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Field methods in bird migration studies and ways of publishing the results

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394 major papers on migration from 18 main North American and European journals have been analysed to show how often the particular field methods are used and various problems treated, and how often those methods are used separately or jointly to solve individual problems. An analysis of the applicability of various methods of data gathering to the solving of the particular problems is made, showing the necessity of complex usage of many methods. However, attempts at solving various problems are very often based on one method only, and the number of papers representing parts of bigger programs is small.

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Полевые методы и способ их использования в исследованиях по миграциям птиц.

Произвели обзор 394 более обширных публикаций, касающихся миграций птиц, опубликованных в 18 главных североамериканских и европейских журналах, с целью выяснения, как часто используются различные методы сбора материала, как часто исследования посвящены тем или иным проблемам и как часто эти методы применяются каждый в отдельности или комплексно для разрешения отдельных проблем. Проанализировали пределы возможности использования различных методов сбора материала для изучения различных проблем, констатируя необходимость комплексного использования многих из этих методов. Констатировали, однако, что попытки разрешения отдельных проблем очень часто основываются на одном только методе, а число работ, являющихся составными частями исследовательских программ невелико.

The purpose of our article is an analysis of the papers on bird migration, published in northern Europe and America in the period 1967–1976. The analysis concentrates on field methods used and on the manner of publishing the results.

Table 1. Journals and anthologies surveyed

Journals and anthologies	Volumes and numbers	Country	No. of publications on migration
Communications of the Baltic Commission for the Study of Bird Migration Migracii životnych Migracii ptic pribaltiki. Leningrad, 1967 Ekologičeskije i fizjologičeskije aspekty pereletov ptic. Leningrad, 1971	1967-1975: 4-9 1968: 5	U.S.S.R.	64
Ornis Fennica	1967-1976	Finland	12
Vår Fågelvärld Ornis Scandinavica	1967, 1968: 1, 1969, 1970: 2-3, 1971-1974, 1975: 1, 2 (partly), 1976 1970, 1972-1974, 1975: 1, 1976: 2	Sweden	29
Dansk Ornithologisk Forenings Tidsskrift	1967-1972, 1973: 1-2, 1976: 1-2	Denmark	30
Die Vogelwarte	1967-1976	G.F.R.	37
Acta Ornithologica Acta Zoologica Cracoviensia Notatki Ornitologiczne	1967-1976 1972: 1-18, 1973: 1-8, 10-17, 1974: 1-21 1967-1976	Poland	27
British Birds Bird Study Ringing and Migration The Ibis	1973: 1-3, 5-9, 11-12, 1974: 3, 1975: 1-8, 11-12, 1976 1967-1976 1975-1976 1967: 1, 1968, 1969: 2-3, 1970: 3-4, 1971: 1-2, 1972: 2-3, 4 (partly), 1973-1976	Great Britain	64
The Auk Bird-Banding The Condor The Wilson Bulletin	1967-1976 1967-1972, 1974-1976 1967-1976 1967-1975, 1976: 1-2, 4	U.S.A.	131
Total			394

We have looked through 18 journals containing the majority of the papers on migration (Table 1). From European journals which are very active in the field of bird migration studies, only a few have been omitted. A half of the journals have been searched fully, others in their greater part. Thus we hope that our review is representative enough although far from complete. The only exception may be the material from the Soviet Union. In this country a great number of study results is published outside periodicals, in irregular publications and proceedings of conferences which are the sources not included in our survey, with the exception of two important Soviet anthologies.

We took only the main papers into consideration, excluding short notes, letters and so on.

The papers on cage and other laboratory experiments, as well as displacement experiments, have not been taken into account. Nor were the reports on ringing and observing migration by ringing centres, birds stations and so on, even if they contain some simple elements of analysis. The same applies to the papers describing findings of rarities.

The division of the field methods is shown in Fig. 1. Not all those methods are equally often used. Especially papers from journals of some countries show a preference of particular methods.

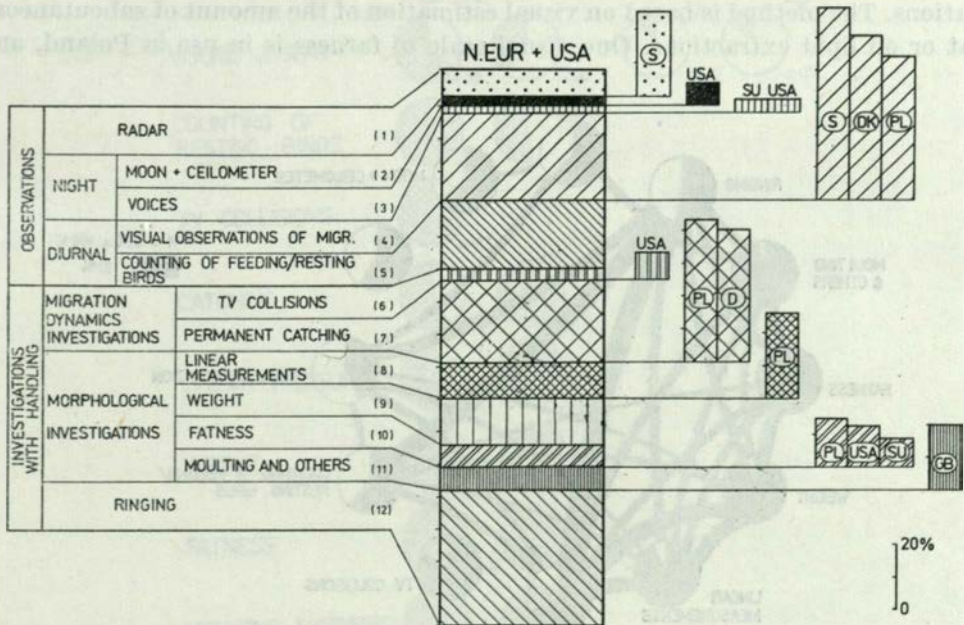


Fig. 1. The classification of the field methods and frequency of their usage in studies published in the papers surveyed.

Comments to some methods: 2 - observations against the moon disk and in the beam of a strong flood-light. A ceilometer of a range up to several hundred metres is usually used as the light source, 6 - investigations of migrational dynamics and phenology by analysing the dates and number of birds killed in night collision with large obstacles, mainly television towers, 8 - mainly measurements of wing, tail, bill, leg length and the wing formula. N. EUR. - northern Europe, S - Sweden, S.U. - the Soviet Union, DK - Denmark, PL - Poland, D - German Federal Republic, G.B. - Great Britain.

Radar investigations are carried out mainly in Sweden and the U.S.A. Taking into consideration also the countries excluded from our detailed study we should mention Switzerland as well. A quarter of the Swedish papers is based on radar studies.

Night observations against the moon disc and in ceilometer beam are especially popular in the U.S.A. and are rarely used in Europe. The auditory investigations of night migration are used only in the U.S.A. and the Soviet Union.

Nearly 60% of Swedish papers include the analysis of migration dynamics based on daily visual observations. This method is used in some 50% Danish and Polish papers. The counting of resting and feeding migrants is made with a similar frequency in every country.

Studies of the phenology, dynamics and ways of migration based on the data about birds killed against television towers are carried out in the U.S.A. only. One of such works, by NISBET (1970), contains an analysis of 140 thousand specimens of *Parulidae* killed in 135 places.

Migration dynamics investigated by regular catching is dealt with in nearly half papers in Poland and G.F.R.

Linear measurements of birds were especially commonly used in the Polish papers. Fatness was analysed in Polish, American, British and Soviet publications. The method is based on visual estimation of the amount of subcutaneous fat or on lipid extractions. One visual scale of fatness is in use in Poland, and

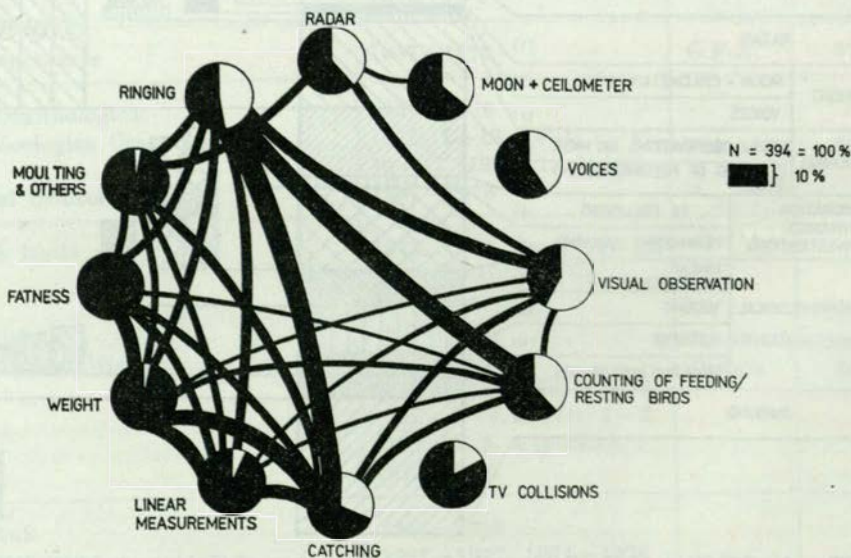


Fig. 2. Frequency of joint usage of different field methods in studies described in one paper, and independence in the use of particular methods.

The width of connections between the two circles designating the particular methods correspond to the fraction of papers in which both these methods are joined. Connections between the methods used together in four or fewer papers are excluded. Each full circle designates all papers in which a given method is used. The white part of the circle corresponds to the fraction of papers using this method as the only one.

another one in the Soviet Union. But in the United States many variants of the scale are used, adjusted to the particular species.

The most commonly used method is ringing (in 42 % of all papers reviewed). In the particular countries the number of papers using this method varies from 27 (Denmark) to 49 (U. S. A.) per cent.

Some of the methods are often used separately while others are usually combined. The methods most commonly used jointly in one paper are shown in Fig. 2.

It is clear that ringing results and morphological data are often used in the same papers as migration analysis obtained by catching activities. However, the statement that ringing and counting of resting birds is also commonly used in the same papers, may be not so obvious. The same, but to a lesser extent, refers to the ringing and visual observations of migration.

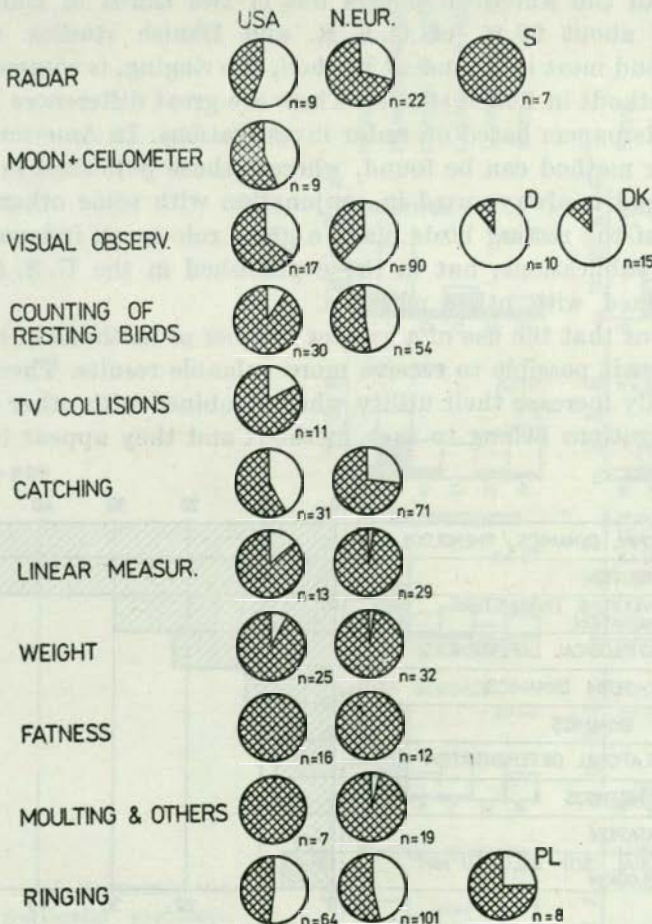


Fig. 3. Independence in the use of different methods in American and European publications. Explanation of the letter symbols — see Fig. 1, for other explanations — see Fig. 2.

Another aspect of the same question, that is the independence of using the particular methods, is shown inside the circles in Figure 2. There are two most independent methods: visual observations and ringing. In 58 % and 47 %, respectively, of the studies applying those methods do not use any other. Both these methods are among the most universal ones. "Universal" means giving a great number of basic types of information about migration. On the other hand, the less universal method (but nevertheless sometimes irreplaceable in solving some important problems) consists in morphological investigations. Each of them is nearly always used together with other morphological methods, very often several of them.

This general and rather obvious picture, has some interesting exceptions, when papers edited in the particular countries are taken into consideration separately (Fig. 3). Visual observations of migration as only method appear in one third of the American papers but in two thirds of European papers, and even in about 90 % of G. F. R. and Danish studies. On the other hand, the second most independent method, the ringing, is commonly combined with other methods in Polish studies. There are great differences between countries as regards papers based on radar investigations. In American papers very often no other method can be found, whereas those published in Sweden show that the method is always used in conjunction with some others.

Counting of the resting birds plays a great role as an independent method in European publications, but in those published in the U. S. A. it is nearly always combined with other methods.

It is obvious that the use of a greater number of methods in solving a given question makes it possible to receive more valuable results. There are methods which especially increase their utility when combined with other ones. Morphological investigations belong to such methods and they appear to be very va-

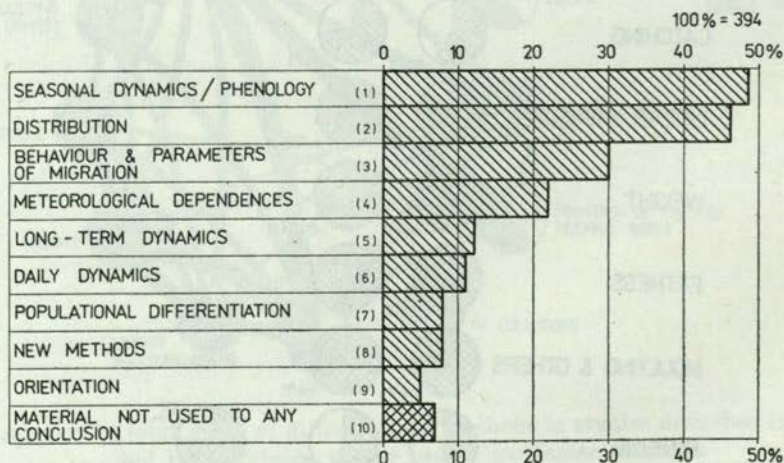


Fig. 4. Percentage of papers dealing with the particular problems.

Comments to some problems: 3 - parameters of migration: direction, height, speed, 8 - new methods of gathering or elaborating the data, 9 - orientation without orientation experiments.

luable when used to check the hypothesis of populational differentiation of bird groups, distinguished with other methods (such as catching, visual observations and so on).

Also radar research often gains in quality when connected with the use of other methods. It is so especially in respect of the identifying of the species and number of tracked birds. Studies on *Columba palumbus* migration by ALERSTAM and ULFSTRAND (1974) may serve as a good example of this. The flock detected on the radar screen was checked for the identify of the species by a light aeroplane connected by radio with a radar operator.

When surveying the publications, we have checked which kinds of problems were undertaken by them. We have distinguished 9 problems or groups of

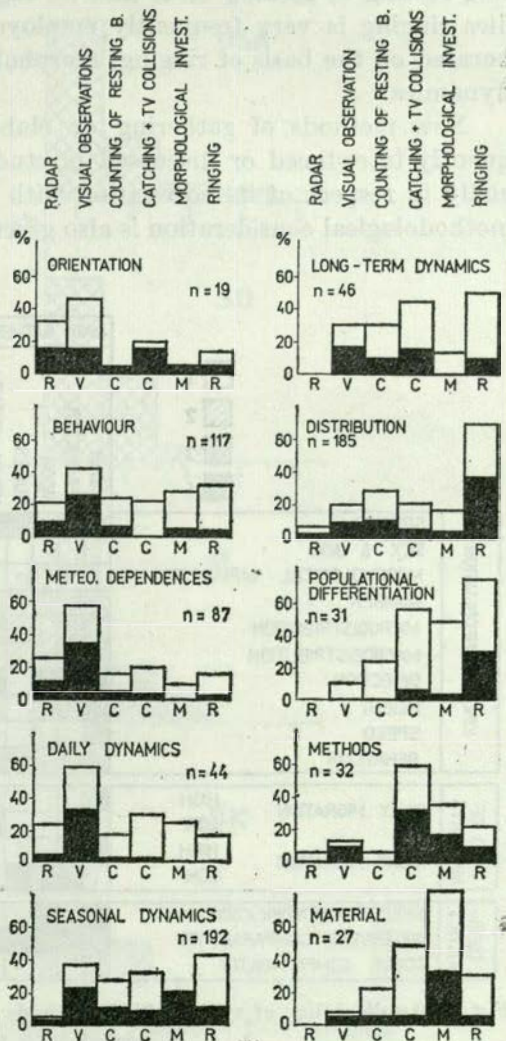
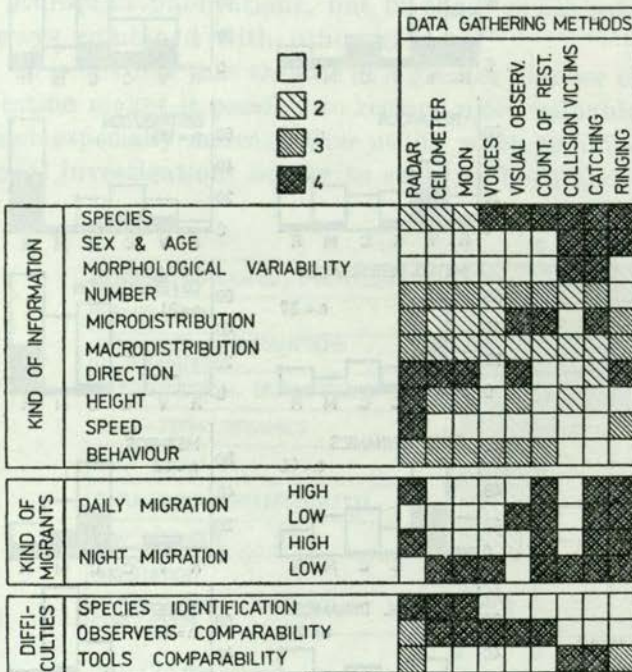


Fig. 5. Methods, most frequently used in solving the particular problems. Black colour denotes papers based on one method only, white one - papers using also other methods.

problems most frequent in those papers (Fig. 4). Nearly half of all the papers analyse the seasonal dynamics of migration and migration phenology. A similar number of papers deals with the distribution (here "distribution" means — positions of breeding and wintering areas of various groups of migrants and ways of migration on macro and local scale). It is surprising that quite a large number of papers give crude materials, not analysed and not leading to any conclusions.

Fig. 5 shows methods most frequently used in solving particular questions. The orientation, behaviour, meteorological dependences and daily dynamics are investigated mainly by radar and visual observations. Seasonal and long-term dynamics are investigated mainly by observing the migration and counting resting or feeding birds and by regular catching. In the distribution studies ringing is very frequently employed. Populational differentiation is elaborated on the basis of ringing, morphological studies and analysis of catching dynamics.

New methods of gathering or elaborating the data are particularly frequently introduced or discussed in studies based on catching dynamics, especially in respect of its correlation with the intensity of bird migration. Much methodological consideration is also given to biometrical studies.



Applicability: 1 - lack, 2 - in special cases only, 3 - on a limited scale, 4 - complete or nearly complete.
 Difficulties: 1 - small or lack, 3 - middle, 4 - heavy.

Fig. 6. Applicability of various field methods to a particular problem, and difficulties connected with the methods.

Papers giving only crude not analysed material, are those based on morphological investigations, especially on measurements and weighting. It means, that migratory birds are often measured, but the authors are not equally often able to use the gathered data in any analysis. The reason is that material of this kind is frequently gathered in the field without any defined purpose.

The applicability of various methods of data gathering to particular problems is shown in Fig. 6. It can easily be seen that there is not a method giving an answer to all the important questions. For instance, the methods making possible a direct following of the night migration hardly allow one to recognise

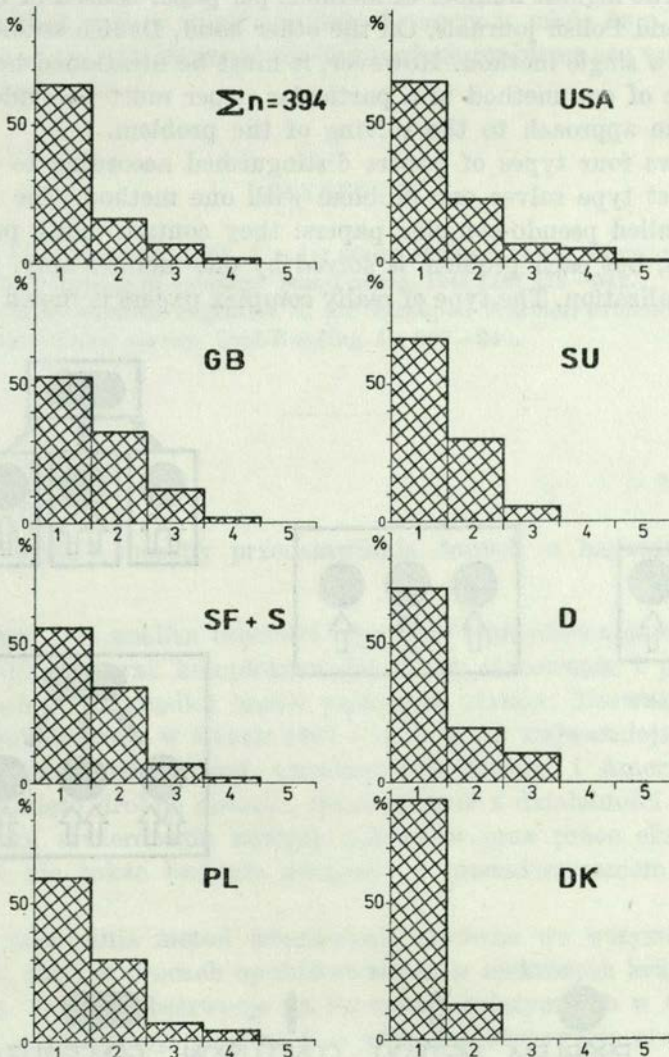


Fig. 7. Percentage of papers based on various numbers of field methods

SF - Finland. For other abbreviations - see Fig. 1.

the species of the birds observed. Quantities of such importance as the number of passing birds cannot be fully estimated with any method. Some methods fail to reach birds migrating at very high altitudes; others such as radar, do not detect birds flying at a low altitude. In case of using every method there arises a question: is the observed sample a good representation of the general passage or not? These problems can be at least partly avoided by parallel usage of the two or more methods estimating the numbers of migrating birds. The same applies to other problems.

But in fact 64 % of all the publications surveyed is based on one method only (Fig. 7). The highest number of methods per paper is used in British, Swedish, Finnish and Polish journals. On the other hand, Danish studies especially frequently use a single method. However, it must be mentioned here, that not always the use of one method in a particular paper must be evidence of one-sidedness in the approach to the solving of the problem.

Fig. 8 shows four types of papers distinguished according to their complexity. The first type solves one problem with one method. The second type comprises so-called pseudo-complex papers: they contain many problems and many methods, but each problem is solved by one method only, and there is a lack of generalization. The type of really complex papers is shown on the right

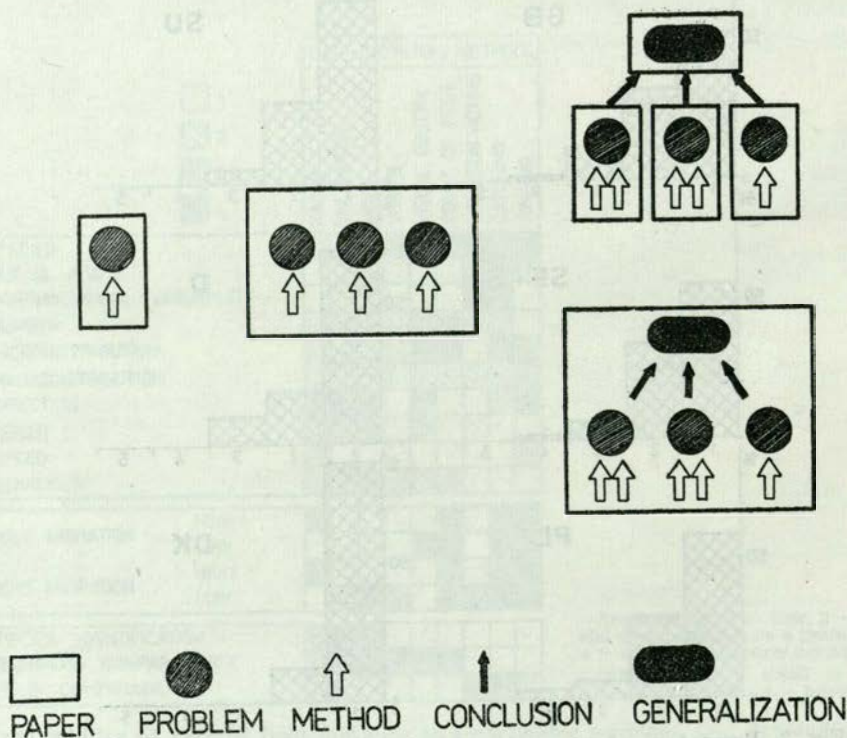


Fig. 8. Types of papers according to complexity of approach to the solving of the problem.

hand side bottom. But an equally good result can be achieved by one-problem and one-method papers, if they are prepared according to the general plan and their results are used in a common generalization (right hand side top).

Unfortunately, most of the one-method papers, shown in Fig. 7 do not belong to this type. On the other hand, some of the many-method papers shown there, represent the second type, the pseudo-complex one. Some of the others do not use several joint methods, because of their need to solve the previously stated problem, but because these methods are available and usually used. Such case is particularly common with morphological data.

The most striking conclusion from the review of European and American periodicals is that such a small number of papers is made as a part of bigger programme, and that attempts at solving various problems are very often based on one method only.

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STRESZCZENIE

[Metody terenowe i sposoby przedstawiania danych w badaniach wędrówek ptaków]

Celem pracy jest analiza częstości używania i przydatności różnych metod zbierania materiału oraz kompleksowości w ich stosowaniu i przedstawianiu w publikacjach w przypadku badań wędrówek ptaków. Rozważaniami objęto 394 prace opublikowane w latach 1967–1976 w 18 najważniejszych, w dziedzinie badań nad wędrówkami, czasopismach Europy i Ameryki Północnej (tab. 1). Pominięto drobne notatki, sprawozdania z działalności stacji badających wędrówki, stwierdzenia nowych gatunków oraz prace eksperymentalne (włączając w nie także badania związane z przemieszczaniem schwytych ptaków).

Częstość stosowania metod terenowych, zarówno we wszystkich przejrzanych pracach, jak i w pracach opublikowanych w niektórych krajach przedstawiono na ryc. 1 (2 – obserwacje na tle tarczy księżyca lub w świetle silnego reflektora, 3 – rejestracja głosów; 4 – wizualne obserwacje przelotu, 5 – liczenie ptaków żerujących lub odpoczywających, 6 – badanie ofiar zderzeń z wieżami telewizyjnymi, 7 – chwywanie, 8 – mierzenie, 9 – ważenie, 10 –

określanie otłuszczenia, 11 — badanie pierzenia i inne badania morfologiczne, 12 — obrączkowanie). Niektóre z metod są stosowane samodzielnie, zaś część — przeważnie lub wyłącznie w połączeniu z innymi (ryc. 2 — szerokością połączeń zaznaczono względną liczbę prac, w których stosowano obie metody zbierania materiału. Pusta część kół odpowiada procentowi prac wykorzystujących daną metodę, które oparły się wyłącznie na niej).

Samodzielne stosowanie pewnych metod jest odmienne w różnych krajach (ryc. 3). Za metody mające szczególnie dużą wartość wtedy, gdy używa się ich równolegle ze stosowaniem innych metod, uznano mierzenie ptaków i obserwacje radarowe.

Poszczególne problemy związane z wędrówkami są podejmowane z różną częstością (ryc. 4: 1 — dynamika sezonowa i fenologia, 2 — rozmieszczenie, 3 — zachowanie oraz kierunek, wysokość i prędkość przelotu, 4 — wpływ pogody, 5 — dynamika wieloletnia, 6 — dynamika dobowa, 7 — zróżnicowanie populacyjne, 8 — nowe metody zbierania lub opracowywania danych, 9 — orientacja, 10 — materiał nie wykorzystany do jakichkolwiek wniosków).

Do rozwiązywania poszczególnych problemów są stosowane różne metody (ryc. 5), dostarczające mniej lub bardziej pełnej informacji (ryc. 6). Żadna z nich nie pozwala na całościowe zbadanie głównych problemów wędrówkowych, lecz mimo to większość prac zawiera materiał zebrany przy pomocy tylko jednej metody (ryc. 7). Stosunkowo niewiele prac stanowi część większych programów badawczych. Różne stopnie kompleksowości podejścia do badanego problemu przedstawiono na ryc. 8.

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