Avocetta 33: 53-58 (2009)

An important flyway for raptors in Europe: 13 years of monitoring in the North East of Italy

Francesco Mezzavilla[1], Arturo Gargioni[2], Marco Girardello[3], Stefano Bellintani[4], Gianfranco Martignago[1], Angelo Pasqua[2], Giancarlo Silveri[1], Fabio Piccolo[1]

[1] *Associazione Faunisti Veneti. Museo Civico di Storia Naturale - S. Croce 1730, 30135 Venezia (f.mezza@libero.it)*

[2] *GRA (Gruppo Ricerca Avifauna) www.grupporicercheavifauna.org*

[3] *School of Biology, University of Newcastle upon Tyne - Newcastle upon Tyne, UK*

[4] *GOM, Gruppo Ornitologico Mantovano*

Abstract – There has been an increase of interest in the study of raptor migration in Italy during the last two decades. We present the results of a long-term program aimed at monitoring post-breeding migrating raptors at two sites in North-eastern Italy. The sites are 107 km apart from each other, one being at Colle S Giorgio (430 sml) in the Asolani Hills (Province of Treviso E 11.56 N 45.49), and the other at Ponti sul Mincio, a few kilometers south of Lake Garda (Province of Mantova E 10.37 N 45.28). Monitoring at Colle San Giorgio has been underway since 1994. Monitoring at Ponti sul Mincio started in 2002. Both sites showed a constant increase in the number of birds observed with the highest peak of 11421 individuals recorded at Colle San Giorgio in 2004, and 15581 recorded at Ponti sul Mincio in 2003. The mean angle of the flying direction of the birds was 243°. A comparison of daily counts showed a similarity in the daily number of individuals counted at both sites, suggesting that the two sites count many of the same birds. Flying height was also estimate or recorded, using a telemeter. Flying height was generally above 1500 m, suggesting that a large proportion of migrating raptors were not counted. Honey Buzzard was the most commonly observed species making up between 97.3 % and 99.9 % of total number of birds observed. In conclusion, in comparison with the results reported by Zalles and Bildstein (2000) this new flyway is amongst the most important sites in Europe for the number of Honey Buzzard recorded in recent years.

INTRODUCTION

Diurnal raptors are well suited to migrate over long distances. Their ability to do so enables many species to breed and winter in areas which are several thousands kilometers apart from each other. Moreover, during their long distance migratory movements, raptors tend to become gregarious and concentrate at a few points where they can be easily monitored (Kerlinger 1989).

In Italy the Alps force migrating raptors to move northwards and fly over Switzerland and Austria (Bruderer e Jenni 1990, Charvoz *et al.* 1996) or over the Pre Alps area situated between the Po Valley and the Alps. (Pedrini *et al.* 2005). Most of the migrating individuals then probably continue their migration journey through France and Spain.

During the past two decades there has been an increase interest in monitoring raptor migration in the Pre Alps area during the autumn, with most of the monitoring activities aimed at (1) understanding what flyway being used by migrating raptors (2) understanding the migration strategies of raptors in relation to regional geography.

After an initial period of some years of research carried out by a few volunteers in the Pre Alps area, the monitoring programme expanded its geographic coverage to the whole Italian peninsula and now involves the participation of numerous ornithologists. The national monitoring programme named Infomigrans (www.parcoalpimarittime.it), was established in 2001 at the XI Italian Ornithological Conference. This programme involves the monitoring of migrating raptors at thirty different sites scattered throughout Italy.

In this paper we present some of the results obtained at two sites in North Eastern Italy. We also highlight the importance of a newly discovered flyway which runs through this area.

METHODS

The two sites from where all the observations were carried out are along the Pre Alps area in Northern Italy. The sites are 107 km from each other (Fig. 1) and are separated by

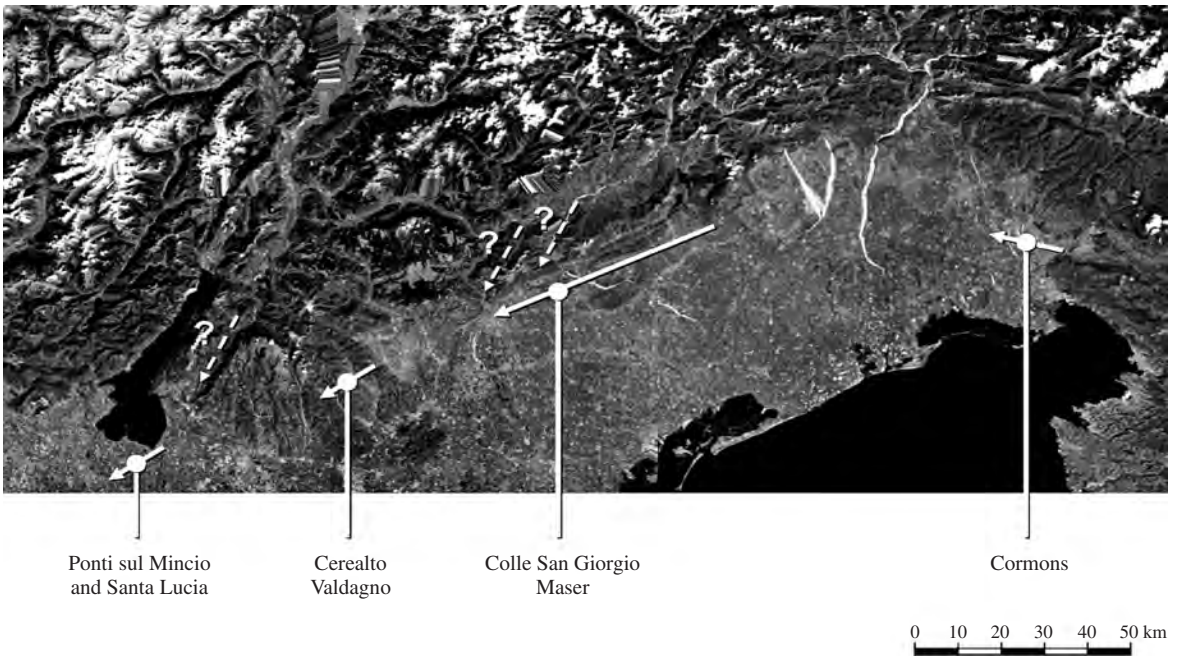

Figure 1. Flyway used by post breeding migrating raptors over the Pre Alps. The length of the arrows indicates the parts of the flyway studied.

lowland and hilly areas. The first site, Colle San Giorgio is in the Colli Asolani area, within the Province of Treviso (E 11.56 N 45.49). The second one, Ponti sul Mincio, is a few kilometres south of Lake Garda (Province of Mantova E 10.37 N 45.28). Most of the flyway is comprised within a belt of 5 km, although some of the raptors might fly across the Alps, through the valleys of the Brenta, Piave and Adige rivers.

The site at Colle San Giorgio is on the top of a 430-m hill. Monitoring at this site started in 1994 and has been on going since, although there has been a change in monitoring effort.

Ponti sul Mincio, is a few kilometers south of the lake Garda, in an area dominated by hills with a moderate height. Most of the observations at this second site were carried from the top of a 126-m. In 2006 the observation point for this site was moved to the top of a chimney of a factory, a more open area, which allowed the observers to see distant flying birds more easily. In 2004 some additional observations were carried out at the same time in another area, named S. Lucia, located near Ponti sul Mincio. The data referred to 2004 were therefore the sum of all the counts from Ponti Sul Mincio and S. Lucia. Double counts were avoided by phone contact between the two groups of observers. In 2006 one site named Cerealto (Valdagno, Vicenza), in an intermediate position between the two main sites was also used for counting migrating raptors (Tonelli & Piccolo *pers. comm.*).

All counts were carried out between the 15th of August and the 5-6th of September. There was a marked increase in counting effort throughout the study period, both in terms of the number of days and the number of hours per days spent counting.

The observations started at 8.00 in the morning and finished at 17.00 in the afternoon (solar time). Counting of flying birds was done with the visual census method, using binoculars (7x, 10x) and spotting telescopes (20-60x) (Kerlinger *et al*. 1985, Gauthreaux 1996). For each group of migrating raptors the number of birds and the flying direction were recorded, and whenever it was possible sex and age of each individual were also recorded. Measurements about wind speed and direction, visibility and cloud cover were taken every hour.

At Colle San Giorgio the flying height was determined through the use of a laser telemeter (Leica LRF 1200 scan). In the case of individuals flying above 1000-2000m, flying height was estimated comparing the position of individual birds, or flocks, with the nearby mountains or hills ranging from a height of 369 m to 1450 m. Flying height was not estimated at Ponti sul Mincio, as most of the migrating birds were flying too high and it was not possible to make any comparison.

RESULTS

The number of raptors recorded increased across the years at both sites (Fig 2). The site at Colle San Giorgio reached stability in the number of birds recorded after the first five years of monitoring, whereas there was a constant increase at Ponti sul Mincio throughout. The Honey Buzzard was the most common species at both sites making up the between 97.3 and 99.9 % of the total number of raptor species. The second most common species was the Common Buzzard, although the birds counted still never reached 1% of the total number of raptors (Tab 1).

The mean daily passage between 19th of August and the 15th of September for all raptor species counted at both sites shows a bimodal trend (Fig 3). In 1994 Colle S. Giorgio showed two peaks with a high mean number of birds counted. The first peak was between the 22nd and 25th of August and the second between the 28th and 30th of August. At Ponti sul Mincio the mean counts show a peak on the 23rd of August and a second one between the 28th and 30th of August. At both sites there was a decrease in the number of birds counted around the 26th of August and after the 31st of August the counts showed a sharp decrease until the end of the passage on the 3rd of September.

We also found a marked fluctuation in the mean number of birds counted/ hour. In 2004 the mean number of birds recorded/hour was between 53.3 and 70.9, at both sites. On the other hand, in 2005, the mean number of birds re-

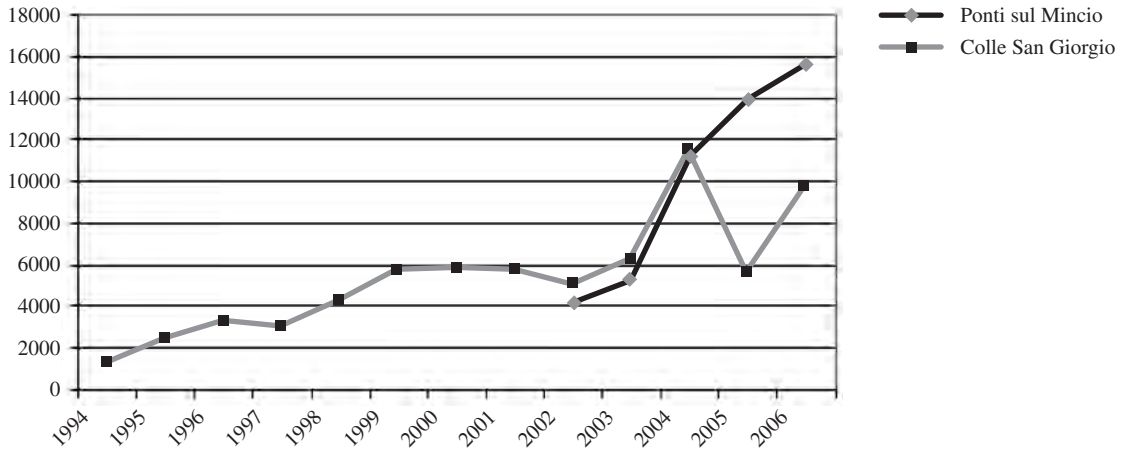

Figure 2. Total number of raptors counted during the study period.

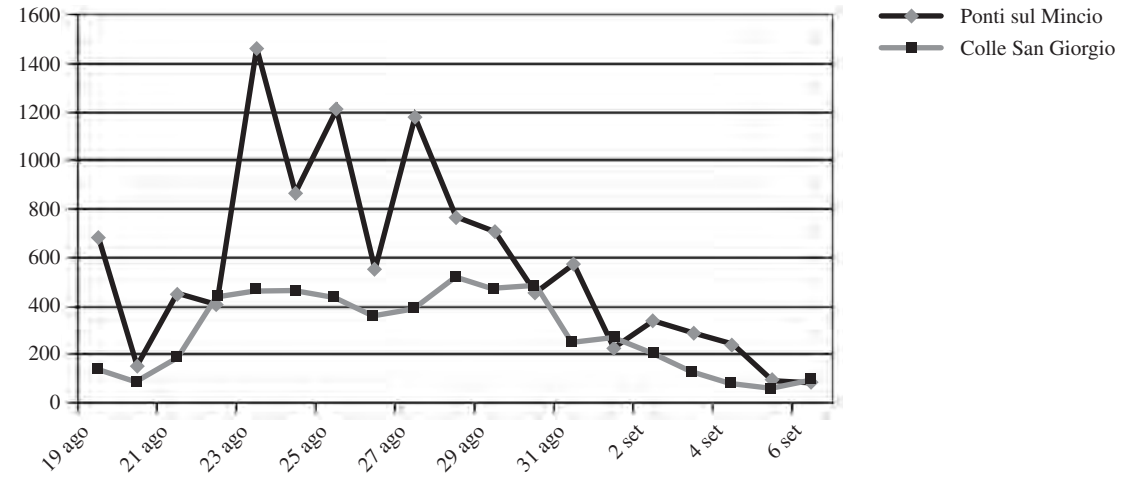

Figure 3. Mean passage rate/day during the study period.

Table 1. List of the species observed during the study period at the two sites.

a. Colle S. Giorgio	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Pernis apivorus	1294	2363	3257	3005	4257	5631	5705	5648	4974	6116	11340	5545	9605	**68740**
Milvus migrans					2	7	1	6	6	3	5	1	7	**38**
Milvus milvus	1					3						1		**5**
Circaetus gallicus									1				3	**4**
Haliaeetus albicilla								1					1	**2**
Circus aeruginosus							15	4	3	17	12	2	7	**60**
Circus cyaneus			2	3	2	1		5	4	1	1		2	**21**
Circus macrourus									1		1			**2**
Circus pygargus	1				2	4	1			2			1	**11**
Circus sp.					1	4	2	2			1	3	1	**14**
Accipiter nisus									6	12	3	10	9	**40**
Buteo lagopus									1				1	**2**
Buteo buteo					2			2	19	40	48	15	97	**223**
Buteo vulpinus										1				**1**
Hieraaetus pennatus						1	4		2	4	1			**12**
Pandion haliaetus						2	1	2	4	2	1	2	3	**17**
Falco tinnunculus									1	2		2	1	**6**
Falco subbuteo										1				**1**
Falco peregrinus									1					**1**
Undet. raptors									2	7	1	6	2	**18**
Totals	**1296**	**2363**	**3259**	**3008**	**4266**	**5653**	**5729**	**5670**	**5025**	**6208**	**11414**	**5587**	**9740**	**69218**

b. Ponti sul Mincio	2002	2003	2004	2005	2006	Total
Pernis apivorus	4056	5064	10948	13575	15302	48945
Milvus migrans	2	3	6	13	5	29
Milvus ssp.				1		1
Circaetus gallicus	7	3	5	6	15	36
Circus aeruginosus	7	10	9	11	22	59
Circus cyaneus	1				3	4
Circus pygargus				5		5
Circus sp.		2	3			5
Accipiter nisus	34	52	72	120	120	398
Buteo buteo	6	49	49	77	50	231
Buteo rufinus					3	3
Buteo lagopus					4	4
Buteo sp.				1	3	4
Aquila pomarina		1				1
Aquila chrysaetos					1	1
Hieraaetus pennatus		1		1	2	4
Aquila sp.			2		1	3
Pandion haliaetus	1	2		1	3	7
Falco tinnunculus			6	21	26	53
Falco subbuteo				5	5	10
Undet. raptors	20	19	17	27	16	99
	4134	**5206**	**11117**	**13864**	**15581**	**49902**

corded per hour was very different, with less than 30 birds recorded at Colle San Giorgio and more than 70 recorded in Brescia.

The number of birds counted at different times of the day differed between the two sites (Fig 4). There was a marked increase in the number of birds counted after the first few hours of the day, but at Ponti sul Mincio the highest hourly peak was normally recorded in the middle of the morning, whereas at Colle San Giorgio the peaks were recorded during the middle of the day and late afternoon.

A plot of flying height for all the raptors counted at Colle San Giorgio, show a strong difference in relation to time of the day (Fig. 5). The graph shows that during the middle of the day raptors were observed at heights of between 1700 and 1800 m, but on several occasion they were also recorded at a height of 2000-2500 m. From the second half of the afternoon there was a general decrease in the flight height.

The flight direction, of the raptors turned out to be different at the two sites, on the basis of the local geographical characteristics. The mean flying angle of the birds at Colle San Giorgio was of 249° (n = 54) and 223° (n= 37) at Ponti sul Mincio. The mean flight angle for both locations was of 243° (Zar 1999).

DISCUSSION

Our results show the importance of this new raptor flyway, which was previously little known, (Mezzavilla *et al.* 1998) and also how this flyway is particularly important for the Honey Buzzard.

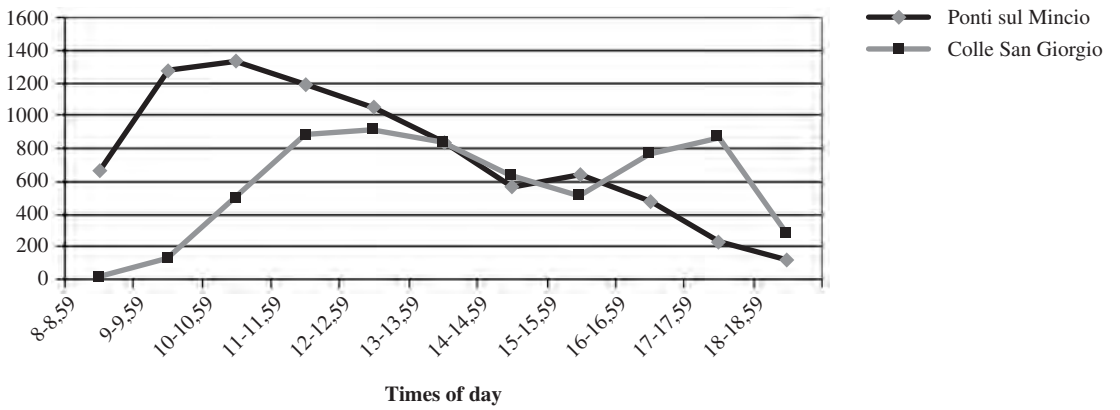

Figure 4. Mean passage rate in relation to time of the day.

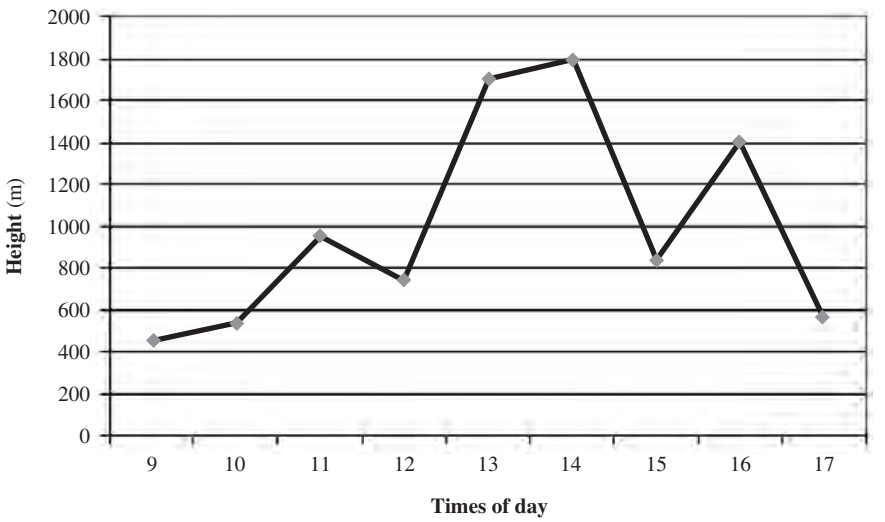

Figure 5. Mean flying height recorded at Colle S Giorgio between the 25th and the 30th of August 2006.

Both sites showed a marked increase in the number of birds seen during the past four years. This is in line with a general trend recorded at other sites in Italy, like the Strait of Messina (Chiofalo *et al.* 2006). The highest number of birds was counted during the middle of day at Colle S. Giorgio, which is in line with what had been observed at other European sites such as Gibraltar (Evans and Lathbury 1973). A decrease in the number of birds observed during the first hours of the afternoon is probably due to the presence of haze and an increase of flying heights of the raptors when the air temperature increased. The mean flying angle of 243° shows a marked difference between the flying angle of migrating Honey buzzard recorded in Europe (201°) (Hake *et al.* 2003). Regarding the flight height of the birds, although our data are not as accurate as the ones produced using a radar, they show that flight heights were higher than those recorded in Israel (Bruderer *et al.* 1994).

The marked increase in the number of birds counted could have been related to a number of factors. As well as being due to a change in the monitoring effort, it is likely that the fluctuations in the numbers of raptors recorded could have been due to weather patterns and visibility. For instance, the presence of ascensional currents, haze and pollution, must have certainly caused some bias in the number of birds counted at colle San Giorgio. This latter hypothesis is supported by the fact that on the 30th of August in 2006, only 16 Honey Buzzard were observed at Colle San Giorgio whereas, on a nearby mountain named Monte Grappa, 212 individuals were counted within two hours (Tasca *pers. com.*). In order to circumvent the problem of biased estimates, we believe that counting should be carried out at several sites along the flyway. Additionally, it is possible that some birds could choose to fly along the valley of rivers Piave, Brenta and Adige or at more northerly locations through the Alps.

Monitoring efforts also focussed on establishing the route followed by raptors along the flyway. To this extent, a third site within the province of Vicenza was monitored in 2006 (Fig. 1), where on the 3rd of September more than 600 Honey Buzzards were counted (Tonelli e Piccolo *pers. com.*) Additionally 333 Honey Buzzards were observed near a locality named Cormons, suggesting that the eastern part of the flyway, where the birds enter Italy from Slovenia, is near Gorizia (Foltran *pers. com.*).

In all, we believe that this flyway may be used by as many as 20.000 raptors. Our estimate is based on the fact that the highest number of counted birds was of 15481 at Ponti sul Mincio in 2006 and taking into consideration that a percentage comprised between 30 and 40% of raptors are normally missed by the observers (Sattler and Bart 1985, Leshem e Yom-Tov 1996). This estimate places the flyway along the Pre Alps amongst one of the most important in Europe, especially for the Honey Buzzard (Zalles & Bildstein 2000, Bildstein 2006).

Acknowledgments – This research would have never been possible without the help of numerous volunteer ornithologists and birdwatchers. We thank all of them for their enthusiasm and dedication.

REFERENCES

Bildstein KL 2006. Migrating raptors of the world. Comstock Publishing Associates. Ithaca.

Bruderer B, Jenni J 1990. Migration across the Alps. In Gwinner E (Ed.) Bird Migration. Springer, Berlin, pp. 61-77.

Bruderer B, Blitzbau S, Peter D 1994. Migration and flight behaviour of Honey Buzzards *Pernis apivorus* in Southern Israel observed by radar. Ardea 82:111-122.

Charvoz P, Materac J-P, Maire M 1996. La migration postnuptiale visible en 1993 au défilé de Fort l'Eclusé (Haute-Savoie et Ain) pres de Genève. Nos Oiseaux 43:261-288.

Chiofalo G, Cutini S, Giordano A, Ricciardi D 2006. La migrazione primaverile sullo Stretto di Messina-Monti Peloritani. InfoMigrans 17:2. (www.parcoalpimarittime.it).

Evans PR, Lathbury GW 1973. Raptor migration across the Strait of Gibraltar. Ibis 115: 572-585.

Gauthreaux S 1996. Bird migration: methodologies and major research trajectories (1945-1995). The Condor 98:442-453.

Hake M, Kjellen N, Alerstam T 2003. Age-dependent migration strategy in Honey Buzzards *Pernis apivorus* tracked by satellite. Oikos 103:385-396.

Kerlinger P, Gauthreaux S 1985. Seasonal timing, geographic distribution, and flight behaviour of Broad-winged Hawks during spring migration in South Texas: a radar and visual study. The Auk 102:735-743.

Kerlinger P 1989. Flight strategies of migrating hawks. The University of Chicago Press, Chicago.

Leshem Y, Yom-Tov Y 1996. The magnitude and timing of migration by soaring raptors, pelicans and storks over Israel. Ibis 138:188-203.

Mezzavilla F, Martignago G, Foltran D 1998. Migrazione post riproduttiva del falco pecchiaiolo *Pernis apivorus* attraverso le Prealpi Trevigiane (anni 1985-1997). In Bon M e Mezzavilla F (Red), Atti 2° Convegno Faunisti Veneti. Ass. Faunisti Veneti, Boll. Mus. civ. st. Nat. Venezia, suppl. vol. 48, pp 78-82.

Pedrini P, Rizzolli F, Rossi F, Spina F 2005. I tempi ed i modi di attraversamento della catena alpina italiana durante la migrazione postriproduttiva: un'analisi della banca dati del Progetto Alpi. Avocetta 29:16.

Sattler G, Bart J 1985. A technique for evaluating observer efficiency in raptor migration counts. In: Harwood M (ed.), Proc. 4th Hawk Migration Conf. Hawk Migration Association of North America, Rochester, pp 275-280.

Zalles J I, Bildstein K L 2000. Raptor watch. A global directory of raptor migration sites. BirdLife International, Cambridge.

Zar J H 1999. Biostatistical analysis. Prentice Hall, New Jersey.