

Dinevich L., Leshem Y. 2007. *Algorithmic system for identifying bird radio-echo and plotting radar ornithological charts*. Ring 29, 1-2: 3-40.

### **Abstract**

The territory of Israel is a route for major bird migration from Europe and certain areas in Asia and Africa and back. During the period of intensive migration, the average density of birds may reach over 500 birds per a square kilometre of the air. These figures, alongside with the fact the air over the country is saturated with aircraft, makes it an urgent task to find solutions for prevention of disasters caused by aircraft-bird collisions.

In the present paper, a new algorithm is proposed aimed at identifying bird radar echoes against the background of other reflectors. The implementation of the algorithm has made it possible to improve the computerised radar system for bird monitoring developed earlier in Israel on the basis of MRL-5 meteorological radar station. The time needed for echo selection has been significantly reduced, while the trustworthiness of the ornithological data provided by the algorithm has increased. The new algorithm utilizes several echo properties that have been added to the algorithm previously developed by the authors, the most important of them being the pattern of echo movement. These properties in combination with a set of techniques used for their identification enabled to isolate the echo from moving birds against the background of other objects (ground clutter, clouds, atmospheric inhomogeneities, aircraft, etc.) at the accuracy level sufficient for operational purposes. The information on echo movement was used for plotting flight vectors (velocity and direction) of individual birds and bird groups. On the basis of movement pattern, four types of movement were distinguished: straightforward at non-uniform velocity; straightforward at uniform velocity; significant deviation from a straight line, non-uniform velocity and chaotic undirected shifts. The system enables on-line plotting of operational ornithological charts every 15-30 min, including charts that combine meteorological and bird monitoring data, to be provided to air traffic control services. This makes the proposed radar ornithological system an efficient means of maintaining air traffic safety in complicated meteorological and ornithological conditions.

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**Key words:** radar ornithology, radar meteorology, radio-echo, birds, bird migration, ornithology, air traffic safety.