isten observaciones de movimientos migratorios de la especie en Bolivia. Entre el 17 y el 24 de noviembre del 2000, se contaron un total de 477 individuos, volando solos o en bandadas en el Aeropuerto Internacional de Viru-Viru, en Bolivia. Todas las aves exhibieron un vuelo de planeo o aleteo unidireccional hacia el sur. La tasa de paso fue de 8.5 halcones por hora. La mayoría de las rapaces 91% fueron registrados entre las 11 de la mañana y la 1 de la tarde.

[Traducción del autor]

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NOCTURNAL ARRIVAL AT A ROOST BY MIGRATING LEVANT SPARROWHAWKS

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KEY WORDS: Levant Sparrowhawk; *Accipiter brevipes*; Eilat; nocturnal migration.

Most soaring birds (i.e., raptors, *Accipiteridae*, pelicans, *Pelicanus* spp., storks, *Ciconia* spp., and cranes, *Grus* spp.) require rising air currents, thermals, over and slope-updrafts to accomplish their long distance movements (e.g., Porter and Willis 1968, Safriel 1968). On migration, or other long-distance movements, this requirement restricts species with a heavy wing loading to regions (i.e., land masses vs. bodies of water) where thermals and updrafts occur and dictates diurnal flight (Spaar 1997). This soaring strategy is used almost exclusively by the large raptor species (eagles, buteos) because they are mostly incapable of generating sufficient power for sustained flapping flight (Pennycuick 1972). Smaller raptors (harriers, *Circus* spp., falcons, *Falco* spp., sparrowhawks, *Accipiter* spp.) however, can resort to flapping (powered)-gliding flight (Spaar 1997) during inclement weather conditions, or at night (Stark and Liechti 1993, Spaar and Stark 1996).

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Table 1. Number of Levant Sparrowhawks observed arriving after dark at palm plantations at Eilat, Israel. Time is presented as minutes after sunset (0). Data are presented Mean ± SD for the seven nights observations were undertaken.

MIN AFTER SUNSET	MEAN	SD	TOTAL	PERCENT
0–30	20	9	136	<1
30–60	309	28	2164	10
60–90	612	174	4286	19
90–120	1049	151	7341	33
120–150	1158	99	8104	37
150–180	13	7	90	<1
>180	0			
Total			22 121	

Table 2. Number of Levant Sparrowhawks observed arriving after dark at palm plantations at Eilat, Israel, and the numbers counted lifting off the next morning. Number in parentheses represents the percentage of birds counted arriving at roost in the dark, or trapped the next morning, in comparison to those counted at lift off from the same area the following morning.

DATE	*N* DETECTED AT ROOST (PERCENT)		*N* COUNTED AT LIFT OFF	*N* TRAPPED (PERCENT)
18 April	1136 (31)	19 April	3111	22 (0.7)
19 April	1201 (24)	20 April	4432	36 (0.8)
20 April	3752 (53)	21 April	7018	31 (0.4)
21 April	6726 (70)	22 April	9652	36 (0.4)
22 April	6040 (71)	23 April	8422	44 (0.5)
23 April	90 (16)	24 April	546	19 (3.5)
24 April	3176 (59)	25 April	5344	53 (1.0)
TOTAL	22 121 (57)	7	38 525	241 (0.6)

Israel, the only land bridge between three continents, is at a junction for birds migrating south from Eurasia to Africa in autumn and north to their breeding grounds in spring (Safriel 1968). In spring the Red Sea and the Gulf of Aqaba/Eilat act as a long deflection barrier diverting many northbound raptors to Eilat (Shirihai and Christie 1992, Yosef 1995, Grieve 1996). Eilat is at the northern edge of almost 2000 km of continuous desert regions of the Sinai and the Sahara. Hence many birds land here to rest after crossing deserts to the south (Safriel 1968, Yosef 1998a).

Recent studies document that during the northbound migration Levant Sparrowhawks (*Accipiter brevipes*) concentrate in the Eilat region in great numbers (e.g., 45 000–50 000; Safriel 1968, Shirihai 1987, Yosef 1995, Clark and Yosef 1997, Shirihai et al. 2000, Yosef and Fornasari 2000) and migrate north along the Great Rift Valley towards Syria and Lebanon (Frumkin et al. 1995). Levant Sparrowhawks are considered scarce, and Cramp and Simmons (1980) state that information on their distribution, populations, and status is limited. Recoveries of birds banded at Eilat during northbound migrations are from Romania, Ukraine, Russia, and Syria (Yosef 1998b).

During the trapping and banding operations of spring 1996, 1997, and 1998, we noted that although we remained in the vicinity of the palm (*Phoenix dactylifera*) plantations until dark we seldom saw Levant Sparrowhawks arrive, and yet on the next morning we observed large numbers departing from the palmeries on their migration north along the Syrio-African Rift Valley. Stark and Liechti (1993) suggested that Levant Sparrowhawks might resort to flapping flight to reduce time spent on migration (i.e., that they were time minimizers—that minimize overall migration time from Africa to their Asian and European breeding sites). Using radar, they identified the "signature" wing-beat pattern of Levant Sparrowhawks at night in autumn 1991. This led to a prediction that based on the number of birds I observed at the palm groves after sunset, I could predict the volume of the flocks that would take off early the next morning, and thereby increase our trapping success the next morning.

METHODS AND MATERIALS

I conducted seven night watches during the peak migration period of the Levant Sparrowhawk (18 April–24 April) in the spring 1998 season. Observations were initiated at sunset and continued until no flocks or individual birds were seen for at least 30 min. I used a Swarovski NC2 night scope (×4 magnification) to time the arrival of the flocks and to estimate their numbers. For convenience of calculation I split the observation period into 30 min blocks I opted to observe the northern of the two palm plantations owing to logistic constraints along the Israeli–Jordan border Data were recorded on appropriate observation sheets and are presented as mean values ±SD (Table 1).

RESULTS AND DISCUSSION

I observed after-dark arrival by Levant Sparrowhawk on all seven nights of observation. For the first 60 min after sunset very few arrivals were noted. An increase in the number of arrivals was noted between 90–150 min post-sunset (Table 1). No Levant Sparrowhawks were observed arriving after 180 min post-sunset. Numbers estimated with the night scope were consistently lower than the numbers observed at lift-off at dawn the next morning (Table 2). I attribute this to two major factors—my visibility being restricted to the magnification available in the night scope, and that the limited field of vision at night prevented the discovery of flocks that arrived along the shoreline of the Red Sea from the south to the southern palmeries and remained undetected until the next morning. However, the early warning of the numbers ar-

riving at the roost allowed the trapping team to organize the trapping equipment appropriately and during the study period a record total 368 Levant Sparrowhawk was trapped (Table 2). This is in contrast to the trapping success during the two years (1996, 1997) prior to the night observations and four subsequent years (1999–2002) when no such observations were conducted and the numbers of Levant Sparrowhawks trapped was less than 200 individuals per season.

Data suggest that south of Israel a larger than previously reported proportion of the Levant Sparrowhawk population resorts to nocturnal flight in order to minimize the time spent over inhospitable areas. Spaar et al. (1998) showed that migratory strategy depend on feeding conditions en route and that in good conditions a nonstop flight strategy of soaring-gliding during daylight hours and flapping-gliding flight during the night is the time minimizing strategy. However, under poor conditions, soaring-gliding flight when thermal convection is available and roosting during the night is the energy- and time-minimizing strategy. The fact that 22 121 Levant Sparrowhawks, i.e., 57% of total observed, were observed arriving at a single roost site up to two hours after sunset suggests that the latter appears to be the case for the Levant Sparrowhawk at Eilat. Stark and Leichti (1993) argued that nocturnal migrants minimized time to join larger flocks for the next day's migration. Spaar et al. (1998) thought that the very short period of their passage in Israel suggests that the migratory timing of the Levant Sparrowhawks was under strong endogenous control and that delays in the migratory timing was compensated by nocturnal flights, as has been shown for Tree Pipits (*Anthus trivialis*, Jenni 1984). In contrast, Kerlinger (1989, 1995) thought that raptors that undertake long crossings of barriers, and are unable to complete them during daylight, would resort to nocturnal migration. However, the above does not entirely explain why a substantial proportion of the population arrives at Eilat several hours after dark and do not stop at other human settlements, to the south of Eilat, in the Sinai Peninsula or along the Red Sea coast. Hence, I assume that these species have knowledge, based on previous migrations or innate, of specific staging areas along the migratory route at which they roost and will resort to nocturnal migration to reach them.

The data presented here, which validate previous radar studies based on "flight signature" (e.g., Casement 1996, Stark and Leichti 1993), represent the first time that migratory raptors have been observed and identified at close range with a nightscope arriving at a roost site.

During banding operations we noted that although we remained in the vicinity of the palm plantations until dark we seldom saw Levant Sparrowhawks (*Accipiter brevipes*) arrive, and yet on the next morning we observed large numbers departing from the palmeries on their migration north along the Syrio-African Rift Valley. We predicted that based on the number of birds observed at the palm groves after sunset, I could estimate the volume of the flocks that would take off early the next morning, and thereby increase our trapping success the next morning. I conducted seven night watches during the peak migration period of the Levant Sparrowhawk in spring 1998. Observations were initiated at sunset and continued until no flocks or individual birds were seen for at least 30 minutes. I used a Swarovski NC2 night scope (×4 magnification) to time the arrival of the flocks and to estimate their numbers. For the first 60 minutes after sunset very few arrivals were noted. An increase in the number of arrivals was noted between 90–150 min post-sunset. No Levant Sparrowhawks were observed arriving after 180 min post-sunset. The early warning of the numbers arriving at the roost allowed the trapping team to organize the trapping equipment appropriately and during the study period a record total 368 Levant Sparrowhawk was trapped. The data represent the first time that migratory raptors have been observed and identified at close range with a nightscope arriving at a roost site.

RESUMEN.—Durante las operaciones de marcaje notamos que aunque permaneciéramos en la vecindad de las plantaciones de palma hasta oscurecer, contadas veces vimos arribar azores del mediterráneo oriental (*Accipiter brevipes*), y con todo, a la mañana siguiente vimos grandes números partiendo de las palmeras en su migración hacia el norte a lo largo del valle de la falla Sirio-Africana. Predecimos que con base en el numero de aves observadas en el boscaje de palmas después del ocaso, podríamos estimar el volumen de las bandadas que despegarían temprano en la mañana siguiente, y por tanto incrementar nuestro éxito de capturas en la mañana siguiente. Lleve a cabo siete rondas nocturnas durante el periodo pico de la migración del azor del mediterráneo oriental en la primavera de 1998. Las observaciones se iniciaban al caer el sol y continuaban hasta que ninguna bandada o individuo fuera visto por al menos en 30 minutos. Usé lentes nocturnos Swarovski NC2 (×4 de aumento) para registrar el tiempo de arribo de las bandadas y para estimar sus números. En los primeros 60 minutos después del ocaso se notaron muy pocos arribos. Un incremento significativo de ellos se notó 90–150 min. posteriormente al ocaso. Ningún azor del mediterráneo oriental fue observado arribando después de 180 min post-ocaso. El aviso previo de los números que arribaban a las perchas, permitió al equipo de captura organizar adecuadamente el dispositivo de captura, y durante el periodo de estudio un total de 368 azores del mediterráneo oriental fueron atrapados. Los datos representan la primera vez en que rapaces migratorias han sido observadas e identificadas de cerca con unos lentes de visión nocturna, arribando un sitio percha.

[Traducción de César Márquez]

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NESTING DISTRIBUTION, FOOD HABITS, AND CONSERVATION OF OSPREY ON BOAVISTA ISLAND (ARCHIPELAGO OF CAPE VERDE)

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KEY WORDS: *Osprey*; Pandion haliaetus; *Boavista*; *conservation*; *diet*; *distribution.*

The Osprey (*Pandion haliaetus*) is widely distributed around the world and it has suffered heavily from several human impacts such as persecution, disturbances, and fishery practices (Saurola and Koivu 1987). This raptor eats live fish almost exclusively (Häkkinen 1977, 1978, Saurola and Koivu 1987) and therefore its distribution is restricted to the vicinity of favorable fishing waters; e.g., rivers, lakes, and sea coasts (Poole 1989).

In ideal conditions Osprey nests are located close to

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