





## Impact of Covid-19 Pandemic on Public Aquariums in Turkey

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### Abstract

In order to reduce the dispersing of the Coronavirus disease 2019 (COVID-19), countries worldwide placed limitations on social interactions including closures of public aquariums. Fifteen public aquarium in different cities of Turkey helped economic growth of cities before covid-19 pandemic. Effects of the COVID-19 global pandemic on public aquariums in Turkey were investigated. Data collected from four representative samples of the public aquariums. A face-to-face survey method used. Forty-one questions were asked. Based on the survey, COVID-19 has affected virtually all aspects of the public aquariums. Prolonged and repetitive COVID-19 public aquarium closures led to an abrupt cessation of visitors within Turkey public aquariums. The number of visitors decreased by 37.5%. Activities of public aquariums decreased by 100% in one aquarium, 25% and 5% in other two aquariums. The number of workers in all public aquariums decreased by 25% during COVID-19. 100% of public aquariums did not promote by the government and /or any other organization. 25% of public aquariums observed stress in aquarium animals in post COVID-19 pandemic. These results suggest variable impacts of COVID-19 closures, reflecting public aquariums and government interactions. The findings from this research may be useful in the advance readiness of public aquariums against disaster like COVID-19. Moreover, we suggest a national organization to be established and named as ‘‘Turkish Public Aquariums Group’’ including all public aquariums in Turkey.

### Keywords:

*COVID-19, survey, visitors, fiscal aid, government*

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## Introduction

First public aquarium established at the London Zoo in England in 1853. Several decades before that date Japan displayed sea fish and creatures that had never been seen before by the public. Nevertheless, these public aquariums were not recorded in history books. Bella public aquarium established in 1904 in Michigan America. It is the oldest public aquarium continually operating in the world. Establishment of public aquariums in Europe, North America and Japan escalated in 1970. First Public aquarium in Turkey was established in 2009. Çelik & Yalçın-Ülger (2020) have studied current statuses of public aquariums in Turkey. The authors indicated 13 public aquariums located in different cities in Turkey (Çelik & Yalçın-Ülger, 2020).

Coronavirus disease 2019 (COVID-19) was first reported from Wuhan, China, on 31 December 2019 and The World Health Organization (WHO) declared the outbreak a pandemic on 11 March 2020. Thereafter COVID-19 has altered human interactions, society, and economies rapidly and badly. Governments around the world are including Turkey implemented lockdowns, improved hygiene and social distancing to reduce human contact. During COVID-19 and lockdown periods, few studies performed relating to public aquariums. Giannetto & Innal (2021) did one of these studies. In the study, status of endemic freshwater fish fauna inhabiting major Lakes of Turkey investigated. The authors (Giannetto & Innal, 2021) reported 62 endemic fish species. Climate change and anthropogenic disturbances were found to be the threats that most affect the fish communities of the considered Turkish Lakes. These fish species can be protected by taking them in public aquariums. During COVID-19 pandemic, Aydın (2021) carried an important second study on public aquariums. Twenty-six small-spotted catshark, *Scyliorhinus canicula*, transferred from catch to the public aquarium for the exhibition (Aydın, 2021). Impact of COVID-19 pandemic on public aquariums in Turkey has not investigated.

The aim of this study was to evaluate the effects of COVID-19 pandemic on some parameters of public aquariums in Turkey.

## Materials and Methods

Data was collected at four different public aquariums. Data collection was performed when lockdown was cancelled, at the beginning of 2022. These four public aquariums were particularly chosen which were the most popular and profitable aquariums before COVID-19 pandemic. Participants were asked to complete a survey that was face to face. Parameters for participation included executives over a certain age and currently directing the public aquarium. In order to ensure minimal image anxiety experienced by the participants, the questionnaire was limited to 41 questions. Limited demographic questions were asked, as the objective of the present study was to investigate the impact of the COVID-19 pandemic on public aquariums. Data collection limitations existed and the participants did not answer some questions. Those questions eliminated. Measurement was an educational affective survey designed to collect quantitative data. Answers

were a selected response item format; answers were either yes/no. Multiple-choice questions were also asked. Table 1 provides a detailed overview of survey questions.

Table 1. Sample survey questions distributed to directors in order to find out the impact of COVID-19 Pandemic on public aquariums

<b>Pre-COVID-19 Pandemic Survey Specific Questions</b> (Represented by YES/NO values)	<b>Post-COVID-19 Pandemic Survey Specific Questions</b> (Represented by YES/NO values)	<b>Pre-COVID-19 Pandemic Survey Specific Questions</b> (Represented by MULTIPLE CHOICES values)	<b>Post-COVID-19 Pandemic Survey Specific Questions</b> (Represented by MULTIPLE CHOICES values)
Are any displaying shows exist during the week and at the weekend (If yes how often?)	Are any displaying shows exist during the week and at the weekend (If yes how often?)	What were your activities in the public aquarium	What were your activities in the public aquarium
Do you artificially producing any fish species (If yes, how many species do you propagate and are there any endangered species?)	Do you artificially producing any fish species (If yes, how many species do you propagate and are there any endangered species?)	Are you a member of any organization	Are you a member of any organization
Do you observe any changes in animal behavior?	Do you observe any changes in animal behavior?	How much does it cost to visit the aquarium?	How much does it cost to visit the aquarium?
Has any change been observed in the amount of feed consumed by the animals (If yes, how, increased, decreased?)	Has any change been observed in the amount of feed consumed by the animals (If yes, how, increased, decreased?)	How many executive staff do you have	How many executive staff do you have
Did you get any economic support from the government and/or any other organization (If yes indicate how much)	Did you get any economic support from the government and/or any other organization (If yes indicate how much) due to the COVID-19 pandemic,	What is expertise area of general director in public aquarium	What is expertise area of general director in public aquarium
		What was daily average visitors before COVID-19 pandemic	What was daily average visitors after COVID-19 pandemic
		Was there any decrease in the number of visitors when close-ended during COVID-19 pandemic	Was there any decrease in the number of visitors when close-ended during COVID-19 pandemic
		Was there any increase in the number of visitors when close-ended during COVID-19 pandemic	Was there any increase in the number of visitors when close-ended during COVID-19 pandemic
		How many months were your aquarium closed to visitors due to the pandemic	How many months were your aquarium closed to visitors due to the pandemic
		How many people were working in your organization	How many people were working in your organization

## Results

### *Public Aquariums in Turkey*

Based on the present study, currently, there are 15 public aquariums in Turkey. Of these 87%, belong to the private organization. 13%, Ortahisar and Gaziantep public aquariums are belong to the municipality. Five of them located in Istanbul, 3 located in Ankara. The other public aquariums are located one in each city and these cities are Antalya, Bursa, Diyarbakır, Trabzon, Eskişehir, Gaziantep and İzmir (Figure 1). First public aquarium in Turkey was installed in 2009 in Istanbul and first named as Turkuazoo then the company changed and the public Aquarium renamed as Istanbul Sea Life Aquarium. The Istanbul Sea Life Aquarium is the largest public aquarium in Turkey. Last public aquarium installed and opened on 19 May 2022 in Ortahisar Trabzon. Ortahisar public aquarium is distinct from other public aquariums, by connecting two valleys with a tunnel. Gaziantep Aquarium has made artificial marine aquarium fish production. This is most important characteristic of the aquarium (personal communication). Only two public aquariums are member of organization (WAZA, IZUG and CWE).

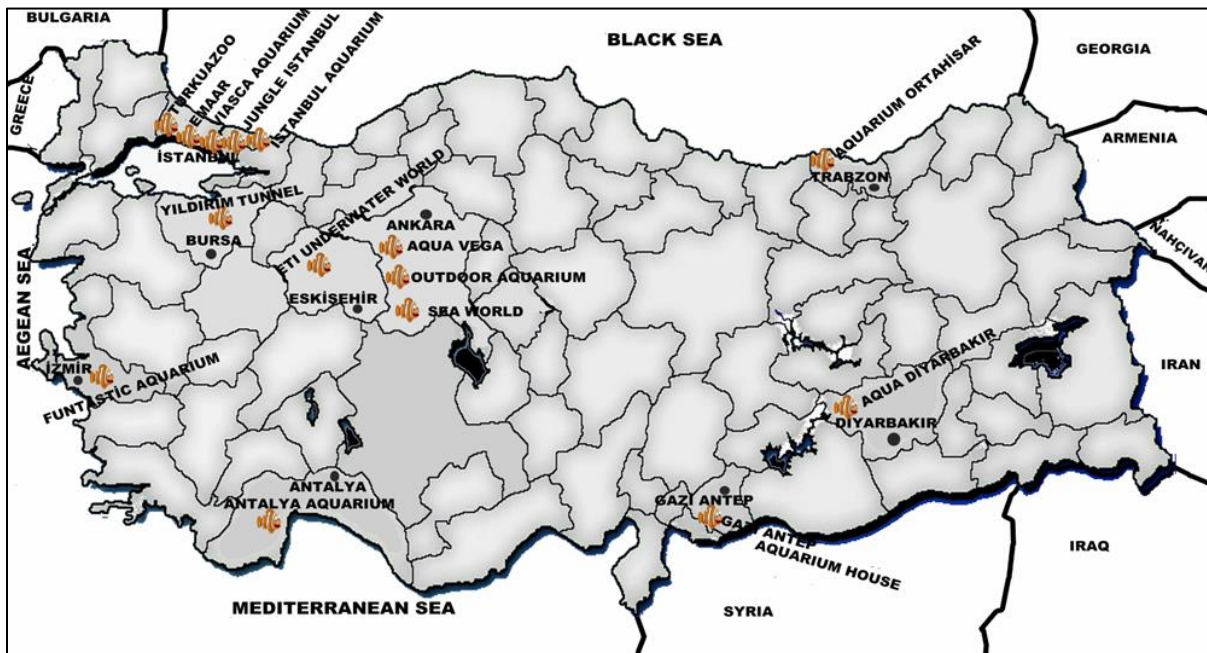


Figure 1. Map showing location of public aquariums in Turkey. (As of May 2022), Istanbul, Ankara, Izmir, Antalya, Bursa, Diyarbakır, Eskişehir (Çelik & Yalçın, 2020), Trabzon and Gaziantep, from present study

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Activities of public aquariums during COVID-19 pandemic decreased in three public aquariums in different percentages (In first one decreasing rate was, 100%, in second public aquarium, decreasing rate was 25% and in third aquarium 5% decreasing rate was recorded) and 11% increase in one aquarium (Figure 2A). The number of workers during COVID-19 pandemic decreased in all public aquariums. The rate was 25% in all of them. The job of executives was found to be secure during COVID-19 pandemic and executives did not lose their job (Figure 2B). 75% of shows decreased in public aquariums during covid-19 pandemic while 25% were still used scuba diving (Figure 3A). According to our survey, the number of visitors was severely affected by the COVID-19 pandemic. Those four public aquariums suffered their worst year on record in 2020 with visitors decreasing by 37.5% according to the survey (Figure 3B). Based on the survey, 25% of public aquariums observed animal stress after COVID-19 pandemic (Figure 3C). All public aquariums affected by the COVID-19 pandemic and 100% of public aquariums did not promote any fiscal aid from Turkish government and/or any other organization (Figure 3D). 33% of decrease in the production of animal species recorded (Figure 4A). Public aquariums entry fee gradually increased from 2019 to 2022 (Figure 4B). Entry fee for student increased from 35 Turkish lira (TL) to 100 TL (Figure 4B). Entry fee increased in all public aquariums by 285%. Minimum average entry fee for adults was  $48.75 \pm 7.81$ . Whereas, maximum average entry fee for adults was  $130.5 \pm 21.57$  (Figure 4B).

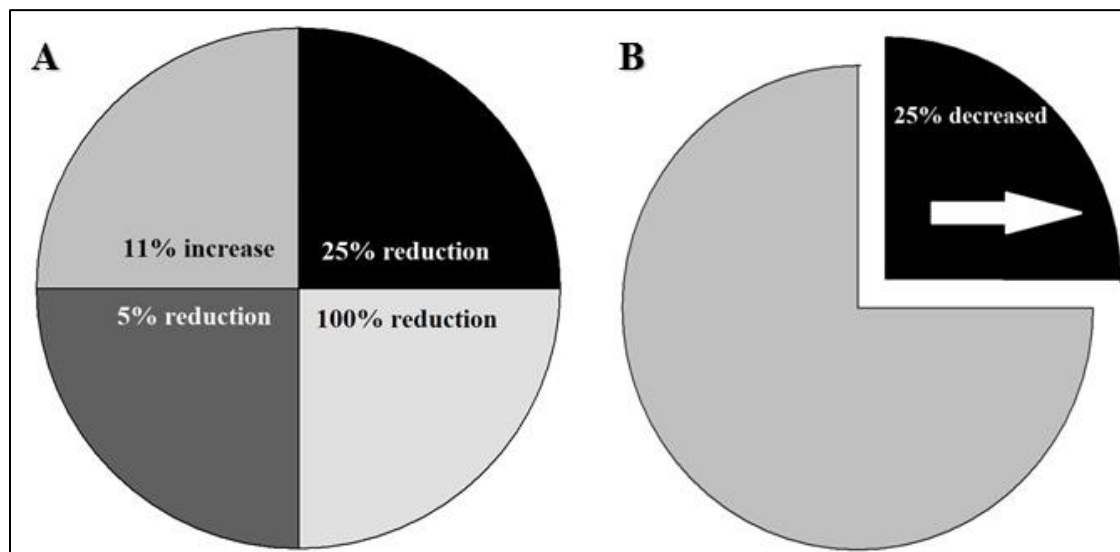


Figure 2. A) Decrease and increase in the activities of public aquariums during COVID-19 pandemic are shown, B) Decreasing in the number of workers during COVID-19 pandemic is given

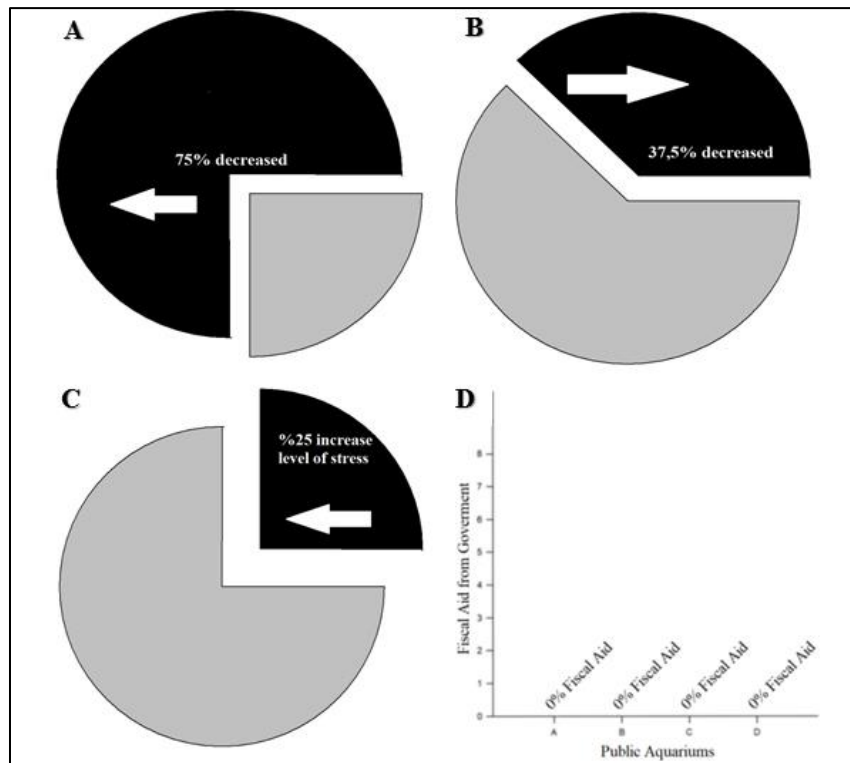


Figure 3. A) Demonstrations decreased by 75% in public aquariums during COVID-19 pandemic, B) Decrease in the number of visitors are given, C) 25% of public aquariums observed animal stress after COVID-19 pandemic, D) No economic aid were provided by the government or any other establishment

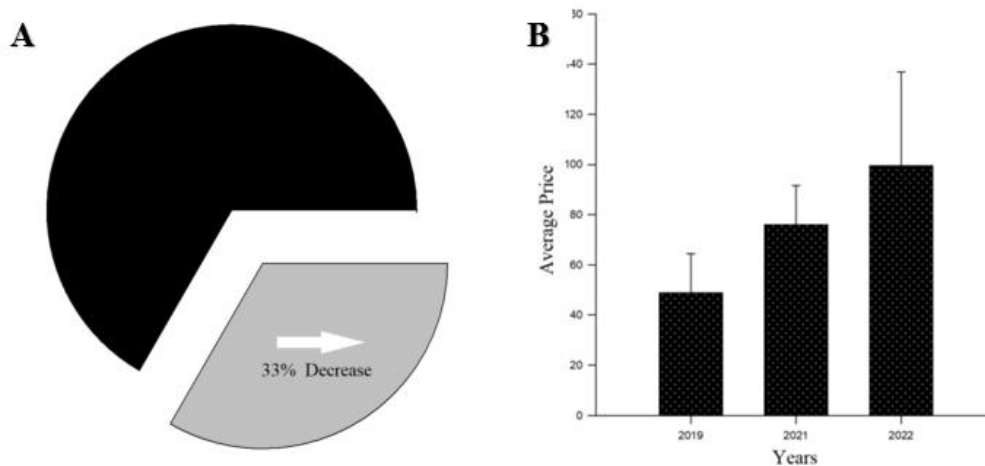


Figure 4. A) Decrease in the production of species in public aquariums during COVID-19 pandemic shown, B) Gradual increase in the entry price to public aquariums are given

## **Discussion**

During the COVID-19 pandemic, very few studies on public aquariums carried out in Turkey. Aydın (2021) did one of those studies. The author indicated that the supply of the species to be exhibited in public aquariums was one of the most important issues. Therefore, 26 living small-spotted catshark was successfully caught and transferred to public aquariums by the author. Other study briefly observed public aquariums and indicated that only one public aquarium is member of international organization (Avcı et al., 2021). Çelik & Yalçın-Ülger (2020) did most important study where they noted 13 public aquariums in Turkey. According to the present study, 15 public aquariums are currently operating in Turkey. Recently, one public aquarium in Hatay has been started in Project level (Personal communication). There is one more public aquarium, which is located in Gaziantep Zoo. This public aquarium is one of the prominent public aquariums of Turkey due to its various features despite not being included in the classification of public aquariums in Turkey. Artificial production of some valuable sea fish species are successfully done in Gaziantep public aquarium. One public aquarium in Trabzon Ortahisar constructed and opened on 19 May 2022.

Associations regarding to public aquariums are classified as; World Association of Zoos and Aquariums (WAZA), The European Association of Zoos and Aquariums (EAZA) and the Association of Zoos and Aquariums (AZA), International Zoo Veterinary Group (IZUG) and Conservation Welfare Engagement (CWE). According to Avcı et al. (2021) 34 public aquariums in Germany, 13 in UK, 9 in France and one in Turkey are members of several associations. In our study, in Turkey it has been determined that only two public aquariums are members of those associations by meeting the required standards. Of these, one is a member of WAZA and the other is member of IZUG and CWE.

Massive COVID-19 impact has been recorded particularly in tourism sector, however no direct national or international investigations has been done on public aquariums. In our survey, we may not address all questions and problems seen during the COVID-19 pandemic but we highlighted major difficulties seen during the pandemic.

Because of COVID-19 pandemic has caused uncertainty and instability for the activities to be carried out in the public aquariums. Activities such as, Diving in aquarium, photo shooting, animation, organization of public aquariums during COVID-19 pandemic decreased in three public aquariums in different percentages. 100%, 25% and 5% of dropping in the activities of public aquariums was recorded. Government decisions such as domestic travel restrictions, restriction of public transportation and age-based lockdown has caused the majority of public aquariums to cease their activities. Only one aquarium declared 11% increase in their activities during COVID-19 pandemic however, there was no justification and we interpreted as unreasonable reply.

In our survey, visitors to public aquariums decreased by 37.5%. This was the actual effects of visitor's restriction in order to reduce the spread of infections. However, what actually caused this decrease is unclear. Because visiting restrictions had been one out of many precautions for COVID-19 infection control. Such as, visitor, transportation restrictions and age-related lock down restrictions. Those restrictions implemented within Turkey during the pandemic.

Williams et al. (2021) studied impacts of COVID-19 pandemic on animals in zoos. The authors suggested variable impacts of COVID-19 closures and reopening, reflecting human-animal interaction literature. They highlighted the potential for some species to take longer re-habituate to the presence of zoo visitors (Williams et al., 2021). Based on the current survey, public aquariums in Turkey, observed signs of negative affect in their animals at the end of the COVID-19 pandemic. 25% of public aquariums observed stress in their aquarium species. When public aquariums were closed to the public, a welfare issue was identified in the reduction of human interaction with the animals. The human-animal interaction was found out to be very important to the welfare of some captive animals (Marras Tate, 2022). This interesting study was on garden eels. Garden eels were found to be particularly susceptible to isolation from humans. Ng et al. (2021) also investigated human animal interactions. They outlined the impact of the pandemic on human animal interactions and suggested preparations for post-pandemic re-entry into the community with animals. These findings are similar to our survey.

Fine et al. (2022) investigated the impact of COVID-19 pandemic on a zoological institution. Their survey results revealed that the top two perceived challenges to the conservation projects at the Saint Louis Zoo due to the COVID-19 pandemic were lack of funding (83.9%) reduction in Zoo visitors (56.3%) (Fine et al., 2022). Zoos everywhere were facing financial collapse. The lockdowns implemented in response to the COVID-19 pandemic have forced zoos and aquariums to close their doors to the public, thereby ending their primary source of income (Pepper & Voigt, 2021). The authors interestingly suggested that governments declare zoos and public aquariums as sanctuaries places. Even in context where zoos were allowed to reopen, ongoing physical distancing requirements typically reduce visitor numbers (Loeb, 2021).

The unprecedented economic shock of the COVID-19 pandemic has promoted Turkish government to financially support jobs, live hoods and distressed businesses such tourism but not public aquariums. 100% of public aquariums did not promote by the government and /or any other organization. Public aquariums play an important role in freshwater biodiversity conservation through activities including species reintroduction programs, habitat restoration, education programs and ex-situ research programs (Cooke et al., 2021). The global COVID-19 pandemic has had serious financial implications for numerous non-profit organizations such as public aquariums that rely heavily on ticket and membership sales, along with donations to operate. Ticket prices increased from 35 Turkish liras (TL) to 100 TL. Indicating fiscal hardship in public aquariums in Turkey (Current study). WAZA, EAZA, WCS and AZA (WAZA, AZA, 2020; WCS 2022) called emergency operating funds for public aquariums. However only two public aquariums were the



member of such organizations in Turkey. This organization asked for the protection of professionals who were essential for taking care of animals. During the pandemic, they had been required to report to work continuously, even when the aquarium had been closed to the public, because the public aquarium is home for the animals. The Australian Federal Government released a \$94.6 million package to Zoo and Aquarium Association (ZAA) accredited zoos and public aquariums to the ongoing provision of animal care (Baptista et al., 2021). Public aquariums in US, Europe get financial support but not public aquariums in Turkey. The main reason for not getting any fiscal aid from Turkish government was that most of the public aquariums (87%) in Turkey are non-governmental organizations. Based on our survey, the number of workers in all public aquariums decreased by 25% during COVID-19 pandemic. Only, executives kept their management positions and jobs by 100%.

In conclusion, the global COVID-19 pandemic threatened all Turkish public aquariums that care for animals. It seems that public aquariums in Turkey were not well prepared for any kind of earthquake, flooding, tsunami and infectious diseases like COVID-19 pandemic. Therefore for sustainability of public aquariums during crises, public aquariums, must take precautions against unprecedented disasters. Saving emergency funds, appropriate insurance coverage, contingency plans for public aquariums, clear communications between and within aquariums, a crisis response group, and support systems for animal care providers can be count. Moreover, a spontaneous formation of an organisation, a national organisation on public aquariums would had been helpful during covid-19 pandemic. Thereby, we suggest the name of this organisation as ‘‘ Turkish Public Aquariums Group’’.

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### **Author Contributions**

G.A. writing survey questions, data collection by face-to-face survey questions. S.Ç.Y. Supervision conceived the idea and wrote the paper. Both authors read the final version of the manuscript and approved it for publication.

### **Conflict of Interest**

The authors declare that they have no conflict of interest.

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