REGULATORY AMENDMENT
TO THE FISHERY MANAGEMENT PLAN FOR THE REEF FISH FISHERY OF PUERTO RICO AND THE UNITED STATES VIRGIN ISLANDS CONCERNING RED HIND SPAWNING AGGREGATION CLOSURES INCLUDING A REGULATORY IMPACT REVIEW AND AN ENVIRONMENTAL ASSESSMENT

CARIBBEAN FISHERY MANAGEMENT COUNCIL

AUGUST, 1996

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I INTRODUCTION

The Fishery Management Plan for the Shallow-water Reeffish Fishery of Puerto Rico and the U. S. Virgin Islands (FMP) became effective September 22, 1985. The FMP (and each of the amendments) was prepared, under the authority of the Magnuson Act, by the Caribbean Fishery Management Council to establish a management system for the reef fish resources within the Exclusive Economic Zone (EEZ) and the waters under the authority of the Commonwealth of Puerto Rico and the Territory of the U.S. Virgin Islands, from the shoreline to the edge of the insular platform.

The FMP that went into effect in 1985, established regulations to rebuild declining reef fish stocks in the fishery and reduce conflicts among fishers. It established the criteria for the construction of fish traps; required owner identification and marking of gear and boats; prohibited the hauling of or tampering with another person's traps without the owner's written consent; prohibited the use of poisons, drugs and other chemicals and explosives for the taking of reef fish; established a minimum size limit on the harvest of yellowtail snapper (Ocyurus chrysurus) and Nassau grouper (Epinephelus striatus); and established a spawning season closure for Nassau grouper.

In November 1990, Amendment 1 to the FMP established regulations to rebuild declining reef fish stocks. It prohibited the harvest or possession of Nassau grouper; closed an area in the EEZ southwest of St. Thomas, U.S. Virgin Islands to all fishing during the spawning season for red hind (Epinephelus guttatus); increased minimum mesh size for traps to 2 inches; defined overfishing; revised the section on habitat description; provided for the collection of socio-economic data through federal/state agreements already in existence.

In October 1993, Amendment 2 to the FMP incorporated the major species of the deep-water reef fish fishery and the marine aquarium finfish fishery into the reef fish management unit. This action was accompanied by a change in the FMP's original title and to the present the FMP is known as the Fishery Management Plan for the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands (Reef Fish FMP). To protect important species and rebuild declining reef fish stocks Amendment 2 prohibited the harvest or possession of jewfish (Epinephelus itajara); prohibited the harvest/possession/sale of certain species used in the aquarium trade; restricted the collection of marine aquarium fishes to hand-held dip nets and slurp guns; closed 2 additional red hind spawning aggregation areas, to all fishing, from December through February; closed a spawning aggregation area, to all fishing, for mutton snapper (Lutjanus analis) from March through June each year in St. Croix, U.S. Virgin Islands; and changed the criteria for the construction of fish traps.

II STATEMENT OF THE PROBLEM

A seasonal closure for red hind (Epinephelus guttatus) was established in Puerto Rico in 1993. The location of the spawning aggregation is given by the following point coordinates (see Figure 1):

POINT	LATITUDE	LONGITUDE
A	18E11.0'N	67E25.5'W
B	18E11.0'N	67E20.4'W
C	18E08.0'N	67E20.4'W
D	18E08.0'N	67E25.5'W

The seasonal closure, to all fishing, in the above mentioned area, runs from December 1 to February 28 of each year.

It was brought to the attention of the Council that the red hind closure established off Mayagüez in 1993 needs revision because the closure area is too large and there are two additional red hind spawning aggregations that need protection.

The commercial fishers have stated that the area around Buoy 8, (Tourmaline Bank) which is, under the current regulations, closed from December 1 through February 28, is too large. The red hind spawning aggregation is restricted to an approximate radius of 1.5 miles around Buoy 8 and not in most of the area to the west of this radius. Further, because the sea bottom in most of the area that is presently closed is sandy, it has traditionally been used to store fish traps during bad weather so that the fishers may avoid having to bring traps back to shore with each bad weather event.

After holding an informal meeting with commercial fishers from the area the Reef Fish Committee reviewed the new information. The alternatives suggested by the commercial fishers were then presented at a Public Hearing.

As a result of these meetings and hearings, the Council proposes the closure of two additional (Abrir La Sierra or Buoy 6 and Bajo de Cico) red hind spawning aggregations off the west coast of Puerto Rico and a re-definition of the site (Tourmaline Bank) originally closed in 1993.

Background information:

The proposed action addresses continuing and growing concerns by the public and the Council over scarce resources, and the need to protect important species when they aggregate for spawning. Whenever possible, the Council relies upon closing aggregation sites during spawning seasons to regulate the fishery instead of size limits or quotas that

result in excessive fishing mortality to juveniles. Most species that aggregate during the spawning season are highly vulnerable to capture at that time. Allowing mature individuals the opportunity to spawn is important to reverse declines in stocks.

Since a red hind spawning area in the EEZ southwest of St. Thomas was first closed on December 1, 1989, through the duration of the spawning season (that is, through February 28, 1990) and each consecutive year after that, and the closure of 2 additional red hind spawning aggregation areas, one off Mayagüez and the other on Lang Bank, St. Croix (1993), the Council has attempted to identify additional spawning aggregation areas to further protect declining resources.

During the spawning season, many reef fishes are very aggressive and extremely vulnerable to capture. Protecting spawning aggregations is a sound management practice and the Council prefers spawning area closures to other approaches, such as size limits and quota management, that are more labor intensive and inflict high rates of mortality on undersized fish. Because of their concentration and distribution through most of the water column when aggregating to spawn, a total ban on gear capable of taking fish is necessary.

The Fisheries Research Laboratory (FRL) of the Department of Natural and Environmental Resources and the CFMC have identified several spawning aggregations around Puerto Rico, three off the West coast (Figure 2) and one of these three (Tourmaline Bank) has been closed since 1993. The Reef Fish Stock Assessment (SAFE Report, 1992) group recommended that spawning aggregations be protected. It is at this time that the species are more vulnerable and, traditionally, fishing effort increases during the periods of spawning aggregations. Whenever possible, the Council relies upon closing aggregation sites thus, allowing mature individuals the opportunity to spawn. This is an important step in reversing the observed declines in fish population.

Information available regarding the status of the red hind fishery indicates that landings have shown a continuous decline since 1991 (Figure 3). The data shown in Figure 3 are for the West Coast which include the towns of Cabo Rojo, Mayagüez, Añasco, Rincón, Aguada, and Aguadilla. Action was taken by the Council when grouper landings in general showed a decline in their percentage of the total commercial catch; from 13% in 1989 to 5.3% in 1994 (Table 1). In the West Coast, as well as all around the Island, red hind landings have shown a dramatic decrease in recent years (Figure 3 and Table 2). The increase in the commercial landings for groupers, seen in Figure 3, could be due to the increase in the harvesting of coneys (Epinephelus fulvus). There has been a shift in species of groupers in the commercial landings category of the FRL. Coneys, rock hind, red hind, graysby are prevalent now as opposed to the past landings of Nassau grouper, jewfish, yellowfin and red groupers. Monthly landings reported for red hind have also shown a declining trend (Figure 4) which is specially noticeable during the peak spawning

months of January and February. Monthly grouper landings show enormous variability (Figure 5) which warrants more detailed explanation.

Fishery-dependent data from the FRL show that the number of red hinds measured through the Biostatistical Sampling Program has decreased from 1,422 red hinds measured in 1991, to 590 red hinds measured in 1993. The red hind size frequency distribution continues to show a decline in the average size of fish in Puerto Rico. The SAFE report (1992) showed a decrease in mean size of commercially caught red hinds from 1985 (290 mm) to 1990 (265 mm). The commercial landings of red hind show a continuous declining trend, since 1991, in number and size of fish caught. Fishery-independent data show that the average size of red hinds caught at the spawning aggregations has declined as well as the total number of fish harvested from the aggregations at Bajo de Cico and Abrir La Sierra or Buoy 6 (A. Rosario per. com.). Figures 6 and 7 show the data from the fishery-independent survey for 1994-1995 and 1995-1996 at Bajo de Cico and Abrir La Sierra, respectively, (A. Rosario, unpublished data).

The FRL, abiding by the regulations in place, did not sample the red hind area closure of Tourmaline Bank during December through February from 1993 to the present. In addition, although at the public hearing it was stated that recreational fishers were very actively fishing at Abrir La Sierra, there are no data available from the recreational sector.

Most of the red hinds caught during the annual fishery-independent (SEAMAP-Caribbean and FRL Reef Fish Monitoring Program) surveys were harvested at Bajo de Cico and the area around Buoy 6 (Abrir La Sierra). This was the case not only between December and February of each year, but also during sampling the rest of the year. The surrounding areas do not show significant numbers of red hinds at any time (A. Rosario, per. com.). The FRL has been monitoring the spawning aggregations for 5 years, between December and March each year, specifically Stations 95 and 96 (Bajo de Cico) and Station 59 (Abrir La Sierra or Buoy 6). The monitoring effort began in 1987 and continues to the present. The only year for which monitoring was not possible was in 1993. The 3 stations (95,96,59) account for 77% of the total annual sample. Highest numbers of red hinds have been reported for Bajo de Cico since 1992.

A dramatic change in the sex ratio of red hinds, decreasing from 8:1 to 3.9:1 females to males, has been detected between 1988-1989 and 1993-1994. It is possible that the number of females to males at the time of spawning affects the success of the spawning output. This could be specially significant when considered in conjunction with the decrease in mean size of fish at the aggregations and throughout the year. In most fish, the number of eggs is related to the size of the fish, that is, the bigger the fish the more eggs it has. The combination of these data need to be looked at in more detail.

Red hind maximum CPUE correspond to the spawning season. Smith and Ault (1993) and Rosario (1996) show that mean CPUE is 1.5 to 2 times higher than during the non-spawning season. However, sampling of the 1993 spawning aggregation was not completed. Spawning season for red hind has been reported to extend from December through February (Erdman, 1977; García-Moliner, 1986) with peak spawning in January (Sadovy et al., 1994). The two species which dominate the fishery-independent catch in the sampling area are red hind and coney. The dominant factor in determining which species dominates the catch is the sampling of the spawning aggregation when red hinds are most vulnerable and the greatest numbers of fish are caught over this short period of time (Rosario, 1996).

Fishery-independent data have been collected since 1988, using hook and line and fish traps. Unpublished data from the FRL shows a sharp decline in the mean size of red hinds caught off the west coast of Puerto Rico (Rosario, 1996; Figure 8).

The most commonly used gear in the commercial harvest of red hinds are hook and line and fish traps. Red hinds caught with traps in the fishery-independent surveys were significantly larger than those sampled with hook and line (Rosario, 1996). However, data from the commercial catch show that red hinds caught with hook and line were larger than those caught with traps (Matos, 1991) at least for the years 1988-1990.

Groupers are now widely acknowledged to be extremely vulnerable to anything other than light fishing pressure and large size of first capture. This has been shown consistently in different studies and appears to be a pattern typical of species, like many of the groupers, which are long-lived, slow-growing, and aggregate for spawning. Protogynous hermaphrodites (change from female to male) may be particularly susceptible to differential mortality of males since females may not change sex quickly enough to compensate male losses. Many fish that aggregate to spawn are likewise increasingly being recognized as vulnerable to heavy exploitation of aggregations. There are good examples of declines in, and disappearances of, aggregations worldwide. Some of the more spectacular (and more extreme) examples involve aggregations of various grouper species in both the western Atlantic and Indo-Pacific that have severely dwindled after only a few years of pressure. We can only guess at what the long- and short-term effects are on non-aggregation catches due to the decline in aggregation catches. It is clear that aggregation protection is widely and consistently supported by fishers who depend on the long-term sustainability of aggregating species for their livelihood.

Spawning aggregations that are large (in terms of number of animals participating) are relatively few and are widely spaced in distribution. These spawning aggregations are particularly vulnerable and they should receive maximum protection within practical and socio-economic constraints.

Red hind catches in western Puerto Rico constitute a substantial proportion of local grouper catches and very likely depend on "healthy" aggregations in the areas currently under discussion. Given that red hind in western Puerto Rico show evidence of growth, and possible recruitment, overfishing, and continue to show a decline in landings since 1991, management approaches should be conservative. The data collected by FRL are critical in monitoring the long-term impacts of fishing and effectiveness of management measures for this species.

There are two additional factors which might have a significant impact on red hind stocks: (1) recreational fishing activities, and (2) net-fishing. According to testimony offered at public hearings, recreational fishers are fishing the red hind aggregations and selling hundreds of pounds of this species. This fishing activity should be monitored to determine the impact of the recreational sector on this fishery (this holds true for other reef fishes.) Detrimental use of fishing gear include the unattended nets and the non-regulation of fishing activity. Specifically, nets are being fished at night and left unattended (from 5 p.m. till 6 a.m. the next morning) and fished in areas such as Bioluminescent Bay in La Parguera. This is not much of a problem for certain species (e.g., trunk fish and lobster) which survive the long hours but, these nets are killing hundreds of fish (groupers, mutton snappers, hogfish). These fish spoil and have to be thrown out. The mesh being used is 5½" with three panels and of nylon #9, #12 and #15.

III OBJECTIVES OF THIS AMENDMENT

The original objectives addressed by the Reef Fish FMP, as amended, are unchanged. The objectives are to: 1) obtain the necessary data for stock assessment and for monitoring the fishery; 2) reverse the declining trend of the resource by (a) restoring and maintaining adult stocks at levels that ensure adequate spawning and recruitment to replenish the population and (b) preventing the harvest of individuals of species of high value (e.g., snappers, groupers, and others) that are less than the optimum size; 3) reduce conflicts among users of the resource; 4) promote international cooperation in managing the pan-Caribbean species; and 5) help resolve the ciguatera problem.

The proposed adjustment to a management measure (red hind area closure) in this amendment is directed toward fulfilling some of these objectives (1, 2, and 3 above) and is in accordance with this FMP's overfishing definition. It is recommended that the State expand the data collection efforts and monitoring of spawning aggregations (for groupers and other species) through the Department of Natural and Environmental Resources.

IV MANAGEMENT MEASURE AND ALTERNATIVES

The management measure adopted by the Council and those considered but rejected are presented below:

<u>Adopted Measure 1</u> (Preferred option): Close the corresponding sections of the EEZ in all three (3) areas presented below to all fishing between December 1 and February 28 of each year. (Figure 9 shows all three areas as well as the original red hind area closure.)

1. Close the corresponding section of the EEZ in an area of one and a half (1.5) miles radius around Buoy 8 at Tourmaline Bank. (This is part of the area already closed but it allows for the use of the sandy area where red hinds are not found.) This area is bound by rhumb lines connecting the following point coordinates:

Point	Latitude (N)	Longitude (W)
A	18E11.2	67E22.4
B	18E11.2	67E19.2
C	18E08.2	67E19.2
D	18E08.2	67E22.4

2. Close the corresponding section of the EEZ in an area of one and a half (1.5) miles radius around Buoy 6 at Abrir La Sierra Bank. This area is bound by rhumb lines connecting the following point coordinates:

Point	Latitude (N)	Longitude (W)
A	18E06.5	67E26.9
B	18E06.5	67E23.9
C	18E03.5	67E23.9
D	18E03.5	67E26.9

3. Close the corresponding section of the EEZ in an area of one and a half (1.5) miles radius centered around a buoy to be deployed in the area known as "Bajo de Cico." This area is bound by rhumb lines connecting the following point coordinates:

Point	Latitude (N)	Longitude (W)
A	18E15.7	67E26.4
B	18E15.7	67E23.2
C	18E12.7	67E23.2
D	18E12.7	67E26.4

Discussion: Red hind (one of the most prevalent species in the commercial landings) are being harvested at less than optimum size. The average size and production of red hind have been shown to be declining. These conditions are contrary to objective 2b of the FMP: "Prevent the harvest of individuals of species of high value (e.g., snappers, grouper, and others) which are less than the optimum size."

Red hind, as many other species of reef fish, aggregate in geographically limited areas for spawning. Protection of spawning aggregations is a practical way to reduce fishing mortality at the time when fishing effort is the most intensive and CPUE is the highest. Protection of these areas will also increase the likelihood of spawning success. The benefits of the closure could depend, however, on the extent that fishing effort and catch are increased or decreased during the remainder of the year. Complementary regulations from the government of Puerto Rico are recommended to protect the spawning aggregations.

The federal waters in these areas are to be closed to all fishing, neither commercial nor recreational fishers, will be permitted in the area. There is no known selective method of harvesting other species in the areas where the red hinds aggregate to spawn. The fishing gears used are non-selective (except for professional spear fishers who could discriminate among fishes), fish traps and hook and line. Because aggregating fish are highly susceptible to capture by a variety of gears, a total ban on all fishing is needed to protect the spawning aggregations and to facilitate effective enforcement of this measure.

It is believed that this will be less of a burden on the commercial fishers since they can redirect their fishing effort to other species. In addition, the sandy areas around Buoy 8 at Tourmaline Bank can be used by the commercial fishers to keep their traps during periods of bad weather.

Each of the identified spawning aggregations provides an effective rectangular enforcement area of 9 square miles for a total of 27 square miles of closed area. Enforcement of these areas will not present a problem for the US Coast Guard and other enforcing agencies.

The areas need to be well demarcated (with buoys) at least during the period of the closure.

REJECTED MEASURE: Close only one or two of the considered areas for three months.

The Council would not be protecting the additional spawning aggregations which have been identified and monitored. As stated previously, aggregations need protection because of the heavy fishing pressure that they experience when fish are most vulnerable to capture (that is, at reproduction) and because of the large number of ripe fish which are

removed without allowing them to spawn. The sex ratio and the mating groups are disrupted when fishing takes place over the aggregations and the behavior and spawning activity might be further jeopardized. It is necessary to protect as many spawning aggregations as possible, especially since so few have been identified around Puerto Rico and not protecting them could result in the collapse of the fishery. Protection of the maximum number of aggregations allows for a greater number of fish to spawn.

REJECTED MEASURE: Close the area for red hinds but allow fishing for other species.

It is not possible for fishing to take place over a red hind spawning aggregation and selectively fish for other species. Fishing gear used in these areas does not discriminate by species. In addition, enforcement will be almost impossible if fishers are allowed in the closed areas.

REJECTED MEASURE: No action. Keep the same area of seasonal closure as is (Amendment 2 of the Reef Fish FMP, 1993).

Leaving the identified areas unprotected from intensive fishing effort could lead to the demise of the spawning aggregations. Red hind are very aggressive and easily caught when aggregated for spawning. No action would definitely contribute to a continued decline of red hind resource.

The argument against keeping the closed area as it is currently defined, is that most of the area is not actually protecting a spawning aggregation, but is unduly burdening the fishers targeting other species in the area. At the public hearing it was stated that most of the area closed at present includes fishing grounds for other species rather than red hinds. At present, the area is approximately 3 x 5 miles. It has been proposed that the area be made smaller and that in conjunction with that area, 1 or 2 other aggregations be protected. See preferred option above.

It has been brought to the attention of the Council that the area closed is too large. The aggregation takes place over a smaller area (about 1.5 mile radius around Buoy 8). The currently closed area, approximately 3 x 5 miles, is an added burden on the commercial fishers fishing in the area for snapper and other species. Three (3) aggregations have been identified off the West coast of Puerto Rico (Sadovy et al., 1994). Figure 2 shows the three aggregation sites identified by Sadovy et al. (1994) and the proposed closed areas as identified by the commercial fishers are shown in Figure 9. The identification of the spawning aggregations has been done by both the fishing and the scientific community. It would be more effective to protect the spawning aggregations in these smaller areas than to keep the large area presently closed.

Other Measures Considered and Rejected

1. Prohibit fishing for red hind island-wide during the three months of spawning (December - February).

This alternative was rejected because fishing gears are not selective and all red hinds caught would have to be returned to the water unharmed which might prove very difficult. High mortality is expected because the depth from which the red hinds are removed (37-90 m) do not allow the fish to deflate the swim bladder, unless kept in live-wells until the swim bladder deflates, thus reducing predation when returned to the sea. In addition, island-wide enforcement would be very difficult since there would be no way of proving, except when caught "red handed," that fish were caught in federal waters. This however could be avoided if local governments adopt the same regulation, i.e., closed season during December through February.

2. Close the three proposed areas off Mayagüez (Buoys 6 and 8, and Bajo de Cico) and establish a closed season for red hind in Puerto Rico and the U.S. Virgin Islands during December through February of each consecutive year.

The Council considers that at present this measure would cause an unnecessary extra burden to the commercial fishers in addition to the problems mentioned in 1 above with the high mortality of red hind due to the depths at which it is hooked.

3. Close the red hind aggregations only during daylight hours.

Fishers stated that red hinds do not bite at night. However, data from the FRL (A. Rosario, unpublished) show that a total of 765 red hinds have been sampled from the fishery-independent survey between 2 p.m. and 8 p.m. The mean size of these red hinds, caught with hook and line, was 265 mm (same average size as for red hinds caught during daylight hours.) Anecdotal information also suggests that red hinds do bite at night.

Commercial fishing for species other than red hind is done in the proposed closed areas. Specifically, night-fishing is done for snappers. Other species which are caught in the area include tunas, mackerel, shark, and dolphin fish. Data from the FRL do not show increased landings for any of these species during the months of the closure. These species are pelagic and there is no indication that they aggregate in the proposed area closures.

4. Prohibit the sale of red hind during the months of the closure.

The amount of red hind caught outside the spawning aggregations or imported from other areas into Puerto Rico is unknown. Prohibition of imported red hind is not warranted at this time. The available information does not show the need for this measure at present.

5. Close all aggregations around Puerto Rico and the U.S.V.I.

There should be a number of unknown aggregations and aggregations which might still be healthy. If fishing effort increases, other aggregations might need to be closed and monitored. The Council has decided to postpone closing other aggregations until more information becomes available.

The Council considered and rejected combinations of the above rejected measures, e.g., close all spawning sites and establish a closed season for Puerto Rico and the U.S.V.I., because these are not necessary at this time. However, if the declining trend continues, such stricter measures might be needed.

V RECOMMENDATIONS TO THE LOCAL GOVERNMENT

1. It is recommended that complementary regulations be developed by the local government [i.e., close the corresponding sections of the territorial waters around the proposed areas for the red hind seasonal closure] to protect spawning aggregations.

2. It is recommended that the closed areas be monitored to assess the effect of this measure on the stock.

3. Fishing activity from both the commercial and the recreational sectors have an impact on the species' stock.

3a. It is recommended that the local government assess the net fishing activity and its effect on the fish populations.

3b. No information is available on the catch and effort of recreational fishers in Puerto Rico. According to testimony offered at public hearings, recreational fishers are fishing the red hind aggregations and selling hundreds of pounds of this species. This fishing activity should be monitored to determine the impact of the recreational sector on this fishery. It is recommended that surveys be conducted to assess the impact of reeffish recreational fishing activity.

4. Near shore habitat is of extreme importance in the life cycle of many species, among them the red hind. Nursery grounds are usually found over seagrass beds, mangrove ecosystems and reef areas. These are very sensitive ecosystems which are negatively impacted by such anthropogenic activities as pollution, sedimentation, boating activities (e.g., anchoring, use of motorized boats in shallow areas). Thus, it is recommended that the local government assess the condition of these near shore habitats and proceed with conservation, protection and restoration efforts, if necessary in the area.

VI PROCEDURES FOR ADJUSTING MANAGEMENT MEASURES AS SPECIFIED IN THE FMP

Amendment Number 1 to the Fishery Management Plan for the Shallow-Water Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands (1990) included a section entitled "Procedures for Adjusting Management Measures" which stated that "Adjustments that may be made by this procedure include size limits, closed seasons or areas, and fish trap mesh size, and the level of SSBR necessary to rebuild an overfished stock."

The Council will conduct one or more public hearings, depending on the nature of the proposed adjustments, prior to taking final action. For adjusting measures within the regulatory scope of the FMP, a regulatory amendment, consisting of a regulatory impact review, environmental assessment, and a proposed rule, will be prepared for submission to the Regional Director. After reviewing the proposed regulatory adjustment for consistency with the Magnuson Act, other applicable law, and the objectives of the FMP, the Regional Director will forward the proposed rule for publication in the Federal Register. The proposed rule will describe the proposed change(s) and make the supporting documents available for public review and comment. After a 30-day comment period, public input will be addressed by the Council and Regional Director and a final rule prepared for publication. In addition to overfished conditions of a resource, other concerns may trigger the adjustments of management measures. These concerns may involve new gear introductions that might damage overfished resources, environmental disasters, etc.

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