Influx of Kittiwakes *Rissa tridactyla* into Catalonia (NE Spain) in January 2009 and a review of previous records

Raül Aymí*, Martí Rodríguez & Albert Cama

Storms caused by the Atlantic cyclones *Joris* and *Klaus* reached Catalonia on 23–25 January 2009 in the form of strong winds of speeds peaking at 225 km/h. In the following days, there was a massive influx of Kittiwake *Rissa tridactyla* into inland Europe and the Mediterranean as birds from the Atlantic were literally swept inland and into the Iberian Peninsula, southern France, Switzerland and north-west Morocco. Here we summarize and analyze the information collected during this event in Catalonia (NE Spain), where a minimum of 900 birds were observed. Important concentrations were first detected at a number of inland reservoirs in the Pyrenees and later in fishing ports in S Catalonia. In accordance with other Iberian observations, Catalan data suggest that the eruption was caused by kittiwakes arriving from France and the Bay of Biscay that crossed the Pyrenees and followed the River Ebro downstream to the Mediterranean coast. Some birds were extremely weak and exhausted and at least 15 individuals are known to have been found dead. Although the overall mortality of the species during the event is unknown, records of several large flocks flying northwards off the N Catalonia coast suggest a high survival rate. Despite its abundance in the winters of 1957 and 1984, the events of 2009 represent the best documented Kittiwake invasion in Catalonia. Previous inland observations of kittiwakes are also reviewed to assess the status of this species in Catalonia and establish how often this type of behaviour occurs.

Key words: Kittiwake, *Rissa tridactyla*, influx, winds, extreme weather conditions, Catalonia.

Raül Aymí*& Martí Rodríguez, Institut Català d'Ornitologia, Museu de Ciències Naturals, Passeig Picasso, s/n, 08003 Barcelona.
Albert Cama, Institut de Recerca de la Biodiversitat i Departament de Biologia Animal, Facultat de Biologia, Universitat de Barcelona, 08028 Barcelona.

*Corresponding author: ico@ornitologia.org

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Although many seabirds spend an important part of their lives away from the coast (Galván *et al.* 2003, Schwemmer *et al.* 2008), some of the most specialized pelagic seabird species behave differently and occur only very rarely inland (Schreiber & Burger 2002). These inland incursions are often linked to episodes of strong winds, which have a serious effect on seabird movements (Felicísimo *et al.* 2008); they also illustrate well just how the weather affects seabirds and reveal the inherent difficulties of life at sea (Schreiber & Burger 2002). Here we present an example of one such 'continental invasion' by Kittiwakes *Rissa tridactyla* into Catalonia, NE Iberia, during the winter of 2008-2009. The Kittiwake is a true pelagic seabird that occurs inland only infrequently during the non-breeding season (Cramp & Simons 1983) and is thus of interest for investigating the effects of adverse weather on seabird movements. We link these data with a review of all the inland observations of this species in Catalonia, where the species is a scarce winter visitor (average of 26-51 individuals in the winters 2006-2009; Feliu 2011).

From 17–25 January 2009 the west coast of European was buffeted by storms caused by two deep depressions, one situated off the NE coast of Scotland (*Joris*) and the other (*Klaus*)

located in the Bay of Biscay (see Figure 1 for more information on the weather conditions). These harsh weather conditions were considered to be responsible for the eruption of large numbers of Atlantic seabirds into inland areas of France, Switzerland, Spain and even Morocco and the Mediterranean Sea (Dubois & Duquet 2009, Gutiérrez 2009a, Qninba *et al* 2009). In Catalonia the storm caused strong winds on 23–25 January, with peak wind speeds of 225 km/h (ACAM 2009) that caused serious damage to vegetation and buildings, and even human casualties. In the aftermath of these storms, an important influx of kittiwakes was detected in Catalonia, both along the Mediterranean coast and at many inland sites.

Material and methods

In order to assess the magnitude of the event and its geographical distribution, we analyzed both the information submitted by observers in Catalonia to the ornithological web page *Ornitho* (www.ornitho.cat) and sightings collated by the Catalan Ornithological Institute and by one

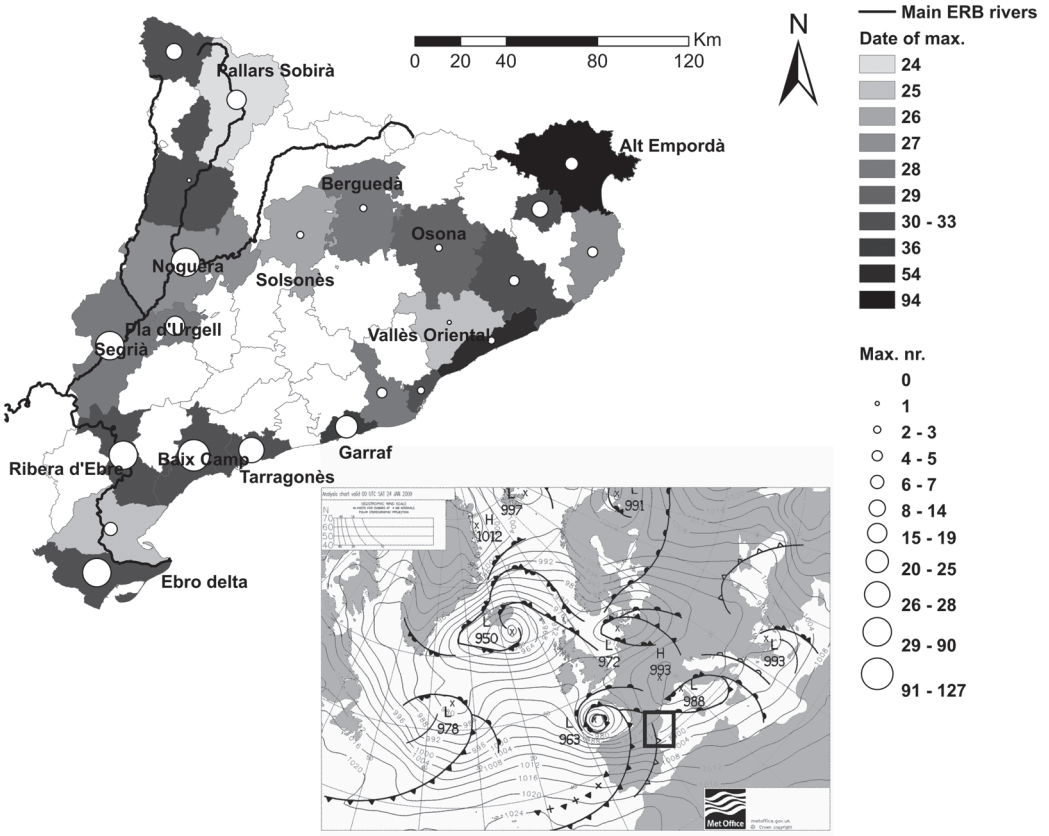

Figure 1. Map showing the *comarques* (administrative divisions) of Catalonia and the main rivers in the Ebro basin. The size of the dots indicates the maximum number of Kittiwakes *Rissa tridactyla* recorded in each *comarca*, while the colour reflects the date of these maxima (the darker the colour, the later the appearance of the Kittiwakes; white denotes no records at all). Also shown is the position of Catalonia on the atmospheric pressure map during *Klaus* on 24 January 2009. Pressure map taken from *www.wetterzentrale.de*.
Mapa amb les comarques de Catalunya i els principals rius de la conca de l'Ebre. La mida dels punts indiquen el màxim nombre de gavinetes de tres dits Rissa tridactyla *enregistrades a cada comarca i el color representa la data en què es produeixen aquests màxims (els colors més foscos indiquen una arribada més tardana, el color blanc correspon a les comarques sense observacions). També es mostra la localització de Catalunya dins el mapa de pressió atmosfèrica durant la tempesta del cicló Klaus, el 24 de gener de 2009. Mapa de pressió atmosfèrica elaborat a partir de* www.wetterzentrale.de.

of the authors (M.R.). Here, we present data collected between 24 January and 27 April of a total of 167 Kittiwake sightings, which are summarized on a map (Figure 1) showing the maximum number of individuals detected and the date on which these maxima were recorded. We used the Catalan *comarques* (administrative divisions) as spatial units. Additionally, we compiled inland Kittiwake records prior to 2009 in order to asses the frequency and importance of this type of behaviour.

Results

Most kittiwakes were detected in coastal areas of southern Catalonia, especially in fishing ports and in the Ebro Delta. Interestingly, the species was also reported in 12 inland *comarques*. A summary of these observations is shown in Figure 1.

The first inland Kittiwake sighting in Catalonia occurred on 24 January, when 19 birds were seen on a reservoir, Embassament de La Torrassa, at more than 900 m a.s.l. in the Pyrenees. Further records came on the following day, 25 January, with a few individuals recorded in some inland *comarques* (Solsonès, Berguedà, Osona and Vallès Oriental; see Figure 1). On the subsequent days, inland Kittiwake observations were widespread and the number of birds seen increased. For example, 28 birds were seen at the Embassament de Santa Anna (Noguera) on 28 January and up to 80 birds in Lleida (Segrià) on 29 January. At the Embassament de Riba-roja (Ribera d'Ebre) in southern Catalonia, there were at least 62 birds on January 30 and up to 90 the following day, although by February 19 only seven kittiwakes remained.

The arrival of kittiwakes was first detected in coastal areas in southern Catalonia in the Ebro Delta, where at least 16 gulls were seen on January 24. A single individual was seen the same day at the opposite end of Catalonia in L'Alt Empordà and on successive days the species appeared in different harbours and spread along the Catalan coast, with sightings increasing notably from 26 January onwards. The area with highest numbers (but also the site with the greatest observation effort) was Cambrils harbour (Baix Camp), where birds fed on trawler discards. Here, Kittiwake numbers peaked (127 individuals) on 30 January, somewhat later than the peaks recorded in inland areas. Bird numbers decreased to 75 birds on 5 February, to about 30 on 20 February and to 9 birds on 20 March, the last Kittiwake being recorded at Cambrils on 16 April. In Tarragona harbour (Tarragonès) kittiwakes peaked on 31 January 31, with a flock of 28 gulls that stayed there for over a week, although individual birds were seen in the area throughout the month. To the north at the port of Vilanova i la Geltrú (Garraf), the highest concentration (25 individuals) was recorded at a later date, on 5 February.

Observed kittiwakes were mainly adult-type birds (i.e. adults or 3cy) and, for example, constituted 98% of the birds seen in Tarragona and Cambrils (n=132).

As a rough calculation of the Kittiwake influx in Catalonia, *ca.* 900 birds were seen during the first week after the storm, of which many (59) were observed in inland *comarques*. This contrasts with the scarcity of previous inland records of the species in Catalonia, for which we could only find 17 observations in the period 1954–2007 (Table 1).

Discussion

The events of winter 2009 represent the best documented influx of kittiwakes into Catalonia and the 900 observed birds contrast greatly with the 26-51 individuals estimated by the winter bird atlas for the Catalan coast during the winters of 2006–2009 (Feliu 2011). In inland areas, the contrast is even more dramatic, since there had only ever been 17 previous observations. Two previous massive influxes are documented, one in 1957 and another in 1984 (Palaus 1957, de Juana & Paterson 1986, Carboneras 1987, Finlayson 1992). The latter took place in January–February 1984 (Bermejo *et al.* 1986, Ferrer *et al.* 1986), when at least 30,000 kittiwakes were found dead on French beaches (see references in de Juana & Paterson 1986) and dead birds were detected even in Morocco (Beaubrun 1985). This influx also reached the Aragonese Pyrenees, where at least nine gulls were found dead in Canfranc (Samprieto *et al.* 1998) on 23–28 January 1984. These dates coincide with those of the 2009 event. However, despite the number of kittiwakes observed in January 1984 in Spain (1,432 birds), most were seen along

Table 1. Inland records of Kittiwakes in Catalonia before 2009. * indicates an observation from near the coast. *Citacions interiors de Gavineta de tres dits a l'interior de Catalunya abans de 2009. * Indica que són observacions fetes prop de la costa.*

Date/year/season	Site	Number	Observations	Source
February 1954	Alàs (Alt Urgell)			Ferrer *et al*. 1986
07/02/1956	Manresa (Bages)	1		Maluquer 1981
16/02/1957	Near La Seu d'Urgell (Alt Urgell)	25-30	some trapped	Palaus 1957
29/01/1961	El Pinell de Solsonès (Solsonès)	1	found dead	Maluquer 1981
1980s	Sant Ponç (Solsonès)	3	2 alive and 1 dead	Borràs & Junyent 1993
04/11/1980	Parc de l'Agulla, Manresa (Bages)	1		Borràs & Junyent 1993
1981	Ripoll (Ripollès)			Ferrer *et al*. 1986
winter 1983-1984	Isona (Pallars Jussà)		important influx	Ferrer *et al*. 1986
winter 1983-1984	Vallès Occidental		important influx	Ferrer *et al*. 1986
winter 1984	La Gleva (Osona)	1	dead	Aymerich *et al.* 1991
19/01/1987	River Ter, Torelló (Osona)	1	first-winter	Aymerich *et al.* 1991
29/09/1990	La Baells (Berguedà)	1		Aymerich & Santandreu 1998
14/02/1999	River Segre, Comportes de la Mitjana (Segrià)	1	adult	Calvet *et al.* 2004
01/11/1999	*River Muga, Castelló d'Empúries (Alt Empordà)	1	first-winter	Martínez Vilalta 2002
22/12/2001	*Bassa del Dofí, Castell-Platja d'Aro (Baix Empordà)	1	adult	Aymí & Herrando 2005
14/03/2006	*Riudecanyes reservoir (Baix Camp)	1	first-winter	Estrada & Anton 2007
16/03/2007	*Riudecanyes reservoir (Baix Camp)	1		Anton 2008

the Cantabrian and Atlantic coasts and only eight birds were detected in the Mediterranean, and only two of those in Catalonia (Bermejo *et al.* 1986). Although it is difficult to establish a direct comparison between the 1984 and 2009 influxes (mainly because of the different degrees of observation effort), these two events should probably be regarded as roughly equivalent.

Analyzing both inland and coastal 2009 observations (summarized in Figure 1), it seems that the kittiwakes first arrived in the Pyrenees and from there headed south to the Ebro Basin and on to the southern Catalan coast. Not all the kittiwakes reached the coast and at least 15 birds were found dead at different inland localities according to data from individual observers and wildlife recovery centres. Some birds were extremely weak and exhausted, and allowed humans to approach and even feed them. These individuals were highly vulnerable to predation and a direct attempt at predation by a Golden Eagle *Aquila chrysaetos* at Embassament de Santa Anna on 27 January was observed (Marc Gálvez pers. comm.).

Sightings from elsewhere in Catalonia from early February onwards probably represent movements by kittiwakes once they had recovered their body condition after feeding in southern harbours. This supposition would coincide with the record of 107 birds on migration at Creus Cape (Alt Empordà) on 7 February, an unusually high figure for Catalonia (Paterson 1997) and probably due to the survival of birds swept south by the gales. As well, a few individual kittiwakes were seen throughout May, with the last record coming from Creus Cape on 6 June (Feliu 2011).

This influx of kittiwakes involved mostly adult birds, whereas in normal winters the individuals visiting the study area are mainly first-year birds (50%, n=22, A.C. own data). This predominance of adult birds concurs with

previous influxes (Paterson 1987) and can be explained by the fact that Catalonia is considered as a residual wintering site for the species (Cramp & Simons 1983), with a preponderance of younger birds according to the provisional migratory model (Baker 1978). During the 2009 event, the storms forced the whole population to move southwards and so also involved adult birds. The percentage of 2cy birds in France during January 2009 reached 20-26% (Dubois & Duquet 2009), suggesting a higher immature-adult ratio in northern latitudes or a higher death rate in younger birds dispersing to more distant areas (i.e. crossing the Pyrenees).

The inland influx in Catalonia was preceded by the arrival of large numbers of kittiwakes along the Cantabrian coast and in the Bay of Biscay that was first detected at Estaca de Bares, a north-pointing headland, from 20 January onwards (Sandoval *et al.* 2010). It is likely that *Joris* pushed pelagic kittiwakes towards the coast from their Atlantic wintering areas. Dubois and Duquet (2009) even suggest that some of these birds came from as far away as NE North America, a supposition that, curiously, coincides with the Canadian origin of a bird recovered in Valencia (E Spain) during the 1984 invasion (Dennis 1986). After the initial effects of *Joris*, *Klaus* then pushed some individuals into inland Spain and France. During the first days of the event the highest inland figures were from NE Spain, *ca.* 500 individuals in north Aragón and more than a hundred in Navarra (Molina *et al* 2009). In addition, about two hundred corpses were collected in the Aragonese Pyrenees at a reservoir, Embalse de Sabiñánigo (Bueno & Vidaller 2009) (the main Spanish inland concentrations during the first days after the storms are summarized in Figure 2). These records, together with those from Catalonia, suggest that the bulk of the kittiwakes were first pushed into the Bay of Biscay and inland France, and then probably entered into Iberia after crossing the Pyrenees. Once in NE Spain, the Ebro River would have funnelled survivors

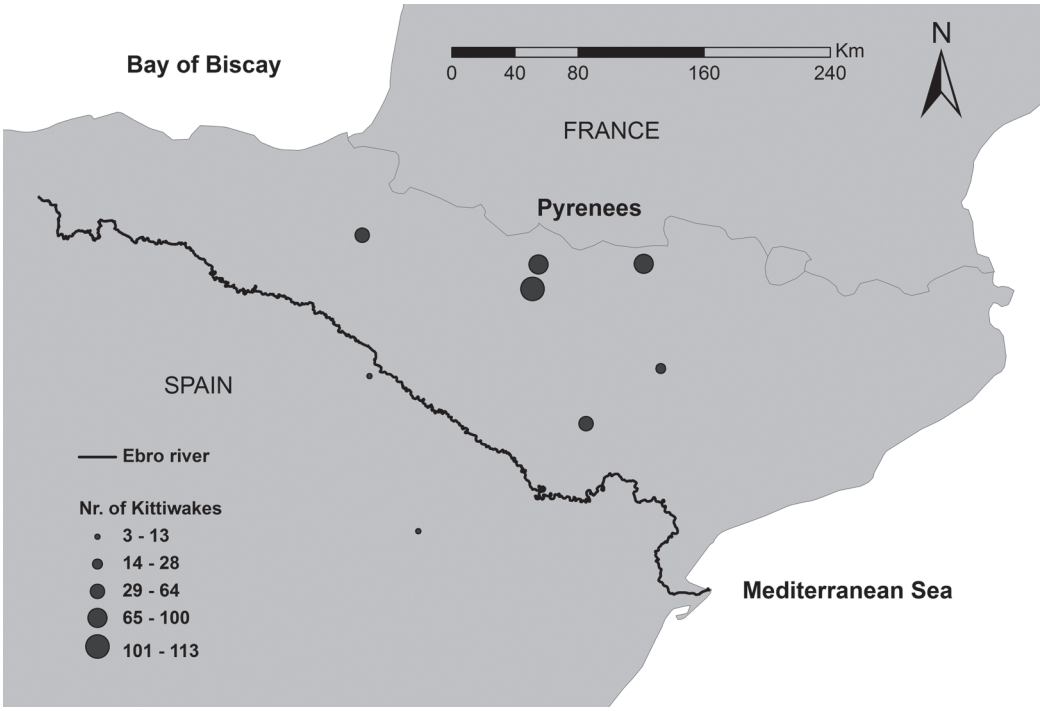

Figure 2. Distribution of the observations of Kittiwakes in inland Spain after the storms in late January and February 2009 (based on Bueno & Vidaller 2009, Molina *et al.* 2009 and Birding Navarra 2009).
Distribució de les observacions de Gavineta de tres dits a l'interior d'Espanya després de les tempestes, finals de gener i febrer de 2009 a partir de les dades de Bueno & Vidaller 2009, Molina et al*. 2009 i Birding Navarra 2009.*

towards the Mediterranean coast. Subsequently, the highest figures were detected further south in the Iberian Peninsula: thousands were seen in Huelva harbour, over 200 at Gibraltar, over 500 in the Canary Islands and even several birds in NW Morocco (Molina *et al* 2009, Qninba, A. *et al* 2009, Garcia 2010). Whether these birds arrived via the Ebro valley or along the Atlantic coast – or even via both routes - is unknown.

The extreme windy weather of January 2009 also had an effect on other species of seabirds, although none to the extent that the kittiwakes were affected. In Catalonia, two Shags *Phalacrocorax artistotelis* resembling the Atlantic subspecies *aristotelis* where seen at La Baells, an inland reservoir (Berguedà), on 29 January (Miquel Casas pers. comm.) and a Common Scoter *Melanita nigra* was reported from the Embassament de la Torrassa (Balbino & Pinós 2011). In a wider context, the arrival of both Iceland *Larus glaucoides* and Glaucous *Larus hyperboreus* Gulls was remarkable in both France (for an overview of the effects of these storms on birds in France, see Dubois & Duquet 2009) and in Spain (Gutiérrez 2009b). The Iceland Gulls even reached the Mediterranean and one of the two records of this species on 4 February was the first ever for Catalonia (Ferrer-Obiol & Cama 2011).

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Resum

Irrupció de gavinetes de tres dits *Rissa tridactyla* a Catalunya durant el mes de gener de 2009 i revisió de les dades antigues

Les tempestes causades pels ciclons *Joris* i *Klaus* a l'Atlàntic es van manifestar a Catalunya amb forts vents entre el 23 i el 25 gener de 2009 que van arribar a una velocitat de fins a 225 km/h. Durant els dies posteriors a aquestes condicions extremes, es va produir una entrada massiva de gavinetes de tres dits *Rissa tridactyla* a l'interior d'Europa i la Mediterrània. Aquesta entrada va afectar ocells de l'Atlàntic, que van ser literalment escombrats al continent i van arribar a la península Ibèrica, el sud de França, Suïssa i el nord-oest del Marroc. S'ha resumit i analitzat la informació recollida durant aquest esdeveniment a Catalunya, on es van detectar un mínim de 900 exemplars. Les primeres concentracions es van produir als embassaments del Pirineu, passant més tard als ports pesquers del sud. Les dades disponibles, tant per a Catalunya com per a la resta de la península Ibèrica, suggereixen que les gavinetes van arribar des del golf de Biscaia i França, creuant els Pirineus i seguint després la vall de l'Ebre fins a la costa mediterrània. Algunes d'aquestes gavines van arribar extremadament febles i esgotades, i sabem d'almenys 15 exemplars morts. Es desconeix la taxa de supervivència dels ocells durant aquest episodi, però es van detectar diversos grups volant cap al nord, fet que indica que en va sobreviure almenys una part. Durant els hiverns de 1957 i 1984 l'espècie va ser també inusualment abundant, però aquesta és la invasió més ben documentada a Catalunya. També es revisen les observacions prèvies de Gavineta de tres dits a l'interior Catalunya abans d'aquesta irrupció per establir la freqüència cíclica d'aquest comportament.

Resumen

Irrupción de gaviotas tridáctilas *Rissa tridactyla* en Cataluña durante el mes de enero de 2009 y revisión de las citas antiguas

Las tormentas causadas por los ciclones *Joris* y *Klaus* en el Atlántico se manifestaron en Cataluña con fuertes vientos entre el 23 y el 25 de enero de 2009 que alcanzaron velocidades de hasta 225 km/h. Durante los días posteriores a estas condiciones extremas se produjo una entrada masiva de gaviotas tridáctilas *Rissa tridactyla* en el interior de Europa y en el Mediterráneo. Esta entrada afectó a ejemplares del Atlántico, que fueron literalmente barridos hacia el continente, llegando a la península Ibérica, el sur de Francia, Suiza y el noroeste de Marruecos. Se ha resumido y analizado la información recogida durante este evento en Cataluña (NE de España), donde se detectaron un mínimo de 900 ejemplares. Las primeras concentraciones se produjeron en los embalses del Pirineo, pasando después a los puertos pesqueros del sur. Los datos disponibles, tanto para Cataluña como para el resto de la península Ibérica, sugieren que

las gaviotas llegaron del golfo de Vizcaya y Francia, cruzando los Pirineos siguiendo luego por el valle del Ebro hasta la costa mediterránea. Algunas de estas gaviotas llegaron extremadamente débiles y agotadas, y sabemos de al menos 15 ejemplares muertos. Se desconoce la tasa de supervivencia de las aves durante este episodio, aunque las observaciones de distintos grupos volando hacia el norte sugieren que, por lo menos, una parte habría superado este evento. Durante los inviernos de 1957 y 1984 la especie también fue inusualmente abundante, pero éste es el caso mejor documentado de invasión de gaviotas tridáctilas en Cataluña. También se revisan las observaciones de gaviotas tridáctilas en el interior de Cataluña antes de esta irrupción con el fin de evaluar la frecuencia cíclica de este comportamiento.

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