# Appendix 9.1: Fishing Study

# Executive Summary

This report has been prepared as part of the South Stream Offshore Pipeline (referred to throughout this report as “the Project”) as an Appendix to the ESIA Report. It gives a summary of the most important commercial species and fisheries in the Black Sea as a whole then examines the three countries through which the pipeline will pass Bulgaria, Russia and Turkey. For each country the size of the fleet, the economic importance of the fisheries and the possible effects that the Project may have during the Construction and Pre-Commissioning Phase were evaluated. For all three phases it was assessed that, given the information available, the Project would be unlikely to have any discernible effect upon catches outside the normal annual variations for the countries concerned.

**Bulgaria**

The Bulgarian fleet had the lowest annual catch of the three countries studied and took only 1% of the Black Sea catch in 2010; only Romania took less (0.05%). All of Bulgaria’s fishing fleet operate within Bulgarian waters inside their 24 NM Contiguous Zone; their distant water fleet was dismantled in the early 1990s and as such have no fishing interests outside of Bulgarian waters. The Project is unlikely to have a distinguishable impact on fish stocks that the fishing industry targets and the effect on the commercial fisheries as a whole is likely to be minimal. Fishing grounds are located in the offshore section of the Project Area which will be affected by the safety exclusion zone during the Construction and Pre-Commissioning Phase when the pipe-lay vessel passes through but this will be temporary and localised, approximately 9 to 10 days per pipeline. Effects due to sedimentation and noise during this phase will also be temporary and localised. During operation the exclusion zone will overlap with an area in which beam trawling is currently permitted which will reduce the fishable area for bottom trawling, although this will account for less than 1% of the total permitted fishing area. In addition there is a small fishing community, the Ada Bacha Community, based approximately 2.7 km to the north of the Project Area. The effect of the Project on them is likely to be minimal during construction and pre-commissioning and operation.

**Russia**

Russian catches represent only around 5% of the total amount caught in the Black Sea. As a fishing nation in the Black Sea they are fourth in terms of total catches, behind Turkey, Ukraine and Georgia. Fishing activity in Russian waters is largely confined to the shallower waters of the continental shelf where concentrations of fish species are greatest, these is no fishing outside their 24 NM Contiguous Zone. Anchovy make up the majority of Russia’s Black Sea catch, both in terms of the quantity caught and economic value and is therefore the most important marine fish resource for Russia in the Black Sea.

The impact on the fishing activities will most likely be minimal. While the pipeline landfall section does lie in the proximity of a number of fishing grounds and fixed traps, the use of microtunnelling will reduce the disturbance caused by dredging close to shore as it will limit the extent of seabed disturbance; the noise and light generated during the Construction and Pre-Commissioning Phase will only be temporary and localised allowing migrating fish to pass by, further from shore if necessary. It has also been reported that there is no bottom trawling in the

area, all catches offshore are taken through midwater trawls, purse seines or fixed nets. On this basis, an operational safety exclusion zone on the seabed will have minimal effect on the offshore fleet in the area.

### Turkey

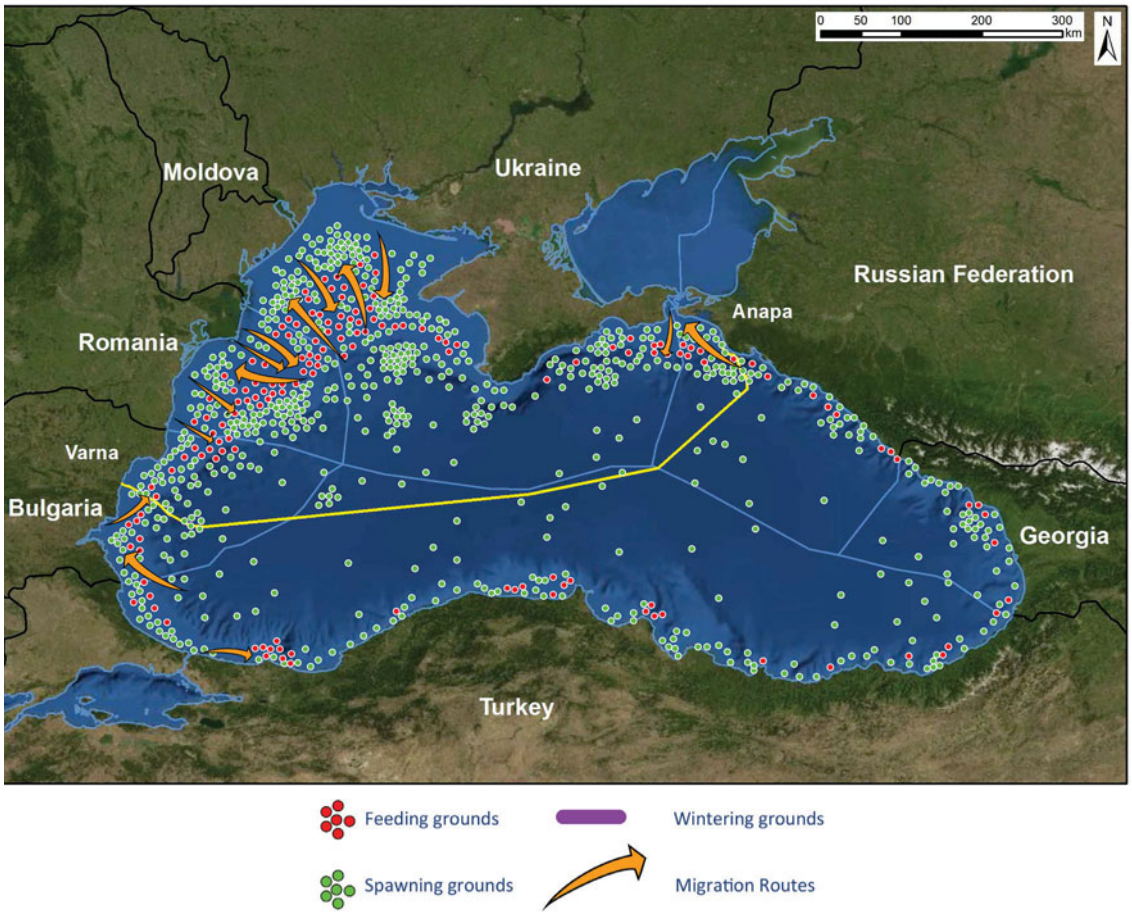
Turkey is the dominant country in Black Sea fisheries. As in Bulgaria and Russia, fishing activity in Turkish waters is largely confined to the shallower waters of the continental shelf areas where concentrations of fish species are greatest. The European anchovy makes up the majority of Turkey's Black Sea catch in terms of the quantity caught and economic value and is therefore the most important marine fish resource for Turkey in the Black Sea.

It is unlikely that the pipe-laying activities in the Project Area in Turkey will impact on Turkish fishing activities. Although the Project in Turkey is located in Turkey's Exclusive Economic Zone (EEZ), it is more than 110 km from the coast and little evidence that fishing activity takes place near or in the Project Area has been found. It is unlikely that a fishery does operate in this area due to its distance from the coast with associated low catch per unit effort (CPUE) and the fact that the distribution of fish is largely within the shallower coastal waters as the deeper waters do not support marine life. Most fishing activities target the Turkish coastal wintering grounds of commercially important fish when their aggregations are greatest.

The literature reviewed as part of this assessment identify that only the European anchovy migration route intersects the proposed pipeline route in Turkey. European anchovy migrate through the Black Sea twice a year, however it is unlikely that the pipe-laying activities will impact upon these migrations as the disturbance generated by the activities will result in a relatively small impact zone of only 280 m diameter around the construction spread, which is insignificant in relation to the 125 km width of the migration corridor. Furthermore, the disturbance is likely to only cause a startle response and not a significant change in fish behaviour therefore the European anchovy is likely to avoid the source of disturbance and continue their migrations unaffected.

sprat do not have specific wintering grounds. Their migrations are strongly influenced by environmental conditions such as temperature and the availability of trophic resources (Ref. 12).

**Figure 1.6 Sprat distribution, migratory routes, spawning and feeding grounds in the Black Sea (adapted from Ref. 4)**

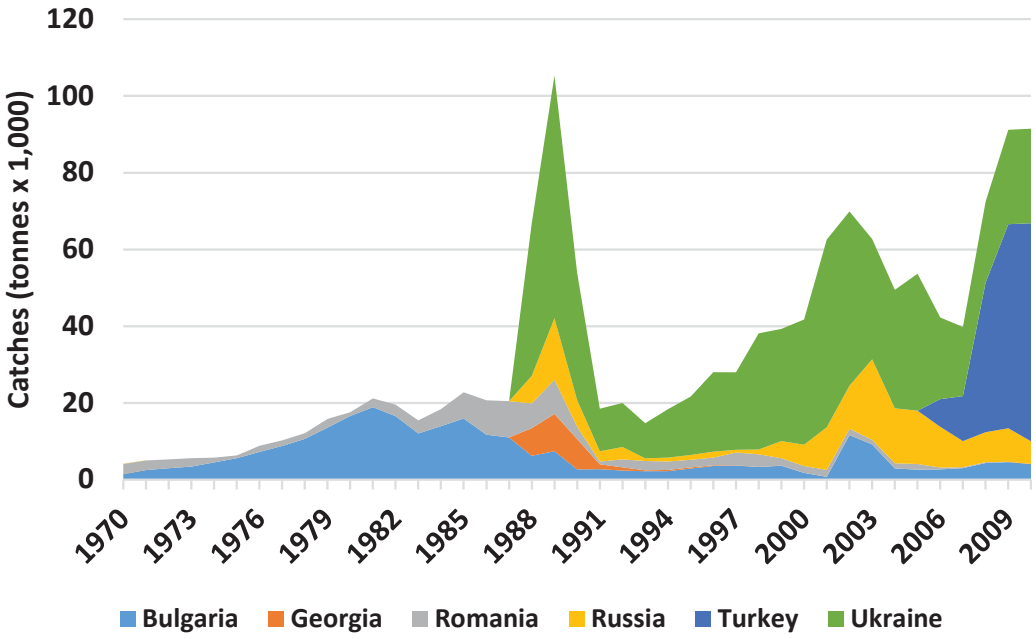



The Azov Sea sprat is present in the Sea of Azov and the north-western area of the Black Sea. It is a brackish water species but also semi-anadromous and fresh water variations also occur. The Azov Sea sprat breeds in early summer in the Sea of Azov peaking in May and also in the lower areas of the rivers from May until the end of summer (Ref. 74). Although it is used as a food product and restrictions are put in place for its capture off the Russian coast, it is not recorded as a species in the General Fisheries Commission for the Mediterranean (GFCM) Capture Production Database (Ref. 1) or recognised as a separate stock by STECF (Ref. 44) and is probably all just reported as European sprat.

Sprat fishing takes place on the continental shelf between depths of 15 m to 110 m and is conducted during the day with mid-water trawls when aggregations are denser. The main fishing gears are mid-water trawls, pelagic pair trawling (Turkey only) and uncovered pound nets. The main fishing season in Bulgarian and Russian waters is between April and October (with mid water trawlers) and in Turkey in spring and autumn (with pair trawlers). Figure 1.7 shows the sprat catches by Black Sea countries since 1970, with the exception of the Ukraine,

catches remained fairly constant until 2007 when Turkey entered the sprat fishery and catches increased to 91,000t in 2010 (62% from Turkey), although Bulgarian, Russian and Ukrainian fleets also increased their catches.

**Figure 1.7 Sprat landings in Black Sea countries 1970 to 2010 (Ref. 1)**

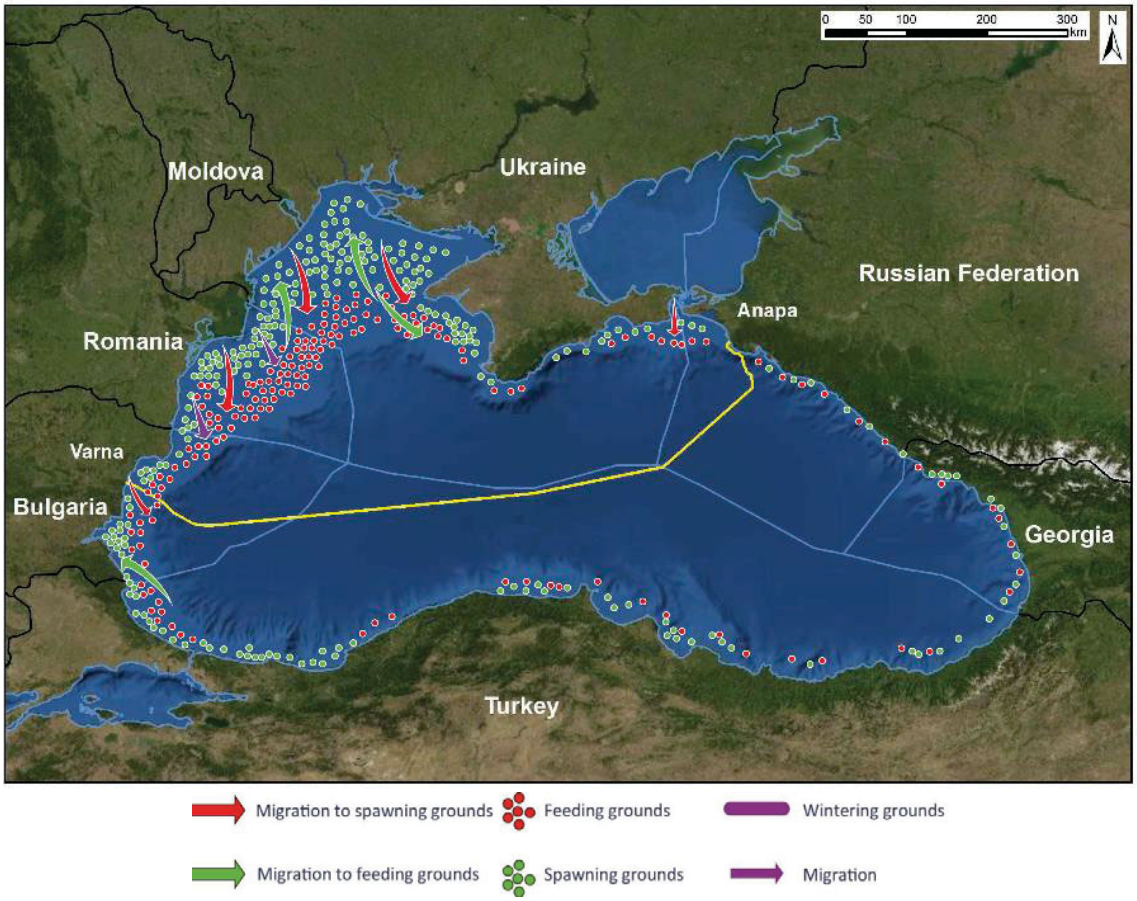



### 1.3.3 Whiting (*Merlangius merlangus*)

Whiting (*Merlangius merlangus*) is one of the most abundant species within the Black Sea. It is a demersal species found mainly on mud and gravel seafloors but also occasionally sand and rock. It does not undertake long migrations, instead spawning during the winter season within its habitat area (Figure 1.8). It occurs all along the shelf, most often at depths between 60 m to 120 m but sometimes up to 150 m. Dense commercial concentrations are formed but not every year, normally every 4 to 6 years, and as a result it is not normally selected as a target species but often caught as by-catch on trawl fisheries, particularly for sprat, or in fixed nets in the coastal areas and therefore it may not be reported. The southern area of the Black Sea is the only area where it is found on a more regular basis and Turkey is the only country that actively targets this species through either trawl fishing or gillnets. Gillnets account for 15% of the catch with the remainder taken through bottom trawling (Ref. 4).

Figure 1.9 shows that catches of whiting between 1970 and 2010 with Turkey taking almost 100% of the reported catch, although some were taken by Romania in the 1980s. Catches peaked towards the end of the 1980s but as with other species this was followed by a sharp drop and steady decline.

**Figure 1.8 Distribution of whiting within the Black Sea showing migratory routes, spawning and feeding grounds**




## 1.3.4 Turbot (*Scophthalmus maeticus*)

Turbot (*Scophthalmus maeticus*) occurs over all shelf areas of the Black Sea coastal states and is commercially the most valuable species to be exploited. It is mainly taken using gillnets, apart from Turkey, the only country where bottom trawling is permitted (minimum mesh size 40 mm). In 2010 there were 225 Turkish vessels targeting turbot (Ref. 12).

Annual surveys are carried out in both Bulgaria and Romania and these have determined that the species is distributed all along the continental shelf with the largest abundance in water depths between 50 and 75 m. Adults migrate to shallower waters and aggregate during the spawning period in spring after which they move into deeper waters (100 m to 140 m). Feeding and spawning areas and the movement between them are shown in Figure 1.11.

Turkey and Ukraine have been the main countries to exploit the stock, with small amounts also taken by Bulgaria and Romania. Catches since 1989 are shown in Figure 1.10. The highest catches were registered in 1995 and since 2007 catches have remained below 1,000t, although it is thought that there is a large, non-reported catch several times higher than the official reported catch (Ref. 12).

**Figure 1.9 Whiting landings in Black Sea countries 1970 to 2010 (Ref. 1)**

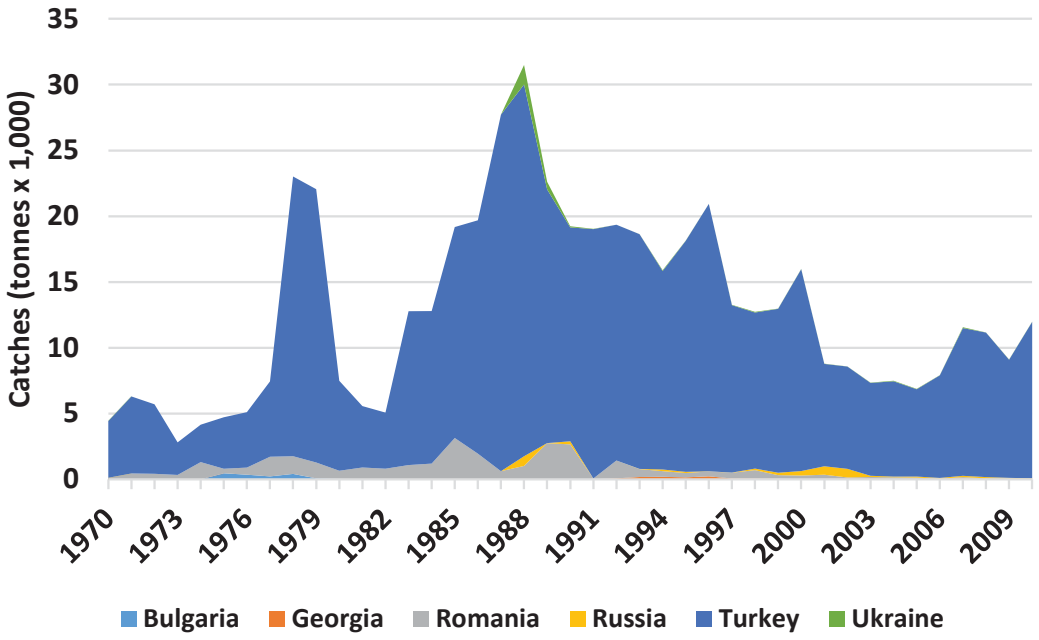



**Figure 1.10 Turbot landings in Black Sea countries 1992 to 2012 (Ref. 1)**

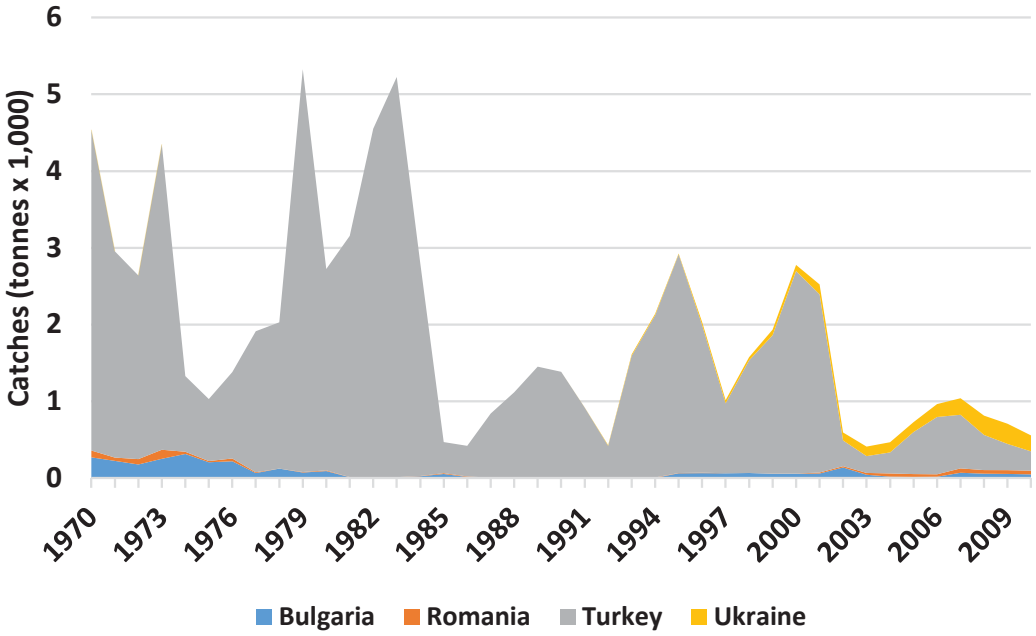
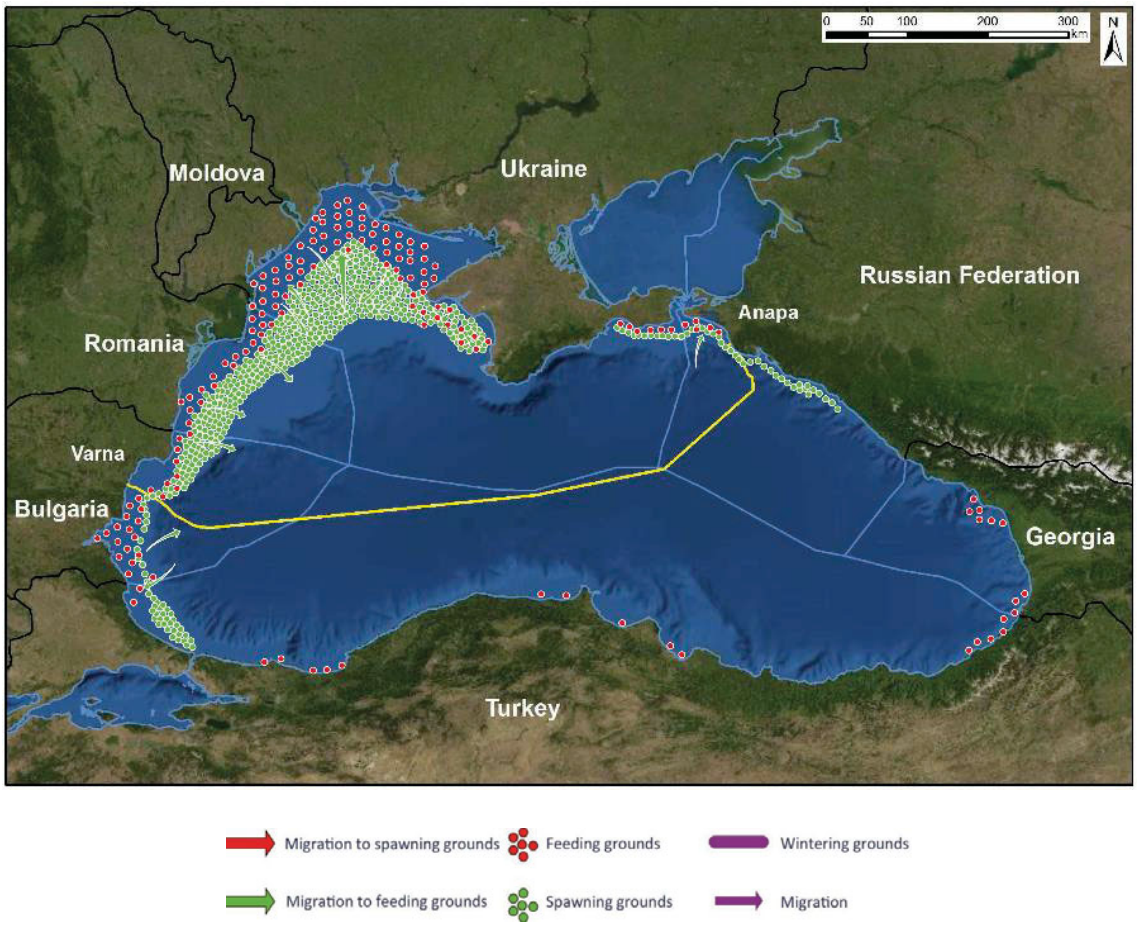


**Figure 1.11 Turbot distribution, migratory routes, spawning and feeding grounds in the Black Sea (Ref. 67)**



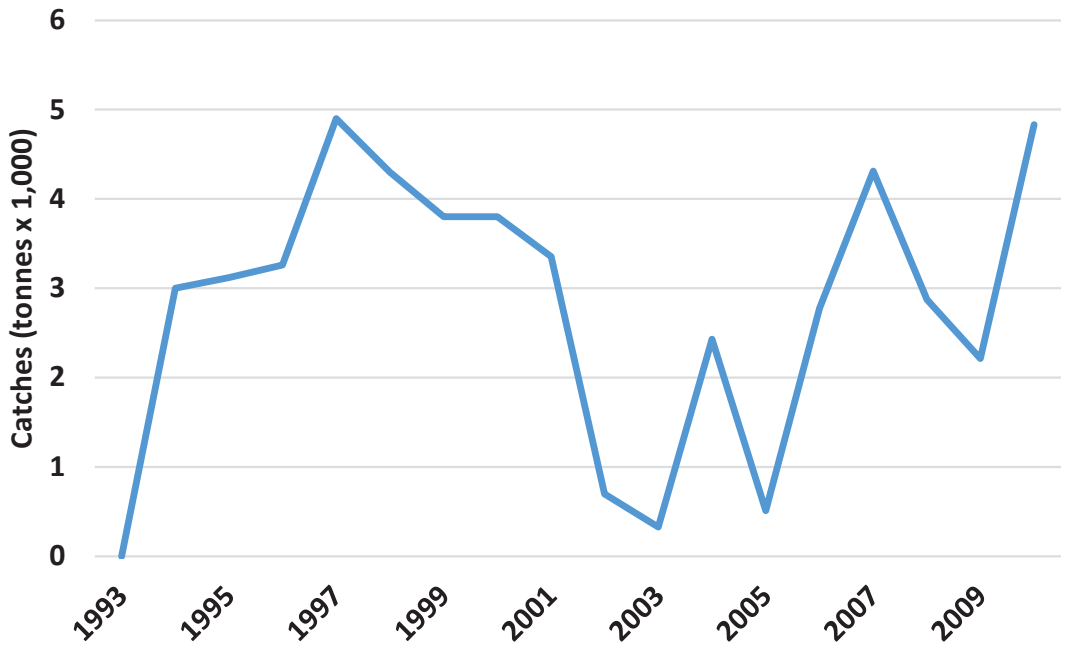

## 1.3.5 Mediterranean Horse Mackerel *(Trachus mediterraneus)*

The Mediterranean horse mackerel (*Trachus mediterraneus*); because of its wide distribution and large seasonal migrations forms the basis of a shared stock between different Black Sea countries, as seen in Figure 1.12 (Ref. 12). For the basis of reporting it has previously been recorded as either Mediterranean horse mackerel or Atlantic horse mackerel (*Trachus trachus*) however the species caught is actually the Black Sea horse mackerel (*Trachus mediterraneus ponticus),* a distinct subspecies (Ref. 60; Ref. 53). Their main spawning and feeding grounds are in the north-western and western continental shelf regions of the Black Sea, but they also spawn in the north east of the Black Sea along Russian coasts. In the autumn (September to November) they migrate along the coastal waters to wintering grounds which are situated in the coastal waters of Turkey, Georgia, Russia and the Crimea Peninsula. In the spring (Mid-April) they migrate back to feeding and spawning grounds (Ref. 4).

The stock is almost exclusively exploited by Turkey (97%) with negligible amounts from other countries. It is caught in the wintering grounds of the southern Black Sea by purse seiners and mid-water trawlers; catch is mostly made up of fish aged 1 to 3 years (they mature at age 1 to

including oysters and mussels and has had some severe impacts in the Black Sea causing collapses on some of the local populations. Due to insufficient data there is no current assessment done but catches of Bulgaria remain high though fluctuating (Figure 2.11) with 3,793t being caught in 2012, accounting for around 60% of the catch. They move inshore in summer to spawn on compact, sandy areas of seabed, after spawning they move to deeper water where they bury themselves in the seabed sediments. The fishing season is in summer, when they are easier to catch on the seabed surface. They are mainly harvested though bottom trawling, using a beam trawl. Although banned in Bulgarian waters, there are a number of areas where beam trawling for rapa is permitted (Figure 2.8 and Figure 2.9); they are also caught using divers. Most processing is carried out in Varna (Section 2.1.3). The effects of noise on the animal are unknown. Sedimentation may have a moderate effect as being a demersal animal it could affect their breeding and feeding, either directly or impact their prey. Turbidity is unlikely to affect them as they are a non-visual predator.

**Figure 2.11 Catches of *Rapana venosa* by the Bulgarian Fleet 1993 - 2010**

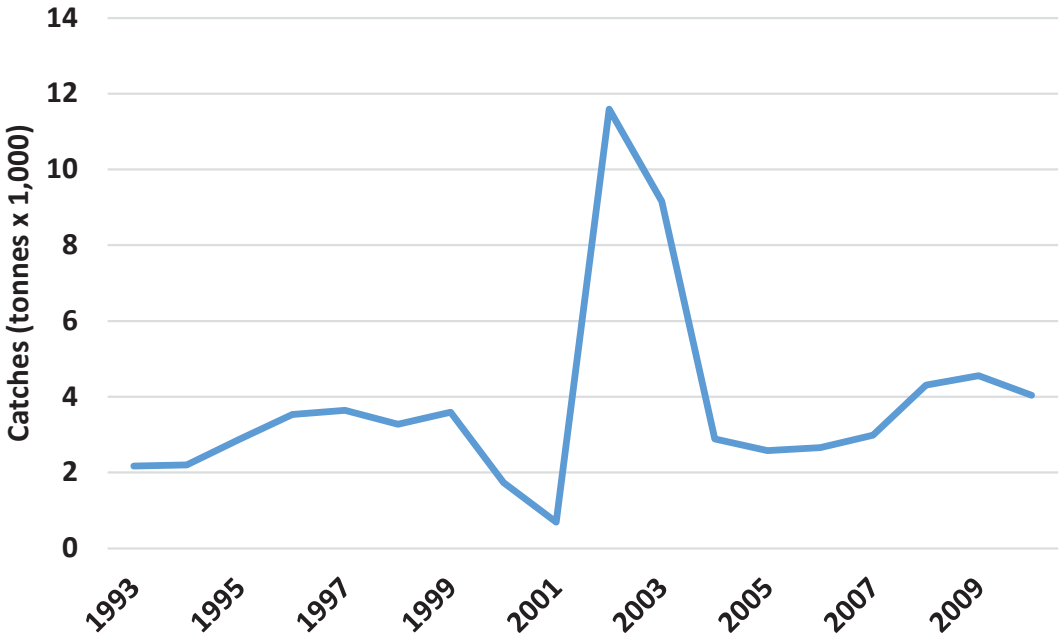



**Sprat (Sprattus sprattus)**

A profile of sprat is given in Section 1.3.2. Along with the Rapa whelk, sprat account for over 90% of the total catches by the Bulgarian fleet, in 2012 2836t were landed in Bulgarian waters, although this represents only around a third of the quota of 8,032t set for Bulgaria in that year. Catches peaked in 2002 at just over 11,000t, after a steep decline they recovered partially but have been declining again in recent years (Figure 2.12). They are normally fished on the continental shelf, between depths of 15 and 110 m, during the day using midwater trawls or uncovered pound nets nearer to shore. Special permission is required if vessels wish to fish beyond the 12 NM territorial zone. Fishing season is normally over the winter months as sprat move inshore to form aggregations over their winter feeding ground, in spring and summer

they move to deeper water over the shelf to spawn, up to 100 km offshore. They have no set wintering grounds and their movements are highly dependent on environmental conditions, particularly water temperature. Low catches in some areas of the Black Sea have been attributed to warmer waters on the continental shelf causing them to move elsewhere. They are a visual predator, feeding mainly on planktonic crustaceans, and are known to avoid turbid waters, although they are unlikely to be affected by sedimentation as they are pelagic spawners with pelagic eggs and larvae. They have also been shown to be highly sensitive to low frequency sound.

**Figure 2.12 Catches of sprat by the Bulgarian fleet 1993 - 2010**




# 2.6 Impacts

## 2.6.1 Construction and Pre-Commissioning Phase

### 2.6.1.1 Sedimentation

Seabed sediment dispersion caused by the construction of the microtunnel and the seabed dredging process could impact adversely on fish or other marine resources and subsequently the commercial or artisanal fisheries.

Sedimentation during the trenchless shore crossing Construction Phase will be limited to the exit point locations of the four pipelines; located at a depth of approximately 12 m about 420 m offshore, where exit pits will need to be dredged[001]. Depending on the construction method

used there may be additional discharge of drill cuttings and slurry (made up of water and bentonite[2]), however the quantity and dispersal of this discharge will be minimised through a number of measures put in place during the construction process (refer to **Chapter 5 Project Description**).[002]

Sedimentation will also result from dredging activities from the trenchless shore crossing exit points out to a distance of approximately 2 km offshore and a depth of approximately 24 m. Sediment modelling has shown that the sediment plume will be present throughout the proposed dredging activities, thought to be about 40 days in total (10 days per pipe), but disperse 4 to 6 hours after activities cease. The affected distance northward (towards Ada Bacha) is about 2.5 km, just before the location of the community, although the anticipated sedimentation is low (5 mg/l) (Ref. 71). Southwards the spread of the plume would be further but confined within 5 km.

Increased sediment may affect fish in two ways: through increased turbidity caused by high suspended sediment concentrations reducing the capacity of visual predators to locate prey, or sediment settling on the seabed smothering eggs and possible prey items for some benthic feeders and restricting the settlement of larvae. Both of these have the potential to reduce the reproductive capacity of the fish causing a reduction in stocks over time or causing fish to locate elsewhere, although the effects are likely to be minimal given the anticipated timescale for the nearshore section of the Construction and Pre-Commissioning Phase is less than 12 months with the actual nearshore (up to 2 km) dredging scheduled for around 40 days.

Of the commercial fish species, sprat will be the most likely to be affected by the turbidity as they are known to avoid turbid waters. While the sediment plume does appear over some of the fishing areas (based on Figure 2.7) the dispersal of the plume is rapid (4 days after the end of dredging (Ref. 71)) and the higher concentrations of suspended sediment are near the seabed so the effect will be temporary, localised and only have the potential to affect the fishery if it occurs during the winter fishing season. There may be some effect of sedimentation on Rapa populations although it appears that the plume does not significantly impact any of the permitted Rapa fishing areas. The majority of the fish species targeted by the Community are pelagic spawners and species and are migratory (i.e. will pass through the area), so it is unlikely they will be adversely impacted by sedimentation or turbidity. There may be some effect on their feeding grounds but this is also likely to be minimal. Of the species targeted by the Community, the species most like to be adversely affected is the goby, as it has demersal eggs that stick to solid substrates and thus have the potential to be smothered. A mussel farm is also planned for the bay outside the Community; however, mussels are relatively resistant to sedimentation and, in this case, are far enough away (i.e. over 2 km) not to be significantly affected.

#### 2.6.1.2 Loss of Fishing Grounds

The impact on fishing from the safety exclusion zones during the Construction and Pre-Commissioning Phase as well as the need to avoid the additional supply and pipe-laying vessels

[2] Natural, inert, non-toxic clay.

operating in fishing areas may restrict the available fishing grounds or restrict navigation of fishing vessels to fishing grounds.

The effect of the restrictions on marine navigation during the Construction and Pre-Commissioning Phase is dependent on the physical extent of the exclusion zones and the time of year during which the restrictions are put in place.

The exclusion zone during the Construction and Pre-Commissioning Phase will be a 'moving' circle (progressing between approximately 1.5 and 2.75 km per day, depending on the type of vessel used) of about 2 to 3 km radius around the pipe-lay vessel, thus extending 2 to 3 km north and south of the pipeline route during pipe-laying. Near the coast, this radius will be a maximum 2 km. Therefore, it will not extend to restrict shipping to and from Ada Bacha harbour. It will also be defined and operationally managed to avoid any significant interference with maritime traffic and vessels approaching the harbour. Due to the use of a trenchless shore crossing technique (microtunnelling) for all four pipelines, there will be no dredging until the exit points of the microtunnels.[003] The microtunnel exit points vary between a minimum of 545 m (pipeline #4) and maximum of 584 m (pipeline #1) from where the pipelines cross the shoreline. The microtunnel exit pit associated with pipeline #4 is located nearest to the coast; a distance of approximately 420 m. When the dredging is taking place, an exclusion zone of 0.5 km around the dredging vessel will be maintained.

During pre-commissioning there will be an exclusion zone of 0.5 km radius around the vessels engaged in the pre-commissioning activities, which will be anchored at the tie-in location. The exclusions zones and related restrictions will be coordinated with, and approved by the Bulgarian Maritime Authorities, who will also define procedures for their implementation, for example where the pipe-lay vessels cross shipping lanes.

For commercial vessels the main potential for impact will be when the pipe-laying enters the offshore area into the fishing grounds shown in Figure 2.6 and Figure 2.7. Prior to that there may be some minor inconvenience if vessels have to navigate their way around the safety exclusion zone on their way to and from the fishing grounds, along the routes shown in Figure 2.7.

The Community currently depends largely on fishing within an area of their landing site, approximately 2.5 NM (approximately 4.6 km) to the north, 5.5 NM (approximately 10 km) to the south and 3.5 NM (6.5 km) offshore. They do not fish in the Galata gas pipeline exclusion zone (Area 310) but their fishing grounds do extend to the south of it. This was indicated as the maximum extent of the fishing depending on the time of year and species targeted and it is probable that the majority of effort is closer to the Community. Their vessels are small (between 3.4 and 6.8 m in length, with engine power mostly ranging between 4 hp and 10 hp) and as such are more geographically constrained in their fishing activities than larger commercial vessels, with a realistic range for the smaller engines being around 10 NM (assuming a speed of 5 knots giving a travelling time to and from the fishing grounds of 4 hours).

The local and temporary nature of the safety exclusion zone means that the effect of the Construction and Pre-Commissioning Phase on navigation and fishing activities for commercial vessels and the Community will be minor and likely to be indistinguishable from the baseline or the usual limits of variation of catch. It is unlikely that the Community will look for new fishing

grounds outside the areas they currently fish but may concentrate more of their fishing to the north or circumnavigate the safety exclusion zone, leading to increased fuel costs. Restrictions when the pipe-lay vessel is close to shore could prevent them leaving and they would need to either re-locate their boats further north or cease fishing.

#### 2.6.1.3 Noise and Light

Noise, vibration and light generated by the dredging, pipe laying and support vessels may affect fish migration patterns or cause dispersal of some benthic species which may reduce catches and revenues for artisanal fisheries.

A full assessment of the likely effects of noise generated during the Construction Phase on fish is given in Ref. 27. This shows that the avoidance reactions are likely to be most significant on hearing specialist fish (sprat and anchovy). In shallow water active anchor handling during pipe-laying results in the highest behavioural effects ranges of 480 m for sprat and 130 m for anchovy. In mid water anchor handling results in effects over 600 m for sprat and 500 m for anchovy. Similarly, when the crew change vessel is part of the pipe-laying spread behavioural effects over 600 m are seen in sprat but not in anchovy. In deep water, behavioural effects are only seen for sprat where pipe-laying results in a behavioural effects range of 700 m. Shad species and hearing generalists are not predicted to be affected due to noise from Project activities. It will possibly alter the migration routes for some of the hearing specialist species causing them to move further offshore and out of the normal fishing grounds of the Community. Commercial vessels targeting pelagic fish may need to alter their fishing patterns temporarily to account for the displaced movement. It is unlikely to have any effect on vessels targeting the rapa whelk.

Light may also attract zooplankton to the surface and in turn some small (and some larger) pelagic species, altering their distribution within the body of water and possibly their normal fishing areas, although this impact would be minimal.

These impacts would be adverse but temporary and given the migratory nature of most of the target species the impact on catches and revenue would be small and likely to be indistinguishable from the baseline or the usual limits of variation of catch.

#### 2.6.1.4 Summary

**Commercial Fleet**

On the basis of the analysis presented above, it is unlikely there will be any effect on the catches of the Bulgarian fleet. Should any effects occur it is unlikely they will be outside the normal variation in the annual catches and will be indistinguishable from those recorded in the baseline study.

**Ada Bacha**

The Ada Bacha Community rely mainly on fishing for their livelihood, and their sensitivity is therefore considered to be moderate. Considering the three potential impact pathways described above, the overall impact is likely to be temporary and reversible. Fishermen will be

able to focus on alternative areas within their established grounds if necessary. Thus, the overall impact is considered to be low.

## 2.6.2 Operational Phase

### 2.6.2.1 Loss of Fishing Grounds

Impact on fishing due the safety exclusion zone put in place during the Operational Phase of the South Stream Offshore Pipeline.

After construction, a permanent 0.5 km (0.27 NM) Operational Phase exclusion zone[3] with respect to fishing is likely to be imposed from the trenchless crossing offshore pits (approximately 420 m offshore at the nearest point to the coastline) out to a water depth of 100 m, to prevent damage by third party activities; this will be agreed in consultation with the appropriate authorities and it will be in addition to the existing Galata gas pipeline exclusion zone (Area 310), which extends 0.5 NM on either side of that pipeline. [005] It extends out several kilometres to a depth of over 65 m and is closed to fishing, construction of mussel farms, underwater dredging activities and anchoring. Figure 2.9 shows the Galata gas pipeline exclusion zone (Area 310) along with the proposed South Stream Offshore Pipeline Operational Phase safety exclusion zone and is it evident that the two exclusion zones will mostly overlap as far out to sea as approximately 13 km (or 7 NM) from the shore. Overall, the anticipated South Stream Offshore Pipeline Operational Phase exclusion zone is expected to be only a small extension of the existing Galata gas pipeline exclusion zone, by approximately 150 m to the south (at the widest point). Approximately 11 km out to sea the two exclusion zones will diverge, this is outside the Community's normal fishing grounds but will overlap with one of the permitted areas for Rapa fishing (Area 3) for a distance of around 5 km. It will also increase the area of exclusion zone over current fishing grounds (Figure 2.7) and, depending on the restriction in place (all fishing or just bottom trawling); this will remove some of the fishable area.

Commercial fisheries and the Community currently operate with the existing Galata gas pipeline exclusion zone in place. The Community do not carry out any fishing operations within the existing Galata gas pipeline exclusion zone but their fishing grounds do extend approximately 2 to 3 NM to the south of its southern boundary. Most of the species they target (bluefish, horse mackerel, bonito, shad and sardine) are migratory and are caught as they pass through the fishing grounds; there is some flexibility in where they can be caught. The less migratory species, such as gobies, are caught closer to the Community and the extended exclusion zone (existing Galata gas pipeline exclusion zone and South Stream Offshore Pipeline Operational Phase exclusion zone combined) is likely to have minimal additional impact. If the purpose of the South Stream Offshore Pipeline Operational Phase exclusion zone is just to restrict bottom trawling or dredging then there will be no additional impact as the Community only use fixed nets, drift nets and hooks and lines. There will be a small impact on the commercial fisheries as the Operational Phase exclusion zone will remove some of the fishable area for rapa whelk in

[3] The precise distance is yet to be confirmed, this assessment has assumed it will be 0.5 km.

Area 3 (less than 5%), the Operational Phase exclusion zone may also affect other demersal fisheries if the setting of bottom nets is prohibited as the restricted zone passes over active fishing grounds.

Recommended mitigation would consist of notices to mariners, chart updates and surface marker buoys to reduce risks of contact, although the pipeline should also show up clearly on depth finders used by fishing fleets.

#### 2.6.2.2 Noise

**Impact on Fish Migration or Behaviour Patterns Due to Any Noise or Vibrations Emitted by the Pipeline During Operation**

A representative of the Community stated that certain species of fish did not cross the Galata pipeline because of the noise it generated during operation (i.e. the gas flowing through the pipeline). This was the reason suggested by the Ada Bacha fishermen for the perceived reduction in catches of bonito and the bluefish. Studies have shown that some fish species are particularly sensitive to low frequency sound (0.1 to 100 Hz) resulting in low frequency sources being used to induce fish avoidance around dams and power plant intakes in some areas (Ref. 72). Although these studies were specific for two species (Baltic herring *(Clupea harengus membras)* and Atlantic salmon *(Salmo salar)*) it is possible that low frequency noise will also affect other species, particularly migratory ones, possibly disturbing their navigation and orientation. In shallower water the sea surface and the seabed reflect the sound and increase the distance travelled (Ref. 73). It is possible that, rather than not crossing the Galata gas pipeline at all, certain migratory species travel further offshore to deeper water before crossing, putting them outside the current Community fishing grounds. However, the underwater noise assessment undertaken for the Pipeline (Ref. 27) shows that effects during operation will not be significant particularly compared to those already caused by the Galata gas Pipeline. As the pipeline will be underground, in the trenchless crossing up to 584 m offshore and buried in 2.5 m deep trenches up to 2 km offshore, noise and vibrations will be minimised. As such, there should be little change in catches.

The Community will not attempt to identify new fishing grounds outside where they already fish as the combined Galata gas pipeline and South Stream Offshore Pipeline exclusion zone will have little if any impact on them. This was a view shared by the representative of the Community, who felt if they could operate with the Galata gas pipeline exclusion zone in place then they could also manage with the South Stream Offshore Pipeline Operational Phase exclusion zone. Changes in the migratory patterns of fish as a result of the South Stream pipeline are likely to be minimal as the species affected will have already altered their behaviour because of, or become habituated (Ref. 54) to, the Galata gas pipeline. The magnitude of impact on the Community during the Operational Phase is considered to be negligible.

Commercial fisheries may need to adjust their fishing patterns if there are alterations in the migratory routes of any of their target species. The commercial species most affected would probably be sprat which has been shown to be sensitive to low frequency noise. The most likely outcome would be that they would shift their wintering grounds to avoid the noise generated during the operation of the pipeline. Commercial fleets would need to alter their fishing patterns and normal fishing grounds to account for this.