FISH POISONING IN THE CARPATHIAN AREA AND IN THE BALKAN PENINSULA

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New World anthropologists have recently published several studies dealing with aboriginal fish poisons. I should like first to call attention to the studies of R. F. Heizer and C. Quigley, in which reference is made also to the history of fishing in the Old World.[1] Since these authors did not always take into consideration the research carried on by anthropologists in Europe, it may be useful to supplement these excellent studies with the new data of a European anthropologist. In writing this study I drew upon a wide European anthropological literature and investigated Hungarian, Slavic, and Rumanian sources that are not readily accessible.

In addition, I carried out extensive field work in several regions of the Carpathians and in the Balkan Peninsula from 1943 to 1964 in order to study the remnants of fish poisoning, among other things. I have indicated only the regions in which the data were recorded and have omitted the names of the Hungarian, Rumanian, Slovakian, Serbian, Croatian, Bulgarian, and other villages as an unnecessary burden upon the reader. Students may find the particulars in my Ethnographica Carpathica, published in Hungarian (Budapest, 1966).

K. Weule considers that the use of poison plants for stupefying fish is universal.[2] J. Janko states that fish poisoning has no special ethnic character, the technique being the same everywhere and the material used as poison varying locally with the different plant forms available.[3] J. Martinka, in discussing Slovakian fishing, suggests that the origin of fish poisoning cannot be determined.[4] A quite different point of view is that of J. Loewenthal, who regards fish poisoning as part of the phenomena through which local Old West European and Old Oceanian (Malayan-Polynesian) links can be shown.[5]

This opinion is disputed by the Polish anthropologist K. Moszyński, who raises the question of whether fish poisoning is a secondary phenomenon apart from West Europe and Oceania. His opinion is that Australia, southern parts of South America, a significant territory of North America, and North Asia are areas in which fish poisoning was not practiced.[6] This theory is modified by the studies of Heizer and Quigley, although Moszyński's statement regarding North Asia may be accepted. It is notable, however, that in North Euro-Asia plant poisons were used in the hunting of wild animals. The Lapps gather lichen (Letharia vulpino) from old birch trees, break it up and mix it with grease and flesh, and, after adding fresh blood and reindeer milk cheese to the warmed-up mixture, they introduce it into the carrion of reindeer; a wolf or fox that eats this bait perishes within twenty-four hours.[7] It is also known that the Lapps put a certain plant into bait in order to poison beasts of prey.[8]

In investigating the diffusion of plant poisons for fish poisoning K. Moszyński does not take into consideration only the local geographic distribution of the plants, but suggests that the use and diffusion of plant

poisons for fishing are associated with knowledge of the cultivation of plants. Although the Bushmen, Veddas, Andamans, and Sakais of Sumatra have piscicides and do not cultivate plants, they live in the neighborhood of plant cultivators from whom they could have learned fish poisoning.[9] Moszyński believes that plant cultivators have an understanding of botany that enables them to cultivate and use not only domestic plants but wild plants as well. This knowledge may be transmitted to the neighboring food-gathering/hunting/fishing tribes. The use of plants for fish poisoning is not an obvious one even for tropical and subtropical people because the gathering of these plants in the required quantity is difficult. It may sometimes take many years until certain plants (e.g. Derris elliptica Bentham, in Sumatra) can be used as fish poisons in the same river or pond again.[10] Moszyński takes a similar position with regard to traps and snares; more developed forms of traps and snares are not found in food-gathering/hunting/fishing groups, but are used by groups practicing hoe or plough cultivation, because their technical knowledge is superior and they need to protect their fields and harvest.[11]

In connection with the history of European fishing, I refer to certain statements of Heizer and Quigley. Heizer made the statement that fish poisoning is a very old practice in Europe. A plant (plomos, species Verbascum) used for stupefying fish was mentioned in Aristotle's Historia Animalium. Pliny also reports certain plants (a species of Aristochia and Euphorbia) that stupefy fish. Dioscorides, a Greek physician and expert on medicinal plants from whom Arabian medicine borrowed much, mentions some plants that are used for drugging fish. Fish poisoning is often referred to in European herbals, plant lists, and pharmacopoeia of the Middle Ages.[12] According to Heizer fish poisoning occurs very rarely in the Causasus, Asia Minor, and Iran, the latter two areas having large stretches of desert and very few fish. If the gaps between South Asiatic and European diffusion could be explained--as suggested by Heizer--the South Asiatic and European areas of fish poisoning could be connected and we might speak of a continuous Euro-Asian fish-poisoning area. Until such a connection can be shown, Heizer considers Europe as a separate area of fish drugging.[13] Later, however, he states that the Euro-Asian occurrence of fish drugging, notwithstanding the apparent Turko-Iranian discontinuity, is probably a historical unit. Fish poisoning entered Australia via Queensland from Melanasia; Oceanian fish stupefying was probably borrowed from an ultimately continental Asiatic source through an intermediate Indonesian route. In Asia the area to the north of the Bay of Bengal may have been the center of development of fish poisoning.[14] Recently B. Anell demonstrated the South Asiatic origin from several South Sea fishing implements (thorn-lined trap, plunge basket, round conical casting net, etc.).[15] Anell's statement may perhaps support Heizer's findings.

Heizer's research is supplemented by that of C. Quigley, who states that the use of fish-poisoning plants is based on the recognition of certain connections. The occurrence of fish poisoning in different areas may be due more to diffusion than to independent discovery, even though different plants may be used in the separate areas. The connection is more likely if the same plants are used in the two areas. Botanical considerations indicate that the Old World may be taken as a single fish-drugging territory. In Asia and Europe the same plants (e.g. Anamirta cocculus, Verbascum sinuatum) are used to poison fish.[16] Quigley further disputes Heizer's theory that fish poison-

ing was probably an independent discovery in Africa that occurred in tropical West Africa--that is, that African fish poisoning may have been a tropical West African invention, later diffused generally throughout the continent. However, Heizer does not exclude the possibility that there may have been some connection with Europe in this regard.[17] In my opinion this possibility exists unconditionally since it is known that fishing implements[18] (casting net, plunge basket) came by different routes from Eurasia to Africa.

Quigley recognizes the West African center of fish poisoning but regards it as more an "ecological focus" than an "origin focus," which can be explained by the fact that the southern part of West Africa has tropical rainforest conditions like those of the northeastern part of South America and the southeastern part of Asia, and these conditions favor many fish-poisoning plants. The success of fish poisoning is promoted by an abundance of fish-poisoning plants, warm water (in which poison dissolves more quickly), and the rapid revival of fish stock. The idea that West Africa is the "origin focus" of fish poisoning is contradicted by the fact that cultural diffusion took place in a southwesterly direction, more toward West Africa than from West Africa. East and southeast Africa, and Madagascar form an organic area influenced by Asiatic cultural trends. The absence of fish poisoning in Egypt and Asia Minor can be explained by the early high civilization there.[19] Although fish poisoning is unknown on both sides of the Bering Straits, this does not prove that fish poisoning developed in the New World in the northeastern part of South America independently from the traditions of the Old World, as Heizer suggests. In the opinion of Quigley it is likely that fish poisoning was carried on sea routes from West Africa to the opposite tropical coast of South America in the pre-Columbian period, and he offers proofs of this possibility.[20]

The researches of Heizer and Quigley indicate the strong probability of a close connection between diffusion areas of fish poisoning in Europe and Asia. The absence of fish drugging in Asia Minor, as demonstrated by Heizer, cannot be deciding. It may be only that the data have not been discovered. It must be remembered that several poisons were known throughout the Near East in antiquity and that Asia Minor was the source and mediator of several poisons in the time of the Roman Empire.[21] The use of Verbascum species in the Mediterranean area, especially in Greece, Israel, and Syria,[22] suggests that drugging plants were known also in the island parts of Asia Minor. From a report made at the beginning of the last century (1817), it is known that Verbascum sinuatum was used as a fish-drugging plant in Constantinople and the Isle of Zante (Zacynthus, one of the Isles Ioni).[23] Euphorbia and Verbascum species are used for fish stupefying by Bulgarians living on both sides of the Bosphorus Straits.[24] The occurrence of fish-drugging plants in Asia Minor and Iran is proved by records of Persian writers (Muvaffaq al Haravī, Ibn al Baiṭār) from the 10th and 13th centuries who refer to fish-poisoning plants (Euphorbia, Verbascum, and Daphne species).[25] According to information from the Turkish Hydrobiological Institute (for which I am indebted to Erdem Refik, professor in Istanbul), fish poisoning through the use of wild plants is known also in Middle and East Anatolia, where Verbascum sinuatum in flowers is broken up and thrown into the water for this purpose. The seeds of Daphne also have fish-poisoning effect when mashed and mixed with bait. The fish poison is placed in the still bays of rivers and ponds, but nowadays it is rarely used. In Israel fish are stupefied by a poison

called to'm "food." The Bedouins living there use the seeds of Styrax broken up and mixed with flour for fish drugging.[26] According to J. Hornell, Cyclamen latifolium, Styrax officinalis, and Verbascum sinuatum are fish-poisoning plants used by the Arabs in Israel.[27] Inhabitants of marshes in South Iraq employ a poisonous dried fruit, rubyan, for fish drugging; this fruit is mashed, mixed with flour, and formed into "sausages" which are hidden in sedges growing in the water. After eating these sausages the stupefied fish rise to the surface of the water. Sometimes this same fruit is cooked with rice and the poisoned rice is then thrown into the water.[28]

Fish-poisoning plants may have diffused by many various routes from Asia via the Near East to Europe. The possibility of various maritime routes suggested by Quigley[29] should not be rejected. In my opinion the knowledge of fish-drugging plants may have derived from the old Arabian and Persian literature on natural science, in addition to classical Greek and Latin sources. In the diffusion of fish-poisoning plants of Asiatic origin an important role was doubtless played by the trade that transported Anamirta cocculus, a fish drug, until nearly our own time.[30] Its Oriental origin and diffusion is also shown by its French name coques du Levant.[31] The fruits of Anamirta cocculus are sold by sailors in Rumanian ports of the Black Sea even today, and are bought by Rumanian fishermen living in the Danube delta for poisoning fish. The sale of this plant is prohibited but a prosperous black market is carried on especially by Arabian and Greek sailors. It is known that Greeks of Hellenic times did not meet their need for fish only from those in the Aegean Sea and the rivers of the continent, but that they imported quantities of fish from Gibraltar, the Sea of Marmora, and the rivers flowing into the Black Sea.[32] Knowledge and diffusion of new fishing methods and implements were, of course, promoted by this importation of fish.

Unfortunately, the local terminology for fish-poisoning plants was not taken into consideration by Heizer and Quigley. Etymological examination may shed light on the route of diffusion and support different ethnological conclusions. The historical material of the Australian, African Negro, and eastern South American languages is not known, but there are some lexicological and grammatical works on Bantu, Malayan, and Melanesian languages which permit such investigation. In any case the botanical terminology of the Arabian language is known and may throw light on the routes of fish-drugging plants at their diffusion in Africa, Asia Minor, and in the Mediterranean area. R. Zaunick succeeded in defining some fish-poisoning plants more exactly just by means of the analysis of Arabian botanical terminology.[33]

Further problems are raised by the study of fish-poisoning methods and their diffusion in the Carpathian area and in the Balkan Peninsula. Through my field work I learned that fish poisoning was fairly general in several regions of Transylvania fifteen or twenty years ago. Fish poisoning was not practiced at the swiftly flowing sources of brooks and rivers in the mountains and at cataracts because the rapid flow of the water immediately carried downstream any plants thrown into it. The Hungarian and Rumanian peasants say that only the stiller water in the bays or smaller branches is suitable for the use of fish poisons. Similar observations are also reported by Gr. Antipa; he states that the Rumanians rarely stupefy fish by the use of quick lime or poisonous plants in mountain brooks because of the drift and rapid flow of the water. Fish-poisoning plants are more often used in larger

rivers and brooks. When fish poisoning is being carried on the river is often dammed to prevent the rapid flow of the water.[34]

Successful fish poisoning also depends upon the level of water. After a heavy rain the swollen and rapidly flowing rivers and brooks are not suitable for fish poisoning. But when the water level is low and falling, and especially when the water is warmed by the sun, mountain brooks are very productive for fishing by means of poisonous plants.

Fish poisoning in the Carpathian area is also seasonal. It is done usually in the spring and at the beginning of summer when the fish-drugging plants are still very moist. Rumanians living along the river Aranyos say that it is not possible to poison the water with Verbascum and Euphorbia species as autumn approaches because the moisture in the plants is "dried."

In the Bihar mountains I studied the kind of fishing implements that are used along the Jád brook, which is about 30 km. long. At the upper flow of the brook, as it runs between rocks, trout hiding under stones are caught by hand or sometimes with the use of harpoons. Where the brook reaches the wide valley fish traps are used. About 10 km. from the mouth of the brook its flow is slower as it makes wide turns; it has more branches and there are islands in it. In this last stretch all these methods of fishing are practiced and the water is also poisoned by small pieces of cut and broken stems of certain plants (Euphorbia villosa, Euphorbia cyparissias, Euphorbia angulata, Verbascum phlomoides, Verbascum thapsus). Near its mouth the brook is channeled into a deep ditch in which these plants are thrown. The water is stirred with branches in order to dissolve the poison.

In the eastern Carpathians, it is often women who gather the piscicides, break them up, and throw them into the water. The fish that emerge from the water are caught by hand and in baskets. Women never use harpoons in fishing.

According to my own observation, fish stupefying using Euphorbia species is very general in Transylvania. These species are widely used for fish poisoning at the upper flow of the Black Körös River, in addition to the Jád and Dragan brooks in the Bihar Mountains, in the valley of Little Szamos, along the middle flow of the Aranyos and Maros rivers, in the valley of Great Szamos, Lápos, and elsewhere. Euphorbia angulata, Euphorbia cyparissias, Euphorbia amygdaloides, Euphorbia palustris, and Euphorbia villosa are used as piscicides. In the brooks of the southern part of the Transylvanian Erzgebirge, Euphorbia species are mashed with fist-sized stones on the rocks that emerge from the water and are then thrown into the brook. The milky parts of the plant, broken or cut into small pieces, are mixed into maize porridge and balls formed of this porridge are cast into the river or brook where there are large numbers of fish.

Rumanian fishing and ethnographical literature often refers to fish stupefying by means of Euphorbia species. Rumanian authors mention the use of Euphorbia salicifolia, Euphorbia Gerardiana, Euphorbia agraria, Euphorbia amydaloides, and Euphorbia helioscopia, which, according to these authors, are used by peasants to stupefy fish in Transylvania and south of the Carpa-

thians (Muntenia).[35] In the southern Carpathians, in Zabala brook, Euphorbia is also used to stupefy fish.[36]

The gypsies near the river Maros, in Moldavia and in the eastern part of Hungary use Euphorbia species for fish stupefying.

At the end of the last century, O. Herman reported that the Hungarians in Transylvania were familiar with Euphorbia cyparissias, Euphorbia esula, and Euphorbia palustris as piscicides. The plants are gathered in sheaves and broken with stones in the brooks, thus poisoning the water and killing the fish, especially the trout that live in the streams.[37] Later records confirm that these plants are the important piscicides used by the Hungarians living in the eastern part of Transylvania.[38] In the Hargita Mountains the custom of stupefying fish with Euphorbia species was widely diffused before World War II. The literature also indicates that some Euphorbia species were used forty or fifty years ago for fish stupefying in the marshy regions of the Great Hungarian Plain.[39]

Euphorbia palustris was used as a piscicide by the Slovaks.[40] It is also known that Euphorbia species were used in fish poisoning in the Balkan Peninsula in Bosnia and Herzegovina, and at Lake Prespa.[41] Euphorbia was the fish-poisoning plant used by the Bulgarians, including those in the regions of Asia Minor where Bulgarians lived formerly.[42]

A. Haberlandt makes the general statement that Euphorbia is a fish-poisoning plant used in South Europe.[43] J. Loewenthal mentions the use of Euphorbia alepicca in South Europe.[44] More species are used in South Europe according to F. N. Howes, who describes Euphorbia esula as a piscicide in Central Europe.[45] The available sources offer more details for study. In the botanical and fishing literature the use of Euphorbia species is reported from Greece, where it is used not only by the Greeks but also by Albanians living there. The Albanians also use a species of Euphorbia which they cut and break and then put in water under stones or in holes where fish hide; the fish come to the surface after some minutes and can be taken out with a net or by hand.[46] The names of Euphorbia species in some Italian dialects, names such as esca da pesci and tasso de' pesci, suggest that Euphorbia also plays the role of a piscicide in the Italian Peninsula.[47] In addition to this terminological evidence the use of Euphorbia by the Italians to stupefy fish is mentioned several times in our sources.[48] L. M. Wagner says that in Sardinia Euphorbia is the most commonly used plant as a fish poison, broken up and placed among stones. Its use as a piscicide is similarly reported by other authors. Thus the use of Euphorbia atlantica for this purpose is mentioned by J. Loewenthal.[49] Euphorbia is a piscicide in Spain,[50] France (Basses Alpes, Vosges, Vagney),[51] England,[52] and Ireland.[53] In these regions the species available locally are used.

The ancient use of Euphorbia species in Europe is proved not only by their wide diffusion as fish-poisoning plants but also by old records in the literature. Pliny was aware that fish could be killed by a species of Euphorbia and the same observation was reported by Dioskorides and by Galenos and others. The Persian Avicenna (died 1037 A.D.) and the famous Arabian pharmacologist Ibn al Baiṭār (died 1248 A.D.) were aware of this use for the plant. Later the fish-poisoning effect of Euphorbia species is mentioned in

several European works on botany and fishing.[54] On the basis of careful analysis R. Zaunick concludes that the records from antiquity and the Middle Ages support the wide diffusion of fish poisoning.

Euphorbia species contain euphorbon, aesculetine, and organic acids (tannoide) that affect the central nervous system; the gill is inflamed, the swimming bladder is enlarged, and in consequence the fish perish.[55]

It is interesting that I did not encounter the use of Verbascum species north of the Warm Szamos River even after careful investigation in the field. But south of Warm Szamos, along the Aranyos and Maros rivers and in several brooks in the mountains, species of Verbascum were often used by Rumanians for fish stupefying. Along the Warm Szamos, the green leaves and flowers of the plant are broken up and thrown into the slower flow of the river. In some villages along the Warm Szamos the seeds of the plant are also broken up, kneaded, and formed with maize porridge into small balls which are thrown into the water. Along the Jád brook the Rumanians mix seeds of Verbascum into small mincemeat balls. The green plant is often crushed in mortars and thrown into the lateral branches of the Aranyos River which is closed by stone dams. The Rumanian peasants believe that the trout is the fish most sensitive to the poison of the Verbascum species. With from three to four bags of green plants the Rumanian peasants living along the Maros River can poison a stretch of shallow, slowly flowing water about 40 meters long and two to five meters wide. At first the water foams a little owing to the plants that have been cast into the river and then the stupefied fish come to the surface where they can be gathered by hand. Rumanian fish poachers sometimes leave their villages in order to collect Verbascum species in the mountains for poisoning fish, but this is seldom necessary because the plant is fairly common along the roadsides and in the meadows and grazing ground around the villages.

Rumanians and Hungarians stupefy fish along the Jád brook between the middle flows of the Warm Szamos and Maros rivers by using the following species of Verbascum: Verbascum phlomoides, Verbascum thapsus, Verbascum blattaria, Verbascum glabratum, and others.

Verbascum thapsus is also used for stupefying fish by the Hungarians living in the Gyimes Strait in East Transylvania. The plant is cut, broken up, and put into the brooks in linen bags.

In studying the Rumanian literature on fishing I found that several earlier authors had directed their attention to the use of Verbascum species. Unfortunately the older records do not give details on how these plants were used and only a few mention the places where fish poisoning was carried on. Gr. Antipa says that Rumanians buy seeds of Verbascum in the drugstore and break them up. The broken seeds of Verbascum is a fish poison currently used in Transylvania.[56] Gr. Antipa also reports that the Rumanians dry some species of Verbascum, break the plants into small pieces, and mix them with water in a barrel; the water is stirred until it is no longer milky and then poured into the river. The stupefied fish come to the surface after a short time and can be gathered.[57]

According to the observations of G. D. Vasiliu the green stems and leaves of Verbascum phlomoides, Verbascum thapsus, and Verbascum nigrum are used in fish poisoning, although the poison of the last named plant is not very effective.[58] Among the fish-poisoning plants listed in a Rumanian book on fishing published in 1937 are Verbascum thapsus, Verbascum phlomoides, and Verbascum nigrum. The stems of these plants are gathered together with the flowers and seeds and after being thoroughly dried are ground into meal and poured into a suitable part of the brook, after which the stupefied fish soon emerge to the surface of the water.[59] In the brooks of West Transylvania (Banate), the Verbascum species (e.g. Verbascum glabratum) are very commonly used as fish-poisoning plants.[60] Along the Cserna River, Verbascum was smuggled across the Hungarian-Rumanian boundary out of Old Rumania before World War I. During the war the control of the boundary was very strict and fish poisoning with Verbascum therefore ceased, but after the war this practice was resumed. The special time for using Verbascum was July 22nd (Mary Magdalen) when all the village, even the intelligentsia, took part in fish poisoning. The plant was crushed by stones and cast into the river. It was chiefly the trout which were poisoned by this plant.[61] Verbascum is also used for fish poisoning by the Rumanians living in the southeastern Carpathians (Zăbala brook).[62]

The fish-drugging effect of the Verbascum species is also known in the old Hungarian botanical literature. A. Veszelszki, in his botanical work published at the end of the 18th century, writes that if the stem of Verbascum thapsus is thrown into fishponds the fish perish.[63] We know further that Verbascum thapsus was a very important fish poison in the swamps of the Great Hungarian Plain.[64] My field work showed that the Verbascum species were used for fish stupefying in some Hungarian villages lying north of the River Drave (County Baranya) as well.

Among the Slovaks Verbascum may have been a fish-drugging plant too, although I have only a single piece of evidence for this. My observations suggest that the inhabitants of a Slovakian village in North Hungary beside the Boldva may have used this plant for fish drugging. At the end of the last century, the seeds of Verbascum thapsus were used as a fish poison north of the Carpathians in Polish Pomerania.[65] There is mention of the use of Verbascum in Russia in the 19th century.[66]

There are many more such references available with regard to Southern Europe. K. Moszyński states that several Verbascum species are most commonly used as fish-poisoning plants in the Balkan Peninsula.[67] A bait made of bread in which crushed seeds and flowers of a Verbascum species is mixed is used along the Save River.[68] A Verbascum species is used as a fish poison in Herzegovina,[69] and in Montenegro fish are poisoned by Verbascum phlomoides.[70] At the boundary between Serbia and Bosnia along the Drina River a Verbascum species is used to stupefy fish; the plant is crushed with stones and the crushed wet leaves and stems are thrown into the river.[71] Along the Macedonian and Bulgarian frontier the water, which is nearly 1 mile deep, is dammed with stones or grass sod and some Verbascum species are crushed and thrown into the water, which then foams, and the fishermen wait until the stupefied fish come to the surface where they can be gathered by hand.[72] Verbascum is also a fish-poisoning plant among the Bulgarians in the Baltic Peninsula and in Asia Minor.[73] The use of Verbascum phlomoides as a fish poison is wide-

spread among the Bulgarians living in the Balkans in the valley of the Isker River. The Tartars living in South Dobrudja throw crushed Verbascum species into the water of the smaller, closed bays of the Black Sea to drug the fish.

The Arabs in Israel use the leaves and stems of Verbascum sinuatum for poisoning fish,[74] and a similar use of this plant is recorded in Constantinople and in one of the Ionian Islands (Zante)[75] at the beginning of the 19th century. Verbascum phlomoides and Verbascum sinuatum are the fish-poisoning plants of the Greek fishermen on the continent, and they were used on the coasts as well, the plants being bound into bundles and thrown into the sea with stones placed upon the bundles so that the surf would not whirl them away.[76] In Albania a Verbascum species is called lulë peshkut, "fish flower," and is used for drugging fish.[77] Verbascum is in widespread use as a fish-poisoning plant in Italy (especially in South Italy and Sicily),[78] in Sardinia,[79] in Portugal and Spain (including the Pyrenees),[80] and in South France.[81] According to records from the beginning of the century Verbascum was a known fish poison in Germany (Torgau, Ravelberg, etc.). It is of interest to mention that the physiological effect of the plant was forgotten in Bavaria, but the night before there was to be fishing the seeds of Verbascum were cast into the water to entice the fish.[82]

The use of Verbascum species today and in the recent past can be traced back to old traditions. Historical records from different areas show that its use has deep roots in the folk culture. Also the writers of antiquity and of the Middle Ages were familiar with its fish-poisoning effect. A general summary of these references follows:

Aristotle reported fish poisoning in rivers and ponds with Verbascum (plomos). He also reported that this plant was used by the Phoenicians for poisoning fish in the sea. Aelian adds some interesting information; he says that the progeny of frogs can be killed by this plant if its leaves and seeds are cast into the water. Verbascum was reported as a fish poison by the Arab Ibn al Baiṭār. According to Zaunick's investigations some Verbascum and Euphorbia species were used to drug fish from early times but these plants are often confused in the works of Arabian and Persian writers. The same confusion is seen in the Italian fishing terminology of today. The fact that in the 15th and 16th centuries Spanish and Portuguese laws forbade the stupefying of fish by Verbascum and other plants is proof that the Verbascum species were generally known as fish-poisoning plants and that great damage was done to fish stock by fishermen and peasants using poisonous plants. It is reported by Amatus Lusitanus in 1554 that Spanish and Italian peasants turned milk to curd by the addition of Verbascum flowers. The Spaniards crush the seeds of Verbascum and mix them with meal and cheese for fish poisoning. Since the 16th century, Verbascum species have been mentioned as piscicides by Dutch, Italian, Sicilian, and other botanists, and the fish-drugging effects of the Verbascum species were also observed by the great botanist Linnaeus.[83] In all probability Verbascum is the plant ("Wolle-cruydt") referred to by R. Dodoens in his botanical work written in Dutch (1554); he writes that some people wash their hands with the leaves of this plant and then put them into the water in the belief that this makes the fish swim to the hands where they can be caught.[84]

The Verbascum species contain saponin and some species (e.g. Verbascum thapsus) also contain rotenone. Therefore they have a physiological effect corresponding to that of the tropical Derris root, causing haemolysis, which appears first in the gills when the saponin reaches the blood through the mucous membrane.[85]

The red berries and crushed thin roots, stems, and leaves of Daphne mezereum are kneaded with maize porridge and bread crumbs and then thrown into slowly flowing water where there are fish. This method is employed only occasionally by the Rumanians in Transylvania, in the valleys of Lápos and Aranyos. O. Herman reports that Hungarians also use the berries of Daphne mezereum kneaded into balls with bread crumbs and brandy to poison fish.[86] Unfortunately neither he nor other Hungarian authors mention the local places where this is done.

There is no reference to the fish-poisoning effect of the Daphne species in the works of Greek and Roman writers, but a Persian author, Abū Mansūr Muvaffaq al Haravī says in his work, edited about 970, that fish are stupefied by the seeds of māzarijūn (Daphne oleoides).[87] Also Avicenna refers to its poisoning effect on animals. Among the Portuguese in the 13th century it was a privilege of the nobility to drug fish by Daphne and the serfs were obliged to place this plant at the disposal of the nobles. However, its use has been forbidden in Spain since the 15th century and in Portugal since the 16th.[88] Daphne is listed by A. Haberlandt among the plants used for drugging fish in South Europe.[89] In the modern fishing and botanical literature of the Mediterranean area the use of Daphne species is often mentioned. Leaves and berries of Daphne cneorum and Daphne Gnidium are used for fish poisoning in Spain,[90] and the latter species is considered a piscicide in the Portuguese province of Amarante[91] and in Italy (Liguria).[92] In Sardinia fish are drugged by stripped roots of Daphne Gnidium crushed and cut small, and the use of Daphne mezereum is also mentioned. Daphne is often confused with Verbascum in the Sardinian dialect and also in other neo-Latin areas.[93] According to my observation Daphne is used for fish poisoning by the Bulgarians living in the Rhodope mountains; the berries, roots, and crushed leaves of Daphne mezereum are kneaded with bread and cast into the brooks. M. Zaunick is of the opinion that southwestern Europe is an old autochthonous area of the use of Daphne species.[94] On the basis of its occurrence in Transylvania and the Balkans one can surmise that Daphne is a characteristic fish-poisoning plant of the Mediterranean areas and that knowledge of its use might have been brought by the Arabs to the regions of the Mediterranean Sea. My opinion is supported by the lack of reference to its use in the old Greek and Latin sources.

The use of Daphne mezereum for fish drugging is mentioned in North Asia and northwestern Russia,[95] but the authenticity of these data must be confirmed and it will also be necessary to localize the data more exactly.

The fish poisoned by Daphne are probably killed by glycoside daphnine and by some acids the physiological effects of which are not yet known.[96]

The berries, roots, and stems of Solanum dulcamare mixed with maize porridge or bread crumbs are used by the Rumanians in Transylvania (Cold

Szamos River, Almás brook). In the valley of the Almás brook Solanum nigrum also is used as a piscicide.

The effective agent of Solanum dulcamare consists of a glycoside, solanine (which paralyzes the action of the heart and causes haemolysis), and some kinds of saponin.[97]

In West Transylvania--in the region of the Jára brook, the valley of Aranyos, Maros, and the brooks flowing into the Maros--Conium maculatum is used for fish poisoning. Rumanian peasants crush the stems, roots, leaves, and seeds of the plant and throw them into quiet water. According to the peasants trout are especially sensitive to this plant. Sometimes this plant is made into bundles and used to close off a very narrow part of the brook; for a distance of from 30 to 50 meters the fish die in the water flowing through these bundles.

The alkaloids of Conium maculatum belong to the quick-acting poisons but this plant has no significance in Central and South European fishing.[98] In addition to the Rumanians, this plant is used by Slovakian,[99] Greek,[100] and Portuguese fisherman.

Conium maculatum contains poisonous alkaloids (coniine, methylconiine, conhydrine, etc.). The fish poisoned by it turn on their sides, breathe roughly, and tremble; their fins bend and they perish within 4 to 5 minutes.[101]

The Rumanians gather seeds of Hyoscyamus niger and then break them slightly and knead them with bread and maize porridge to form small balls, which poison the hungry fish. In some brooks and rivers of West Transylvania, in the valley of Little Szamos, and in the ponds of central Transylvania, Hyoscyamus niger is a favorite piscicide with the Rumanians. G. D. Vasiliu[102] also reports that the Rumanians use this plant for fish poisoning.

Hyoscyamus niger has been known as a fish and bird poison since the beginning of the 13th century. In Latin and German books on natural history and botany many recipes for fish poisoning with Hyoscyamus niger are published. The author of a German economics work published in the 16th century writes that the seeds of this plant must be mixed with brandy, honey, cheese or Italian nut; then small balls must be prepared and cast into the water. In 1435 and 1552 the use of the plant (beleno) was strictly forbidden, showing that fish poisoning was ruthlessly carried out at this time. A German book on magic sciences edited about 1915 describes the use of this plant as it was described in the so-called Brussels recipe dating from the 15th century.[103] Hyoscyamus niger was a known piscicide plant at the beginning of the century with the Norwegians,[104] with the Hungarians in the Great Hungarian Plain,[105] with the Slovaks,[106] and its use for fish drugging is reported also from Spain.[107]

Hyoscyamus niger, containing hyosciamine and scopolamine, exerts the same physiological effect as Datura stramonium,[108] which is dealt with below.

The use of Datura stramonium in the Eastern Carpathians for fish poisoning occurs sporadically. In the valley of Cold Szamos its use is general and, old Rumanians say, this way to poison fish was learned from foreign

woodsmen. In the southern part of the Transylvanian Erzgebirge also, the use of this plant may be met here and there. The seeds, stems, and leaves of the plant are broken up and scalded several times and maize porridge is soaked in the fluid; then the porridge is spread where the water flows slowly. Fish poisoned by Datura stramonium must be boiled or fried very thoroughly before being eaten lest they be poisonous. This plant is used also by wandering gypsies in Transylvania and Hungary.[109]

The use of Datura stramonium is also mentioned in the Rumanian literature on fishing. According to G. D. Vasiliu its leaves are used for fish drugging.[110] The locality of its use, however, is not mentioned. The Hungarians, as well, know Datura stramonium as a piscicide plant, and it is spread especially in Northeastern Hungary.[111] Also the Slovaks drug fish with this plant along the Vág River and elsewhere.[112] In Bosnia beside the Save the fishermen mix seeds of Anamirta cocculus with seeds of Datura stramonium, cattle and carp bile, sulphur powder, and flour, and small balls are made of the mixture that are then put into night crawlers and cast into the water. The bait is soon eaten by the fish, which are stupefied in a short time and can be gathered. If a fish recovers, bread or absorbent cotton soaked with brandy is put into its mouth, or some brandy is poured in.[113]

Datura stramonium is an imported plant in Europe. It was introduced in West Europe only late (in about the 15th or 16th century). In Germany it was a rare garden flower in the 16th century. The region of the Black Sea, West Asia, may have been its native land, but there is much uncertainty regarding the place of origin of this plant. It is derived from South America according to the botanical literature.[114] Man probably played an important role in its diffusion. A Hungarian botanical work states that Datura stramonium has been known in Transylvania for two centuries and that it must have been brought there by immigrating gypsies.[115]

The effective agents of Datura stramonium are the hyoscyamine, atropine, and the scopolamine alkaloids. The peripheral terminal nerves are paralyzed by them.[116]

The terms maszlag and gebulya very often occur in the Hungarian ethnographic and fishing literature with the meaning "fish poison." Maszlag is a word of Arabian origin, but it is not known from which language it came directly into the Hungarian language. Gebulya is a Slovakian loan word in the Hungarian language. The words maszlag and gebulya seem to mean different piscicide plants (Datura stramonium, Solanum nigrum, Atropa belladonna, Anamirta cocculus) in the Hungarian language; it is not always possible to determine their exact meaning by the references.[117]

Anamirta cocculus is a very widespread fish-drugging plant in Central Europe and the Balkan Peninsula. It is used by Hungarians along the Danube[118] and the rivers in the northeastern part of Transdanubia (Rába, Rábca).[119] The Hungarian names for it are kukulifánk, kukorifánk; this terminology proves that Anamirta cocculus was brought from the west to Hungary. In Styria this fish poison was called Koklefant, Oculifant, or Kuglifant in the 17th century.[120] This Hungarian terminology (kukulifánk, kukorifánk) is an adoption of the German words. The diffusion of this fish poison in Hungary was surely

promoted by Danubian boatmen and by the folk trade of itinerant vendors between the Hungarian and Styrian areas.

Anamirta cocculus is a commonly used fish poison with the Slovaks[121] and the Bohemians.[122] Under different Rumanian names (măslad, masleac, gogoşi de peşte, etc.) Anamirta cocculus is mentioned by Gr. Antipa, who says it is bought by the Rumanians in drugstores and is used to stupefy the fish mainly of large rivers. It is used by the Rumanians both in Transylvania and in the areas south of the Carpathians. In Transylvania the seeds are broken up and mixed with cow liver; raw paste is added and then after standing for a short time the mixture is cast into the river. The Rumanians in Bukovina and Moldavia mix the broken-up seeds with maize porridge; in the Southern Carpathians[123] they mix them with night crawlers' flesh. According to G. D. Vasiliu the Rumanians mix the seeds of Anamirta cocculus with bread, flour, and liver, and the mixture is thrown into the water.[124] Along the Great Szamos River the seeds of Anamirta cocculus are bought in the shops by the Rumanians, broken up thoroughly on a stone, kneaded with small cut-up night crawlers or liver, and dried in the sun or near the stove for some hours. Then the mixture is spread in quiet water frequented by fish. After two hours all the stupefied fish emerge and can be gathered by hand or in a basket. The fish caught in this way are distributed by the fishermen taking part in the fish poisoning and the man who bought the poison has the right of choosing first. Along the Lápos River the Rumanians mix the broken seeds with maize flour and meat to form small balls and cast them into the water. Fish poisoning takes place mostly at night by torchlight. The Hungarians living along the Lápos River also practice fish poisoning and fishing in this same way.

In Moldavia along the river Beszterce Anamirta cocculus is a very popular fish drug of the wandering gypsies.

In 1940 I encountered the use of Anamirta cocculus among the Ukrainians in the Northeastern Carpathians along the Latorca River. The seeds are broken up, mixed with cut-up night crawlers and flour, and after standing three days small balls are made of the poison and cast into the water. The poison quickly exerts its stupefying effect. A description of fish drugging among the Ukrainians living in the Northeastern Carpathians is given by V. Vladykov. This poison is sold secretly by the merchants. The seeds are dried, broken small, mixed with cut-up night crawlers, crickets, grubs of wasps, meat, dough, and curded ewe cheese. The mixture is held in a warm place one night so that it will sour, and next day small balls are made of it, which are cast into the water. Within 15 to 20 minutes of consuming the bait the symptoms of poisoning appear in the fish. Mainly Leuciscus cephalus, Barbus barbus, Thymallus thymallus are poisoned. When the water is flowing rapidly, the Ukrainian peasants run along the bank in order to gather the fish before they are carried too far downstream. The poisoned fish are quickly disemboweled.[125]

Anamirta cocculus is a rambling plant that is native to Ceylon, East India, Indonesia, the Philippine Islands, and New Guinea. The seeds of the plant were brought to Europe chiefly by the maritime trade out of the ports of Bombay and Madras. In spite of the fact that its use as a piscicide was prohibited by most European states (in Germany, for example, it can be bought

in the drugstores only on showing the necessary certification), fishermen could get a considerable quantity of it on the black market. When "fish poison" is spoken of in Europe, Anamirta cocculus is usually understood. It was long unknown among the ancient European fish poisons since it was brought to Europe only late, where it soon replaced the autochtonous traditional poisons. In studying the old European pharmaceutical and botanical works, R. Zaunick learned that this poison was unknown in Europe, at least in the western part, until the beginning of the 16th century. In Germany it is first mentioned in the inventory of the drugstore of the municipal council in Braunschweig in 1528. In the 16th and 17th century the plant from which the seeds are derived was also unknown in Europe. The Englishman J. Gerarde, in his often published work, considers it the fruit of a Solanum species but he also mentions that others believe it to be the fruit of a Tithymale or Clematis species. He then describes how it is mixed in the form of powder with flour, honey, and bread crumbs to drug fish. Similar recipes are published in the Latin and German works edited on the continent in the 16th century.[126] It is a good proof of its quick diffusion that its use was already prohibited, together with Daphne and Verbascum species and lime, in Portugal in 1565.[127] An interesting German process reported by R. Zaunick from the years 1718-1720 dealt with fish poisoning by "Kockelskörner." The Faculty of Law of the University of Lipsia was also concerned with it.[128]

In Europe Anamirta cocculus was still widely used at the beginning of this century. It was a piscicide plant in France,[129] in addition to the areas mentioned. Its occurrence in South Europe is mentioned by A. Haberlandt.[130] Anamirta cocculus was a known and widespread fish poison in Bulgaria.[131] It is often met as a piscicide plant in Serbo-Croatian areas.[132] The seeds of Anamirta cocculus are called balukat, balukot in the Serbo-Croatian literature. Anamirta cocculus is evidently meant by the poison mentioned as "Fischkörnerstrauch" by D. Zelenin in his description of Russian fishing.[133] Some data give evidence that this fish poison was known also by the Poles.[134]

Anamirta cocculus (Anamirta paniculata) reached East Turkestan also where it is known by the Dōlan people by the name dārō "medicine." The seeds are ground and cast into the water, then the stupefied fish are pulled out of the water by a hook fastened on a line.[135]

In my opinion Anamirta cocculus was directly imported from the Near East to Central Europe, the Balkan Peninsula, and Russia. I referred to the fact that it is sold today by sailors in the Rumanian parts of the Black Sea as well. The Serbo-Croatian names of Anamirta cocculus balukat, balukot are of Turkish origin, meaning "fish-plant, fish-grass."[136]

The bitter seeds of Anamirta cocculus contain a very effective poison, picrotoxin.[137]

In the middle reach of the river Maros and in the valley of Lápos (Transylvania), the Rumanians smash the bright black berries of Atropa belladonna and mix them with crumbs of bread and maize porridge. This poisoned bait causes the very rapid death of the fish. I was told by Rumanian fishermen in the valley of Lápos that it was also customary to mix the cut-up leaves and stems of the plant with liver, meat, and curded ewe-cheese and to

throw the mixture in the form of small balls into the water. According to the peasants the plant is also very effective in smaller quantity. The heads of the fish poisoned in this way are cut off and then thoroughly cooked or fried. A Hungarian botanical periodical reports in the beginning of the century that Atropa belladonna occurs as sporadic piscicide plant also among the Slovaks. The berries of the plant are kneaded with butter and bread and given to the fish.[139]

The alkaloids (hyoscyamine and atropine) of Atropa belladonna paralyze the central nervous system and cerebral activity.[140]

I have only one record of the use of Aconitum vulparia, the seeds of which are broken up by Rumanian fishermen in a side valley of the Great Szamos and the fish drugged in the same way as by the seeds of Anamirta cocculus.

Not much is known of the use of Aconitum species in fish poisoning. R. F. Heizer cites only one case where it was employed as fish poison.[141] The Slovaks living in the upper valley of Garam smash the root of Aconitum napellus, mix it with raw dough, and then throw the mixture into the water.[142] It may be possible that this plant was more commonly used as a piscicide in Europe. The Saxons of Transylvania use its cooked root to poison wolves, dogs, mice, etc.[143] A fact proving the ancient knowledge of Aconitum species as poisons is that it is used for poisoning the whaling harpoons in the Aleutian, Kurile, and Kodiak islands.[144] The knowledge of the poisonous effect of the plant in the Aleutian Islands is very likely diffused from the Eurasian continent.

According to my observation fish drugging is very often carried out by the use of Veratrum album is Southeastern Transylvania. My observations are supported by earlier literary references. B. Dorner writes that the Hungarians living there smash Veratrum album on the stones emerging from the brook and then throw it into the water.[145] The Rumanians also know its fish poisoning effect[146] but this reference cannot be localized more exactly. Veratrum album plays the role of a piscicide plant among the Spanish.[147] It is an interesting fact that the employment of Veratrum album for poisoning rodents, poultry, and doves is often mentioned from Pliny on in the Latin, German, and Italian botanical works of the 16th and 17th centuries. (In Transylvania this plant is cooked in maize porridge by bad neighbors today in order to poison each other's hens.) The old Gauls poisoned their arrows with the sap of this plant. Poisoning of hunting implements with Veratrum sap was prohibited in Spain as late as 1527.[148]

Veratrum album contains alkaloids belonging to the sterin group (jervine, rubijervine, pseudojervine, protoveratrine, etc.) that paralyzes the activity of striated muscle, the breathing, and circulation of blood.[149] It is interesting that the quail is immune to Veratrum album and according to Pliny it consumes the seeds of this plant with great pleasure,[150] a fact that is mentioned also by Lucretius in his work De rerum natura (IV:620-624).[151]

The husks of nuts (Juglans regia) are used in fishing in the brooks of the southern regions of the Transylvanian Erzgebirge. The husks are thoroughly broken up and cast into still water. In order to prevent their being carried off, dams of stones are built. The smaller fish come to the surface

of the water poisoned by the husks of this nut. Gr. Antipa also mentions that this way of fishing spread to the Rumanians living south of the Carpathians. As this method is described by Gr. Antipa, the husks of the nut are placed in bags which are then put into brooks having shallow water and stamped on so that the poison may be dissolved better in the water.[152] According to G. D. Vasiliu the Rumanians use the leaves of this nut tree for fish drugging.[153]

Green nuts and leaves of this nut tree were probably used much more for fish poisoning earlier. Cracked green nuts were used for fish drugging along the Drina in the Balkan Peninsula.[154] This method is known also in other areas of Serbia and its occurrence is dealt with also in the dictionaries.[155] In Italy husks of the nut are cast with Verbascum into the water.[156] Also in India nut husks are used for fish poisoning.[157] In Sardinia fish are poisoned by broken-up hazelnut (Corylus).[158]

The effective substance of unripe nut are the hydro-juglon, emulsine, citric acid, and malic acid.[159] Oak galls belong also to this group of vegetable poisons. Pulp made of oak gall, vinegar, red pepper, and other stuffs is used for fish drugging by the Italians.[160]

Physalis alkekengi is mentioned as a piscicide plant from the middle regions of Transylvania.[161]

It is generally known among the Rumanians and Hungarians in Transylvania that in the retting of hemp the fish perish because of the water of the rettery. This water often flows into the river or brook, and therefore the neighboring part of the river or brook is observed to see whether stupefied fish can be caught. But no hemp stalk is placed in the water only for that purpose, because hemp is esteemed much more in the households of the Rumanian or Hungarian women than are the few fish that could be stupefied by its use.

G. D. Vasiliu writes that the Rumanians seldom use Cannabis sativa for fish poisoning.[162] The poisoned water of the rettery is released by the Slovaks into a dammed-up brook and the fish are stupefied in this way.[163] I. Ecsedi reports that at the end of the last century fish were drugged also by wild hemp in the Great Hungarian Plain.[164] In spite of the few data I consider fish poisoning by hemp very old and rather general, at least in South Europe. This opinion is supported by the order of the ruler of Sicily, Frederick II, in 1231 prohibiting fish poisoning with flax and hemp.[165] A similar order was issued in Saxony in the 16th century.[166] Fish poisoning with the stems, leaves, and flowers of hemp is practiced also in India.[167]

It is likely that the fish are affected by the trigonelline alkaloid, the malic acid calcium salt, and some bitter stuffs, the cannabis.[168]

In the northern part of the Bihar Mountains (Transylvania) a fungus (Amanita muscaria) is employed for fish drugging. This fungus is gathered by the herdsmen, mashed to pieces in an old pot and cast into a slow-flowing brook dammed by stones. I did not encounter the use of Amanita muscaria as a piscicide in other regions of Transylvania. It seems to be an isolated occurrence with the Rumanian inhabitants of West Transylvania.

But Amanita muscaria is used for fish poisoning also with the Slovaks in the northern Carpathians.[169] It is reported in a German book on fishing in 1498 and in a Latin book published in Naples in 1589 that Amanita muscaria mixed with the seeds of Hyoscyamus niger etc. is employed for bird poisoning. From this record the conclusion may be drawn that it was used earlier also for fish poisoning in Europe.

The effective agent of Amanita muscaria is the muscarine.

There are more plants mentioned in the Rumanian literature on fishing that are used for fish poisoning by the Rumanian peasants. These plants are as follows: Cyclamen europaeum (its bulbils are used for poisoning),[171] Arctium lappa,[172] Agrostemma githago (its seeds are considered pisciçide),[173] Digitalis grandiflora,[174] lipan (Lappa major or Verbascum species),[175] iarba-rosie (Bindens species?),[176] hariu (Vincetoxicum officinale?),[177] Strychnos Nux vomica.[178] The last-named is an East Indian plant, the extract of which is probably bought in the drugstores or on the black market by Rumanian fishermen. Among the plants listed above the Cyclamen species are most important. They were generally used as fish-poisoning plants in the Mediterranean areas from antiquity until our day. Cyclamen had been employed for fish drugging according to J. Loewenthal in the original home of Indo-European peoples.[179]

Fish poisons of animal origin are not known in the Carpathians. At least I failed in finding any evidence of them during my field work and such poisons are not mentioned in the literature either. But fish poison of animal origin is employed in the Balkan Peninsula. In Macedonia along the Vardar River the fish are poisoned by sheep and cow gall mixed in raw dough.[180] In Bosnia, cow and carp gall are a part of the poison bait with which Datura stramonium and Anamirta cocculus is mixed.[181] Pulp made of cow gall, tobacco, flour, and oak gall is used for fish drugging by the Italians.[182]

In Southwestern Transylvania (along the river Feketeügy) fish are poisoned with spirits by the Hungarians; minced liver is put into spirits, kneaded with dough leaven and cast into the river.[183] The stupefying of caught fish by alcohol is practiced along the Save in Bosnia where bread crumbs or cotton balls soaked in brandy are put into the mouths of the fish, or brandy is poured into their mouths.[184]

I have already mentioned the poisoning of fish with lime. This way of fishing was carried on at the end of the last century in the lower-lying villages of the western highlands of Transylvania where lime could be bought or wandering lime burners delivered it from village to village. In the higher mountains, where the houses were made of wood and were not whitened, lime was not required and fishing with lime was not practiced by the Rumanians. In Bosnia along the Save River similar observation was made by V. Ćurčić.[185]

Today Hungarians, Rumanians, Slovaks, and Ukrainians fish by quicklime throughout the North and East Carpathians. This observation was not only made by me but is recorded also in several literary sources.[186] Among the Hungarians this way of fish drugging is also diffused in the areas outside the Carpathians.[187] A fairly general way of fish stupefying by this means is to place quicklime in a loosely corked bottle which is then thrown into the

brook. When water gets into the bottle it causes an explosion which stupefies the fish. The Rumanians in North Transylvania and the Hungarians in Southeast Transylvania carry quicklime in bags into the brooks and kill a lot of fish in this way.

Pliny records the use of quicklime for fish drugging in Campania where fishermen cast the root of a species of Aristolochia mixed with lime into the sea. Pliny's recipe occurs in the botanical and fishing literature of the Middle Ages and of later centuries, but the explosion method with quicklime was also known. The first record can be found in the work of Petrus de Crescentiis (1230-1321), Liber ruralium commodorum. We learn from his description that if a bag filled with lime is drawn in the water here and there the fish go blind and may be caught with the hands.[188] As this work was translated into German, Italian, French, and Polish, it is likely that the use of lime in fishing was promoted in Europe by these translations. Many German works published on fishing and household matters since the end of the 15th century mention fishing with use of lime. According to the recipes quicklime can be mixed with several plants. The German agricultural work "Haushaltung in Vorwerken" (16th century) recommends putting quicklime, saltpeter, and mercury into a closed pot and placing it in the water. The water filters into the pot and the explosion caused by it kills all the fish in the brook.[189] The use of lime was already prohibited by Spanish and Portuguese laws in the 16th century.[190] Since 1669 this barbarous way of fishing has been forbidden in France and prohibitive decrees have been issued also in other countries.[191] In spite of these prohibitions, this way of fishing has been preserved until today. It is mentioned in a great many works on fishing published at the end of the 19th and the beginning of the 20th centuries. A. Haberlandt reports its use in South Europe.[192] The use of lime in fishing is known in the Caucasus,[193] in Italy,[194] in Sardinia,[195] in the Serbo-Croatian areas, etc.[196] J. Jankó thinks that it is diffused throughout Europe but that Western culture has restricted it more and more to the East.[197]

In my opinion the knowledge and spread of fishing with lime together with dynamite promoted the suppression of fish-poisoning plants significantly.

If dynamite is exploded in the water the fish perish in large quantities because of the power of the explosion. This barbarous method is practiced by several peoples of Europe. Fishing by explosion is known by the Hungarians,[198] Rumanians,[199] Ukrainians,[200] Bohemians,[201] Slovaks,[202] Croats,[203] Serbs,[204] Sards,[205] Swedish,[206] etc. The inhabitants of the villages learned the effect of dynamite from road-building workers, miners and quarrymen. During World War II soldiers of different nationalities met their need for fish in Central Europe by casting hand grenades into brooks and rivers.

I will describe two quite primitive methods of fish catching. In Transylvania (in the valley of Great Szamos) the Rumanians cast sawdust from the lumber mills into the water, which gets thick and the fish swimming on the surface of the water can be caught with the hands.[207] The Ukrainians living in the Northeastern Carpathians carry large amounts of snow into the rivers and brooks in winter, thickening the water so the fish may be caught in a similar manner.[208]

Fish poisoning is, of course, only a vestige and is disappearing in Central Europe and the Balkan Peninsula. Its disappearance is promoted by the several prohibiting orders that I referred to above. Such prohibitions were also issued in antiquity and there are many similar data from the Middle Ages as well. It is noticeable, however, that tradition did not yield to the prohibitory orders, and fish poisoning was employed as a food-getting method. According to what plants were prohibited, the number of narcotic plants was increased or decreased. Prohibitory orders are interesting because one can learn from them what kind of plants were used for fish poisoning.

Let us see some prohibitory orders.

Plato says that fishing is permitted in ports, rivers, ponds and marshlands if it is not carried out by narcotics.[209] In Sicily the use of Taxus and other plants was prohibited by Frederick II in 1212. The fishermen caught in the act were punished by forced labor, fastened in chains, for one year.[210] In Spain fish poisoning was forbidden by John II in 1435 and his order was confirmed by later rulers. In Portugal an order was issued in 1565 which prohibited the use of Verbascum, Daphne, Cocco (Anamirta cocculus), and lime was also forbidden.[211] In Sardinia fish drugging has been prohibited by law since the 16th century but in spite of this L. M. Wagner knew of the use of many piscicide plants there (Verbascum thapsus, Euphorbia, Daphne mezereum, Ranunculus sceleratus, etc.).[212] J. Janko mentions that the use of lime has been forbidden in France since 1669 (also the use of Anamirta cocculus is prohibited by the French laws).[213] The use of lime is forbidden in Russia.[214] In a town of West Hungary (Köszeg) fish poisoning was prohibited in 1649.[215] Some time later (1667) a similar order was issued in Transylvania. In some towns of North Hungary fish drugging was forbidden much later, only in 1839.[216] An order valid for the whole country was issued in Hungary as late as 1888 to prohibit fish poisoning.[217] In this time the use of Euphorbia palustris, lime, and dynamite might have been general because these are especially mentioned in the law.

In connection with the prohibition of fish drugging, mention must be made of a Balkan folk belief that if somebody poisons fish he will meet with an accident. Evlia Čelebi, a Turkish traveler writes of a fishpond in the court of a Mohammedan cloister (in Herzegovina). The inhabitants believe that if somebody catches or poisons the fish there he will be hanged, but if he gives ewe liver to the fish and the fish eat it, all the wishes of that man will be fulfilled.[218]

It is clear that the use of fish-poisoning plants was very old in Central Europe and the Balkan Peninsula. But it is very difficult to determine the exact time of their employment. The great age of the use of piscicide plants in Central Europe is proved by their wide geographical diffusion and indirectly by many Mediterranean literary sources. The most important piscicide plants used in the area of the East Carpathians, as in the Balkan Peninsula, are the Euphorbia and Verbascum species, which are known both among the Hungarians and the Rumanians. The use of Verbascum species is known also by the Transylvanian Saxons. The use of Euphorbia species occurs in the Hungarian areas lying east of Transylvania and it is probable also that the single occurrence among the Slovaks shows its wider diffusion. The use of Verbascum species in the Great Hungarian Plain and in South Trans-

danubia may be a vestige of earlier and more intensive fish poisoning. The center of use and the antiquity of Euphorbia and Verbascum species in the Mediterranean areas and in the Balkan Peninsula (which can be proved on the basis of literary records) suggest that there must be a historical connection between fish poisoning in South Europe and Central Europe (the Carpathian area). The Rumanians may have brought the knowledge of the use of Verbascum and Euphorbia species with them. It would be difficult to account otherwise for the source of knowledge of this kind among the Hungarians in Transdanubia, the Great Hungarian Plain, and Transylvania. In Transylvania an adoption from the Rumanians and in Transdanubia and the Great Hungarian Plain a more direct connection with the Balkans may be assumed. As there is only a single record of the use of Verbascum as a piscicide plant from the Slovaks in North Hungary it is proved that fish poisoning with Verbascum was diffused from the south--perhaps the mediatory role was played by Hungarians. The more sporadic use of Daphne species can be explained by the plant's geographical circumstances; Daphne is a plant much less available than Euphorbia or Verbascum. It can be suggested that the earlier use of Veratrum album for fish poisoning was common with the Hungarians in Transylvania first of all in the eastern areas. But a more general employment of it is not known by the Rumanians. The data from South Europe indicate that this plant was not originally a piscicide. The Mediterranean character of its use for fish drugging is without any doubt. The green nut of the Cyclamen species belongs to the same south European cultural complex as do Verbascum and Euphorbia. Fish poisoning with Canabia sativa has a secondary significance because its use is a result of the experience with retting hemp. The use of Atropa belladonna, Solanum dulcamare, Solanum nigrum, Conium maculatum, Aconitum species, and Amanita muscaria is rare in the East and North Carpathians. It is probable that the use of these plants for fish poisoning is secondary. After the Rumanian peasants had seen their intensive poisoning effect they were used for fish poisoning. In Europe they must have been unconditionally very old poison plants. Conium maculatum was a known poison in Athens in the 5th century B.C.[219] But it is not mentioned in the Greek-Latin and Medieval sources as a piscicide plant, which shows that is was only later employed in fishing. Recorded relatively late in the list of fish poisons are Hyoscyamus niger (in the 13th century) and Datura stramonium (15th and 16th centuries). The knowledge of the poisoning effect of these latter plants may have found its way to the Carpathian areas on different routes (e.g. transferred by wandering vendors of medicinal herbs, wandering gypsies, village priests and teachers, etc.). In Europe Anamirta cocculus has been spread by trade since the 16th century. In the Carpathian area it was likely used later than in the areas of large West European ports. It reached Hungary from the West until the Black Sea ports in Rumania became the centers of its spread. Anamirta cocculus was brought to the Balkan Peninsula from the Near East. Anamirta cocculus, Hyoscyamus niger, and Datura stramonium suppressed other piscicide plants being used for a long time, first of all Verbascum, Euphorbia, and Daphne species. The same situation occurs also in the Mediterranean area,[220] where Anamirta cocculus is such a characteristic piscicide plant that its names are used also in the Italian and French dialects[221] (coque du Levant, coque-levin) for the Euphorbia and Verbascum species.

I do not really think that the conservative Rumanian peasants learned about fish-poisoning plants directly from the old botanical works since their social and cultural situation would preclude this.[222] The knowledge of fish

stupefying was handed down not by written records but by verbal information among the peasants in the Carpathians and the Carpathian Basin until recent days. The route of inheritance can scarcely be traced from the present time to the remote past. The economic and social situation of the peasants and herdsmen in the Carpathians contributed toward the survival of fish poisoning and other primitive ways of fishing. The structure of the Rumanian folk culture was very archaic until the beginning of the 20th century, and in this culture fish poisoning historically and functionally occupies a very organic place.

In all probability the fish-stupefying plants belong to two strata in the East Carpathians (and generally in the Carpathian area). The older stratum consists of Euphorbia, Verbascum, Daphne species, and Cyclamen europaeum, and the younger stratum of Hyoscyamus niger, Datura stramonium, and Anamirta cocculus. The historical date of the use of other piscicide plants cannot be exactly determined though their ethnogeographical connections point to the Mediterranean area. It is not surprising that a significant majority of fish-poisoning plants in the Carpathian area is connected with the same traditions in the Mediterranean area. L. Lewin's book gives excellent proof that several poisons had great significance with the ancient Greeks and Romans and that the East was the teacher of these two peoples of antiquity in this respect.[223] The use of fish-drugging plants in the Carpathian area was, of course, the consequence of the deep botanical knowledge of the peoples living there. This botanical knowledge plays a role in the choice of wild food plants, in the use of a great number of medicinal herbs, and in the rich botanical mythology. Al. Borza and V. Butură write in 1938 that medicinal herbs and magical herbs were sold by peasant herb-sellers in Moldavia at the markets of the towns. About 60-70 plants can be bought there. The authors remark, humorously, that the cheapest clinics and drugstores of Europe can be found here because a portion of medicinal herb with the oral directions for use and advice cost only 1 leu.[224] Under such circumstances it is natural that similarly very rich traditions of fish-poisoning plants are preserved in the Carpathians. The ethnobotanical knowledge of the people is not restricted only to one aspect of a territory but involves food plants and plants used for dyeing, for healing, and for industrial purposes. The natural flora, renewing from year to year, was always the most important source of raw material requirements in the Carpathian area.

In studying the cultural anthropological problems of piscicide plants it would have been instructive to take the etymology of the Rumanian and Hungarian plant names into consideration. Unfortunately, the etymological investigation of the plant names has not been successful. From the folk names of fish-poisoning plants no historical conclusion can be drawn.[225] I should like only to call attention to the fact that Verbascum species are called divizma in the Southern Slav languages, a name that does not occur in the Rumanian language. The names of Verbascum species in the Rumanian language are coada lupului, lumînărică, etc. This fact may prove that the use of Verbascum as a piscicide was known by the Rumanians before their cultural contact with the Slavs. The Rumanian name of Conium maculatum (cucută) is of Latin origin[226] and refers to the ancient origin of the plant, but, as has been mentioned, the use of Conium maculatum with other plants as fish poisoning is secondary. The Rumanian term deriving from Latin for Juglans regia (nuc, nuci) and Cannabia sativa (cînepa)[227] cannot be taken into account with

regard to the antiquity of fish poisoning because these plants are used also for other purposes. Knowledge of it is obviously not connected with fish drugging.

Our data on the use of fish-poisoning plants north of the Carpathians are very scarce, not so much as a consequence of insufficient examination. The ethnographical connections of the areas north of the Carpathians with the classical European territory of fish poisoning with the Mediterranean-Balkan area are very loose. However, so far as the geographical distribution of the plant is concerned, there would be some possibility of the intensive use of Verbascum, Euphorbia, Daphne species and other plants for fish drugging as well.[228]

ENDNOTES

1. Heizer 1953:225-283; Quigley 1956:508-525.
2. Weule 1922:64.
3. Jankó 1900:253.
4. Martinka 1931:96.
5. Loewenthal 1929:1-8.
6. Moszyński 1938:B 36-40.
7. Santesson 1939:1-4.
8. Ekman 1910:460.
9. Moszyński 1938:B 36-40.
10. Moszyński 1938:B 41-42.
11. Moszyński 1960:193.
12. Heizer 1953:248-249; Howes 1930:146.
13. Heizer 1953:249.
14. Heizer 1953:256.
15. Anell 1955:11, 16-17, 20-28, 238-239.
16. Quigley 1956:508, 512.
17. Heizer 1953:247, 256.
18. Lagercrantz 1950:116-131, 409, 416.
19. Quigley 1956:510-512.
20. Quigley 1956:520-521.
21. Ebert, Reallexikon der Vorgeschichte, Vol. IV, 2 (Berlin 1926), p. 334.
22. Howes 1930:146-147; Heizer 1953:263; Quigley 1956:512.
23. Howes 1930:148.
24. Vakarelski 1935:17; Moszyński 1938:B 44.
25. Zaunick 1928:561, 586, 621.
26. Dahlman 1928-1934:Vol. VI, p. 344.
27. Hornell 1941:127.
28. Westphal-Hellbusch-Westphal 1962:83-84.
29. Quigley 1956:508-509.
30. Howes 1930:178; Zaunick 1928:685-707.
31. Jankó 1900:253; Zaunick 1928:690-694. In the 16th-17th centuries Anamirta cocculus was called cocculi orientalis, cuculi de Alexandria, etc. These names prove its origin from the East. More names are mentioned by Bertoldi 1928:9-10.
32. Rostovtzeff 1953:1177.
33. Zaunick 1928:559-564, 586-587.
34. Antipa 1916:90-91, 125.

35. Vasiliu 1935:8-9; Pojoga 1959:523; Dinulescu 1943:1-30; Dinulescu 1936:1-5; Naţiunu elementare de creşterea păstravului şi crapului (Bucharest, 1937), Cap. V.
36. Stahl 1940:Vol. III, p. 136.
37. Herman 1887:533, 785, 813.
38. Kovács 1901:12; Sztripszky 1902:176; Hargitai 1942:50.
39. Györffy 1955:68; Ecsedi 1934:113. In Northwest Hungary, along the river Ipoly, a fish trap is covered with Euphorbia so that the fish may not try to escape (Györffy 1933:25). Such a use of Euphorbia may be a vestige of fish poisoning.
40. Martinka 1940:96; Moszyński 1938:B 42.
41. Ćurčić 1913-1915:509, 89; Moszyński 1938:B 43; Ćurčić 1936:51; Moszyński 1929:378.
42. Vakarelski 1935:17; Moszyński 1938:B 44.
43. Haberlandt 1926:319.
44. Loewenthal 1927:146.
45. Howes 1930:148.
46. Zaunick 1928:590-592; Howes 1930:148.
47. Zaunick 1928:584.
48. Jaberg-Jud 1928-1940:Vol. III, Maps 523, 631.
49. Wagner 1943:257; Loewenthal 1927:146; Bertoldi 1928:2.
50. Zaunick 1928:589; Heizer 1953:263.
51. Zaunick 1928:592-593; Bertoldi 1928:2, 9.
52. Heizer 1953:263.
53. Zaunick 1928:593-594; Heizer 1953:263; Loewenthal 1927:146.
54. Zaunick 1928:583-589.
55. Zaunick 1928:594-602; Wehmer 1929-1931:696-697.
56. Antipa 1916:91.
57. Antipa 1916:125.
58. Vasiliu 1935:7-8.
59. Pojoga 1959:523; Dinulescu 1943:1-30; 1936:1-5. I mention here that the Transylvanian Saxons throw the seeds of Verbascum thapsus into the water and thus stupefy the fish (Schullerus 1916-1921:409).
60. In the review Növénytani Közlemények, Vol. III (Budapest, 1904), p. 88.
61. Goaţă 1934:143.
62. Stahl 1940:Vol. III, p. 136.
63. Veszelszki 1798:439.
64. Györffy 1955:68.
65. Moszyński 1938:B 42.
66. Zaunick 1928:567. R. F. Heizer identifies the place of occurrence in the following way: "Russian Empire (Moscow)" (Heizer 1953:263).
67. Moszyński 1938:B 45.
68. Ćurčić 1912:556; Moszyński 1938:B 43.
69. Ćurčić 1913-1915:509; Moszyński 1938:B 43; 1929:378.
70. Moszyński 1938:B 43; Loewenthal 1927:146.
71. Drobnjaković 1934:44; Moszyński 1938:B 43.
72. Moszyński 1938:B 44.
73. Vakarelski 1935:17; Moszyński 1938:B 44.
74. Hornell 1941:127.
75. Zaunick 1928:567; Howes 1930:148.
76. Zaunick 1928:567; Howes 1930:146-147; Heizer 1953:263; Greshoff 1893:804-809; Schuchardt 1899:183.

77. Zaunick 1928:568; Bertoldi 1928:1.
78. Greshoff 1893:804-809; Bertoldi 1928:1-14; Jaberg-Jud 1928-1940:Vol. III, Maps 523, 626; Howes 1930:147; Heizer 1953:263.
79. Wagner 1943:257; Bertoldi 1928:3. Among the Sards, also, the water is beaten with Verbascum stems to make it turbid.
80. Portuguese: Pinho 1905-1908:453; Howes 1930:147. Spaniards: Greshoff 1893:804-809; Griera 1921:97; Zaunick 1928:568; Krüger 1936:205; Howes 1930:146; Heizer 1953:263. In the Spanish and Portuguese languages embarbascar "to poison the water by fish drugging stuff" and barbasco "Verbascum" are words that belong together (Schuchardt 1899:183; Howes 1930:146). More references to the terminology can be found in the dictionary of J. Corominas (Diccionario crítico etimológico de la lengua castellana, Bern, 1954, Vol. IV:706). Some writers state only that Verbascum species are commonly used piscicide plants in the Mediterranean regions and in Central and South Europe (Greshoff 1893:804-809; Haberlandt 1926:319).
81. Bertoldi 1928:2.
82. Zaunick 1928:568.
83. Zaunick 1928:557-566; Howes 1930:147.
84. Zaunick 1928:566; Howes 1930:147. A similar fishing method was mentioned several times in the literature on fishing of the Middle Ages. The fishing book of Erfurt (1498) suggests smearing the hands with Anchusa officinalis or Nepeta cutaria. Thus the fish can be caught more easily (Zaunick 1916:7). Sempervivum tectorum is used for the same purpose in Germany (Loewenthal 1927:149).
85. Zaunick 1928:568-572; Wehmer 1929-1931:1119-1120.
86. Herman 1887:793.
87. Zaunick 1928:620-621.
88. Schuchardt 1899:183; Zaunick 1928:622-623; Howes 1930:147.
89. Daphne Gnidium is mentioned from South Europe (Haberlandt 1926:319; Loewenthal 1927:146).
90. Radlkofer 1887:413; Zaunick 1928:624; Bertoldi 1928:11; Howes 1930:148; Heizer 1953:263.
91. Pinho 1905-1908:453.
92. Bertoldi 1928:11.
93. Zaunick 1928:624; Bertoldi 1928:3; Howes 1930:147; Wagner 1943:257; Heizer 1953:263.
94. Zaunick 1928:624.
95. Radlkofer 1887:412; Heizer 1953:256, 263.
96. Zaunick 1928:625-626; Wehmer 1929-1931:813.
97. Wehmer 1929-1931:1089-1090.
98. Martinka 1931:96; Moszyński 1938:B 42.
99. Zaunick 1928:714.
100. Pinho 1905-1908:453. According to a German manuscript from the years 1511-1520, scherling (Schierling, Conium maculatum or perhaps Cicuta virosa) is a piscicide plant (Lindner 1957:172).
101. Zaunick 1928:714-715; Wehmer 1929-1931:872.
102. Vasiliu 1935:9; Dinulescu 1943:1-30; Pojoga 1959:523.
103. Zaunick 1928:664-674; Loewenthal 1929:4; Marzell 1938:224.
104. Zaunick 1928:674.
105. Ecsedi 1934:113.
106. Martinka 1931:96; Moszyński 1938:B 42.
107. Radlkofer 1887:411; Heizer 1953:263.

108. Zaunick 1928:675-676; Wehmer 1929-1931:1087.
109. Kiss 1961:42.
110. Vasiliu 1935:9; Pojoga 1959:523.
111. Kiss 1943:26.
112. Martinka 1931:96; Moszyński 1938:B 42; Mjartan 1952:118.
113. Ćurčić 1912:556; Moszyński 1929:378.
114. Zaunick 1928:684; Marzell 1938:227-228. (Referring to the history of the plant farther south) A. G. Avery, S. Satina, J. Rietsema, Blakeslee, The Genus Datura (New York, 1959), pp. 19-21.
115. Hanusz 1905:43.
116. Zaunick 1928:675, 684; Wehmer 1929-1931:1106-1107.
117. Gunda 1966.
118. In the review Magyar Nyelvör, Vol. XXXIII (Budapest), 194, p. 417.
119. Vajkai 1940:292.
120. Wallner 1917:15; Zaunick 1928:690. In Styria, Anamirta cocculus was a commonly used fish poison. In the year 1638 students of the Jesuitical College poisoned the water near the college along the river Mura. But prohibiting orders prescribed that it should not be sold to vagabonds (Wallner 1917:15).
121. Bednárik 1943:194.
122. Krause 1904:263; Bertoldi 1928:1; Machek 1957:155.
123. Antipa 1916:91, 125; Tunsoiu 1937-1938:144.
124. Vasiliu 1935:8.
125. Vladykov 1926:130-132. Among the Hutzuls (a Ukrainian ethnic group in the Northeastern Carpathians), fish poison is bought in the shops and thrown into the water (Suchievicz 1902:271). This poison is likely Anamirta cocculus.
126. Zaunick 1928:685-707.
127. Zaunick 1928:632; Howes 1930:147. Anamirta cocculus was still used for fishing along the Rio Tamega in Portugal in the beginning of the century (Pinho 1905-1908:453).
128. Zaunick 1928:702-707. (Referring to the use of fish poisoning farther south) Krause 1904:263.
129. Jankó 1900:253; Bertoldi 1928:2; Heizer 1953:263.
130. Haberlandt 1926:319.
131. Verbal communication of Chr. Vakarelski (Sofia).
132. Drobnjaković 1934:43-44; Cvar 1941:36-37.
133. Zelenin 1927:71.
134. Sulimirski 1932:42; Misińka 1958:11.
135. V. Le Coq 1916:38-39.
136. F. Iveković, I. Broz, Rječnik hrvatskogo jezika, Vol. I (Zagreb 1901), p. 30; Ćurčić 1912:555.
137. Wehmer 1929-1931:333.
138. In the review Növénytani Közlemények, Vol. III (Budapest, 1904), p. 88.
139. Martinka 1931:95; Moszyński 1938:B 42; Bednárik 1943:184.
140. Wehmer 1929-1931:1082.
141. Heizer 1953:263.
142. Markuš 1961:218.
143. Schullerus 1916-1921:388.
144. Heizer 1943:443.
145. Dorner 1910:126.
146. Pojoga 1959:523.
147. Heizer 1953:263; Zaunick 1928:725.

148. Zaunick 1928:724-726.
149. Zaunick 1928:727.
150. Zaunick 1928:728.
151. According to information from Hungarian peasants the quail eats the seeds of all poisonous plants and does not perish.
152. Antipa 1916:125.
153. Vasiliu 1935:9.
154. Drobnjaković 1934:44; Moszyński 1938:B 45.
155. Moszyński 1938:B 45.
156. Jaberg-Jud 1928-1940:Vol. III, Map 523.
157. Heizer 1953:260.
158. Wagner 1943:258.
159. Wehmer 1929-1931:208.
160. Jaberg-Jud 1928-1940:Vol. III, Map 523.
161. In the review Növénytani Közlemények, Vol. III (Budapest, 1904), p. 88.
162. Vasiliu 1935:9.
163. Martinka 1931:96.
164. Ecsedi 1934:113. The Hungarian botanical and agricultural literature of the 18th century already mentions that the seeds of hemp and the water of a retting ground are dangerous for the fish (Veszelszki 1798: 121; Mátyus 1787-1793:Vol. II, p. 195).
165. Zaunick 1928:565.
166. Zaunick 1928:565.
167. Heizer 1953:260.
168. Wehmer 1929-1931:246-247; Vasiliu 1935:9.
169. Martinka 1931:95; Moszyński 1938:B 42.
170. Zaunisk 1928:733.
171. Vasiliu 1935:8-9; Pojoga 1959:523-524.
172. Vasiliu 1935:8-9.
173. Vasiliu 1935:8-9; Pojoga 1959:523-524.
174. Dinulescu 1943:1-30; Pojoga 1959:523-524.
175. Băcescu 1947:13.
176. Băcescu 1947:13.
177. Tunsoiu 1937-1938:142.
178. Vasiliu 1935:8-9. According to M. Greshoff, Tephrosia tomentosa Pers. is a piscicide plant in Bessarabia neighboring Rumania (Greshoff 1893: 729). I do not know any other reference to the use of this plant from Central and East Europe, the Balkan Peninsula.
179. Radcliffe 1926:239-240; Loewenthal 1927:146; Zaunick 1928:607-620. According to J. Loewenthal, Cyclamen europeum is a known piscicide plant in Savoy (Loewenthal 1927:146).
180. Moszyński 1938:B 44.
181. Ćurčić 1912:556.
182. Jaberg-Jud 1928-1940:Vol. III, Map 523.
183. Sztripszky 1903:288.
184. Ćurčić 1912:556.
185. Ćurčić 1912:556.
186. Hungarians: Herman 1887:532; Sztripszky 1902:176. Rumanians: Antipa 1916:125; Tunsoiu 1937-1938:144. Slovaks: Martinka 1931:95; Mjartan 1952:118. Ukrainians: Vladykov 1926:128-130.
187. Herman 1887:813.

188. Zaunick 1928:573-577. In Herzegovina the peasants believe that the sap of Euphorbia species etches the eyes of the fish and the fish cannot see (Moszyński 1938:B 43).
189. Zaunick 1928:578.
190. Zaunick 1928:632; Howes 1930:147.
191. Jankó 1900:253.
192. Haberlandt 1926:319.
193. Jankó 1900:253.
194. Zaunick 1928:579; Jaberg-Jud 1928-1940:Vol. III, Map 523.
195. Wagner 1943:258.
196. Ćurčić 1921:556; Drobnjaković 1934:43; Cvar 1941:36.
197. Jankó 1900:253. Data regarding the German territories are reported by Krause 1904:263.
198. Herman 1887:533; Sztripszky 1903:288; Györffy 1933:25.
199. Antipa 1916:90; Tunsoiu 1937-1938:144.
200. Kaindl 1898:114; Vladykov 1926:128-130.
201. Krause 1904:263; Bertoldi 1928:1.
202. Mjartan 1952:118.
203. Cvar 1941:36.
204. Drobnjaković 1934:43.
205. Wagner 1943:258.
206. Ekman 1910:322.
207. Verbal information of G. Inczefi (Szeged, Hungary).
208. Sztripszky 1909:220.
209. Heizer 1953:241.
210. Howes 1930:149; Heizer 1953:249. According to R. Zaunick, taxus, mentioned in the orders of Frederic II, was a Verbascum species (Zaunick 1928:565).
211. Zaunick 1928:623; Howes 1930:147; Quigley 1956:521.
212. Wagner 1943:257.
213. Jankó 1900:253.
214. Kolozsvári-Óvári 1904:212.
215. Szádeczky 1897:316; Degré 1939:148.
216. Mjartan 1952:115.
217. In Poland fish poisoning was prohibited by orders issued at the end of the 18th century (Chmielewski 1960:292). Repeated orders contain the rule that it is forbidden to ret hemp or flax at fishing places. In Saxony retting of hemp was prohibited at fishing places first in 1555 (Zaunick 1928:565).
218. Karácsony 1904:455.
219. Lewin 1920:65.
220. Zaunick 1928:685.
221. Bertoldi 1928:9-10.
222. At the same time, such works and the prohibiting orders doubtless promoted the survival of knowledge of fish poisoning. A. Haberlandt lists 23 kinds of recipes for fish drugging on the basis of "fishing books" out of the 18th century (Haberlandt 1926:319).
223. Lewin 1920:168.
224. Borza-Butură 1938:82.
225. Gunda 1966.
226. Tiktin 1903-1925:Vol. I, p. 448; Puşcariu 1905:37.
227. Tiktin 1903-1925:Vol. I, p. 275, Vol. II, p. 1063; Puşcariu 1905:31, 104; Meyer-Lübke 1935:1599, 6009.

228. The fish poisoning plants of the East Carpathians are known as medicinal herbs with the Ukrainian inhabitants of Galicia and Bukovina. Warts are extirpated by the sap of Euphorbia and Verbascum species. Beggars and soldiers cause ulcers on their bodies by using Euphorbia and Daphne species (Hoelzl 1861:154-155). In Podolia, Volhynia, and Galicia, Euphorbia is known as a medicinal herb against the bite of rabid animals (Krebel 1858:184).

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