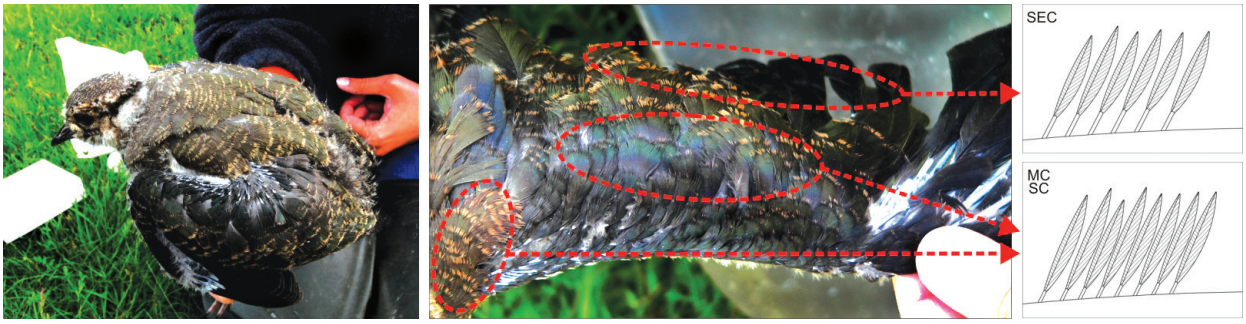

Fig. 2f. Stage of feather development of 29–35 days old Northern Lapwing chicks (SEC – secondaries, MC – median coverts, SC – scapulars).

consideration due to their highly variable growth. We found that the first pins appear in the scapulars; that these feathers grow at the fastest rate and are the first fully grown feathers before fledging. The development of the scapulars, combined with that of the other two feather tracts we describe, seem to be the best means of determining age.

For all of the age-classes we identified, apart from the oldest (29–35 days), our sample size was at least ten. Therefore, as a means of determining age, our criteria should give fairly robust results. However, until they receive further verification, we suggest that they be used with caution and in conjunction with biometric methods where possible. Once verified, our criteria should prove to be a valuable tool for ageing in the field because they are simple and easy to apply. Moreover their accuracy in terms of the size of the age-classes should be sufficient for most studies.

It should be borne in mind that poor foraging conditions caused, for example, by bad weather or a high risk of predation could reduce the growth rate of lapwing chicks considerably (Baines 1990, Beintema & Visser 1989, Galbraith 1988, Schifferli *et al.* 2006). Moreover, populations breeding in different regions have shown different growth rates which are positively related to latitude (Redfern 1983, Tjorve 2007). Seasonal differences in growth rate can be also expected due to temporal changes in ambient factors including day-length (Jackson & Jackson 1980, Yalden & Dougall 1994). Therefore we can expect some differences in growth rates between Belarusian and other European populations. Lower risk of predation and good feeding conditions on the Pripyat River might accelerate feather development to the extent that the growth of chicks in our study area is in advance of other populations.

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Northern Lapwing with newly-hatched chicks near the Turov Ringing Station, Pripyat River floodplain, Belarus. Photo: Mateusz Sciborski.