

# Sexing of eastern white pelican (*Pelecanus onocrotalus*) based on biometric measurements

Piotr Ćwiertnia<sup>1</sup>, Adam Wysocki<sup>2</sup>, Kamila Kamińska<sup>1</sup>,  
Zbigniew Kwieciński<sup>1</sup>, Honorata Kwiecińska<sup>1</sup>

<sup>1</sup> Poznań Zoological Garden, Browarna 25, 61-063 Poznań, pelecanus@interia.pl

<sup>2</sup> Department of Plant taxonomy, Adam Mickiewicz University, Umultowska 89, 61-614 Poznań

**Abstract:** We examined sexual size dimorphism of Eastern White Pelicans (*Pelecanus onocrotalus*). Investigation were carried out in Poznań Zoological Garden (Poland). For adult and juvenile individuals culmen length was taken on late Autumn (1993-2003) (N=46). Very detailed investigation were carried on chicks reared, during 1998, 1999 and 2002 years. Totally body mass was taken for 20 birds, culmen length for 12, and corpus length and wing chord for 9 birds. Sex determination on culmen length is possible in age 21 weeks. For younger chicks better method for sexing is use body mass, which allow in age 5 weeks, on sexing every second chick.

**Key words:** Eastern White Pelican; *Pelecanus onocrotalus*; sex determination; Biometry; Zoo

## Introduction

The identification of the sex of birds is of fundamental importance. Most seabirds are sexually monochromatic and it can be difficult to sex individuals. Relatively easy, non-lethal and non-invasive techniques are useful not only for captive management of endangered species, but also for aspects of avian biology, where results are divided into sexes. Since the possibility of sex determination by DNA analysis appeared it is possible to identify sex without harming the bird. But this method is time consuming. The attempt to recognize sexes of the pelicans based by culmen length are known (Dorr *et al.* 2005, Grummt, 1984). Sexing of Eastern White Pelicans (*Pelecanus onocrotalus*), is easy but possible for birds which stoped their growth , and usually it is done at second year of life.

Aim of our investigation was to find age when sexing by culmen lenght is possible, and find another way to sexing younger chicks.

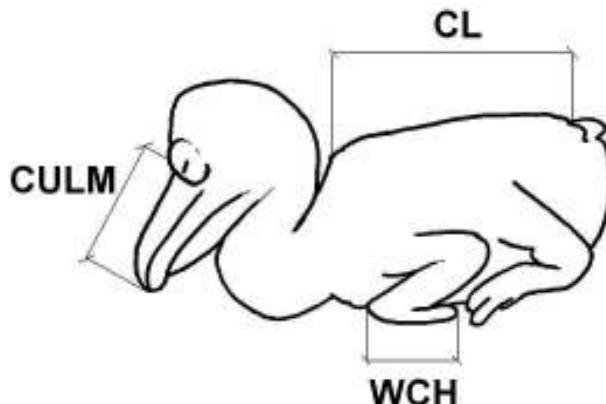
## Materials and methods

Investigations were carried out during ten years (1993-2003).

For adult and juvenile individuals culmen length was taken on late Autumn (N=46). Very detailed investigation were carried on on chicks reared, during years: 1998, 1999 and 2002. At 1998 year we have recorded body mass of 8 chicks up to chicks reached age of one month. Three of them were males and one females. For four chicks sex is unknown (three died). Measurements were taken to the nearest 0.05kg with a Pesola spring scale.

During 1999 year we have investigated 9 Great White Pelicans reared at Poznań zoo two of them were males (one hand reared and one reared by fosters *P. onocrotalus*), and 6 females (two reared by parents and four by hand). One chick died at age 7 days (unknown sex).

Measurements were taken every week on all birds: culmen length (CULM), (straight line down the centre of the bill from the hook to the skin at the base). Wing chord (WCH), (wrist joint to the tip of the most distal point of wing- without feathers) corpus length (CL), (from thorecicol 1 (Th1) up to coccigeal 1 (Cc1)). Measured were taken by vernier caliper, to the nearest 1mm. (Fig. 1).



**Fig. 1.** Method of measurement taking on pelicans chicks. CULM – culmen length, WCH – wing chord, CL – corpus length

At the same time body mass was recorded. Body mass was measured to the nearest 0.05kg (to age two weeks), and 0.2 kg with a Pesola spring scale. Chick reared by parents or fosters were measured at every visit at colony. Regular measurements were taken to age 13 weeks (for hand reared) and 5 weeks (for parents or fosters reared chicks). After this age chicks kept distance to keepers and measurements were irregularly. After age 21 weeks there were no visible different in body measurement. Additionally data about chick's development were noted.

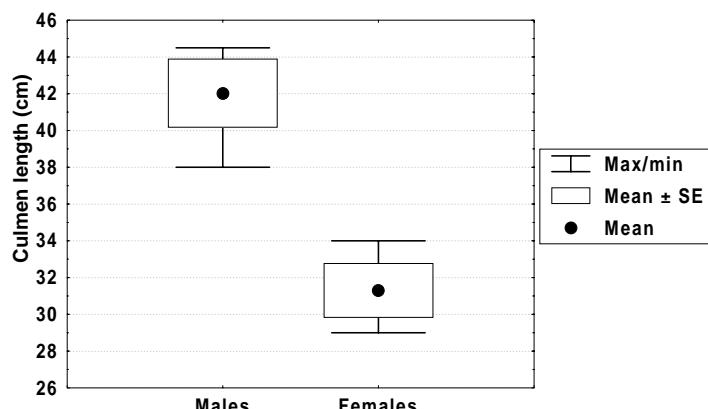
During 2002 were measured three, hand reared Great white pelicans (two males and one female), but only culmen length (up to age 22 weeks), and body mass (to 18 weeks) were taken. Measurements were taken in similar way as in 1999 year.

Sexes for investigation were recognized on gonadal ispection during autopsy or by breeding behavior. Chicks were sexed by culmen length.

## Result

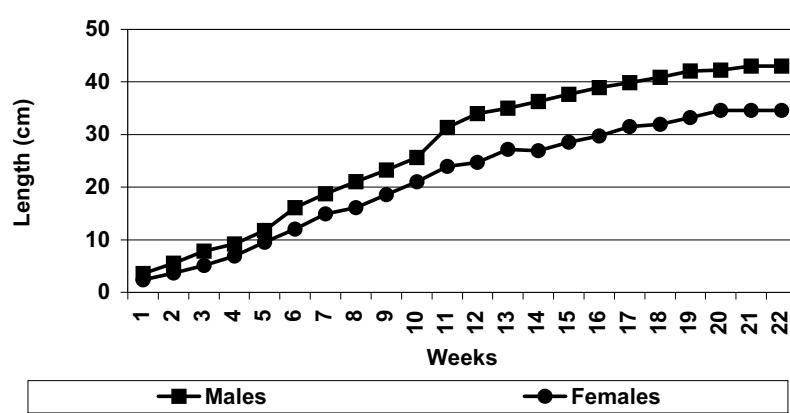
Culmen length for adult birds showed differences among sexes. Always males bill was longer than females and there were no exceptions (males bill length: mean= 42.03cm., SD= 1.85cm., maximum= 44.5cm., minimum= 38cm., and females bill length: mean= 31.38cm., SD= 2.11cm., maximum= 34.1cm., minimum= 28cm.).

Repeated measurement showed that culmen length grew up for individuals younger than 6 month (N= 6), after this age culmen length have no changes even after period of 10 years.



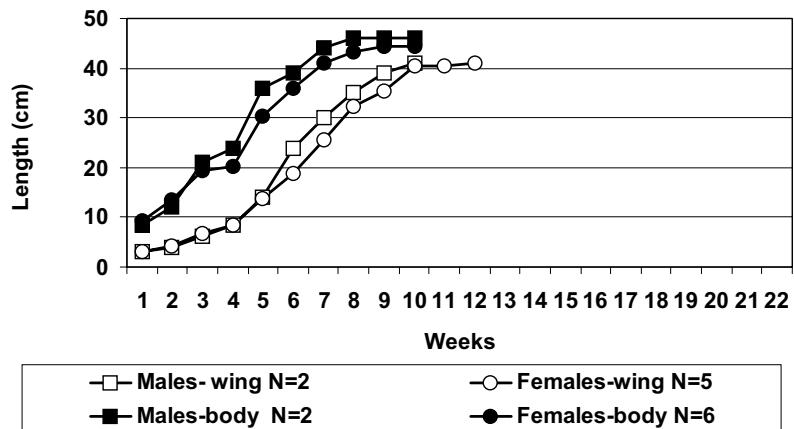
**Fig. 2.** Culmen length of adult males (N=12) and females (N=15) reared at Poznań zoo during 1993-2003 years

Chicks culmen length grow up contentiously up to age about 21 weeks when growing rapidly stop. Good visible different among sexes appear at age 11 weeks.



**Fig. 3.** Changes in culmen length of males (N=4) and females (N=8) reared at Poznań zoo during 1999 and 2002 year

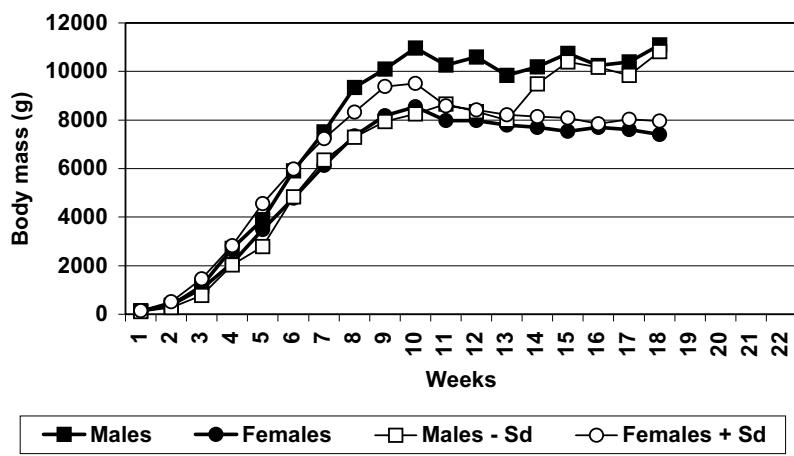
Growing rate of chicks wing chord and body length for females and males are similar although body length grew up more rapidly during first six weeks of life, and stop in age 8 weeks. On the other hand wing chord start rapid growing later, at age 5 weeks and finishing in age 10 weeks.



**Fig. 4.** Changes in wing chord and body length of males and females reared at Poznan zoo during 1999 year

Different among sexes in chicks body mass seems as high, but Standard deviation is also high and some females can be bigger than medium male. On the other hand males can be lower than females. After maximum at age 10 weeks body mass drop for about half kilo.

Growth rate of one parent reared male at the first days of life increase much more rapidly than other chick, but after few days this different has decreased.



**Fig. 5.** Changes in body mass of males (N=7) and females (N=10) reared at Poznan zoo during years 1998, 1999 and 2002

## Discussion

Sex determination. At sexually monochromatic species it is always difficult. Similar is at Great White Pelican. Investigation carried out on American White Pelicans (*P. erythrorhynchos*). showed that from many measurement only culmen length is good for sexing (Dorr *et al.* 2005) . Similar is at Eastern White Pelicans, where males' culmen reach 38 cm or more, and female is below 36 cm. This results standing in agreement to other authors (Dementiev and Gladkov 1951; Grummt 1984; Grummt 1984 after: Ali and Ripley 1968; Bauer *et al.* 1966; Hartert 1912-21; Delacour 1931; Portman 1937). Although we haven't found any exceptions, Chaplin and Amadon (1950) have found male with shorter bill (34.7 cm.) and Romashova (1994) has found culmen length for males is 35-47cm (average 43,2cm) and for females 30-46cm (average 34cm).

This method is very useful in age of 21 weeks, when bill stop growing, We could expect that possibility of sexing is earlier, but although figure 4 don't suggest it we have found females with similar bills' longevity as males.

Culmen length is very stable and in some cases can be use for individual identification.

Result suggest that better method of sexing at early age is body mass. In age 5 weeks (we choose this age for complete data), this method allow on sexing every second chick. In this method male is birds whose body mass is over Medium females body mass + Standard Deviation (SD). Similar female is birds with body mass lower than medium body mass for males - Standard Deviation.

In this age growing rate for hand and parent reared chick were similar, although it is soon after beginning of food limitation by parents.

We haven't also found different in grow rate from chick reared at Praha zoo (Pithart *et al.* 1991) and observed by Din and Eltringham (1974) in situ.

Body mass, and wing chord stop their growing in age 10 weeks, it is far after strong limitation of parental care, which occurred in age 7 weeks, and before fledging time, which for Great White pelican is estimated on 2,5 month (Romashova, 1994) or 100-105 days (Dementiev and Gladkov, 1951).

Discriminant analysis, although in low number investigated birds not statistical significant, suggest that the main measurement for sexing in early age could be body length, but further investigation are needed.

## Conclusion

1. Sexing by culmen length is possible in age 21 weeks (males culmen >38 cm., females culmen < 36 cm.)
2. Younger chicks can be sexed by body mass. In age 5 weeks it allow on sexing every second chick.
3. Culmen length is very stable and can be used for identification individuals.

### References

ALI S. AND RIPLEY S.D. 1968. Handbook of the Birds of India and Pakistan. Vol 1. Bombay, London, New York.

BAUER K. M. GLUTZ V. BLOTZHEIM U. N. 1966. Handbuch der Vogel Mitteleuropas. Bd. 1. Frankfurt/M.

CHAPLIN J.P. AND AMADON D. 1950. The Roseate Pelicans of Africa. Ostrich 21: 15-18.

DELACOUR J. ET: JABOUILLE P. 1931. Les Oiseaux de l'Indochine française. Tome 1.

DEMENTIEV G. P. I GLADKOV N. A. (Red). 1951. Pticy Sovetskogo Sojuza. Vol. 1.

DIN N. A. AND ELTRINGHAM S. K. 1974. Ecological separation between White and Pink-backed Pelicans in the Ruwenzori National Park., Uganda. Ibis 116: 28-43.

DORR B. D., KING T. D., HARREL B. J., GERARD P. AND SPALDING M. G. 2005. The Use of Culmen Length to Determine Sex of the American White Pelican. Waterbirds 28 (SP 1): 102-106.

GRUMMT, W. 1984. Beitrag zur Biologie, speziell zur Fortpflanzungsbiologie der Pelikane. Zool. Garten 54: 225-312.

HARTERT E. 1912-21. Die Vogel der palaarktischen Fauna. Bd 2. Berlin.

PITHART K., HRALA I., PITHARTOVA A., AND VELENSKY P. 1991. Umely odchov pelikana bieleho (*Pelecanus onocrotalus*) v Zoo Praha. Gazella 18: 71-78.

PORTMANN A. 1937. Beobachtungen über die postembryonale Entwicklung des Rosapelicans. Rev. Suisse Zool. 44: 363-370.

ROMASHOVA A. T. 1994. Breeding biology and feeding ecology of *Pelecanus onocrotalus* and *P. crispus* in the northern Caspian Pp. 99-114 In Pelicans in the former USSR. Crivelli A.J., Krivenko V.G. and Vinogradov V.G.. IWRB Publication 27.