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Short communications

Is the water-crossing tendency of adult European Honey Buzzards influenced by a time minimization strategy during spring migration?

Nicolantonio Agostini^{1*} & Michele Panuccio¹

The European Honey Buzzard, *Pernis apivorus*, is a completely migrant species wintering in central West Africa and breeding in the Palearctic region (Ferguson-Lees & Christie, 2001). Compared with other raptors, it has an intermediate morphology between smaller species, such as falcons and harriers largely using powered flight, and heavier soaring raptors, such as buzzards, eagles and vultures (Kerlinger, 1989; Pennycuik, 2008; Panuccio *et al.*, 2013b). European Honey Buzzards mostly use soaring and gliding flight over land during migration, concentrating at bottlenecks such as the Strait of Gibraltar and Bosphorus like broad winged raptors (Zalles & Bildstein, 2000). However, counts at several European bottlenecks suggest different spatial migration patterns of this species in autumn and spring. In particular, at the Strait of Gibraltar up to 17042 individuals were counted per season during spring 2008 and 2009 from six watch points used at the same time. On the other hand in autumn 2008 more than 70000 European Honey Buzzards (about four times the number recorded during spring) were counted from three watch points, 63192 from a single point, peaking in the third ten-days of August (De La Cruz *et al.*, 2011; Programa Migres, 2009). Conversely, in the Central Mediterranean region the migratory flow of this species is less conspicuous during autumn movements, although occurring on a narrower front such as at the Strait of Gibraltar in the same season. Each spring at least 25000-30000 individuals reach Europe crossing the Mediterranean between Tunisia and western Sicily. On the other hand, the autumn migration of adult European Honey Buzzards through the Central Mediterranean area involves on average 15000 individuals each season (Agostini & Panuccio, 2005; Morabito *et al.*, 2013; Agostini *et al.*, unpub. data). These differences in counts at these two bottle-

necks clearly show a stronger tendency of adult European Honey Buzzards to undertake longer sea crossings during northbound rather than during southbound movements.

During their first (southward) migration, juvenile European Honey Buzzards generally migrate later than adults (Agostini *et al.*, 1999), and thus cannot learn the shorter crossings of the Mediterranean (via the Strait of Gibraltar and the Bosphorus) by following experienced individuals. As a result, they mostly migrate on a broad front over water, like falcons and harriers (Meyer *et al.*, 2000; Panuccio & Agostini, 2010; Panuccio *et al.*, 2013b), along an innate NE-SW axis (Agostini & Logozzo, 1995; Agostini *et al.*, 2002; Agostini, 2004; Agostini *et al.*, 2004; Schmid, 2000; Hake *et al.*, 2003). On the base of this age-dependent migration strategy, some authors have suggested that long water crossings through the Mediterranean are performed by less experienced individuals during both spring and autumn (Schmid, 2000; Hake *et al.*, 2003). This hypothesis would implies that birds will eventually learn the more favorable, though longer, routes via Gibraltar and Bosphorus. However, during visual observations in spring at the Strait of Messina (between the 'toe' of southern continental Italy and Sicily, Fig. 1), only a minority of birds with immature characteristics was reported (note that most juveniles remain in Africa until their second spring, Ferguson-Lees and Christie 2001) and, as expected, younger birds migrated later in the season, mostly during the last ten days of May (Panuccio & Agostini, 2006).

In spring, after reaching Sicily from Tunisia, northbound European Honey Buzzards make further decisions, with alternative flyways over water en route to mainland Italy and the Balkans; they are not all funneled towards the Strait of Messina, the shortest sea crossing between Sicily and Italy, but thousands of individuals fly across the Tyrrhenian Sea (Panuccio *et al.*, 2004; Agostini *et al.*, 2005; 2007; Fig. 2). To explain these results, Agostini & Panuccio (2005) suggested that, during spring migration, adult European Honey Buzzards tend to cross the Mediterranean on a broader front using more direct paths between wintering and breeding range since spring birds may be more strongly motivated to reach their destination as quickly as possible as a result of a time minimization strategy (Nilsson *et al.*, 2013). Also in the eastern Mediterranean, observations on the migration of this species seem to confirm a

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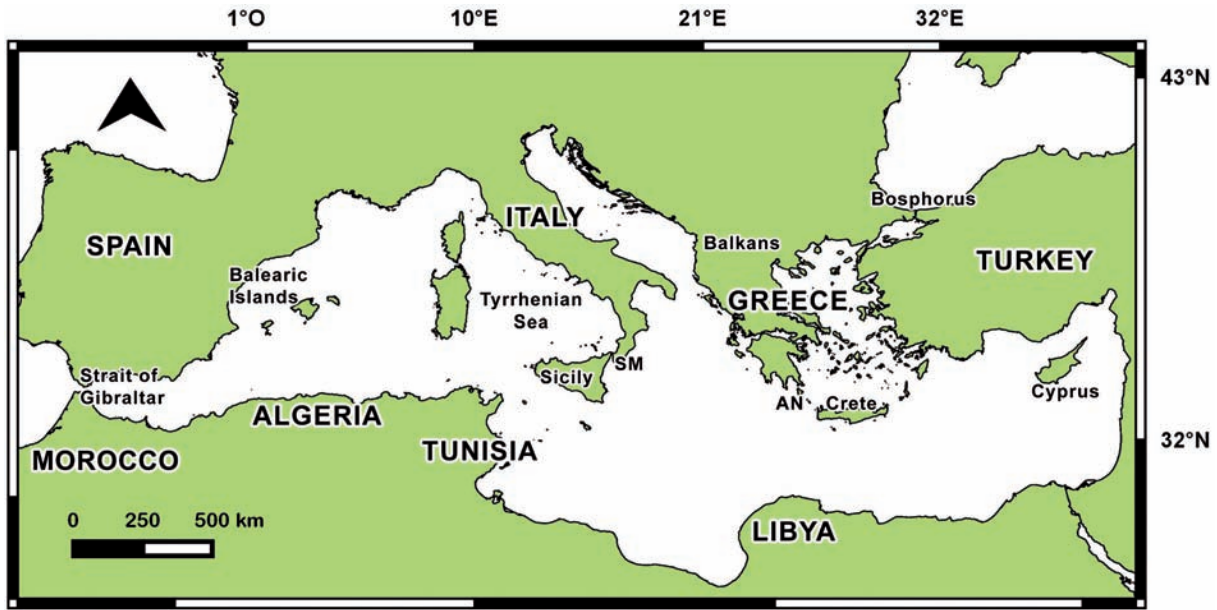


Fig. 1 - The Mediterranean Sea (SM = Strait of Messina; AN = Antikythira).



Fig. 2 - An adult male European Honey Buzzard during the crossing of the Tyrrhenian Sea along the Central Mediterranean flyway. May 2011. (Photo by Michele Panuccio).

stronger tendency to cross larger stretches of sea in spring rather than in autumn. In particular hundreds of individuals concentrate each autumn over the island of Antikythira en route to Crete and Africa, while during spring European Honey Buzzards are expected to bypass the island probably choosing a more direct route between Libya and Greece (Agostini *et al.*, 2012; Panuccio *et al.*, 2013a; Fig. 1).

In recent studies, some authors (Meyburg *et al.*, 2010; 2013; Vansteelant *et al.*, 2014) plotted movements of

European Honey Buzzards fitted with GPS loggers and satellite transmitters. One bird, an adult male breeding in northern Germany and wintering in Nigeria, was tracked for three consecutive spring migrations in 2004-06. In 2004 it crossed the Mediterranean at the Strait of Gibraltar, but in 2005 and 2006 it made longer sea crossings from Algeria to northern Spain via Balearic Islands (Meyburg *et al.*, 2010; Fig. 1). Another bird showed loop migration at a larger scale, undertaking the crossing of the central

Mediterranean during spring movements (Meyburg *et al.*, 2013). In addition, Vansteelant *et al.* (2014) showed that European Honey Buzzards migrate faster during spring rather than autumn. These results do not match the hypothesis of Schmid (2000) and Hake *et al.* (2003) but suggest that experienced birds can choose more direct flyways between wintering and breeding areas during spring movements, undertaking longer sea crossings probably as a result of a time minimization strategy. In this scenario, the discovery of more direct paths between breeding and wintering areas made by juvenile birds during their first migration (Hake *et al.*, 2003) may have adaptive value (Agostini & Panuccio, 2005).

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