TOLEDO ZOO
CONSERVATION

2019 ANNUAL REPORT

TOLEDO ZOO & AQUARIUM

CONTENTS

INSPIRING OTHERS TO JOIN US IN CARING FOR ANIMALS

CONSERVING THE NATURAL WORLD.

TOLEDOZOO.ORG/CONSERVATION

TOLEDO ZOO CONSERVATION IN ACTION!

ARCTIC
Supporting **Polar Bear International's** work conserving the **Polar Bear** and partnering with the **Alaska SeaLife Center** to assist with research and recovery efforts for the **Steller's Eider**.


Polar Bear


Steller's Eider

MICHIGAN

Rescue-rearing and releasing **Piping Plovers** from abandoned nests at **Sleeping Bear Dunes State Park** where the endangered birds congregate prior to migration.

MICHIGAN & OHIO

Captive breeding, reintroduction and research of the endangered **Karner Blue Butterfly**.

WYOMING

Surveying and monitoring **Wyoming Toad** populations in **Laramie Basin, Albany County**.

OHIO

Rearing more than 500 **Hellbender salamanders** in conjunction with Penta Career Center for release into portions of their former range in **eastern and southern Ohio**.


Installing more than 40+ acres of **native prairies** on Zoo grounds and at partner organizations throughout **northwest Ohio**.


Reintroducing **Lake Sturgeon** to the **Maumee River** with the help of partner organizations.


Researching Ohio's imperiled **turtle species,** including **Blanding's Turtles**, for 12+ years.


Researching Ohio's rare snake species, including **Kirtland's Snakes**.

INDIANA & MICHIGAN

Breeding and reintroducing endangered **Mitchell's Satyr Butterflies** to restored wetland sites.

MEXICO & OHIO

Assisting threatened **Monarch Butterfly** populations by creating summer habitats in our native prairies and rearing and releasing approximately 1,000 butterflies for their annual migration to over-wintering areas in **Mexico**.

CUBA

Working with the US Navy to use radio telemetry to track the habitat use and activity patterns of the largest snake in the Caribbean, the **Cuban Boa**.

ARUBA

Conserving the **Aruba Island Rattlesnake** through research and education for the last 27+ years.

TANZANIA

Utilizing our captive breeding program to reintroduce more than 600 **Kihansi Spray Toads** into their native **Kihansi Gorge**.

CHINA

Supporting the **Scaly-sided Merganser Task Force** in efforts to bolster population numbers and increase healthy habitat for this endangered bird.

TASMANIA

Partnering with **Save the Tasmanian Devil Program** to support species recovery from Devil Facial Tumour Disease.

NORTH EAST CHINA

Managing the US assurance population of critically endangered **Amur Leopards**.

KYRGYZSTAN

Participating in **Snow Leopard** radio collaring efforts with Panthera.

PACIFIC ISLANDS
Conserving several species of imperiled **Pacific birds**, including translocation efforts to sanctuary islands.


Pink-necked Fruit Dove


Many-colored Fruit Dove

MARIANAS ISLAND

AMERICAN SAMOA

SOLOMON ISLANDS

NEW ZEALAND

Aiding **Kiwis for Kiwi** efforts to conserve this iconic nocturnal bird species.

REPRODUCTIVE BIOLOGY OF THE CUBAN BOA

2003–present

The Toledo Zoo Conservation staff has been working with the U.S. Navy to carry out research on the Cuban boa, *Chilabothrus angulifer*, on Naval Station Guantánamo Bay (NSGB) for nearly 20 years. The result has been the collection of data on home range, habitat use, prey preferences, and reproductive biology that is unparalleled since the description of this species in 1843. Our current work focuses on the reproductive biology of the Cuban boa, including courtship, gestation, and reproductive effort of the females. In 2019, 14 Cuban boas were radio-tracked, yielding courtship, movement, and home range data. The snakes generally maintain similarly -sized home ranges from year-to-year, but seem to make long-distance movements every 3-4 years. The highlight of 2019 was getting reproductive data on two new females, one of which had a litter of neonates that were the heaviest and longest on record at NSGB.

TASMANIAN DEVIL MONITORING PROJECT

2014–present

This long-term project, monitoring the populations of Tasmanian Devils in areas affected by the contagious Devil Facial Tumor Disease (DFTD) has been ongoing since 2014. Eight sites are monitored annually and the findings directly influence management decisions for each population. In 2019, monitoring showed that six of the eight sites are persisting, and that demographic and density indicators have not changed from 2018. However, one population continues to increase steadily, while one population has declined to a low level of persistence that is typical of other long-term diseased sites. Future monitoring will elucidate if these populations stabilize.

SANTA CRUZ GROUND DOVES

2017–present

Having led an emergency mission in 2017, which resulted in the rescue and rehabilitation of 110 Santa Cruz Ground Doves confiscated from the illegal wildlife trade, Toledo Zoo conservation staff have continued their work in the Solomon Islands. 2019 saw the arrival of a new generation of captive-bred chicks and the signing of a partnership agreement with the Guadalcanal Plains Palm Oil company (an accredited member of the Roundtable on Sustainable Palm Oil, paving the way for the construction of a permanent Species Recovery Centre.

In collaboration with the Ministry of Environment, we have sustained our efforts to train animal-keeping staff and forge connections with local communities. We eventually hope to expand the remit of the project to include similar programs for other threatened endemic species.

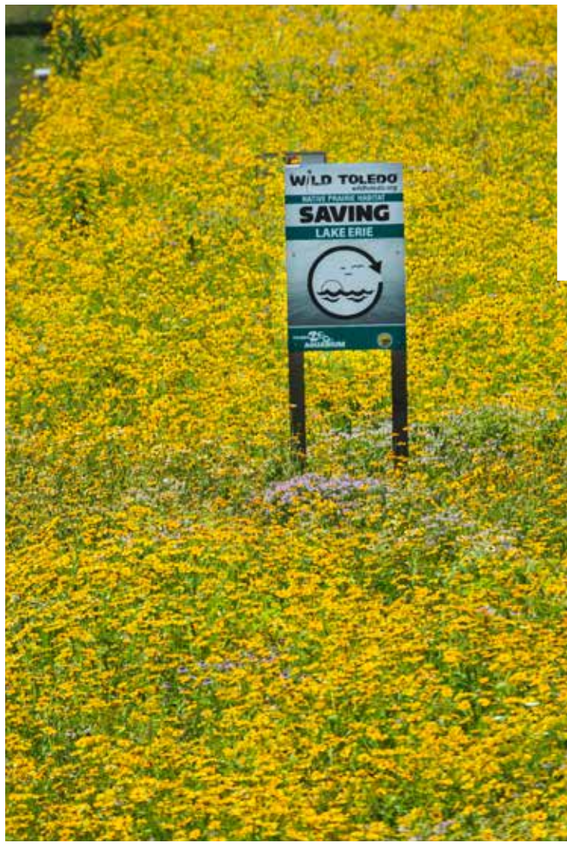
WILD TOLEDO PRAIRIE INITIATIVE

Increasing urban biodiversity

Pollinator decline is a global phenomenon driven primarily by loss of habitat and use of pesticides. Pollinators play a crucial role in food production as well as provide reproductive assistance to most flowering plants. Pollination services are estimated to be worth $217 Billion globally. The prairie initiative seeks to increase pollinator habitat by utilizing abandoned and otherwise under-utilized properties for prairie plantings.

2013–present

The Toledo Zoo started planting prairies on-grounds and on the Anthony Wayne Trail median in 2013 and have expanded the program to include over 48 plantings as of 2018. The success of the 2017 Ohio Environmental Protection Agency Conservation Education grant helped create and educational off-shoot of the prairie program named Project PRAIRIE. All three new prairie installs in 2018 were paid school sites participating in Project PRAIRIE.



NATIVE PLANT SALES

Wild Toledo began selling native plants, produced from seed at the Toledo Zoo, to employees and the general public in 2017. 2019 saw the continued expansion of that program including bi-weekly visits to the Perrysburg farmers market and several on-ground sales opportunities. In addition, a new E-commerce site at WildToledo.org was opened for business. At the new site, people can buy plants online and pick their orders up at pre-determined dates and times. The native plant sales fill a currently unoccupied niche in the local floral market for native plants while allowing Wild Toledo to spread its mission of increasing local biodiversity beyond larger areas that are suitable for prairie installations.

To capitalize on the early growth of the native plant sale business, we bought and erected a new 1600 sq.ft. Production facility. The new facility came on-line at the end of the year and is heated, allowing us to not only dramatically increase our production capacity but also head-start plants. These head-started plants will be full size and flowering in time for Mother's Day, the "Black Friday" of the nursery industry. The new facility will be open to the public for three weekends in May and two in June along with our regular Perrysburg Farmers market trips. In addition, we will be a vendor at the annual Toledo Flower Show at the Toledo Farmers Market in May.

EFFICACY OF URBAN PRAIRIES ON BIOLOGICAL DIVERSITY

Insect and small mammal diversity in the on-grounds installations have been measured since 2014, allowing us to understand the efficacy of the urban plantings. In general, urban prairie plantings result in a 20-26x increase in butterfly species abundance, ~40x increase in invertebrate species abundance and the appearance of local mammal species not often seen in the area.

In 2019 the Toledo Zoo started a new research program in collaboration with the Toledo Area Sanitary District to look at the effect of mosquito control measures on local pollinator diversity, as well as to substantially increase our biodiversity assessments in urban prairies throughout the community. This will be an ongoing project and data is still being analyzed but we have already found tens of insect families not previously found in urban prairies.

PRAIRIE UNDER GLASS

Wild Toledo staff continued to manage and diversify the plantings in the prairie greenhouse of the Promedica Museum of Natural History. The prairie roughly mimics outdoor conditions, going through a shortened and less severe winter than NW Ohio. In addition to over 50 species of prairie plants, the prairie features native box turtles and various species of native butterflies and invertebrates. Staff added over 15 new species to the prairie conservatory in 2019 and have nearly finished installing plant species labels on all plant species in the greenhouse. Staff will again expand the species diversity in 2020 as well as accession the entire collection.

PROGRAM SUSTAINABILITY

The zoo began charging for prairie installations in 2019 with resounding success. In total, over $35,000 in prairie installations were purchased and installed this year. New prairie owners were from a diverse cross-segment including small businesses, government and home-owners. The program was also bolstered by six new school prairie installations through the Project PRAIRIE program. The increased program revenue will allow Wild Toledo to add additional staff as needed to meet growing demand and turn a small profit.

Wild Toledo also received a $5000 grant from the Stranahan Foundation that will be put towards the purchase of a new work truck for the program. This addition, along with more part-time employees will allow the program to continue expansion in 2020.

NATIVE BUTTERFLY CONSERVATION

Research and captive rearing of imperiled butterflies in the region
Lepidopteran species function as ecological indicator species. The relative health of the local environment is reflective on the presence and persistence of many sensitive lepidopteran species. Environmental damage and loss of habitat has led to a global reduction in Lepidopteran abundance by more than 20% with some species such as monarchs declining upwards of 94%. insect families not previously found in urban prairies.

1997–present
Toledo Zoo conservation staff have been working with local and Federal stake-holders to help conserve butterflies since 1997. In 2018, the butterfly program was awarded a two-year, $50,000 grant from USFWS for the purchase of a low-temperature growth chamber to be used to overwinter larvae and eggs as well as outfit the new butterfly conservation lab in the Promedica Museum of Natural History. The new lab opened in May of 2019 as a state-of-the art lepidopteran conservation facility. The first butterflies were brought into the lab in June 2019.

MONARCH

Danaus plexippus plexippus
The overwintering monarch population in Mexico has seen a 90-95% reduction of its highest population numbers. As with most pollinators, the plight of the monarch is closely tied to loss of suitable breeding habitat and an increased use of pesticides across their home range. The Toledo Zoo released 960 tagged, migratory monarchs during the 2019 season, roughly matching prior years. All releases were performed by the education department during regular afternoon releases in Nature's Neighborhood.

With plant production moving to the new greenhouse, the old conservation greenhouse now serves entirely as a monarch rearing facility. This increase in space should allow us to increase our monarch rearing capacity and potentially provide more release opportunities for the public in 2020.

MITCHELL'S SATYR

Neonympha mitchellii mitchellii
The 2019 season was again marked by declines across the remaining populations of satyrs. Our revised permit allowed us to expand collection into a new satyr site which allowed collection of our permit number of adults (25 females, 5 males). Both captive breeding and egg laying was observed in captivity however a large amount of the eggs laid were infertile or were non-viable after the second instar. Adult individuals sent out for testing revealed high levels of Wolbachia spp. Parasite infection in the collected populations. The infection causes infertility and non-viable offspring and was highly correlated with the mortality seen in the captive rearing lab. The surviving animals are being overwintered in the low temperature growth chamber and will serve as the basis for a new captive colony being established in the butterfly lab. All animals currently in captivity, as well as any brought into the lab in the future, will be tested for Wolbachia infection in an effort to establish Wolbachia negative lines to mitigate the effects of the parasite. The data collected from Wolbachia testing on our collected animals also provides insight into a contributing factor on the decline of Mitchell's satyr populations around Michigan. We currently believe the satyr populations have increasing parasite loads that, in tandem with habitat loss and degradation, are precipitating the rapid decline of the species across the range.

The Toledo Zoo hosted the fall USFWS Mitchell's satyr working group meeting which brought researchers, managers and conservationists from across the country to the Toledo Zoo to share insights on the conservation of the species as well as tour and receive information about our new captive rearing facility.

KARNER BLUE BUTTERFLY

Lycaiedes melissa samuelis
Karner rearing and collection was abbreviated in 2019 due to delays in the opening of the butterfly conservation lab. A small wild collection was made in the second flight to obtain eggs for overwintering and test KBB rearing in the new lab. Eggs from that collection will be overwintered and hatched in the lab in the spring of 2020.In 2018 we began a long-term study with a grant from the Ohio Division of Wildlife to deploy 100 temperature loggers in KBB sites in Ohio and Michigan. The loggers record temperature every 5 minutes throughout the year. Along with the deployed loggers, each population is surveyed for population size in both the first and second flights using DISTANCE survey techniques made possible through the purchase of a high-precision GPS unit and laser rangefinder purchased with funding from USFWS. This is the first time many of these populations have had an accurate population estimate made. This research has already allowed us to make the first accurate population estimates of the Ohio population and allowed for targeted land management at the Ohio KBB site. Over the long-term, reliable population size data, coupled with temperature data from the loggers will allow us to understand how weather impacts Karner population size and likelihood of extinction.

NATIVE TURTLE CONSERVATION

Monitoring local turtle populations
2005–present

Turtles are globally on the decline, and are generally considered the most threatened of the major vertebrate groups. Turtles face many familiar threats including habitat destruction, exploitation, pollution, climate change and disease. As populations decline there has been an increase in conservation efforts targeting turtles. Lont-term studies are rare as these efforts typically require a considerable amount of resources to provide meaningful data.

Blanding's Turtle

The Toledo Zoo has been monitoring local turtles since 2005 in an effort to determine population sizes and conduct long-term monitoring to document potential changes. These efforts have included trapping surveys, tracking movements and habitat use with radio-telemetry and GPS loggers, and, more recently, using turtle-sniffing Spaniels to help locate box turtles.

BLANDING'S TURTLE SURVEYS

Emydoidea blandingii

In 2019, we were awarded a Competitive State Wildlife Grant for our proposal entitled: Conservation Status of the Blanding's Turtle in the Lake Erie Watershed. This grant requires at least one other state to participate in the work, and our partners include OSU's Ohio Biodiversity Conservation Partnership (OBCP), Michigan Natural Features Inventory, University of Purdue - Ft. Wayne, Michigan Department of Natural Resources, and Ohio Division of Wildlife. Michigan and Ohio are the only two states in the Midwest lacking large-scale Blanding's Turtle surveys and the goal of this project was to fill those knowledge gaps. Objectives include: 1) Develop and implement a comprehensive monitoring strategy, 2) Develop and refine distribution models, 3) Determine genetic composition, and 4) Develop a Blanding's Turtle conservation strategy.

BLANDING'S TURTLE SURVEYS (CONT.)

Surveys

This work called for a massive survey effort that spanned northern Ohio, from Williams to Ashtabula County. The Toledo Zoo and the OBCP split the surveys along the Portage River and each hired a six-crew team to conduct surveys. We followed the suggested survey protocols of the Northeast Blanding's Turtle Working Group that outlined a coordinated monitoring strategy. This called for a two-tiered approach that would include several long-term assessments (Three 3-week sessions), rapid-assessments (1-week sessions), and visual surveys. Each site was assigned 1-4 focal areas, containing five reference points consisting of one 3' diameter hoop trap and two 1' diameter collapsible traps (total of 15 traps/focal area). Traps were checked every 24 hrs.

Processing

Once turtles were captured, our field technicians collected data on location, sex, length, weight, and body condition, and each turtle was marked using a unique notching code. Blanding's Turtles also received a PIT tag, for a secondary means of permanent identification, and blood was drawn for genetic analyses.

Results

During the 2019 field season, the two Ohio turtle crews put in 10,097 trap nights at 37 sites. Our efforts resulted in the capture of 191 Blanding's Turtles from 12 sites. In addition, we captured 634 Snapping Turtles (Chelydra serpentina) and 2,000 Painted Turtles (Chrysemys picta). We also collected genetic samples from 176 Blanding's Turtles to contribute to range-wide genetic analyses. In some areas, we were pleasantly surprised to catch Blanding's Turtles from all age classes (juvenile-Adult).

Field notes

- At one of our Motroparks Toledo survey sites, we encountered an ~3 yr old Blanding's Turtle; a first at this site and a rarity in the Oak Openings Region.
- Another Metroparks Toledo property surprised our team when our team confirmed Blanding's Turtle sightings at a recently restored wetland site, suggesting restoration projects may be beneficial for this species.

Community Science

Our work with community scientist, Terry Breymaier, continued this year and complimented our survey efforts at the site near his house. We trapped the canals in his neighborhood just before nesting season, in early June, and caught 65 Blanding's Turtles in four days. Terry and his neighbors then took pictures of nesting female Blanding's Turtles they encountered and found an additional 42 unmarked turtles! These numbers helped confirm this site as a hotspot in the state. The results of this project were submitted to a peer reviewed

Education and Outreach

Conducting surveys in so many places gave us plenty of opportunities to interact with interested people. It was a common occurrence for groups of people to see our technicians pulling traps and come over to ask questions. We also used the opportunity to take our Conservation Explorers summer camp to different field sites.

SPOTTED TURTLES

Clemmys guttata

In 2019, we continued our Spotted turtle surveys and recaptured five individuals, including one originally marked by a researcher in 2007. Population estimates for our study site range from 34-79, including several young individuals. This area in particular has undergone restoration work in recent years and long-term studies like this are critical to understanding how turtle populations respond to management.

Box Turtle

WOODLAND BOX TURTLE

Terrapene carolina

We continued tracking box turtles in the Oak Openings Preserve and Wildwood Preserve. About half of the box turtles are outfitted with GPS loggers that will provide much more detailed information on habitat use and movements. In 2019, we again employed turtle-sniffing Spaniels to help researchers locate box turtles in the metroparks. The dogs were particularly successful at Wildwood, where they found 19 box turtles, including five juveniles. These turtles continue to provide useful information to managers, particularly in regards to prescribed fire, and serve as ambassadors for our turtle programs.

KIRTLAND'S SNAKE RESEARCH

Kirtland's Snake

Exploring the ecology of a rare snake 2015–present

In 2017, the Kirtland's Snake was petitioned for listing under the endangered species act, but was declined citing lack of data. Little is known about this cryptic species, making conservation planning difficult. There have been recent efforts, within ohio, to cencus populations and revisit locations with historical sightings.

Kirtland's Snake Surveys

We continued our partnership with the local teenager who helped us find one of the most productive populations of Kirtland's Snake in this area, that we know of. This site is a new record for the county and a range extension was published in Herpetological Review (see Publications and Grants). To date, we have captured 79 Kirtland's Snakes and 41 marked individuals. While within-year recaptures are common, only one snake has been caught in multiple years. We will continue our surveys at this site to gather more data for population estimates.

Kirtland's Snake with transmitter.

LAKE STURGEON REINTRODUCTION

Restoring an iconic species to the Maumee River
2018–present

Lake sturgeon *(Acipenser fulvescens)* were historically abundant in Lake Erie, but overfishing in the late 1800's led to drastic declines and eventual extirpation. These long-lived fish, which can grow to 8' long and weigh >300 lbs, were prized for their caviar and meat. Their decline was further compounded by anthropogenic changes in river conditions which blocked access to or degraded spawning and nursery sites. The Maumee River once supported a large number of spawning lake sturgeon, but an in-depth 2015 survey determined there was no evidence of spawning and the sturgeon were unlikely to repopulate without intervention.

Streamside rearing facilities have been shown to be an effective measure for sturgeon conservation because the young imprint to the rivers where they were born and will return to that river to spawn. Eggs are collected from a stable population, transferred to a streamside rearing facility, and raised on local water to allow the fish to imprint on that waterway. As a pilot study, the Toledo Zoo partnered with the U.S. FWS and USGS to compare long-term results of fish raised at our streamside facility to fish raised at the National Fish Hatchery in Genoa, Wisconsin. The plan is to release 3,000 sturgeon, equally represented from the two hatcheries, into the Maumee River every year for the next 15-20 years.

In 2019, the Toledo Zoo received eggs collected from a population of lake sturgeon in the St. Clair River. These eggs were placed into hatchers, and maintained on Maumee River water. Once they hatched, fish were fed decapsulated brine shrimp and eventually graduated to bloodworms. Growth in 2019 surpassed that of the previous year and we were able to more than double the number of fish raised in the trailer rearing 1,290 lake sturgeon to be released into the Maumee River.

Once they weighed > 10 g, the fish were implanted with PIT tags for future identification. This year, our conservation staff had the help of the BGSU chapter of the American Fisheries Society to weigh and measure the fish.

A subset of the fish were implanted with acoustic transmitters so our partners could monitor movements post-release. Data from fish released in 2018 were finally available and showed the fish moved into Lake Erie and eventually headed toward the reef system.

On October 5th, we held Toledo's second sturgeon release party. Festivities kicked off with speeches from the Zoo and our partners in the Division of Wildlife and USFWS. Partners set up booths to provide educational opportunities and raise awareness about the plight of Lake Erie and its inhabitants. As part of the release, participants were offered the opportunity to sponsor a sturgeon where they would be notified if their fish's PIT tag number was found when they return to spawn as adults. This year saw the addition of a wildly popular sturgeon slide.

In a first for this project, a commercial fisherman working with the Division of Wildlife, recorded the first capture of a PIT tagged sturgeon released in 2018. In the ~1 yr since its release, the fish had almost doubled in size!

TOLEDO CANID CAMERA-TRAPPING

2018–present

2019 marked the completion of the canid rapid assessment survey in which local natural areas were surveyed for canids using scent-baited camera stations. While the target species, the gray fox (Urocyon cinereoargenteus), was not detected in this survey, red foxes (Vulpes vulpes) and coyotes (Canis latrans) were observed with regularity.

Next year, non-scented camera arrays will be consolidated to areas of interest in order to observe habitat use of local canid species, with an emphasis on studying the effects of visual obstruction on canid occurrence. Additionally, red foxes (Vulpes vulpes) will be trapped and fixed with GPS collars to study the spatial ecology of animals within an urban setting.

HELLBENDERS

Inside view of the Hellbender pod.

2014–present

Toledo Zoo is a key member in the Ohio Hellbender Partnership (OHP), where we hatch wild-caught Hellbender eggs and rear them in captivity for three years before release. This head-starting gives the eggs greater hatching success and increases survivorship and growth of individuals released into the wild. This effort includes a partnership with the PENTA Career Center that provides students with the opportunity to gain hands-on animal husbandry experience and participate in endangered species recovery. In 2019, 120 Hellbenders from the Toledo Zoo and PENTA were released into Ohio streams.

WILDLIFE TECHNOLOGY

Using technology to aid conservation efforts
2005–present

App Development: Students and their professor at Bowling Green State University continued to refine an app that will engage citizen scientists in turtle conservation. The app, tentatively named “ShellShots”, would let users upload pictures of turtles and use pattern-recognition software to identify individuals. Next steps are to experiment with a different pattern-matching algorithm to improve accuracy. Upon completion, this app will collect valuable data that can be used in population estimates and to track individual movements.

PUBLICATIONS & GRANTS

Mission-focused research

Publications

1. Cross and Morrision. 2019. Kirtland’s Snake range extension. Herpetological Review 50:105
2. Cain and Cross. 2019. A Low-cost Method of Simulating Motion in Studies Using Physical Models of Animals. Herpetological Review 50:719-721

Grants

USFWS Competitive State Wildlife Grant: Conservation Stuatus of Blanding’s Turtle *(Emydoidea blandingii)* in the Lake Erie Watershed.

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