SU ÜRÜNLERİ ENDÜSTRİSİ MÜHENDİSLİĞİ

Mesleki İngilizce Sözlük & Seviyeli Okuma Kitabı

Professional English Dictionary for Fisheries Industry Engineering

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Bu Kitabı Nasıl Kullanmalısınız?

📋 Önerilen Çalışma Yolu

1️⃣ Kendi İngilizce seviyenizi belirleyin (A1–C2).
2️⃣ Kısım I'den (Sözlük) ilgi alanınıza göre bir tematik bölüm seçin ve terimleri çalışın.
3️⃣ Kısım II'ye (Okuma) geçin — kendi seviyenizdeki paragrafları okuyun ve soruları çözün.
4️⃣ Bilmediğiniz terimlere rastladığınızda Kısım I'e geri dönüp kontrol edin.
5️⃣ Her seviyenin sonundaki öz değerlendirme listesini doldurun.
6️⃣ Mini quizleri ve boşluk doldurma alıştırmalarını atlamamanızı öneriyoruz.
7️⃣ Düzenli tekrar yapın — aralıklı tekrar en etkili öğrenme yöntemidir.

🎯 Sınava Hazırlık İpuçları

• Soru kökünü dikkatlice okuyun — "NOT true", "implies", "closest in meaning" gibi ifadeler cevabı doğrudan etkiler.
• Cevabı kendi bilginize değil metne dayandırın.
• Emin olamadığınız sorularda eleme yöntemi uygulayın.
• Zaman yönetimi: Paragraf başına ortalama 5-7 dakika ayırın.
• Bilmediğiniz kelimelerin anlamını bağlamdan çıkarmaya çalışın — sözlüğe bakmak son çare olsun.

🗺️ Sembol Rehberi

📖 Anahtar Kelimeler — Paragrafta geçen kritik terimlerin önceden tanıtımı
💡 Dil İpucu — Gramer yapısı veya kelime bilgisi notu
🐟 Bunu Biliyor muydunuz? — Konuyla ilgili eğlenceli gerçek bilgi
✅ Öz Değerlendirme — Seviye sonu kendini kontrol listesi
✏️ Mini Quiz — Bölüm sonu boşluk doldurma alıştırması
🔊 Telaffuz — Zor terimlerin okunuşu
[...] İngilizce Açılım — Kısaltmaların tam İngilizce karşılığı

İçindekiler

KISIM I — Mesleki İngilizce Sözlüğü

Bu kısım, SUEM lisans programının tüm alt alanlarını kapsayan 19 tematik bölümde 500'ün üzerinde mesleki İngilizce terim içerir. Her giriş İngilizce terim — Türkçe karşılığı formunda verilmiş, altına iki örnek cümle eklenmiştir.

Bu sözlük, SUEM lisans programının tüm alt alanlarını kapsar. Her giriş: İngilizce terim — Türkçe karşılığı formunda verilmiş, altına iki örnek cümle eklenmiştir. Sonda phrasal verbs, akademik yazım kalıpları ve kısaltmalar bölümü yer alır.

1. Genel Meslek ve Akademik Terminoloji

Su ürünleri mühendisliği, biyoloji, kimya, mühendislik ve ekonominin kesişim noktasında yer alan disiplinlerarası bir alandır. Bu bölümde mesleğin temel kavramlarını ve akademik dünyada sıkça kullanılan terimleri bulacaksınız.

Fisheries industry engineer — Su ürünleri endüstrisi mühendisi.

- → *The fisheries industry engineer supervises raw material reception at the plant.*
- → *As a fisheries industry engineer, she designs new value-added seafood products.*

Aquaculture — Su ürünleri yetiştiriciliği; akuakültür.

- → *Aquaculture now supplies more than half of the fish consumed worldwide.*
- → *Sustainable aquaculture reduces pressure on wild fish stocks.*

🔊 *Telaffuz: Aquaculture → /AK-wə-kəl-çır/*

Fisheries science — Balıkçılık bilimi.

- → *Fisheries science combines biology, ecology and management.*
- → *Our department offers graduate programs in fisheries science.*

Marine sciences — Deniz bilimleri.

- → *Marine sciences cover physical, chemical and biological oceanography.*
- → *She earned her PhD in marine sciences at ÇOMÜ.*

Limnology — İç su (tatlı su) bilimi.

- → *Limnology studies lakes, rivers and reservoirs.*
- → *Limnology is essential for inland fisheries management.*

🔊 *Telaffuz: Limnology → /lim-NOL-ə-ci/*

Oceanography — Oşinografi.

- → *Physical oceanography explains currents and water-mass movements.*
- → *Oceanography data guide the siting of offshore fish farms.*

Ichthyology — Balık bilimi (ihtiyoloji).

- → *Ichthyology focuses on the taxonomy and biology of fish.*
- → *The ichthyology lab houses a large reference collection.*

🔊 *Telaffuz: Ichthyology → /ik-thi-OL-ə-ci/*

Malacology — Yumuşakça bilimi.

→ *Malacology examines the biology of molluscs such as mussels and oysters.*
→ *Malacology research supports bivalve farming in Türkiye.*

🔊 *Telaffuz: Malacology → /mal-ə-KOL-ə-ci/*

Carcinology — Kabuklu bilimi.

→ *Carcinology covers shrimps, crabs and lobsters.*
→ *Carcinology courses include crustacean anatomy and physiology.*

Phycology (algology) — Alg bilimi; fikoloji.

→ *Phycology is increasingly relevant to seaweed cultivation.*
→ *The lecturer published a phycology textbook on microalgae.*

Research and development (R&D) — Araştırma-geliştirme.

→ *Our R&D team is developing a new surimi-based product.*
→ *R&D investment drives competitiveness in the seafood sector.*

Innovation — Yenilik; inovasyon.

→ *Innovation in cold chain management reduces fish spoilage.*
→ *The company received an innovation grant for edible packaging.*

Technology transfer — Teknoloji transferi.

→ *Technology transfer from universities supports small seafood producers.*
→ *We signed a technology transfer agreement with a Norwegian firm.*

Consultancy — Danışmanlık.

→ *The engineer offers consultancy services to fish processing plants.*
→ *Our consultancy covers HACCP and traceability implementation.*

Project management — Proje yönetimi.

→ *Project management skills are essential for building a hatchery.*
→ *She leads project management for the new smoked fish line.*

Undergraduate education — Lisans eğitimi.

→ *Undergraduate education in SUEM combines theory and practice.*
→ *Internships are mandatory in our undergraduate education program.*

Occupational standard — Meslek standardı.

→ *The occupational standard defines the engineer's duties and competencies.*
→ *A new occupational standard was published for SUEM graduates.*

Stakeholder — Paydaş.

→ *Producers, processors and regulators are key sector stakeholders.*
→ *Stakeholder engagement improves policy outcomes.*

Field study — Saha çalışması.

→ *The field study assessed water quality in six fish farms.*

→ *Students completed a two-week field study on Black Sea anchovy.*

Competency — Yetkinlik.

→ *Technical competency is evaluated during the final-year project.*

→ *The job posting lists specific engineering competencies.*

✏️ Mini Quiz — 1. Genel Meslek ve Akademik Terminoloji

Boşlukları doldurun:

1. The _____ engineer supervises raw material reception at the plant.
2. _____ now supplies more than half of the fish consumed worldwide.
3. _____ transfer from universities supports small seafood producers.

Cevaplar: 1) fisheries industry, 2) Aquaculture, 3) Technology

2. Hammadde, Türler ve Sınıflandırma

Bir su ürünleri mühendisinin ilk bilmesi gereken şey, çalıştığı canlıları tanımaktır. Balık, yumuşakça, kabuklu ve yosunlar — her birinin kendine özgü İngilizce terminolojisi vardır. Bu bölüm, tür isimlerinden av kurallarına kadar geniş bir kelime havuzu sunar.

🐟 Bunu Biliyor muydunuz?

Ahtapot 3 kalbe sahiptir: 2'si solungaçlara, 1'i vücuda kan pompalar. Ayrıca kanları bakır bazlı olduğu için mavi renklidir!

Aquatic products — Su ürünleri.

→ *Türkiye exports a wide range of aquatic products.*

→ *Aquatic products include fish, molluscs, crustaceans and algae.*

Seafood — Deniz ürünleri.

→ *Frozen seafood dominates supermarket shelves in Europe.*

→ *Seafood consumption is linked to cardiovascular health.*

Freshwater products — İç su ürünleri.

→ *Rainbow trout is Türkiye's leading freshwater product.*

→ *Freshwater products require different processing than marine species.*

Fish — Balık.

→ *Fish provide high-quality protein and omega-3 fatty acids.*

→ *The fish arrived chilled and were graded by size.*

Fatty fish — Yağlı balık.

→ *Anchovy and mackerel are typical fatty fish.*

→ *Fatty fish are rich in EPA and DHA.*

Lean fish — Yağsız balık.

→ *Lean fish such as hake contain less than 2% fat.*
→ *Lean fish freeze well with minimal oxidation.*

Pelagic fish — Pelajik (açık su) balık.

→ *Pelagic fish move in large schools near the surface.*
→ *Anchovy is the most harvested pelagic fish in Türkiye.*

Demersal fish — Demersal (dip) balık.

→ *Demersal fish live close to the seabed.*
→ *Demersal fish are usually caught by bottom trawl.*

Migratory fish — Göçmen balık.

→ *Migratory fish such as tuna cross ocean basins.*
→ *Managing migratory fish requires international cooperation.*

Anadromous species — Anadrom tür (denizden tatlı suya).

→ *Salmon is a classic anadromous species.*
→ *Anadromous species need unobstructed rivers to spawn.*

Catadromous species — Katadrom tür (tatlı sudan denize).

→ *The European eel is a catadromous species.*
→ *Catadromous species spawn at sea and grow in freshwater.*

Mollusc — Yumuşakça.

→ *Molluscs include bivalves, gastropods and cephalopods.*
→ *Mollusc farming is expanding on the Aegean coast.*

Bivalve — Çift kabuklu.

→ *Bivalves filter large volumes of water daily.*
→ *Mussels and clams are the main farmed bivalves.*

Cephalopod — Kafadan bacaklı.

→ *Cephalopods such as octopus have complex nervous systems.*
→ *Cephalopod landings have declined in recent years.*

🔊 *Telaffuz: Cephalopod → /SEF-ə-lo-pod/*

Crustacean — Kabuklu.

→ *Crustaceans include shrimp, crabs and lobsters.*
→ *Crustacean allergy is a major food-safety concern.*

🔊 *Telaffuz: Crustacean → /krəs-TEY-şın/*

Shrimp — Karides.

→ *Farmed shrimp dominate the global trade.*
→ *We studied black-tiger shrimp shelf life under MAP.*

Lobster — Istakoz.

→ *Live lobsters must be shipped with strict temperature control.*
→ *Lobster meat has high market value.*

Crab — Yengeç.

→ *Blue crab populations are expanding in the Mediterranean.*
→ *Crab meat is used in surimi-based analogues.*

Crayfish — Kerevit.

→ *Crayfish are farmed in freshwater ponds.*
→ *Turkish crayfish exports go mainly to Scandinavia.*

Mussel — Midye.

→ *Mussels are cultivated on ropes or stakes.*
→ *Mussel depuration removes microbial contaminants.*

Oyster — İstiridye.

→ *Oysters are typically consumed raw on the half-shell.*
→ *Pacific oyster farming uses suspended bags.*

Scallop — Deniz tarağı.

→ *Scallop adductor muscle is the most valued part.*
→ *Scallop aquaculture is still emerging in Türkiye.*

Octopus — Ahtapot.

→ *Octopus meat is tenderised by beating or freezing.*
→ *Octopus landings are regulated to prevent overfishing.*

Squid — Kalamar.

→ *Squid rings are a popular frozen seafood product.*
→ *Squid stocks fluctuate with sea temperature.*

Cuttlefish — Mürekkepbalığı.

→ *Cuttlefish ink is used as a natural food colourant.*
→ *Cuttlefish bones are valuable sources of calcium carbonate.*

Edible seaweed — Yenilebilir deniz yosunu.

→ *Edible seaweed is a growing market in Europe.*
→ *Nori, wakame and kombu are common edible seaweeds.*

Macroalga — Makroalg.

→ *Macroalgae are used for food, feed and fertilisers.*
→ *Macroalga cultivation captures atmospheric carbon.*

Microalga — Mikroalg.

→ *Spirulina is a protein-rich microalga.*
→ *Microalgae are cultivated for omega-3 oils.*

Sea cucumber — Denizhıyarı.

→ *Dried sea cucumber is a luxury product in East Asian markets.*
→ *Sea cucumber fishing is strictly quota-controlled.*

Raw material reception — Hammadde kabulü.

- → *Raw material reception is the first critical quality step.*
- → *Temperature is checked at raw material reception.*

Size grading — Boy sınıflandırması.

- → *Size grading ensures uniform portions.*
- → *Automated size grading improves line efficiency.*

Freshness grading — Tazelik sınıflaması.

- → *Freshness grading uses sensory and chemical indices.*
- → *The QIM scheme standardises freshness grading.*

Origin — Menşe; köken.

- → *The label must show the origin of the product.*
- → *Origin traceability is mandatory for EU exports.*

Fishing ground — Av sahası.

- → *Bluefin tuna fishing grounds are tightly regulated.*
- → *Traditional fishing grounds are mapped in the management plan.*

Fishing season — Av sezonu.

- → *The anchovy fishing season opens in September.*
- → *Closed periods protect spawning during the fishing season.*

Minimum landing size — Asgari av boyu.

- → *Undersized fish must be released under minimum landing size rules.*
- → *The minimum landing size for sea bass is 25 cm.*

Prohibited fishing gear — Yasaklı av aracı.

- → *Dynamite is a prohibited fishing gear everywhere.*
- → *Using prohibited fishing gear results in licence suspension.*

✏️ Mini Quiz — 2. Hammadde, Türler ve Sınıflandırma

Boşlukları doldurun:

1. Anchovy and mackerel are typical _____ fish.
2. _____ fish live close to the seabed.
3. Salmon is a classic _____ species that migrates from sea to freshwater.

Cevaplar: 1) fatty, 2) Demersal, 3) anadromous

3. Akuakültür

Dünya nüfusu büyüdükçe doğal stoklar talebi karşılayamaz hale geldi. Akuakültür — su canlılarının kontrollü ortamda yetiştirilmesi — bu açığı kapatmanın en önemli yoludur. Kuluçkahaneden hasata, yem teknolojisinden biyogüvenliğe kadar bu bölümün terimleri sektörün kalbini oluşturur.

🐟 **Bunu Biliyor muydunuz?**
Çin, küresel akuakültür üretiminin %60'ından fazlasını tek başına karşılar.

Culture system — Yetiştiricilik sistemi.

→ *The farm uses an intensive culture system.*
→ *Culture system design affects productivity and welfare.*

Recirculating aquaculture system (RAS) — Kapalı devre üretim sistemi.

→ *RAS facilities reuse up to 99% of their water.*
→ *RAS demands high capital investment but saves water.*

Flow-through system — Akışlı sistem.

→ *Flow-through systems rely on continuous freshwater supply.*
→ *Trout farms often operate as flow-through systems.*

Pond culture — Havuz yetiştiriciliği.

→ *Pond culture is common for carp and tilapia.*
→ *Pond culture productivity depends on fertilisation.*

Cage culture — Kafes yetiştiriciliği.

→ *Cage culture dominates Turkish marine aquaculture.*
→ *Offshore cage culture reduces environmental impact on the coast.*

Offshore aquaculture — Açık deniz yetiştiriciliği.

→ *Offshore aquaculture uses submersible cages.*
→ *Offshore aquaculture faces harsher weather conditions.*

Integrated multi-trophic aquaculture (IMTA) — Entegre çok trofik akuakültür.

→ *IMTA combines fed species with extractive species.*
→ *Seaweed and mussels are typical IMTA partners.*

Aquaponics — Akuaponik.

→ *Aquaponics integrates fish farming with hydroponic plant production.*
→ *Aquaponics systems recycle nutrients between fish and plants.*

Hatchery — Kuluçkahane.

→ *The hatchery produced two million fingerlings last year.*
→ *Hatchery hygiene is critical for larval survival.*

Fingerling — Parmak yavru.

→ *Fingerlings are stocked after they reach 5 grams.*
→ *Fingerling quality predicts grow-out performance.*

Broodstock — Anaç; damızlık.

→ *Selected broodstock are kept in conditioning tanks.*

→ *Broodstock nutrition affects egg quality.*

Roe — Balık yumurtası.

→ *Salmon roe is processed into caviar-like products.*
→ *Roe quality is assessed before fertilisation.*

Larva — Larva.

→ *Larvae are fed live rotifers in the first days.*
→ *Larva mortality peaks during first feeding.*

Juvenile — Genç birey.

→ *Juveniles are transferred to larger tanks.*
→ *Juvenile growth is monitored weekly.*

Stocking density — Stok yoğunluğu.

→ *High stocking density can increase disease risk.*
→ *Optimal stocking density balances growth and welfare.*

Feed conversion ratio (FCR) — Yem dönüşüm oranı.

→ *Lower FCR means more efficient feed use.*
→ *Sea bass FCR typically ranges from 1.1 to 1.5.*

Specific growth rate (SGR) — Spesifik büyüme oranı.

→ *SGR is expressed as percent weight gain per day.*
→ *The new diet improved SGR by 12%.*

Fishmeal — Balık unu.

→ *Fishmeal is the main protein source in salmon feed.*
→ *Fishmeal prices influence aquaculture profitability.*

Fish oil — Balık yağı.

→ *Fish oil provides essential omega-3 fatty acids.*
→ *Fish oil supplies remain a sustainability challenge.*

Extruded feed — Ekstrüde yem.

→ *Extruded feed floats and allows visual feeding control.*
→ *Extrusion improves starch digestibility in feed.*

Dissolved oxygen — Çözünmüş oksijen.

→ *Dissolved oxygen below 5 mg/L stresses most fish.*
→ *Dissolved oxygen is monitored continuously on the farm.*

Ammonia — Amonyak.

→ *Unionised ammonia is highly toxic to fish.*
→ *Biofilters convert ammonia into nitrate.*

Biosecurity — Biyogüvenlik.

→ *Biosecurity plans prevent pathogen introduction.*
→ *Footbaths are a basic biosecurity measure.*

Vaccination — Aşılama.

→ *Vaccination reduces antibiotic use on farms.*
→ *Injection vaccination is standard for salmon.*

Parasite — Parazit.

→ *Sea lice are a major parasite in salmon farming.*
→ *Parasite load is checked during health monitoring.*

Antibiotic residue — Antibiyotik kalıntısı.

→ *Antibiotic residue testing is mandatory before harvest.*
→ *Maximum residue limits are set in EU regulation.*

Harvest — Hasat.

→ *Fish are harvested after reaching market size.*
→ *Harvest timing affects flesh quality.*

Partial harvesting — Seçmeli hasat.

→ *Partial harvesting removes only market-sized fish.*
→ *Partial harvesting improves remaining stock growth.*

Furunculosis — Furunkuloz.

→ *Furunculosis caused by Aeromonas salmonicida is one of the most devastating bacterial diseases in salmonid aquaculture.*
→ *Vaccination programmes have significantly reduced furunculosis outbreaks in Norwegian salmon farms.*

Sea lice — Deniz biti.

→ *Sea lice infestations remain the single largest health cost for Atlantic salmon farmers.*
→ *Chemical and biological control methods are both used to manage sea lice populations.*

Vibriosis — Vibriozis.

→ *Vibriosis outbreaks in sea bass cages typically peak when water temperatures exceed 20 °C.*
→ *Early detection of vibriosis through regular health monitoring reduces mortality in cage-farmed fish.*

Columnaris disease — Kolumnaris hastalığı.

→ *Columnaris disease manifests as white or greyish patches on the skin, fins, and gills of freshwater fish.*
→ *Reducing stocking density and improving water quality help prevent columnaris disease.*

Bath treatment — Banyo tedavisi.

→ *A formalin bath treatment at 150–200 ppm for one hour is commonly used to control external parasites in trout.*
→ *The veterinarian recommended a potassium permanganate bath treatment for the affected trout.*

Vaccination (aquaculture) — Aşılama (akuakültür).

→ *Intraperitoneal vaccination of juvenile sea bream significantly reduces mortality from photobacteriosis.*
→ *Oral and immersion vaccination methods are less stressful for fish than injection.*

Total Ammonia Nitrogen (TAN) — Toplam amonyak azotu.

→ *Unionised ammonia becomes lethal to rainbow trout at concentrations above 0.02 mg/L.*

→ *Regular monitoring of TAN levels is essential for maintaining fish health in recirculating systems.*

Nitrification — Nitrifikasyon.

→ *Nitrification in biofilters converts toxic ammonia first to nitrite and then to nitrate.*

→ *A well-established biofilter ensures efficient nitrification and keeps ammonia below toxic levels.*

Alkalinity — Alkalinite.

→ *Maintaining alkalinity above 100 mg/L $CaCO_3$ is essential for stable pH in recirculating systems.*

→ *Sodium bicarbonate is commonly added to recirculating systems to restore alkalinity.*

Secchi depth — Secchi derinliği.

→ *A Secchi depth reading below 25 cm in a catfish pond indicates an excessively dense algal bloom.*

→ *Farmers measure Secchi depth weekly to manage phytoplankton density in earthen ponds.*

Broodstock management — Anaç yönetimi.

→ *Effective broodstock management requires careful selection of mature fish based on growth rate and disease resistance.*

→ *Genetic diversity must be maintained through careful broodstock management over multiple generations.*

Selective breeding — Seçilim ıslahı; selektif yetiştirme.

→ *After five generations of selective breeding, the GIFT tilapia strain showed a 64 % improvement in growth.*

→ *Disease resistance is now a key trait in selective breeding programmes for Atlantic salmon.*

Triploidy — Triploidi.

→ *Triploidy is induced by pressure or thermal shock to produce sterile fish that allocate no energy to gonadal development.*

→ *Triploid oysters grow faster because they do not invest energy in reproduction.*

Photoperiod manipulation — Fotoperiyot manipülasyonu.

→ *Photoperiod manipulation using artificial lighting delays sexual maturation in Atlantic salmon.*

→ *Continuous light regimes are used in photoperiod manipulation to accelerate smolt development.*

Rotifer — Rotifer.

→ *Enriched rotifers serve as the first live prey offered to sea bass larvae at 3–4 days post-hatch.*

→ *Enriching rotifers with DHA-rich oil improves the nutritional quality of first-feeding larvae.*

Artemia — Artemia.

→ *Artemia nauplii are introduced into larval tanks once the fish larvae are large enough to capture bigger prey.*

→ *Artemia cysts are hatched in conical tanks with strong aeration and warm salt water.*

Weaning — Canlı yemden yapay yeme geçiş.

→ *Early weaning onto microdiets at 20 days post-hatch reduces the cost of live-feed production in sea bream hatcheries.*

→ *Successful weaning requires microdiets with high palatability and digestibility for small larvae.*

Swim bladder inflation — Hava kesesi şişmesi.

→ *Failure of swim bladder inflation during the larval stage leads to spinal deformities and high mortality.*

→ *Surface oil films in larval tanks can prevent swim bladder inflation in marine fish species.*

Fishmeal replacement — Balık unu ikamesi.

→ *Soybean meal and insect meal are the most researched fishmeal replacement ingredients in salmonid diets.*

→ *Research on fishmeal replacement aims to reduce the aquaculture industry's dependence on wild-caught forage fish.*

Apparent digestibility coefficient (ADC) — Görünür sindirim katsayısı.

→ *The apparent digestibility coefficient of protein in a novel feed ingredient must exceed 85 % to be commercially viable.*

→ *Researchers measured the ADC of a novel microalgae-based ingredient in rainbow trout diets.*

Anti-nutritional factor (ANF) — Anti-besleyici faktör.

→ *Anti-nutritional factors such as phytic acid and trypsin inhibitors limit the inclusion rate of plant-based proteins.*

→ *Heat treatment can reduce certain anti-nutritional factors in plant-based feed ingredients.*

Biofouling — Biyokirlenme.

→ *Biofouling on cage nets restricts water flow, reduces dissolved oxygen, and increases structural load.*

→ *Regular net cleaning schedules are essential to control biofouling on sea cage structures.*

Fallowing — Nadasa bırakma.

→ *Site fallowing for at least six weeks between production cycles helps break the sea lice lifecycle.*

→ *Coordinated area management agreements ensure that neighbouring farms fallow their sites simultaneously.*

Carrying capacity — Taşıma kapasitesi.

→ *Exceeding the carrying capacity of a bay leads to oxygen depletion and benthic degradation beneath the cages.*

→ *Environmental impact assessments estimate the carrying capacity before granting new aquaculture licences.*

Escape event — Kaçış olayı.

→ *A single escape event from a salmon farm can release thousands of individuals that may interbreed with wild populations.*

→ *Improved cage design with stronger net materials reduces the risk of escape events during storms.*

Cortisol level — Kortizol seviyesi.

→ *Elevated plasma cortisol levels are the primary physiological indicator of acute stress in farmed fish.*

→ *Handling and transport significantly increase cortisol levels in farmed rainbow trout.*

Precision aquaculture — Hassas su ürünleri yetiştiriciliği.

→ *Precision aquaculture integrates sensor data, AI, and automated feeding to optimize growth and reduce waste.*

→ *Precision aquaculture technologies can reduce feed waste by up to 20 % in commercial sea cages.*

Smart feeding system — Akıllı yemleme sistemi.

> → *The smart feeding system adjusts pellet delivery based on real-time fish appetite detected by underwater cameras.*
> → *Data from the smart feeding system showed a 15 % improvement in feed conversion ratio.*

Digital twin — Dijital ikiz.

> → *A digital twin of the recirculating aquaculture system allows operators to simulate changes before applying them.*
> → *The digital twin predicted that increasing flow rate would improve oxygen distribution in the tanks.*

✏️ Mini Quiz — 3. Akuakültür
Boşlukları doldurun:
1. RAS facilities reuse up to _____ of their water.
2. Lower _____ means more efficient feed use.
3. Dissolved oxygen below _____ stresses most fish.

Cevaplar: 1) 99%, 2) FCR, 3) 5 mg/L

4. İşleme Teknolojileri

Hammadde bir kez yakalandığında veya hasat edildiğinde saat işlemeye başlar. İşleme teknolojileri, balığı güvenli, lezzetli ve uzun ömürlü ürünlere dönüştüren adımlardır: yıkamadan filetoya, tütsülemeden konservelemeye.

Seafood processing — Su ürünleri işleme.

> → *Seafood processing starts with chilling upon landing.*
> → *Modern seafood processing integrates automation and sensors.*

Processing plant — İşleme tesisi.

> → *The processing plant operates under an EU approval number.*
> → *Every processing plant must implement HACCP.*

Processing line — İşleme hattı.

> → *A dedicated processing line handles smoked salmon.*
> → *Line speed is adjusted to maintain hygiene.*

Pre-processing — Ön işlem.

> → *Pre-processing includes washing, grading and chilling.*
> → *Good pre-processing extends shelf life.*

Washing — Yıkama.

> → *Washing removes blood, slime and scales.*
> → *Chilled water washing lowers microbial load.*

Scaling — Pullama.

→ *Scaling is performed before filleting.*
→ *Mechanical scalers handle large volumes quickly.*

Gutting — İç organ çıkarma.

→ *Gutting removes viscera to slow spoilage.*
→ *Automatic gutting machines speed up the line.*

Heading — Başını kesme.

→ *Heading removes the skull and gills.*
→ *Heading reduces weight before freezing.*

Filleting — Fileto çıkarma.

→ *Filleting requires sharp knives and skilled operators.*
→ *V-cut filleting removes pin bones mechanically.*

Skinning — Deri yüzme.

→ *Skinning machines separate flesh from the skin.*
→ *Skinning yield is monitored as a process KPI.*

Deboning — Kılçık ayıklama.

→ *Deboning produces boneless fillets.*
→ *Deboning reduces consumer complaints.*

Mincing — Kıyma hazırlama.

→ *Mincing is the first step of surimi production.*
→ *Fine mincing homogenises the muscle tissue.*

Portioning — Porsiyonlama.

→ *Portioning standardises fillet weight.*
→ *Water-jet portioning improves cut precision.*

Drying — Kurutma.

→ *Drying reduces water activity and extends shelf life.*
→ *Different drying methods yield different textures.*

Sun drying — Güneşte kurutma.

→ *Sun drying is traditional but weather-dependent.*
→ *Hygienic sun drying uses covered racks.*

Hot-air drying — Sıcak hava ile kurutma.

→ *Hot-air drying is controllable and scalable.*
→ *Hot-air drying temperature affects protein denaturation.*

Freeze-drying — Dondurarak kurutma; liyofilizasyon.

→ *Freeze-drying preserves flavour and nutrients.*
→ *Freeze-dried shrimp rehydrates quickly.*

Salting — Tuzlama.

→ *Salting lowers water activity in the fish muscle.*
→ *Salting is the basis of many traditional products.*

Dry salting — Kuru tuzlama.

- → *Dry salting is used for cod and anchovy.*
- → *Dry salting produces firmer texture.*

Brining — Salamura.

- → *Brining uses a salt solution to season fish.*
- → *Brining time affects final salt content.*

Marination — Marine etme; marinasyon.

- → *Marination uses acid, salt and spices.*
- → *Anchovy marination is a popular Turkish product.*

Smoking — Tütsüleme.

- → *Smoking imparts flavour and extends shelf life.*
- → *Smoking adds phenolic antimicrobial compounds.*

Cold smoking — Soğuk tütsüleme.

- → *Cold smoking is done below 30 °C.*
- → *Cold-smoked salmon keeps a raw-like texture.*

Hot smoking — Sıcak tütsüleme.

- → *Hot smoking cooks the fish above 65 °C.*
- → *Hot-smoked mackerel is ready-to-eat.*

Liquid smoke — Sıvı duman.

- → *Liquid smoke gives uniform colour and flavour.*
- → *Liquid smoke contains fewer PAHs than traditional smoke.*

Blanching — Haşlama.

- → *Blanching inactivates enzymes before freezing.*
- → *Short blanching preserves colour.*

Steaming — Buharla pişirme.

- → *Steaming retains more nutrients than boiling.*
- → *Steaming is used for ready meals.*

Sterilisation — Sterilizasyon.

- → *Sterilisation achieves commercial sterility.*
- → *Retort sterilisation uses steam above 121 °C.*

Pasteurisation — Pastörizasyon.

- → *Pasteurisation inactivates vegetative pathogens.*
- → *Pasteurised crab meat still requires refrigeration.*

🔊 *Telaffuz: Pasteurisation → /pas-tə-ray-ZEY-şın/*

Canning — Konserveleme.

- → *Canning extends shelf life to several years.*
- → *Tuna canning is a major industry in Türkiye.*

Retort — Retort cihazı; retort işlemi.

→ *The retort heats sealed cans under pressure.*
→ *Retort scheduling depends on product size.*

Commercial sterility — Ticari sterillik.

→ *Commercial sterility means no growth under storage conditions.*
→ *Canned products must meet commercial sterility criteria.*

Surimi — Surimi.

→ *Surimi is a refined fish protein concentrate.*
→ *Surimi-based crab sticks are globally popular.*
🔊 *Telaffuz: Surimi → /su-Rİ-mi/*

Cryoprotectant — Krioprotektan.

→ *Cryoprotectants prevent protein denaturation during freezing.*
→ *Sugar and sorbitol are typical cryoprotectants in surimi.*
🔊 *Telaffuz: Cryoprotectant → /KRAY-o-pro-tek-tənt/*

Seafood analogue — Taklit deniz ürünü.

→ *Seafood analogues mimic crab and shrimp in texture.*
→ *Seafood analogues are cheaper than the original products.*

Smoked fish — Füme balık.

→ *Smoked fish requires vacuum packaging for long shelf life.*
→ *Hot-smoked mackerel is a classic smoked fish.*

Fish cake — Balık köftesi.

→ *Fish cake is made from minced fish and seasoning.*
→ *Ready-to-cook fish cakes are popular frozen products.*

Fish sausage — Balık sosisi.

→ *Fish sausage targets the ready-meal segment.*
→ *Fish sausage combines minced fish and starch.*

Fish protein hydrolysate — Balık protein hidrolizatı.

→ *Fish protein hydrolysate is rich in bioactive peptides.*
→ *Fish protein hydrolysate is used in pet food and nutraceuticals.*

Value-added product — Katma değerli ürün.

→ *Value-added products generate higher margins.*
→ *Breaded fillets are a typical value-added product.*

High-Pressure Processing (HPP) — Yüksek basınçla işleme.

→ *High-pressure processing at 400–600 MPa effectively inactivates Listeria monocytogenes in ready-to-eat smoked salmon.*
→ *HPP-treated oysters have an extended shelf life while retaining their raw sensory characteristics.*

Pulsed Electric Field (PEF) — Darbeli elektrik alanı.

→ *Pulsed electric field treatment can enhance the extraction yield of proteins from fish by-products.*
→ *PEF is a non-thermal technology that preserves heat-sensitive nutrients in seafood products.*

Cold plasma treatment — Soğuk plazma uygulaması.

→ *Cold plasma treatment reduced the total aerobic mesophilic bacteria count on shrimp surfaces by 2.5 log cycles.*

→ *Researchers are investigating cold plasma treatment as a chemical-free surface decontamination method.*

Ultrasound-assisted processing — Ultrason destekli işleme.

→ *Ultrasound-assisted processing improved the brine penetration rate during salting of cod fillets.*

→ *Ultrasound-assisted thawing reduced drip loss in frozen shrimp compared to conventional water thawing.*

Ohmic heating — Ohmik ısıtma.

→ *Ohmic heating provides uniform temperature distribution, making it suitable for thawing large blocks of frozen tuna.*

→ *The rapid and uniform nature of ohmic heating makes it suitable for sterilising particulate seafood products.*

Surimi — Surimi (yıkanmış balık kıyması).

→ *Surimi is produced by repeatedly washing minced fish flesh to concentrate myofibrillar proteins and improve gel-forming ability.*

→ *Alaska pollock is the primary raw material used in global surimi production.*

3D food printing — 3B gıda baskısı.

→ *3D food printing can reshape minced fish by-products into attractive, consumer-ready formats with controlled texture.*

→ *The company used 3D food printing to create fish-shaped products from underutilised species.*

✏️ **Mini Quiz — 4. İşleme Teknolojileri**

Boşlukları doldurun:

1. _____ removes viscera to slow spoilage.
2. Cold smoking is done below _____ °C.
3. _____ is a refined fish protein concentrate used in crab sticks.

Cevaplar: 1) Gutting, 2) 30, 3) Surimi

5. Muhafaza & Soğuk Zincir

"Soğuk zincir kırılırsa, kalite de kırılır." Bu basit kural, su ürünleri sektörünün en temel ilkesidir. Bu bölümde buzlama yöntemlerinden raf ömrü göstergelerine kadar muhafaza dünyasının tüm kritik terimlerini öğreneceksiniz.

🐟 **Bunu Biliyor muydunuz?**

Yaklaşık 28.000–42.000 yıllık mamut dokuları Sibirya permafrostunda kısmen korunmuş halde bulunmuştur. Soğuğun muhafaza gücü inanılmazdır!

Preservation — Muhafaza.

- → *Preservation aims to extend shelf life while keeping quality.*
- → *Preservation techniques include chilling, freezing and drying.*

Chilling — Soğutma.

- → *Chilling slows microbial growth.*
- → *Effective chilling keeps fish below 2 °C.*

Icing — Buzla soğutma.

- → *Icing remains the simplest way to preserve fresh fish.*
- → *Fish are iced immediately after landing.*

Flake ice — Pul buz.

- → *Flake ice covers fish uniformly without damaging the skin.*
- → *Flake ice is produced on board modern vessels.*

Slurry ice — Sıvı buz; çamur buz.

- → *Slurry ice cools fish faster than flake ice.*
- → *Slurry ice is widely used in salmon processing.*

Refrigerated seawater (RSW) — Soğuk deniz suyu.

- → *RSW systems keep small pelagic fish in good condition.*
- → *RSW temperature is maintained near −1 °C.*

Freezing — Dondurma.

- → *Freezing stops microbial growth but not enzymatic activity.*
- → *Freezing quality depends on ice-crystal size.*

Blast freezing — Şok dondurma.

- → *Blast freezing uses cold, fast-moving air.*
- → *Blast freezing preserves cell structure.*

Plate freezer — Plaka dondurucu.

- → *Plate freezers press product between cold plates.*
- → *Plate freezers are common for fish blocks.*

Tunnel freezer — Tünel dondurucu.

- → *Tunnel freezers handle high line throughput.*
- → *Tunnel freezers achieve rapid heat extraction.*

Individual quick freezing (IQF) — Bireysel hızlı dondurma.

- → *IQF prevents shrimp from sticking together.*
- → *IQF allows flexible packaging formats.*

Glazing — Sır kaplama.

- → *Glazing forms a protective ice layer on frozen fish.*
- → *Glazing reduces oxidation during storage.*

Cold storage — Soğuk depo.

- → *Cold storage capacity limits production planning.*
- → *Cold storage temperature is recorded continuously.*

Thawing — Çözündürme.

- → *Thawing should be slow and controlled.*
- → *Drip loss increases with improper thawing.*

Tempering — Tavlama.

- → *Tempering brings frozen product to just below 0 °C.*
- → *Tempering improves cutting performance.*

Cold chain — Soğuk zincir.

- → *The cold chain must stay unbroken from catch to consumer.*
- → *Cold chain failure accelerates spoilage.*

Data logger — Sıcaklık kaydedici.

- → *Data loggers record temperature during shipment.*
- → *Data logger graphs are reviewed on arrival.*

Shelf life — Raf ömrü.

- → *Shelf life studies guide best-before dates.*
- → *Shelf life is extended with MAP packaging.*

Spoilage — Bozulma.

- → *Spoilage makes fish unfit for consumption.*
- → *Specific spoilage organisms define spoilage rate.*

Autolytic spoilage — Otolizik bozulma.

- → *Autolytic spoilage is driven by the fish's own enzymes.*
- → *Rapid icing limits autolytic spoilage.*

Rancidity — Acılaşma.

- → *Rancidity produces unpleasant off-flavours.*
- → *Oxidative rancidity is accelerated by light.*

TVB-N — *[Total Volatile Basic Nitrogen]* Toplam uçucu bazik azot.

- → *TVB-N above 35 mg/100 g indicates spoiled fish.*
- → *TVB-N is a routine freshness indicator.*

TMA — *[Trimethylamine]* Trimetilamin.

- → *TMA is produced by spoilage bacteria.*
- → *Elevated TMA means advanced spoilage.*

TBARS — *[Thiobarbituric Acid Reactive Substances]* Tiyobarbitürik asit reaktif maddeleri.

- → *TBARS measures secondary lipid oxidation.*
- → *Low TBARS indicates good oxidative stability.*

Peroxide value (PV) — Peroksit değeri.

- → *PV reflects primary lipid oxidation.*

→ *A high peroxide value warns of rancidity onset.*

Free fatty acids (FFA) — Serbest yağ asitleri.

→ *FFA rises during enzymatic hydrolysis of lipids.*
→ *FFA content is monitored in fish oil refining.*

K-value — K değeri; tazelik indeksi.

→ *K-value tracks nucleotide breakdown after death.*
→ *A low K-value indicates very fresh fish.*

Hurdle technology — Engel teknolojisi.

→ *Hurdle technology combines mild preservation factors — low pH, reduced aw, and refrigeration — to ensure microbial safety.*
→ *Combining low pH, salt, and refrigeration through hurdle technology is common in marinated fish products.*

Predictive microbiology — Prediktif (öngörücü) mikrobiyoloji.

→ *Predictive microbiology models estimate the growth rate of Vibrio parahaemolyticus in raw oysters at various temperatures.*
→ *The predictive microbiology software estimated a shelf life of eight days for the chilled fillets.*

Accelerated Shelf Life Testing (ASLT) — Hızlandırılmış raf ömrü testi.

→ *Accelerated shelf life testing at elevated temperatures was used to predict the storage stability of canned tuna.*
→ *ASLT results must be validated against real-time storage trials before commercial application.*

Active packaging — Aktif ambalajlama.

→ *Active packaging incorporating oxygen scavengers extended the shelf life of fresh sea bass fillets by three days.*
→ *Antimicrobial active packaging systems release natural preservatives gradually onto the product surface.*

Intelligent packaging — Akıllı ambalajlama.

→ *Intelligent packaging with time-temperature indicators allows consumers to verify that the cold chain has not been broken.*
→ *Freshness indicator labels are a form of intelligent packaging that changes colour as spoilage progresses.*

Edible coating / edible film — Yenilebilir kaplama / yenilebilir film.

→ *Chitosan-based edible coatings reduced bacterial growth and lipid oxidation in refrigerated salmon fillets.*
→ *Alginate-based edible coatings help retain moisture and delay discolouration in fresh fish fillets.*

✏️ Mini Quiz — 5. Muhafaza & Soğuk Zincir

Boşlukları doldurun:

1. _____ ice cools fish faster than flake ice.
2. The cold chain must stay _____ from catch to consumer.
3. TVB-N above _____ mg/100 g indicates spoiled fish.

Cevaplar: 1) Slurry, 2) unbroken, 3) 35

6. Kalite, Hijyen, Gıda Güvenliği

HACCP, GMP, ISO 22000... Bu kısaltmalar, su ürünleri endüstrisinde her gün karşılaşacağınız kalite ve güvenlik sistemleridir. Bu bölüm, denetimden geri çağırmaya, patojenlerden duyusal analize kadar geniş bir yelpaze sunar.

> 🐟 **Bunu Biliyor muydunuz?**
> HACCP sistemi aslında 1960'larda uzay programı kapsamında astronotların gıda güvenliğini sağlamak amacıyla geliştirilmiştir. Uzayda gıda zehirlenmesi yaşanması kabul edilemez bir riskti!

Quality control (QC) — Kalite kontrol.

- → *QC sampling is performed on every production lot.*
- → *QC reports feed back into process improvement.*

Quality assurance (QA) — Kalite güvencesi.

- → *QA builds systems that prevent non-conformities.*
- → *QA documentation supports certification audits.*

Good Manufacturing Practices (GMP) — İyi Üretim Uygulamaları.

- → *GMP covers facilities, equipment and personnel hygiene.*
- → *GMP is a prerequisite for HACCP.*

Good Hygiene Practices (GHP) — İyi Hijyen Uygulamaları.

- → *GHP defines minimum sanitation standards.*
- → *GHP training is repeated annually.*

SSOP — *[Sanitation Standard Operating Procedures]* Standart sanitasyon işletim prosedürleri.

- → *SSOPs standardise cleaning frequencies and methods.*
- → *SSOP compliance is verified by swab tests.*

HACCP — *[Hazard Analysis and Critical Control Points]* Tehlike analizi ve kritik kontrol noktaları.

- → *HACCP is mandatory for seafood exports to the EU.*
- → *HACCP plans identify biological, chemical and physical hazards.*

Critical Control Point (CCP) — Kritik kontrol noktası.

- → *Metal detection is a common CCP.*
- → *Every CCP has a monitored critical limit.*

Hazard analysis — Tehlike analizi.

- → *Hazard analysis identifies significant risks in each step.*
- → *Hazard analysis is reviewed annually.*

Traceability — İzlenebilirlik.

→ *Traceability allows rapid product recall.*
→ *Batch codes support traceability from sea to plate.*

Recall — Geri çağırma.

→ *A recall was issued after Listeria detection.*
→ *Recall effectiveness is tested annually.*

Food fraud — Gıda sahtekarlığı.

→ *Species substitution is a common seafood food fraud.*
→ *DNA barcoding helps detect food fraud.*

Food defense — Gıda savunması.

→ *Food defense protects products against intentional contamination.*
→ *A food defense plan includes access control.*

Cleaning and disinfection — Temizlik ve dezenfeksiyon.

→ *Cleaning removes soil; disinfection kills microbes.*
→ *Cleaning and disinfection efficacy is validated.*

Clean-in-place (CIP) — *[Clean-in-Place]* Yerinde temizlik.

→ *CIP systems clean tanks without dismantling.*
→ *CIP cycles are automated and logged.*

Cross-contamination — Çapraz bulaşma.

→ *Cross-contamination between raw and cooked areas must be avoided.*
→ *Colour-coded tools prevent cross-contamination.*

Pathogen — Patojen.

→ *Listeria monocytogenes is a major seafood pathogen.*
→ *Pathogen testing is performed on ready-to-eat products.*

Histamine poisoning — Histamin zehirlenmesi.

→ *Histamine poisoning follows consumption of scombroid fish.*
→ *Histamine poisoning symptoms mimic an allergic reaction.*

Biogenic amines — Biyojen aminler.

→ *Biogenic amines form during microbial decarboxylation.*
→ *Histamine is the most regulated biogenic amine.*

Heavy metals — Ağır metaller.

→ *Heavy metals accumulate in predatory fish.*
→ *Heavy metals in seafood are monitored by ICP-MS.*

Mercury residue — Civa kalıntısı.

→ *Mercury residue limits apply to tuna and swordfish.*
→ *Mercury residue was below the legal limit.*

Contaminant — Bulaşan.

→ *Contaminants include dioxins and PCBs.*

→ *Contaminant screening is part of official control.*

Codex Alimentarius — Codex Alimentarius.

→ *Codex Alimentarius sets international food standards.*

→ *EU regulations align with Codex Alimentarius.*

ISO 22000 — *[International Organization for Standardization 22000]* ISO 22000 gıda güvenliği standardı.

→ *ISO 22000 integrates HACCP with management systems.*

→ *Our plant is certified to ISO 22000.*

BRCGS — *[Brand Reputation Compliance Global Standards]* BRCGS gıda güvenliği standardı.

→ *BRCGS is widely required by UK retailers.*

→ *A BRCGS audit is scheduled next month.*

Sensory evaluation — Duyusal analiz.

→ *Sensory evaluation complements chemical indices.*

→ *Trained panels perform sensory evaluation.*

Quality Index Method (QIM) — Kalite indeks yöntemi.

→ *QIM is species-specific and objective.*

→ *QIM training improves panelist consistency.*

Rigor mortis — Rigor mortis.

→ *Rigor mortis begins minutes after death in small fish.*

→ *Filleting before rigor causes gaping.*

Lipid oxidation — Lipit oksidasyonu.

→ *Lipid oxidation is the primary cause of rancidity and off-flavour development in fatty fish species such as mackerel.*

→ *Antioxidants such as tocopherol are added to fish oil to slow down lipid oxidation.*

Thiobarbituric Acid Reactive Substances (TBARS) — Tiyobarbitürik asit reaktif maddeler.

→ *TBARS values above 2 mg MDA/kg indicate significant secondary lipid oxidation in frozen fish.*

→ *Researchers measured TBARS at regular intervals to monitor oxidative stability during frozen storage.*

Biogenic amines — Biyojen aminler.

→ *Histamine, a biogenic amine, must not exceed 200 mg/kg in fishery products according to EU regulation.*

→ *Proper cold chain management is the most effective way to prevent biogenic amine accumulation in fish.*

Protein denaturation — Protein denatürasyonu.

→ *Protein denaturation during frozen storage leads to textural changes such as toughening and loss of water-holding capacity.*

→ *Cryoprotectants such as sorbitol and polyphosphates are added to surimi to minimise protein denaturation.*

Myoglobin autoxidation — Miyoglobin otooksidasyonu.

→ *Myoglobin autoxidation causes the discolouration of tuna flesh from bright red to brown during display.*

→ *CO-modified atmosphere packaging slows myoglobin autoxidation and maintains the red colour of tuna.*

Quality Index Method (QIM) — Kalite indeksi yöntemi.

→ *The Quality Index Method assigns demerit points based on changes in skin, eyes, and gills to assess freshness.*

→ *QIM schemes have been developed for more than 30 commercially important fish species worldwide.*

Triangle test — Üçgen test.

→ *A triangle test was performed to determine whether consumers could detect a difference between HPP-treated and untreated shrimp.*

→ *The triangle test confirmed that panellists could not distinguish between fresh and previously frozen fillets.*

Hedonic scale — Hedonik skala.

→ *Panellists rated the smoked trout samples on a 9-point hedonic scale ranging from 'dislike extremely' to 'like extremely.'*

→ *The 9-point hedonic scale is the most widely used method for measuring consumer acceptance of food products.*

Texture Profile Analysis (TPA) — Doku profil analizi.

→ *Texture profile analysis revealed that hardness and chewiness of surimi gels increased with the addition of transglutaminase.*

→ *TPA parameters such as cohesiveness and resilience provide a comprehensive mechanical characterisation of fish gels.*

Psychrotrophic bacteria — Psikrotrofik bakteriler.

→ *Psychrotrophic bacteria such as Pseudomonas spp. are the dominant spoilage organisms in aerobically stored chilled fish.*

→ *Shewanella putrefaciens is a psychrotrophic bacterium responsible for H_2S-producing spoilage in chilled marine fish.*

Specific Spoilage Organism (SSO) — Spesifik bozulma organizması.

→ *Identifying the specific spoilage organism is essential for developing targeted preservation strategies.*

→ *Photobacterium phosphoreum has been identified as the SSO of vacuum-packed cod stored at 0 °C.*

Challenge test — Çelınç testi (inokulasyon testi).

→ *A challenge test with Listeria monocytogenes was conducted to validate the shelf life of vacuum-packed cold-smoked salmon.*

→ *Regulatory agencies may require a challenge test to validate the safety of new ready-to-eat seafood formulations.*

Biofilm formation — Biyofilm oluşumu.

→ *Biofilm formation on processing equipment surfaces is a persistent source of cross-contamination in seafood plants.*

→ *Stainless steel surfaces are preferred in seafood plants because they are less susceptible to biofilm formation.*

✏️ **Mini Quiz — 6. Kalite, Hijyen, Gıda Güvenliği**
Boşlukları doldurun:
1. _____ is mandatory for seafood exports to the EU.
2. _____ contamination between raw and cooked areas must be avoided.
3. _____ evaluation complements chemical indices.

Cevaplar: 1) HACCP, 2) Cross, 3) Sensory

7. Ambalajlama & Lojistik

Ürün ne kadar kaliteli olursa olsun, doğru ambalajlanıp doğru taşınmazsa değerini yitirir. MAP'tan akıllı ambalaja, paletlemeden soğuk konteyner lojistiğine — bu bölüm, fabrikadan raflara uzanan yolculuğun dilini öğretir.

Packaging — Ambalajlama.

→ *Packaging protects the product and conveys information.*
→ *Sustainable packaging is a growing consumer demand.*

Primary packaging — Birincil ambalaj.

→ *Primary packaging is in direct contact with the product.*
→ *Primary packaging must be food-grade.*

Secondary packaging — İkincil ambalaj.

→ *Secondary packaging groups primary units for handling.*
→ *Cartons are typical secondary packaging.*

Tertiary packaging — Üçüncül ambalaj.

→ *Tertiary packaging is used for bulk transport.*
→ *Pallets and stretch film form tertiary packaging.*

Modified Atmosphere Packaging (MAP) — Modifiye atmosfer ambalajlama.

→ *MAP extends fresh fish shelf life.*
→ *MAP gas mixtures vary by species.*

Vacuum packaging — Vakum ambalajlama.

→ *Vacuum packaging removes oxygen and slows oxidation.*
→ *Cold-smoked salmon is sold in vacuum packaging.*

Active packaging — Aktif ambalaj.

→ *Active packaging releases or absorbs compounds intentionally.*
→ *Oxygen scavengers are a common active packaging element.*

Intelligent packaging — Akıllı ambalaj.

→ *Intelligent packaging informs about product status.*

→ *Time-temperature indicators are a type of intelligent packaging.*

Biodegradable packaging — Biyobozunur ambalaj.

→ *Biodegradable packaging reduces environmental impact.*
→ *Biodegradable trays must also meet food-safety criteria.*

Edible film — Yenilebilir film.

→ *Edible films can carry antimicrobials.*
→ *Chitosan-based edible films are studied for fish coating.*

Labelling — Etiketleme.

→ *Labelling is regulated under Turkish food codex.*
→ *Correct labelling builds consumer trust.*

Batch number — Parti numarası.

→ *The batch number links product to production records.*
→ *Batch number is essential for recalls.*

Use-by date — Son tüketim tarihi.

→ *Use-by date applies to highly perishable products.*
→ *Consuming fish after the use-by date is risky.*

Best-before date — Tavsiye edilen tüketim tarihi.

→ *Best-before date refers to quality, not safety.*
→ *Canned products usually carry a best-before date.*

QR code — *[Quick Response code]* Karekod.

→ *QR codes enable consumer-facing traceability.*
→ *Scanning the QR code shows farm origin information.*

Palletising — Paletleme.

→ *Palletising standardises unit loads.*
→ *Correct palletising prevents transport damage.*

Warehousing — Depolama.

→ *Warehousing layouts follow FIFO principles.*
→ *Temperature-controlled warehousing is required for seafood.*

Distribution — Dağıtım.

→ *Distribution networks reach supermarkets within 24 hours.*
→ *Efficient distribution reduces shelf-life loss.*

Supply chain — Tedarik zinciri.

→ *Supply chain transparency is essential in seafood.*
→ *Blockchain is being tested for supply chain traceability.*

Reefer container — Frigorifik konteyner.

→ *Reefer containers maintain set-point temperatures for weeks.*
→ *Reefer container temperature logs are reviewed on arrival.*

✏️ **Mini Quiz — 7. Ambalajlama & Lojistik**

Boşlukları doldurun:

1. _____ packaging is in direct contact with the product.
2. MAP extends fresh fish _____ life.
3. _____ containers maintain set-point temperatures for weeks.

Cevaplar: 1) Primary, 2) shelf, 3) Reefer

8. Yan Ürün Değerlendirme & Sürdürülebilirlik

Eskiden "atık" denen balık başları, derileri ve kemikleri artık biyoaktif peptid, kolajen, kitosan ve omega-3 kaynağı olarak değerlendiriliyor. Döngüsel ekonomi ve sürdürülebilirlik, sektörün geleceğini şekillendiren kavramlardır.

🐟 **Bunu Biliyor muydunuz?**

Balık kolajeni, sığır kolajeninden 1.5 kat daha hızlı emilir. Bu nedenle kozmetik ve nutrasötik endüstrisinde giderek daha fazla tercih ediliyor.

By-product — Yan ürün.

- → *Fish heads are a valuable by-product.*
- → *By-product valorisation increases plant profitability.*

Waste reduction — Atık azaltma.

- → *Waste reduction is a key sustainability goal.*
- → *Waste reduction measures are built into process design.*

Recovery — Geri kazanım.

- → *Protein recovery uses membrane filtration.*
- → *Recovery of oils adds significant revenue.*

Recycling — Geri dönüşüm.

- → *Plastic recycling complements circular economy goals.*
- → *Recycled PET trays are used in some seafood packaging.*

Circular economy — Döngüsel ekonomi.

- → *A circular economy keeps materials in use longer.*
- → *Circular economy principles guide by-product strategies.*

Biorefinery — Biyorafineri.

- → *A biorefinery converts fish waste into multiple products.*
- → *Biorefinery concepts integrate proteins, lipids and minerals.*

Discards — İskarta; atılan av.

→ *Discards are the unwanted fraction of the catch.*
→ *EU landing obligation aims to end discards.*

Collagen — Kolajen.

→ *Fish collagen is extracted from skin and bones.*
→ *Collagen peptides have cosmetic applications.*
🔊 *Telaffuz: Collagen → /KOL-ə-cın/*

Gelatin — Jelatin.

→ *Fish gelatin is an alternative to mammalian gelatin.*
→ *Gelatin functions as a gelling and film-forming agent.*
🔊 *Telaffuz: Gelatin → /CEL-ə-tin/*

Chitin — Kitin.

→ *Chitin is abundant in shrimp and crab shells.*
→ *Chitin extraction requires demineralisation and deproteinisation.*
🔊 *Telaffuz: Chitin → /KAY-tin/*

Chitosan — Kitosan.

→ *Chitosan has antimicrobial properties.*
→ *Chitosan-based coatings extend fish shelf life.*
🔊 *Telaffuz: Chitosan → /KAY-to-san/*

Fish silage — Balık silajı.

→ *Fish silage is a low-cost protein source for animal feed.*
→ *Acid fish silage stabilises fish waste biologically.*

Omega-3 fatty acids — Omega-3 yağ asitleri.

→ *Omega-3 fatty acids support cardiovascular health.*
→ *EPA and DHA are the main marine omega-3s.*

Bioactive peptide — Biyoaktif peptid.

→ *Bioactive peptides show antioxidant and ACE-inhibitory activity.*
→ *Bioactive peptides are released by enzymatic hydrolysis.*

Nutraceutical — Nutrasötik.

→ *Nutraceuticals bridge food and pharmaceutical markets.*
→ *Fish-oil capsules are leading marine nutraceuticals.*
🔊 *Telaffuz: Nutraceutical → /nu-trə-SU-ti-kəl/*

Sustainability — Sürdürülebilirlik.

→ *Sustainability covers environmental, social and economic dimensions.*
→ *Sustainability reports disclose supply-chain practices.*

Overfishing — Aşırı avcılık.

→ *Overfishing depletes stocks below biological safe levels.*
→ *Overfishing in the Mediterranean threatens several species.*

Bycatch — Hedef dışı av.

→ *Bycatch includes unwanted fish and protected species.*
→ *Selective gear reduces bycatch.*

Ecosystem-based management — Ekosistem temelli yönetim.

→ *Ecosystem-based management considers species interactions.*
→ *Ecosystem-based management is the modern fisheries paradigm.*

Carbon footprint — Karbon ayak izi.

→ *Carbon footprint is reported per kilogram of product.*
→ *Fishing vessel fuel use dominates the carbon footprint.*

Water footprint — Su ayak izi.

→ *Water footprint measures total freshwater use.*
→ *Aquaponics reduces the water footprint.*

Life cycle assessment (LCA) — Yaşam döngüsü değerlendirmesi.

→ *LCA evaluates impacts from cradle to grave.*
→ *LCA guides eco-design decisions.*

MSC certification — *[Marine Stewardship Council certification]* MSC sertifikası.

→ *MSC certification signals sustainable wild-capture fisheries.*
→ *Many retailers require MSC certification.*

ASC certification — *[Aquaculture Stewardship Council certification]* ASC sertifikası.

→ *ASC certification applies to responsibly farmed seafood.*
→ *ASC audits cover environmental and social criteria.*

Environmental impact assessment (EIA) — Çevresel etki değerlendirmesi (ÇED).

→ *EIA is required before building new aquaculture sites.*
→ *EIA reports are reviewed by the Ministry of Environment.*

Circular bioeconomy — Döngüsel biyoekonomi.

→ *A circular bioeconomy approach converts shrimp shell waste into chitosan for biomedical and food packaging applications.*
→ *The EU Bioeconomy Strategy promotes a circular bioeconomy approach across all food sectors including fisheries.*

Upcycling — Değer artırımlı geri dönüştürme (ileri dönüşüm).

→ *Upcycling of fish processing by-products into collagen peptides creates a high-value nutraceutical product stream.*
→ *Fish skin upcycling into leather for fashion accessories is an emerging niche market in Iceland.*

Life Cycle Assessment (LCA) — Yaşam döngüsü değerlendirmesi.

→ *Life cycle assessment revealed that the RAS farm's carbon footprint was 40 % lower than the conventional net-pen operation.*
→ *LCA studies consistently show that feed production is the largest environmental hotspot in salmon farming.*

Cell-cultured seafood — Hücre kültürlü deniz ürünü.

→ *Cell-cultured seafood is produced by cultivating fish muscle cells in bioreactors without harvesting live animals.*

→ *Regulatory frameworks for cell-cultured seafood are still under development in most countries.*

Plant-based seafood analogue — Bitkisel bazlı deniz ürünü alternatifi.

→ *Plant-based seafood analogues made from pea protein and algal extracts are gaining market share in Europe.*

→ *Consumer acceptance of plant-based seafood analogues depends heavily on texture and flavour accuracy.*

Microalgae biomass — Mikroalg biyokütlesi.

→ *Microalgae biomass rich in omega-3 fatty acids is used both as aquafeed and as a direct human food ingredient.*

→ *Spirulina and Chlorella are the most commercially produced microalgae biomass species worldwide.*

Insect meal — Böcek unu.

→ *Black soldier fly insect meal is replacing up to 30 % of fishmeal in commercial salmon diets.*

→ *The EU approved insect meal for use in aquaculture feeds in 2017 under Regulation 2017/893.*

✏️ Mini Quiz — 8. Yan Ürün Değerlendirme & Sürdürülebilirlik

Boşlukları doldurun:

1. Fish _____ is extracted from skin and bones.
2. _____ has antimicrobial properties and extends fish shelf life.
3. MSC certification signals sustainable _____-capture fisheries.

Cevaplar: 1) collagen, 2) Chitosan, 3) wild

9. Analiz & Enstrümantal Teknikler

Modern su ürünleri mühendisliği, laboratuvar ve enstrümantal analiz olmadan düşünülemez. NIR, FTIR, GC-MS, DNA barkodlama — bu bölüm, kalite ve doğrulama analizlerinin İngilizce terminolojisini kapsar.

🐟 Bunu Biliyor muydunuz?

Elektronik burun (e-nose) cihazları, eğitimli insan panellerinin tespit edemediği erken bozulma işaretlerini bile algılayabilir. Geleceğin kalite kontrolü sensörlere emanet!

Near-infrared spectroscopy (NIR) — Yakın kızılötesi spektroskopi.

→ *NIR rapidly predicts fat and moisture content in fish fillets.*

→ *Handheld NIR devices are used for on-line quality screening.*

Fourier-transform infrared spectroscopy (FTIR) — FTIR spektroskopisi.

- → *FTIR identifies functional groups in seafood lipids.*
- → *FTIR spectra help detect species adulteration.*

Raman spectroscopy — Raman spektroskopisi.

- → *Raman spectroscopy complements FTIR in seafood analysis.*
- → *Raman can measure frozen samples without contact.*

Hyperspectral imaging — Hiperspektral görüntüleme.

- → *Hyperspectral imaging maps composition across a fillet.*
- → *Hyperspectral imaging detects parasites non-destructively.*

Computer-based image analysis — Bilgisayarlı görüntü analizi.

- → *Computer-based image analysis quantifies colour changes.*
- → *Computer-based image analysis supports automated grading.*

Chemometrics — Kemometri.

- → *Chemometrics turns spectral data into predictive models.*
- → *Chemometrics courses complement analytical chemistry.*

🔊 *Telaffuz: Chemometrics → /ki-mo-MET-riks/*

Principal Component Analysis (PCA) — Temel bileşen analizi.

- → *PCA reveals clustering among sample groups.*
- → *PCA is often the first exploratory step.*

Partial Least Squares Regression (PLSR) — Kısmi en küçük kareler regresyonu.

- → *PLSR predicts fat content from NIR spectra.*
- → *PLSR models are validated with an independent set.*

Calibration — Kalibrasyon.

- → *Calibration relates instrument response to reference values.*
- → *A robust calibration needs diverse samples.*

Validation — Validasyon.

- → *Validation confirms that the method fits its purpose.*
- → *External validation uses unseen samples.*

Gas chromatography (GC) — Gaz kromatografisi.

- → *GC is used to analyse volatile flavour compounds.*
- → *GC coupled with MS identifies off-odour molecules.*

HPLC — *[High-Performance Liquid Chromatography]* Yüksek performanslı sıvı kromatografi.

- → *HPLC separates biogenic amines in fish extracts.*
- → *HPLC quantifies histamine with high precision.*

Mass spectrometry (MS) — Kütle spektrometresi.

- → *MS identifies compounds by their mass-to-charge ratio.*
- → *Tandem MS is the gold standard for residue analysis.*

ICP-MS — *[Inductively Coupled Plasma Mass Spectrometry]* İndüktif eşleşmiş plazma kütle spektrometresi.

→ *ICP-MS measures trace elements at parts-per-billion levels.*

→ *ICP-MS is used for heavy metal screening in seafood.*

DNA barcoding — *[Deoxyribonucleic Acid barcoding]* DNA barkodlama.

→ *DNA barcoding confirms species identity.*

→ *DNA barcoding uncovers mislabelling of fish products.*

qPCR — *[quantitative Polymerase Chain Reaction]* Gerçek zamanlı PCR.

→ *qPCR quantifies pathogens in seafood samples.*

→ *qPCR is faster than traditional microbiology.*

Electronic nose — Elektronik burun.

→ *Electronic noses detect spoilage volatiles.*

→ *An electronic nose was trained on fresh and aged anchovy.*

Texture profile analysis (TPA) — Tekstür analizi.

→ *TPA provides instrumental hardness and chewiness values.*

→ *TPA supplements sensory texture data.*

Colour measurement (L*a*b*) — Renk ölçümü.

→ *Colour measurement tracks pigment changes in salmon.*

→ *L*a*b* values are compared before and after storage.*

Proximate analysis — Proksimat analiz.

→ *Proximate analysis quantifies moisture, protein, fat and ash.*

→ *Proximate analysis supports nutritional labelling.*

Total viable count (TVC) — Toplam mezofil aerob bakteri sayısı.

→ *TVC above 10^7 CFU/g indicates spoilage.*

→ *TVC is the most common microbial indicator.*

Computer vision — Bilgisayarlı görü.

→ *Computer vision systems can automatically grade fish by size and detect quality defects on the processing line.*

→ *Computer vision-based sorting machines can process over 200 fish per minute on a commercial filleting line.*

Predictive analytics — Öngörücü analitik.

→ *Predictive analytics uses historical water quality data to forecast harmful algal bloom events in coastal farms.*

→ *The predictive analytics model identified temperature as the most critical variable affecting fillet yield.*

Machine learning algorithm — Makine öğrenmesi algoritması.

→ *A machine learning algorithm trained on acoustic data can estimate fish biomass in sea cages with over 90 % accuracy.*

→ *The machine learning algorithm classified spoilage levels in salmon fillets using hyperspectral imaging data.*

Neural network — Yapay sinir ağı.

> → *Convolutional neural networks are increasingly used to classify fish species from underwater camera images.*
> → *Deep neural networks outperformed traditional statistical models in predicting shelf life of chilled seafood.*

Environmental DNA (eDNA) — Çevresel DNA.

> → *Environmental DNA sampling from seawater can detect the presence of invasive species without physical capture.*
> → *eDNA metabarcoding of harbour water revealed the presence of 47 fish species in a single sample.*

CRISPR gene editing — CRISPR gen düzenleme.

> → *CRISPR gene editing is being explored to improve disease resistance in farmed shrimp and tilapia.*
> → *Ethical and regulatory debates around CRISPR gene editing in aquaculture species are ongoing worldwide.*

Whole-genome sequencing (WGS) — Tüm genom dizileme.

> → *Whole-genome sequencing enables rapid identification of Listeria strains during a seafood plant outbreak investigation.*
> → *WGS data helped trace a Salmonella outbreak back to a specific batch of imported shrimp.*

DNA barcoding — DNA barkodlama.

> → *Regulatory laboratories use DNA barcoding to verify that the species on the label matches the actual product.*
> → *The COI gene region is the standard molecular marker used in DNA barcoding of fish species.*

Internet of Things (IoT) — Nesnelerin interneti.

> → *IoT-enabled sensors continuously monitor dissolved oxygen, pH, and temperature across all ponds in real time.*
> → *The IoT platform sends automatic alerts when water quality parameters deviate from the set thresholds.*

Edge computing — Uç bilişim.

> → *Edge computing processes sensor data locally at the farm, reducing latency in automated feeding decisions.*
> → *Edge computing enables real-time feeding adjustments without depending on cloud server response times.*

Big data analytics — Büyük veri analitiği.

> → *Big data analytics combining oceanographic, genetic, and market data supports evidence-based site selection.*
> → *Big data analytics revealed seasonal patterns in feed conversion that were invisible in traditional reports.*

10. Pazarlama, Ticaret, Yönetim

Mühendislik sadece üretim değildir. Ürünü pazarlamak, maliyetini analiz etmek, stoklarını yönetmek ve mevzuata uygunluğunu sağlamak da mühendislik becerisidir.

Marketing — Pazarlama.

- → *Marketing strategies must address consumer perceptions of seafood.*
- → *Marketing campaigns promote farmed fish sustainability.*

Market analysis — Pazar analizi.

- → *Market analysis identifies emerging consumer trends.*
- → *Market analysis guides product development.*

Branding — Markalaşma.

- → *Branding differentiates Turkish sea bass globally.*
- → *Strong branding supports premium pricing.*

Product development — Ürün geliştirme.

- → *Product development combines consumer insight and technology.*
- → *Product development pipelines need clear milestones.*

Commercialisation — Ticarileşme.

- → *Commercialisation transforms lab prototypes into market products.*
- → *Commercialisation requires regulatory approval.*

Pricing — Fiyatlandırma.

- → *Pricing reflects cost, value and competition.*
- → *Dynamic pricing adapts to daily market signals.*

Consumer trend — Tüketici eğilimi.

- → *Ready-to-eat meals are a strong consumer trend.*
- → *Plant-based seafood alternatives follow the same trend.*

Production planning — Üretim planlaması.

- → *Production planning balances demand and capacity.*
- → *Production planning integrates raw material availability.*

Capacity utilisation — Kapasite kullanımı.

- → *Capacity utilisation measures plant efficiency.*
- → *Low capacity utilisation raises unit cost.*

Productivity — Verimlilik.

- → *Productivity gains come from training and automation.*
- → *Productivity indicators are reviewed weekly.*

Cost analysis — Maliyet analizi.

- → *Cost analysis reveals profit drivers.*
- → *Cost analysis is part of investment decisions.*

Inventory management — Stok yönetimi.

- → *Inventory management prevents overstock and stock-out.*
- → *FIFO is essential in seafood inventory management.*

Regulatory compliance — Mevzuata uygunluk.

- → *Regulatory compliance is audited by authorities.*

→ *Regulatory compliance protects market access.*

Certification — Sertifikasyon.

→ *Certification costs are offset by market premiums.*
→ *Annual certification audits are mandatory.*

Audit — Denetim.

→ *External audits build customer confidence.*
→ *Internal audits verify day-to-day compliance.*

Occupational health and safety — İş sağlığı ve güvenliği.

→ *Occupational health and safety training is mandatory.*
→ *Occupational health and safety reduces accidents.*

11. Hukuk & Mevzuat

Su ürünleri sektörü, Türk Gıda Kodeksi'nden AB müktesebatına, UNCLOS'tan balıkçılık mevzuatına kadar yoğun bir hukuki çerçevede faaliyet gösterir.

Fisheries law — Su ürünleri hukuku.

→ *Turkish fisheries law is governed by Law No. 1380.*
→ *Fisheries law regulates catch, trade and aquaculture.*

Law of the sea — Deniz hukuku.

→ *The law of the sea defines maritime zones.*
→ *Law of the sea principles apply to fishing vessels.*

Food law — Gıda hukuku.

→ *Food law protects public health and consumer rights.*
→ *EU food law is harmonised across member states.*

Fisheries legislation — Balıkçılık mevzuatı.

→ *Fisheries legislation is updated seasonally.*
→ *The ministry publishes new fisheries legislation on its website.*

Regulation — Yönetmelik.

→ *The aquaculture regulation defines farm siting criteria.*
→ *A new regulation entered into force last month.*

Communiqué — Tebliğ.

→ *A communiqué specifies technical details of a regulation.*
→ *The labelling communiqué lists mandatory fields.*

Circular — Genelge.

→ *The ministry issued a circular on vessel inspection.*
→ *Circulars clarify administrative procedures.*

Presidential decree — Cumhurbaşkanlığı kararnamesi.

→ *The presidential decree restructured the general directorate.*
→ *Presidential decrees have the force of law.*

Turkish Food Codex — Türk Gıda Kodeksi.

→ *The Turkish Food Codex sets limits for contaminants.*
→ *Turkish Food Codex aligns with EU regulations.*

EU acquis — *[European Union]* AB müktesebatı.

→ *Türkiye continues to align with EU acquis on food safety.*
→ *The acquis includes over 20,000 food-related legal acts.*

UNCLOS — *[United Nations Convention on the Law of the Sea]* BM Deniz Hukuku Sözleşmesi.

→ *UNCLOS grants coastal states rights over their EEZ.*
→ *UNCLOS entered into force in 1994.*

Exclusive Economic Zone (EEZ) — Münhasır ekonomik bölge.

→ *The EEZ extends up to 200 nautical miles offshore.*
→ *The coastal state manages fisheries in its EEZ.*

Territorial waters — Karasuları.

→ *Territorial waters extend 12 nautical miles from the baseline.*
→ *Territorial waters are under full national sovereignty.*

High seas — Açık deniz.

→ *High seas lie beyond national jurisdictions.*
→ *High seas fishing requires regional cooperation.*

Flag state — Bayrak devleti.

→ *The flag state is responsible for vessel compliance.*
→ *Flag state obligations include monitoring and inspection.*

Port state control — Liman devleti denetimi.

→ *Port state control inspects foreign fishing vessels.*
→ *Port state control helps combat IUU fishing.*

IUU fishing — *[Illegal, Unreported and Unregulated]* Yasa dışı, bildirilmemiş, düzenlenmemiş avcılık.

→ *IUU fishing undermines stock management.*
→ *IUU fishing catch certificates are required at EU borders.*

Fishing quota — Av kotası.

→ *Fishing quotas are allocated annually per species.*
→ *Exceeding the quota leads to sanctions.*

Total Allowable Catch (TAC) — Toplam izin verilen av miktarı.

→ *Scientists advise the TAC for each stock.*
→ *The TAC for Black Sea turbot was reduced.*

Closed season — Av yasağı dönemi.

→ *The closed season protects spawning fish.*
→ *Violating the closed season results in fines.*

Marine Protected Area (MPA) — Deniz koruma alanı.

- → *MPAs conserve biodiversity and fish habitats.*
- → *An MPA was declared around Gökçeada.*

Fishing licence — Av ruhsatı.

- → *A fishing licence is renewed every three years.*
- → *Commercial fishing without a licence is illegal.*

Geographical indication — Coğrafi işaret.

- → *Geographical indications protect traditional food identity.*
- → *Türkiye registered several GIs for fish products.*

Intellectual property rights (IPR) — Fikri mülkiyet hakları.

- → *IPR protects inventions, trademarks and designs.*
- → *IPR training is provided for our R&D team.*

Contract — Sözleşme.

- → *The supply contract specifies delivery times.*
- → *Contract disputes are resolved under Turkish commercial law.*

Liability — Sorumluluk.

- → *Product liability follows defective food incidents.*
- → *Liability clauses are negotiated during contracting.*

Compensation — Tazminat.

- → *Compensation was paid for delayed shipments.*
- → *Contractual compensation is capped by a penalty clause.*

Arbitration — Tahkim.

- → *Arbitration offers faster dispute resolution than courts.*
- → *International contracts often specify arbitration clauses.*

Product liability — Ürün sorumluluğu.

- → *Product liability insurance is mandatory for exporters.*
- → *A product liability claim can result in heavy damages.*

Consumer protection — Tüketicinin korunması.

- → *Consumer protection laws ban misleading claims.*
- → *Consumer protection covers labelling and advertising.*

Border Inspection Post (BIP/BCP) — Sınır kontrol noktası.

- → *Seafood imports pass through a Border Control Post.*
- → *The BCP checks documents and samples shipments.*

RASFF — Hızlı uyarı sistemi.

- → *RASFF alerts member states about food-safety risks.*
- → *A RASFF notification triggers immediate action.*

TRACES — AB ticaret kontrol ve uzman sistemi.

- → *TRACES tracks animal-origin shipments to the EU.*

→ *TRACES generates the CHED electronically.*

Approval number — Onay numarası.

→ *The EU approval number appears in an oval stamp.*
→ *Only establishments with an approval number can export.*

Non-conformity — Uygunsuzluk.

→ *Non-conformities are logged and corrected.*
→ *Repeated non-conformities trigger audits.*

Administrative fine — İdari para cezası.

→ *An administrative fine was imposed for labelling errors.*
→ *Administrative fines can be appealed within 30 days.*

Occupational health and safety legislation — İş sağlığı ve güvenliği mevzuatı.

→ *Law No. 6331 regulates occupational health and safety.*
→ *OHS legislation covers training, PPE and risk assessment.*

Personal Data Protection Law (KVKK / GDPR) — Kişisel verilerin korunması.

→ *KVKK and GDPR apply to customer and employee data.*
→ *KVKK compliance is reviewed by the data protection officer.*

Public procurement — Kamu ihalesi.

→ *Public procurement of fish is regulated under Law No. 4734.*
→ *Public procurement tenders are announced on EKAP.*

Ministry of Agriculture and Forestry — Tarım ve Orman Bakanlığı.

→ *The Ministry of Agriculture and Forestry oversees fisheries.*
→ *The Ministry issues aquaculture permits.*

General Directorate of Fisheries and Aquaculture (BSGM) — Balıkçılık ve Su Ürünleri Genel Müdürlüğü.

→ *BSGM collects fisheries statistics nationally.*
→ *BSGM drafts regulations for the sector.*

IUU Regulation (EC No 1005/2008) — IUU yönetmeliği.

→ *Any consignment of fishery products entering the EU must be accompanied by a catch certificate under the IUU Regulation.*
→ *Third countries that fail to cooperate against IUU fishing may receive a yellow or red card from the EU.*

Common Market Organisation (CMO) Regulation — Ortak piyasa düzeni yönetmeliği (EU No 1379/2013).

→ *The CMO Regulation sets mandatory consumer information requirements for fishery and aquaculture products sold in the EU.*
→ *The CMO Regulation also governs producer organisations and marketing standards for fishery products.*

Official Controls Regulation (EU 2017/625) — Resmi kontroller yönetmeliği.

→ *Under the Official Controls Regulation, competent authorities perform risk-based inspections on imported food of animal origin.*
→ *The Official Controls Regulation harmonises inspection procedures across all EU member states.*

General Food Law (EC No 178/2002) — Genel gıda yasası.

→ *The General Food Law establishes the principles of traceability, requiring food business operators to identify their suppliers.*
→ *Under the General Food Law, any unsafe product must be withdrawn from the market immediately.*

Hygiene Package (EC No 852/2004, 853/2004) — Hijyen paketi.

→ *Establishments exporting seafood to the EU must comply with the Hygiene Package, including Regulation 853/2004.*
→ *The Hygiene Package requires all food business operators to implement HACCP-based procedures.*

Discard Ban (Landing Obligation) — Iskarta yasağı (karaya çıkarma yükümlülüğü).

→ *The EU landing obligation requires all regulated species caught to be brought to port and counted against quota.*
→ *The discard ban has created challenges for mixed fisheries where multiple species are caught together.*

Flag State Responsibility — Bayrak devleti sorumluluğu.

→ *Under UNCLOS, the flag state bears responsibility for ensuring its vessels comply with international conservation measures.*
→ *Weak flag state responsibility allows some vessels to operate with minimal oversight on the high seas.*

Rapid Alert System for Food and Feed (RASFF) — Gıda ve yem için hızlı uyarı sistemi.

→ *When a contaminated shipment is detected, the information is immediately shared through the RASFF network.*
→ *RASFF notifications for histamine in tuna remain among the most frequent alerts in the seafood category.*

12. Dış Ticaret, İç Ticaret, İthalat-İhracat

Küresel su ürünleri ticareti, ihracat sertifikalarından gümrük tarifelerine kadar özel bir dil gerektirir. Bu bölüm, uluslararası ticarete adım atan mühendislerin ihtiyaç duyacağı terimleri sunar.

Domestic trade — İç ticaret.

→ *Domestic trade in fresh fish moves mostly through wholesalers.*
→ *Domestic trade volumes peak during Ramadan.*

Foreign trade — Dış ticaret.

→ *Foreign trade in seafood contributes significantly to GDP.*
→ *Foreign trade statistics are published monthly.*

Import — İthalat.

→ *Türkiye imports salmon from Norway.*

→ *Imports require veterinary health certificates.*

Export — İhracat.

→ *Turkish sea bass exports have shown steady growth in recent years.*
→ *Exporters must hold an EU approval number.*

Re-export — Yeniden ihracat.

→ *Re-exports pass through bonded warehouses.*
→ *Re-export documents are issued by customs.*

Free Trade Agreement (FTA) — Serbest ticaret anlaşması.

→ *An FTA reduces tariff barriers.*
→ *The Türkiye–UK FTA covers seafood products.*

Customs union — Gümrük birliği.

→ *The Türkiye–EU Customs Union covers industrial goods.*
→ *Agricultural products are only partially covered by the customs union.*

World Trade Organization (WTO) — Dünya Ticaret Örgütü.

→ *WTO rules limit subsidies that harm fisheries.*
→ *WTO dispute panels resolve trade conflicts.*

Trade balance — Ticaret dengesi.

→ *Türkiye's seafood trade balance is positive.*
→ *Trade balance improves with higher value-added exports.*

Exporter — İhracatçı.

→ *Exporters must register with the exporters' association.*
→ *The exporter issues a commercial invoice.*

Importer — İthalatçı.

→ *Importers lodge pre-notifications at BCPs.*
→ *The importer is responsible for customs payment.*

Distributor — Distribütör.

→ *The distributor supplies supermarkets nationwide.*
→ *Distributor agreements define exclusivity clauses.*

Wholesaler — Toptancı.

→ *Wholesalers buy fish at auction halls.*
→ *Wholesalers distribute to restaurants and retailers.*

Retailer — Perakendeci.

→ *Retailers sell directly to end consumers.*
→ *Retailers demand certified and traceable seafood.*

Country of origin — Menşe ülke.

→ *Country of origin must be declared on the label.*
→ *Country of origin affects tariff treatment.*

Customs declaration — Gümrük beyannamesi.

- → *The customs declaration lists goods, values and codes.*
- → *The customs declaration is submitted electronically.*

Customs Tariff Statistics Position (GTİP) — Gümrük tarife istatistik pozisyonu.

- → *Each product has a unique 12-digit GTİP code.*
- → *GTİP determines duty and VAT rates.*

Harmonised System (HS) code — Armonize sistem kodu.

- → *HS codes are used worldwide.*
- → *HS code 0302 covers fresh fish (except fillets).*

Customs duty — Gümrük vergisi.

- → *Customs duty varies by HS code and origin.*
- → *A preferential agreement may zero the customs duty.*

VAT — Katma değer vergisi (KDV).

- → *VAT on seafood in Türkiye is reduced compared to general rate.*
- → *VAT refund is granted for exported goods.*

Anti-dumping duty — Anti-damping vergisi.

- → *Anti-dumping duties protect against unfair pricing.*
- → *The EU imposed anti-dumping duties on certain frozen fish.*

Tariff-rate quota (TRQ) — Tarife kotası.

- → *A TRQ allows limited duty-free imports.*
- → *TRQs are announced annually.*

Inward processing regime — Dahilde işleme rejimi.

- → *Inward processing suspends duties for re-exported products.*
- → *Inward processing is popular for tuna canning.*

Free zone — Serbest bölge.

- → *Free zones offer tax advantages for export manufacturing.*
- → *The İzmir Free Zone hosts several seafood exporters.*

Customs broker — Gümrük müşaviri.

- → *The customs broker handles import clearance.*
- → *A reliable customs broker prevents delays.*

Authorised Economic Operator (AEO) — Yetkilendirilmiş yükümlü.

- → *AEO status speeds up customs procedures.*
- → *AEO certification requires a rigorous compliance audit.*

Commercial invoice — Ticari fatura.

- → *The commercial invoice states value and Incoterm.*
- → *The commercial invoice supports customs valuation.*

Proforma invoice — Proforma fatura.

- → *A proforma invoice precedes the contract.*

→ *Proforma invoices are used for letters of credit.*

Packing list — Koli listesi.

→ *The packing list details cartons, weights and dimensions.*
→ *The packing list matches the commercial invoice.*

Bill of Lading (B/L) — Konşimento.

→ *The Bill of Lading is a document of title.*
→ *Original B/L is surrendered to claim the cargo.*

Air Waybill (AWB) — Hava konşimentosu.

→ *Air Waybills are non-negotiable.*
→ *Live lobster shipments travel with an AWB.*

CMR — Karayolu taşıma belgesi.

→ *The CMR note accompanies international road shipments.*
→ *The CMR is signed by driver and consignee.*

Certificate of origin — Menşe şahadetnamesi.

→ *The certificate of origin is stamped by the chamber of commerce.*
→ *Certificate of origin is required for non-preferential trade.*

A.TR certificate — A.TR dolaşım belgesi.

→ *A.TR is used between Türkiye and the EU customs union.*
→ *A.TR exempts goods from customs duty.*

EUR.1 certificate — EUR.1 dolaşım sertifikası.

→ *EUR.1 is used in preferential trade with non-EU countries.*
→ *EUR.1 requires local content thresholds.*

Certificate of analysis (COA) — Analiz sertifikası.

→ *The COA accompanies each export shipment.*
→ *COA tests include microbial and chemical parameters.*

Health certificate — Sağlık sertifikası.

→ *The health certificate is issued by the competent authority.*
→ *Each consignment requires an original health certificate.*

Export licence — İhracat lisansı.

→ *Export licences are issued for controlled species.*
→ *Export licence applications are made online.*

Ex Works (EXW) — İş yerinde teslim (Incoterm).

→ *Under EXW the buyer arranges everything from the seller's premises.*
→ *EXW places maximum responsibility on the buyer.*

FOB (Free on Board) — Gemide masrafsız (Incoterm).

→ *Under FOB the seller loads the goods onto the vessel.*
→ *Risk transfers once goods are on board under FOB.*

CIF (Cost, Insurance, Freight) — Mal bedeli, sigorta ve navlun (Incoterm).

→ *Under CIF the seller pays freight and insurance to destination port.*
→ *Risk transfers at the loading port despite cost coverage.*

DDP (Delivered Duty Paid) — Gümrük vergisi ödenmiş olarak teslim (Incoterm).

→ *Under DDP the seller covers all duties and delivery costs.*
→ *DDP places maximum responsibility on the seller.*

Letter of credit (L/C) — Akreditif.

→ *A letter of credit reduces payment risk.*
→ *The L/C is opened before shipment.*

Irrevocable L/C — Dönülemez akreditif.

→ *Irrevocable L/Cs cannot be changed without all parties' consent.*
→ *Most international trade uses irrevocable L/Cs.*

Confirmed L/C — Teyitli akreditif.

→ *A confirmed L/C adds a second bank's undertaking.*
→ *Exporters prefer confirmed L/Cs for risky markets.*

Bank transfer — Banka havalesi.

→ *International bank transfers use SWIFT codes.*
→ *Bank transfer charges vary by currency and bank.*

SWIFT — SWIFT (uluslararası ödeme mesajı).

→ *SWIFT messages carry payment instructions.*
→ *A SWIFT MT103 confirms a customer transfer.*

Factoring — Faktoring.

→ *Factoring converts receivables into immediate cash.*
→ *Export factoring covers commercial and political risks.*

Forfaiting — Forfaiting.

→ *Forfaiting discounts medium-term export receivables.*
→ *Forfaiting transfers risk to the financier.*

Exchange rate risk — Kur riski.

→ *Exchange rate risk affects export margins.*
→ *Forward contracts hedge exchange rate risk.*

Export credit insurance — İhracat kredi sigortası.

→ *Türk Eximbank provides export credit insurance.*
→ *Export credit insurance protects against buyer default.*

Freight — Navlun.

→ *Freight rates are volatile in post-pandemic markets.*
→ *Freight surcharges apply during peak seasons.*

Reefer container — Frigorifik konteyner.

→ *A reefer container keeps cargo at set temperature.*

→ *Reefer container temperature logs are archived.*

Port of loading — Yükleme limanı.

→ *The port of loading is listed on the Bill of Lading.*
→ *İzmir Alsancak is a major port of loading for seafood.*

Port of discharge — Boşaltma limanı.

→ *The port of discharge handles import clearance.*
→ *Rotterdam is a common port of discharge for Turkish exports.*

Demurrage — Demuraj.

→ *Demurrage charges arise after free time expires.*
→ *Fast customs clearance avoids demurrage.*

FCL (Full Container Load) — Tam konteyner yükü.

→ *FCL suits bulk frozen shipments.*
→ *FCL reduces per-unit freight cost.*

LCL (Less than Container Load) — Parsiyel yük.

→ *LCL works for small export consignments.*
→ *LCL shipments share container space.*

Common Health Entry Document (CHED) — Ortak sağlık giriş belgesi.

→ *The CHED accompanies animal-origin imports to the EU.*
→ *CHED data is entered in the TRACES system.*

IUU catch certificate — *[Illegal, Unreported and Unregulated]* IUU yakalama belgesi.

→ *The IUU catch certificate validates legal origin.*
→ *Without an IUU catch certificate, import is refused.*

Exporters' union — İhracatçı birliği.

→ *Exporters must register with the relevant union.*
→ *The union issues export documents and statistics.*

TİM (Turkish Exporters' Assembly) — Türkiye İhracatçılar Meclisi.

→ *TİM publishes monthly export figures.*
→ *TİM coordinates sector-level unions.*

Commercial counsellorship — Ticaret müşavirliği.

→ *Commercial counsellorships support exporters abroad.*
→ *The Paris commercial counsellorship arranged buyer meetings.*

Trade fair — Ticaret fuarı.

→ *The Brussels Seafood Expo is the largest trade fair.*
→ *Trade fairs open new export channels.*

Catch certificate — Av sertifikası.

→ *The exporting country's competent authority must validate the catch certificate before the consignment leaves the port.*
→ *Digital catch certificates are expected to replace paper-based systems in the near future.*

Electronic trade documentation (e-Cert) — Elektronik ticaret belgelendirmesi.

→ *New Zealand and Australia already use electronic trade documentation systems to transmit veterinary certificates digitally.*

→ *The e-Cert system reduces processing time at the border from days to hours.*

TRACES (Trade Control and Expert System) — TRACES sistemi (AB ticaret kontrol ve uzman sistemi).

→ *All consignments of animal-origin products entering the EU must be pre-notified through TRACES.*

→ *All pre-notifications in TRACES must be completed at least one working day before the consignment arrives.*

Common Health Entry Document (CHED) — Ortak sağlık giriş belgesi.

→ *Importers must submit a Common Health Entry Document in TRACES before the goods arrive at the border control post.*

→ *A CHED-P is required for products of animal origin, while a CHED-D covers other food products.*

Border Control Post (BCP) — Sınır kontrol noktası.

→ *Fishery products from third countries may only enter the EU through a designated Border Control Post.*

→ *Physical checks at the BCP include temperature verification, sensory assessment, and laboratory sampling.*

Tariff-rate quota (TRQ) — Tarife oranı kotası.

→ *Turkey benefits from a tariff-rate quota for certain fishery products under the Customs Union framework.*

→ *Exporters must apply for a TRQ allocation certificate before shipping goods under preferential terms.*

Catch area designation — Avlanma alanı tanımlaması.

→ *EU labelling rules require the catch area designation using FAO major fishing area names and numbers.*

→ *FAO Area 37 covers the Mediterranean and Black Sea and must appear on labels of fish caught in this region.*

Production method (wild-caught / farmed) — Üretim yöntemi (doğal avcılık / yetiştiricilik).

→ *Retailers must clearly indicate the production method on the label so consumers can distinguish wild-caught from farmed fish.*

→ *Mislabelling the production method is considered a violation of EU consumer information regulations.*

Scientific name disclosure — Bilimsel ad bildirimi.

→ *In the EU, the scientific name must appear alongside the commercial name on all pre-packed fishery products.*

→ *Adding the scientific name helps prevent species substitution fraud in the supply chain.*

Country of origin marking — Menşe ülke işaretlemesi.

→ *Country of origin marking must reflect where the product was caught, not merely where it was processed.*

→ *For farmed fish, the country of origin is the country where the final rearing stage took place.*

Lot number / batch code — Parti numarası / seri kodu.

→ *Each package must carry a lot number to enable targeted recall if a food safety issue arises.*

→ *Automated printing systems assign a unique lot number to each production batch on the packing line.*

Species substitution — Tür ikamesi (tür sahteciliği).

→ *DNA barcoding has become a primary tool for detecting species substitution in processed fish products.*

→ *Cheaper species such as pangasius are sometimes fraudulently substituted for more expensive sole or cod.*

Mislabelling — Yanlış etiketleme.

→ *Studies have revealed mislabelling rates exceeding 30 % in certain retail fish markets worldwide.*

→ *Routine DNA testing programmes have significantly reduced mislabelling rates in major retail chains.*

Chain of custody — Gözetim zinciri (belge izlenebilirlik zinciri).

→ *MSC certification requires an unbroken chain of custody from the fishing vessel to the final point of sale.*

→ *Every handler in the chain of custody must hold a valid MSC certificate to use the ecolabel.*

Third-country approved establishment list — Üçüncü ülke onaylı tesis listesi.

→ *Only facilities on the EU's approved establishment list are permitted to export fishery products to the Union.*

→ *Facilities must pass an EU inspection before being added to the third-country approved establishment list.*

GFSI benchmarking — GFSI kıyaslama (küresel gıda güvenliği girişimi).

→ *Major retailers increasingly require suppliers to hold a GFSI-benchmarked certification such as BRC or IFS.*

→ *GFSI-benchmarked schemes are recognised by most major global retailers as meeting their food safety requirements.*

Unannounced audit — Habersiz denetim.

→ *Under BRC Food Safety Issue 9, at least one unannounced audit is required within the three-year certification cycle.*

→ *The unannounced audit found no critical non-conformities, and the facility retained its BRC AA grade.*

Corrective action request (CAR) — Düzeltici faaliyet talebi.

→ *The auditor issued a corrective action request after identifying a gap in the facility's allergen management procedure.*

→ *All corrective action requests must be closed with documented evidence within 28 calendar days.*

Blockchain traceability — Blok zinciri tabanlı izlenebilirlik.

→ *Blockchain traceability allows consumers to scan a QR code and verify the entire supply chain of a tuna fillet.*

→ *Several pilot projects have demonstrated that blockchain traceability can reduce fraud in the tuna supply chain.*

Non-tariff barrier (NTB) — Tarife dışı engel.

> → *Overly stringent testing requirements at the border can function as a non-tariff barrier to market access.*
> → *Harmonising laboratory testing methods across countries would help eliminate unnecessary non-tariff barriers.*

13. Balıkçılık Gemiciliği & Av Araçları / Fishing Vessels & Gear

Denizde av, karada işlemenin ilk halkasıdır. Trol teknelerinden gırgır ağlarına, sonar cihazlarından güverte donanımına — bu bölüm denizcilik ve avlanma terminolojisini kapsar.

Fishing vessel — Balıkçı gemisi.

> → *Fishing vessels must carry a vessel monitoring system.*
> → *Fishing vessel logbooks record daily catch.*

Trawler — Trol teknesi.

> → *Trawlers drag large nets across the seabed.*
> → *Modern trawlers are equipped with sonar and fish finders.*

Purse seiner — Gırgır teknesi.

> → *Purse seiners encircle schools of pelagic fish.*
> → *Purse seiner catches dominate anchovy landings.*

Longliner — Paragat teknesi.

> → *Longliners deploy baited hooks on long lines.*
> → *Longliner bycatch is monitored for sea turtles.*

Gillnetter — Uzatma ağı teknesi.

> → *Gillnetters are widely used in small-scale fisheries.*
> → *Gillnetters operate in coastal waters.*

Fishing gear — Av aracı.

> → *Fishing gear selectivity reduces bycatch.*
> → *Fishing gear is inspected at the port.*

Trawl net — Trol ağı.

> → *Trawl nets vary by target species.*
> → *Bottom trawl nets damage benthic habitats.*

Purse seine — Çevirme ağı; gırgır.

> → *Purse seines are closed from below like a drawstring bag.*
> → *Purse seine mesh size affects catch composition.*

Gillnet — Uzatma ağı.

> → *Gillnets entangle fish by the gills.*
> → *Gillnet mesh size is regulated by species.*

Longline — Paragat.

→ *Longlines stretch for kilometres with hundreds of hooks.*
→ *Longline fishing targets tuna and swordfish.*

Fish trap — Dalyan; tuzak.

→ *Fish traps guide fish into holding chambers.*
→ *Traditional fish traps are still used in lagoons.*

Pot — Sepet tuzağı.

→ *Pots are baited traps for crab and lobster.*
→ *Pot fisheries have low bycatch rates.*

Mesh size — Göz açıklığı.

→ *Minimum mesh size protects juvenile fish.*
→ *Mesh size is measured with a calibrated gauge.*

Sonar — Sonar.

→ *Sonar locates fish schools beneath the vessel.*
→ *Multibeam sonar maps the seabed structure.*

Vessel Monitoring System (VMS) — Gemi izleme sistemi.

→ *VMS transmits position data every two hours.*
→ *VMS data support fisheries control.*

Logbook — Av günlüğü.

→ *The logbook records catch, effort and fishing area.*
→ *Logbook entries are verified at landing.*

Landing port — Çıkış limanı; boşaltma limanı.

→ *Every fishing vessel is assigned a landing port.*
→ *Landing ports host first-sale auctions.*

Auction hall — Müzayede (mezat) salonu.

→ *Fresh fish are sold in auction halls.*
→ *Auction halls set daily reference prices.*

Catch per unit effort (CPUE) — Birim çabaya düşen av.

→ *CPUE is a stock-status indicator.*
→ *Declining CPUE may signal overfishing.*

Skipper — Reis; kaptan.

→ *The skipper commands the fishing vessel.*
→ *The skipper signs the logbook entries.*

Deckhand — Güverte tayfası.

→ *Deckhands handle nets and sorting.*
→ *Deckhand safety requires non-slip footwear.*

Live well — Canlı muhafaza tankı (teknede).

→ *Live wells keep fish alive until landing.*
→ *Live wells are oxygenated continuously.*

Onboard freezing — Teknede (gemide) dondurma.

→ *Onboard freezing preserves quality at sea.*
→ *Large trawlers include onboard freezing tunnels.*

Purse seine — Gırgır ağı.

→ *Purse seining is the dominant method for catching schooling pelagic species such as anchovy and sardine.*
→ *Turkish purse seiners target anchovy and sardine stocks in the Black Sea during the winter season.*

Longline — Paragat; uzun olta takımı.

→ *Pelagic longline fisheries targeting tuna must adopt circle hooks to reduce sea turtle mortality.*
→ *Circle hooks on longlines reduce gut-hooking and improve the post-release survival of non-target species.*

Gillnet — Fanyalı ağ; solungaç ağı.

→ *Drifting gillnets exceeding 2.5 km in length have been banned by the United Nations since 1992.*
→ *Monofilament gillnets are more efficient but also less selective than multifilament nets.*

Pot / Trap fishery — Sepet / tuzak avcılığı.

→ *Pot fisheries for crab and lobster are considered low-impact compared to bottom trawling.*
→ *Escape panels in pots allow undersized crabs to exit, improving the selectivity of trap fisheries.*

Fish Aggregating Device (FAD) — Balık toplama düzeneği.

→ *Drifting FADs attract juvenile tuna along with target-size fish, raising concerns about long-term stock health.*
→ *Biodegradable FADs are being developed to reduce the marine debris caused by conventional designs.*

Bycatch Reduction Device (BRD) — Hedef dışı av azaltma düzeneği.

→ *Shrimp trawlers are required to install bycatch reduction devices to protect juvenile fish.*
→ *Testing showed that the new BRD design reduced juvenile fish bycatch by 40 % without affecting shrimp catch.*

Turtle Excluder Device (TED) — Kaplumbağa kaçış düzeneği.

→ *The turtle excluder device allows sea turtles to escape from shrimp nets without significant catch loss.*
→ *Many countries now require TEDs as a condition for accessing shrimp export markets.*

Gear selectivity — Av aracı seçiciliği.

→ *Increasing mesh size is one of the most effective ways to improve gear selectivity for target species.*
→ *Square-mesh panels in the codend significantly improve gear selectivity for roundfish species.*

Ghost fishing — Hayalet avcılık.

→ *Abandoned gillnets continue ghost fishing for years, killing marine organisms with no commercial benefit.*
→ *International clean-up programmes recover thousands of tonnes of ghost fishing gear from the oceans each year.*

Maximum Sustainable Yield (MSY) — Azami sürdürülebilir verim.

→ *The EU Common Fisheries Policy requires member states to fish at or below Maximum Sustainable Yield levels.*

→ *Fishing at MSY ensures that stocks can replenish themselves and remain productive over the long term.*

Spawning Stock Biomass (SSB) — Yumurtlayan stok biyokütlesi.

→ *When the spawning stock biomass falls below the reference point, fishing pressure must be reduced immediately.*

→ *Annual acoustic surveys are conducted to estimate spawning stock biomass for key commercial species.*

Catch Per Unit Effort (CPUE) — Birim efor başına av miktarı.

→ *A declining CPUE over consecutive years is often the first indicator of overfishing.*

→ *Standardised CPUE data are used as relative abundance indices in stock assessment models.*

Precautionary approach — İhtiyat yaklaşımı.

→ *Under the precautionary approach, fishing activity should be restricted when scientific data are uncertain.*

→ *The precautionary approach requires management action even when scientific data are incomplete.*

Ecosystem-Based Fisheries Management (EBFM) — Ekosistem temelli balıkçılık yönetimi.

→ *Ecosystem-based management considers the interactions among species rather than managing each stock in isolation.*

→ *EBFM considers the effects of fishing on habitat, food webs, and non-target species.*

Trophic level — Trofik düzey; besin zinciri basamağı.

→ *Fishing down the trophic level occurs when top predators are depleted and fleets shift to smaller forage species.*

→ *Jellyfish blooms in overfished seas indicate a shift towards lower trophic level dominance.*

Habitat degradation — Habitat bozulması; yaşam alanı tahribatı.

→ *Bottom trawling causes significant habitat degradation on continental shelves, destroying benthic communities.*

→ *Seagrass restoration projects aim to reverse decades of habitat degradation in coastal zones.*

Invasive species — İstilacı tür.

→ *The Lessepsian migration through the Suez Canal has introduced numerous invasive species into the Eastern Mediterranean.*

→ *The silver-cheeked toadfish is a toxic invasive species that now threatens fisheries in the Eastern Mediterranean.*

Marine Protected Area (MPA) — Deniz koruma alanı.

→ *Turkey has designated several marine protected areas along the Mediterranean coast to safeguard biodiversity.*

→ *Well-enforced MPAs have been shown to increase fish biomass and diversity within their boundaries.*

Ocean acidification — Okyanus asitlenmesi.

→ *Ocean acidification threatens shellfish aquaculture by impairing the formation of calcium carbonate shells.*

→ *Long-term monitoring of ocean acidification is essential for predicting its impact on commercial shellfish stocks.*

Range shift — Dağılım alanı kayması.

→ *Warming sea temperatures are causing poleward range shifts in commercially important fish stocks.*
→ *Atlantic mackerel has shown a notable northward range shift over the past two decades.*

Thermal tolerance — Sıcaklık toleransı.

→ *Species with narrow thermal tolerance ranges are the most vulnerable to climate-driven habitat changes.*
→ *Laboratory experiments determine the thermal tolerance limits of aquaculture candidate species.*

Unmanned Aerial Vehicle (UAV) / Drone survey — İnsansız hava aracı (İHA); drone ile araştırma.

→ *Drone surveys equipped with multispectral cameras are used to monitor coastal aquaculture site conditions.*
→ *Drone surveys provide high-resolution aerial imagery for mapping coastal habitats and monitoring fish aggregations.*

Autonomous Underwater Vehicle (AUV) — Otonom sualtı aracı.

→ *AUVs inspect net pen integrity and collect environmental data beneath offshore fish cages.*
→ *The AUV completed a 12-hour survey of the benthic environment beneath the offshore salmon farm.*

Remote sensing — Uzaktan algılama.

→ *Satellite-based remote sensing of chlorophyll-a concentration helps predict phytoplankton blooms near shellfish farms.*
→ *Remote sensing data are integrated with GIS platforms for spatial planning of aquaculture zones.*

14. Laboratuvar & Güvenlik / Laboratory & Safety

Laboratuvar, her mühendislik öğrencisinin eğitiminin ayrılmaz parçasıdır. Kişisel koruyucu ekipmandan kimyasal güvenliğe, bu bölüm laboratuvarda hayatta kalmanın İngilizce'sini öğretir.

Laboratory — Laboratuvar.

→ *The quality laboratory runs microbial tests daily.*
→ *Laboratory records are archived for five years.*

Fume hood — Çeker ocak.

→ *Acid digestion is performed inside a fume hood.*
→ *Fume hood airflow is verified monthly.*

Pipette — Pipet.

→ *Calibrated pipettes ensure accurate dilutions.*
→ *The pipette is rinsed three times with the sample.*

Volumetric flask — Balon joje.

→ *Standard solutions are prepared in volumetric flasks.*
→ *Volumetric flasks are filled to the calibration mark.*

Autoclave — Otoklav.

→ *The autoclave sterilises media at 121 °C.*
→ *Autoclave cycles are verified with biological indicators.*

Incubator — İnkübatör.

→ *Plates are incubated at 37 °C for 24 hours.*
→ *Incubator temperature is logged continuously.*

Personal protective equipment (PPE) — Kişisel koruyucu donanım.

→ *PPE includes lab coat, gloves and safety goggles.*
→ *PPE is mandatory in the chemistry lab.*

Material safety data sheet (MSDS/SDS) — Malzeme güvenlik bilgi formu.

→ *SDS documents are kept near each chemical.*
→ *SDS lists hazards and emergency procedures.*

Biohazard — Biyolojik tehlike.

→ *Biohazard symbols mark infectious material.*
→ *Biohazard waste is autoclaved before disposal.*

Chemical waste — Kimyasal atık.

→ *Chemical waste is segregated by category.*
→ *Chemical waste is collected by licensed firms.*

Risk assessment — Risk değerlendirmesi.

→ *Risk assessment precedes any new lab procedure.*
→ *Risk assessment outputs are reviewed annually.*

Calibration certificate — Kalibrasyon sertifikası.

→ *Each balance has a calibration certificate.*
→ *Calibration certificates are traceable to SI units.*

Standard operating procedure (SOP) — Standart çalışma prosedürü.

→ *SOPs ensure reproducible results.*
→ *New staff are trained on each SOP.*

Accreditation — Akreditasyon.

→ *The lab is accredited to ISO/IEC 17025.*
→ *Accreditation covers specific test methods.*

Proficiency test — Yeterlilik testi.

→ *Proficiency tests validate laboratory performance.*
→ *Our lab passed the latest proficiency test for histamine.*

15. Sayılar, Ölçü Birimleri, Formüller / Numbers, Units, Formulas

Bilimsel iletişimde sayılar ve birimlerin doğru ifade edilmesi kritiktir. ppm'den CFU'ya, yüzde hesaplarından regresyon denklemlerine — bu bölüm sayısal okuryazarlığın İngilizce karşılığıdır.

Tonne (metric ton) — Ton (metrik ton).

- → *Annual anchovy landings reached 280,000 tonnes.*
- → *One tonne equals 1,000 kilograms.*

Kilogram (kg) — Kilogram.

- → *The fish weighed 2.4 kilograms.*
- → *Export prices are quoted per kilogram.*

Gram (g) — Gram.

- → *The fillet sample was 10 grams.*
- → *Histamine limits are expressed in milligrams per 100 grams.*

Millilitre (mL) — Mililitre.

- → *Pipette 10 mL of the diluent.*
- → *The reagent bottle holds 500 mL.*

Degrees Celsius (°C) — Santigrat derece.

- → *Frozen storage should be below −18 °C.*
- → *Chill water is maintained at 0.5 °C.*

pH — pH (asitlik derecesi).

- → *Post-mortem muscle pH drops to about 6.2.*
- → *pH is measured with a calibrated electrode.*

Water activity (aw) — Su aktivitesi.

- → *Water activity below 0.90 inhibits most pathogens.*
- → *Dried fish has water activity around 0.75.*

Colony-forming unit (CFU) — Koloni oluşturan birim.

- → *TVC is reported as log CFU per gram.*
- → *CFU counts are obtained after incubation.*

Parts per million (ppm) — Milyonda bir.

- → *Mercury was below 1 ppm in tuna samples.*
- → *Residue limits are often expressed in ppm.*

Nautical mile — Deniz mili.

- → *The EEZ extends 200 nautical miles offshore.*
- → *One nautical mile equals 1,852 metres.*

Knot — Knot; deniz mili/saat.

- → *The trawler fishes at 3 knots.*

→ *Wind speed was 15 knots at the fishing ground.*

Percentage (%) — Yüzde.

→ *Moisture content reached 78%.*
→ *Export growth was 12% year-on-year.*

Mean ± standard deviation — Ortalama ± standart sapma.

→ *Fat content was reported as 12.3 ± 1.1%.*
→ *Results are shown as mean ± standard deviation (n = 6).*

Coefficient of determination (R^2) — Belirleme katsayısı.

→ *The calibration had an R^2 of 0.96.*
→ *R^2 indicates goodness of fit.*

Standard error of prediction (SEP) — Tahminin standart hatası.

→ *SEP for fat prediction was 0.42%.*
→ *Lower SEP means better predictive accuracy.*

16. Akademik Yazım Kalıpları / Academic Writing Phrases

Bir makale yazarken veya sunum hazırlarken kullanabileceğiniz hazır akademik kalıplar. Giriş cümleleri, karşılaştırma ifadeleri, sonuç bağlaçları — akademik İngilizce'nin yapı taşları burada.

Objective of the study — Çalışmanın amacı.

→ *The objective of the study was to evaluate shelf life under MAP.*
→ *The objective of the study is clearly stated in the abstract.*

Materials and methods — Materyal ve yöntem.

→ *Materials and methods are described in Section 2.*
→ *The materials and methods section should allow full reproducibility.*

Results and discussion — Bulgular ve tartışma.

→ *Results and discussion are combined in this paper.*
→ *Results and discussion highlight practical implications.*

In accordance with — -e uygun olarak.

→ *Analyses were performed in accordance with AOAC methods.*
→ *In accordance with EU regulation, samples were stored at 4 °C.*

According to — -e göre.

→ *According to FAO, aquaculture now outpaces capture fisheries.*
→ *According to our findings, TVB-N increased after day seven.*

Figure 1 shows — Şekil 1 … göstermektedir.

→ *Figure 1 shows the change in peroxide value during storage.*
→ *Figure 1 shows PCA score plots for the three treatments.*

Table 1 presents — Tablo 1 … sunmaktadır.

→ *Table 1 presents proximate composition of the fillets.*
→ *Table 1 presents sensory scores for all panels.*

Consistent with previous studies — Önceki çalışmalarla uyumlu olarak.

→ *Consistent with previous studies, TMA rose sharply after day five.*
→ *Our results are consistent with previous studies on sea bass.*

Contrary to — -in aksine.

→ *Contrary to Smith et al. (2018), we observed no colour change.*
→ *Contrary to expectations, the control group spoiled first.*

The findings suggest that — Bulgular … düşündürmektedir.

→ *The findings suggest that MAP extends shelf life by four days.*
→ *The findings suggest a strong correlation with fat content.*

Further research is needed — İleri araştırmalar gereklidir.

→ *Further research is needed to validate the model on other species.*
→ *Further research is needed on consumer acceptance.*

The main limitation of this study — Bu çalışmanın temel sınırlılığı.

→ *The main limitation of this study is the small sample size.*
→ *The main limitation of this study was the short storage period.*

Funding — Finansman.

→ *Funding was provided by TÜBİTAK under project 1001.*
→ *The funding source had no role in the study design.*

Conflict of interest — Çıkar çatışması.

→ *The authors declare no conflict of interest.*
→ *Any potential conflict of interest must be disclosed.*

Informed consent — Bilgilendirilmiş onam.

→ *Informed consent was obtained from all participants.*
→ *Ethical approval and informed consent were documented.*

Peer review — Hakem değerlendirmesi.

→ *The manuscript entered peer review in March.*
→ *Peer review reports guided the revision.*

Manuscript — Makale taslağı.

→ *The manuscript was submitted to a Q1 journal.*
→ *The manuscript is currently under revision.*

Corresponding author — Sorumlu yazar.

→ *The corresponding author handles communication with the editor.*
→ *Corresponding author details appear on the title page.*

Keywords — Anahtar sözcükler.

→ *Keywords improve article discoverability.*
→ *Select keywords that are not already in the title.*

Abstract — Özet.

- → *The abstract must fit within 250 words.*
- → *The abstract highlights objective, methods, results and conclusion.*

17. İş İngilizcesi — Toplantı, E-posta, Müzakere / Business English

Sektörde sadece teknik değil, profesyonel iletişim becerisi de gerekir. E-posta yazımından toplantı yönetimine, müzakere tekniklerinden teklif hazırlamaya — iş İngilizcesi'nin temel kalıpları.

Schedule a meeting — Toplantı ayarlamak.

- → *Can we schedule a meeting next week to discuss the contract?*
- → *I would like to schedule a meeting with your quality manager.*

Follow up — Takip etmek.

- → *I am writing to follow up on our conversation at the trade fair.*
- → *Please follow up with the buyer by Friday.*

Please find attached — Ekte bulabilirsiniz.

- → *Please find attached our product catalogue.*
- → *Please find attached the latest lab results.*

At your earliest convenience — En kısa sürede.

- → *Please confirm the order at your earliest convenience.*
- → *We will respond at your earliest convenience.*

Looking forward to — -i dört gözle bekliyorum.

- → *We are looking forward to your feedback.*
- → *Looking forward to meeting you in Brussels.*

Out of office — Ofis dışında.

- → *I will be out of office from 10 to 15 May.*
- → *For urgent matters during out-of-office, contact my colleague.*

Kind regards — Saygılarımla (e-posta kapanışı).

- → *Kind regards, Dr. Zayde Ayvaz.*
- → *Closing with "Kind regards" is standard in business email.*

Minutes of the meeting — Toplantı tutanağı.

- → *Minutes of the meeting will be shared tomorrow.*
- → *Please review the minutes of the meeting before Friday.*

Action items — Yapılacaklar; aksiyon maddeleri.

- → *Action items are listed at the end of the minutes.*
- → *Each action item has an owner and due date.*

Agenda — Gündem.

- → *The agenda was circulated in advance.*

→ *Let's stick to the agenda to finish on time.*

Stakeholder meeting — Paydaş toplantısı.

→ *The stakeholder meeting will be held online.*
→ *Stakeholder meetings gather producers and regulators.*

Price quotation — Fiyat teklifi.

→ *Please send us a price quotation for 20 tonnes of frozen hake.*
→ *The price quotation is valid for 30 days.*

Request for proposal (RFP) — Teklif çağrısı.

→ *We issued an RFP for cold storage services.*
→ *The RFP deadline is next Monday.*

Memorandum of understanding (MoU) — Mutabakat zaptı.

→ *The universities signed an MoU on joint research.*
→ *An MoU is not legally binding.*

Non-disclosure agreement (NDA) — Gizlilik sözleşmesi.

→ *Please sign the NDA before we share technical details.*
→ *NDAs protect proprietary information.*

Negotiate — Müzakere etmek.

→ *We negotiated better payment terms.*
→ *Price and delivery are the most common items to negotiate.*

Counteroffer — Karşı teklif.

→ *Our counteroffer includes a 2% discount for larger volumes.*
→ *The counteroffer was accepted after two rounds.*

Deadline — Son teslim tarihi.

→ *The production deadline is next Tuesday.*
→ *Missing the deadline triggers a penalty clause.*

Lead time — Teslim süresi.

→ *Lead time for frozen tuna is four weeks.*
→ *Reducing lead time improves customer satisfaction.*

Payment terms — Ödeme koşulları.

→ *Payment terms are net 60 days after invoice.*
→ *Payment terms depend on buyer creditworthiness.*

18. Phrasal Verbs — Seafood & Ticaret Bağlamında

İngilizce'nin en zorlu yanlarından biri phrasal verb'lerdir. "Carry out", "break down", "scale up" — bu bölüm, su ürünleri ve ticaret bağlamında en sık kullanılan öbek fiilleri bir araya getirir.

Break down — 1) bozulmak, arızalanmak 2) (bileşenlerine) ayırmak.

→ *The freezer broke down during the night shift.*
→ *Let's break down the costs line by line.*

Carry out — Yürütmek, gerçekleştirmek.

→ *We carry out HACCP verification every quarter.*
→ *The lab carries out microbial analyses on each batch.*

Set up — Kurmak, oluşturmak.

→ *They plan to set up a new processing plant in İzmir.*
→ *We set up a sensory panel of ten trained assessors.*

Scale up — Büyütmek, ölçeği artırmak.

→ *We will scale up production after pilot trials.*
→ *Scaling up RAS farms requires careful water management.*

Scale down — Küçültmek, azaltmak.

→ *Management decided to scale down operations in winter.*
→ *We scaled down the experiment due to limited samples.*

Roll out — Pazara sürmek, devreye almak.

→ *The new smoked salmon line will be rolled out in Q3.*
→ *Retailers rolled out the promotion nationwide.*

Phase out — Kademeli olarak kaldırmak.

→ *The company will phase out plastic trays by 2027.*
→ *Antibiotic use is being phased out in modern salmon farming.*

Follow up on — Bir konuyu takip etmek.

→ *Please follow up on the pending customs documents.*
→ *I'll follow up on the sample results tomorrow.*

Look into — İncelemek, araştırmak.

→ *The QA team will look into the customer complaint.*
→ *Let's look into cheaper cryoprotectant alternatives.*

Come up with — Ortaya çıkarmak, üretmek (fikir).

→ *R&D came up with a novel edible coating.*
→ *We need to come up with a solution by Friday.*

Work out — Çözmek, hesaplamak.

→ *We worked out the FCR for the grow-out phase.*
→ *Let's work out the total customs cost.*

Rule out — Elemek, reddetmek.

→ *Lab tests ruled out Listeria contamination.*
→ *We cannot rule out temperature abuse during transport.*

Point out — Dikkat çekmek, belirtmek.

→ *The auditor pointed out several labelling errors.*
→ *I'd like to point out that shelf life depends on temperature.*

Bring up — Gündeme getirmek.

→ *The manager brought up the new quota regulation.*
→ *Please bring up your concerns at the safety meeting.*

Turn down — Reddetmek.

→ *The buyer turned down our initial offer.*
→ *We turned down the contract due to unfavourable terms.*

Put forward — Önermek, sunmak.

→ *The committee put forward a new sampling plan.*
→ *She put forward a proposal to reduce waste.*

Go over — Gözden geçirmek.

→ *Let's go over the audit checklist together.*
→ *Please go over the report before submission.*

Take over — Devralmak.

→ *A Norwegian company took over the local hatchery.*
→ *The new manager will take over next month.*

Hand in — Teslim etmek.

→ *Please hand in your inspection reports by 5 p.m.*
→ *Interns hand in their logbooks weekly.*

Hand over — Devretmek, teslim etmek.

→ *The outgoing manager handed over the project files.*
→ *Goods are handed over at the port of loading.*

Sort out — Halletmek, çözmek.

→ *We need to sort out the customs clearance delay.*
→ *IT will sort out the traceability software issue.*

Write up — Yazıp tamamlamak.

→ *Please write up the validation report this week.*
→ *She wrote up the thesis chapter in three days.*

Send off — Göndermek, sevk etmek.

→ *We sent off the samples to the accredited lab.*
→ *The container was sent off yesterday evening.*

Check in — (Gemi/ürün) kayıt yaptırmak, girişini yapmak.

→ *All vessels check in at the port office.*
→ *Shipments check in at the cold storage on arrival.*

Check out — Kontrol etmek; çıkış yapmak.

→ *Could you check out this new MAP film supplier?*
→ *Please check out at the customs desk before leaving.*

Look out for — Dikkat etmek, tetikte olmak.

→ *Look out for temperature deviations during transport.*

→ *Look out for Anisakis larvae during visual inspection.*

Run out of — Tükenmek, bitirmek.

→ *We ran out of ice during peak season.*
→ *The plant ran out of packaging material.*

Cut back on — Azaltmak.

→ *The industry aims to cut back on fishmeal use.*
→ *We cut back on energy consumption by 18%.*

Keep up with — Ayak uydurmak.

→ *Producers must keep up with changing regulations.*
→ *It is hard to keep up with global market trends.*

Catch up on — Geriden gelerek tamamlamak.

→ *I need to catch up on last week's lab reports.*
→ *Let's catch up on the new publications in this field.*

Fill in — (Formu) doldurmak.

→ *Please fill in the CHED fields before submission.*
→ *The supplier filled in the traceability form.*

Fill out — (Belgeyi) doldurmak.

→ *Exporters fill out the customs declaration electronically.*
→ *Fill out the QA checklist at the end of the shift.*

Line up — Sıralamak, ayarlamak.

→ *We lined up three buyers for the Brussels fair.*
→ *The products are lined up in the IQF tunnel.*

Pass on — Aktarmak, iletmek.

→ *Please pass on the results to the production manager.*
→ *The auditor passed on several recommendations.*

Deal with — Başa çıkmak, ele almak.

→ *Customs will deal with the documentation issue.*
→ *We deal with spoilage through strict cold chain control.*

Draw up — Hazırlamak (belge, plan).

→ *The lawyer drew up the distribution contract.*
→ *We drew up a corrective action plan.*

Back up — Desteklemek; yedeklemek.

→ *Claims must be backed up by laboratory evidence.*
→ *Please back up the data logger files daily.*

Stand by — Bağlı kalmak; hazır beklemek.

→ *We stand by our quality commitment.*
→ *The auditor is on stand-by for the re-check.*

Sign off — Onaylamak, imzalamak.

→ *The QA manager signed off the batch release.*
→ *The minister signed off the new regulation.*

Wrap up — Sonuçlandırmak, bitirmek.

→ *Let's wrap up the meeting with the action list.*
→ *We wrapped up the harvest campaign ahead of schedule.*

19. Sıkça Kullanılan Kısaltmalar / Common Abbreviations

HACCP, IUU, MAP, NIR, TAC, MSC... Su ürünleri dünyası kısaltmalarla doludur. Bu referans listesi, her kısaltmanın açılımını ve Türkçe karşılığını sunar.

HACCP — Hazard Analysis and Critical Control Points — Tehlike Analizi ve Kritik Kontrol Noktaları.

CCP — Critical Control Point — Kritik Kontrol Noktası.

GMP — Good Manufacturing Practice — İyi Üretim Uygulamaları.

SSOP — Sanitation Standard Operating Procedures — Sanitasyon Standart İşletim Prosedürleri.

BRC — British Retail Consortium — İngiliz Perakende Konsorsiyumu.

IFS — International Featured Standards — Uluslararası Öne Çıkan Standartlar.

ISO — International Organization for Standardization — Uluslararası Standardizasyon Örgütü.

FSMA — Food Safety Modernization Act — Gıda Güvenliği Modernizasyon Yasası (ABD).

NIR — Near-Infrared Spectroscopy — Yakın Kızılötesi Spektroskopi.

TMA — Trimethylamine — Trimetilamin.

TVB-N — Total Volatile Basic Nitrogen — Toplam Uçucu Bazik Azot.

TBA — Thiobarbituric Acid — Tiyobarbitürik Asit.

PV — Peroxide Value — Peroksit Değeri.

FFA — Free Fatty Acid — Serbest Yağ Asidi.

CFU — Colony Forming Unit — Koloni Oluşturan Birim.

MPN — Most Probable Number — En Muhtemel Sayı.

LOD — Limit of Detection — Tespit Sınırı.

LOQ — Limit of Quantification — Tayin Sınırı.

MRL — Maximum Residue Limit — Maksimum Kalıntı Limiti.

aw — Water Activity — Su Aktivitesi.

pH — Potential of Hydrogen — Hidrojen Potansiyeli.

AOAC — Association of Official Analytical Chemists — Resmi Analitik Kimyagerler Birliği.

DHA — Docosahexaenoic Acid — Dokosaheksaenoik Asit (omega-3).

EPA — Eicosapentaenoic Acid — Eikosapentaenoik Asit (omega-3).

PUFA — Polyunsaturated Fatty Acid — Çoklu Doymamış Yağ Asidi.

MAP — Modified Atmosphere Packaging — Modifiye Atmosfer Paketleme.

IQF — Individually Quick Frozen — Bireysel Hızlı Dondurma.

HPP — High Pressure Processing — Yüksek Basınçla İşleme.

BOD — Biochemical Oxygen Demand — Biyokimyasal Oksijen İhtiyacı.

COD — Chemical Oxygen Demand — Kimyasal Oksijen İhtiyacı.

DO — Dissolved Oxygen — Çözünmüş Oksijen.

RAS — Recirculating Aquaculture System — Kapalı Devre Yetiştirme Sistemi.

FCR — Feed Conversion Ratio — Yem Dönüşüm Oranı.

SGR — Specific Growth Rate — Spesifik Büyüme Oranı.

FIFO — Fish In – Fish Out — Balık Girdi – Balık Çıktı (oranı).

IMTA — Integrated Multi-Trophic Aquaculture — Entegre Çok Trofik Akuakültür.

TAC — Total Allowable Catch — Toplam İzin Verilen Av Miktarı.

MSC — Marine Stewardship Council — Deniz Yönetim Konseyi.

ASC — Aquaculture Stewardship Council — Akuakültür Yönetim Konseyi.

IUU — Illegal, Unreported and Unregulated — Yasadışı, Bildirilmemiş ve Düzenlenmemiş.

EEZ — Exclusive Economic Zone — Münhasır Ekonomik Bölge.

RFMO — Regional Fisheries Management Organization — Bölgesel Balıkçılık Yönetim Örgütü.

VMS — Vessel Monitoring System — Gemi İzleme Sistemi.

MPA — Marine Protected Area — Deniz Koruma Alanı.

MSY — Maximum Sustainable Yield — Azami Sürdürülebilir Verim.

CPUE — Catch Per Unit Effort — Birim Efor Başına Av Miktarı.

FAO — Food and Agriculture Organization — BM Gıda ve Tarım Örgütü.

WHO — World Health Organization — Dünya Sağlık Örgütü.

WTO — World Trade Organization — Dünya Ticaret Örgütü.

EFSA — European Food Safety Authority — Avrupa Gıda Güvenliği Otoritesi.

FDA — Food and Drug Administration — ABD Gıda ve İlaç Dairesi.

EU — European Union — Avrupa Birliği.

SPS — Sanitary and Phytosanitary Measures — Sağlık ve Bitki Sağlığı Önlemleri.

FOB — Free on Board — Gemide Teslim.

CIF — Cost, Insurance and Freight — Mal Bedeli, Sigorta ve Navlun.

L/C — Letter of Credit — Akreditif.

B/L — Bill of Lading — Konşimento.

HS — Harmonized System — Armonize Sistem (gümrük kodu).

RASFF — Rapid Alert System for Food and Feed — Hızlı Uyarı Sistemi.

TRACES — Trade Control and Expert System — AB Ticaret Kontrol Sistemi.

CHED — Common Health Entry Document — Ortak Sağlık Giriş Belgesi.

BCP — Border Control Post — Sınır Kontrol Noktası.

Hazırlayan: Prof. Dr. Zayde Ayvaz — ÇOMÜ Deniz Bilimleri ve Teknolojisi Fakültesi, Su Ürünleri Endüstrisi Mühendisliği Bölümü — 2026.

KISIM II — Seviyeli Okuma Metinleri ve Sınava Hazırlık Soruları

Bu kısım, CEFR A1'den C2'ye 6 seviyede toplam 36 okuma paragrafı ve 108 çoktan seçmeli soru içerir. Her paragraftan önce anahtar kelimeler, sonrasında dil ipuçları ve her seviyenin sonunda cevap anahtarı ile öz değerlendirme yer alır.

A1 — Beginner

Bu seviyede çok kısa ve basit cümleler göreceksiniz. Temel mesleki kelimeler tanıtılır. Amacınız: ana fikri yakalamak ve basit soruları cevaplamak.

🐟 **Bunu Biliyor muydunuz?**
Dünyada her yıl yaklaşık 180 milyon ton su ürünü üretilmektedir — bunun yarısından fazlası akuakültürden gelir!

A1 — Paragraf 1: My Job

📖 **Anahtar Kelimeler (Key Vocabulary)**
- fisheries engineer — su ürünleri mühendisi
- factory — fabrika
- fresh — taze
- ice — buz
- truck — kamyon

I am a fisheries engineer. I work at a fish factory in İzmir. Every day, I check the fish. The fish are fresh. They come from the sea. The workers clean the fish. Then they put the fish in boxes with ice. The boxes go to the cold room. I like my job because I love the sea.

Sorular:

1. Where does the writer work?

A) in a hotel
B) in a fish factory
C) in a hospital
D) on a farm
E) in a school

2. What do the workers do with the fish?

A) They cook the fish.
B) They sell the fish.
C) They clean the fish.

D) They eat the fish.
E) They paint the fish.

3. Why does the writer like the job?

A) because it is easy
B) because it is short
C) because he/she loves the sea
D) because it is near home
E) because it is new

💡 **Dil İpucu: Present Simple Tense**
İngilizce'de günlük alışkanlıkları anlatmak için Present Simple kullanılır: "I work", "She checks", "They clean". 3. tekil şahısta fiil sonuna -s eklenir: he works, she checks.

A1 — Paragraf 2: Fresh Fish

📖 **Anahtar Kelimeler (Key Vocabulary)**
- gills — solungaçlar
- smell — koku
- safe — güvenli
- go bad — bozulmak
- cold — soğuk

Fresh fish is very important. Fresh fish has clear eyes and red gills. It smells like the sea. Old fish has a bad smell. Old fish is not safe. We keep fish cold. We use ice. Ice stops the fish from going bad. A good fisheries engineer knows fresh fish.

Sorular:

1. What colour are the gills of fresh fish?

A) white
B) black
C) red
D) yellow
E) green

2. Why do we use ice?

A) to cook the fish
B) to clean the fish
C) to stop the fish from going bad
D) to sell the fish
E) to paint the fish

3. What is NOT true about old fish?

A) It has a bad smell.
B) It is not safe.
C) It has red gills.
D) It is old.
E) We should not eat it.

💡 **Dil İpucu: "Have/Has" Kullanımı**
"Have" sahiplik bildirir: "Fresh fish has clear eyes." I/you/we/they → have; he/she/it → has. Bu yapıyı tanımlamalarda çok görürsünüz.

A1 — Paragraf 3: At the Market

📖 **Anahtar Kelimeler (Key Vocabulary)**
- market — pazar
- price — fiyat
- sign — tabela
- seller — satıcı
- friendly — cana yakın

There is a fish market near my house. The market opens at six in the morning. People buy fresh fish. There are many fish: sea bass, sea bream, anchovy, and mackerel. The prices are on small signs. The fish are on ice. The sellers are friendly.

Sorular:

1. What time does the market open?
A) at five
B) at six
C) at seven
D) at eight
E) at nine

2. Where are the fish?
A) in the water
B) on shelves
C) on ice
D) in boxes
E) in bags

3. How are the sellers?
A) tired
B) busy
C) angry
D) friendly

E) old

💡 **Dil İpucu: "There is/There are"**
"There is" tekil, "there are" çoğul nesneler için kullanılır: "There is a market", "There are many fish". Bu kalıp yer ve varlık bildirir.

🐟 **Bunu Biliyor muydunuz?**
Bir balığın taze olup olmadığını anlamanın en eski yolu gözlerine bakmaktır. Parlak ve şeffaf gözler = taze balık!

A1 — Paragraf 4: Types of Fish

📖 **Anahtar Kelimeler (Key Vocabulary)**
- river — nehir
- lake — göl
- trout — alabalık
- carp — sazan
- tuna — ton balığı

Fish live in the sea and in rivers. Sea bass and anchovy live in the sea. Trout and carp live in rivers and lakes. Some fish are big. Tuna is a big fish. Some fish are small. Anchovy is a small fish. All fish are good food.

Sorular:

1. Where do trout live?

A) in the desert
B) in the sea
C) in rivers and lakes
D) in the garden
E) in the forest

2. Which fish is small?

A) tuna
B) sea bass
C) anchovy
D) carp
E) trout

3. What do all fish have in common according to the paragraph?

A) They are big.
B) They are small.

C) They are good food.
D) They are cheap.
E) They are red.

💡 **Dil İpucu: "Live in" Yapısı**
Yaşam alanları anlatılırken "live in" kullanılır: "Fish live in the sea." "In" kapalı alan/sınırlı bölge; "on" yüzey anlamı taşır.

A1 — Paragraf 5: The Cold Room

📖 **Anahtar Kelimeler (Key Vocabulary)**
- cold room — soğuk oda
- temperature — sıcaklık
- degree — derece
- thick coat — kalın kaban
- machine — makine

We have a big cold room at the factory. It is very cold inside. The temperature is minus eighteen degrees Celsius. Workers wear thick coats. They move the boxes with a machine. The fish stay in the cold room for many months. Cold keeps the fish safe.

Sorular:

1. What is the temperature in the cold room?
A) +18 °C
B) 0 °C
C) −18 °C
D) +10 °C
E) −5 °C

2. What do workers wear in the cold room?
A) t-shirts
B) shorts
C) thick coats
D) swim suits
E) sandals

3. How long do the fish stay in the cold room?
A) a few minutes
B) one hour
C) one day
D) one week
E) many months

💡 **Dil İpucu: Sıcaklık İfadeleri**

"Minus" eksi, "degrees" derece, "Celsius" Santigrat anlamına gelir. Teknik metinlerde sıcaklık çok sık geçer: "−18 °C" = "minus eighteen degrees Celsius".

A1 — Paragraf 6: A Healthy Meal

📖 **Anahtar Kelimeler (Key Vocabulary)**

- healthy — sağlıklı
- oil — yağ
- heart — kalp
- grilled — ızgara
- fried — kızartılmış

Fish is a healthy meal. Fish has good oil. This oil is good for the heart. Children can eat fish two times a week. Grilled fish is better than fried fish. A small salad and bread with fish is a nice dinner. My family likes fish on Fridays.

Sorular:

1. Why is fish good for you?

A) because it is cheap
B) because it has good oil for the heart
C) because it is small
D) because it is hot
E) because it is sweet

2. How often can children eat fish?

A) every day
B) once a month
C) two times a week
D) never
E) only on holidays

3. Which is better according to the text?

A) fried fish
B) raw fish
C) grilled fish
D) frozen fish
E) salted fish

💡 **Dil İpucu: "Better than" Karşılaştırması**

Karşılaştırma: sıfat + -er + than veya more + sıfat + than. "Grilled fish is better than fried fish." Better, good'un düzensiz karşılaştırma halidir.

A1 — Cevap Anahtarı

A1 — Paragraf 1: My Job

Cevap: B) in a fish factory. Açıklama: Metinde “I work at a fish factory in İzmir.” cümlesi açıkça yazarın iş yerini belirtir. Diğer seçenekler metinde geçmez.

Cevap: C) They clean the fish. Açıklama: “The workers clean the fish.” cümlesi işçilerin görevini net gösterir. Diğer eylemler metinde yoktur.

Cevap: C) because he/she loves the sea. Açıklama: Son cümlede “I like my job because I love the sea.” geçer. “Because” bağlacı sebep bildirir.

A1 — Paragraf 2: Fresh Fish

Cevap: C) red. Açıklama: Metin “Fresh fish has clear eyes and red gills.” diyor. “Gills” = solungaç.

Cevap: C) to stop the fish from going bad. Açıklama: “Ice stops the fish from going bad.” cümlesi buzun görevini açıklar. “Go bad” = bozulmak.

Cevap: C) It has red gills. Açıklama: Metne göre taze balığın solungaçları kırmızıdır; eski balığın değil. “NOT true” ifadesine dikkat.

A1 — Paragraf 3: At the Market

Cevap: B) at six. Açıklama: “The market opens at six in the morning.” Metin saati açıkça veriyor.

Cevap: C) on ice. Açıklama: “The fish are on ice.” Bu A1 seviye “be + on” yapısı.

Cevap: D) friendly. Açıklama: “The sellers are friendly.” Sıfat + isim + be yapısı.

A1 — Paragraf 4: Types of Fish

Cevap: C) in rivers and lakes. Açıklama: “Trout and carp live in rivers and lakes.” cümlesi bu bilgiyi verir.

Cevap: C) anchovy. Açıklama: “Anchovy is a small fish.” cümlesinden. Tuna büyüktür.

Cevap: C) They are good food. Açıklama: Son cümle “All fish are good food.” tüm balıklar için ortak bilgiyi verir.

A1 — Paragraf 5: The Cold Room

Cevap: C) −18 °C. Açıklama: “The temperature is minus eighteen degrees Celsius.” “Minus” = eksi.

Cevap: C) thick coats. Açıklama: “Workers wear thick coats.” Soğukta kalın kaban giyerler.

Cevap: E) many months. Açıklama: “The fish stay in the cold room for many months.” Süre belirtir.

A1 — Paragraf 6: A Healthy Meal

Cevap: B) because it has good oil for the heart. Açıklama: “This oil is good for the heart.” cümlesinden. “Oil” = yağ; kalp sağlığına iyi.

Cevap: C) two times a week. Açıklama: “Children can eat fish two times a week.” sıklık bildirir.

Cevap: C) grilled fish. Açıklama: “Grilled fish is better than fried fish.” karşılaştırma yapar. “Better than” = daha iyi.

✅ A1 Seviye Öz Değerlendirme

☐ Basit cümleleri anlayabiliyorum.
☐ Temel su ürünleri kelimelerini tanıyorum.
☐ Kısa paragrafların ana fikrini bulabiliyorum.
☐ Sorulardaki anahtar kelimeleri eşleştirebiliyorum.

A2 — Elementary

Günlük iş hayatı senaryolarına dayalı metinler. Cümleler biraz daha uzun, basit bağlaçlar (because, when, after) kullanılır. Pratik bilgiler ön plandadır.

🐟 Bunu Biliyor muydunuz?
Türkiye, Avrupa'nın en büyük levrek ve çipura üreticisidir. Toplam akuakültür üretimi yılda 450.000 tonu aşmaktadır.

A2 — Paragraf 1: Working at a Processing Plant

📖 Anahtar Kelimeler (Key Vocabulary)
- processing plant — işleme tesisi
- filleting line — fileto hattı
- hygiene — hijyen
- jewellery — takı
- report — rapor

My name is Ayşe. I work at a seafood processing plant in Çanakkale. I start work at eight in the morning. First, I check the temperature of the cold room. Then I go to the filleting line. The workers wear white coats, gloves, and hats. We do not use jewellery because it is a hygiene rule. At noon we have lunch in the canteen. In the afternoon I write reports. I finish work at five.

Sorular:

1. What is the first thing Ayşe does at work?

A) She writes reports.
B) She has lunch.
C) She checks the temperature of the cold room.
D) She trains new workers.
E) She cleans the machines.

2. Why don’t the workers wear jewellery?

A) because it is not nice
B) because it is heavy
C) because of a hygiene rule
D) because it is expensive
E) because it is old

3. What does Ayşe do in the afternoon?

A) She goes home early.
B) She writes reports.
C) She goes to the fish market.
D) She trains customers.
E) She cleans the canteen.

💡 **Dil İpucu: "First, Then, After that" Sıralama**
İş adımlarını anlatırken sıralama kelimeleri kullanılır: First (önce), Then (sonra), After that (ondan sonra), Finally (son olarak). İşleme hatlarını anlatırken çok işe yarar.

A2 — Paragraf 2: Buying Frozen Seafood

📖 **Anahtar Kelimeler (Key Vocabulary)**
- frozen — dondurulmuş
- packaging — ambalaj
- label — etiket
- soft — yumuşak
- freezer — dondurucu

When you buy frozen seafood, you should look at some important things. First, check the packaging. It must not be broken. Second, check the date on the label. Do not buy old products. Third, the fish should be hard. If the fish is soft, it was not cold enough. Finally, take the fish home quickly and put it in the freezer.

Sorular:

1. What should the packaging be like?
A) broken
B) colourful
C) not broken
D) heavy
E) transparent

2. Why is soft fish a problem?
A) It is too cheap.
B) It was not cold enough.
C) It is too small.
D) It is from a river.
E) It has no label.

3. What should you do after buying?
A) leave the fish in the car
B) cook the fish outside
C) put it in the freezer quickly

D) wash it with hot water

E) throw away the label

💡 **Dil İpucu: "Must / Must not" Zorunluluk**

"Must" zorunlu, "must not" yasak anlamına gelir: "It must not be broken." Gıda güvenliği kurallarında çok kullanılır.

A2 — Paragraf 3: Fish Farms

📖 **Anahtar Kelimeler (Key Vocabulary)**

- fish farm — balık çiftliği
- cage — kafes
- tank — tank
- feed — yem/beslemek
- wild fish — doğal balık

Many fish on our tables come from fish farms. A fish farm is a place where people grow fish. They put young fish in big cages in the sea or in tanks on land. The farmer feeds the fish every day. After one or two years, the fish are big enough to eat. Fish farming is important because the seas do not have enough wild fish for everyone.

Sorular:

1. Where do people put the young fish?

A) in rivers only

B) in big cages in the sea or tanks on land

C) in small bags

D) in cold rooms

E) in glass bottles

2. How often does the farmer feed the fish?

A) once a week

B) every day

C) every month

D) never

E) only in summer

3. Why is fish farming important?

A) because fish farms are cheap

B) because the seas do not have enough wild fish

C) because it is easy

D) because fish farmers are famous

E) because it is a hobby

💡 **Dil İpucu: "If" Koşul Cümleleri (Basit)**
"If the fish is soft, it was not cold enough." If cümleleri neden-sonuç ilişkisi kurar. Kalite kontrol metinlerinde sık görürsünüz.

🐟 **Bunu Biliyor muydunuz?**
Konserve balığın raf ömrü doğru koşullarda 5 yıla kadar çıkabilir. İlk balık konservesi 1800'lerin başında askeri lojistik ihtiyaçlar için geliştirilmiştir!

A2 — Paragraf 4: Ice and Fish

📖 **Anahtar Kelimeler (Key Vocabulary)**
- fisherman — balıkçı
- bacteria — bakteri
- immediately — hemen
- ratio — oran
- go bad — bozulmak

Ice is very important for fresh fish. When fishermen catch fish, they put the fish on ice immediately. Ice keeps the fish cold and stops bacteria from growing. Without ice, fish go bad in a few hours. Modern boats make their own ice on board. At the factory, we also use ice during cleaning and packing. One kilogram of fish needs about one kilogram of ice.

Sorular:

1. When do fishermen put the fish on ice?

A) after one day
B) after one week
C) immediately
D) only in summer
E) never

2. What does ice stop?

A) the wind
B) bacteria from growing
C) the boat
D) the noise
E) the rain

3. How much ice do we need for 1 kg of fish?

A) 100 g
B) 500 g

C) about 1 kg
D) 5 kg
E) 10 kg

💡 **Dil İpucu: "Every day" vs "Everyday"**
"Every day" (iki kelime) = her gün (zarf). "Everyday" (tek kelime) = günlük/sıradan (sıfat). "The farmer feeds the fish every day."

A2 — Paragraf 5: A Label on Canned Tuna

📖 **Anahtar Kelimeler (Key Vocabulary)**
- label — etiket
- weight — ağırlık
- ingredient — içerik
- producer — üretici
- fridge — buzdolabı

Every food label must give information to the customer. On a can of tuna, you can see the name of the product, the weight, the ingredients, and the date. You can also see the name and address of the producer. The label shows how to store the product. For canned tuna, it says “store in a cool and dry place.” After opening, you must keep it in the fridge.

Sorular:

1. What does “store in a cool and dry place” mean?
A) Put it in the sea.
B) Put it in a cold and dry place.
C) Put it in the sun.
D) Put it in the oven.
E) Throw it away.

2. Which information is NOT on the label?
A) the weight
B) the ingredients
C) the producer’s address
D) the price of the boat
E) the date

3. What should you do after opening the can?
A) keep it in the sun
B) keep it at room temperature
C) keep it in the fridge
D) put it back on the shelf
E) wash it with soap

💡 **Dil İpucu: Etiket Okuma Kelimeleri**
İngilizce gıda etiketlerinde sık geçen ifadeler: weight (ağırlık), ingredients (içindekiler), use by (son tüketim), store in (saklanma koşulu), keep refrigerated (buzdolabında saklayın).

A2 — Paragraf 6: A School Visit

📖 **Anahtar Kelimeler (Key Vocabulary)**
- cage — kafes
- pellet — pelet yem
- surface — yüzey
- clean water — temiz su
- healthy — sağlıklı

Last week, our class visited a fish farm near the city. The farmer showed us the cages in the sea. He explained that the fish were sea bass. We saw how he gave the pellets to the fish. The fish came to the surface very fast. The farmer said that clean water is very important. He tests the water every morning. We learned a lot and had a nice day.

Sorular:

1. What fish did the farmer grow?

A) tuna
B) salmon
C) sea bass
D) mackerel
E) trout

2. What did the farmer give to the fish?

A) bread
B) pellets
C) fruits
D) meat
E) salt

3. Why is clean water important?

A) because the farmer said so
B) because fish drink it
C) because it keeps the fish healthy
D) because it is cheap
E) because it is blue

💡 **Dil İpucu: "Showed / Explained / Saw" Past Simple**
Geçmiş zaman: show→showed, explain→explained, see→saw. Gezi/ziyaret anlatımlarında sık kullanılır: "The farmer showed us the cages."

A2 — Cevap Anahtarı

A2 — Paragraf 1: Working at a Processing Plant

Cevap: C) She checks the temperature of the cold room. Açıklama: “First, I check the temperature of the cold room.” cümlesinde “first” kelimesi sıralamayı belirtir.

Cevap: C) because of a hygiene rule. Açıklama: “We do not use jewellery because it is a hygiene rule.” cümlesi sebebi verir. Takıların gıda güvenliği için yasak olması gerçek hayattaki kuraldır.

Cevap: B) She writes reports. Açıklama: “In the afternoon I write reports.” zaman zarfı olarak “in the afternoon” öğleden sonra anlamına gelir.

A2 — Paragraf 2: Buying Frozen Seafood

Cevap: C) not broken. Açıklama: “It must not be broken.” cümlesi paketin bozuk olmaması gerektiğini belirtir. “Must not” = yasak.

Cevap: B) It was not cold enough. Açıklama: “If the fish is soft, it was not cold enough.” Dondurulmuş balık yumuşaksa soğuk zincir kırılmıştır.

Cevap: C) put it in the freezer quickly. Açıklama: “Take the fish home quickly and put it in the freezer.” son tavsiyedir. Hız önemli, çünkü çözünme başlar.

A2 — Paragraf 3: Fish Farms

Cevap: B) in big cages in the sea or tanks on land. Açıklama: Metin iki seçenek sunar: deniz kafesi veya kara tankı. Her ikisi de akuakültür yöntemidir.

Cevap: B) every day. Açıklama: “The farmer feeds the fish every day.” sıklık bildirir.

Cevap: B) because the seas do not have enough wild fish. Açıklama: Son cümle: “because the seas do not have enough wild fish for everyone.” Aşırı avlanma ve talep dengesizliği ima edilir.

A2 — Paragraf 4: Ice and Fish

Cevap: C) immediately. Açıklama: “They put the fish on ice immediately.” hemen anlamına gelir. Bozulmayı yavaşlatmak için kritik.

Cevap: B) bacteria from growing. Açıklama: “Ice keeps the fish cold and stops bacteria from growing.” Soğuk, mikrobiyal büyümeyi yavaşlatır.

Cevap: C) about 1 kg. Açıklama: “One kilogram of fish needs about one kilogram of ice.” Pratik bir oran verilir (1:1).

A2 — Paragraf 5: A Label on Canned Tuna

Cevap: B) Put it in a cold and dry place. Açıklama: “Cool” = serin; “dry” = kuru. Konserve için standart depolama talimatıdır.

Cevap: D) the price of the boat. Açıklama: Metinde tekne fiyatı geçmez. Diğerleri hepsi zorunlu etiket bilgileridir.

Cevap: C) keep it in the fridge. Açıklama: “After opening, you must keep it in the fridge.” Açılmış konserve hızla bozulduğu için soğuk saklanmalı.

A2 — Paragraf 6: A School Visit

Cevap: C) sea bass. Açıklama: “He explained that the fish were sea bass.” “Sea bass” = levrek.

Cevap: B) pellets. Açıklama: “We saw how he gave the pellets to the fish.” Pelet yem, akuakültürde temel yem formudur.

Cevap: C) because it keeps the fish healthy. Açıklama: Metinde açıkça “clean water is very important” denir; sebep olarak fish health’ı ima eder. Temiz su = düşük patojen = sağlıklı balık.

✅ **A2 Seviye Öz Değerlendirme**

☐ Günlük iş hayatıyla ilgili metinleri anlayabiliyorum.
☐ Basit talimatları (yönergeleri) okuyup uygulayabilirim.
☐ Neden-sonuç ilişkilerini metinde bulabiliyorum.
☐ Su ürünleri temel terimlerini İngilizce kullanabiliyorum.

B1 — Intermediate

Teknik kavramlar devreye girer: soğuk zincir, HACCP, NIR spektroskopi. Kelime dağarcığınız genişler, bağlamdan anlam çıkarma beceriniz test edilir.

🐟 **Bunu Biliyor muydunuz?**

NIR spektroskopisi ile bir balık filetosunun yağ, protein ve su içeriği birkaç saniye içinde ölçülebilir — hiçbir kimyasal kullanmadan!

B1 — Paragraf 1: Why Shelf Life Matters

📖 **Anahtar Kelimeler (Key Vocabulary)**

- shelf life — raf ömrü
- consumption — tüketim
- storage — depolama
- initial quality — başlangıç kalitesi
- reduce — azaltmak

Shelf life is the period during which a product remains safe and acceptable for consumption. For fish and seafood, shelf life depends on several factors such as storage temperature, packaging, and the initial quality of the raw material. When fish is kept at 0 °C on ice, the shelf life can reach ten days. However, if the temperature rises to only 5 °C, the shelf life may drop by half. This is why temperature control is one of the first lessons for every fisheries engineer.

Sorular:

1. According to the passage, shelf life mainly depends on _____.

A) the colour of the fish
B) the weight of the fish
C) several factors including temperature and packaging
D) the name of the supplier

E) the season of harvest

2. What happens if the temperature rises from 0 °C to 5 °C?

A) Shelf life stays the same.
B) Shelf life doubles.
C) Shelf life may be reduced by half.
D) The fish immediately spoils.
E) The packaging expands.

3. The word “initial” in the passage is closest in meaning to _____.

A) final
B) first / beginning
C) frozen
D) useful
E) cheap

💡 **Dil İpucu: "Depends on" Kalıbı**
"Depends on" = bağlıdır. Teknik metinlerde çok yaygın: "Shelf life depends on several factors." Çoklu faktörleri "such as" ile sıralayabilirsiniz.

B1 — Paragraf 2: The Cold Chain

📖 **Anahtar Kelimeler (Key Vocabulary)**
- cold chain — soğuk zincir
- perishable — kolay bozulan
- vessel — gemi
- data logger — veri kaydedici
- spoilage — bozulma

A cold chain is a system that keeps perishable food at low temperatures from production to consumption. If any step in the chain fails, the whole system can fail. For seafood, every link matters: fishing vessels, trucks, cold stores, and even supermarket shelves. Engineers use digital data loggers to track temperature and identify problems. A single hour above the safe limit can reduce shelf life significantly.

Sorular:

1. What is the main idea of the passage?

A) The cold chain is optional.
B) Every step in the cold chain is important.
C) Trucks are more important than vessels.
D) Supermarkets cause spoilage.
E) Data loggers are always expensive.

2. What do engineers use to track temperature?

A) thermometers on paper
B) digital data loggers
C) only their experience
D) weather reports
E) random visits

3. The word “perishable” is closest in meaning to _____.

A) durable
B) long-lasting
C) easily spoiled
D) artificial
E) frozen only

💡 **Dil İpucu: "Perishable" Kelime Ailesi**
Perishable (kolay bozulan), perish (bozulmak/çürümek), perishability (bozulabilirlik). Non-perishable = bozulmayan (konserve gibi). Bu kelime ailesi gıda biliminde temeldir.

B1 — Paragraf 3: Sustainable Fisheries

📖 **Anahtar Kelimeler (Key Vocabulary)**
- sustainable — sürdürülebilir
- population — popülasyon
- TAC — toplam izin verilen av
- spawning — yumurtlama
- net — ağ

Sustainable fisheries aim to catch fish in a way that does not damage fish populations or the environment. If we catch too many fish, there will be no fish left for the future. Scientists study fish populations to decide how many fish can be caught each year. This amount is called the Total Allowable Catch (TAC). Fishermen must follow the TAC, avoid fishing during spawning seasons, and use nets that do not catch young fish.

Sorular:

1. What does TAC refer to?

A) the size of the boat
B) the total amount of fish that can be caught
C) the price of fish
D) the type of net
E) the number of fishermen

2. Which of the following is NOT a rule mentioned in the passage?

A) Follow the TAC.

B) Avoid fishing during spawning seasons.
C) Use nets that do not catch young fish.
D) Sell fish only in winter.
E) Catch fish sustainably.

3. The expression “for the future” implies _____.

A) fishermen should earn more money now
B) coming generations should also have fish to eat
C) the sea will always be full
D) fishing is only for tourists
E) scientists will replace fishermen

💡 **Dil İpucu: Kısaltmaları Tanımak**
Teknik metinlerde kısaltmalar parantez içinde açılır: "Total Allowable Catch (TAC)", "Near-infrared (NIR)". İlk geçişte uzun halini okuyun, sonraki kullanımlarda kısaltma yeterlidir.

🐟 **Bunu Biliyor muydunuz?**
HACCP'nin 7 temel prensibi vardır: tehlike analizi, kritik kontrol noktalarının belirlenmesi, kritik limitlerin tespiti, izleme, düzeltici faaliyetler, doğrulama ve kayıt tutma. Bu sistematik yaklaşım, su ürünleri işletmelerinde gıda güvenliğinin temelini oluşturur.

B1 — Paragraf 4: A Brief Introduction to NIR

📖 **Anahtar Kelimeler (Key Vocabulary)**
- spectroscopy — spektroskopi
- infrared — kızılötesi
- non-destructive — tahribatsız
- calibration — kalibrasyon
- sample — numune

Near-infrared spectroscopy, or NIR, is a fast method that measures how much infrared light a sample reflects or absorbs. With NIR, a scientist can predict the fat, protein, and water content of a fish fillet in only a few seconds. The method is non-destructive, which means the sample is not damaged during analysis. NIR is very useful on production lines, because thousands of fillets can be tested without slowing down the process.

Sorular:

1. Which of the following is true about NIR?

A) It is a slow method.
B) It damages the sample.

C) It predicts fat and water content quickly.
D) It works only for fresh fish.
E) It requires a large laboratory.

2. What does “non-destructive” mean in the passage?

A) very powerful
B) not damaging the sample
C) cheap
D) portable
E) illegal

3. Why is NIR useful on production lines?

A) because it is expensive
B) because it tests thousands of samples without slowing the process
C) because it uses visible light only
D) because it needs chemicals
E) because it replaces the cold room

💡 **Dil İpucu: "Non-destructive" Önek Analizi**
"Non-" olumsuzluk öneki: non-destructive (tahribatsız), non-invasive (girişimsiz). "De-" geri alma: decompose (ayrışmak). Önek bilgisi bilmediğiniz kelimelerin anlamını tahmin etmenizi sağlar.

B1 — Paragraf 5: HACCP in Simple Words

📖 **Anahtar Kelimeler (Key Vocabulary)**
- hazard — tehlike
- critical control point — kritik kontrol noktası
- bacteria — bakteri
- legal requirement — yasal zorunluluk
- monitor — izlemek

HACCP stands for Hazard Analysis and Critical Control Points. It is a food safety system used all over the world. The idea is simple: find the steps in the process where something dangerous could happen, and then control those steps carefully. For example, in a smoked-fish plant, the smoking temperature is a critical control point. If the temperature is too low, harmful bacteria may survive. HACCP is not optional; it is a legal requirement in the European Union.

Sorular:

1. What is the main idea of HACCP?

A) to make food cheaper
B) to control only the price of food
C) to identify and control hazards in the process

D) to make food smell nicer
E) to reduce the number of workers

2. Why is smoking temperature a critical control point?

A) because it affects the colour
B) because low temperature can let bacteria survive
C) because high temperature is illegal
D) because it changes the weight
E) because it uses electricity

3. According to the passage, HACCP is _____ in the European Union.

A) optional
B) a legal requirement
C) forbidden
D) new
E) only recommended for fish

💡 **Dil İpucu: "It is a legal requirement" Yapısı**
"It is + sıfat + isim" kalıbı teknik yazımda çok kullanılır: "It is a legal requirement", "It is a standard procedure." Nesnel bir zorunluluk veya gerçek bildirir.

B1 — Paragraf 6: Seafood Exports

📖 **Anahtar Kelimeler (Key Vocabulary)**
• export — ihracat
• shipment — sevkiyat
• document — belge
• certificate — sertifika
• paperwork — evrak işleri

Türkiye is one of the biggest seafood exporters in the Mediterranean region. Most exports go to countries such as Italy, Spain, and the Netherlands. The main products are farmed sea bass and sea bream. Exporters must follow strict EU rules, including HACCP, traceability, and veterinary health certificates. A single mistake, like a missing document, can stop a whole shipment at the border. Therefore, paperwork is as important as product quality.

Sorular:

1. What are the main export products of Türkiye?

A) frozen tuna and anchovy
B) salmon and trout
C) farmed sea bass and sea bream
D) canned mackerel and octopus
E) dried shrimp

2. What could stop a shipment at the border?

A) good quality
B) clean packaging
C) a missing document
D) an early delivery
E) a new label

3. The sentence “paperwork is as important as product quality” suggests that _____.

A) paperwork is less important than quality
B) paperwork and quality have equal importance
C) only quality is important
D) paperwork only matters in summer
E) exporters do not need documents

> 💡 **Dil İpucu: "As important as" Eşitlik**
> "As...as" eşitlik kurar: "Paperwork is as important as product quality." Sınavlarda bu yapı sıkça sorulur: iki şeyin eşit olduğunu ifade eder.

B1 — Cevap Anahtarı

B1 — Paragraf 1: Why Shelf Life Matters

Cevap: C) several factors including temperature and packaging. Açıklama: “Shelf life depends on several factors such as storage temperature, packaging, and the initial quality of the raw material.” Cümlede birden fazla etmen listelenir.

Cevap: C) Shelf life may be reduced by half. Açıklama: “The shelf life may drop by half.” Sıcaklık artışı, mikrobiyal büyümeyi hızlandırır ve raf ömrünü kısaltır.

Cevap: B) first / beginning. Açıklama: “Initial” = başlangıçtaki. “Initial quality” hammaddenin başlangıç kalitesi demektir.

B1 — Paragraf 2: The Cold Chain

Cevap: B) Every step in the cold chain is important. Açıklama: “If any step in the chain fails, the whole system can fail.” ifadesi ana fikirdir. Bir zincir kadar güçlüdür en zayıf halkası kadar.

Cevap: B) digital data loggers. Açıklama: “Engineers use digital data loggers to track temperature.” Dijital kayıt cihazları standart teknolojidir.

Cevap: C) easily spoiled. Açıklama: “Perishable” = kolay bozulabilen. Taze balık, süt, et gibi gıdalar için kullanılır.

B1 — Paragraf 3: Sustainable Fisheries

Cevap: B) the total amount of fish that can be caught. Açıklama: “Total Allowable Catch (TAC)” bilimsel tavsiyeye dayalı yıllık av kotasıdır.

Cevap: D) Sell fish only in winter. Açıklama: Mevsimle satış kısıtlaması metinde geçmez. Diğerleri açıkça listelenir.

Cevap: B) coming generations should also have fish to eat. Açıklama: Sürdürülebilirliğin tanımı gelecek nesillerin ihtiyaçlarını karşılama yetisidir. “For the future” nesiller arası eşitliği çağrıştırır.

B1 — Paragraf 4: A Brief Introduction to NIR

Cevap: C) It predicts fat and water content quickly. Açıklama: “NIR can predict the fat, protein, and water content of a fish fillet in only a few seconds.” cümlesi hız ve ölçtüğü parametreleri verir.

Cevap: B) not damaging the sample. Açıklama: Metin bu kelimeyi hemen tanımlar: “the sample is not damaged during analysis.” Analitik kimyada önemli bir avantajdır.

Cevap: B) because it tests thousands of samples without slowing the process. Açıklama: Hat üstü analizin avantajı hızdır. “Thousands of fillets can be tested” ifadesi yüksek verimi gösterir.

B1 — Paragraf 5: HACCP in Simple Words

Cevap: C) to identify and control hazards in the process. Açıklama: “Find the steps where something dangerous could happen, and then control those steps carefully.” HACCP’in kalbi budur.

Cevap: B) because low temperature can let bacteria survive. Açıklama: “If the temperature is too low, harmful bacteria may survive.” Soğuk tütsüleme patojen risk taşıdığı için sıcaklık kritiktir.

Cevap: B) a legal requirement. Açıklama: “It is a legal requirement in the European Union.” ifadesi açık. Türk ihracatçıları için de bu nedenle zorunludur.

B1 — Paragraf 6: Seafood Exports

Cevap: C) farmed sea bass and sea bream. Açıklama: “The main products are farmed sea bass and sea bream.” Türk akuakültür sektörünün amiral türleridir.

Cevap: C) a missing document. Açıklama: “A single mistake, like a missing document, can stop a whole shipment.” Evraksız ihracat mümkün değildir.

Cevap: B) paperwork and quality have equal importance. Açıklama: “As…as” yapısı eşitlik kurar. Belge yönetimi ürün kalitesi kadar kritiktir.

✅ B1 Seviye Öz Değerlendirme

☐ Teknik konulardaki metinleri genel olarak anlıyorum.
☐ Bilmediğim kelimelerin anlamını bağlamdan çıkarabiliyorum.
☐ HACCP, soğuk zincir gibi kavramları İngilizce açıklayabiliyorum.
☐ Sınav tarzı çıkarım sorularını çözebiliyorum.

B2 — Upper-Intermediate

Akademik metinlere geçiş seviyesi. MAP, biyojen aminler, IUU avcılık gibi konular işlenir. Çıkarım ve ima soruları ağırlık kazanır.

🐟 Bunu Biliyor muydunuz?

Her yıl dünyada satılan deniz ürünlerinin yaklaşık %20'sinin yanlış etiketlendiği tahmin edilmektedir. DNA barkodlama bu sahtecilikle mücadelenin en güçlü aracıdır.

B2 — Paragraf 1: Modified Atmosphere Packaging

📖 Anahtar Kelimeler (Key Vocabulary)

- modified atmosphere — modifiye atmosfer
- preservation — muhafaza
- bacterial growth — bakteriyel büyüme
- texture — doku

• microbial load — mikrobiyal yük

Modified Atmosphere Packaging (MAP) is a preservation technique in which the air around the food is replaced by a specific mixture of gases, usually carbon dioxide, nitrogen, and a small amount of oxygen. For fresh fish, the aim is to slow down bacterial growth while preserving colour and texture. Because seafood is highly perishable, MAP can extend shelf life from a few days to more than a week when combined with low temperatures. However, MAP is not a substitute for hygiene; if the initial microbial load is too high, no packaging technology can save the product.

Sorular:

1. What is the purpose of MAP for fresh fish?

A) to increase the oxygen level
B) to slow bacterial growth while keeping colour and texture
C) to cook the fish inside the package
D) to change the taste of the fish
E) to reduce the weight

2. According to the passage, MAP works best when _____.

A) used without refrigeration
B) combined with low temperatures
C) the fish is slightly spoiled
D) oxygen is the only gas used
E) the package is opened often

3. What does the last sentence imply?

A) MAP can replace hygiene practices.
B) Packaging alone cannot rescue poor-quality raw material.
C) Hygiene is only for dry products.
D) Any technology can save spoiled fish.
E) MAP increases microbial load.

💡 **Dil İpucu: "Replaced by" Edilgen Yapı**
Passive voice teknik metinlerde çok yaygın: "The air is replaced by a gas mixture." Yapı: be + V3 (past participle). Özne yerine nesne ön plana çıkar.

B2 — Paragraf 2: Traceability in Seafood

📖 **Anahtar Kelimeler (Key Vocabulary)**
• traceability — izlenebilirlik
• supply chain — tedarik zinciri
• batch code — parti kodu

• blockchain — blok zinciri
• fraud — sahtekârlık

Traceability refers to the ability to follow a food product through every stage of the supply chain, from catch or harvest to final consumer. In seafood, traceability is particularly challenging because fish often change hands many times: boats, auction halls, processors, distributors, and retailers. Modern traceability systems use unique batch codes, digital documents, and increasingly blockchain technology. A well-implemented traceability system not only improves food safety but also helps to fight fraud, such as the sale of cheaper species under the name of more expensive ones.

Sorular:

1. Why is traceability especially difficult in seafood?

A) because fish do not swim in groups
B) because products change hands frequently along the chain
C) because batch codes are illegal
D) because there are only two processors in the world
E) because consumers do not eat seafood

2. Which technology is mentioned as an emerging traceability tool?

A) photocopies
B) blockchain
C) fax machines
D) handwriting
E) radio stations

3. According to the passage, traceability also helps _____.

A) make fish cheaper
B) close fishing grounds
C) fight fraud such as species substitution
D) reduce the number of retailers
E) increase the price of packaging

💡 **Dil İpucu: "Particularly / Especially" Vurgu**
"Particularly" ve "especially" özel bir durumu vurgular: "Traceability is particularly challenging." Bu zarflar, genel bir kuralın belirli bir alanda daha önemli olduğunu gösterir.

B2 — Paragraf 3: Biogenic Amines and Histamine Poisoning

📖 **Anahtar Kelimeler (Key Vocabulary)**
• biogenic amines — biyojen aminler
• histamine — histamin

• decarboxylation — dekarboksilasyon
• heat-stable — ısıya dayanıklı
• flushing — yüz kızarması

Biogenic amines are compounds formed in food by the bacterial decarboxylation of amino acids. In fish, the most important one is histamine. Species such as tuna, mackerel, and anchovy contain high levels of the amino acid histidine, which can be converted to histamine by bacteria when the fish is not kept cold enough. Histamine poisoning, also known as scombroid poisoning, causes symptoms that resemble an allergic reaction: headache, flushing, and nausea. Unlike most other food-safety risks, histamine is not destroyed by cooking; prevention relies entirely on strict temperature control.

Sorular:

1. What is the primary cause of histamine formation?

A) exposure to sunlight
B) bacterial conversion of histidine at elevated temperatures
C) too much ice
D) modified atmosphere packaging
E) the use of nitrogen gas

2. Which of the following is NOT mentioned as a symptom?

A) headache
B) flushing
C) nausea
D) fever above 40 °C
E) (symptoms resembling) allergic reaction

3. Why is cooking NOT a reliable protection against histamine?

A) because cooking spreads the histamine
B) because histamine is heat-stable
C) because cooking creates more histamine
D) because it makes the fish too dry
E) because it is illegal

💡 **Dil İpucu: "Heat-stable" Bileşik Sıfatlar**
İngilizce'de tire ile bağlanan bileşik sıfatlar çok kullanılır: heat-stable (ısıya dayanıklı), high-quality (yüksek kaliteli), water-soluble (suda çözünen). İsimden önce gelirler.

🐟 **Bunu Biliyor muydunuz?**
Histamin, pişirmeyle yok olmaz! Bu yüzden ton balığı, uskumru gibi türlerde soğuk zincirin hiç kırılmaması hayati önem taşır.

B2 — Paragraf 4: Integrated Multi-Trophic Aquaculture

📖 **Anahtar Kelimeler (Key Vocabulary)**

- trophic level — trofik seviye
- by-product — yan ürün
- seaweed — deniz yosunu
- diversify — çeşitlendirmek
- nutrient — besin maddesi

Integrated Multi-Trophic Aquaculture (IMTA) is a farming approach in which species from different trophic levels are grown together so that the by-products of one species become inputs for another. For example, fish produce nitrogen-rich waste that can be used by seaweeds or filter-feeding shellfish such as mussels. In this way, IMTA reduces environmental impact while diversifying the farmer's income. Despite these advantages, IMTA is not yet widely adopted because it requires more complex management, careful site selection, and longer-term investment.

Sorular:

1. Which statement best describes IMTA?

A) Fish are farmed separately in isolated tanks.
B) Species from different trophic levels are grown together.
C) Only one species is cultivated to maximise yield.
D) Farms use chemical fertilisers heavily.
E) The system does not use water.

2. According to the passage, what is an economic benefit of IMTA?

A) fewer workers are required
B) income is diversified through multiple products
C) the farm does not pay taxes
D) feed is completely unnecessary
E) licences are not required

3. Why is IMTA not yet widespread?

A) because it is illegal
B) because it requires complex management and longer-term investment
C) because it damages the environment
D) because fish dislike seaweed
E) because it produces too much waste

💡 **Dil İpucu: "So that" Amaç Yapısı**

"So that" amaç bildirir: "Species are grown together so that by-products become inputs for another." Akademik yazımda "in order that" da aynı anlamda kullanılır.

B2 — Paragraf 5: The Problem of IUU Fishing

📖 **Anahtar Kelimeler (Key Vocabulary)**

- IUU fishing — yasa dışı avcılık
- licence — lisans
- certification — sertifikasyon
- enforcement — uygulama/denetim
- jurisdiction — yetki alanı

Illegal, Unreported and Unregulated (IUU) fishing represents one of the most serious threats to global marine resources. IUU activities range from fishing without a licence to operating in protected areas and under-reporting catches. The European Union has established a catch certification scheme that requires all imported seafood to be accompanied by a document proving its legal origin. Although this system has significantly reduced IUU imports, enforcement remains difficult because fishing vessels can quickly change flags and operate under different jurisdictions.

Sorular:

1. What is one example of IUU fishing given in the passage?

A) paying high taxes
B) operating in protected areas
C) using only hook-and-line gear
D) training new fishermen
E) publishing scientific reports

2. How does the EU fight IUU imports?

A) by banning all fish imports
B) through a catch certification scheme
C) by increasing fish prices
D) by promoting vegetarianism
E) by closing all ports

3. Why is enforcement still difficult?

A) because fishermen refuse to register
B) because vessels can change flags and jurisdictions
C) because seafood is always illegal
D) because the EU has no ports
E) because scientists disagree

💡 **Dil İpucu: "Range from... to..." Yapısı**

"Range from X to Y" bir yelpaze gösterir: "IUU activities range from fishing without a licence to operating in protected areas." Ölçek veya çeşitlilik bildirmek için kullanılır.

B2 — Paragraf 6: Life Cycle Assessment of Seafood

📖 **Anahtar Kelimeler (Key Vocabulary)**

- life cycle — yaşam döngüsü
- environmental impact — çevresel etki
- feed production — yem üretimi
- disposal — bertaraf
- assumption — varsayım

Life Cycle Assessment (LCA) is a scientific tool that evaluates the environmental impacts of a product from the extraction of raw materials to final disposal. For wild-capture fisheries, the main impact is usually fuel consumption at sea, while for aquaculture it is often the production of feed. LCA results can be surprising: a well-managed farmed sea bass may have a lower carbon footprint than wild-caught fish transported over long distances. However, LCA studies should be interpreted with care because the boundaries, assumptions, and data sources can strongly influence the results.

Sorular:

1. What does LCA mainly evaluate?

A) the taste of the product
B) the environmental impacts throughout the life cycle
C) the price of the product
D) the colour preference of consumers
E) the weight of the packaging only

2. According to the passage, what is usually the main impact for aquaculture?

A) transportation
B) feed production
C) packaging
D) labelling
E) marketing

3. Why must LCA results be interpreted carefully?

A) because they are always wrong
B) because assumptions and boundaries influence the outcome
C) because LCA is illegal
D) because only scientists read them
E) because they never change

💡 **Dil İpucu: "Assumptions and boundaries" Akademik İfade**

"Assumptions" = varsayımlar, "boundaries" = sınırlar. Bilimsel çalışmalarda her sonucun belirli varsayımlara dayandığını belirten bu ifade LCA, araştırma metodolojisi gibi konularda sıkça geçer.

B2 — Cevap Anahtarı

B2 — Paragraf 1: Modified Atmosphere Packaging

Cevap: B) to slow bacterial growth while keeping colour and texture. Açıklama: Paragraf MAP'in çift amacını belirtir: mikrobiyal inhibisyon + duyusal özelliklerin korunması. CO_2 mikrobiyalları baskılar, N_2 oksijeni uzaklaştırır.

Cevap: B) combined with low temperatures. Açıklama: "When combined with low temperatures." Engel teknolojileri (hurdle technology) prensibi: MAP + soğuk birlikte etkili olur.

Cevap: B) Packaging alone cannot rescue poor-quality raw material. Açıklama: "If the initial microbial load is too high, no packaging technology can save the product." Çıkarım sorusu: iyi hammadde olmadan teknoloji yetersizdir.

B2 — Paragraf 2: Traceability in Seafood

Cevap: B) because products change hands frequently along the chain. Açıklama: "Fish often change hands many times: boats, auction halls, processors, distributors, and retailers." Zincir uzun ve parçalı olunca izlenebilirlik güçleşir.

Cevap: B) blockchain. Açıklama: "Increasingly blockchain technology." Değiştirilemez dağıtık defter, seafood traceability'de pilot uygulamalara konu olmuştur.

Cevap: C) fight fraud such as species substitution. Açıklama: "The sale of cheaper species under the name of more expensive ones." Tür ikamesi, seafood food fraud'un en yaygın biçimidir.

B2 — Paragraf 3: Biogenic Amines and Histamine Poisoning

Cevap: B) bacterial conversion of histidine at elevated temperatures. Açıklama: Metin histaminin bakteriyel dekarboksilasyonla oluştuğunu ve soğuk zincir kırılınca arttığını belirtir. Histidin substrattır.

Cevap: D) fever above 40 °C. Açıklama: Yüksek ateş metinde geçmez. Diğer semptomlar açıkça listelenir. Negatif soru formatı Sınava Hazırlık'de yaygındır.

Cevap: B) because histamine is heat-stable. Açıklama: "Histamine is not destroyed by cooking" ifadesi ısıya dayanıklılığı söyler. Önlem tamamen soğuk zincire bağlıdır.

B2 — Paragraf 4: Integrated Multi-Trophic Aquaculture

Cevap: B) Species from different trophic levels are grown together. Açıklama: Tanım cümlesi: "species from different trophic levels are grown together." Trofik seviye = besin zincirindeki konum.

Cevap: B) income is diversified through multiple products. Açıklama: "Diversifying the farmer's income." Çeşitli türler çeşitli pazarlar demektir; risk dağıtılır.

Cevap: B) because it requires complex management and longer-term investment. Açıklama: Metinde üç engel sıralanır: yönetim karmaşıklığı, saha seçimi, uzun vadeli yatırım.

B2 — Paragraf 5: The Problem of IUU Fishing

Cevap: B) operating in protected areas. Açıklama: "Operating in protected areas." IUU yelpazesine açıkça alınmıştır.

Cevap: B) through a catch certification scheme. Açıklama: "Catch certification scheme." AB IUU Regülasyonu 1005/2008 kapsamında catch certificate zorunludur.

Cevap: B) because vessels can change flags and jurisdictions. Açıklama: "Fishing vessels can quickly change flags and operate under different jurisdictions." Bayrak değiştirme (reflagging) yaygın bir kaçış stratejisidir.

B2 — Paragraf 6: Life Cycle Assessment of Seafood

Cevap: B) the environmental impacts throughout the life cycle. Açıklama: Tanım cümlesi açıktır: "evaluates the environmental impacts from extraction to disposal." Cradle-to-grave yaklaşımı.

Cevap: B) feed production. Açıklama: “For aquaculture it is often the production of feed.” Yem üretimi LCA’de en büyük kalemdir (balık unu/yağı, soya, enerji).

Cevap: B) because assumptions and boundaries influence the outcome. Açıklama: “Boundaries, assumptions, and data sources can strongly influence the results.” Metodolojik tercihler LCA çıktısını şekillendirir; standardizasyon (ISO 14040/44) bu nedenle önemlidir.

✅ **B2 Seviye Öz Değerlendirme**

☐ Uzun teknik paragrafları detaylı anlıyorum.
☐ Yazarın tutumunu ve ima ettiğini tespit edebiliyorum.
☐ Akademik kelime dağarcığım gelişti.
☐ Karmaşık soru köklerini hızlı analiz edebiliyorum.

C1 — Advanced

İleri akademik okuma seviyesi. Kemometri, döngüsel biyoekonomi, AB mevzuatı gibi çok disiplinli konular. Yazarın tutumunu ve ima ettiğini yakalayın.

🐟 **Bunu Biliyor muydunuz?**

Döngüsel biyoekonomide bir balığın "atık" sayılan kısımlarından (baş, deri, kemik) kolajen, jelatin, omega-3 yağ asitleri, biyoaktif peptidler ve hatta kozmetik ham maddeler elde edilebilir.

C1 — Paragraf 1: Chemometrics and Rapid Quality Assessment

📖 **Anahtar Kelimeler (Key Vocabulary)**

- chemometrics — kemometri
- multivariate — çok değişkenli
- spectroscopic — spektroskopik
- calibration — kalibrasyon
- at-line — hat kenarı

The increasing demand for rapid, non-destructive quality assessment in the seafood industry has driven the integration of spectroscopic techniques with multivariate statistical methods, collectively referred to as chemometrics. Whereas traditional wet-chemistry analyses are accurate, they are also labour-intensive, time-consuming, and often incompatible with at-line or in-line monitoring. Near-infrared spectroscopy coupled with partial least squares regression can predict key compositional parameters — such as fat, moisture, and protein — within seconds, provided that the calibration model has been developed on a representative sample set and rigorously validated. Nevertheless, practitioners should be aware that model performance deteriorates when spectra are

acquired outside the calibration space, a phenomenon particularly relevant for products of mixed geographical origin.

Sorular:

1. What is implied as a limitation of traditional wet-chemistry analyses?

A) They are too cheap to scale.
B) They are incompatible with at-line or in-line monitoring.
C) They are only performed in winter.
D) They cannot measure protein content.
E) They are banned by the European Union.

2. According to the passage, a prerequisite for reliable NIR prediction is _____.

A) the use of a single sample for calibration
B) a representative and rigorously validated calibration model
C) a constant room temperature only
D) measurements taken without light
E) exclusion of fatty fish

3. The expression “outside the calibration space” refers to _____.

A) samples whose characteristics were not captured in the calibration set
B) physical distance from the spectrometer
C) samples kept outside the laboratory
D) any sample containing water
E) samples with barcodes missing

💡 **Dil İpucu: "Driven by" ve "Led to" İlişkileri**
"Driven by" = tarafından yönlendirilen, "led to" = yol açan. Akademik metinlerde neden-sonuç ilişkisini kurar: "The demand has driven the integration of new methods."

C1 — Paragraf 2: The Circular Bioeconomy in Fisheries

📖 **Anahtar Kelimeler (Key Vocabulary)**
- bioeconomy — biyoekonomi
- residue — artık/kalıntı
- feedstock — hammadde
- hydrolysis — hidroliz
- bioactive — biyoaktif

A circular bioeconomy framework reconceptualises fishery residues — heads, viscera, frames, skins, and shells — not as waste but as renewable feedstocks for high-value bioproducts. Enzymatic hydrolysis of protein-rich by-products yields bioactive peptides that exhibit antioxidant and antihypertensive activities, while the demineralisation and deacetylation of crustacean shells produce chitosan, a polysaccharide widely used in edible

coatings, biomedical applications, and wastewater treatment. From an engineering perspective, the challenge is not merely technological but systemic: residues must be collected cold, segregated by category, and processed rapidly to preserve their functional potential. Without coordinated logistics and harmonised specifications across stakeholders, even the most sophisticated extraction technology cannot compensate for degraded raw material.

Sorular:

1. Which of the following best reflects the argument of the passage?

A) Recycling fish waste is technically impossible.
B) The circular bioeconomy relies on both technology and systemic coordination.
C) Fishery residues should be incinerated immediately.
D) Chitosan is the only valuable by-product.
E) Enzymatic hydrolysis is no longer relevant.

2. The word "reconceptualises" is closest in meaning to _____.

A) forbids
B) sells
C) redefines / reframes
D) ignores
E) patents

3. Why is rapid, cold handling of residues emphasised?

A) to make by-products heavier
B) to preserve the functional potential of the raw material
C) to reduce tax obligations
D) to improve labelling
E) to shorten the sales cycle

💡 **Dil İpucu: "Not merely... but" Yapısı**
"Not merely X but Y" = sadece X değil aynı zamanda Y. Akademik yazımda güçlü bir vurgu aracıdır: "The challenge is not merely technological but systemic."

C1 — Paragraf 3: EU Regulatory Architecture for Seafood

📖 **Anahtar Kelimeler (Key Vocabulary)**
• regulatory — düzenleyici
• hygiene — hijyen
• audit — denetim
• delisting — listeden çıkarma
• compliance — uyum

The European Union's regulatory architecture for seafood comprises a layered set of instruments, the most prominent of which are Regulations 852/2004 on the hygiene of foodstuffs, 853/2004 on specific rules for food of animal origin, and 854/2004 on official controls. These regulations impose obligations not only on EU producers but also on third-country exporters wishing to access the single market. Member states designate competent authorities responsible for inspection, listing approved establishments, and issuing health certificates. Any deficiency identified during an audit may result in delisting, with substantial commercial consequences. For Turkish exporters, compliance is therefore not a one-off achievement but a continuous obligation sustained through internal verification and ongoing staff training.

Sorular:

1. Which statement best captures the main idea?

A) The EU seafood framework consists of only one regulation.
B) Compliance is a continuous, not one-off, process.
C) Third countries are exempt from EU rules.
D) Hygiene regulations are optional for exporters.
E) Health certificates are issued by the World Bank.

2. What is the consequence of deficiencies identified during an audit?

A) immediate closure of all EU borders
B) delisting with commercial consequences
C) an automatic tariff exemption
D) a change of jurisdiction
E) a reduction of VAT

3. The phrase "layered set of instruments" suggests that _____.

A) only one instrument is applied at a time
B) multiple legal instruments operate together
C) regulations are applied randomly
D) instruments replace one another
E) the EU uses only soft-law instruments

💡 **Dil İpucu: "Reconceptualise" Akademik Kelime Yapısı**
"Re-" (yeniden) + "conceptualise" (kavramsallaştırmak). Akademik metinlerde paradigma değişikliğini ifade eder. Benzerler: redefine, restructure, reformulate.

🐟 **Bunu Biliyor muydunuz?**
Engel teknolojisinde (hurdle technology) hiçbir koruma faktörü tek başına yeterli olmak zorunda değildir — kombinasyon güçtür! Tıpkı bir kalede her duvarın tek başına yıkılabilir ama hepsinin birlikte aşılamaz olması gibi.

C1 — Paragraf 4: Supply Chain Risk in Global Seafood Trade

📖 **Anahtar Kelimeler (Key Vocabulary)**
- supply chain — tedarik zinciri
- intermediary — aracı
- nearshoring — yakın kaynak
- resilience — dayanıklılık
- strategic — stratejik

Global seafood supply chains have become increasingly complex, with a single canned tuna often incorporating inputs from three continents and passing through multiple intermediaries before reaching the consumer. While globalisation has expanded markets and reduced unit costs, it has also amplified exposure to a variety of risks, ranging from geopolitical disruptions and exchange-rate volatility to pandemic-related logistics breakdowns. Recent shocks have highlighted the fragility of just-in-time inventory models, prompting companies to diversify their supplier base, nearshore critical operations, and invest in digital visibility platforms. Crucially, risk management is no longer viewed as a peripheral function but as a strategic capability that directly influences brand resilience.

Sorular:

1. What contributed to the amplification of risks in global seafood trade?

A) the use of local suppliers only
B) the increasing complexity and geographical spread of supply chains
C) the absence of technology
D) the reduction of fish consumption globally
E) the abolition of customs duties

2. What is one response companies have adopted in light of recent shocks?

A) abandoning all supplier relationships
B) nearshoring critical operations
C) dismantling their digital platforms
D) centralising all production in one plant
E) ignoring risk management altogether

3. The passage suggests that risk management _____.

A) is now seen as a strategic capability
B) is primarily the responsibility of customers
C) is irrelevant to brand resilience
D) has been outsourced to governments
E) applies only to wild-capture fisheries

💡 **Dil İpucu: "Nearshore" ve Yeni İş Terimleri**
"Nearshoring" = yakın coğrafyaya taşıma. Pandemi sonrası yeni iş terimleri: offshoring (uzak dış kaynak), reshoring (geri getirme), nearshoring (yakına taşıma). Tedarik zinciri metinlerinde sıkça görülür.

C1 — Paragraf 5: Hurdle Technology for Shelf-Life Extension

📖 **Anahtar Kelimeler (Key Vocabulary)**
- hurdle technology — engel teknolojisi
- sub-lethal — öldürücü altı
- lag phase — adaptasyon fazı
- clean-label — temiz etiket
- synergistic — sinerjistik

Hurdle technology rests on the principle that microbial growth can be controlled more effectively by combining multiple preservation factors — each at a sub-lethal intensity — than by relying on a single severe treatment. In seafood preservation, typical hurdles include low temperature, reduced water activity, modified atmospheres, mild acidification, and natural antimicrobial compounds. The combined stress imposes cumulative injury on microbial cells, prolonging the lag phase and delaying measurable growth. The appeal of this strategy is twofold: it preserves sensory and nutritional quality far better than harsh single-factor treatments, and it aligns with contemporary consumer preferences for minimally processed, clean-label products.

Sorular:

1. What is the underlying principle of hurdle technology?

A) applying one strong preservation factor at maximum intensity
B) combining multiple sub-lethal factors for cumulative effect
C) eliminating all bacteria at once
D) relying solely on thermal treatment
E) ignoring water activity

2. Why is hurdle technology considered appealing?

A) because it is the cheapest method available
B) because it preserves sensory and nutritional quality and suits clean-label trends
C) because it removes the need for packaging
D) because it shortens the production line
E) because it requires no trained staff

3. The phrase “prolonging the lag phase” refers to _____.

A) extending the time before microbial growth becomes detectable
B) eliminating all microorganisms permanently
C) shortening the production cycle
D) increasing the enzymatic activity
E) accelerating lipid oxidation

💡 **Dil İpucu: "Sub-lethal" Teknik Önek Kombinasyonu**
"Sub-" = altı; "lethal" = öldürücü. "Sub-lethal" = öldürücü dozun altında. Bilimsel metinlerde önek kombinasyonları çok yaygındır: sub-zero, sub-optimal, supra-national.

C1 — Paragraf 6: Governance of Mediterranean Fisheries

📖 **Anahtar Kelimeler (Key Vocabulary)**
- governance — yönetişim
- mandate — yetki
- enforcement — uygulama
- stock assessment — stok değerlendirme
- cooperation — iş birliği

Governance of Mediterranean fisheries is shaped by a dense web of overlapping mandates, encompassing the General Fisheries Commission for the Mediterranean (GFCM), the European Union's Common Fisheries Policy, and the distinct legal frameworks of non-EU coastal states. This plurality, while reflective of the sea's political complexity, often results in fragmented stock assessments, inconsistent enforcement, and uneven data quality. Recent efforts towards regionalisation — including multi-annual management plans for priority stocks such as hake and red mullet — have yielded modest but encouraging improvements. Yet scholars caution that without genuine scientific cooperation across jurisdictions and a transparent reconciliation of divergent interests, long-term sustainability will remain elusive.

Sorular:

1. Which of the following best describes the governance situation?

A) a single authority manages the Mediterranean
B) overlapping mandates and fragmented enforcement
C) all coastal states share the same legislation
D) governance is absent from the region
E) only GFCM is responsible

2. What have recent regionalisation efforts produced?

A) a single unified law
B) modest but encouraging improvements
C) the dissolution of the GFCM
D) full ecological recovery
E) the closure of all fisheries

3. The author implies that true sustainability requires _____.

A) abolishing the Common Fisheries Policy
B) authentic scientific cooperation and transparent reconciliation of interests

C) increasing fishing quotas

D) eliminating all non-EU states

E) outsourcing governance to NGOs

> 💡 **Dil İpucu: "Modest but encouraging" Temkinli Akademik İyimserlik**
> Akademik yazarlar genellikle kesin ifadelerden kaçınır. "Modest but encouraging", "promising yet incomplete" gibi ifadeler bilimsel temkinliliği gösterir. Sınavlarda yazarın tutumunu soran sorularda bu nüansı yakalamak önemlidir.

C1 — Cevap Anahtarı

C1 — Paragraf 1: Chemometrics and Rapid Quality Assessment

Cevap: B) They are incompatible with at-line or in-line monitoring. Açıklama: Metin açıkça klasik yöntemlerin "labour-intensive, time-consuming, and often incompatible with at-line or in-line monitoring" olduğunu söyler. Üretim hattıyla entegre edilemezler.

Cevap: B) a representative and rigorously validated calibration model. Açıklama: "Provided that the calibration model has been developed on a representative sample set and rigorously validated." Kalibrasyonun genişliği ve validasyon titizliği tahmin doğruluğunu belirler.

Cevap: A) samples whose characteristics were not captured in the calibration set. Açıklama: Çok değişkenli istatistikte "calibration space" modelin öğrendiği değişkenlik aralığıdır. Bu aralığın dışındaki numuneler için ekstrapolasyon hatası büyür.

C1 — Paragraf 2: The Circular Bioeconomy in Fisheries

Cevap: B) The circular bioeconomy relies on both technology and systemic coordination. Açıklama: "The challenge is not merely technological but systemic." Ana iddia çok boyutludur: teknoloji + lojistik + paydaş uyumu.

Cevap: C) redefines / reframes. Açıklama: "Re-" öneki "yeniden" anlamı katar; "conceptualise" kavramsallaştırmak. Atıkları hammadde olarak yeniden tanımlamak.

Cevap: B) to preserve the functional potential of the raw material. Açıklama: "Processed rapidly to preserve their functional potential." Biyoaktivite ve fonksiyonel özellikler, otoliz ve oksidasyonla hızla bozulur.

C1 — Paragraf 3: EU Regulatory Architecture for Seafood

Cevap: B) Compliance is a continuous, not one-off, process. Açıklama: Son cümle doğrudan ana fikri verir: "Not a one-off achievement but a continuous obligation." Denetimler sürekli performans ister.

Cevap: B) delisting with commercial consequences. Açıklama: "Delisting" = AB onaylı işletme listesinden çıkarılma. Bu, ihracat kaybı anlamına gelir.

Cevap: B) multiple legal instruments operate together. Açıklama: "Layered" = katmanlı; çoklu düzenlemeler birbirini tamamlar. 852/853/854, resmi kontrol + hijyen + hayvansal ürün kurallarının üst üste işleyişini temsil eder.

C1 — Paragraf 4: Supply Chain Risk in Global Seafood Trade

Cevap: B) the increasing complexity and geographical spread of supply chains. Açıklama: "Inputs from three continents" ve "multiple intermediaries" karmaşıklığı vurgular. Karmaşıklık, kırılganlık yaratır.

Cevap: B) nearshoring critical operations. Açıklama: "Nearshore critical operations." Uzak tedarikçilerden yakın coğrafyalara taşınma, pandemi sonrası trenddir.

Cevap: A) is now seen as a strategic capability. Açıklama: "No longer viewed as a peripheral function but as a strategic capability." Paradigma değişimi: operasyonel detay değil, stratejik yetkinlik.

C1 — Paragraf 5: Hurdle Technology for Shelf-Life Extension

Cevap: B) combining multiple sub-lethal factors for cumulative effect. Açıklama: “Combining multiple preservation factors — each at a sub-lethal intensity.” Bu, klasik hurdle concept'idir (Leistner, 2000).

Cevap: B) because it preserves sensory and nutritional quality and suits clean-label trends. Açıklama: “Appeal is twofold”: duyusal/besinsel korunma + temiz etiket uyumu. İki gerekçe açıkça listelenir.

Cevap: A) extending the time before microbial growth becomes detectable. Açıklama: Mikrobiyolojik büyüme eğrisinde “lag phase” adaptasyon dönemidir; uzatmak, raf ömrünü artırır.

C1 — Paragraf 6: Governance of Mediterranean Fisheries

Cevap: B) overlapping mandates and fragmented enforcement. Açıklama: “Dense web of overlapping mandates” ve “fragmented stock assessments, inconsistent enforcement.” Çoklu yetkili, parçalı uygulama.

Cevap: B) modest but encouraging improvements. Açıklama: Metin ılımlı iyimserlik gösterir: “modest but encouraging improvements.” Mutlak başarı iddia etmez.

Cevap: B) authentic scientific cooperation and transparent reconciliation of interests. Açıklama: Son cümle normatif yargıyı içerir: “genuine scientific cooperation across jurisdictions and a transparent reconciliation of divergent interests.” Bunlar olmadan sürdürülebilirlik ulaşılamazdır.

✅ C1 Seviye Öz Değerlendirme

☐ Akademik yazım stilini tanıyorum ve anlıyorum.
☐ Çok disiplinli metinlerde ana argümanı çıkarabiliyorum.
☐ "Implies", "suggests" gibi dolaylı ifadeleri yakalayabiliyorum.
☐ İleri düzey sınava hazır hissediyorum.

C2 — Proficiency

Ustalık seviyesi. Epistemolojik tartışmalar, politik bilim kavramları ve disiplinlerarası analiz. Metinlerin hem içeriğini hem argüman yapısını anlamanız beklenir.

🐟 Bunu Biliyor muydunuz?

Ortak alanların trajedisi tezinin her zaman geçerli olmadığı, topluluk düzeyinde örgütlenmenin de etkili olabileceği gösterilmiştir (Ostrom, 1990). Bu yaklaşım açık deniz yönetiminde de umut vaat etmektedir.

C2 — Paragraf 1: Epistemological Foundations of Seafood Authentication

📖 Anahtar Kelimeler (Key Vocabulary)

- epistemological — epistemolojik
- authentication — doğrulama
- DNA barcoding — DNA barkodlama
- sovereign — egemen
- inferential — çıkarımsal

Contemporary seafood authentication sits at the intersection of analytical chemistry, molecular biology, and data science, yet its epistemological foundations remain under-examined. While DNA barcoding has been celebrated as a gold-standard technique for species identification, its reliability is contingent upon the curation of reference sequence databases — databases which, despite considerable expansion, retain taxonomic gaps and, at times, mislabelled entries that propagate through subsequent analyses. Spectroscopic fingerprinting, by contrast, circumvents sequence-level ambiguity but introduces its own interpretive burden: without robust chemometric models anchored in explicit assumptions, its inferential leap from spectral patterns to authenticity claims may obscure more than it reveals. The prudent practitioner, therefore, treats no method as sovereign; rather, convergent evidence across orthogonal platforms constitutes the defensible epistemic standard.

Sorular:

1. Why, according to the passage, is DNA barcoding not infallible?

A) because it is a very recent method
B) because reference databases retain taxonomic gaps and mislabelled entries
C) because it can only identify mammals
D) because it has been abandoned by regulators
E) because it requires no laboratory equipment

2. Which phrase best characterises the author's stance towards individual authentication methods?

A) absolute trust in DNA barcoding
B) wholesale rejection of spectroscopic methods
C) no single method is epistemically sovereign
D) only regulators can decide on methods
E) methods are interchangeable without consequence

3. The expression "inferential leap" is used to suggest that _____.

A) spectroscopic methods are always wrong
B) moving from spectra to authenticity claims risks unwarranted conclusions
C) spectra are physically unstable
D) the methods are illegal
E) DNA barcoding is a form of spectroscopy

💡 **Dil İpucu: "Epistemological" — Bilgi Felsefesi Terimleri**
"Epistemology" = bilgi felsefesi (neyi nasıl bilebiliriz?). "Ontology" = varlık felsefesi. C2 metinlerde bu terimler bilimsel yöntemlerin temellerini sorgulamak için kullanılır.

C2 — Paragraf 2: Ocean Governance and the Tragedy of the Commons

📖 **Anahtar Kelimeler (Key Vocabulary)**
• commons — ortak alan

• asymmetric — asimetrik
• polycentric — çok merkezli
• stewardship — koruyuculuk
• nested — iç içe geçmiş

The persistent difficulty of governing the open ocean is frequently framed through the metaphor (Hardin, 1968) of the "tragedy of the commons", wherein rational self-interested actors, in the absence of binding institutions, cumulatively exhaust a shared resource. Yet the metaphor, powerful as it is, tends to obscure the heterogeneity of the actors involved: artisanal fleets, industrial operators, flag-of-convenience vessels, and state subsidy regimes each contribute asymmetrically to overexploitation. Ostrom's (1990) subsequent work on polycentric governance has demonstrated that community-level institutions, when nested within broader regulatory frameworks, can forestall the tragedy more effectively than centralised command-and-control. In fisheries, this insight has catalysed experiments with co-management, rights-based allocations, and bottom-up monitoring — though none, it must be conceded, has yet produced an unambiguous template for planetary-scale ocean stewardship.

Sorular:

1. What is the author's critique of the Hardin (1968) metaphor?

A) It is factually incorrect.
B) It oversimplifies the asymmetric contributions of different actors.
C) It has never been tested in fisheries.
D) It contradicts international law.
E) It was written before the twentieth century.

2. According to the passage, Ostrom's (1990) contribution demonstrated that _____.

A) only centralised command-and-control can solve the problem
B) community-level institutions nested in broader frameworks can be effective
C) the tragedy of the commons is inevitable
D) subsidies always benefit fisheries
E) fisheries cannot be governed

3. What is the author's overall assessment of recent governance experiments?

A) They have produced a definitive planetary template.
B) They have failed completely.
C) They show promise but have not yielded an unambiguous template for ocean stewardship.
D) They are relevant only to freshwater systems.
E) They have been universally abandoned.

💡 **Dil İpucu: "Inferential Leap" — Akademik Eleştiri Dili**
"Inferential leap" = çıkarımsal sıçrama; veriden sonuca giderken yapılan mantıksal atlama. Yazarlar bunu bir yöntemin varsayımlarının tartışılabilir olduğunu ima etmek için kullanır.

C2 — Paragraf 3: Rethinking Protein Transition in an Aquatic Context

📖 **Anahtar Kelimeler (Key Vocabulary)**
- protein transition — protein geçişi
- aquatic — su ürünleri
- reductionist — indirgemeci
- externality — dışsallık
- epistemic — bilgisel

Calls to decarbonise food systems have converged on the notion of a protein transition, yet much of the debate remains terrestrially centred, privileging plant-based substitutes and precision-fermented analogues while relegating aquatic proteins to a secondary role. This framing is analytically tenuous. When assessed through rigorous, well-bounded life-cycle inventories, certain low-trophic aquatic species — bivalves, filter-feeding fish, and microalgae — outperform their terrestrial counterparts on multiple impact categories, including land use, freshwater consumption, and greenhouse gas emissions per gram of utilisable protein. A more intellectually honest discourse would therefore treat aquatic and terrestrial pathways as complementary rather than competitive, while acknowledging that the scalability of any alternative hinges not merely on environmental metrics but also on cultural acceptability, governance maturity, and distributive justice.

Sorular:

1. Which statement best reflects the author's central claim?

A) Terrestrial plant-based proteins are the only viable alternative.
B) Aquatic proteins deserve a more central role and the debate should be reframed.
C) Precision fermentation is the sole path forward.
D) All proteins have identical environmental footprints.
E) Aquatic proteins are always inferior to terrestrial ones.

2. Why are low-trophic aquatic species emphasised?

A) because they are cheaper to harvest
B) because they perform favourably on multiple LCA impact categories per gram of utilisable protein
C) because they are the tastiest
D) because their populations are the largest
E) because they require no water

3. The author notes that scalability depends not only on environmental metrics but also on _____.

A) the price of electricity only
B) cultural acceptability, governance maturity, and distributive justice
C) the mood of consumers

D) the weather

E) the number of supermarkets

💡 **Dil İpucu: "Reconceptualise" vs "Rethink"**

"Reconceptualise" akademik, "rethink" günlük dildeki karşılığıdır. C2 metinlerde daha sofistike terimler tercih edilir. "Problematise" = sorunsallaştırmak, "foreground" = ön plana çıkarmak.

🐟 **Bunu Biliyor muydunuz?**

Mikroplastikler artık Mariana Çukuru'nun en derin noktasında bile tespit edilmektedir. Deniz ürünleri yoluyla insana geçişi, 21. yüzyılın en büyük gıda güvenliği sorularından biridir.

C2 — Paragraf 4: The Ethics of Precision Aquaculture

📖 **Anahtar Kelimeler (Key Vocabulary)**

- antimicrobial resistance — antimikrobiyal direnç
- resistome — rezistom
- horizontal gene transfer — yatay gen aktarımı
- surveillance — sürveyans
- stewardship — doğru kullanım

The proliferation of sensors, actuators, and machine-learning models has ushered in an era of precision aquaculture, in which biomass, appetite, and water quality are continuously inferred and managed at a granularity once unattainable. Framed by its proponents as the logical culmination of operational efficiency, this technological densification nonetheless provokes ethical interrogations that deserve more than cursory treatment. Who owns the data generated on a single farm, especially when sensors are supplied by multinational vendors and models are trained in opaque jurisdictions? How should welfare metrics be weighed when an optimised growth trajectory entails chronic subclinical stress? And what epistemic authority should algorithmic recommendations command over the tacit knowledge of experienced farm managers? Far from being peripheral, these questions constitute the normative core of any defensible deployment of precision technologies.

Sorular:

1. The author's tone towards precision aquaculture can best be described as _____.

A) uncritically enthusiastic

B) nostalgically dismissive

C) carefully ambivalent, calling for ethical scrutiny

D) commercially promotional

E) purely technical and descriptive

2. Which of the following is NOT one of the ethical questions raised?

A) ownership of farm-generated data
B) welfare trade-offs of optimised growth trajectories
C) the authority of algorithmic recommendations
D) the wholesale banning of aquaculture
E) relationship between technology and tacit knowledge

3. The expression “normative core” implies that the ethical questions are _____.

A) peripheral matters of style
B) central to legitimate technology deployment
C) irrelevant to farmers
D) confined to legal scholars
E) technical issues only

💡 **Dil İpucu: "Polycentric" ve Çok Merkezli Yönetişim**
"Polycentric" (çok merkezli) çok merkezli yönetişim teorisinden gelir (Ostrom, 1990). "Mono-" = tek, "bi-" = iki, "poly-" = çok. Bu önekleri tanımak akademik metinleri hızlı çözmenize yardımcı olur.

C2 — Paragraf 5: Valuation of Marine Ecosystem Services

📖 **Anahtar Kelimeler (Key Vocabulary)**
• terroir — terruar
• organoleptic — organoleptik
• biogeochemical — biyojeokimyasal
• appellations — menşe tescili
• provenance — köken

Attempts to internalise the value of marine ecosystem services within standard economic accounts have produced a body of work as ambitious as it is contested. Methods ranging from contingent valuation to benefit transfer have been deployed to monetise provisioning, regulating, and cultural services, yet each carries well-rehearsed limitations: stated-preference surveys are susceptible to hypothetical bias; benefit transfer risks unwarranted extrapolation from ill-matched reference sites; and production-function approaches depend on ecological models whose parameter uncertainties are rarely propagated into final estimates. More fundamentally, commodification critics argue that assigning monetary values to, say, the cultural attachment of coastal communities to their traditional fishing grounds risks misconstruing the very nature of what is being protected. A mature valuation practice must therefore pair technical rigour with epistemic humility, treating monetary figures as one input among many rather than as definitive verdicts.

Sorular:

1. Which of the following is a limitation of stated-preference surveys discussed in the passage?

A) they produce no numerical results
B) they are susceptible to hypothetical bias
C) they are prohibited by international law
D) they require no human respondents
E) they always underestimate value

2. What is the core argument of the “commodification critics”?

A) that more valuation studies are always better
B) that monetising cultural attachments may distort what is being protected
C) that ecosystems have no value whatsoever
D) that only market prices should be used
E) that fisheries should pay no taxes

3. The author recommends that valuation practice should _____.

A) avoid technical methods entirely
B) combine technical rigour with epistemic humility
C) deliver definitive monetary verdicts
D) be reserved for policymakers only
E) ignore cultural dimensions

💡 **Dil İpucu: "Terroir" — Disiplinlerarası Kavramlar**
"Terroir" Fransızca'dan gelir ve bir ürünün coğrafi kökeninin tadına etkisini ifade eder. C2 metinlerde disiplinlerarası kavramlar sıkça ödünç alınır.

C2 — Paragraf 6: Climate Change and Adaptive Capacity in Turkish Aquaculture

📖 **Anahtar Kelimeler (Key Vocabulary)**
- microplastics — mikroplastikler
- bioaccumulation — biyobirikim
- trophic transfer — trofik aktarım
- translocation — yer değiştirme
- precautionary — ihtiyati

Projected shifts in Mediterranean sea-surface temperatures pose a distinctive set of adaptive challenges for Turkish aquaculture, whose growth has been underpinned by the thermal tolerances of its two flagship species — gilthead sea bream and European sea bass. Empirical evidence already documents altered growth performance during summer thermal peaks, heightened susceptibility to pathogens at the upper limit of the species’ preferendum, and episodic mass mortalities associated with stratification events. Responses that merely optimise existing production regimes are unlikely to prove durable; a more transformative adaptation agenda would diversify the species portfolio towards thermally resilient candidates, reconfigure site selection on the basis of downscaled climate projections, and integrate insurance mechanisms that reflect the non-stationary

distribution of extreme events. Such reorientation, however, requires institutional capacities — scientific, regulatory, and financial — that are currently unevenly distributed across the sector.

Sorular:

1. Which effect of climate change on Turkish aquaculture is NOT mentioned?

A) altered growth performance during thermal peaks
B) heightened susceptibility to pathogens
C) episodic mass mortalities linked to stratification
D) the complete disappearance of sea bass from the Mediterranean
E) challenges at the upper thermal preferendum

2. What does the author mean by a "transformative adaptation agenda"?

A) minor tweaks to existing practices
B) a fundamental reconfiguration including species diversification, site selection, and insurance
C) complete abandonment of aquaculture
D) return to wild capture only
E) waiting for governmental solutions

3. What is the author's concluding concern?

A) that there are too many scientists in the sector
B) that the needed institutional capacities are unevenly distributed
C) that climate change has no effect on aquaculture
D) that insurance is always unnecessary
E) that Turkish aquaculture has already fully adapted

💡 **Dil İpucu: "Precautionary Principle" — Politik Bilim Dili**
"Precautionary principle" = ihtiyat ilkesi; kesin bilimsel kanıt olmasa bile önlem alma yaklaşımı. Çevre ve gıda güvenliği metinlerinde temel bir politika aracıdır.

C2 — Cevap Anahtarı

C2 — Paragraf 1: Epistemological Foundations of Seafood Authentication

Cevap: B) because reference databases retain taxonomic gaps and mislabelled entries. Açıklama: "Retain taxonomic gaps and, at times, mislabelled entries that propagate through subsequent analyses." Yöntemin doğruluğu, referans veritabanının kalitesine bağlıdır.

Cevap: C) no single method is epistemically sovereign. Açıklama: "Treats no method as sovereign; rather, convergent evidence across orthogonal platforms." Yazar yöntemsel çoğulculuğu ve yakınsayan kanıt standardını savunur.

Cevap: B) moving from spectra to authenticity claims risks unwarranted conclusions. Açıklama: "Inferential leap" = çıkarımsal sıçrama; modeli destekleyen varsayımlar açıkça kurulmazsa sonuçlar savunulabilir olmaktan çıkar. Örtük model varsayımlarının eleştirisidir.

C2 — Paragraf 2: Ocean Governance and the Tragedy of the Commons

Cevap: B) It oversimplifies the asymmetric contributions of different actors. Açıklama: “Tends to obscure the heterogeneity of the actors involved.” Metafor güçlü ama homojenleştirici; farklı filoların katkıları eşit değildir.

Cevap: B) community-level institutions nested in broader frameworks can be effective. Açıklama: “Community-level institutions, when nested within broader regulatory frameworks, can forestall the tragedy.” Polisentrik yönetişim modeli.

Cevap: C) They show promise but have not yielded an unambiguous template for ocean stewardship. Açıklama: “None, it must be conceded, has yet produced an unambiguous template.” Yazar tartışmalı ama umut verici bir bakış sunar; kesin zafer ilan etmez.

C2 — Paragraf 3: Rethinking Protein Transition in an Aquatic Context

Cevap: B) Aquatic proteins deserve a more central role and the debate should be reframed. Açıklama: “Analytically tenuous … a more intellectually honest discourse would treat aquatic and terrestrial pathways as complementary.” Yazar yeniden çerçevelemeyi savunur.

Cevap: B) because they perform favourably on multiple LCA impact categories per gram of utilisable protein. Açıklama: “Outperform their terrestrial counterparts on multiple impact categories.” Karasal kaynaklara kıyasla çok kriterli çevresel üstünlük.

Cevap: B) cultural acceptability, governance maturity, and distributive justice. Açıklama: Metin çok-eksenli bir analiz çerçevesi sunar; sosyal ve kurumsal faktörlere işaret eder. Protein transition çok boyutludur.

C2 — Paragraf 4: The Ethics of Precision Aquaculture

Cevap: C) carefully ambivalent, calling for ethical scrutiny. Açıklama: Yazar kazanımları kabul eder ama etik sorular yöneltir: “ethical interrogations that deserve more than cursory treatment.” Dengeli eleştirel duruş.

Cevap: D) the wholesale banning of aquaculture. Açıklama: Yazar yasak önermez; etik sorgulama çağrısı yapar. Diğer seçenekler metinde açıkça yer alır. Negatif tarama.

Cevap: B) central to legitimate technology deployment. Açıklama: “Far from being peripheral, these questions constitute the normative core.” Normatif = değer yüklü; “core” = merkez. Etik, dağıtımın meşruiyet ekseni.

C2 — Paragraf 5: Valuation of Marine Ecosystem Services

Cevap: B) they are susceptible to hypothetical bias. Açıklama: “Stated-preference surveys are susceptible to hypothetical bias.” Katılımcıların hipotetik ödemeye ile gerçek ödemeleri farklılaşır.

Cevap: B) that monetising cultural attachments may distort what is being protected. Açıklama: “Assigning monetary values to … risks misconstruing the very nature of what is being protected.” Ahlaki-epistemik eleştiri: her değer parasal ifadeye indirgenemez.

Cevap: B) combine technical rigour with epistemic humility. Açıklama: Son cümle reçete niteliğindedir: “pair technical rigour with epistemic humility.” Sayılar tek başına karar değil, karara girdi olmalıdır.

C2 — Paragraf 6: Climate Change and Adaptive Capacity in Turkish Aquaculture

Cevap: D) the complete disappearance of sea bass from the Mediterranean. Açıklama: Metin total yok oluş öngörmez. Diğerleri açıkça listelenen empirik gözlemlerdir. Aşırılıktan kaçınma.

Cevap: B) a fundamental reconfiguration including species diversification, site selection, and insurance. Açıklama: Yazar “transformative” = dönüşümcü yaklaşımın bileşenlerini açıkça sıralar. Incremental değil, yapısal değişim.

Cevap: B) that the needed institutional capacities are unevenly distributed. Açıklama: “Institutional capacities — scientific, regulatory, and financial — that are currently unevenly distributed.” Adaptasyon kapasitesinin eşitsiz dağılımı sektörel kırılganlık yaratır.

✅ C2 Seviye Öz Değerlendirme

- ☐ Felsefi/epistemolojik tartışmaları takip edebiliyorum.
- ☐ Akademik İngilizce'de nüans farklarını ayırt edebiliyorum.
- ☐ Karmaşık argümantasyon yapılarını analiz edebiliyorum.
- ☐ Bu seviyedeki metinleri rahat okuyup yorumlayabiliyorum.

Kelime Öğrenme Stratejileri

Bağlam İçinde Öğrenin

Bir kelimeyi tek başına ezberlemek yerine, cümle içinde öğrenin. Kısım I'deki örnek cümleleri yüksek sesle okuyun.

Kelime Kartları Oluşturun

Bir yüze İngilizce terimi, diğer yüze Türkçe karşılığını ve bir örnek cümle yazın. Günde 10 kart çalışın.

Tematik Gruplar Halinde Çalışın

Birbiriyle ilişkili terimleri birlikte öğrenin: freezing, thawing, cold storage, cold chain gibi terimleri bir blok olarak çalışmak hafızayı güçlendirir.

Okumayla Pekiştirin

Kısım I'de öğrendiğiniz terimleri Kısım II'deki okuma metinlerinde arayın. Bir terimi farklı bağlamlarda görmek kalıcı öğrenmeyi sağlar.

Aktif Kullanın

Öğrendiğiniz terimleri günlük notlarınızda, ödevlerinizde veya arkadaşlarınızla konuşurken kullanmaya çalışın.

Düzenli Tekrar Edin

Aralıklı tekrar araştırmalarına göre (Ebbinghaus, 1885) en etkili tekrar aralıkları: 1 gün, 3 gün, 7 gün, 14 gün, 30 gün sonra.

Son Söz: İngilizce Okuma Becerisi Nasıl Gelişir?

• Her gün en az 15 dakika İngilizce okuyun. Düzenlilik, yoğunluktan daha önemlidir.

• Bilmediğiniz her kelimeyi sözlükten aramayın — önce bağlamdan tahmin edin, sonra Kısım I'den kontrol edin.

• Okuduğunuz metinleri sesli okuyun. Bu hem telaffuzunuzu hem okuma hızınızı geliştirir.

• Öğrendiğiniz yeni kelimeleri bir deftere yazın ve haftalık tekrar yapın.

• Sınav hazırlığında zaman tutarak pratik yapın — gerçek sınav koşullarını simüle edin.

• Bu kitaptaki metinleri ilk geçişte anlamadıysanız endişelenmeyin — tekrar okumalarda mutlaka daha iyi anlayacaksınız.

Geri Bildirim
Bu kitapla ilgili önerilerinizi, hata bildirimlerinizi veya ek içerik taleplerinizi zaydealcicek@gmail.com adresine gönderebilirsiniz.

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