



Weight variation and age estimation of kentish plover *Charadrius alexandrinus* nestlings hatched along the Senigallia's coastline (Marche region, Italy)



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Abstract

- Il fratino *Charadrius alexandrinus* è in declino in gran parte del suo areale Europeo, soprattutto in Italia, a causa principalmente delle attività antropiche.
- Nelle Marche, il litorale di Senigallia costituisce la roccaforte della **popolazione nidificante regionale**.
- Lo **scopo del lavoro** è studiare la variazione del peso dei puli di fratino durante la stagione riproduttiva, verificando eventuali differenze di peso tra puli di covate precoci e quelli di covate tardive, possibilmente mettendole in relazione a variabili climatiche, ed infine analizzare la relazione tra peso ed età.

Study area and methodology

- 578 Kentish plover nests have been recorded since 2007. For 563 of these (N. nests XY), it was possible to map the exact location too (Fig. 1).
- Data on nests' productivity (Tab.1), number of broods per year and pair, clutch size, laying and hatching dates have been collected as well.
- Bird ringing has been carried out targeting both adults and chicks since 2010 and 2011, respectively.
- A dataset of 227 observations, in which each one corresponds to a chick of known age (n. days) (Fig. 2) being ringed and weighed, was used for this work.
- Data on daily cumulative rainfall (mm), minimum and maximum temperature (°C) were collected too.

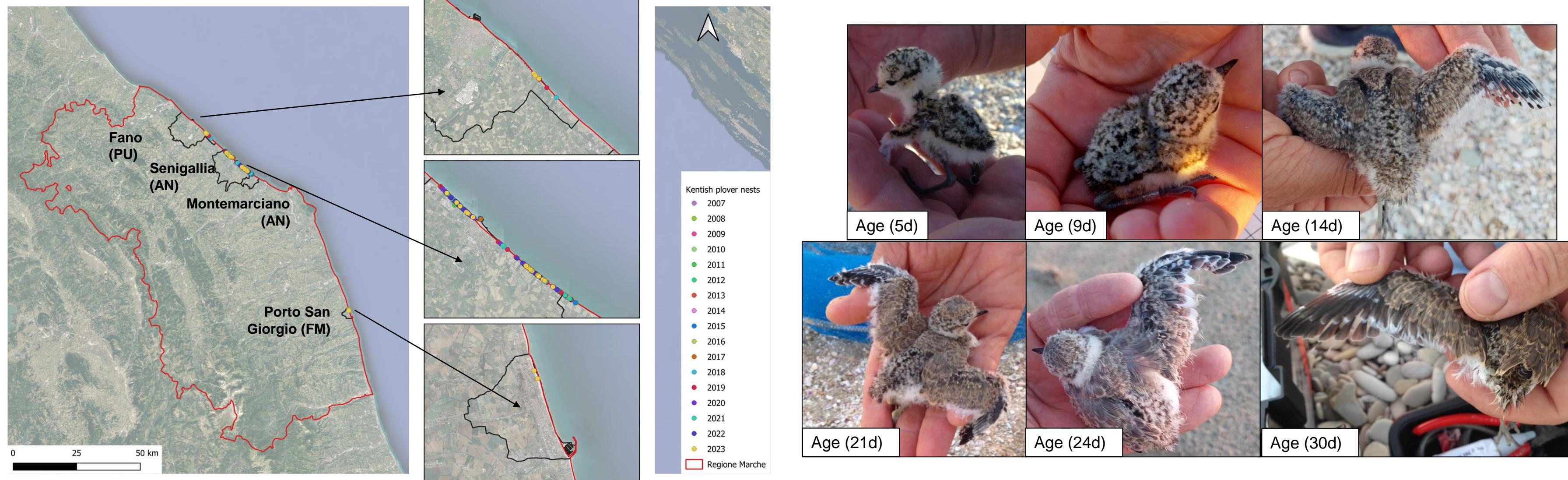


Fig. 1: Location of the 563 Kentish plover nests (N. nests XY) along the coastline of the Marche region recorded between 2007 and 2023.

Fig. 2: Pictures showing the development of Kentish plover chicks' plumage across 25 days (5d = 5 days etc.) (photos credits to Claudio Sebastianelli)

Tab. 1: Total n. of eggs, chicks hatched, fledged for all the nests recorded and for each municipality.

	Senigallia + Marzocca	Fano	Porto San Giorgio	Tot
N. nests	557	19	2	578
N. eggs	1568	46	8	1622
N. chicks hatched	935	37	4	976
N. chicks fledged	424	18	2	444
Breeding success ^a	0.27	0.38	0.25	0.27
Breeding success ^b	0.45	0.49	0.50	0.45

^a N. chicks fledged/N. eggs

^b N. chicks fledged/N. chicks hatched

Results and discussion

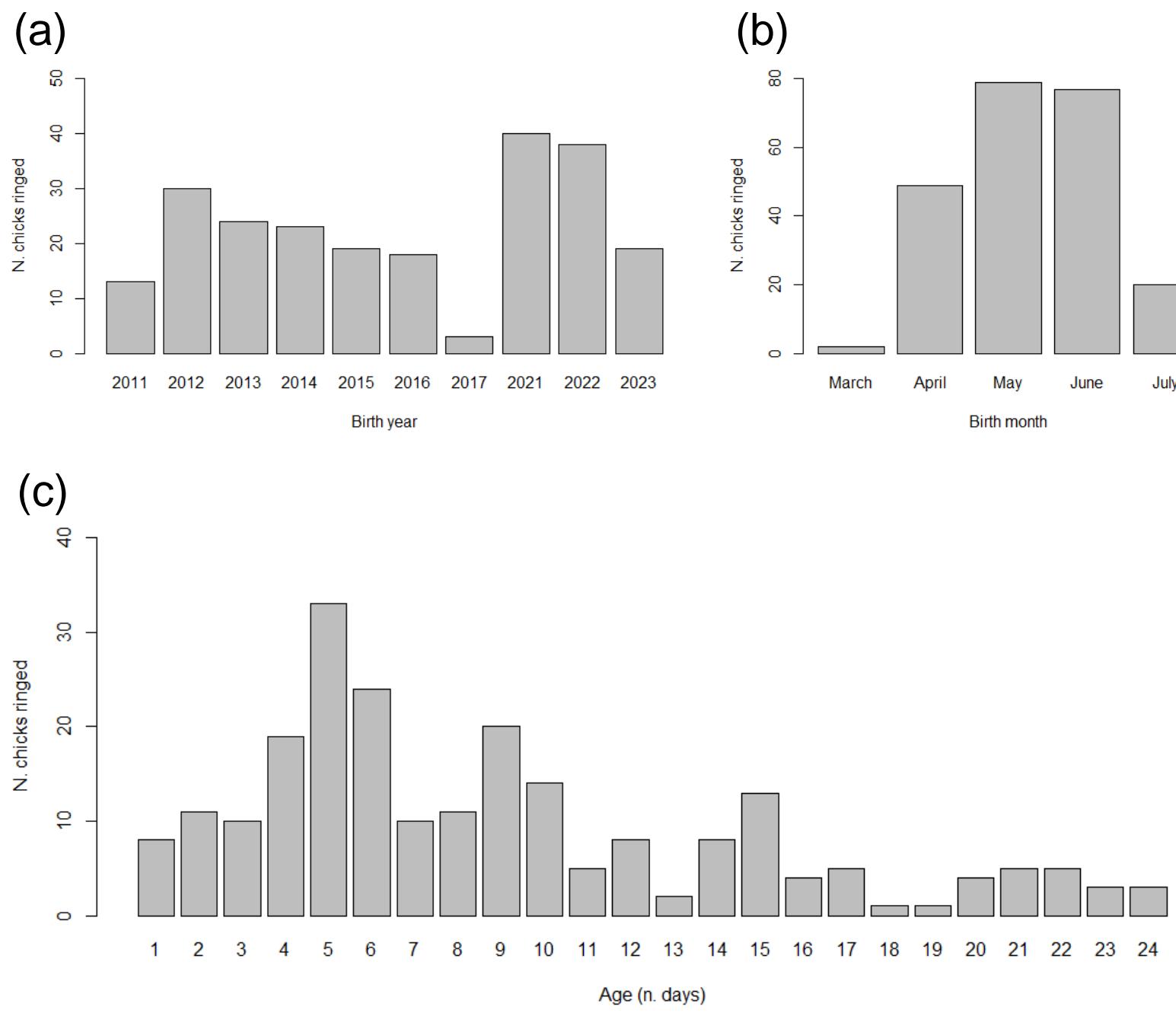


Fig. 3: N. chicks ringed per birth year (a), birth month (b) and age (c)

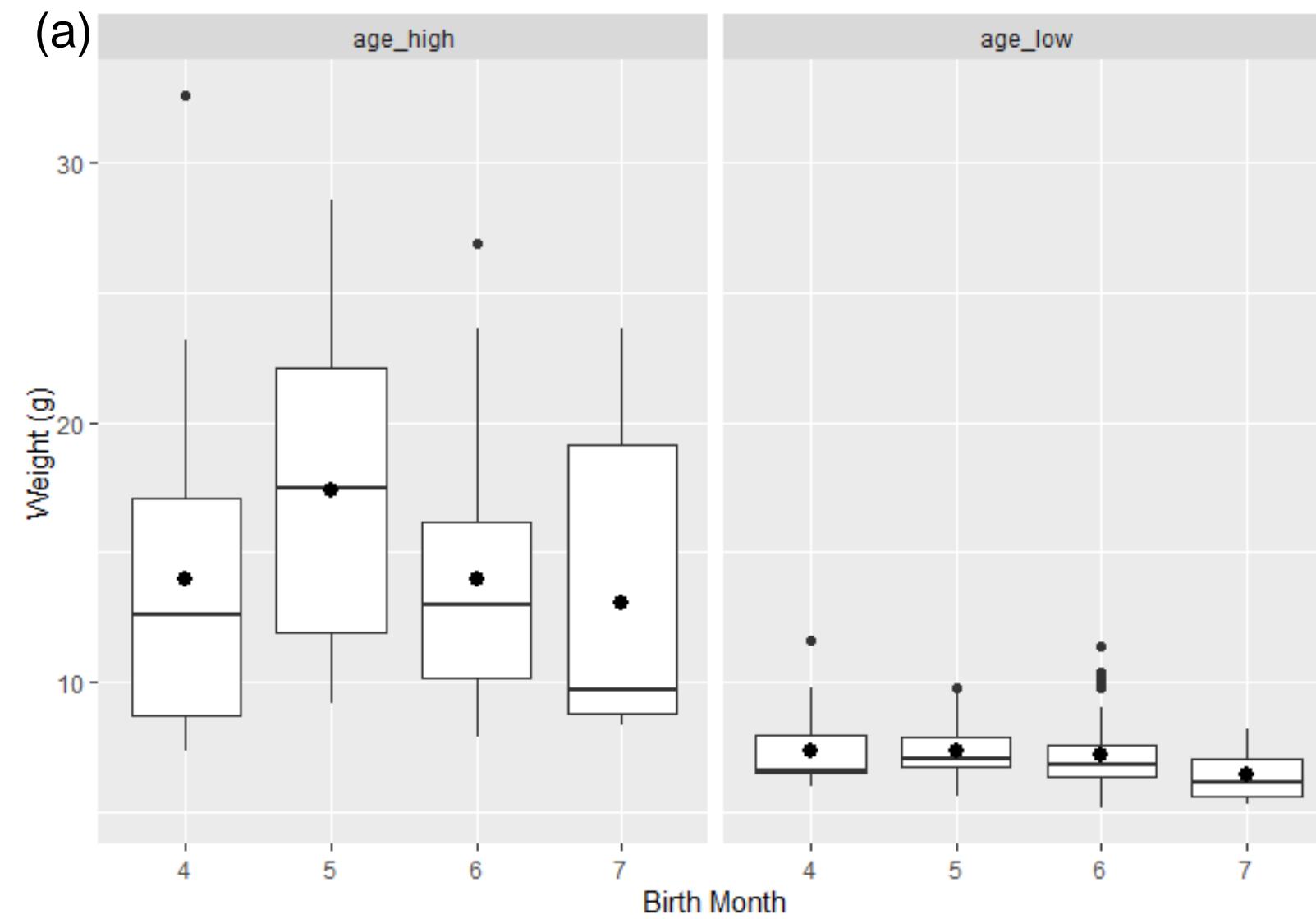


Fig. 5: Weight variation per each birth month based on two age groups (age_low = 1-6 days, age_high = 7-24 days) (a). Weight variation per breeding period (1 = early (until 15th May), 2 = late (after 15th May)) based on the two age groups (b). Black dots represent the mean values.

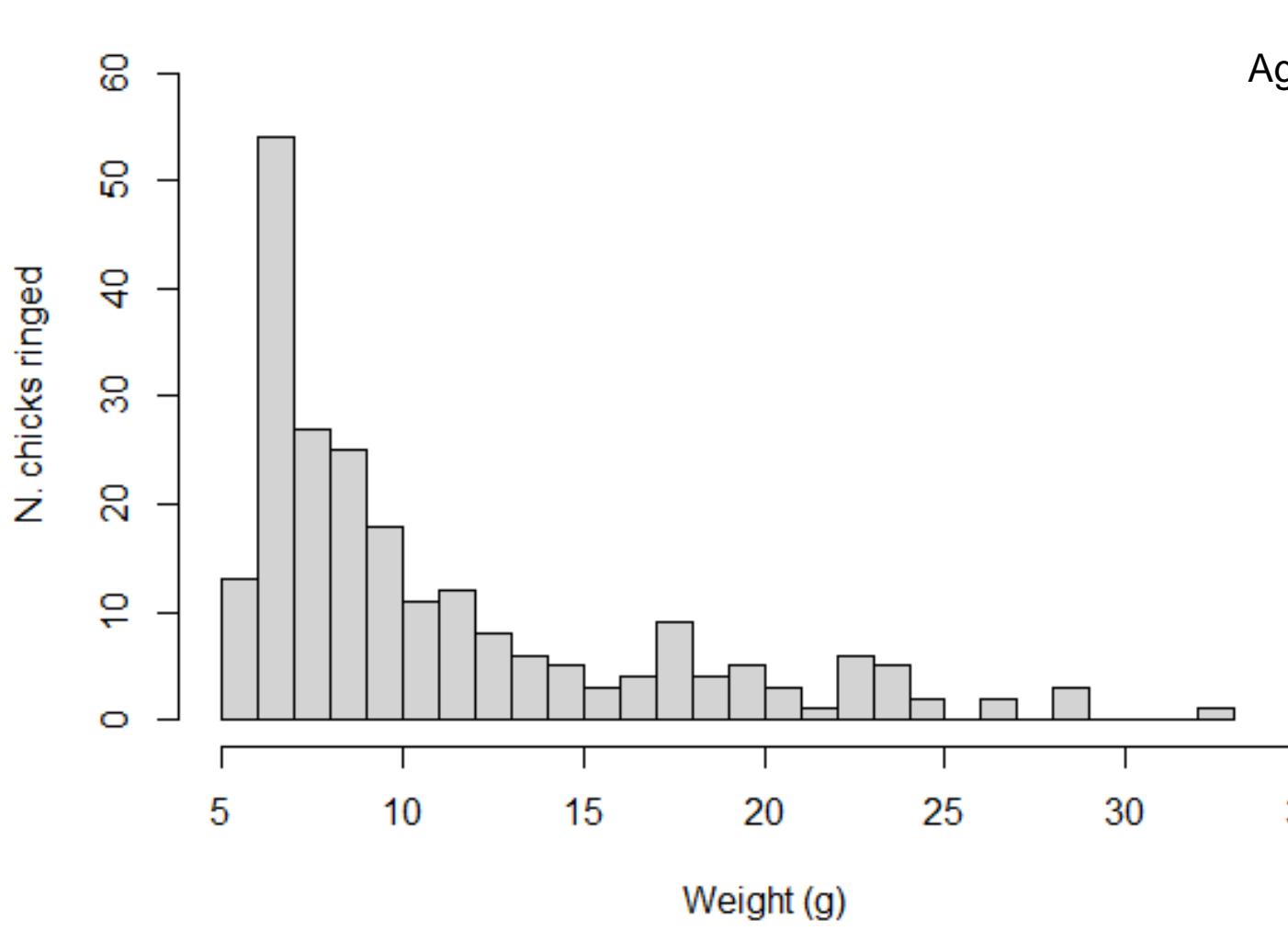


Fig. 4: Weight distribution

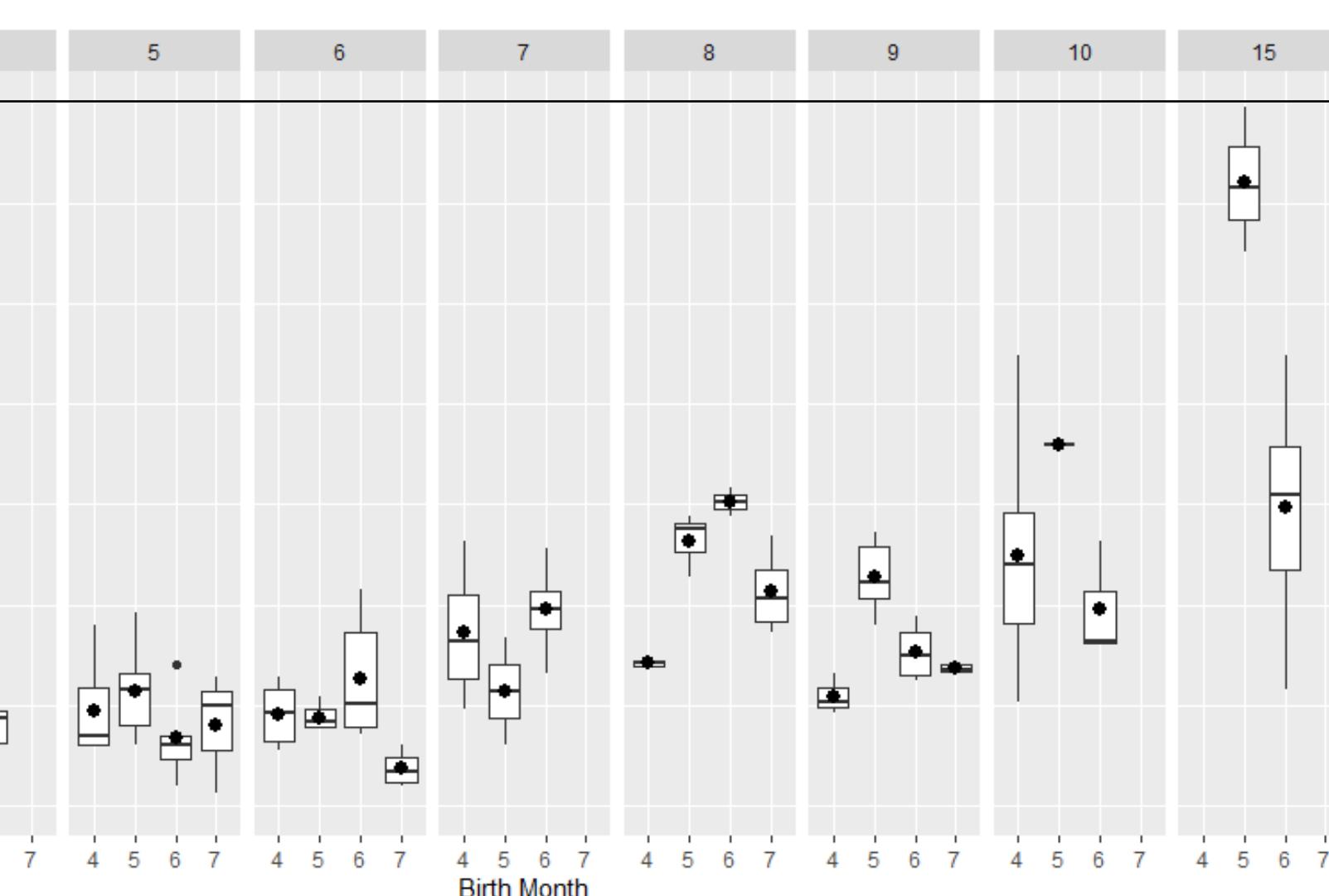


Fig. 6: Weight variation per each birth month with equal age (only those ages with more than 10 observations). Black dots represent the mean values.

MLR model: Weight (Log) ~ Age + Birth month + Climatic variables

Minimal Adequate Model:

Indipendente variables	Slope	Std error	t value	Pr(> t)
Age	0.042	0.014	3.047	0.003**
Birth month	-0.020	0.030	-0.650	0.516
Cumulative rainfall (15d) ^a	0.010	0.003	3.049	0.003**
Min Temp (5d)	0.110	0.021	5.392	0.000***
Max Temp (5d)	0.060	0.014	4.411	0.000***
Age:Birth Month	0.006	0.003	2.220	0.027*
Min Temp (5d):Max Temp (5d) ^c	-0.004	0.001	-5.685	0.000***
Cumulative rainfall (15d):Max Temp (5d)	-0.000	0.000	-2.980	0.003**

^a 15d = 15 days-period before the chick was weighed

^b 5d = 5 days-period before the chick was weighed

^c Min and Max Temp (5d) were highly correlated with Min and Max Temp (15d), respectively

Residual standard error: 0.1755 on 218 degrees of freedom

Multiple R-squared: 0.8501,

Adjusted R-squared: 0.8446

F-statistic: 154.5 on 8 and 218 DF, p-value: < 0.000

