

# The correlation between cruise tourism and overcrowding in Dubrovnik Old City

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Cruisers' impact on Dubrovnik's overcrowding

## The correlation between cruise tourism and overcrowding in Dubrovnik Old City

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## ABSTRACT

Overcrowding of the Dubrovnik Old City, a heritage site protected by UNESCO, has become one of the most discussed issues today. Public perception is that cruise ship industry is the biggest variable that affects an increase in overcrowding effect. This research investigated to what degree, if any, cruise ships account for overcrowding in the Old Town. The methods of this research were statistical analyses of two variable data sets from June to August, 2017: number of visitors in the Old City (MaxCount) and number of cruise passengers arriving in Dubrovnik (Cruiser). The results showed that the relation between Cruiser and MaxCount is inconsistent, but generally positive with the highest difference in analysis of June and August. The research indicated that cruise passengers significantly affect overcrowding in the low-season periods. However, cruise passengers do not significantly affect overcrowding in the high-season periods due to additional tourist flows.

Keywords: *overcrowding, Dubrovnik Old City, sustainable tourism, cruise industry, carrying capacity*

## INTRODUCTION

### *Carrying Capacity and Overcrowding*

Increased number in tourist visitors is beneficial for a destination's economy and development; however, it also might pose negative consequences to the destination, as well. These negative consequences include social and environmental impact on the destination that is a result of an increase in demand for that destination. (Damian, Fernandez-Morales, & Navarro Jurado, 2013). Furthermore, Butler (2011) stated that most Mediterranean destinations are either in the maturity or decline phase of tourist demand for those destinations, a phenomenon he associated with reaching the peak number of tourists for those destinations. In other words, significant number of these destinations has reached or exceeded their carrying capacity.

Carrying capacity, as defined by the World Tourism Organization, is the 'maximum number of people that may visit a tourist destination at the same time without causing destruction of the physical, economic or socio-cultural environment and an unacceptable decrease in the quality of the tourist satisfaction' (Coccossis, Mexa, & Collovini, 2002, p. 38). The social aspect (please note that the environmental aspect will be addressed later) is often referred to as the phenomenon of tourist overcrowding; also referred to as exceeding a destination's carrying capacity (Coccossis & Mexa, 2004). Overcrowding's effect on tourism destinations, although vaguely defined in literature, can be explained as the level of tourists' and locals' perceived satisfaction with the destination impacted by the number of tourists in that destination (Damian, Fernandez-Morales, & Navarro Jurado, 2013). The issue of overcrowding falls into the physical capacity element of carrying capacity. According to Santana-Jimenez & Hernandez (2011), overcrowding negatively influences tourist destination by making it less attractive to potential tourists due to its negative influence on supply factors of a destination, with mostly environmental values (the

natural environment that a destination has to offer) being affected. Some of the mentioned specific negative influences on the ecosystem are: inadequate waste management, air pollution level, flora and fauna destruction, etc. They argue that this effect, eventually, leads to a decrease in the number of incoming tourists. They also stated that overcrowding is directly linked to carrying capacity model of a destination.

According to McKinsey & Company (2017), there are five categories of challenges related to overcrowding effect. The first challenge is the degraded tourist experience mostly caused by long waiting time to receive a service or product. The second challenge is the overloaded infrastructure that also leads to prolonged waiting time, but it can also cause water shortages or create waste management problems. The third challenge, threat to culture and heritage, refers to masses of tourists that damage cultural attractions, such as monuments, or that cause pollution and erosion. This leads to the challenge of damage to nature that is mostly caused by the overuse of natural resources. Finally, all challenges lead to the alienated local residents who often organize protests and raise rent rates of private accommodation in response to high tourist demand with aim of decreasing the number of incoming tourists.

### *The Concept of Carrying Capacity and Sustainable Tourism*

According to Saarinen (2006), carrying capacity is a measure destinations evaluated when considering sustainability. Sustainable tourism is a balance of tourism, environment and satisfaction of both locals and tourist in a destination (UNWTO, 2005). According to Hunter and Green (1995), strive for sustainability occurred as a reaction to the negative impact of increased tourism activity on locals in a destination and its ecosystems. Also, destinations, specifically coastal ones, should strive to achieve sustainability because of its importance when it comes to keeping a competitive edge and ensuring further development (Navarro Jurado, 2012). Basically,

sustainability can be defined as an equation where exploitation is smaller than regeneration of that destination (Carić, 2016).

Overcrowding effect that negatively influences the sustainability of a destination is mainly caused by the notion of organized mass tourism because of the significant number of tourist it brings in a time and space frame (Diedrich, 2010). Cohen (1972) defined organized mass tourism as one out of four types of tourism (individual mass tourist, the drifter and the explorer) which is institutionalized since organized mass tourist buys an arranged package or a tour which is fixed in advance. Organized mass tourist is dependent on the organization that provides the package and, usually, contributes less than other three categories to the economics of local population. Based on Cohen's definition, cruise tourism is a form of mass tourism.

According to Carić (2011), cruise tourism poses a threat to the ecosystem of the destination in five major categories: waste increase, air pollution, waste waters, dangerous waste and metal emissions. The research showed that the direct cost of pollution from the cruise ship industry to be 6 to 7 times more than the economic benefits of cruise tourism for that destination. Furthermore, Diedrich (2010) stated that cruise tourism, as a form of mass tourism, tends to concentrate people in small areas and increase the number of organized tours to specific sites, often causing the overcrowding effect.

#### *Example Destinations Coping with Tourist Overcrowding Issue*

The Canary Islands are characterized by appealing natural sites, attractive landscapes and a steep increase in number of tourists, occurring sometime before 2011. The scientific research that used panel data model to estimate the effect of overcrowding on The Canary Islands showed that the overcrowding effect in The Canary Islands significantly decreased the perceived quality of

the tourist experience, with the largest negative influence occurring on Lanzarote Island due to its relatively poorly developed infrastructure and high demand of only few of natural attractions as these were find two variables mostly influencing negative perception of overcrowding in a destination. The case of The Canary Islands shows that supply factors of the destination, with environmental values being the most affected factor, are important variables when measuring the influence of overcrowding on tourists' perceived satisfaction with the destination that, ultimately, led to a decrease in demand for that tourist destination (Santana-Jimenez & Hernandez, 2011).

Another example is Venice, a historic Italian city with a UNESCO calculated carrying capacity of 11 million tourists that attracted around 22 million tourists in 2011, double its prescribed carrying capacity by UNESCO (Culture Unit, UNESCO Venice Office, 2011). According to the article *The Environmental Impact of Tourism in Venice* (2016), Venice has been experiencing negative consequences due to increased tourism: overcrowding, pollution, dissatisfied local population, etc. All of these negative aspects combine and lead to a decrease in the perceived quality of it as a tourist destination, while, at the same time, creating social and environmental problems, such as organized protests by locals against increase in number of tourists or reputation that the city has a distasteful scent (*The environmental impact of tourism in Venice*, 2016). According to a more recent article (Mourby, 2017), the incoming number of tourists to Venice is still increasing; however, the pace of the increase has slowed from 2013 due to certain actions of the city's government, including limiting the number of cruise ship arrivals and redistributing them from weekends to less crowded days. However, the article stated that 30 million tourist arrivals to Venice in 2016 is still over the capacity of the city since it is still perceived by locals as overcrowded and more than the city can cope with.

Barcelona, A southeastern Spanish city, is predominantly tourism oriented and it was the twentieth most visited city in the world in 2015. Furthermore, Barcelona's tourism statistics have continued to rise and its tourism is still in the blooming phase. From 2012 to 2016, the number of incoming tourist per year has increased by more than 25%, going from 27 million to more than 34 million. Simultaneously, the counter-tourism movements from the side of the citizens of Barcelona have also been increasing. Locals have become increasingly anti-tourists oriented and have been starting protests on the streets, while also flooding the city with numerous graffiti expressing the hatred towards tourist. For example, Barcelona's graffiti say: 'Why call it tourist season if we can't shoot them?' and 'Tourist, you are a terrorist!' The reason behind this situation, termed 'tourism-phobia', is the fact that locals started feeling irritated and isolated from their own city because of the increasing tourist crowds and other negative consequences associated with tourism. Some of the most mentioned negative consequences are the lack of long-term accommodation and overpricing of accommodation for locals, the price of which has increased by 16.5% in 2016. Because of the strong tourist demand, renters are able to raise prices to both tourists and locals looking for accommodation, while most, due to the higher profits, decide to rent to tourists instead of locals. Furthermore, prices in general are increasing, while locals' favorite bars and restaurants are becoming tourist-oriented and more expensive, and the waiting time in the facilities and streets have increased by a factor of three as compared to 2012. Above all, locals are forced into moving to distinct areas of the city, while there is a feeling that the city, overcrowded by the tourists, is no longer theirs (Lopez Diaz, 2017).

#### *The case of Dubrovnik, Croatia*

Dubrovnik, a city located on the Adriatic Sea in southern Croatia, has been experiencing a rise in tourism which is predicted to further rise in the near future, as well. In years 2015, 2016



and then 2017, Dubrovnik has been achieving record numbers in tourist arrivals and overnights with an increase of 11% to 15% per year. In 2017, Dubrovnik counted up to 1,184,152 of tourist arrivals, and close to 4 million of tourist overnights (Dubrovnik and Neretva County Tourist Board, 2018). Furthermore, in 2017, 660,184 cruiser passengers arrived in Dubrovnik, with 50.5% of them arriving from June to August (Dubrovnik Port Authority, 2018). Dubrovnik's most visited attraction is its Old City with more than a million visitors per year. (Pavlic, Portolan, & Puh, 2017). The Old City has World Heritage status since October, 1979 and is a world famous cultural site in which only 4% of local residents live (UNESCO, 2015). The encompassing walls of Dubrovnik's Old City are 1940 meters long, with 16 towers, 3 fortresses and a height of up to 25 meters. There are six entrances in the Old City: Pile, the widest and mostly used one, Ploče, Peškarija, Veliki Mul, Buža and Mala Vrata (DURA, 2014). Dubrovnik is known in media as the 'Pearl of the Adriatic' due to the rich heritage of its medieval city, UNESCO status and touristic offer of natural and cultural beauties (Carić, 2011). According to the latest tourism statistics report by the Dubrovnik Tourist Board published in 2017, Dubrovnik had more than 1.160 million of tourist arrivals in 2017, which is an increase of 17% compared to 2016. Also, tourist overnight stays have increased by 14% in this period, leading to more than 3.9 million of them in 2016 (Thomas, 2018).

### *Dubrovnik & Overcrowding*

Tourist demand theory measures the influence of certain touristic elements on the appeal of one destination. As previously stated, Dubrovnik's strong tourist demand, which is the number of incoming tourists, has been increasing each year and overcrowding, as one of the factors in environmental and social tourist supply elements, is one of the most important issues in tourism industry of this coastal destination (Santana-Jimenez & Hernandez, 2011). A report issued by

UNESCO (2015) stated that Dubrovnik, specifically the Old City of Dubrovnik and its immediate surroundings, carries important cultural and historic value for Croatia and entire region of South East Europe. The report highlighted the fact that the City of Dubrovnik, with preserved centuries old historic documents and physical infrastructure of a medieval city, should make further preservation and protection of its cultural and natural attributes its priority. Furthermore, due to Dubrovnik's prosperous tourism statistics and future predictions, the main components of management plans for the city's preservation were tourism related. One of the components regarding the Old City and its immediate surroundings was the proposed carrying capacity of the Old City of 8,000 people at any time, estimated by the UNESCO itself and based on previously measured peaks of number of visitors in the city. The reason behind this proposal, according to this report, is the fact that these visitors enter the city mostly through three gates, with most visitors directed through Pile gate, which 'leads to tourist blight, because over-crowding at the gates themselves and in the main thorough fares diminishes the visitor experience'.

In the past several years, tourist overcrowding has often been mentioned as an issue in various Dubrovnik local, but also foreign, newspapers. For example, newspapers Index published an article that explained how local people monitor the Old City on local news to check the crowds and decide on leaving their homes based on that information. (Ž.L., 2017). Recently, CNN published an article in which it listed Dubrovnik as the number three destination to avoid in 2018. Dubrovnik climbed so high on this list because of the measures proposed by the city of Dubrovnik to decrease the maximum number of people visiting the Dubrovnik City Walls to 4000 while the numbers used to climb to over 10 000 in recent years. The reason behind this decision is UNESCO's threat to deprive Dubrovnik of its World Heritage status due to significant overcrowding that has led to a decrease in tourist satisfaction (Minihane, Joe., 2018). Reuter's

article referred to the problem of overcrowding as an ‘overtourism’ issue and it identified Dubrovnik as one of three European destinations, including Venice and Barcelona, that have been experiencing an increase in tourism as an issue the most. The article highlighted the fact that tourism in these cities, although it is the main source of income, has been negatively associated by locals and tourists due to overcrowding it causes; overcrowding caused mainly by cheap flights and cruise tourism. Also, it stated that 9% of respondents in survey done by IP consultancy firm have stated that overcrowding significantly decreased the perceived quality of that destination. Dubrovnik’s mayor summarized the essence of the problem by sayings that: "Overcrowded destinations are successful, but there is a thin line between success and failure" (Sheahan & Bryan, 2018).

#### *Dubrovnik & Cruise Industry*

Cruise industry trends are ones of rapid growth and development, such as the trend of building larger vessels, with approximately 3000 or more passenger per ship. Furthermore, since 1996 to 2006, the number of cruise tourism passengers per year had been increasing by 250%. In this attractively growing industry, the Mediterranean had 18% share in world cruise market in 2006. In Croatia, cruising industry is growing, as well. Dubrovnik is the most often visited destination with 85% of the cruise ship passenger market in Croatia and the fifth city in Mediterranean by the number of cruise passengers. In its two ports, Gruž and the Old City port, capturing 70% and 30% respectively of Dubrovnik cruiser activity, Dubrovnik hosted cruisers for more than 200 days a year and up to 13 thousand cruise passengers in 2007 (Carić, 2011). More recent numbers indicate that the growth in cruising tourism has continued. In 2013, cruise passenger number reached its peak of 942, 909. From 2013 to 2014 there has been a decrease of 14.5% in cruise passenger arrivals, and it continued to decrease by, on average, 5% per year up to

2017, when 660,184 cruise passengers arrived in Dubrovnik ports (Dubrovnik Port Authority, 2018).

Cruise industry significantly influences the destination's tourism, mostly by positively affecting the revenues of that destination increasing the profits. However, Dubrovnik hosts mostly big cruisers and spending per guest is lower than in other Croatian cities that host cruise ships. Note that Dubrovnik cruiser guests spend only 37 euros in Dubrovnik, money spent mostly on excursions and sightseeing. Another negative aspect are the overcrowded city streets. Note that the average traveling time for the three kilometer trip Gruž port to the Old City can take up to 90 minutes on peak cruise ship days (Đurković, 2007). Carić (2011) concluded that, when looking at all the aspects of cruise tourism, its outcomes directly violate the concept of sustainable tourism that Dubrovnik and The World Tourism Organization promote.

## METHODS

Dubrovnik's Old City is a heritage site protected by UNESCO. Over crowdedness of the Old City has become one of the most discussed issues today. Public perception is that cruise ship industry is the biggest variable that affects an increase in overcrowding effect in the Old City. However, as previously mentioned, non-cruiser related visitation numbers are also increasing. The question, then, is to what degree, if any, cruise ships account for overcrowding in the Old Town? The purpose of this research was to provide descriptive data concerning visitor levels in the Old City of Dubrovnik, as well as to provide the relational data between the number of visitors in the Old City (MaxCount) and number of cruiser passengers in Dubrovnik ports (Cruiser) by determining whether or not the level of cruiser guests statistically influences the number of visitors in the Old City.

### *Data Sources*

The data on visitor levels in the Old City required for this research was obtained from DURA's (City of Dubrovnik Development Agency) Dubrovnik visitors camera program that counted people entering and exiting the old city. The data is not publicly published, but is available to public on request which is how it was obtained for this research. The data acquired was for the months of June, July and August of year 2017, which included data arranged by day, hour, gate (entry/exit passage to/from the old city), temperature and precipitation. The data on cruiser arrivals and passengers was acquired through Dubrovnik Port Authority's report (2016) on Cruise Ship Arrivals for the year 2017, which included information on port location, number of passengers, arrival and departure time and cruiser name. The research worked on the assumption that cruisers were at their maximum capacity in terms of guests.

### *Conducted Statistical Analyses*

The descriptive and relational data was provided using statistical analyses as an instrument. Histograms are provided to present the frequency of three ranges of both MaxCount and Cruiser data. The ranges (Green: less than 3500, Yellow: 3500-7500 and Red: more than 7500) for the Cruiser data were determined on the criteria established by the Port Authority. The ranges (Green: less than 6000, Yellow: 6000-7000 and Red: more than 7000) for MaxCount data were determined on the criteria set by the Dubrovnik City Office. Microsoft excel 2010 was used for all statistical analyses. Correlation analysis was used to determine the correlation coefficient of Cruiser data on MaxCount data and vice versa and Regression analysis was then employed to check for the significance level of the results. Also, regression analysis with multiple independent variables was used to establish the impact level of Cruiser guests, temperature and precipitation

on the MaxCount. Anova Single Factor and T-test for two samples with unequal variances were employed to determine the influence of Cruiser passengers on the MaxCount.

## RESULTS

This research used statistical analyses to determine to what degree, if any, cruise ships account for overcrowding in the Dubrovnik Old Town. Descriptive analysis indicate that cruiser guest total was 107,321, 109,456, and 113,798 for months of June, July and August, 2017, respectively (see Table 1).

### *Peak Hours per Day*

The total for MaxCount (number of visitors in the Dubrovnik Old City) was 192,037, 199,580, and 209,646 for June, July and August, respectively (see Table 2). An analysis of MaxCount reveals that it occurs predominantly from 8:00 to 12:00 and from 15:00 to 19:00 (see Figure 1). Note, for example, that Maxcount, over the 92 days of study, occurred 11, 42, and 19 times in the 8:00, 9:00, and 10:00 hours, respectively. Traffic flows follow a pattern in all three months: rise sharply in the midmorning with 9:00 being the peak hour, fall in the afternoon around 15:00, and rise again in the early evening with the peak at 19:00 (see Figure 2). On the other hand, research shows that, in between 3:00 and 12:00, majority of cruise passengers arrive at the port (92%), while in between 13:00 and 19:00, cruise passenger arrivals are low (8%) (see figure 3).

### *Analysis of Gate Entry Frequency*

The research showed that among six total gates to the Old City of Dubrovnik, Pile (39.2%), Veliki Mul (17.6%) and Ploče (17.2%) are most frequent gates for entry of visitors in

June, July and August (see table 3). The frequency per gate for each separate month follow the trend of the frequency for all three months.

#### *The Relationship between Cruiser and MaxCount*

A number of tests were conducted to determine the relationship between MaxCount and Cruiser. Correlation analysis of Cruiser on MaxCount suggests a positively sloping trend line for the period from June to August (See Figure 4). Also, it showed that the highest correlation is found in June (correlation-coefficient of 0,638, see Table 4). The significance of this correlation was supported with the regression analysis that confirmed this correlation to be significant ( $p$ -value=0.00015). The lowest correlation between Cruiser and MaxCount was found for the month of August (see Table 4). Also, this correlation was found significant ( $p$ -value=0.70896).

#### *Data Criteria*

The count levels (Green: less than 3500, Yellow: 3500-7500 and Red: more than 7500) for the Cruiser data were determined on the criteria established by the Port Authority (see Figure 5). The count levels (Green: less than 6000, Yellow: 6000-7000 and Red: more than 7000) for MaxCount data were determined on the criteria set by the Dubrovnik City Office (see Figure 6).

#### *ANOVA Single Factor & T-Test Analyses between Count Levels*

Anova Single Factor showed that at least one significant difference exists among the three count levels of Cruiser compared to MaxCount means for belonging count levels (see Table 5). The T-test analyses results ranged from being significant for comparison of Green to Yellow, to partially significant for Green to Red and nonsignificant for Yellow to Red count level (see Table 6). Note that when August, 10<sup>th</sup>, which is a Green MaxCount level day, is removed from the analysis, T-test result for Green to Red comparison is significant ( $p$ -value=0, 00387).

### *Regression Analysis*

Within regression model, MaxCount was a dependent variable, Cruiser an independent variable, and precipitation and temperature were control variables. The regression analysis revealed that precipitation and temperature do not have significant influence on MaxCount. However, only Cruiser had a significant influence (p-value of 0,008) on MaxCount for the period from June to August, 2017. On the other hand, *R-square* of 0, 09487 indicates that the analysis describes only 9.5% of the variation in MaxCount (see Table 7).

## DISCUSSION

Dubrovnik's Old City is a heritage site protected by UNESCO. Over crowdedness of the Old City has become one of the most discussed issues today. Public perception is that cruise ship industry is the biggest variable that affects an increase in overcrowding effect in the Old City. However, non-cruiser related visitation numbers are also increasing. This research investigated to what degree, if any, cruise ships account for overcrowding in the Old City.

### *The Relation between Cruiser and MaxCount*

The results of the research showed that the relation between Cruiser and MaxCount is inconsistent, but generally positive with the highest difference in analysis of June and August. The correlation was significant for the 3 month period under study, with the highest correlation significant in June, but not for august specifically. The research indicated that cruise passengers significantly affect overcrowding in the low-season periods (June). However, cruise passengers do not significantly affect overcrowding in the high-season periods due to additional tourist flows (August). As July and August have more non-cruiser visitors than June, the effect of cruiser visitors on MaxCount is relatively muted.



### *The Relation between Cruiser and MaxCount per Hour*

Partial support to the conclusion that tourist flows, other than cruise industry, influence the overcrowding in Dubrovnik Old City comes from the observation of daily peak hours throughout three months. The research shows that peak hours occur between 8:00 and 12:00, and then again between 15:00 and 19:00. However, 92% of cruise passengers arrive before 12:00, and only 8% in the afternoon. This finding suggest that cruise passengers are not the main influence on overcrowding of the Dubrovnik Old City in the afternoon hours and supports the conclusion that other tourist flows, such as overnights, plane arrivals, etc. are important variables influencing the overcrowding effect. For example, on July, 10<sup>th</sup>, peak number of visitors occurs at 19:00 because of the people flow in the Old City coming to Dubrovnik Summer Festival that is held in the late afternoon.

### *Ground for Further Research and Limitations*

The frequency percentages for entry at all six gates to the Old City were calculated showing that Pile and Veliki Mul, most common entrances for cruise passenger arriving at Gruž and Old City ports, respectively, are two most frequent gates in all three months and each month separately. The suggestion for the further research is to compare the flow of visitors through these two gates with cruise arrival data divided on two Dubrovnik ports, Gruž and the Old City, to estimate if there is a significant correlation and influence on visitor flows through these gates compared to cruiser dockings in the corresponding port.

Furthermore, the research found several dates that show irregularity in correlation since cruise passengers' numbers are extremely low (below 500) and number of visitors in the Old City are high (above 7000). The relational analysis of this situation was not done due to insufficient

data amount and therefore should be investigated further. However, descriptive and observational analysis suggest that this inconsistency happens due to additional tourist flows in the Old City. Also, same inconsistency was found in days when visitor's numbers are categorized as low (below 6000) and cruise passengers' numbers are high (above 7500). The relational analysis of this situation was not done due to insufficient data amount and therefore should be investigated further. August 10<sup>th</sup> is the example when Cruiser number are at Red level (9287 passengers), and MaxCount is at the Green level (5359 visitors). When this date was removed from the analysis, the correlation changed from being partially significant to significant, meaning that one such date influenced the analysis significantly and is, therefore, an anomaly.

#### *Potential Explanation for the Anomaly and Suggested Solution*

Looking at the Dubrovnik Port Authority cruise schedule (2016), these days as August, 10<sup>th</sup>, are characterized by dispersed arrivals of cruise ships throughout the day. However, this insight suggests that evenly organizing cruise ship arrivals throughout the day decreases the influence of cruise ship passengers' number on visitors' number in the Old City. The suggested solution for the Dubrovnik City and Dubrovnik Port Authority is to, in advance, organize the schedule of cruise ship arrivals on high demand days to evenly disperse it in order to decrease the overcrowding effect and maintain the level of cruise tourism so that the Dubrovnik as the destination achieves the needed level of sustainability.

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## APPENDICES

Table 1

*Descriptive Analysis of MaxCount by Month*

Month	MaxCount Total	Mean	Standard Deviation
June	192037	6401,23	884,457468
July	199580	6438,06	707,9329505
August	209646	6762,77	1085,838899

Table 2

*Descriptive Analysis of Cruiser by Month*

Month	Cruiser Total	Mean	Standard Deviation
June	107321	3577,37	2971,93
July	109456	3453,50	109456
August	113798	3670,90	113798



Table 3

*Sum and percentage of entries on each gate over June, July and August*

TOTAL 7443159	BUZA		MALA VRATA		PESKARIJA		PILE		PLOCE		VELIKI MUL	
JUNE	7.3%	156928	2.5%	60623	14.1%	300709	38.4%	821462	17.7%	377640	19.6%	419948
JULY	7.4%	185445	2.7%	68620	17.6%	440815	40.1%	1002981	18.5%	463930	13.6%	341558
AUGUST	8.1%	225984	3.5%	98067	14.0%	391001	39.1%	1096788	15.7%	438668	19.7%	551992
ALL MONTHS	7.6%	568357	3.1%	227310	15.2%	1132525	39.2%	2921231	17.2%	1280238	17.6%	1313498

Table 4

*Correlation Analysis of Cruiser on Maxcount for 3 months, June, July and August, respectively*

Cruiser on MaxCount

June-August

	<i>Cruiser</i>	<i>MaxCount</i>
Cruiser	1	
MaxCount	<b>0,275971829*</b>	1

June

	<i>Cruiser</i>	<i>MaxCount</i>
Cruiser	1	
MaxCount	<b>0,638066655*</b>	1

July

	<i>Cruiser</i>	<i>MaxCount</i>
Cruiser	1	
MaxCount	<b>0,12648528</b>	1

August

	<i>Cruiser</i>	<i>MaxCount</i>
Cruiser	1	
MaxCount	<b>0,069825115</b>	1

*\*p-value significant at 0, 01*

Table 5

*Anova: Single Factor for MaxCount Means vs. Cruiser Count Levels*

#### SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Green	52	328905	6325,096	870904,7
Yellow	32	215409	6731,531	604524,7
Red	8	56949	7118,625	874302

#### ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	6252011	2	3126005	4,015999	0,021386	3,0988697
Within Groups	69276520	89	778387,9			
Total	75528531	91				

Table 6

*T-test with Two Samples and Unequal Variances*

	<i>green</i>	<i>yellow</i>
Mean	6325,096	6731,531
Variance	870904,7	604524,7
Observations	52	32
Hypothesized Mean Difference	0	
Df	75	
t Stat	-2,15291	
P(T<=t) one-tail	0,017271	
t Critical one-tail	1,665425	
P(T<=t) two-tail	0,034542	
t Critical two-tail	1,992102	

	<i>green</i>	<i>red</i>
Mean	6325,096	7118,625
Variance	870904,7	874302
Observations	52	8
Hypothesized Mean Difference	0	
df	9	
t Stat	-2,2352	
P(T<=t) one-tail	0,026126	
t Critical one-tail	1,833113	
P(T<=t) two-tail	0,052252	
t Critical two-tail	2,262157	

	<i>yellow</i>	<i>red</i>
Mean	6731,531	7118,625
Variance	604524,7	874302
Observations	32	8
Hypothesized Mean Difference	0	
df	10	
t Stat	-1,0812	
P(T<=t) one-tail	0,152495	
t Critical one-tail	1,812461	
P(T<=t) two-tail	0,304991	
t Critical two-tail	2,228139	

Table 7

*Regression Analysis with 1 dependent, 1 independent and 2 Control Variables*

SUMMARY OUTPUT JUNE-AUGUST								
<i>Regression Statistics</i>								
Multiple R	0,307998							
R Square	0,094863							
Adjusted R	0,064006							
Standard Error	881,3967							
Observations	92							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	3	7164844	2388281	3,074275	0,031782			
Residual	88	68363687	776860,1					
Total	91	75528531						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	7727,33	1157,135	6,677982	2,1E-09	5427,766	10026,89	5427,766	10026,89
Temperature	-49,2342	37,34163	-1,31848	0,190764	-123,443	24,97442	-123,443	24,97442
Precipitation	-17,6144	35,29319	-0,49909	0,618962	-87,7522	52,52336	-87,7522	52,52336
Cruiser	0,092022	0,033997	2,706771	0,00816	0,02446	0,159584	0,02446	0,159584

### *Figure Captions*

Figure 1 – Histograms of MaxCount Daily Maximum per Hour, June to August and Each Month

Figure 2 – Scattergraph of MaxCount Daily Maximum per Hour, June to August and Each Month

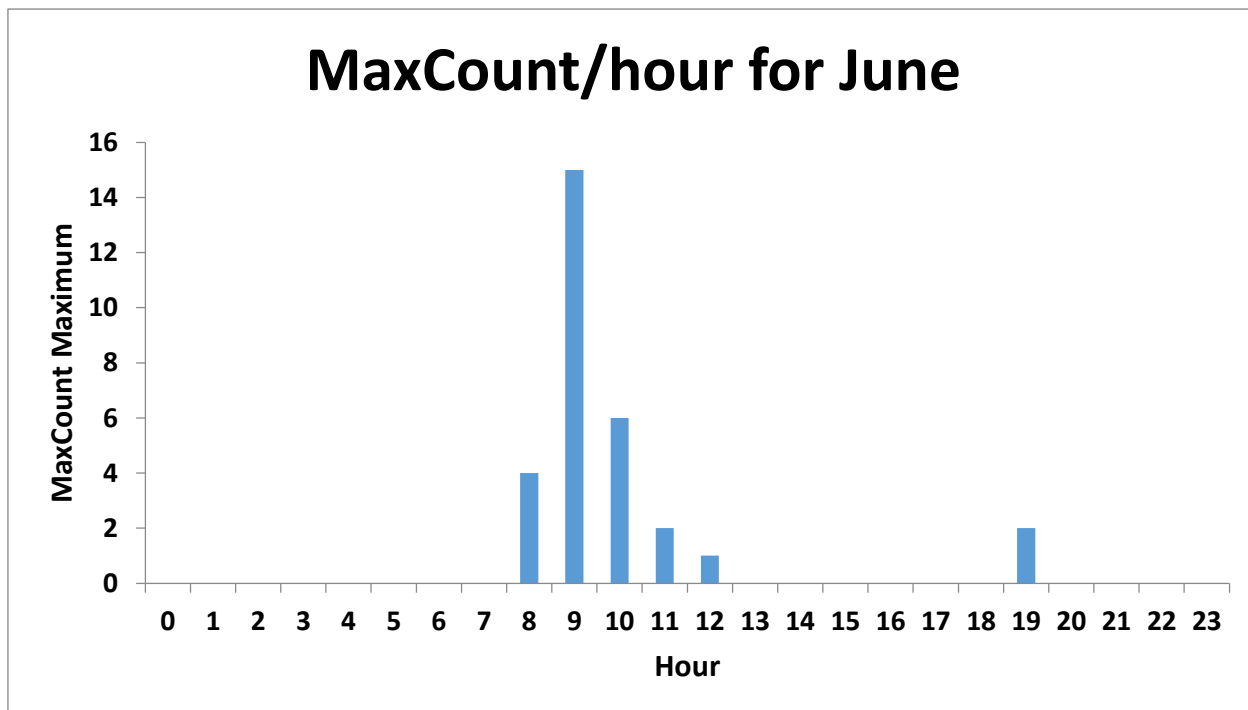
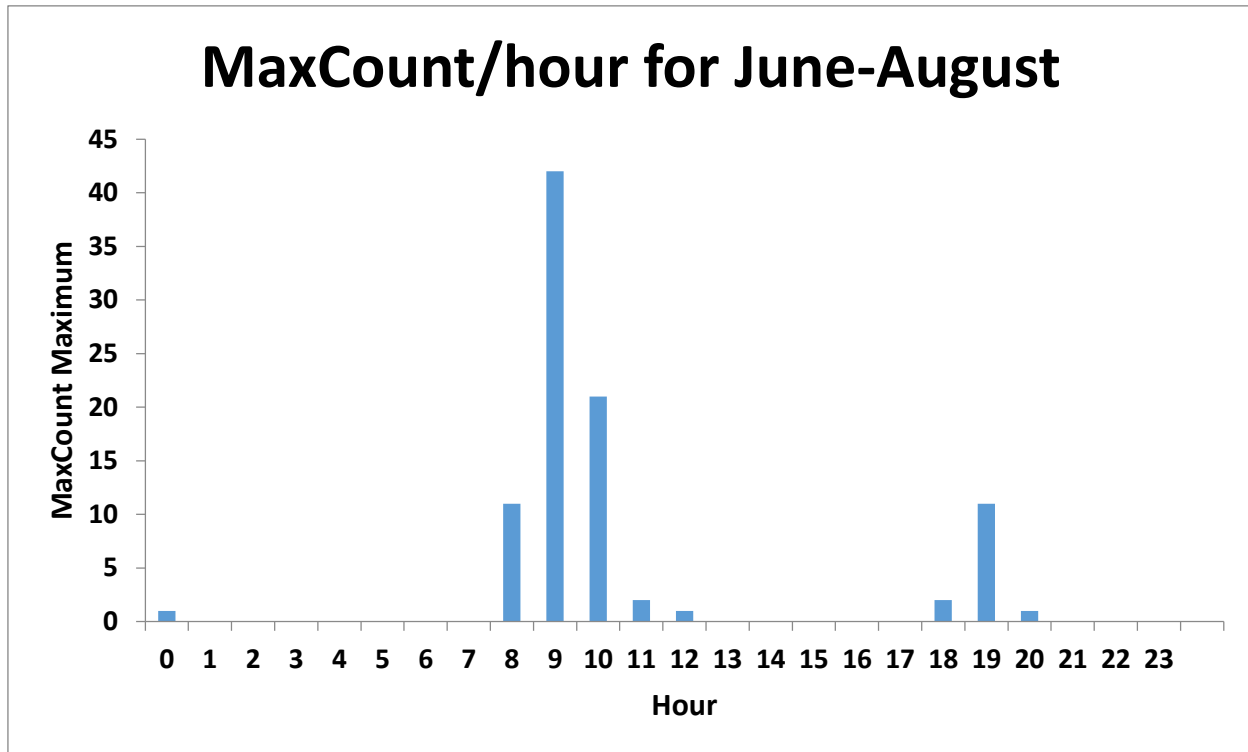
Figure 3 – Pie Chart of Cruise Passengers Arrivals in the Morning and in the Afternoon

Figure 4 - Correlation Scattergraph of Cruiser and MaxCount, June to August

Figure 5 – Histograms of Cruiser Count Levels Frequency, June-August and Each Month

Figure 6 - Histograms of MaxCount Count Levels Frequency, June-August and Each Month

Figure 1



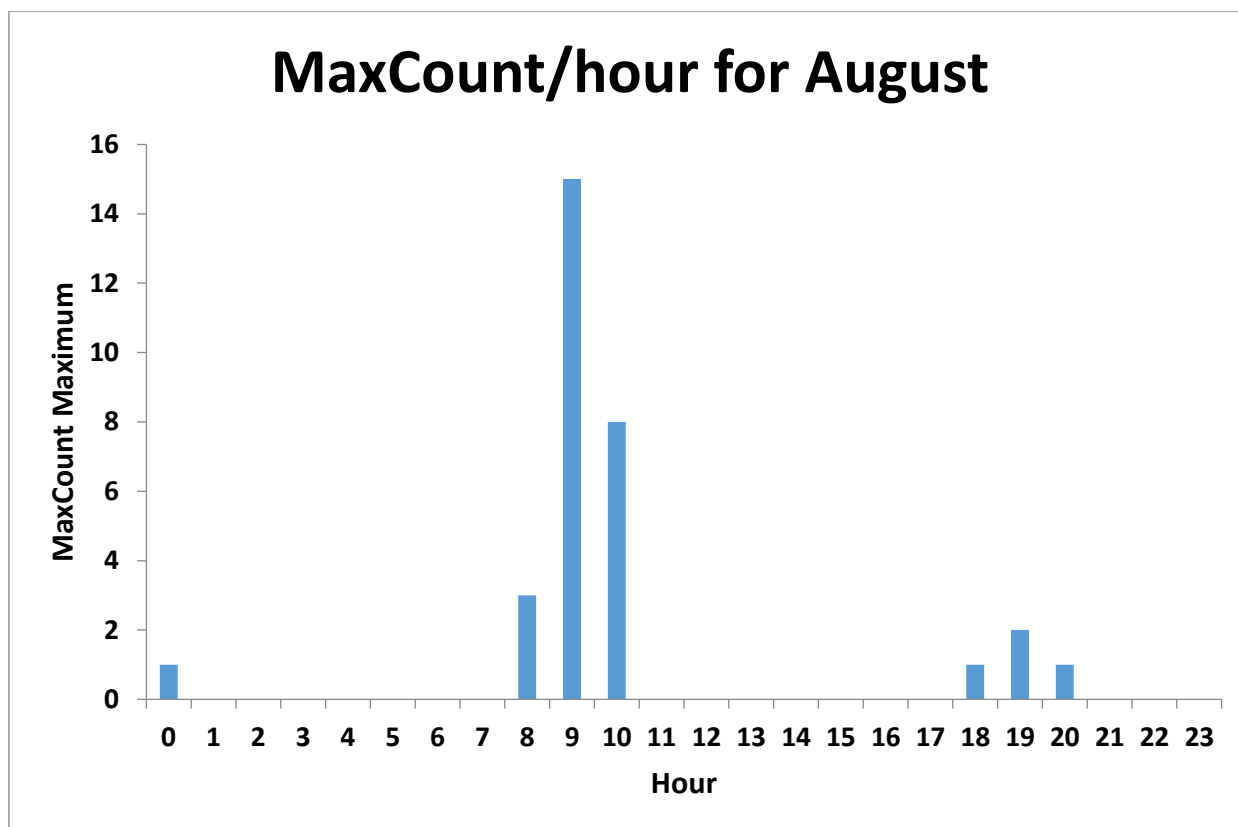
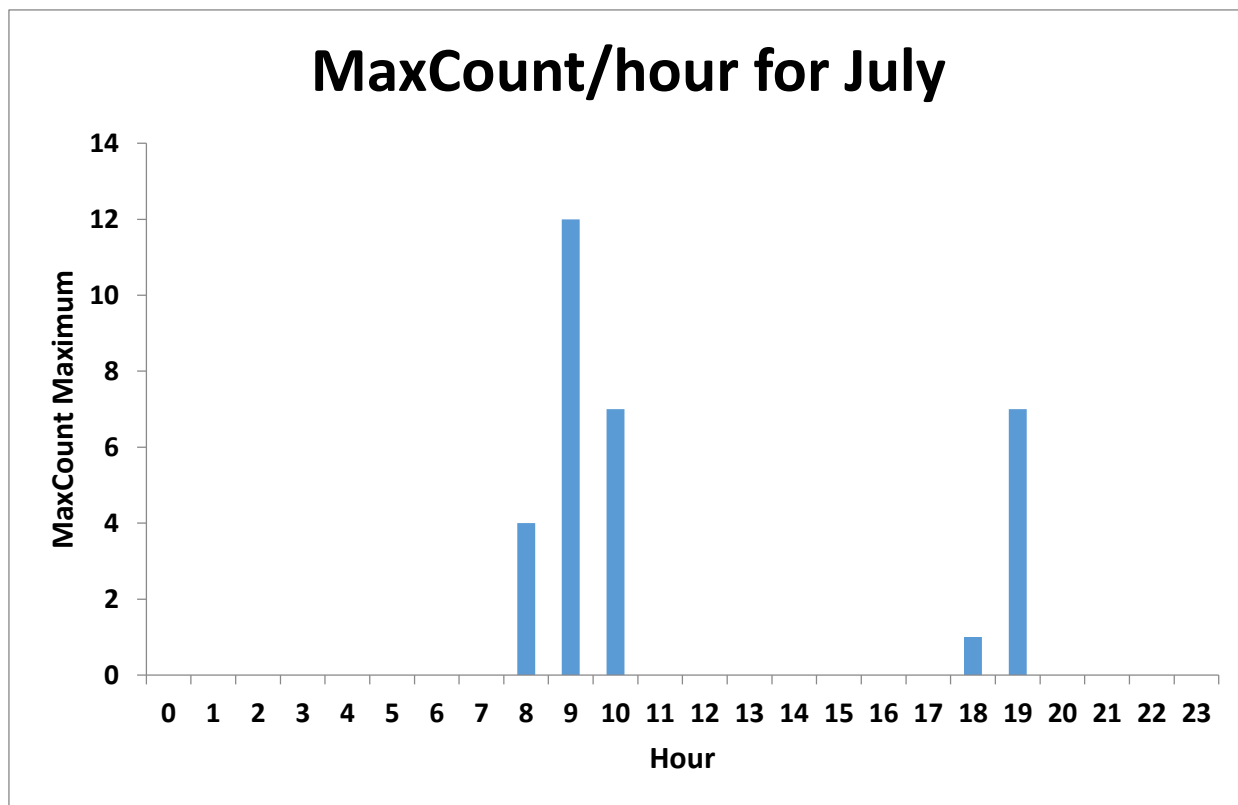
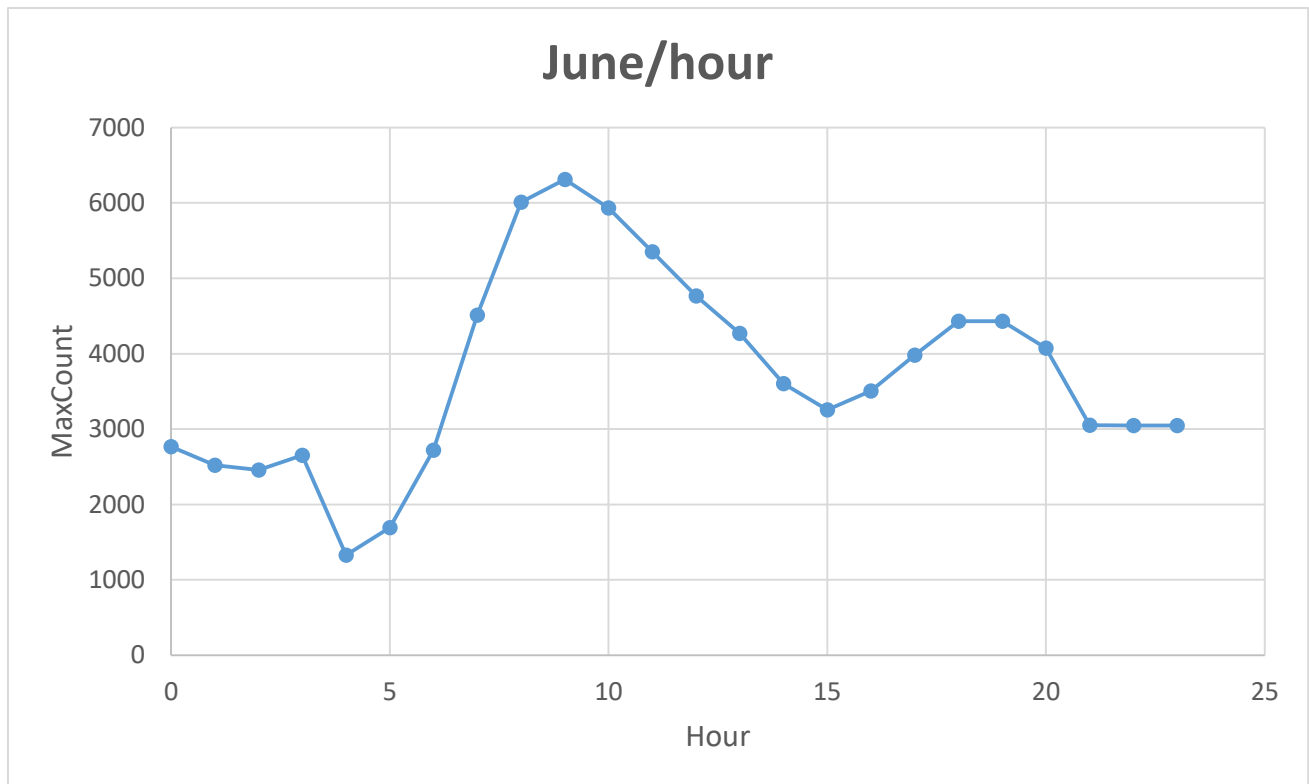
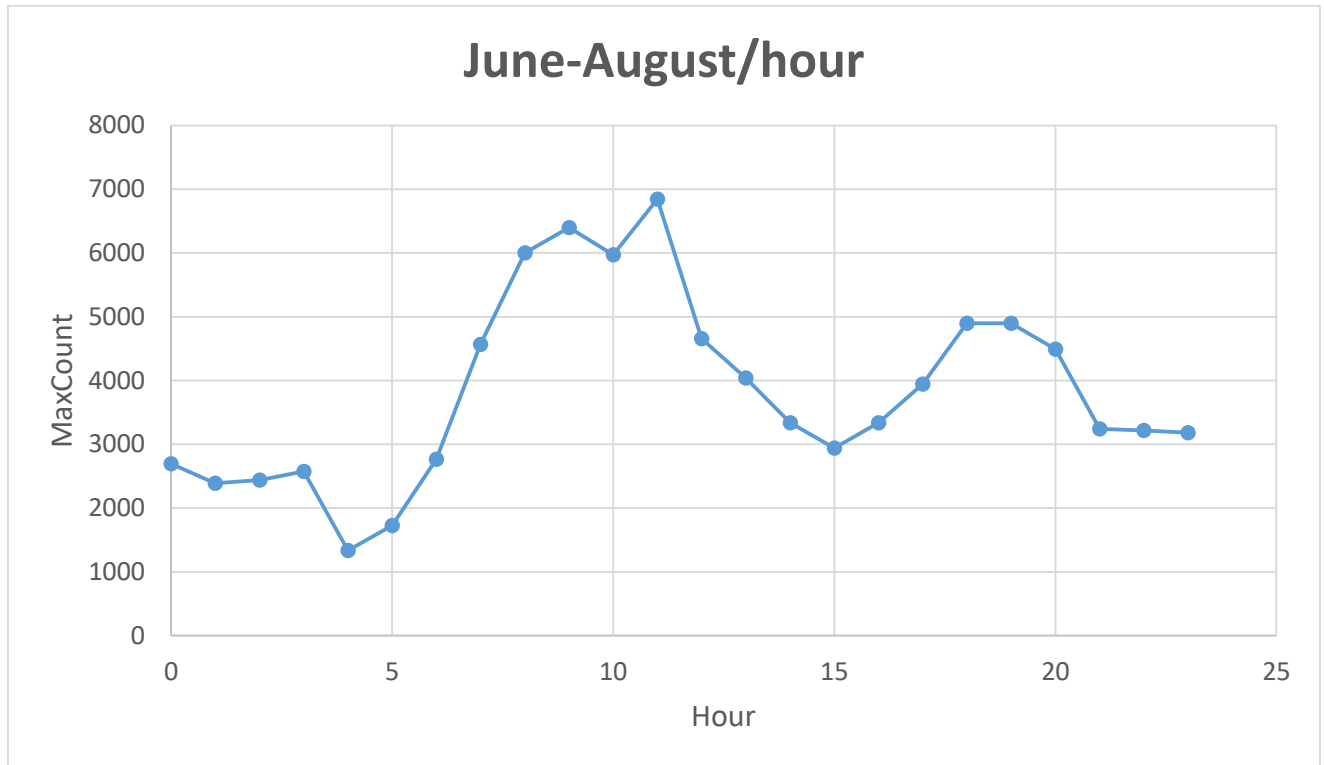




Figure 2



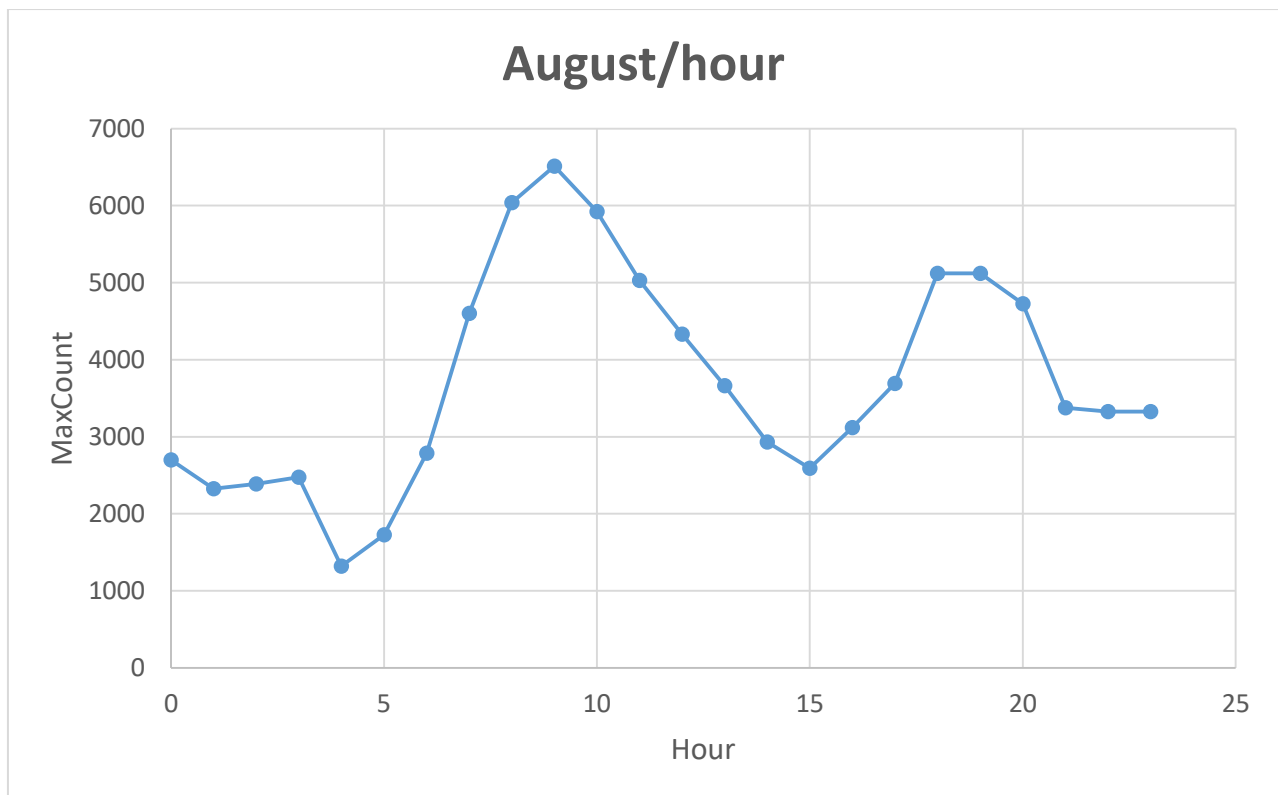
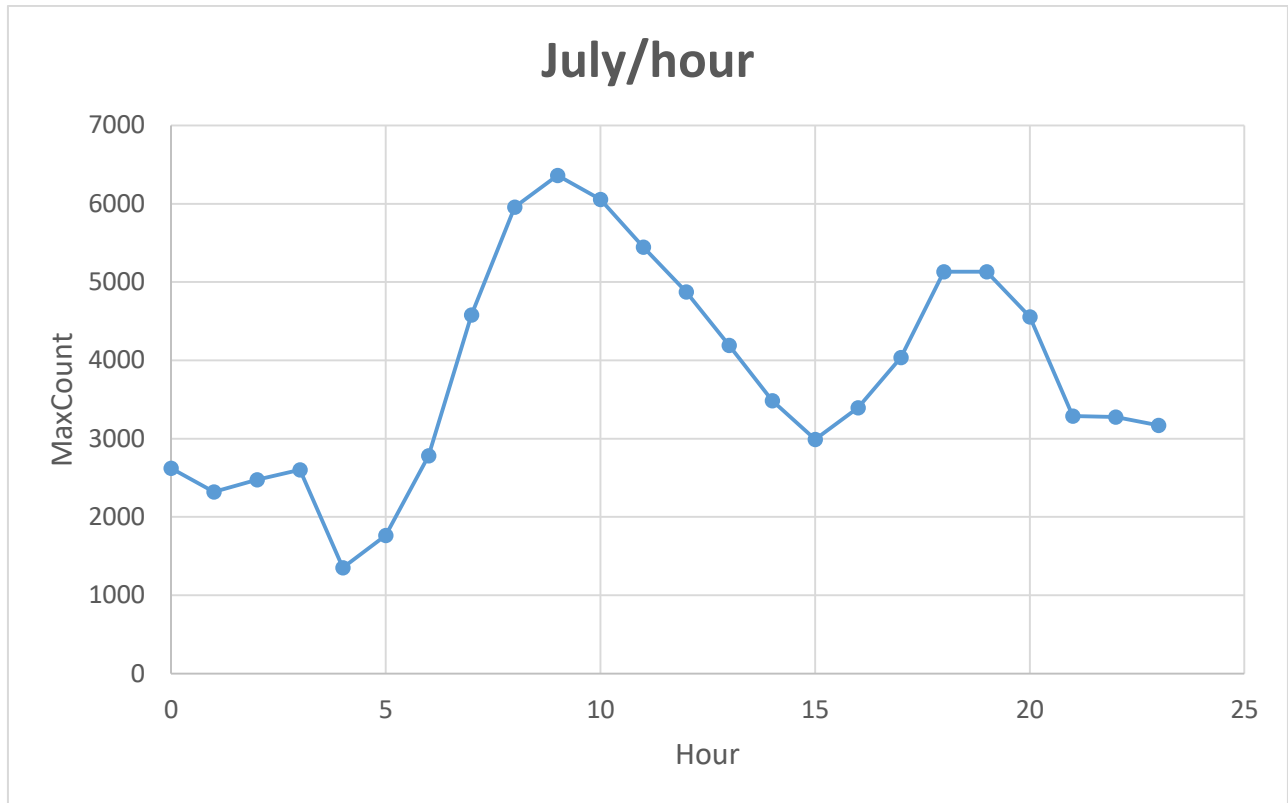


Figure 3

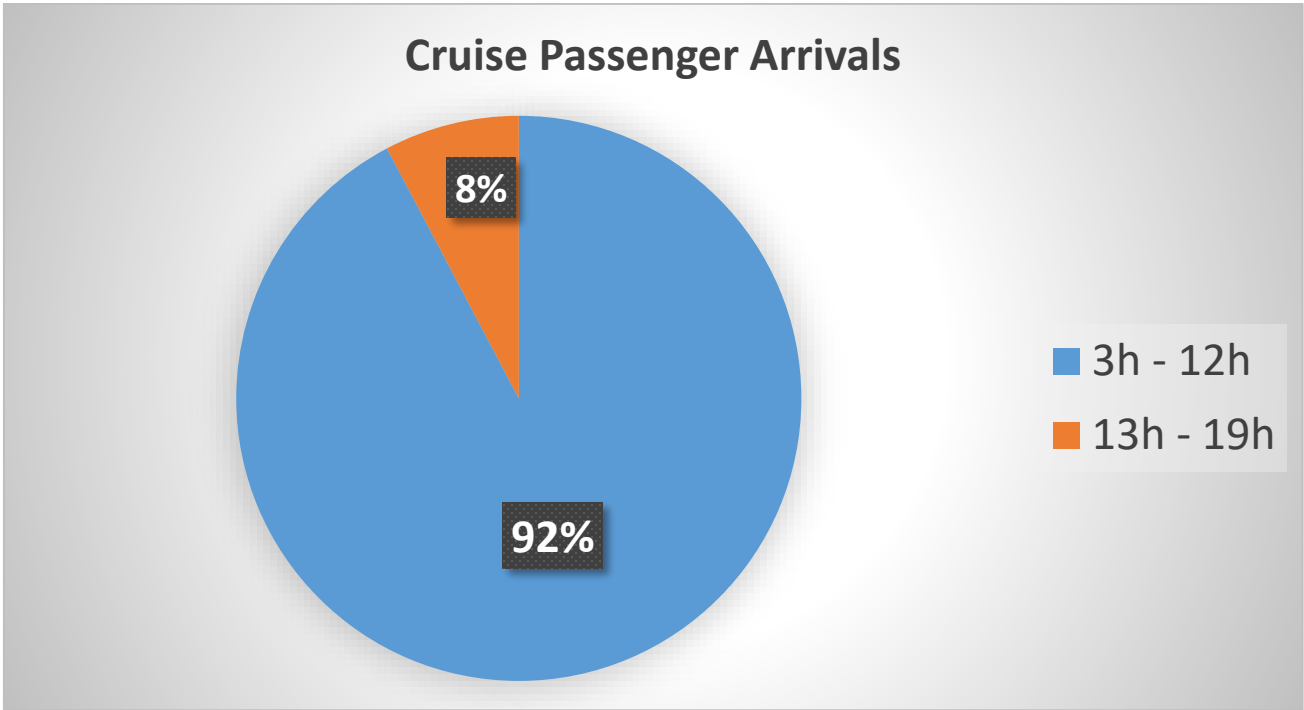


Figure 4

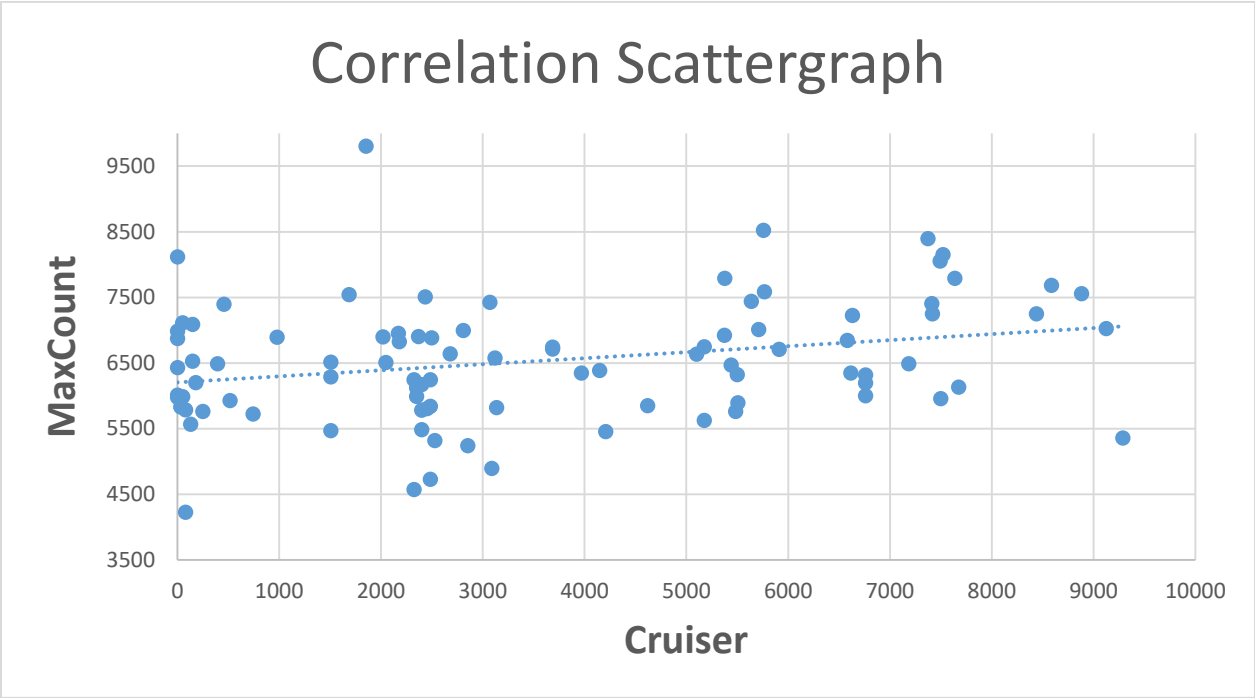
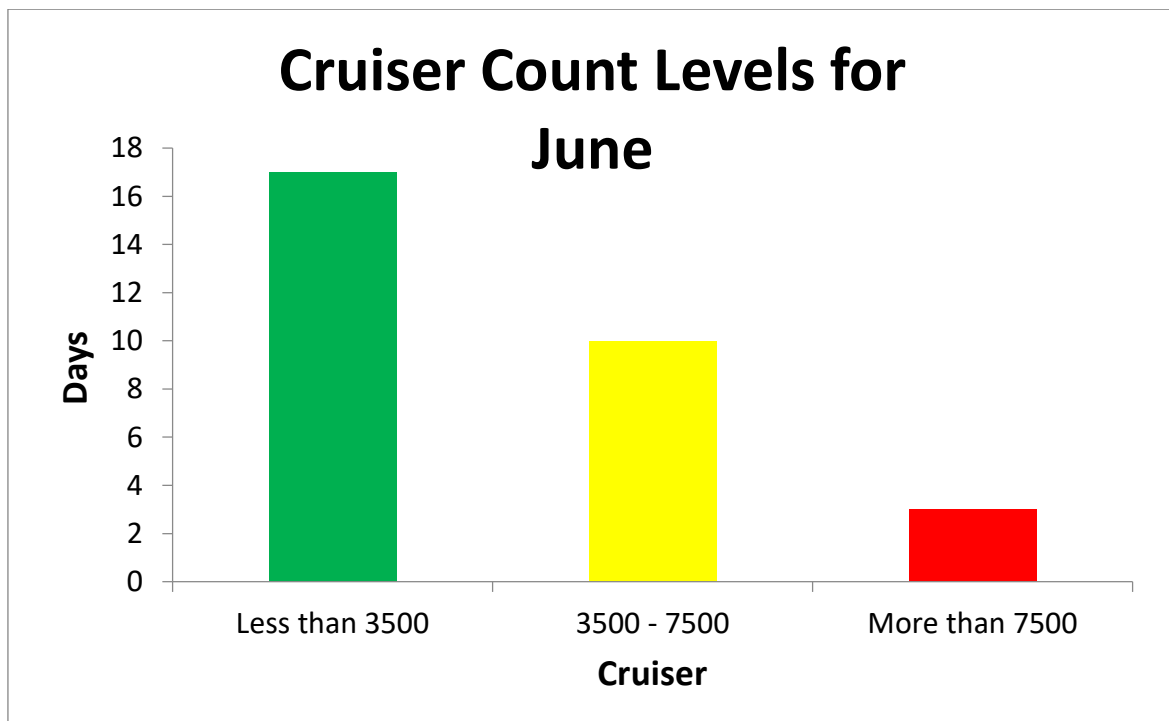
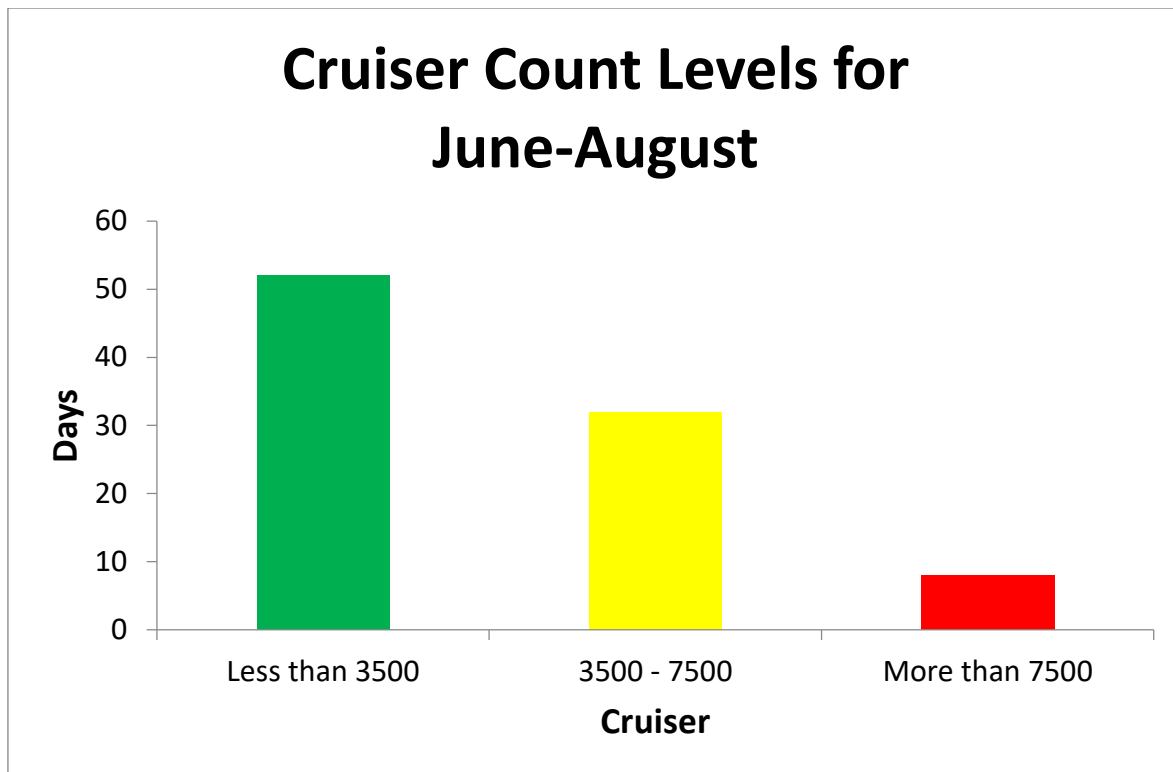
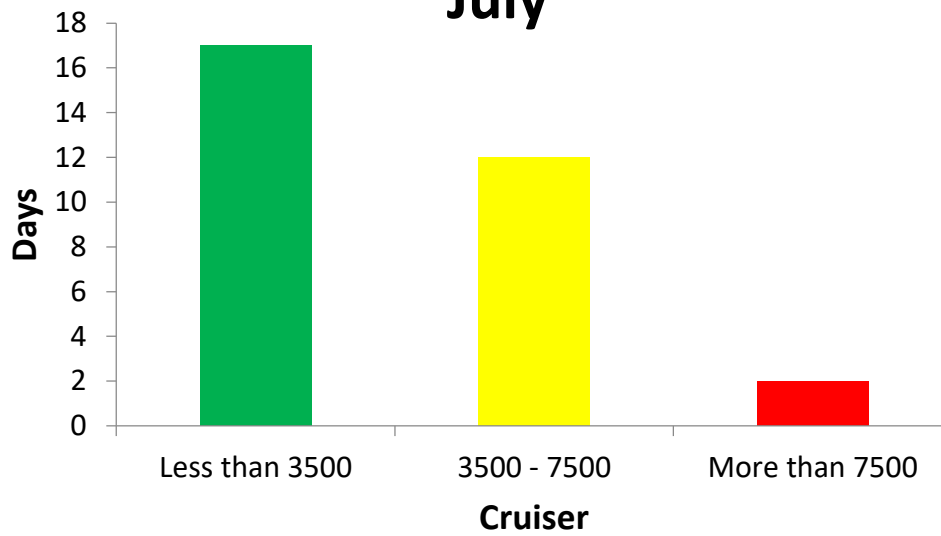


Figure 5



## Cruiser Count Levels for July



## Cruiser Count Levels for August

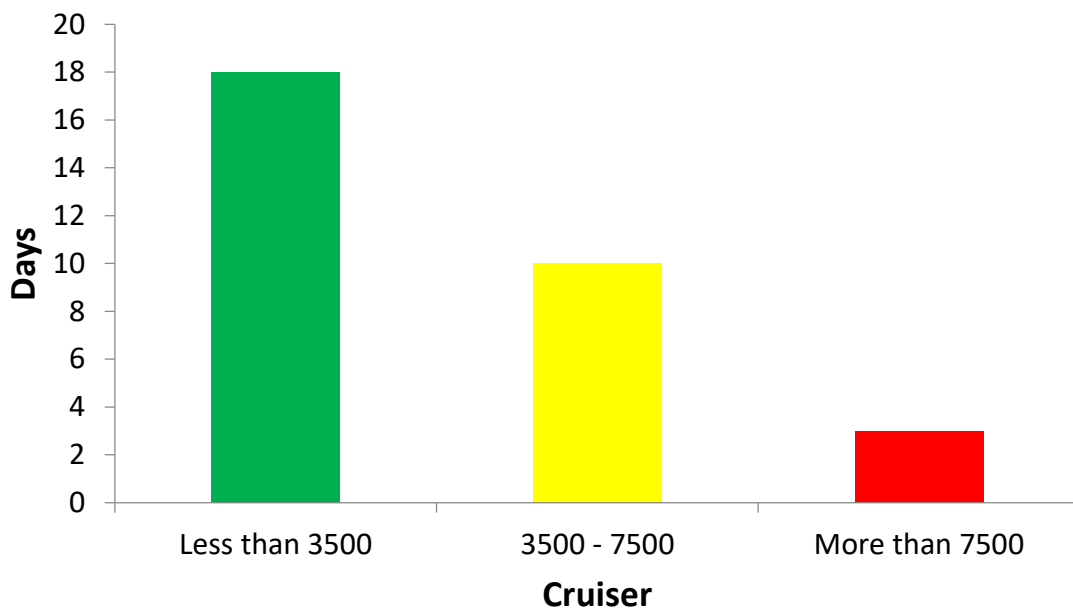


Figure 6

