

# Sorting CR-data for the Real Migration Profile of Gulls

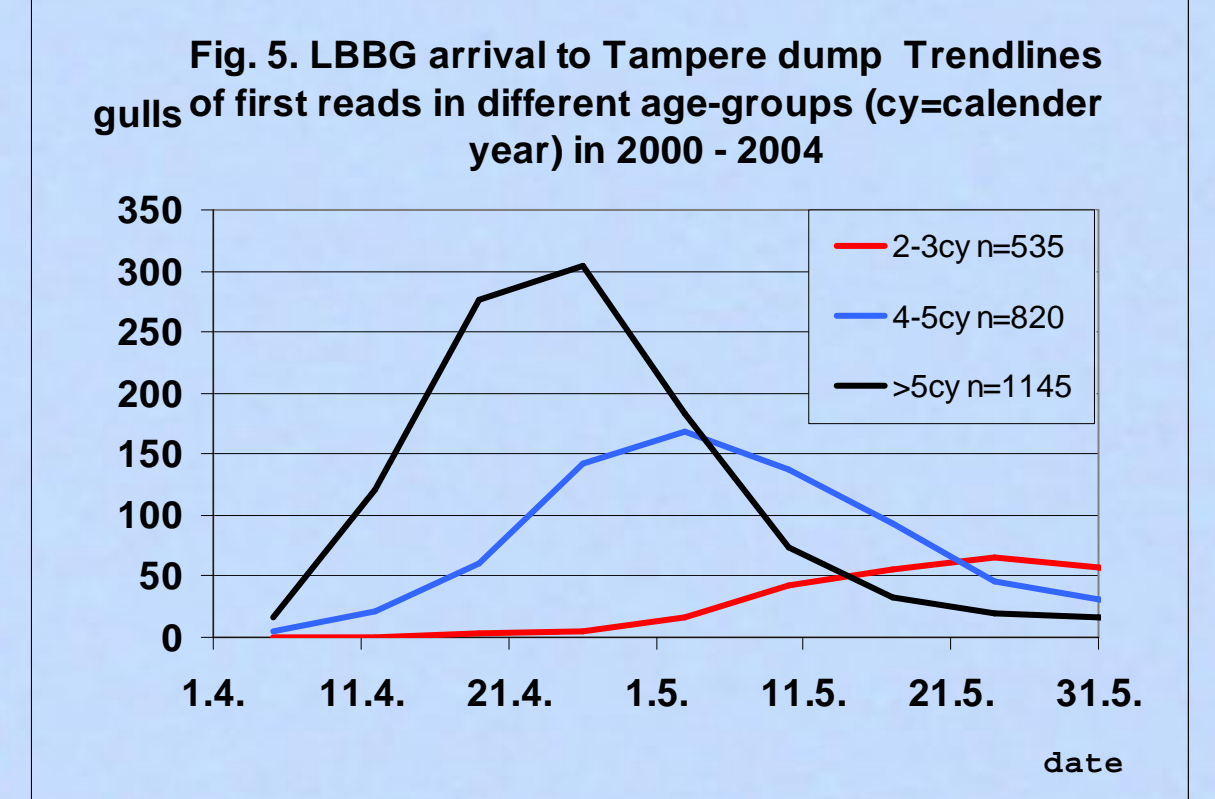
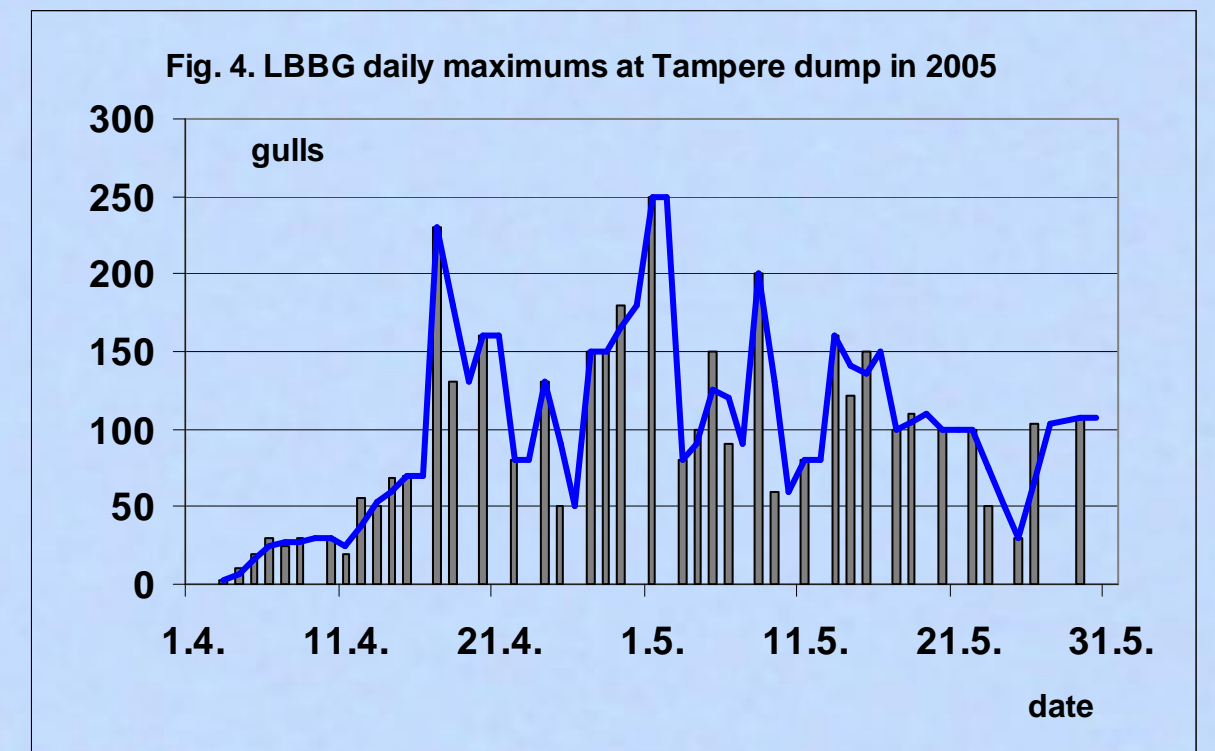
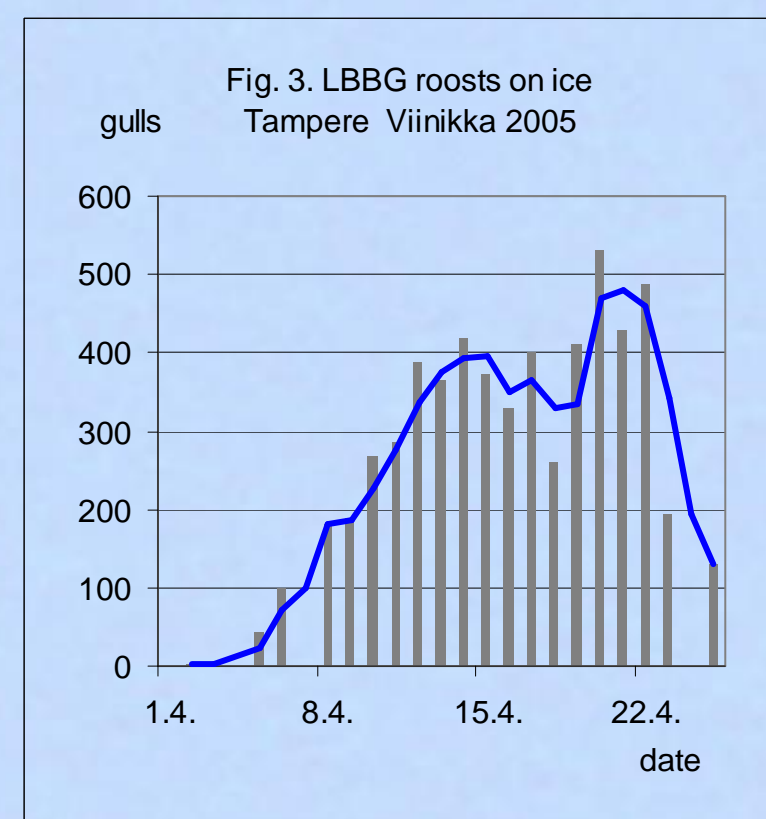
Risto Juvaste

The use of the read rings (individually coded colour rings) gives an opportunity to look at migration in detail. Here CR-analysis is used to estimate the real migration of Lesser Black-backed Gulls (*Larus fuscus fuscus*) in Tampere, Finland. The encounter histories of the migrating population were sorted into three different sub-groups: transients, visitors and locals. These were analysed by different models. This improves the estimate of the total migration profile and the arrival times. The total profile was estimated by using meta-population modelling of the Finnish LBBG population.

## LBBG READ RINGING PROJECT IN FINLAND

The read ringing of LBBGs (*Larus fuscus fuscus*) in Finland started in 1993. Risto Juvaste has organized the ringing and produced the rings. At the end of 2005 total 12167 read ringed LBBGs have yielded 58 000 day-reads. Most of these (44 553 day-reads/1607 individuals) have been read at Tampere dump by the Tampere Gull Group (Table 1). The numbers are based on the data from Finnish Ringing Centre (FRC): This spring migration study is based on 18 491 reads at Tampere dump during May-June over the years 2000 – 2005. The distribution of the Finnish LBBG read ringing can be seen in Fig. 1. The tables in the map show the pooled ringing numbers and the estimates for breeding pairs at five study cohorts. The breeding estimates are based on the 2003 data of BirdLife Finland. The Tampere breeding area has a 100 km radius. The origin of the gulls, which were read at Tampere is shown in Fig 2. There are also the tables showing the numbers of reads/gulls from the ringing cohorts.

Year	Read Rings	Day Reads	Gulls Read
1993	281		
1994	709		
1995	700		
1996	795	10	9
1997	1145	22	19
1998	1024	224	98
1999	1028	1006	245
2000	805	2465	350
2001	979	7221	543
2002	1054	7820	524
2003	1112	9449	642
2004	1200	9437	729
2005	1335	9437	648
<b>Total</b>	<b>12167</b>	<b>44553</b>	<b>1607</b>



## THE STUDY OF LBBG MIGRATION

In the migration studies the first field observations are normally used to describe the start of migration. It is also common to define the time of main migration with the largest flocks or roosts. In Finland, LBBGs roost on the ice fronts of first open waters. Fig. 3. shows typical data from ice roosts at the city of Tampere (data from Rainer Mäkelä and PILY ornithological club). When the ice at lakes melts, the gulls spread around and it is difficult to follow the migration after that. It is also difficult to define different age-groups in these flocks. The observations at open rubbish dumps, where the gulls gather in large numbers, provide some data from the movements of the gulls (Fig. 4).

The use of read rings (individually coded colour rings) allows us to look at the migration in detail all the year, and also within different age- and sub-groups. Even the direct use of read data gives us a lot of information about the movements of gulls (Fig.5.). However, these figures can give false images from the migration, due to the gaps in observations and may be biased because the ringed population is not representative of the whole ringed population.

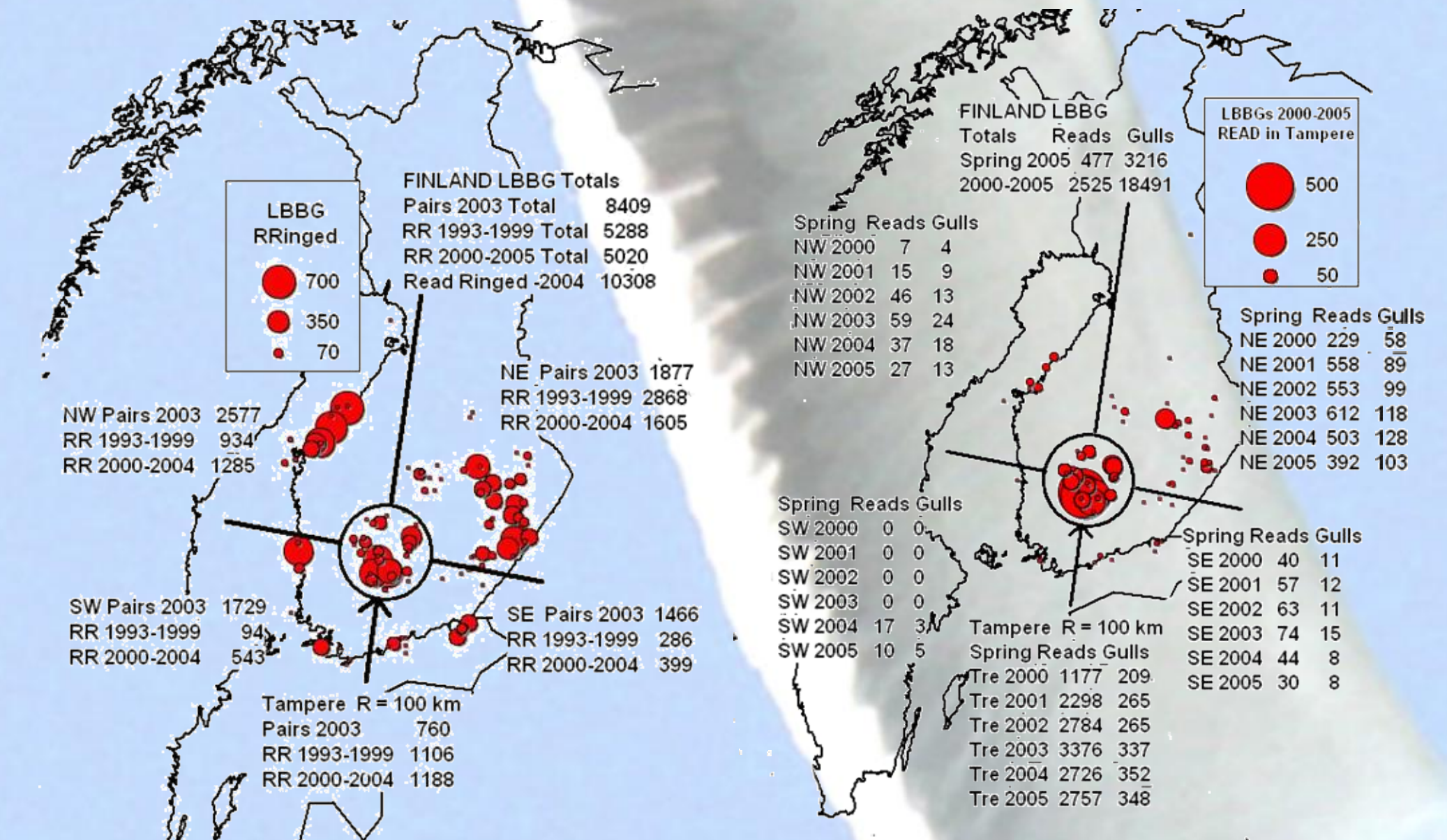


Fig. 1. The numbers of read ringed LBBGs and breeding pairs in 2003 in study cohorts in Finland. Ringing data from FRC 8.8.2006 and breeding data from BirdLife Finland.

Fig. 2. The origin and the numbers of the LBBGs read in Tampere dump 2000-2005. Tampere district has radius of 100 km. Original ringing data from FRC 8.8.2006. Reads by Tampere Gull Group.

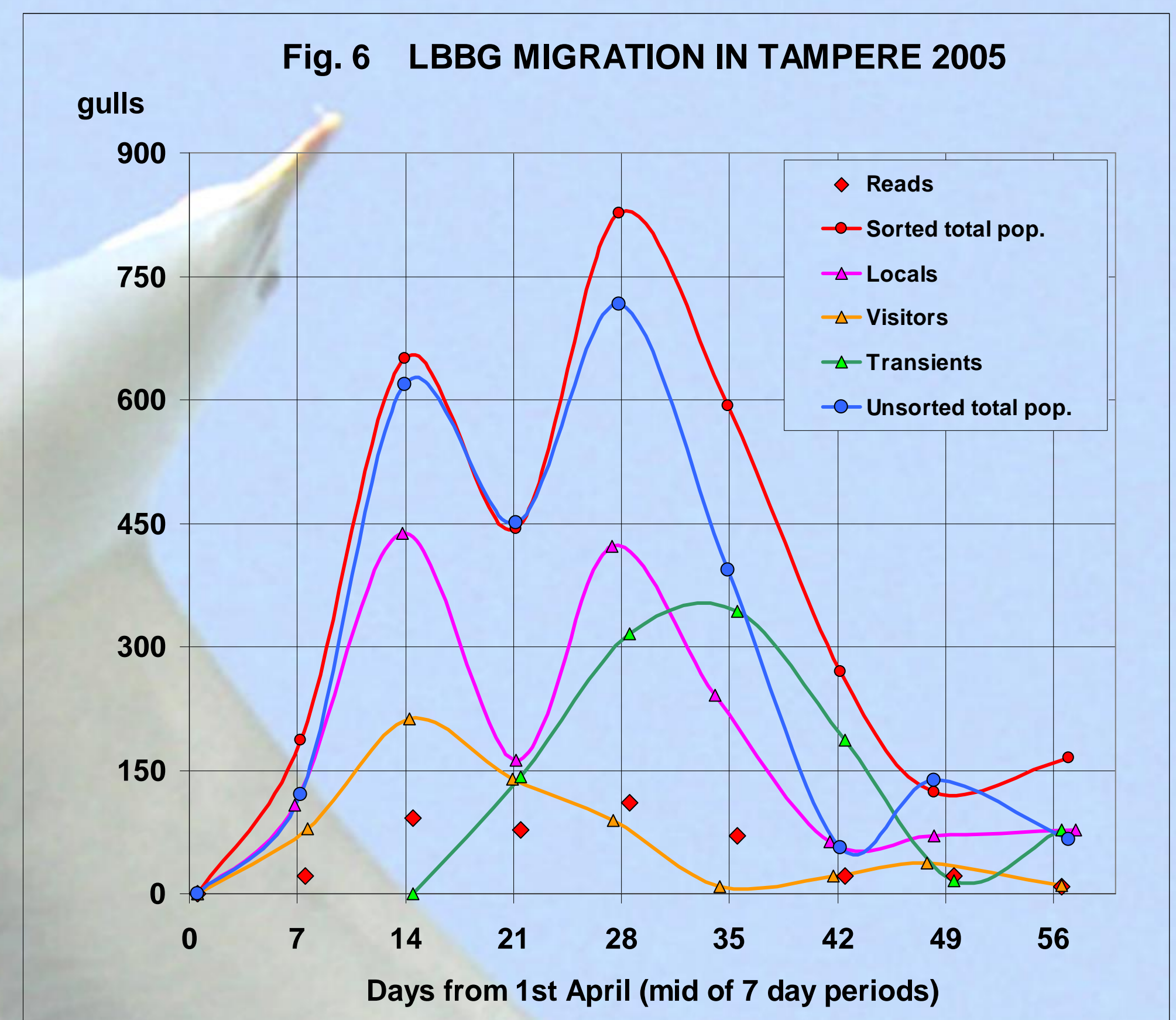
## THE REAL PROFILE OF LBBG SPRING MIGRATION

The CR-analysis can be used to estimate the real migrating populations. The impact of heterogeneity in the read ringed population is here reduced by sorting the encounter histories of the migrating population into three different sub-groups: transients, visitors and locals. The gulls seen only once were classified as transients. Typically they are migrating LBBGs, which stop for very short time. Birds that are seen in Tampere during the main breeding time are classified as locals. Most of those bird breed at nearby lakes. There are also subadults. Visitors are those birds that remain at the study site for some time, yet are not seen at the Tampere dump in June. In the spring of 2005 the proportions of these groups were: locals 52 %, visitors 16 % and transients 32 %.

The locals were analysed with Popan 5 software using the Jolly-Seber birth-only model. The visitors were analysed using the full Jolly-Seber model. The capture probabilities of the first observed birds were estimated weighting the three next ones. For transients, CR-methods can not be used, because there are no recaptures. They were estimated by using the observation effort. For 20 hours of observation time per day, the probability of recapture (read) was set as 0,75.

The origins of the birds were used to estimate the total migration i.e. to group the unringed gulls to the correct subgroup. For this a meta-population model of Finnish LBBGs was calculated using breeding estimates of BirdLife Finland in 2003. In this model productivity and survival was constant over years. Very few birds from the south coast come to Tampere. However, the data from the SW-coast was scarce (Fig 2.). The years with no ringing in some areas were corrected to the ringing ratio. The modelled ratios of read ringed and unringed birds were close to the ratios in real counts at dump. However, the coarse model needs to be defined.

The analysis was done by pooling into 7 days periods, because most of the observations were made at weekends. This was corrected by weighting first observations onto real weekdays by migration trends, though the change was fairly small. However, the total results of the corrections were obvious. As an example, the results of year 2005 are shown in Fig. 6. Then 424 read ringed individuals were seen. Estimate for total ringed individuals was 686 gulls (without sorting 451). The total estimate of LBBGs was 3214 birds (without sorting 2560). It is interesting to note the effect of exceptionally cold weather at the end of in April 2005, which induced two peaks to the locals and the total estimate of the migration profile.



## DISCUSSION

Some ideas on how to improve the estimates of the migration profiles are presented here. As an example, the spring migration of LBBGs in Tampere is used. These methods can also be used for movements of other populations. The estimates can still be improved by many ways. For instance, the use of more detailed sorting and age-specific multi-state models could produce better results. The meta-population model of LBBGs here was very simple and should be further developed by inserting more detailed geographical productivity and survival modelling. Also the use of metal ringing data can give some further information for models, though here it was tested to be poor. The essential element of this study is the use of read rings for LBBGs. They yield large amounts of raw data for the analysis, if there are places, where a lot of birds can be checked. Tampere dump is the Finnish paradise for LBBG research, but without the huge work of the Tampere Gull Group this study would have been impossible.

## Note:

This study continues, the year 2006 yielded 10 000 new reads from Tampere LBBGs. There are a lot of other similar data also: LBBG data from Joensuu district (NW-area) and about 200 000 reads from Herring Gulls (*L. argentatus*) in Finland. So assistance of a statistical expert is needed. If you are interested in co-writing, please, take contact.



Read ring samples LBBGs' and others.

## PARTICIPANTS

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Read ringing pages [www.ncp.fi/staff/juvaster/rt/e/](http://www.ncp.fi/staff/juvaster/rt/e/)



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