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ORIGINAL ARTICLE

MIGRATION OF RAPTOR BIRDS ACROSS THE GALLIPOLI PENINSULA/DARDANALLES, TURKEY

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ABSTRACT

Background: Turkey, is one the primary migration bottlenecks in Europe for soaring birds. On the western part of Turkey, on the other hand, the movement of migration mainly takes place in two bottlenecks where water masses are the narrowest (Bosphorus, Gallipoli Peninsula-Dardanelles). According to bosphorus, there is a limited number of migration monitoring studies in Gallipoli Peninsula (Dardanelles). **Objectives:** The aim of our study is to monitor the migration movements of the Gallipoli peninsula (Dardanelles) in spring and autumn and to evaluate the relationship between wind intensity and direction of migration intensity. **Methods:** Raptor migratory birds were observed during the spring and autumn migration period from 5 point determined on the Gallipoli peninsula 2015. in A total of 45 days of land work was conducted, 19 days in the autumn migration period (11 August-18 October) and 26 days in the spring migration period (12 March-11 May). Counts were performed following the method described by Bird & Bildstein (2007). **Results:** We observed 5296 raptor belonging to 22 species during spring migration period and 3061 raptor belonging to 20 species during autumn migration period in the field studies. There is a positive (0.464) linear relationship between the number of individuals observed in the spring migration period and the wind speed (t: 8.089, p: 0.000). 66.6% of the passages were observed at wind speeds above 20 km / h and 88.5% were observed in the days when the northern winds dominated. In the autumn migration period, there was no significant relationship between wind speed and number of individuals. It was observed that 69.6% of the passages occurred on days when the northern winds were dominant. **Conclusions:** The present study, in 2015, carried out a reasonably complete census of the raptor birds passing over the Gallipoli peninsula, one of the important migration routes in the western palearctic region. In this study, it was determined that there is much less passage in the Gallipoli peninsula than in the Bosphorus. But it was observed that the number of passes increased in the days when strong winds from north and northeastern dominated.
Keywords: *Raptor, Migration, Western Palearctic Region, Bottlenecks, Gallipoli Peninsula, Turkey.*

1. INTRODUCTION

It is reported that there are about 10.000 bird species on Earth [1]. In the region Turkey is located within the western Palearctic distribution shows about 10% of the world's bird species. 2.600 species migrate from at least 141 families of birds in the world, accounting for about 26.2% of all bird species [2]. Many species perform long-distance migrations between breeding and non-breeding grounds with tremendous energetic costs, especially when overcoming ecological barriers such as deserts, water bodies and high mountain chains. For many bird species, the most risky life stage occurs during migration [3].

Migration is an annual seasonal movement between regular breeding and wintering grounds, covering large geographical distances over continents, caused primarily by seasonal changes in food abundance [4]. Migration in birds is recognized as an energetically demanding process due to the long distances covered in flight, thus the flight strategy adopted can influence survival directly [5]. In order to pass beyond the large sea connections between the continents of Europe and Africa, birds perform their migration process by centering upon the spots where terrestrial connections are the narrowest. In particular, the gliding type of migratory birds use thermal air currents so as to be able to complete their migration, and thermal air currents occur on lands. Broad winged large birds prefer soaring and gliding to flapping flight during migrations. The fact that while birds during active flying exhausts 23 times higher energy than still flying or gliding [6]. Thermals are columns of rising warm air that form mainly over the land, but not exclusively. Soaring birds exploit the uplifting force of the ascending warmer air mass, gaining height by circling up to high altitudes from where they can glide in their favoured migration direction [7]. For this reason, these tough barriers are very important in shaping the migration routes of birds.

Since soaring species greatly vary in size and wing shape, differences in their flight behaviour may be explained by bird size and morphology, as well as different responses to weather conditions such as wind and convective thermal uplifts

[8]. Since soaring species greatly vary in size and wing shape, differences in their flight behaviour may be explained by bird size and morphology, as well as different responses to weather conditions such as wind and convective thermal uplifts [8]. In particular, eagles and vultures have a lower limit for efficient use of thermals than smaller raptors such as harriers and falcons. They are also more vulnerable to crosswinds, which cause them to refrain from migration or accept a drift [9].

Turkey, is one the primary migration bottlenecks in Europe for soaring birds [10]. On the western part of Turkey, on the other hand, the movement of migration mainly takes place in two bottlenecks where water masses are the narrowest (Bosphorus, Gallipoli Peninsula/Dardanelles). Bosphorus (Istanbul) is one of two Bottlenecks in the west of Turkey. The investigations are concentrated in the Bosphorus. A lot of scientific research have been carried out in different periods and dates from the Bosphorus [10-17]. A limited number of researches were carried out in the Gallipoli peninsula/Dardanalles [8, 18, 19].

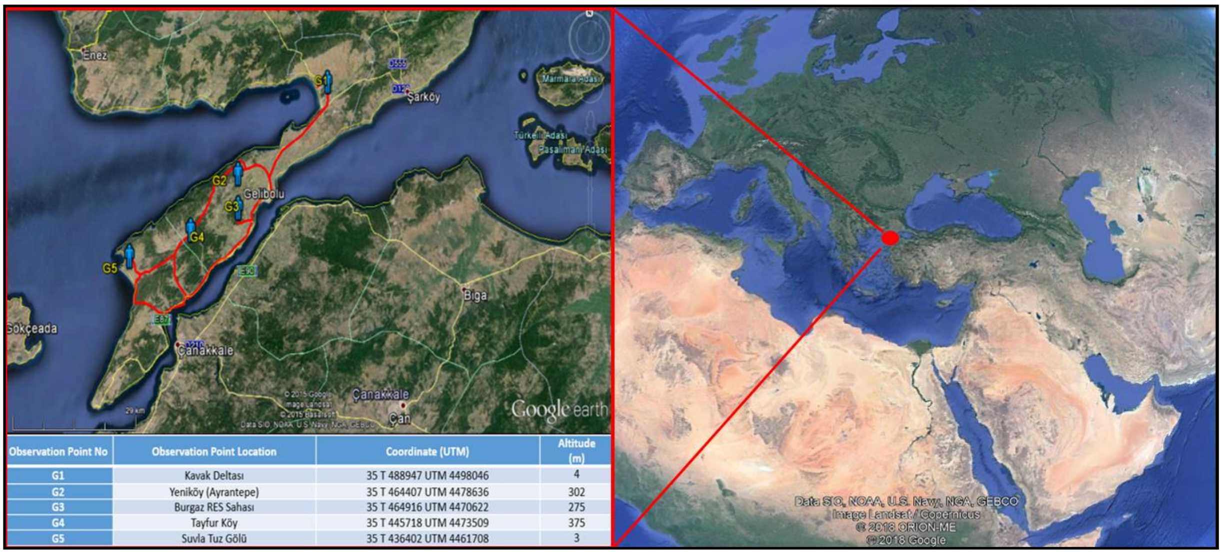
In western Turkey, there are two narrow constitutes one of the Dardanelles strait is at a critical point in terms of bird migrations. The wind direction and shape of the coastal area are of great importance for the migration routes of birds. The winds in northwest (NW) Turkey are predominantly coming from the northeast. This wind drives the birds to the southwest, a deviation from their theoretical NW-SE route. In this way (in spring) they get more concentrated along the west coast, especially because most birds hesitate to cross the sea as long as possible. By flying NW (in spring), they eventually arrive in the area of the Dardanelles, where they can easily cross the narrow straits and don't need to cross the much wider Sea of Marmara or Egean Sea [18].

The aim of our study is to monitor the migration movements of the Gallipoli peninsula (Dardanelles) in spring and autumn and to evaluate the relationship between wind intensity and direction of migration intensity. The present study, in 2015, represents to perform a reasonably complete census of the raptor birds passing over the Gallipoli peninsula (Dardanelles), one of the important migration routes in the western palearctic region.

2. MATERIALS AND METHODS

The Gallipoli Peninsula direction between the Dardanelles and Saroz Bay. The narrowest area is 5 km (Bolayır) and the largest region is 25 km. It is connected to Trakya region in northeast part. It extends in a northwest-southeast direction between the Aegean and Marmara Sea. A large part of the peninsula consists of peaks at different altitudes (the highest altitude is 420 meters).

Observational studies were carried out at five locations, allowing a large area to be monitored (Figure 1). A total of 45 days of land work was conducted, 19 days in the autumn migration period (11 August-18 October) and 26 days in the spring migration period (12 March-11 May). Observational studies were carried out between 07:00 and 18:00 hours using the point count method. Counts were performed following the method described by Bird and Bildstein (2007) [20]. Observations were made using binoculars (magnification 10×), spotting scopes (magnification 8-40x 60mm) and telephoto cameras. All observations were recorded on standard data sheets. Each bird was identified to species level if possible. When counting individuals one by one became impossible (e.g. rapidly migrating large flocks), individuals were counted in increments of 10. Wind speed and direction data are taken from the web page of Çanakkale meteorology general directorate (http://www.mgm.gov.tr/tahmin/il-ve-ilceler.aspx?m= GELIBOLU#sfB).



Observation Point No	Observation Point Location	Coordinate (UTM)	Altitude (m)
G1	Kavak Deltası	35 T 488947 UTM 4498046	4
G2	Yeniköy (Ayrantepe)	35 T 464407 UTM 4478636	302
G3	Burgaz RES Sahası	35 T 464916 UTM 4470622	275
G4	Tayfur Köy	35 T 445718 UTM 4473509	375
G5	Suvla Tuz Gölü	35 T 436402 UTM 4461708	3

Figure 1: Coordinates and distribution of observation points.

Descriptive statistical analyzes were used in the evaluation of the obtained data. Multiple regression analysis was used to test the relationship between total daily numbers of raptor species and wind speed and direction. We used the following variables as independent factors wind direction (categorical variable) and wind speed (km/h).

3. RESULTS

We observed 5296 raptor belonging to 22 species during spring migration period and 3061 raptor belonging to 20 species during autumn migration period in the field studies. The species with the greatest number of migrants during the spring migration period were *Clanga pomarina* (52.81 %, 2797 individuals), *Circaetus gallicus* (15.54 %, 823 individuals) and *Buteo buteo* (12.86 %, 681 individuals). In the autumn migration period, the most common species were *Clanga pomarina* (26.43 %, 809 individuals), *Buteo buteo* (24.53 %, 751 individuals) and *Pernis apivorus* (19.96 %, 611 individuals). The rest of the species were represented by less than 5% from the total of migrating raptors counted (Table 1).

Table 1: Raptor species and total number of individual observed during the present study.

Species	Spring Period				Autumn Period			
	Total Number of Passes		Total Number of Individual		Total Number of Passes		Total Number of Individual	
	N	Percent	N	Percent	N	Percent	N	Percent
Pernis apivorus	33	4.64 %	484	9.14 %	58	13.74 %	611	19.96 %
Milvus migrans	23	3.23 %	124	2.34 %	11	2.61 %	38	1.24 %
Gyps fulvus	1	0.14 %	1	0.02 %	0	0.00 %	0	0.00 %
Circaetus gallicus	183	25.74 %	823	15.54 %	77	18.25 %	566	18.49 %
Circus aeruginosus	3	0.42 %	6	0.11 %	4	0.95 %	5	0.16 %
Circus cyaneus	5	0.70 %	5	0.09 %	0	0.00 %	0	0.00 %
Circus macrourus	0	0.00 %	0	0.00 %	1	0.24 %	1	0.03 %
Circus pygargus	0	0.00 %	0	0.00 %	1	0.24 %	1	0.03 %
Accipiter gentilis	1	0.14 %	2	0.04 %	3	0.71 %	4	0.13 %
Accipiter nisus	30	4.22 %	50	0.94 %	23	5.45 %	28	0.91 %
Accipiter brevipes	7	0.98 %	48	0.91 %	0	0.00 %	0	0.00 %
Buteo buteo	162	22.78 %	681	12.86 %	108	25.59 %	751	24.53 %
Buteo rufinus	9	1.27 %	9	0.17 %	8	1.90 %	15	0.49 %
Falco tinnunculus	9	1.27 %	10	0.19 %	6	1.42 %	7	0.23 %
Clanga pomarina	158	22.22 %	2797	52.81 %	69	16.35 %	809	26.43 %
Clanga clanga	34	4.78 %	90	1.70 %	8	1.90 %	13	0.42 %
Aquila heliaca	9	1.27 %	13	0.25 %	1	0.24 %	1	0.03 %
Aquila chrysaetos	11	1.55 %	26	0.49 %	6	1.42 %	10	0.33 %
Pandion haliaetus	7	0.98 %	10	0.19 %	0	0.00 %	0	0.00 %
Hieraaetus pennatus	22	3.09 %	90	1.70 %	26	6.16 %	139	4.54 %
Falco naumanni	1	0.14 %	1	0.02 %	2	0.47 %	2	0.07 %
Falco vespertinus	1	0.14 %	24	0.45 %	2	0.47 %	44	1.44 %
Falco peregrinus	1	0.14 %	1	0.02 %	3	0.71 %	3	0.10 %
Falco subbuteo	1	0.14 %	1	0.02 %	5	1.18 %	13	0.42 %
TOTAL	**711**	**100 %**	**5296**	**100 %**	**422**	**100 %**	**3061**	**100 %**

During the spring migration period, 81.2% (4241 individuals) of the total number of migrated individuals were observed at the observation point 2 (Yeniköy) and 61.8% (2620 individuals) of the migrations were *Clanga pomarina* individuals. in the autumn migration period, % 41.2'si (1240 individual) of the total number of migrated individuals were observed at the observation point 3 (Cevizli village) and %30.7'sini (381 individual) of the migrations were *Buteo buteo* individuals. The distributions of the migrating raptor individual counted from the each observation points are shown on the map by divided the 10 km^2 grids (Figure 2).

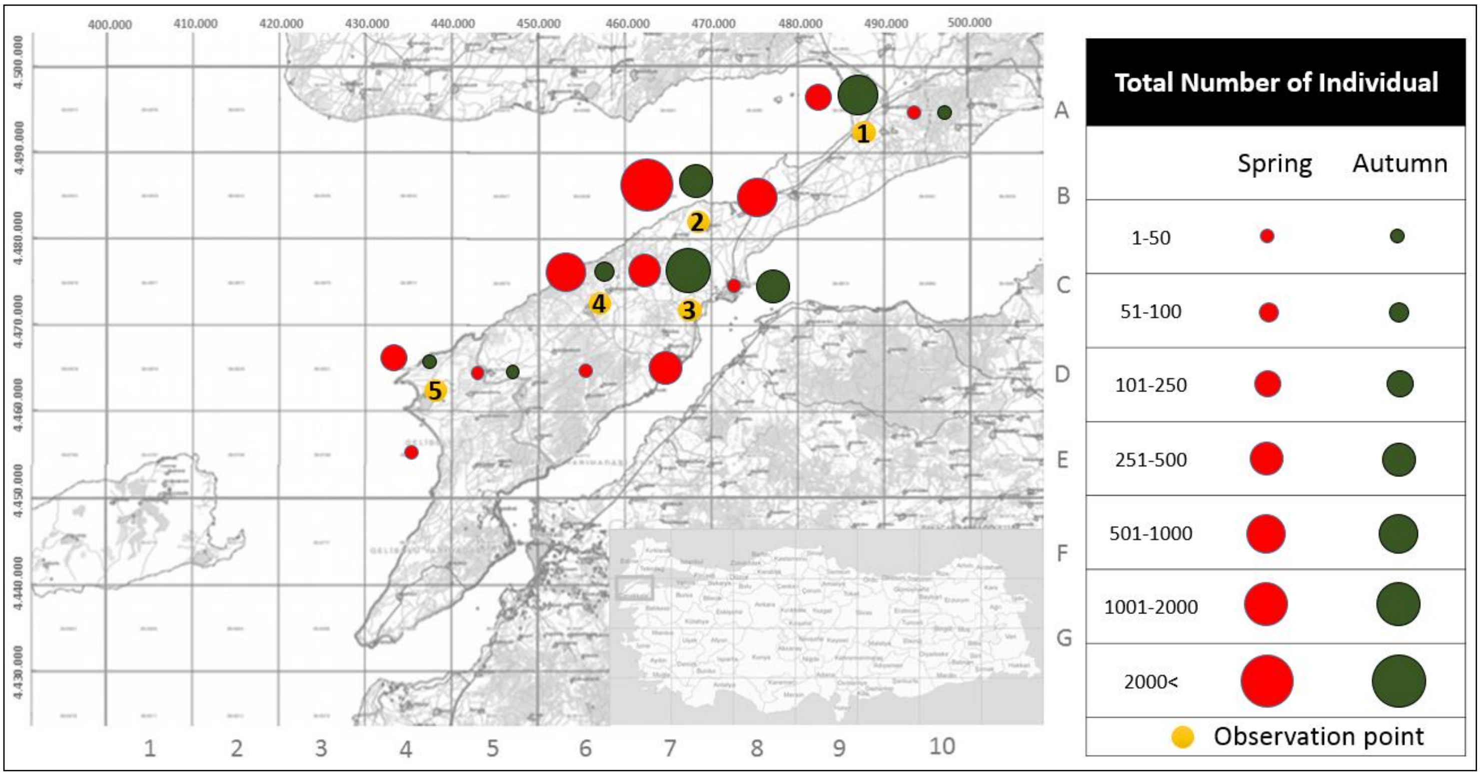


Figure 2: Distribution of individual numbers according to observation points.

There is a positive (0.464) linear relationship between the number of individuals observed in the spring migration period and the wind speed (t: 8.089, p: 0.000). 66.6% of the passages were observed at wind speeds above 20 km / h and 88.5% were observed in the days when the northern winds dominated. In the autumn migration period, there was no significant relationship between wind speed and number of individuals. It was observed that 69.6% of the passages occurred on days when the northern winds were dominant (Figure 3-4).

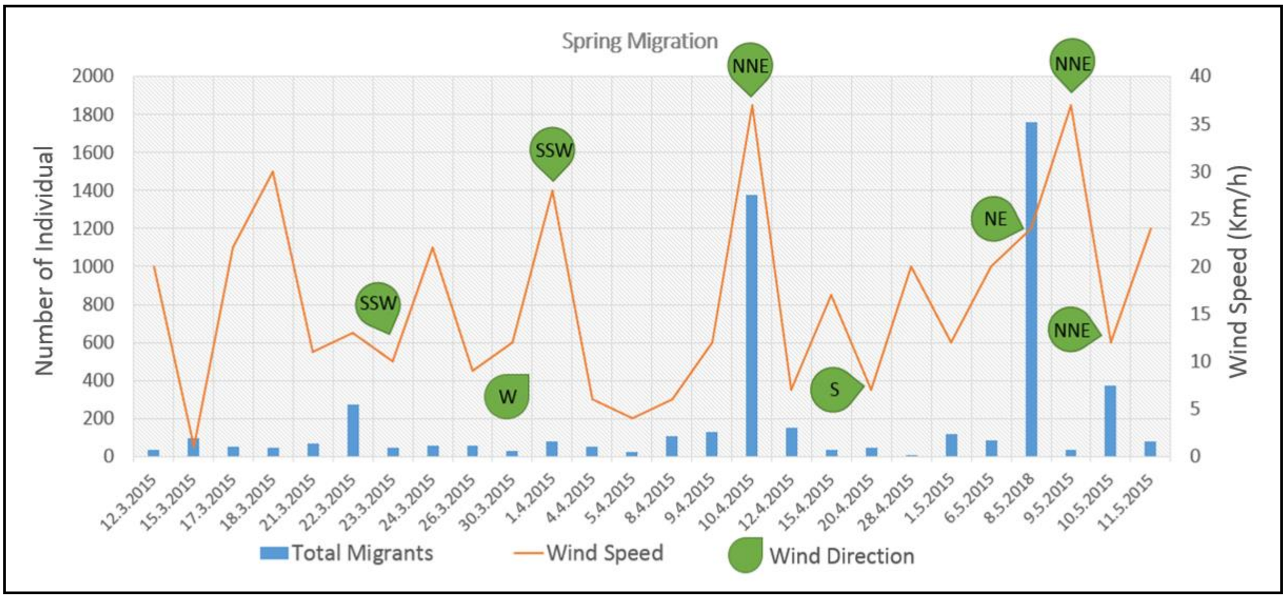


Figure 3: Number of daily passages during spring migration.

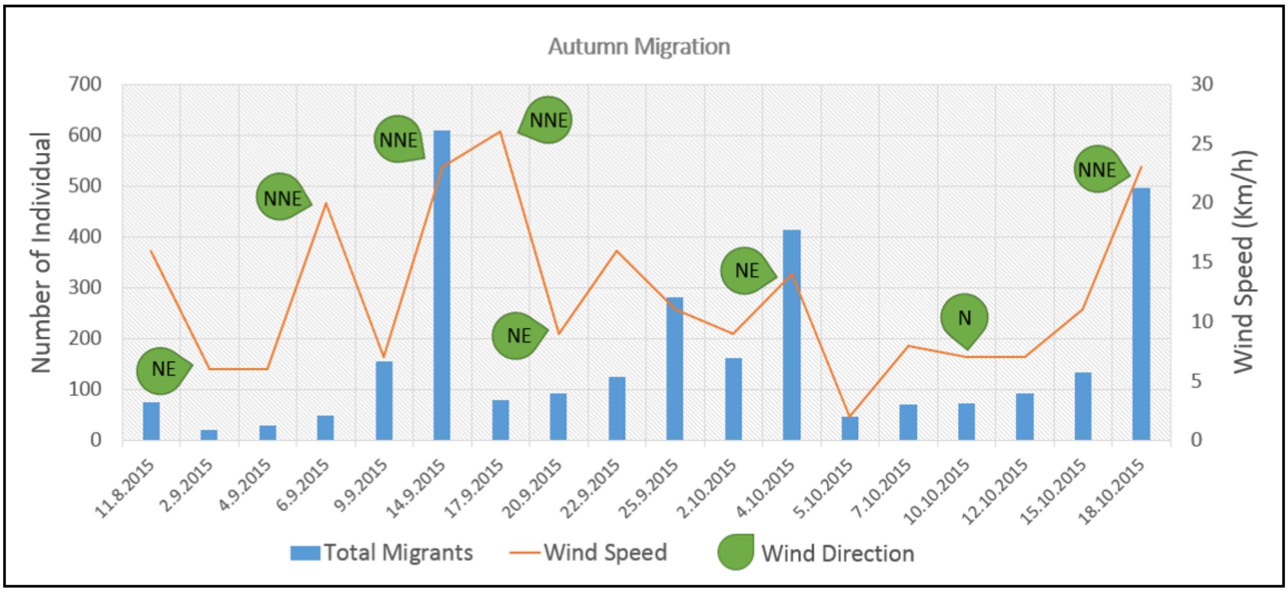


Figure 4: Number of daily passages during autumn migration.

4. DISCUSSION

The wind direction and shape of the coastal area are of great importance for the migration routes of birds. Raptor species react differently to different weather conditions and in particular to crosswinds at the bosphorus. In this study, the west of Turkey made less explored than the other major migration route in the Dardanelles, raptors counts were conducted during the spring and autumn migration periods. During the spring migration period 5296 and during the autumn migration period 3061 raptor birds were observed. *Clanga pomarina* has become the raptor species most observed in individuals during migration periods (3606 individual). More than 95% of the breeding range of these species is in Europe and the significant part from the global population migrates over Turkey at Bosporus [15]. The highest observation of the *Clanga pomarina* was reported in 58327 individuals during autumn migration period on the Bosphorus [15]. It is seen that the raptor migration observed in the studies conducted on the Bosphorus is considerably higher than the Gelibolu peninsula (Bosphorus: 2006 spring migration period 46862 raptor, 2008 autumn migration period 141844 raptor, 2007 autumn migration period 24622 raptor individual; Gallipoli peninsula: 2017 autumn migration period 1618 raptor) [8, 10, 15, 21]. In this study, it was determined that there is much less passage in the Gallipoli peninsula than in the Bosphorus. But it was observed that the number of passes increased in the days when strong winds from north and northeastern dominated.

5. CONCLUSION

In this study, we observed raptor migration in 5 different points during the spring and autumn migration periods in the Gallipoli peninsula (Dardanalles). During the spring migration period 5296 and during the autumn migration period 3061 raptor birds were observed. The present study, in 2015, carried out a reasonably complete census of the raptor birds passing over the Gallipoli peninsula (Dardanelles), one of the important migration routes in the western palearctic region. In this study, it was determined that there is much less passage in the Gallipoli peninsula than in the Bosphorus. But it was observed that the number of passes increased in the days when strong winds from north and northeastern dominated. New observation points have been determine for future soaring birds monitoring studies in Gallipoli peninsula (Dardanalles).

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