OBSERVATIONS REGARDING THE AERIAL BEHAVIOUR OF THE SPARROWHAWK (*ACCIPITER NISUS*) (LINNAEUS 1758) IN THE RÂUL DOAMNEI HYDROGRAPHICAL BASIN

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Abstract. During March 2005 – December 2008 in the Râul Doamnei hydrographical basin there were effectuated observations regarding the presence and aerial behaviour of the sparrowhawk (*Accipiter nisus*). 1,408 observations and 1,493 individuals were registered. Depending on the air temperature, measured at shadow at two meters height above the soil, we remarked that the birds have their main activity generally at the middle of the diurnal characteristic interval of temperature for every ecological season. The temperature variation recorded along the day directly influenced the formation of the thermals that, themselves, influenced both the practiced type of flight (soaring, gliding, active flight) and its maximum height.

Keywords: sparrowhawk, behaviour, the Râul Doamnei, the Argeş.

Rezumat. Observaţii privind comportamentul de zbor al uliului păsărar (*Accipiter nisus*) (LINNAEUS 1758) în bazinul hidrografic Râul Doamnei. În perioada martie 2005 – decembrie 2008, în bazinul hidrografic Râul Doamnei au fost făcute observaţii cu privire la prezenţa şi comportamentul de zbor al uliului păsărar (*Accipiter nisus*). Au fost înregistrate 1408 observaţii şi 1493 de exemplare. În funcţie de temperatura aerului (măsurată la umbră la înălţimea de 2 metri faţă de nivelul solului) am constatat că păsările au principala activitate în general la mijlocul intervalului diurn de temperatură caracteristic pentru fiecare sezon ecologic. Variaţia de temperatură înregistrată pe parcursul zilei influenţează direct formarea termalelor care, la rândul lor, influenţează atât tipul practicat de zbor (planare, alunecare, zbor activ) cât şi înălţimea maximă a acestuia.

Cuvinte cheie: uliu păsărar, comportament, Râul Doamnei, Argeş.

INTRODUCTION

In the world, scientific research on the aerial behaviour of the sparrowhawk (*Accipiter nisus*) (LINNAEUS, 1758) refers mainly to the aerial display (FERGUSON-LEES et al., 2001). In our country, such studies have not been done until now.

The present work shows the results of the research effectuated between March 2005 and December 2008 in the Râul Doamnei hydrographic basin. The aim of these research studies was the occurrence and behaviour of the flight of the sparrowhawk depending on the temperature of the air.

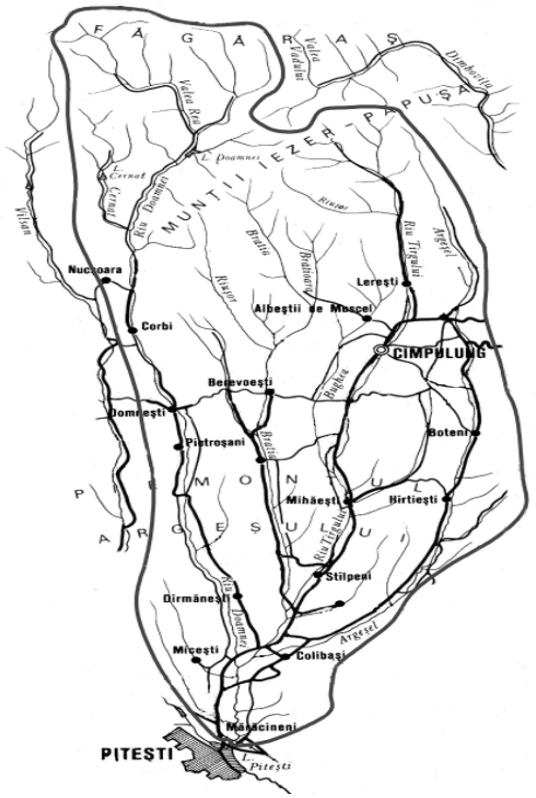

Figure 1. The hydrographical basin of the Râul Doamnei (modified), (BARCO & NEDELCU, 1974).
Figura 1. Bazinul hidrografic al Râului Doamnei (modificat), (BARCO & NEDELCU, 1974).
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MATERIALS AND METHODS

The Râul Doamnei is a major tributary of the Argeş River that flows into the Danube. It springs from the Fagaraş and Iezer-Păpuşa Mountains and it is 109.1 km long. The difference of level of 2,284 m between Moldoveanu Peak (2,544 m) and the point of confluence with the Argeş River (260 m) offers a great diversity of relief and habitats, favourable for the sparrowhawk along the year, mainly in the mountain and hill areas (Fig. 1).

The sparrowhawk is a small raptor bird with rather short, broad, blunt tipped wings and long tail (SVENSSON et al., 2009). Its food is represented by small birds (LINŢIA, 1954). It breeds in the Palearctic from Western Europe to Japan, preferring the coniferous forest interspersed with farmlands and villages (HAGEMEIJER & BLAIR, 1997). In Romania, it breeds mostly in the hilly area (MUNTEANU et al., 2002).

We analysed the aerial presence and behaviour taking into account all the observations that were made during each ecological season. We registered the data, the number of individuals, the hour of observation, the type of flying, the air temperature measured at two meter above the soil, the wind speed rendered by Beaufort scale, the locality and the type of ecosystem they flew over, as well as other details (intra-and inter-specific conflicts, flying with food etc.) after each observation.

RESULTS AND DISCUSSIONS

The number of observations and sparrowhawk individuals that were observed flying depended on the seasonal and circadian rhythm of their activity, on the weather conditions and the time for monitoring, which varied from one month to another. During the 1,408 observations, 1,493 individuals were seen in 732 days (Table 1, Fig. 2).

Table 1. The repartition of the number of observations and observed individuals and the days of observation according to the ecological seasons, as well as their weight from the total of every season. / Tabel 1. Repartiția numărului de observații și de exemplare observate și zilele cu observații după sezoanele ecologice precum și ponderea lor din totalul fiecărui sezon.

Season	Prevernal			Vernal			Aestival			Serotinal			Autumnal			Hiemal				
Month	March	April	Total	May	June	Total	June	July	Total	August	September	Total	September	October	Total	November	December	January	February	Total
No. of observations	120	132	252	59	25	84	62	130	192	172	94	266	133	202	335	90	79	52	58	279
The weight of the observations	47.62	52.38		70.24	29.76		32.29	67.71		64.66	35.34		39.70	60.30		32.26	28.32	18.64	20.79	
No. of individuals	124	137	261	60	25	85	64	132	196	181	106	287	153	224	377	94	82	52	59	287
The weight of the individuals	47.51	52.49		70.59	29.41		32.65	67.35		63.07	36.93		40.58	59.42		32.75	28.57	18.12	20.56	
No. of days of observations	57	70	127	39	20	59	33	76	109	88	41	129	46	85	131	55	48	39	35	177
The weight of the observation days	44.88	55.12		66.10	33.90		30.28	69.72		68.22	31.78		35.11	64.89		31.07	27.12	22.03	19.77	

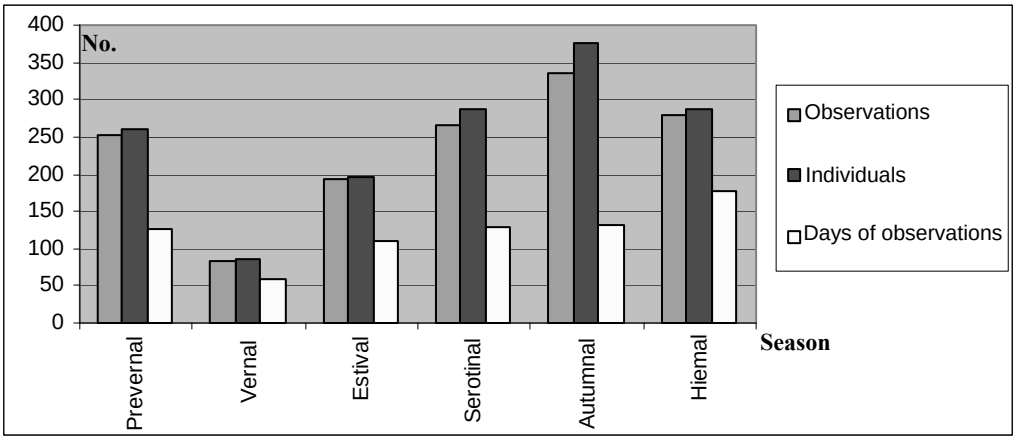

Figure 2. The distribution of the observations, number of observed individuals and the number of days with observations according to the ecological seasons during March 2005 – December 2008. / Figura 2. Distribuția observațiilor, a numărului de exemplare observate și a numărului de zile cu observații după sezoanele ecologice în perioada martie 2005 – decembrie 2008.

The autumnal season is the first regarding the number of observations and the number of observed individuals and the hiemal season is the first regarding the number of days when observations were effectuated (because its duration is more extended comparatively with the one of the other seasons). The most reduced number of observations, observed individuals and days of observations were recorded in the vernal season, when the birds cover the eggs (Table 1, Fig. 2).

The ratio between the number of the observed individuals and the number of observations is 1.04 during the prevernal season, 1.01 during the vernal season, 1.02 during the aestival season, 1.08 during the serotinal season, 1.13 during the autumnal season and 1.03 during the hiemal season. So, the sparrowhawk prefers to fly solitary.

The ratio between the number of days of observations and the number of the observed individuals is 2.06 during the prevernal season, 1.44 during the vernal season, 1.80 during the aestival season, 2.22 during the serotinal season, 2.88 during the autumnal season and 1.62 during the hiemal season. Similarly to the previous case, the biggest values are straight related with the pre- and post breeding periods.

Depending on the weight of the number of observations and the number of individuals observed according to the air temperature, we remarked an intense activity mainly in the middle of the interval of temperature characteristic for every ecological season (Table 2, Fig. 3). The thermal intervals of the maximum bird aerial activity included the average of the temperatures in the moment of the observations for every ecological season (Table 3). The variation of flight activity along the year was closely connected to the values of temperature characteristic for every ecological season and to the diurnal variation of the air temperature.

The weight of the individuals seen in active flight had generally big values at the beginning of the interval of

temperatures registered at the moment of the observations. The curve of the individuals' weight that practiced gliding varied from one season to another. The weight of the individuals seen in soaring generally increased as the temperatures were increasing (Table 2, Fig. 4).

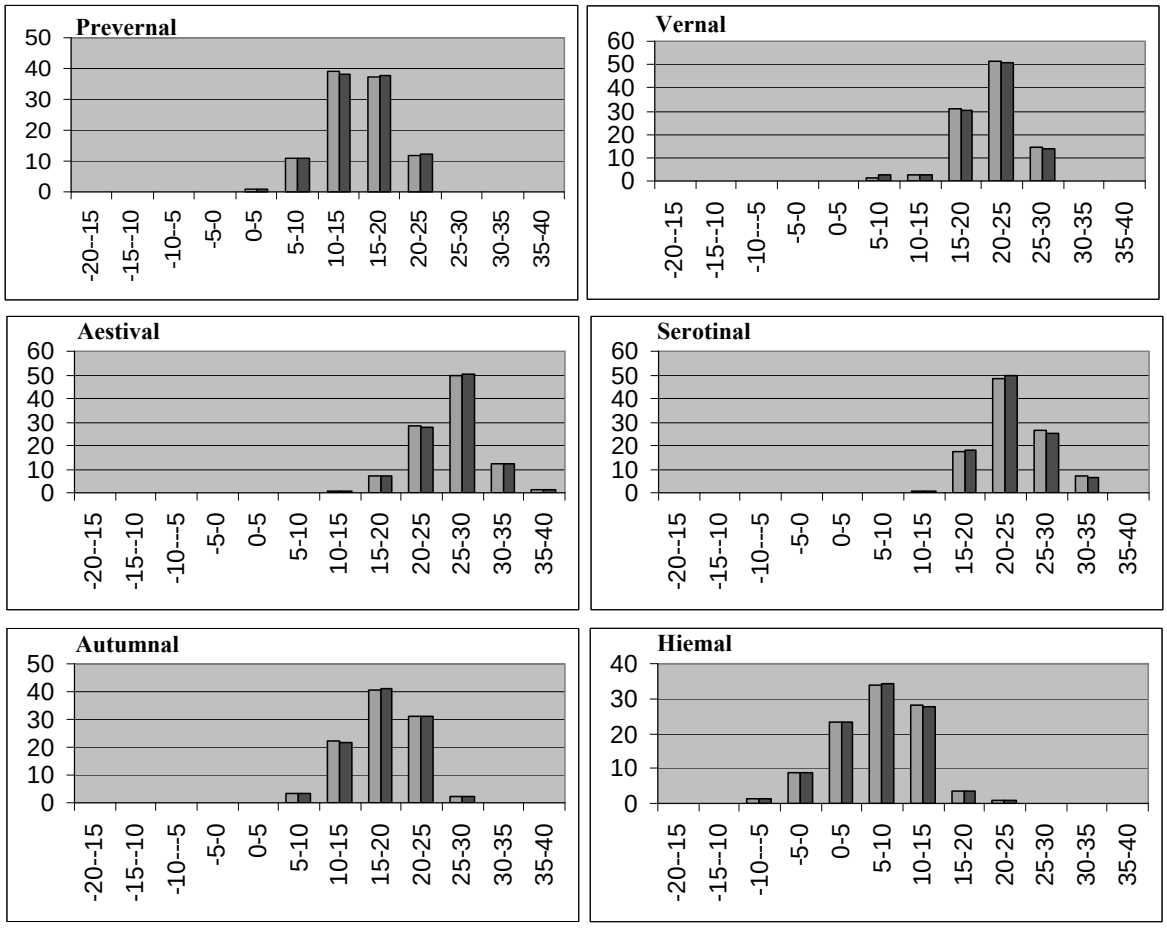

Figure 3. The weight of the observations and observed individuals depending on temperature interval (^{0}C) and season (OX axis – interval of temperature, OY axis – weight in %).
Figura 3. Ponderea numărului de observaţii şi de exemplare observate în funcţie de intervalul de temperatură (^{0}C) şi sezon (axa OX – interval de temperatură, axa OY – ponderea în %).

Table 2. The weight of the number of observations and that of the number of observed individuals as well as that of the observed individuals according to the type of flight and temperature (^{0}C) in every ecological season.
Tabel 2. Ponderea numărului de observaţii şi a numărului de exemplare observate, precum şi ponderea exemplarelor observate în funcţie de tipul de zbor şi temperatură (^{0}C) în fiecare sezon ecologic.

Season	Interval of temperatures	Observations	Individuals	Soaring	Gliding	Active flight
Prevernal	**0-5**	0.79	0.77	0	0	100
	5-10	10.71	11.11	79.31	79.31	100
	10-15	39.29	38.31	77	70	81
	15-20	37.30	37.55	81.63	68.37	72.45
	20-25	11.90	12.26	87.50	62.50	62.50
Vernal	**5-10**	1.19	2.35	100	100	100
	10-15	2.38	2.35	100	0	100
	15-20	30.95	30.59	69.23	53.85	92.31
	20-25	51.19	50.59	72.09	72.09	86.05
	25-30	14.29	14.12	66.67	83.33	75
Aestival	**10-15**	0.52	0.51	0	100	100
	15-20	7.29	7.14	50	35.71	100
	20-25	28.65	28.06	72.73	63.64	80
	25-30	50	50.51	80.81	62.63	81.82
	30-35	11.98	12.24	87.50	75	66.67
	35-40	1.56	1.53	66.67	66.67	100
Serotinal	**10-15**	0.75	0.70	50	100	100
	15-20	17.29	17.77	70.59	70.59	88.24

	20-25	48.50	49.83	86.71	65.03	74.13
	25-30	26.32	25.09	88.89	69.44	63.89
	30-35	7.14	6.62	94.74	73.68	63.16
Autumnal	**5-10**	3.58	3.45	46.15	92.31	84.62
	10-15	22.39	21.75	68.29	71.95	79.27
	15-20	40.60	41.38	82.69	75	78.21
	20-25	31.04	31.03	92.31	71.79	74.36
	25-30	2.39	2.39	88.89	55.56	88.89
Hiemal	**-10--5**	1.43	1.39	25	75	100
	-5-0	8.96	8.71	24	60	100
	0-5	23.30	23.34	28.36	76.12	97.01
	5-10	34.05	34.49	54.55	71.72	94.95
	10-15	27.96	27.87	76.25	62.50	92.50
	15-20	3.58	3.48	80	50	70
	20-25	0.72	0.70	50	50	100

Table 3. The statistical parameter regarding temperature during every ecological season.
Tabel 3. Parametrii statistici privind temperatura în fiecare sezon ecologic.

Season	**Prevernal**	**Vernal**	**Estival**	**Serotinal**	**Autumnal**	**Hiemal**
Mean	14.365	20.797	25.541	23.026	17.426	6.580
Standard error	0.266	0.391	0.296	0.234	0.222	0.319
Standard deviation	4.238	3.586	4.104	3.818	4.079	5.336
Minimum	0	7	14	14	6	-7
Maximum	24	29	37	33	27	20
Confidence level (95.0%)	0.525	0.778	0.584	0.461	0.438	0.628

Regarding the maximum height reached in flight during every observation according to the air temperature measured at 2 m height above the soil level (Table 4, Fig. 5), the weight of individuals that moved bellow 100 m generally decreased in time as the temperature increased. Instead, the weight of the individuals that flew between 500 and 1,000 m commonly increased in time as temperature increased. For the height interval 100-500 m a general conclusion cannot be specified. Between 1000 and 1500 m maximum height the birds were seen only in the autumn season, in the 10-15 ^{0}C interval of temperatures and upper never.

The maximum height (visually estimated) reached in flight was: 700 m in the aestival season, 800 m in the hiemal season, 900 m in the prevernal, vernal and serotinal seasons and 1200 m in the autumnal season.

Table 4. The weight of the individuals depending on the interval of temperature (^{0}C) and height (m), by seasons.
Tabel 4. Ponderea exemplarelor în funcție de intervalul de temperatură (^{0}C) şi de înălțime (m), pe sezoane.

Season	**Interval of temperatures**	**Maximum height**				
		0-100	**100-500**	**500-1000**	**1000-1500**	**above 1500**
Prevernal	**0-5**	100	0	0	0	0
	5-10	41.38	55.17	3.45	0	0
	10-15	22	59	19	0	0
	15-20	23.47	54.08	22.45	0	0
	20-25	18.75	53.13	28.13	0	0
Vernal	**5-10**	100	0	0	0	0
	10-15	100	0	0	0	0
	15-20	38.46	57.69	3.85	0	0
	20-25	37.21	51.16	11.63	0	0
	25-30	16.67	75	8.33	0	0
Aestival	**10-15**	100	0	0	0	0
	15-20	78.57	21.43	0	0	0
	20-25	32.73	61.82	5.45	0	0
	25-30	36.36	59.60	4.04	0	0
	30-35	25	66.67	8.33	0	0
	35-40	66.67	33.33	0	0	0
Serotinal	**10-15**	50	50	0	0	0
	15-20	25.49	62.75	11.76	0	0
	20-25	16.08	61.54	22.38	0	0
	25-30	22.22	55.56	22.22	0	0
	30-35	26.32	47.37	26.32	0	0
Autumnal	**5-10**	46.15	46.15	7.69	0	0
	10-15	29.27	63.41	6.10	1.22	0
	15-20	15.38	60.26	24.36	0	0
	20-25	14.53	62.39	23.08	0	0
	25-30	0	66.67	33.33	0	0
Hiemal	**-10---5**	100	0	0	0	0
	-5-0	88	8	4	0	0
	0-5	85.07	14.93	0	0	0
	5-10	58.59	39.39	2.02	0	0

	10-15	41.25	55	3.75	0	0
	15-20	40	50	10	0	0
	20-25	100	0	0	0	0

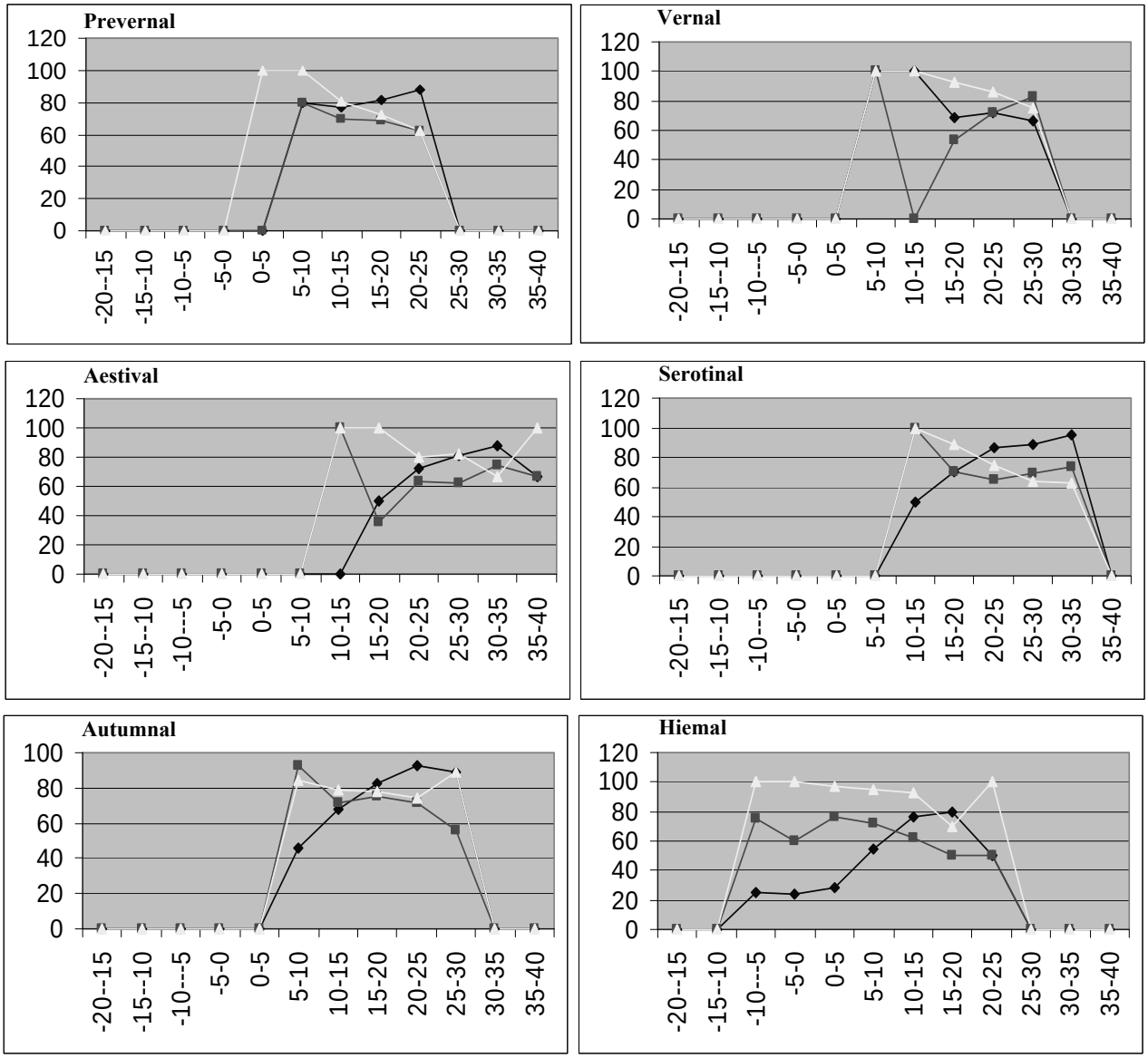

Figure 4. The weight of the number of observed individuals depending on the type of flight, interval of temperature (^{0}C) and season (OX axis – interval of temperature, OY axis – weight in %). / Figura 4. Ponderea numărului de exemplare observate în funcție de tipul de zbor, intervalul de temperatură (^{0}C) și sezon (axa OX – intervalul de temperatură, axa OY – ponderea în %).

CONCLUSIONS

Analyzing the results of the research performed between March 2005 and December 2008 on the aerial presence of the sparrowhawk in the Râul Doamnei hydrographical basin (on a number of 1,048 observations and 1,493 individuals) we can say that the flight behaviour of this species is influenced by air temperature and seasons. The variation of the temperature registered along the day influenced the vertical circulation of the air, the presence in flight being bigger when the thermals appeared. Concomitantly, the presence of the thermals modified the type of flight. Every season, the soaring was more frequent and the active flight less frequent when the temperatures were high than when the temperatures were low.

The thermals are also favourable for the ascendant flight effectuated in circles (soaring). So, the maximum height reached in flight by the sparrowhawks increased as the temperature increased.

However, we should consider the results as being less reliable at the extremities of the interval of temperature of every ecological season because of the reduced number of observations effectuated at the respective values of temperatures, which are not frequent, too.

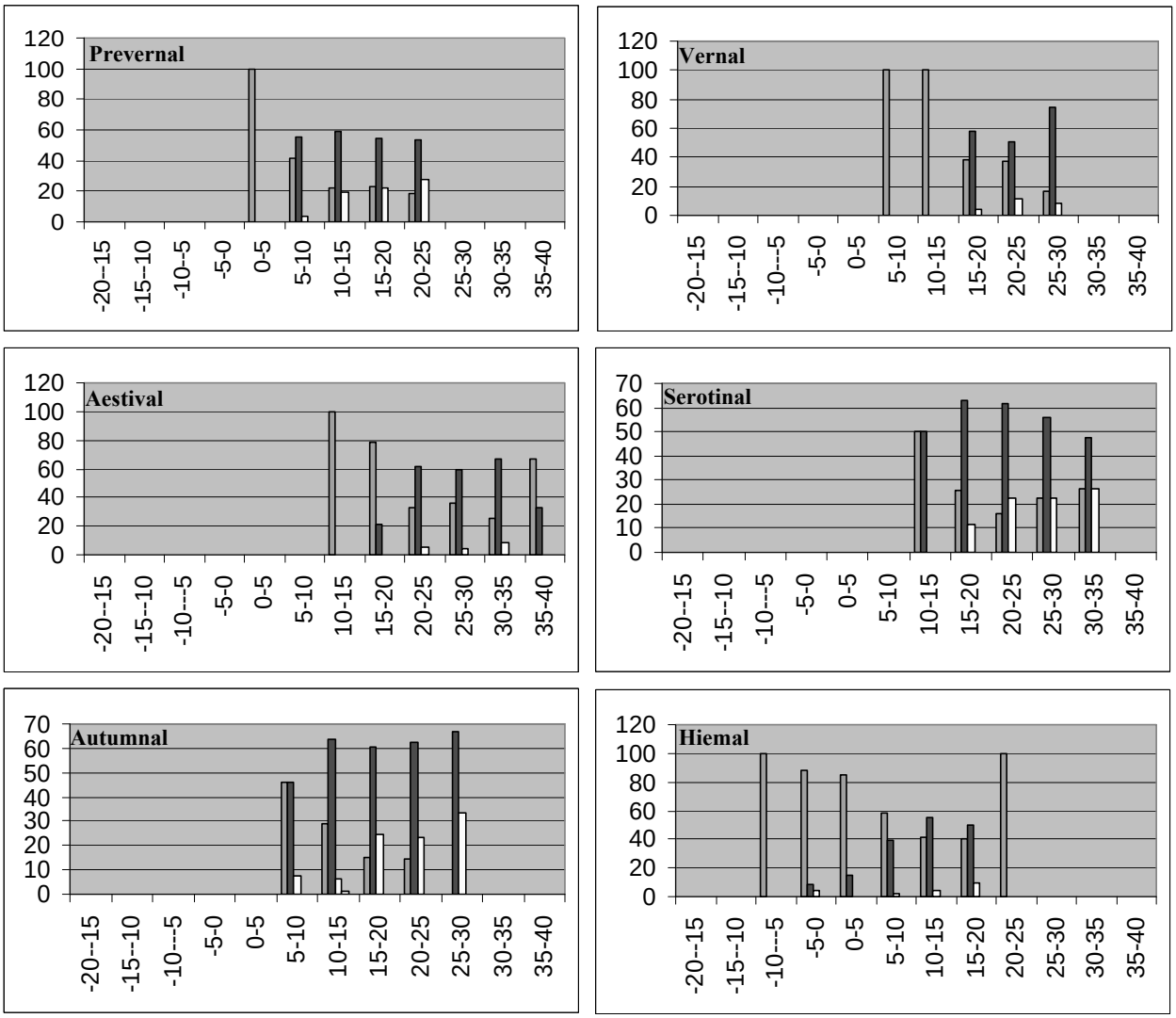

Figure 5. The weights distribution of the observed individuals' number depending on the interval of temperature (^{0}C) and seasons, by maximum height (m). / Figura 5. Distribuția ponderilor numărului de exemplare observate pe intervale de temperatură (^{0}C) și pe sezoane, după înălțimea maximă (m).
(axa OX – intervalul de temperatură, axa OY – ponderea în %)

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