

# Migration and population structure of the Isle of Wight, UK: the antecedents of tourism

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## Abstract

The Isle of Wight is an island situated off the coast of central Southern England. At its closest point to the mainland the Island is separated by only 5 km of sea from the busy commercial and naval city of Portsmouth. The principal economy in the present day is tourism, but until the twentieth century agriculture was by far the most important means of livelihood. The beginnings of tourist development can be detected in the changing migration patterns and population structure of the nineteenth century, when a substantial number of immigrants came to the Island for recreation as well as for employment.

In this paper data from the 1851 census are used to assess the impact of migration on the Island's genetic structure. Whether the Isle of Wight can serve as a more general model for the biodemographic changes consequent upon tourist development will be discussed.

## Résumé

*L'île de Wight se trouve au bord de la côte du sud de l'Angleterre, séparée par seulement 5 km de mer du port commercial de Portsmouth. Aujourd'hui, le tourisme est l'activité principale, mais avant le vingtième siècle, l'agriculture constituait la base de l'économie de l'île. Le début du développement touristique peut être détecté dans les changements des modalités migratoires et de la structure de population du XIXème siècle, période pendant laquelle un grand nombre d'immigrants arrivèrent sur l'île à la recherche de loisirs ainsi que d'emplois.*

*Cet article se sert de données datant de 1851 pour évaluer l'impact de la migration sur la structure génétique de l'île. D'autre part, il examine la possibilité d'utiliser l'île de Wight à la façon d'un modèle plus général pour les changements biodémographiques résultant du développement touristique.*

## INTRODUCTION

The Isle of Wight is separated from the southern English coast by a narrow stretch of sea, the Solent and Spithead, five kilometers at its narrowest extent. Portsmouth, with its important naval harbour, is the nearest mainland city and remains the easiest of the three usual crossing points. In outline, the Isle of Wight is roughly diamond-shaped, with a maximum distance from east to west of 37 kilometers, and of 21 from north to south. It has an area of 60 hectares (fig. 1). During the nineteenth century «the Island», as it has long been known (Austen, 1814) greatly increased in population from the 22097 at the 1801 census, largely owing to its development from a predominantly agricultural community into a fashionable watering place. The purpose of this paper is to describe and interpret the changing genetic structure of the Island's population in the context of this historical transformation, using data taken from the 1851 census enumerators' books in conjunction with a migration matrix model.

## HISTORICAL BACKGROUND

Sir Richard Worsley, writing in 1781, gave a contemporary portrait of the Island where he lived, depicting an agricultural community of steadily growing prosperity, dependant on the mainland both as a market for its products and as a supplier of manufactured imports. The Island's principal exports were wool in the fleece, wheat, barley, malt, salt and poultry for victualling. There was no wool-processing industry, and even the sacks for exporting grain had to be brought over from the mainland. The only processed item among the principal exports was salt from the coastal pans. Although a lace-making factory had been set up at Newport in 1826, and a number of people born in Nottingham (England's traditional lace-manufacturing centre, some 280 kilometers to the north) can be identified in the 1851 census, the enterprise did not last for long, closing down in 1868 when the founder retired (Jones and Jones, 1987). The chief ports were Newport at the navigable limit of the River Medina, and Cowes at its mouth, where there was also some shipbuilding.

The nineteenth century saw the beginnings of that shift in the economy which has led to the Isle of Wight's development as an important national tourist resort. The appreciation of natural beauty fostered by the Romantic movement made the Island a desirable place of both residence and excursion for the leisured professional classes. The extraordinarily mild climate, the clean air and the spa waters made it no less fashionable as a health resort. When Prince Albert and Queen Victoria bought the Osborne estate at Whippingham in 1845, these developments had long been in progress, but the royal seal of approval consolidated the trend and ensured its continuation. Throughout the nineteenth century the list of residents and visitors contained the names of the most famous and respected: Keats, Dickens, Darwin, Marx, Lewis Carroll and above all Tennyson and his circle lent their fame to its reputation. Figure 2 depicts the growth of population through historical time, and clearly shows the elevated trajectory of population growth sustained throughout the nineteenth century. The data for figure 2 are estimates based on the Poll Tax (of 1377) and Hearth Tax (in 1665 and 1673), a count of population by the clergy (made in 1777), and nineteenth and twentieth century census figures (Page, 1912; OPCS, 1975).

Much of this population growth was fuelled by immigration, and the distribution of new residents and hotels by no means reflected the previous importance of the Island's towns. In the east, for example, Brading and Newchurch lost their traditional pre-eminence and were outstripped in size by Ryde, Ventnor, Shanklin and Sandown. The Victoria County History gives census figures which show that population increase was extremely unequal between parishes, and that appreciable growth was largely confined to the developing resorts, predominantly in the east of the Island. The exception to this is the parish of Carisbrooke, whose population increase was due to the commercial activity in Newport caused by the rapid development of other towns.

Associated with population increase was an improvement in communications. The first regular passenger ferry service began in 1805, a sailing boat plying between Ryde and Portsmouth. This was superseded by a steam ferry in 1825, and soon a rivalry developed between this and an alternative route from Southampton to Cowes. A direct rail link between London and Southampton began

in 1840, a competitor from London to Portsmouth following in 1847. Just as the mainland railways and the ferries facilitated access to the Island, so the Isle of Wight railways eased communications within it. Persistent wrangling between the rival companies ensured that the network was slow to develop, but throughout the second half of the century lines continued to be opened, reaching their greatest extent by 1900. Since the first line opened in 1859, however, the role of the railways in breaking down internal isolation lies beyond the limits of the present discussion, which is based on data taken principally from the 1851 census.

#### METHODS AND MATERIALS

The 1851 census enumerators' books contain names and details of birthplaces and relationships of all members of each household and thus are a suitable data source for constructing accurate migration matrices. In this paper birthplace — residence matrices are used to estimate the transition of genes from place to place through time though the virtues of migration estimates over a whole generation are acknowledged (Jorde, 1984). The individuals sampled were the first married couple to include a head of household on each page of the census returns. In the case of the most populous towns (Carisbrooke, Ryde and West Cowes), the first equivalent couple on every second page was recorded. This is admittedly a rather rough and ready sampling procedure, but it achieved the desired objective of representing each community by a sample of reasonably large absolute size, which also formed a relatively consistent proportion of the enumerated population. These sample and population sizes are shown in table 1, which also includes a numerical code used to identify the position of each parish on the physical map (fig. 1) and in fig. 4 and 5. The data were transcribed from microfilm copies of the enumerators' books consulted in the Isle of Wight County Record Office, Newport.

To predict genetic structure from these data a migration matrix model was used, with movement between birthplace and residence at the census employed as the measure of migration. The model employed was Malécot's (Malécot, 1950), slightly modified following the practice of Swedlund *et al.* (1984) and Jorde (1982). The raw migration matrix was made symmetrical, following Morton (1973), before dividing each element by its column total to obtain a matrix,  $P$ , of transition probabilities that a

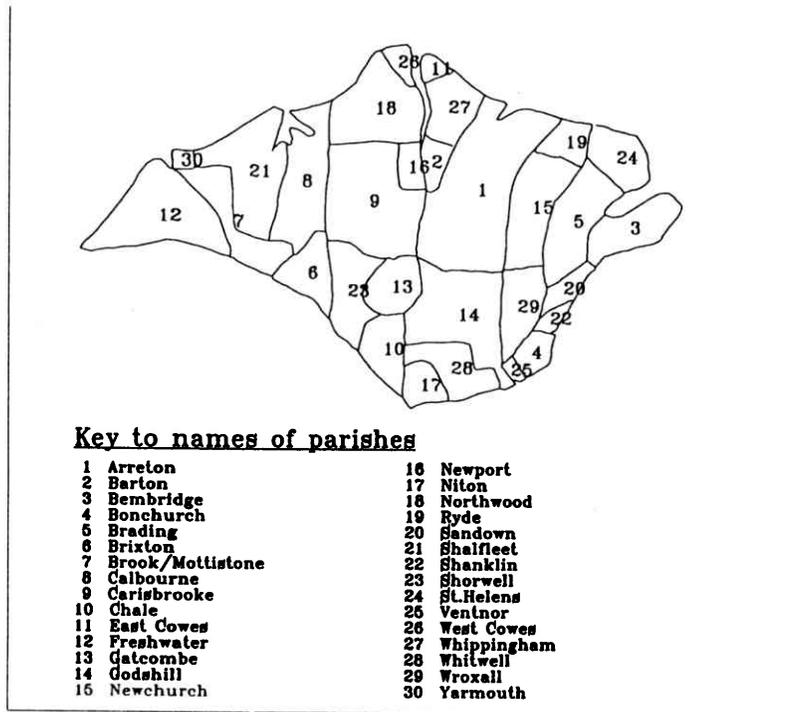


Figure 1 : Isle of Wight at the 1851 census: Location of parishes

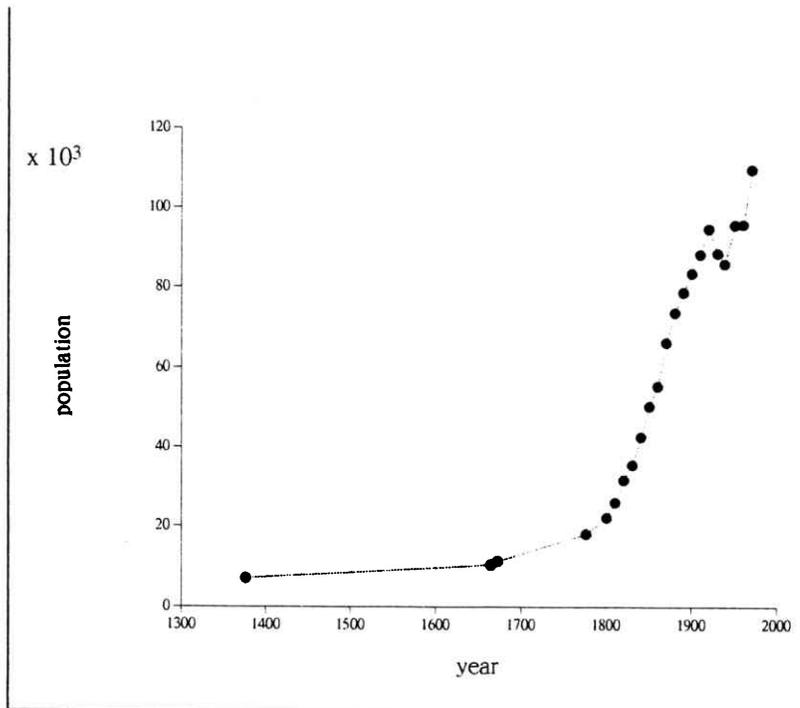


Figure 2 : Isle of Wight population growth.

Table 1 : Population and sample sizes, 1851 Census.

Parish	Code (figs 1,4,5)	Census size	Sample size
Arreton	1	1902	71 (couples)
Barton	2	)	37
East Cowes	11	) 3100	77
Whippingham	27	)	58
Bembridge	3	78	30
Bonchurch	4	523	27
Brading	5		52
Sandown	20	3046	40
Brixton	6	695	45
Brook/Mott	7	454	28
Calbourne	8	781	43
Carisbrooke	9	7630	158
Chale	10	629	32
Freshwater	12	1391	77
Gatcombe	13	325	24
Godshill	14	1316	71
Newchurch	15	)	68
Ryde	19	)11856	156
Ventnor	25	)	136
Wroxall	29	)	29
Newport	16	3994	110
Niton	17	684	40
Northwood	18	)	48
West Cowes	26	) 6049	99
Shalfleet	21	1245	53
Shanklin	22	355	27
Shorwell	23	678	39
St. Helens	24	1948	63
Whitwell	28	748	38
Yarmouth	30	572	54

gene in population  $j$  originated in population  $i$ . A matrix of kinship coefficients within and between populations was then obtained by iteration until convergence at time  $t$  of the equation

$$\Phi^{(t)} = \sum_{n=1}^t S^r P^{r-1} D^{(r-1)} P^r S^r$$

where  $P'$  is the transpose of  $P$ , the column-stochastic migration matrix;  $S$  is a diagonal matrix with elements  $1-S_k$  ( $S_k$  is the systematic pressure value of the  $k$ th subdivision, given by the proportion of residents of each enumeration district who were born outside the Isle of Wight);  $D^{(r-1)}$ , which incorporates the effect of random genetic drift, is a diagonal matrix with elements  $(1-\Phi_{kk}^{(r-1)})/2N_k$ .  $N_k$  is the effective population size of the  $k$ th subdivision. Conditional kinship matrices,  $R$ , can be obtained by using Harpending and Jenkins's (1974) transformation, and Wright's  $F_{ST}$  estimated as the sum of the diagonal elements of  $R$ , weighted by effective population size; in every case effective population size was estimated as one third of census population size. In this paper, however, the analysis is confined to  $\Phi$  matrices, though some mention is also made of within-population kinship estimated from random isonymy (Morton *et al.*, 1971). This method is analogous to computing Lasker's coefficient of relationship by isonymy (Lasker, 1977, 1985) between a population and itself, and has previously been used to examine occupational and geographical genetic structure in coastal populations of North Yorkshire, UK (Smith and Hudson, 1984).

The spatial display of migration and kinship by parish (fig. 3 and 6) was carried out using the GIMMS geographical information system (GIS) software (Carruthers, 1987).

## RESULTS AND DISCUSSION

The distribution of immigrants (i.e. those whose birthplace was not on the Isle of Wight) by place of residence on the Island is shown in fig. 3. It is apparent that the antecedents of the development of tourism, the economic mainstay of the Island in the twentieth century, are already in evidence by 1851. The highest influx of immigrants is in Ryde, with large proportions also in West Cowes, East Cowes, Shanklin, Ventnor and Freshwater. With the exception of the last, whose sustained growth as a tourist resort has been undermined by difficulties of communication and transport, the

members of this list constitute the focus of the modern tourist industry. Only Sandown among the major present-day resorts had not yet gained momentum in its transformation from fishing hamlet and army barracks to holiday town. Many of the parishes of central and West Wight remained apparently untouched by the profound changes occurring in the coastal towns.

The effects of immigration on the Island's genetic structure must be considered alongside those of internal migration and random genetic drift, and all these parameters are taken account of in Malecot's model. Figures 4 and 5 present NMMS plots (using the SPSS Alscal procedure) of the  $\Phi$  matrices generated when systematic pressure is either excluded from consideration (fig. 4) or represented, as is usual, by immigration (fig. 5). It is clear that the effect of immigration on the  $\Phi$  matrix is to disperse as outliers those populations which receive the highest proportion of immigrants. This result stems from a property of the model, which is to measure kinship relative to the original population (*a priori* kinship, as it is called). This contrasts with the distribution of kinship in the  $R$  matrix (Smith, in preparation), which computes conditional kinship, i.e. kinship relative to the population after migration has taken place. The  $\Phi$  matrix result also differs from the outcome of using the Hiorns *et al.* (1969) migration matrix model, where immigration is considered as a single vector which tends to homogenize the recipient populations, and where population size and consequent drift effects are ignored (Smith, 1988).

In fact the effects of immigration on the  $\Phi$  matrices are similar to the consequences on Lasker's coefficient of relationship by isonymy among these populations where, again, the populations receiving high proportions of incomers were dispersed as outliers (Smith, 1988). Furthermore, the pattern of kinship estimated from random isonymy within parishes is complementary to the pattern of immigrant settlement, as shown by a comparison of fig. 3 with fig. 6, which depicts the spatial distribution of random isonymy.

The nineteenth century immigration to the Isle of Wight initiated a profound development of the Island's genetic structure. Migration within the Island among those who had been born there was concordant with geography, but immigration brought large numbers of people principally to a few selected localities, and it was these towns,

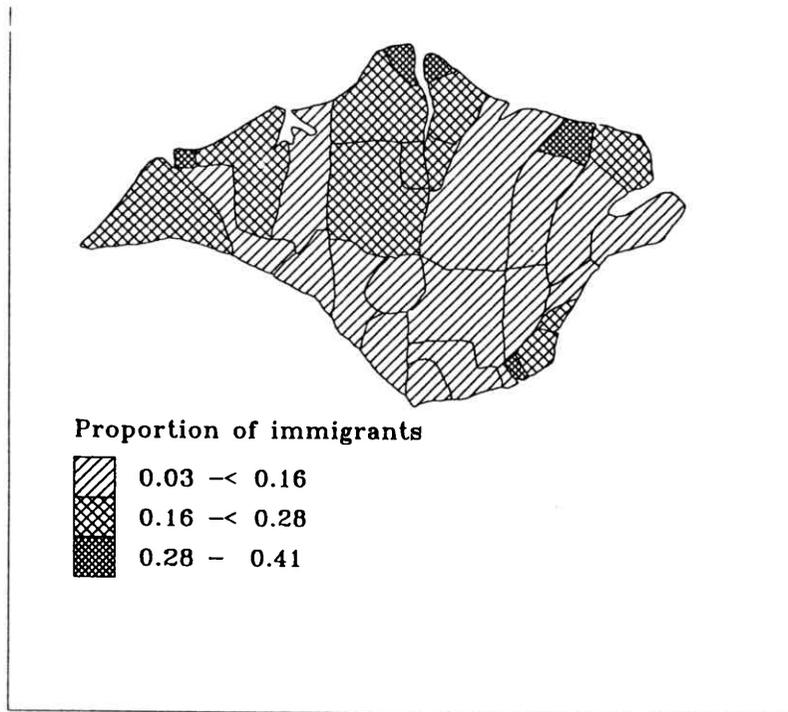


Figure 3 : Isle of Wight at the 1851 census: Location of immigrants.

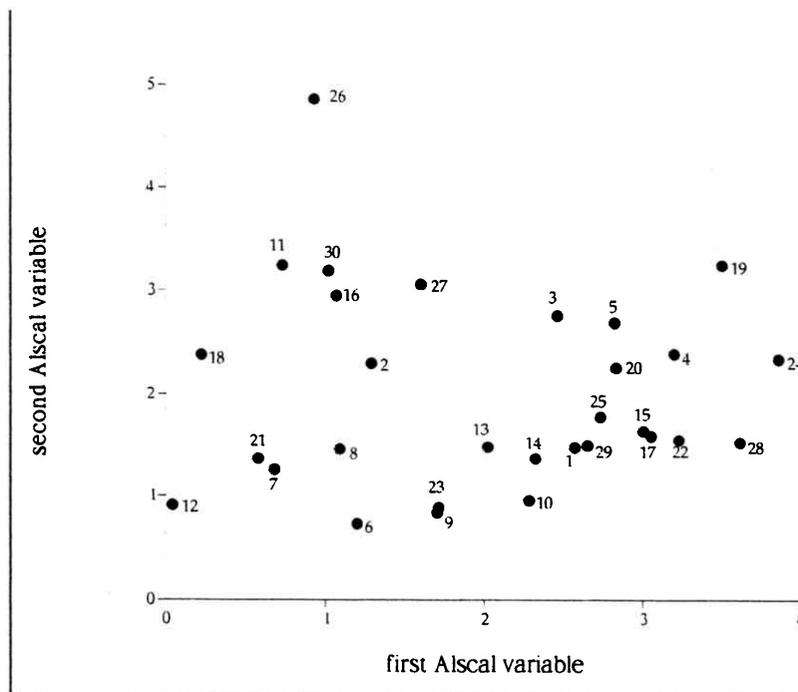


Figure 4 : NMMS plot of  $\Phi$  matrix, based on migration within the Isle of Wight only. Immigrants excluded from analysis.

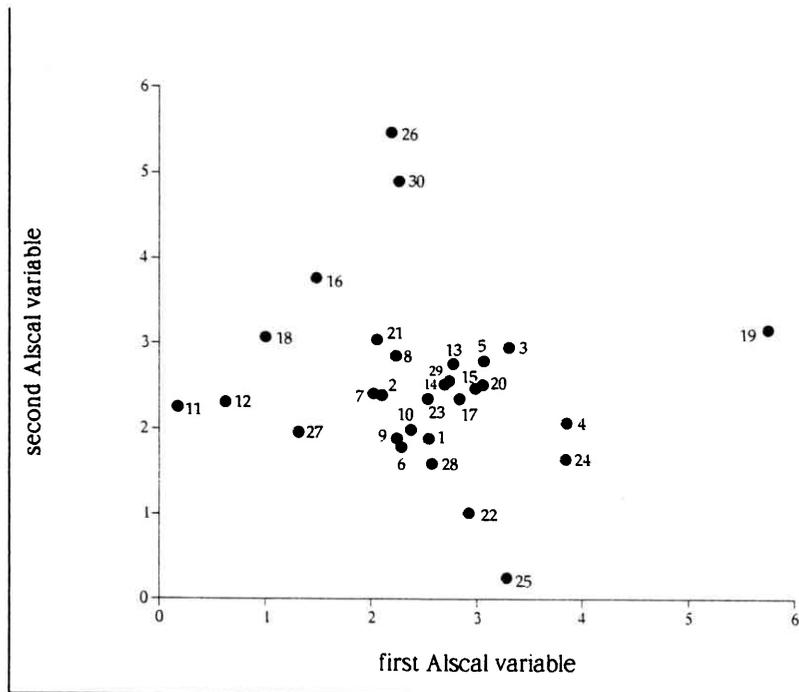


Figure 5 : NMMS plot of  $\Phi$  matrix, based on migration onto and within the Isle of Wight. Immigrants included in analysis.

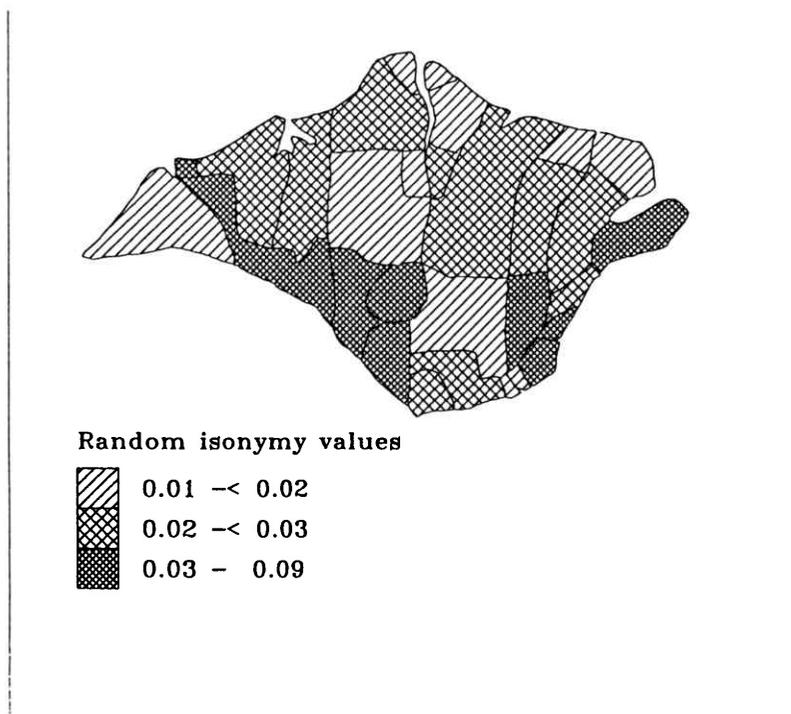


Figure 6 : Isle of Wight at the 1851 census: Random isonymy within populations.

which began to develop as tourist resorts, which have continued to be the focus of further settlement throughout the twentieth century. The tourist industry in the present day is owned and managed largely by migrants from the English mainland (*overners*, as they are known) and they settle in the same localities as the migrants of more than a hundred years ago. The tourist resorts thus provide a long-term focus for immigration, and a conduit for gene flow on to the Island.

Tourism and migration are linked together in a number of ways. The most obvious manifestation is the seasonal influx of holiday makers, and in a situation such as the Isle of Wight there is a striking contrast between the crowded streets and beaches of the summer, and the deserted shores and closed shops of winter-time. Tourism creates seasonal employment, and so there is also a migration of summer migrant workers from the English mainland and also from Europe, notably from Spain and Scandinavia.

As described above, there is the migration of hoteliers, and there is also a substantial migration of people of post-reproductive age, moving on retirement from work. This last group is of course of negligible genetic significance except for the migration target they may present for younger family members. The categories of migrant do not necessarily remain distinct: any of them may of course be connected by gene flow, and it is not uncommon for holiday-makers or migrant workers to settle more permanently by entering the holiday trade themselves.

In present day Europe, tourism plays an increasingly important role in transforming the economy, carrying capacity and, as argued above, genetic structure of large areas of rural countryside and coast. If the Isle of Wight is used as a model, then this transformation is characterised by (1) an enduring and consistent pattern of migration, and (2) the large-scale involvement of migrants in the new economy. Whilst this is likely to be applicable with some accuracy to the development of tourism in Britain, the situation in Europe may call for different models, most notably in terms of the time-scale of development, but also perhaps in the relative roles of migrant and indigenous population in the tourist economy. In any event, the sheer scale of tourist development in Europe suggests that its likely impact on genetic structure be seriously and systematically considered.

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